Deltares Strategic Agenda 2018-2021

Enabling Delta Life
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This Strategic Agenda for 2018-2021 is being published even before the end of the period covered by the last Deltares Strategic Plan because all the Applied Research organisations (TO2) synchronise their planning for the longer term. This is also an excellent opportunity for Deltares to update, where necessary, the goals we have formulated previously. We aim to be adaptive, not just in the formulation of our strategic goals but also in our work on deltas worldwide. This document looks four years ahead but that horizon is an artificial one. Where real events require an acceleration or a change in our course, we will intervene before then. This Strategic Agenda outlines our objectives for development and sets out a direction, but it is not cast in stone. That is why we thought the term Strategic Plan was no longer appropriate.

In our last Strategic Plan, we stated our ambition to be an international ‘Triple A’ institute in the field of water and the subsurface. We haven’t been sitting on our hands since then, and that can be seen in our results. There is increasing international awareness and appreciation for our knowledge, as became clear from the recent evaluation by the Schaaf Commission1. We score well in terms of quality and impact.

As a result, we are seeing an increase in the amount of work from outside the Netherlands. We need this international knowledge to maintain the knowledge base for the Netherlands as well. Investments in that knowledge base are declining sharply, and that is affecting the vitality of the Deltares organisation. That is an area where we do not now have A status. In other words, it is preventing us from being ‘Triple A’ and excelling, both now and in the long term. The implication is that we must develop our knowledge further on the basis of assignments and partnerships outside our own country, and make the case for more government investment in a healthy knowledge base for the Netherlands.

Enabling Delta Life is our mission and it will remain so in the years to come. The solutions needed to fulfill that mission in the future require substantial innovative capacity from us all. The changes in the climate make that inevitable. So there are concerns for Deltares, but also opportunities. We have mapped out the challenges and ambitions in discussions with our stakeholders and our own staff. In addition, we have drawn on the insights from the recent Evaluation Study of Organisations for Applied Research (Schaaf Commission, February 17) and other relevant national and international reports as input for this Strategic Agenda. Where we see changes of strategy by comparison with the previous plan, they will be stated in this document. Where we are currently successful, we will be continuing full speed ahead.

1 Evaluation study of organisations for applied research (TO2), final report, sub-evaluation for Deltares, February 2017
The Deltares motto is ‘Enabling Delta Life’. We have been delivering reliable expertise about water and the subsurface for almost a hundred years. Our history began with the construction of one of the largest hydraulic-engineering projects ever: the Zuyderzee Works. And our knowledge is still contributing to the preservation of robust dikes, dams and dunes that prevent regular flooding in large parts of the Netherlands.

These days, we apply our knowledge and skills across the globe. We work on microorganisms, mega-dams and everything in between. We engage in scientific research, set up trials and get out into the field to test the results. And in the end, we make sure that our knowledge can be used by others. We share our knowledge because we are convinced that an ‘open community’ approach creates opportunities to do things even better and to learn from one another. In that way, we come up with smart innovations that benefit people, the environment and society with applications that improve flood risk management, enhance economic returns and benefit nature. Integrated and sustainable solutions. Solutions that may not always be the most obvious way ahead. Call us headstrong, but we believe that we are only really relevant when our knowledge benefits society as a whole.

We are a foundation and we work on a non-profit basis. We deliver knowledge to governments, social institutions and companies, and in that way allow them to provide the best social services, solutions or the best propositions. As indicated in the foreword, we are only halfway through the planning period of the current strategic plan (2015-2018) as we are drafting this strategic agenda. We are on track to achieve the objectives in that plan. For example, our revenue increased by almost 5% in 2014-2016, bringing the target of 10% for the end of 2018 within reach. Revenue from abroad also increased by about 20% in 2014-2016. At the start of 2017, we have a healthy international portfolio that brings revenue of 40 million in sight for 2018. Revenue from Dutch government projects fell by 10% in 2014-2016 due to a sharp reduction in the contribution from the Dutch government and contract research for Rijkswaterstaat. This was partly offset by more work for local authorities. Work for the private sector increased by 20% in 2014-2016 to approximately 36 million. This means that the target for the end of 2018, in other words 40 million in revenue from private bodies, is already within reach.

1.1 Our mission
We stand for ‘Enabling delta life’. We use our top-level knowledge in order to open up the way to innovative and sustainable solutions for global issues relating to the use, and the risks, of water and the subsurface.
That will continue to guide our activities in the time to come; our mission helps us to continue focusing on the issues where we can make the difference with our knowledge throughout the world, allowing us to use our top knowledge in the Netherlands to address the issues facing our home delta. We intend to excel both nationally and internationally. Our ambition is to be an acknowledged ‘Triple A’ institute in the area of water and the subsurface, both nationally and internationally.

Our added value is that we link knowledge to the market and the needs of society, making a major social impact and maximising the return on innovations in the area of water and the subsurface. We are being more and more successful in terms of increasing our social and economic impact, as has also been demonstrated by the evaluation of the Schaaf Commission: ‘We are impressed by the quality and impact of Deltares’. But there is still work to be done, and we must continue to work on our quality and the impact we make.

We make knowledge applicable; it must not get shelved in research reports and it must make a genuine contribution to society. And we share our knowledge actively with our partners: we dare to share. We focus on five core themes in the field of delta technology: Flood Risk, Ecosystems and environmental quality, Water and subsoil resources, Delta infrastructure and Adaptive delta planning.

