PROFESSOR EMERITUS OF PORTS AND WATERWAYS AT TU DELFT TIEDO VELLINGA

‘THE CHARM OF BEING IN THE PRIVATE SECTOR ON ONE END AND UNIVERSITY ON THE OTHER, IS TRYING **TO CONNECT THOSE WORLDS.’**

After seven years serving as a professor at Delft University of Technology, Tiedo Vellinga recently assumed the new title of Professor Emeritus of Ports and Waterways. During his concurrent career at the Port of Rotterdam Authority, he practiced what he preached, constantly challenging the status quo in port development. The result was an innovative and sustainable approach which expanded the port as well as delivered clear-cut benefits to People, Planet, and Profit.

Photos Mees van den Ekart

What was your role in the Maasvlakte 2 project?

My role in the project was in the management team. I was responsible for all the conditions – as they call it in the Netherlands – which meant the stakeholders, permits and all the environmental studies related to the permits. I was mainly responsible for all the environmental procedures.

What was a factor in the Maasvlakte 2 project's success?

We got a lot of support from the stakeholders and that was a key issue for such a project. In the end it went very well just because we had a good strategy looking back – and not knowing it – which was to include the stakeholders *and* try to be as sustainable as we could. Also by having a very transparent approach, *wanting* to know it *all*, and most importantly, by sharing, which took some time to develop within the project

Normally, projects are rather isolated. People don't like to share information because they are afraid of interference from the outside world. But we changed that all the way around. I think that was the great asset of the project and factor of its success as well.

Why were stakeholders a key to the Maasvlakte 2 project's success?

There are port stakeholders which is the port industry and service providers such as shipping lines, and your own clients and users of the ports. Then you have the local communities and the urban surroundings as well as NGOs that have concerns with all kinds of environmental issues related to nature, air quality, fishing, and agriculture. We also had to realise natural and recreation areas. Farming and fishing had to be bought out so it was a huge project with *many* stakeholders and *many* issues going on.

The legal situation was quite complex. In fact, building into a Nature 2000 site and air quality which presented puzzling legislation. A lot of projects failed before the high court so we did not want to run any risk in the project. That meant we needed to know *everything* that could *obstruct* the project. Every stakeholder that could have a levee or a possibility of power to block something in the project. We wanted to know all of the pitfalls and needed to be very well-informed about all air quality issues, like what would be the emissions over the lifetime of the project? And not just guesses.

With a Nature 2000 project, gaps in knowledge are not accepted because of the precautionary principle. If there was a gap in knowledge, we had to go for the worst case. So we went one step deeper in our initial research to find out what the effects would be on turbidity and turbidity on algae, shellfish and birds. We spent a lot of time talking with experts in seals and birds to try to know it *all*, and then to share the uncertainties and vulnerabilities with stakeholders to make them a partner so you could have a negotiated agreement on the state of the art of the knowledge.

In the past, many projects had failed with the high court because people do not understand each other or agree on certain issues. So we usually had three steps. First, you need to talk about what you and stakeholders want to know, and define your programme of requirements for your research. Then half way, discuss your first results. And in the end, try to agree on results and facts. I especially say *facts* because you should not try to agree on *values*. You may *never* be able to agree on values.

I remember once doing an assessment for the effects in the Wadden Sea which is in the north of the Netherlands and a UNESCO nature conservation site. We made detailed studies with stakeholders and the individuals responsible for the area. In the end, we agreed on the fact that the effects to the environment were minimal and negligible. At the end of the process, the chairlady of the Wadden Sea said to me: 'But still, I don't like your project. For me, every bird counts.' And *that* is a value. We learned a lot and experienced what it is like to work with the People, Planet and Profit concept in practice.

In Maasvlakte 2's Profit situation, there was a clear business case, but in the People situation, a lot of resistance against the project was encountered, and it becomes clear that people have very different needs than the port. If those needs and values are attached to the project and the people's needs are satisfied, the project does much better. In the Planet situation, a lot was learned about the biodiversity and the ecosystem, and that was very important because the effects on the ecosystems were

Meet Tiedo Vellinga

With a background rooted in Civil Engineering, his prolific 38-year career at the Port of Rotterdam Authority culminated with his role as Director Environmental Management for the port's expansion, Maasvlakte 2. As part of the project's management team, his position involved proliferating stakeholder relations and spearheading the environmental studies and permits. While employed by the port, he shared his professional time with the role of professor of Ports and Waterways at Delft University of Technology. Since the end of 2017, after seven years of merging the worlds of academia and practice, he is now fulfilling academic duties in the department as Professor Emeritus.

relatively small and we compensated for all the effects.

