

INTERVIEW

**PROFESSOR
PORTS AND
WATERWAYS
AT TU DELFT
MARK VAN
KONINGSVELD**

‘AS A SECTOR,
WE CAN BE
**MUCH BETTER
AT HANDLING
COMPLEXITIES.**’

Forged through his PhD study and more than a decade of research at Delft University of Technology and Deltares, Mark van Koningsveld found his professional calling in the application of science for decision-making. As a recently-appointed professor of Ports and Waterways at Delft University of Technology, he intends to inject the programme with his own strengths in digitisation, simulation and sustainability, building on the legacy of his predecessors.



Ports and waterways challenges invariably involve a range of disciplines. Progress requires teamwork, integral thinking and the ability to make complex trade-off analyses.

Can you describe all of the roles you hold at the moment?

At Van Oord, my title is Manager R&D Engineering. I am a member of the corporate taskforce that is responsible for aligning Van Oord's total innovation programme together with people in similar roles from different departments. The scope of that innovation programme includes everything that contributes to increased competitiveness in tendering and enhanced control of projects in execution for our three focus areas: dredging, oil & gas infrastructure and offshore wind. Personally I get most excited by innovations in the fields of data management and simulation, and sustainability. I do that three days a week. Within those three days, I spend roughly a half or full day working for 'Topsector Water & Maritiem' where I am the Corporate Secretary – there is also a Governmental Secretary. Our team supports the Topsector's day-to-

Meet Mark van Koningsveld

Armed with a Master's degree in Civil Engineering and Integrated Modelling and a doctorate in Civil Engineering from University of Twente, Mark splits his time as Professor Ports and Waterways at Delft University of Technology, Manager R&D Engineering at Van Oord and Corporate Secretary for Topsector Water & Maritiem, a Dutch agency which aims to advance global business activities in the water transport and maritime sectors. In addition, he is a member of the editorial board for CEDA-IADC's upcoming publication *Dredging for Sustainable Infrastructure* and co-organiser of the Dredging for Sustainable Infrastructure Conference taking place in Amsterdam from 19-20 November 2018.

thinking is of key importance to any ports and waterways engineer.

Do you believe that the university environment can support innovation in the industry?

It should. I think that typically for the civil engineering domain, there has always been a very strong link to practice already, for example with Rijkswaterstaat, Port of Rotterdam, contractors and consultants. So it's quite natural to have a close interaction between academia and practice. Many of our students find jobs with these organisations. It is interesting to notice that the students function more or less like 'containers' that transport knowledge they learn at TU Delft into those organisations. We also interact closely and regularly with industry partners to identify the relevant knowledge gaps experienced in practice. This way it is a continuous exchange that is mutually beneficial.

How do you combine your scientific and environmental work with your operational work?

I think that my working environment at Van Oord actually aligns pretty well with the working environment that I have at the university. At Van Oord, our innovations are focused on increased competitiveness in tendering and enhanced control of projects in execution. This involves continuous improvement and optimisation. In many cases, improvement and optimisation activities focus on logistics – sand, rock, monopiles, and so forth that need to be moved from A to B – which is done mostly with vessels. The operation of the vessels is influenced by natural (e.g. workability limits) as well as man-made constraints (e.g. spill budgets). So to some extent hydraulic infrastructure realisation has great similarities to traffic and transport in port areas and inland waterway systems. So as a matter of technical content, I'm focusing on similar things in many respects. Within Van Oord, the approach focuses on optimised practical application in a specific environment. Within TU Delft, the approach can be more theoretical and therefore it would be more generic.

Important steps in ports, as well as in inland water infrastructure planning, are to estimate future demand, future fleet composition, and establish a range of functional requirements that can then serve as a basis of design. Port planning and design then usually involves the definition of a range of alternatives. To enable

day operations. As of March 2018, I joined Delft University of Technology (TU Delft) for two days a week as professor Ports and Waterways.

What is your aim in bridging Tiedo Vellinga's legacy to your own ideas as you start this journey as a professor at TU Delft?

I found the group to be in a strong state. I want to build on the things he and his predecessors initiated, thus standing on the shoulders of giants. It looks like my enthusiasm for data management and simulation can strengthen approaches that are already in place. I notice that students are very eager to absorb the opportunities that digitisation and data science provide. It was an eye opener that many of the things that we consider to be new, are almost normal to them. I also have my own

background in Building with Nature (BwN) and sustainability issues that I can bring in. BwN is relatively new to the curriculum but it is clear that the subject is very popular with the students. Related MSc topics are in constant high demand.

Will you engage in cross-disciplinary research as a professor?

Ports and waterways challenges invariably involve a range of disciplines. Progress requires teamwork, integral thinking and the ability to make complex trade-off analyses. I believe that we should increase our capability to understand and grasp complexity. This requires careful listening and clear communication next to in-depth analyses. An interesting new way to investigate the beliefs of stakeholders and to transfer complex information is through a process of so-called serious gaming. So really cross-disciplinary

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objective selection, simulation of different alternatives is a strong method to support decision making. Logistical considerations, nautical traffic movements and environmental factors – whether natural or man-made – create the complex logistical puzzles that we are trying to solve.