**1.2 Knowledge and research programming**

We implement the Strategic Agenda in our own research programming, which looks four years ahead. The aim is to further strengthen the leading role that the Netherlands plays in the area of water and the subsurface. We have described the associated choices in ‘The World of Deltares’, a digital overview of our research programming linked to the themes listed here. Every year, these ambitions are worked up into concrete research plans in close collaboration with the relevant Top Sectors, the ministries and Rijkswaterstaat. This year, we will be updating our research programmes, in part on the basis of the recommendations of the Schaaf Commission and the Knowledge Impact Audit (KIA) conducted previously. We will be focusing more on a limited number of specialist areas where we want to excel.

Impact-driven work is the basis for our enduring success. We link knowledge development in our themes to the challenges facing society and tailor our research programme accordingly. In doing so, we follow the line adopted in the Strategic Plan for 2015-2018, focusing on our themes: Flood Risk, Ecosystems and environmental quality, Water and subsoil resources, Delta infrastructure and Adaptive delta planning. An improved understanding of these themes is crucial in the development of solutions for the challenges facing society. We will discuss our ambitions for these themes in greater detail in this Strategic Agenda.

**1.3 Our partners**

The Dutch institutions for applied research (TO2) are pre-eminent specialists in valorisation, as is evident from the letter to the Dutch parliament ‘Science with impact’. Technological innovations are key to making the Netherlands prosperous. A lot of parties in the golden triangle (government, business and research institutes) are collaborating in this area, and that includes Deltares. We are one of the many links in the overall innovation ecosystem that the Netherlands has to offer. Innovations arise as business, universities, research institutes and governments look for solutions to the...
social questions of the future. We work with this entire network of partners, not only separately but also collectively in consortiums. We remain committed to strategic alliances with these partners, as set out in memorandums of understanding covering several years.

1.3.1 Government
The Dutch government is our main client and knowledge partner. That is understandable given the Deltares remit. Two thirds of our contract research comes from the government and one third comes from business. We have alliances and projects involving all government authorities in the Netherlands: municipal authorities, water authorities, provincial authorities and central government. Increasingly, research involves collaboration with end users, for example in living labs. In that respect, the government is increasingly an alliance partner as well as a client. The Ministry of Economic Affairs is the lead partner for Deltares but many of our projects and research programs involve the Ministry of Infrastructure and the Environment, with Rijkswaterstaat as a major contractor. We also work a lot for governments internationally. We maintain the knowledge base in our areas of expertise for the Netherlands. The knowledge base is the foundation of our knowledge economy and it is vital to be in a position to respond to new scientific and social developments, and to provide solutions for the problems of today and tomorrow, such as flood risk management, the renovation of infrastructure, and energy and food supplies. Incidentally, we see pressure on this knowledge base due to the reduction of government funding. This issue will be returned to below.

1.3.2 The business sector
For several years now, we have been making efforts to strengthen our alliances with business, not least in, and in collaboration with, the top sectors: one third of our revenue comes from private bodies. Our ambition is to raise this share to approximately 40% so that our innovations are implemented where they can contribute value and so that we can, at the same time, continue to provide an adequate response to requests from government. We share our knowledge actively with both government authorities and business: we dare to share. We collaborate with SMEs and scale-ups in Joint Industry Projects (JIPs) and Public-Private Partnerships (PPPs). Our knowledge is the accelerator of the innovations here, and it finds its way to the market and society through business.

We do not compete with the Dutch business sector in our own country. We have agreements in this respect with, among others, engineering firms. Those arrangements have been set out in detail in an agreement with NL Ingenieurs. In other countries, we are happy to collaborate with Dutch companies, for example in consortiums on tenders for government authorities, so that those companies can make smart use of our knowledge on their projects. In other words, we work to strengthen the competitive position of Dutch business.

1.3.3 Universities and research institutes
Universities and other research organisations such as our fellow TO2 institutes are important partners for us in knowledge development. We draw on universities for new knowledge; they provide us with both ideas and people. We share employees extensively: from professors to doctorate and undergraduate students.

In this theme, the development and application of knowledge is central to increasing protection against flooding from the river and the sea. The main aims of the theme are to reduce the loss of human life, and the social and economic impact of flood disasters, and to provide action perspectives. This is a very important subject for the Dutch delta. The ambition of the theme is demanding: to be the world leader in the area of flood risks by combining the knowledge of flood risk management, the physical knowledge of water levels, waves and flood defences, and knowledge about warnings (including early warnings) and how to act. The theme plays a major role in the Dutch research world and it also defines the image of the Netherlands Inc. in other countries.
We conduct large joint research projects both nationally and internationally, we engage in research together in living labs such as the Sand Motor and the Marker Wadden, and propose the major research agendas together. We contribute to the ‘Blue route’ in the National Science Agenda. Deltares is involved in approximately fifty R&D projects in Europe, in many cases as the coordinator or in a leadership role. In Climate-KIC we work with others on generating awareness of investments in innovative climate-adaptation solutions. We play an active role in both national and international knowledge networks. Our own research programming is committed to further deepening three scientific priorities: multi-resolution modelling, climate adaptation and nature-based solutions.

We are upgrading our alliances with national research institutions such as the Royal Netherlands Meteorological Institute (KNMI), the Dutch National Institute for Public Health and the Environment (RIVM) and the Netherlands Environmental Assessment Agency (PBL). We are also continuing our collaboration with the TO2 institutions. We coordinate our joint actions and research work in the TO2 federation.

1.3.4 Top sectors: collaboration in the golden triangle

The Top Sectors were set up in order to improve the match between research and the needs of the business sector. In the Top Sectors, and particularly Water, but also in Energy and Transport, and Logistics, Deltares continues to collaborate with the Dutch business community on knowledge development and innovations. These alliances further strengthen the competitive position of the Netherlands. Even though it is still unclear to what extent a new government will continue the top sector policy in its current form, we will continue to focus on maintaining existing public-private partnerships and on developing new ones.

In this way, we not only cooperate intensively with knowledge partners, governments and business as part of the top sector policy but also, of course, in other programmes such as the National Water and Climate Knowledge and Innovation Programme (NKWK) and the National Science Agenda (NWA).
In our previous Strategic Plan, we described the worldwide developments that we expect by sketching a picture of the Netherlands and the world in 2050. Many of these developments are continuing unabated: technological developments are opening up ever more opportunities for economic growth, a green and sustainable living environment is becoming increasingly important, fossil fuels are being replaced entirely by sustainable energy, and food is being grown not only on land but also at sea (or printed in 3D). There are a number of global developments that will have a major impact on the work of Deltares and therefore our strategic choices. In the Netherlands, local and regional authorities are increasingly interested in the circular economy, the energy transition and spatial adaptation.

2.1 Climate change in top gear

The latest research on climate change provides little cheer. The ice caps are melting faster than expected as evidenced by the permanent monitoring of the National Snow and Ice Data Center (NSIDC). Global warming is moving into top gear. The objective from the Paris Climate Agreement — ‘maximum warming of 2°C’ — seems to be moving out of reach. More areas in the world, including the delta of the Netherlands, must prepare for rapid sea level rise. Particularly against a backdrop of rapid population growth and urbanisation in these areas, which means that more food will have to be produced to feed all these mouths. Urgent action is required but the message doesn’t seem to have got through to everyone.

In the Netherlands, flood risk management must continue to be a major priority. Things that have almost become second nature for many will be less straightforward in the future. Weather conditions are becoming more extreme and so water must be removed or stored faster. Once a thousand years of land subsidence is stirred into the equation, the problem is clear: the physical system is being strained to the limits. In many areas, people are starting to realise that action is needed. Good data, innovative techniques and the understanding and acknowledgement of the land-subsidence problem will be needed to devise targeted strategies and solutions.

2.2 The role of knowledge in the public debate

At the socio-economic level, nationalism and populism are on the rise in the world, with protectionism in their wake. Europe is no exception. It has become more difficult to collaborate on the European or global issues mentioned here, even though joint efforts are needed given the size and complexity of the challenges. And there is also the rise of ‘fact-free politics’ in which debate is dominated by impressions rather than facts. Science is under pressure, but ‘evidence-based solutions’ can actually provide an answer here. With a focus on other types of knowledge, such as the practical experience of local residents, in order to increase acceptance and therefore the impact. This can provide

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8 As can be seen in, for example, the National Raw Materials Agreement, January 2017
9 See Energy Agenda, Towards low-carbon energy supplies, Ministry of Economic Affairs, December 2016
10 As evidenced by the permanent monitoring of the National Snow and Ice Data Center (NSIDC)
11 Source: Intergovernmental panel on climate change (IPCC), Climate change 2014, Synthesis Report
society at large and the political world with support in difficult times. A research institute such as Deltares is then seen as a ‘last resort’: when people really don’t know what to think any longer, they turn to Deltares. This implies that our research and our products must be of the very best quality and that we need to maintain our independent position.

2.3 Energy transition
Pressure on our energy reserves is increasing, not only because of the growing world population but also because the size of middle class is rising, as are living standards.

Alongside the innovations required to meet increasing demand for sustainable energy, solutions are needed to reduce energy consumption (and therefore carbon emissions). This energy transition has now begun and it is a major focus in the Netherlands. The share of sustainable energy in the total energy mix is increasing rapidly, not only worldwide but also in the Netherlands. The trend would seem to be irreversible. The fossil-fuel industry is clearly struggling.

The energy transition involves difficult dilemmas. It is sometimes difficult to make sustainable decisions. For example, biofuels have a positive impact on the carbon footprint (slowing down climate change) but they have a negative effect on the water footprint (high water consumption). An understanding of water and the subsurface is vital in the energy transition. How do you deploy water resources effectively, how do you store heat and cold in water and the subsurface, how do you build sustainable wind farms at sea, how can you produce energy from the tides and sewage sludge? These are just some of the questions that need to be addressed.

2.4 Big data and artificial intelligence
Developments in the field of ‘big data’ are moving quickly. We are seeing an exponential growth in the amount of data being stored. Combining datasets generates new insights and technological possibilities. The Aquamonitor is a good example of the new insights that can be achieved by combining datasets, which are then made accessible to everyone. Artificial intelligence is the next step: intelligent systems and robots will take over human capacity for thinking and action. The social impact will be far-reaching. Artificial intelligence can help Deltares to resolve problems related to water and the subsurface. One example is data-driven design, which involves the use of datasets relating to water and the subsurface. The datasets are becoming ever more complete, in part owing to the use of measuring and monitoring (and also citizen data, with residents collecting and sharing data using apps and social media).