What do you consider to be your biggest success and your biggest blunder?

My biggest success – or at least the thing that gives me the most energy – is the domain of BwN and within that, my own involvement in Van Oord's coral rehabilitation initiative. The steps we have been taking with ReefGuard are pretty unique and of that, I am really proud.

And my biggest blunder... haha! I don't know, maybe my biggest blunder is that I find it difficult to say 'no'.

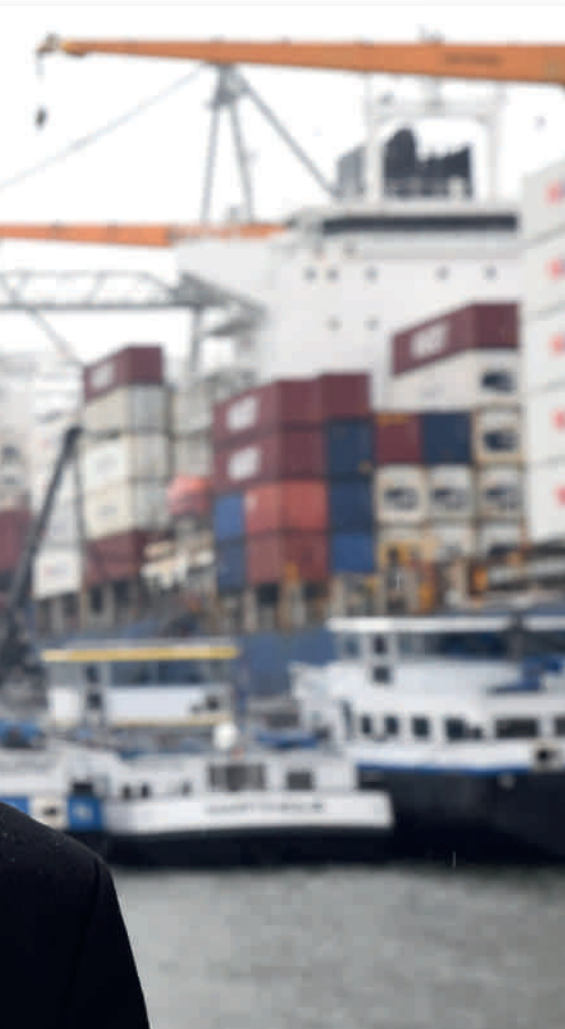
Do you have a first-hand experience that you wish everyone considered in their projects?

I think an interesting development is that projects tend to become more complex over time. On the one hand this is triggered by the sheer size of them, such as the design and installation of offshore wind parks or the reinforcement of the Afsluitdijk. But on the other hand, this is triggered by a drive for more integrated project designs where multiple objectives need to be achieved simultaneously. The complexity lies in the fact that project decisions which are good for one objective could hinder another. When these interactions are not sufficiently understood, there is considerable risk that decisions made during a project can have unforeseen effects later in the project. In the past, a way

to mitigate this risk has been to not take on too many objectives, or to consider them only at the end of the design process as add-ons.

Has this situation been addressed in the book *Dredging for Sustainable Infrastructure*?

One of the key messages in the book *Dredging for Sustainable Infrastructure* is that it is actually very important that we *do* include the important additional objectives right from the start. This means that we must become better at handling the complexity that results from that. This is where I believe simulation techniques can be helpful. As a sector, I believe we can and should become much better in getting a grip on such complexities. This is also key to promoting more sustainable solutions.



Resumé

Mar 2018 – Present

Professor Ports & Waterways at
Delft University of Technology

www.tudelft.nl

April 2015 – Present

Manager R&D Engineering at Van
Oord and initiator of DigiShape

July 2013 – August 2017

Lead Engineer OpenEarth Cluster
for Data Management

September 2008 – August 2017

Lead Engineer Environmental
Engineering

www.vanoord.com

September 2014 – Present

Corporate Secretary at Topsector
Water & Maritiem

www.topsectorwater.nl

July 2013 – April 2015

Management Team Member at
EcoShape

www.ecoshape.org

January 2008 – August 2008

Senior researcher and advisor at
Deltares

January 2001 – December 2007

Senior researcher and advisor at
WL|Delft Hydraulics

www.deltares.nl

September 1998 – April 2003

PhD candidate at Twente
University

www.utwente.nl

Which topics presented in *Dredging for Sustainable Infrastructure* do you believe are going to be challenging topics for the industry?

What we tend to see is people have become very good at identifying negative effects and trying to minimise those as well as looking for the optimal cost solution. What we haven't been able to do – just yet – is quantify the added value of including other elements in a way that this added value can be incorporated in the evaluation process. As long as that is difficult, it will be easiest to favour projects with the least negative effects and with the lowest costs rather than projects with the

greatest added value. In the long run, that may *not* lead us in the right direction.