2.5 Circular economy
The notion of the circular economy is still mainly interpreted as the ‘re-use and recovery of raw materials’. However, raw materials, energy and water cycles are closely inter-related. Deltares therefore focuses primarily on this interaction. We also see that a circular economy makes an important contribution to preventing shortages of resources such as water. The development of ‘nature-based solutions’ is of interest in our field because natural, sustainable materials replace non-sustainable materials with a large footprint (such as concrete or steel).

2.6 Replacement and renovation of infrastructure
New and more efficient modes of transport, such as ever-larger ships, require changes to infrastructure. That is true around the world as a whole but also, and perhaps even more emphatically, in the Netherlands. The majority of our shipping channels, roads, tunnels, bridges, dams, locks and other structures have been in place for decades and they are urgently in need of replacement or renovation. Between now and 2030, a total of € 250 billion will be needed for roads, railways, municipal infrastructure, flood risk management and underground infrastructure. Increasing mobility means that infrastructure sclerosis will worsen in the years to come. In addition, sea level rise, in combination with soft soils and land subsidence, represents an additional challenge for the management and maintenance of the infrastructure in the delta of the Netherlands. All these developments are now faster than ever, in part as a result of the increasing pace of technological developments. We are building for the next 50 to 100 years, even though the requirements may change drastically from day to day. That has an impact on the Netherlands, the work of Deltares and our selected strategy: the designs we commit to, the way we open up our knowledge, the parties we work with, the foreign opportunities we target, our sources of funding, adaptive capacity, and so on. In the next chapter, we turn to our agenda for 2018-2021, while emphasising that we wish to adopt an adaptive approach to that agenda. Because developments are moving fast and they are sometimes unpredictable. We therefore continue to monitor annually whether our agenda is still in line with the questions facing the Netherlands and the world and we change our course where necessary.

13 See aqua-monitor.appspot.com
14 See article ‘The robotics revolution is coming. Should economists be worried?’, World Economic Forum, March 2017
Deltares has challenging ambitions: we want to excel nationally and internationally as a research institute in the field of water and the subsurface. We focus on three basic elements that are essential to our ambitions. We already mapped out this course in our last Strategic Plan and we will stick to it in the time to come.

First of all, we have excellent knowledge at the top international level. We opt for international excellence in several disciplines. In some disciplines, we collaborate with other research institutes and top organisations. We select the areas where we can be genuine world leaders. But first and foremost, we want to be in the top flight in terms of our problem-solving power, contributing to the Dutch reputation in the field of Delta Technology.

In addition, our work has added value for society. That is something we want to be clearly visible\(^\text{16}\). People should understand that our knowledge is used to address important social issues and that it is indispensable if we are to maintain the habitability of deltas sustainably. We must combine our excellent knowledge in the exact sciences with the social and economic sciences if we are to enhance our social impact. Some of that knowledge is present in our own organisation and it is complemented by knowledge acquired during work with our partners. That is the basis for the inclusion of our integrated knowledge in proposals and projects. In areas such as South-East Asia, delta issues are no longer limited to delta technology alone. Political, demographic and economic factors play a major role in the development of the appropriate solutions.

The link between our knowledge and the market is an important factor that helps us to achieve our ambitions. Our research generates added value (financial and otherwise) for government authorities and business. We demonstrate those benefits in ‘business cases’ that, for example, quantify the costs saved for society. Our research also strengthens the competitive position of Dutch business. We are always looking for smart alliances ourselves to take our knowledge further and actually turn it into concrete solutions and products that can be brought onto the market.

This strategy, which is based on the three cornerstones of the Deltares philosophy, has proven successful in the recent past. There is therefore no reason make any drastic changes. We do, however, wish to emphasise some different priorities on the basis of anticipated developments (see Chapter 2). Those emphases will be placed on five areas that we believe will be important in the time to come. In random order:

\(^{16}\) See also Evaluation study of organisations for applied research (TO2), final report, sub-evaluation for Deltares, February 2017
### 3.1 Area 1: Contributing visibly to the international sustainability agenda

It is important to show how our knowledge contributes to solving global climate and sustainability issues. That is our international agenda for the coming period: we want to direct our efforts more, and more visibly, in line with the global sustainability agenda stated in the sustainable development goals of the United Nations. This global agenda has been broken down into 17 goals. The work of Deltares can be linked to almost all of these goals. In the context of corporate social responsibility (CSR), we also want to showcase this aspect of our work and call on our partners to do the same; that makes the social impact of our work more visible. Even so, we want to focus primarily on those goals where we believe that our applied knowledge can generate most added value: clear water and sanitation (6), renewable energy (7), innovation and infrastructure (9), sustainable cities and communities (11), climate action (13) and life below water (14). We will be making extra efforts in the time to come to achieve these goals and demonstrating how our current research programmes and knowledge themes contribute.

We are already fully committed to sharing the knowledge that we acquire in this way, for example by ‘packaging’ it in open-source software. Nevertheless, we want this aspect of our work to be even more emphatically positioned as part of the sustainability agenda. As an international knowledge partner, we want to be involved in discussions at the highest international level as a consultant to global parties working on climate-related issues, including the World Resources Institute (WRI), the World Bank and the United Nations. We also want to be a knowledge partner for the Dutch government and the national business community.

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### WATER AND SUBSOIL RESOURCES THEME

The central focus of this theme is knowledge about natural resources in the subsurface and the availability of water in river basins and deltas. The main aim of the theme is to manage the resources sustainably and therefore to secure them in the future. We collect knowledge about the availability of water and raw materials for various uses and develop action perspectives for resolving shortages in the short and long terms. Sustainable development goal 6 (clean water and sanitation) is central, with the main priorities being the interaction between water, food and energy issues, and in particular the relationship between water scarcity and conflicts.

With this theme, we want to determine the agenda in the field of information systems for water security. In addition, we want to use this theme to maintain our key position with respect to sustainable water distribution issues, water supplies and salinisation, particularly with regard to the Freshwater Delta Programme, but also in the area of operational water management (intelligent water management).

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### Table 1: Contribution of themes to social challenges

<table>
<thead>
<tr>
<th>Theme</th>
<th>Focus areas</th>
<th>Sustainable development goals</th>
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<tbody>
<tr>
<td>Flood Risk Theme</td>
<td>• Flood risk assessment: pluvial, fluvial and coastal</td>
<td>13 Climate action19</td>
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<td></td>
<td>• Understanding flood risk in a multi-hazard context</td>
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<td></td>
<td>• Early warning and crisis management</td>
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<tr>
<td>Ecosystems and environmental quality</td>
<td>• Health Nexus</td>
<td>14 Life below water</td>
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<tr>
<td>theme</td>
<td>• Transition to circular economy</td>
<td>15 Life on Land</td>
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<tr>
<td>Water and subsoil resources theme</td>
<td>• Food Nexus</td>
<td>6 Clear water and sanitation</td>
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<td></td>
<td>• Water and Conflicts</td>
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<tr>
<td>Delta Infrastructure theme</td>
<td>• Energy Nexus</td>
<td>7 Renewable energy</td>
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<td></td>
<td>• Infra Nexus</td>
<td>9 Innovation and infrastructure</td>
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<td></td>
<td>• Transition to sustainable energy</td>
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<tr>
<td>Adaptive delta planning theme</td>
<td>• Transition to climate adaptation</td>
<td>11 Sustainable cities and communities</td>
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<td></td>
<td>• Urban resilience</td>
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<tr>
<td></td>
<td>• Climate Change Impact</td>
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<tr>
<td>Software Programme innovation</td>
<td>• (Big Data) Multi-Scale Modelling</td>
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17 Source: sustainabledevelopment.un.org

18 These goals are also linked to the Sendai Framework for Disaster Risk Reduction. See: http://www.unisdr.org/we/coordinate/sendai-framework

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17 Source: sustainabledevelopment.un.org
For example, we are tailoring our knowledge and research agenda 2018-2021 more closely to the knowledge agenda of, among others, Rijkswaterstaat, which is also addressing these climate and sustainability issues. We are working on increasing the robustness of urbanised delta areas in order to keep the consequences of climate change manageable. The ‘adaptation support tool’, for example, has been developed to show actors a range of measures that can be taken to cope with climate change. The tool helps urban planners and architects to include adaptation measures in their designs and to establish a clear picture of efficacy and costs.

3.1 Water and conflict
We develop the instruments and methods that identify the risks of violent conflict due to water shortages and provide possible solutions. We link our knowledge about water and the subsurface to socio-economic and cultural and/or political knowledge in order not only to identify water shortages (and the associated explanations) but also the social consequences, risks and action perspectives. Our partners include the Dutch Institute for International Relations Clingendael and the Netherlands Environmental Assessment Agency. In the coming period, we want to get this topic on the agenda of world leaders and scientists, and show them the choices available for improving the management and distribution of water as a scarce resource.

3.1.1 Looking for crossovers between food, energy, infrastructure and health
Our knowledge themes form the basis for our work, and they will continue to do so. But our understanding of water and the subsurface has also proven to be of added value for other social issues. These are issues where Deltares does not play a leading research role but where water and the subsurface are important factors in terms of developing solutions.

We want to contribute our knowledge more emphatically here. That process began in 2017 and it will continue in the years to come. We address topics that are high on the agenda both worldwide and in the Netherlands: food supplies, energy, infrastructure and health. We see the same topics in the European Grand Societal Challenges (Horizon 2020)\(^\text{19}\).

These areas are closely linked to the Sustainable Development Goals mentioned here and our current knowledge themes (see Table 1).

We are always looking at how our system knowledge can contribute specifically to the challenges that have to be faced; we target them in our knowledge development. This will also be seen in the updating of our research strategy for 2018-2021, which will come after this Strategic Agenda. The scientific priorities will also be elaborated in this research strategy.

3.2 Area 2: Focus in our foreign strategy
By working internationally, we work on our mission of Enabling Delta Life. In the top sector context, we collaborate with the government, NGOs, research institutions and the Dutch business community to strengthen the competitive position of the Netherlands. To tackle social challenges and to further the interests of Dutch business. And also to improve our chances of recruiting knowledge workers for Deltares (temporarily or permanently). This is one way in which we contribute to achieving the Dutch government’s International Water Ambition\(^\text{21}\), which argues in favour of a stronger connection between national and international water ambitions.

In addition, projects abroad also give us the opportunity to develop relevant knowledge for the Netherlands. For example, the knowledge we are currently using in the ‘Smart Pumping’ Joint Industry Project, in which energy savings are achieved by pumping water out of the polders at the best times, builds on knowledge we acquired in the past during projects in the United States.