Alternatively, we should focus more on identifying positive things that projects can contribute to and find ways to make that count in the tender process. That opens up the door to a wealth of creativity and opportunity. Of course I realise that added value in most cases will come with additional cost that someone will have to pay for. It is my firm belief that if we are not willing to invest in added value, we all will end up paying the cost. So *that* is a big challenge.

What is the collective aim of the authors with the book?

I would say: to show the audience that the natural tendency of projects is to focus on achieving a primary economic objective and then minimising the negatives, but we should consider the opportunities a project brings in stimulating the overall system. The message is to move from one model to the other and the book tries to provide the tools to do that. What does that mean for project design and project assessment? What is the role of equipment? What options are associated with dredged material management? What does that mean in terms of models and tools, and data and

monitoring? That's what I think the book is trying to convey and it's a very good initiative.

What are you hoping attendees to the Dredging for Sustainable Infrastructure conference in November will take away from the event without having read the book?

The way we are trying to design the conference is to make people think about how different the world could look if you move away from just focusing on primary objectives and minimising the negatives, instead moving towards seizing the opportunities that are available. A philosophy that truly embraces the momentum of development projects to create added value yields a fundamentally different future than a philosophy that aims to minimise negative effects only.

I hope we can convince the attendees of that so they will want to read the book to find out how they themselves could make this happen. If we could achieve that, the conference would be a real turning point!

Do you have an example of where you applied this philosophy yourself?

The work I have been involved with at Van Oord related to reef rehabilitation is a typical example of what is possible when you embrace the momentum of development projects to create added value. The construction and field applications of our ReefGuard facility – published in *Terra et Aqua* #147 – and the delivery of the first Coral Engine in the Bahamas – for which PIANC awarded us the title of Supporter of Working with Nature – provide a clear testimony of the creativity that is unleashed when you embrace the search for added value.

In your opinion, is there an innovative-enough attitude in place in the industry that the book's ideas will be welcomed and implemented?

Let's say the root thinking of the book is already very well-appreciated in the sector. You've got Building with Nature, Working with Nature and Engineering with Nature as firmly established philosophies in our industry. Next to that, there are countless other names circulating for nature-based solutions. There is a huge buzz around this topic. Nonetheless people are still finding it hard to turn their enthusiasm for these types of solutions into concrete practical approaches. I feel this

book provides a good first step in providing a 'thought framework' for how to do that.

What do you believe is most important for the industry to consider for the future?

I would address two topics: 'Digitisation for Deltas' to make our sector more data-driven and get a better handle on complexity, and 'Building with Nature' to actively promote sustainability and create added value. Both topics require us to reinvent the traditional ways in which we are doing our work. The transition to a data-driven industry will have a big impact on how we collect, structure and use data. It requires our engineers to develop new skills and learn from other data-driven industries that have already made this transition. Incorporating Building with Nature into projects also involves a large shift in thinking. From our work with corals, I have come to appreciate how limited the interaction between traditional civil engineers and marine biologists was before. It took quite some time and effort to learn each other's languages and understand each other's true beliefs and concerns. But after we made this investment, it opened the door to a wide variety of innovative ideas, a number of which we managed to see through to actual implementation.

The next step is to support the BwN philosophy with a firm evidence base. This past summer, for example, a large test was run in the delta flume at Deltares to see how waves propagate through willow forests: the Woods versus Waves programme. The aim was to understand how vegetation interacts with the waves and to observe what ecosystem services are associated with a willow forest. When it comes to developing such an evidence base, it is good to realise that we are only at the very beginning. It may take years before we reach knowledge levels comparable to what we now know about wave run-up, wave overtopping, and so forth. I am proud that I was involved in the early stages of EcoShape, the foundation that runs the BwN innovation programme. The other philosophies of Working with Nature and Engineering with Nature emerged at around the same time. It is rare to be present during such a major paradigm shift in a sector. The book *Dredging for Sustainable Infrastructure* truly incorporates this broad shift in thought through the active involvement of the people that actually led this change.

That makes me proud of our industry.

It's also interesting to note that students really like this type of thinking. In their curricula at TU Delft, many topics are quite traditional like hydro- and morphodynamics. Only one course is about the BwN philosophy. It is nice to see they are eager to learn about it, which is a great development.

Where do you believe the industry can – or should – take a step forward into the future?

I really believe our industry still has large steps to take on the front of project design and project control based on simulation and data. Individual companies have made huge steps forward in recent years. However, it is still a big step to move from a data-rich industry to a truly data-driven industry. Roughly ten years ago, we set up EcoShape to promote a step change in sustainable infrastructure design capabilities. Today we are working on the set-up of DigiShape which follows a similar approach to EcoShape by bringing together partners from government, businesses and research institutes. However, in the case of DigiShape, we aim to promote the step towards a data-driven industry, once more bringing us to an era of many new opportunities. I believe that taking this step within digitisation will bring about massive changes to the way we design, execute, communicate and evaluate our projects in the future.

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