We have an ambitious target for our foreign activities: in the coming period, we want to work towards generating about 40% of our revenue from outside the Netherlands. Recognition as an international top player will depend on achieving that goal.

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19 See ec.ec.europa.eu/programmes/horizon2020
20 Converging flows - International water ambition, Dutch National Government, February 2016
21 Source: Total Investments in Science and Innovation 2014-2020, Rathenau Institute, April 2016
Given our current international order book and projected orders, it can be done.

But we need to stay critical at all times, to select countries, clients and projects on the basis of their potential for regional growth, opportunities to learn, the probability of repeat business, rates etc.

We must operate effectively with our marketing budget and make a regular assessment of the need for our permanent presence in certain countries. We have a targeted approach to the selection of our strategic alliances abroad. The selected alliances may vary per theme. Our aim is to work with excellent knowledge partners in areas where we believe we can acquire a market share. This depends on establishing, maintaining and extending good contacts. Our alliances are not irreversible commitments. Every year we monitor and evaluate the world stage to see whether changes to our international strategy are needed. Obviously, that benefits our adaptive capacity and our market opportunities.

3.3 Area 3: Strengthening the national knowledge base

The competitiveness and earning capacity of the Dutch economy depend crucially on our national knowledge base, to which Deltares, like the other T02 institutes, makes a significant contribution.

To maintain the knowledge base in the field of water and the subsurface for the Netherlands, Deltares needs sound underpinning, but there has been pressure on our financial base for some time. There will be negative consequences in the long term on our capacity to act as a high-quality knowledge partner for government authorities and to contribute to Dutch business.

We are therefore continuing to press the point in our discussions with the Dutch government that a healthy level of government investment is needed for the long-term development of knowledge so that we can continue to fulfill our role as an applied research institute. The Soete evaluation committee believes that 15-20% of revenue is the lower limit needed to establish a strategic knowledge base.

The current limited resources for long-term research mean we must continue to invest intelligently. We must also focus and make choices. We invest in those areas where we can make a difference, and use our resources to strengthen or enter into strategic alliances. We will also be making better use of EU research funds where we think that offers the best opportunities to learn from our partners and serve the market at the same time. We will further elaborate our strategic choices this year in the update of our research programme for 2018-2021.

To maintain the high quality of our knowledge, we make deliberate decisions to commit less to certain activities, or shut them down alto-
In the coming period, for example, we will not be developing all software ourselves and we will be using third-party software more where possible. We will also be scaling down or terminating our permanent presence in regions where the market conditions are unfavourable. For example, we recently decided to terminate our permanent representation in Azerbaijan.

In addition, we will no longer be engaging in European research as a stand-alone activity. We intend to work on European research only when it contributes directly to the goals of our research programmes. This ensures that we will obtain parallel financing and it will give us the opportunity to strengthen our European network. The European project Danubius is a good example here. In the coming period, we will also be intensifying our relationship with the Ministry of Infrastructure and the Environment, and Rijkswaterstaat. This is an important priority for us. Given, among other things, the planned replacement and renovation of our national infrastructure and the associated costs, it will be vital for us to programme more strategically with the ministry: we must further coordinate different research programmes and sources of financing so that the available resources will be used better.

A range of research programmes initiated by the government are currently moving from the planning to the implementation phase or have already done so. Examples are the Delta Programme for Spatial Adaptation, the High Water Protection Programme and the Statutory Assessment Instruments. In many cases, the transition is accompanied by the transfer of responsibility to local authorities, which often struggle with challenges of this kind. The result is an entirely new range of challenges for which a knowledge base is needed. Deltares can make the difference here with system and process expertise. We will therefore be intensifying collaboration with local authorities in the Netherlands in the time to come.

3.4 Area 4: Strengthening evidence-based reporting

The role that knowledge plays in public opinion and in decision-making processes is changing. There is an increasing tendency to intermingle facts and opinion. Accordingly, there is an even greater need for acknowledged expertise, particularly in areas involving major conflicts of interest. A strong knowledge base that is based on the latest scientific insights and tested in practice becomes crucial in this context. Evidence-based reporting will play an even greater role in our quality system. Our model results are always reproducible and our conclusions are based on hard and indisputable facts. We are also clear about margins of uncertainty and the associated risks. We intend to conform with the scientific integrity protocol stated in the VSNU report on the code of conduct for scientific practice22. We also work with an extra reviewer from our Scientific Council when socially sensitive issues are involved. Our research will be made publicly available as much as possible through Open Access publications. That also applies to computer programs that are distributed more widely on open-source platforms. Not only do we have a transparent and ethical approach to the facts, we are also open to the knowledge of other stakeholders. The ‘wisdom of the crowd’ is increasingly important in the public debate but evidence-based solutions are still needed. Deltares is in a unique position to deliver them but we need to make our voice heard. We plan to raise our profile and ensure that our knowledge can be found more easily, for example by establishing a stronger digital presence on issues where we want to set the agenda. We will be selecting a number of areas that will acquire a more prominent role in our communications, most of them related to issues where our contacts believe we should be seen and heard, and that are in the public spotlight, such as robust cities and fair access to water. This is not new to us but we will be intensifying our commitment in the time to come. We will be actively monitoring these areas and orchestrating our communications strategy accordingly.

3.5 Area 5: Investing in data and artificial intelligence

Hardware, data and software are developing rapidly and they are increasingly prominent in our lives and our work. Data-driven solutions now depend more on big data alongside traditional models. Measurements of system status are used directly as a basis for decisions, for example in operational water management. Working with big data is becoming commonplace and companies are emerging rapidly that deliver fast product development. Major investments are also being made in the development of artificial intelligence and robotics. As a result, it will be possible to make analyses of, for example, crisis situations much faster and easier. We believe there are opportunities to be grasped by combining big data with artificial intelligence and our system knowledge.

We are therefore continuing our full commitment to scientific developments in these fields, where possible in collaboration with other applied research institutes, as has already been seen in the way we have started to build up a track record, for example with the Aquamonitor23. We have also made multi-scale modelling a scientific priority. However, we are also making our own investments in measuring and monitoring, for example by conducting more field measurements.
Our unique combination of people, facilities and software are the basis of our success. They are the most important assets that make it possible for us to develop knowledge and deliver added value. They are indispensable to the acquisition and maintenance of a strong national and international position. As factors that are so crucial to our success, they therefore require our ongoing focus and investment.

Our thinking about sustainability and circularity relates not only to the world around us but also to ourselves. Our Corporate Social Responsibility leads us to adopt business principles that state how we want to operate honestly, sustainably and ethically. The UN Global Compact guides us. Obviously, these principles apply to our own staff but we also bring them to the attention of our alliance partners. Inside the organisation, we are engaged in unceasing discussions about these principles and how to apply them in practice.

We also ensure that our own house is in order. We look for ways to reduce our footprint in our own organisation and operations. For example, we plan to produce and store our own energy more, to reduce the number of kilometres we travel and to compensate where possible (we consult with NGOs to identify an appropriate adoption project).

4.1 People
We need top talent to achieve our knowledge ambition. This means both the optimal deployment and development of our people, and the recruitment and retention of new talent. After all, talent attracts talent.

In the coming years, therefore, there will be a stronger emphasis on talent development, sustainable employability, and recruiting and retaining new talent.

4.1.1 Talent development and sustainable employability
Talent development is about providing high potentials with encouragement and facilities. They are the pioneers of the future at Deltares, and we want to give them the opportunities they merit. Sustainable employability also remains important: the focus is on ownership and delivering added value. In other words, ongoing development, ongoing employability and market value. The combination allows Deltares to secure its position for the future and to maintain our flexibility.

There will be a range of actions in the years to come at the level of both the organisation and individuals.

- Strategic human-resources planning will contribute to the development and agility of both individuals and the organisation.
- Managers play a key role in the encouragement of top talent and the ongoing development of our workforce. That is why we invest...
in our managers by organising, for example, master classes, specials, intervision and community building.

- We encourage staff to take control of their own development in terms of knowledge vitality (professional development), personal development (such as external orientation and customer orientation), and their long-term national and international careers.
- We encourage feedback in both directions as a way of learning.
- We invest in our TOP training programme to facilitate the development of the desired competences.

4.1.2 The recruitment and retention of new talent
We will be focusing more on employer branding in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares on the labour market, and recruiting in the years to come. That involves positioning Deltares

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- We invest in our TOP training programme to facilitate the development of the desired competences.

We plan to set up a ‘learning pathway for young professionals’ for people joining our organisation.

4.2 Facilities
We have unique experimental facilities at our disposal such as the Delta Flume, the iD-Lab and laboratories like Utrecht Castel, and we also use field and monitoring activities. Our facilities are an essential part of our unique mix of research resources. The quality of our facilities is high thanks to the annual investments we make. The facilities play an important role in the validation of numerical models and are used extensively in our knowledge strategy. We also develop interesting datasets over longer periods during the multi-year research in our facilities. These datasets can then be used again for follow-up research. The development of our own datasets, alongside the smart use and integration of datasets from others, is increasing considerably in importance. We are refining our current instruments year on year and exploring the possibilities offered by new technologies such as the use of drones.

Our facilities have a major impact. They can save millions of euros, and that includes large amounts of taxpayers’ money. For example, the first test in the new Delta Flume showed that the planned replacement of a dike revetment wasn’t needed, allowing the Noorderzijlvest water authority to save 25 million euros. The social return from research facilities is clear but we could communicate it more clearly. We plan to do this using business cases. In the years to come, we intend to use the facilities to optimise ‘building with nature’ solutions. Our facilities also accelerate innovative processes and they are a regional, and even European, magnet for public and private funding. The vitality of our facilities will require extra attention in the time to come. Investments alone will not be enough to keep the facilities interesting and attractive in the future. The integral cost price for the use of the facilities is relatively high for private bodies. We can continue to use the facilities for future knowledge development only if we have a clear picture of the issues to which they can provide solutions. We will therefore be conducting an annual review on the basis of the knowledge strategy, and a ‘foresight function’ that is currently under development, to determine the role the facilities can play in future questions relating to water and the subsurface. That will give us a clearer picture of which changes, innovations and/or investments are needed to preserve the vitality of the facilities.

The Deltares research facilities are an integral part of the Dutch and European knowledge infrastructure. They are on the ESFRI roadmap, the initiative from the EU Hydralab, but they are also included on the list of large-scale research facilities of the Netherlands Organisation for Scientific Research NWO. They are unique in the world and play a role in helping Deltares to recruit national and international top talent.

4.3 Software: under the hood
Deltares aims to be at the centre of the world of digital soil and water tools, which are important carriers of our knowledge. In cooperation with national and regional authorities, companies and universities, we are continuing to work on their development in a range of communities. National and regional models in the Netherlands (including water models) are increasingly interconnected. There is also an increasing need for government authorities, business and knowledge institutes to be involved in this area and they are engaging more and more in the joint development of the instruments. The result is increasing efficiency, faster software development and better management of the process.

4.3.1 Making choices
We are committed to being an international leader with a limited number of products. For example in the field of data-driven, global models. That allows us to provide well-founded
The organisation for our ambitions

The organisation for our ambitions

4.4 Finances

Deltares is a non-profit organisation. It is estimated that approximately 60% of our activities can be classified as ‘non-economic activities’. Continuity is important for the long term: a robust financial position and liquidity are therefore essential. To maintain this financial position, we want a return of 2% on turnover. That return will allow for continued investment in knowledge, software and facilities to achieve and maintain our position as a Triple A research institute.

We have made major investments recently in our facilities and in the working environment. In the coming years, we will continue to invest approximately 5 million euros annually to keep up to date. The current contribution of 9.3 million euros from the Dutch government has been used for the purposes of financial planning for the time to come. To maintain our knowledge position and the knowledge base of the Netherlands, in other words the long-term vitality of Deltares, we need a total annual contribution from government of 15 to 20% (approximately 16-22 million euros) of total turnover.

With regard to the share in our sales to private bodies, we aim to increase this to approximately 40 million euros a year, as stated in section 1.2.2. We expect to be able to obtain 40% of our total revenue from outside the Netherlands in the coming years.

4.4.1 Research

We contribute here with our interdisciplinary approach, by making knowledge concrete and by actively sharing it with users. Examples are the development of action perspectives for land subsidence in the city of Gouda and the province of Flevoland, and Water-Sensitive Urban Design concepts for New Orleans and Rotterdam.

With this theme, we want to have a key position in the Netherlands in the field of developing action perspectives and in the application of adaptation pathways for water, climate and land subsidence.

Our ambition for this theme is to be the world leader in adaptive delta planning. We therefore intend to further develop our knowledge of water- and subsurface-sensitive urban design for resilient/climate-resilient cities.

4.4.2 Business development

Achieving this goal depends on having a mix of instruments and software that can be extended straightforwardly. We are therefore professionalising new releases and deciding to hive off older products. Depending on what we need, we develop some products ourselves and, where possible, we also use third-party software. It is therefore essential for us to know about, and use, products from outside our organisation.

We need to make more investments in the development, management and maintenance of the instruments. In the past, it was possible to finance these investments from projects and from the sales of the software products themselves. This will no longer be possible in the future because developments are so rapid. We are focusing on the expansion and further development of a set of basic building blocks that is expected to form the basis for the rapid development of prototypes and customised solutions.

We are also investing in software-related knowledge in technical areas such as algorithms, visualisation and user interfaces. However, our focus is also on skills relating to the setting up, management and implementation of software projects.

4.3.2 Adaptive software development

The pace of successive developments in the field of software is rapid. This creates opportunities but it also imposes stringent demands on our professionals with the right knowledge and flexibility, and to keep them with Deltares.

The Adaptive Delta Planning theme focuses on the integration and application of knowledge about water, the subsurface and infrastructure to support the sustainable development and design of delta areas.

Ongoing climate change and urbanisation require adaptive measures to keep cities liveable. There is a need for assistance with the development of action perspectives, developing concrete measures and surveying the impacts of measures. We contribute here with our interdisciplinary approach, by making knowledge concrete and by actively sharing it with users. Examples are the development of action perspectives for land subsidence in the city of Gouda and the province of Flevoland, and Water-Sensitive Urban Design concepts for New Orleans and Rotterdam.

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4.3.2.2 Adaptive software development

The pace of successive developments in the field of software is rapid. This creates opportunities but it also imposes stringent demands on our capacity to adapt. The strength of Deltares is in the integrated approach: we are experts in collecting data and information, in model development and model use, and in physical systems. The challenge is to find the right
Our Strategic Agenda for 2018-2021 was drawn up on the basis of discussions with stakeholders, staff, the Supervisory Board, the Advisory Council, TO2 institutes, ministries and national and international clients. In addition, a lot of research has been completed recently and reports have been published on applied research and the knowledge base in general, and Deltares in particular. All that input has been valuable in the identification of promising directions for Deltares. It also shows where the risks are located or which activities we may have to terminate.

It is very clear to us that our knowledge of water and the subsurface contributes to major, and urgent, social issues. Everybody who provided input was convinced of this. Climate change, in combination with the increase in the world’s population and the associated demand for natural resources, is creating an unprecedented ‘innovation hunger’. Solutions need to be smarter, more sustainable, and circular. That also applies to the Netherlands as a densely-populated delta below sea level. We are committed to those goals every day, with heart and soul. And we will continue down that road.

It is vital for us to continue our healthy alliances and share knowledge with governments, business and research institutes, and to continue to expand our network, both nationally and internationally. Because the challenge is too large and too urgent to tackle alone. So we trust that this Strategic Agenda is not only for us, but also for others. We look forward to the associated discussions in the years to come.

On behalf of the management and employees of Deltares,

Maarten Smits
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