Do you believe mitigation and compensation is an ideal route for port planning or should a preventative approach be employed to guarantee the most added value for all stakeholders?

As a result of this project, I agree that to *think* in terms of mitigation and compensation is not the right way, it is only half way. You should be one step ahead and incorporate it in your earlier designs.

I teach students that stakeholder agreement is extremely important but never replaces compliance with legislation. The compliance with legislation must be leading even if you don't like the legislation. The habitat and birds directive from Nature 2000 is complicated but it's there for a reason. The legislation is extremely strict and rigid because 80% of the wetlands has been lost. We need to help governments make this legislation more *fit for purpose*. Don't expect when stakeholders agree that it is also legally compliant. If you go one step too quick, then it may not be accepted because the legislation stops it. Bring lawyers on board in the mission.

Of course within nature, there is conservatism and fundamentalists which is very complicated. We have internally fundamental discussions about nature-based solutions and where you should plan ports. There are people within my team that say a port could never be planned in a nature conservation site because it will always bring damage. In my opinion, you can do so if you co-create, you lose some *and* you gain some. But if you are a fundamentalist, nothing can be lost no matter how much is gained.

This fundamental discussion is linked to this European legislation in which acceptance but be achieved first, and then you can lose and gain at the same time. That can happen if you address the issues very much upfront in your project and not after the project is made and in the assessment of the mitigation and the compensation. Once you compensate, you are already in the discussion that you have done something very wrong. Bring in a solution from the beginning that's already accepted by everybody but is also viable within the legislation.

Would it be an option to educate or inform stakeholders to help promote shared values?

Yes, but you have to be serious about it and understand what you are doing. Connect to other disciplines as well as NGOs and bring them onto your team.

We also welcomed co-decision making. We had stakeholder agreements which in my opinion is a co-decision. The stakeholder also decides on the decisions you make. Transparency and openness is extremely important as well as sharing data. The other one is bringing people in your project.

What did you learn from the completion of Maasvlakte 2?

What I learned from the Maasvlakte 2 project is that there should be a shift in the way of thinking about designing infrastructure. In the past we designed infrastructure for a function, for example for the port to make a basin a channel and a quay wall. In Maasvlakte 2, we started out this way as well and then had obstructions. In the end, however we solved those potential problems and created a lot of value for stakeholders. And then I realised when you design it's better to start with the needs and values, and try to create value for stakeholders from the beginning. People always say that is more expensive but I don't believe so. Over the longer term, it's certainly not more expensive and you create more value and also more acceptance. In fact that's also what we now try to pick up as lessons learned for other projects: to start with an inventory of needs and values. The Maasvlakte 2 had many values. Of course there is nature – the biodiversity which has not been affected due to compensation – but it's also creating natural values. There is a lot of landscape, recreation and also clean air. There is less congestion on the roads which is a value for society. There is archaeological value – and lots of it. This is also public value and you can see it at FutureLand in the exposition.

In fact, FutureLand wasn't there in the beginning. It was part of change in thinking during the project that the public should be informed to make people feel part of the project. We had to do dredging and then we

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ran into paleontological artefacts – fossils – offshore. We realised people were extremely interested because the project would be on the evening news because you found fossils, not because you are making a new port. So we invested to do it better and made a programme for the archaeological and paleontological findings. An expert suggested giving some background on the geological context. And we said alright, we have a budget for that research. We did borings and tried to link the findings from the sand mining area to its geological context.

Then we even went one step further. Where we dredged, we could link every cubic metre of dredged material to where we disposed it on the beach. A lot of artefacts, fossils and archaeological objects were found on the beach. So we developed an archaeological app that people can use on the beach and if they find something, they can log in to the app and the app will tell them about the geological context. If it is something they want to know more about, they can immediately send a picture to amateur archaeologists and palaeontologists.

The app is still working today. That's a very good example of something simple: the data you have creates value for society.

Is the research consortium 'Port of the Future' documenting the successes experienced in Maasvlakte 2 ongoing? What so far can be deduced from collected results/data?

We received a research grant to make a framework for integrated and sustainable port design in Africa. One of the linked projects is an eco-based port design. The project works bottom up from an existing pilot on the Port in Tema in Ghana where €1.5 billion is being invested in a new port. That is a good time to connect with a project because once people are investing in the port, it's a reason to look at the scope again and can more easily make some add-ons to improve the project itself. You may spend a little bit more money, but you are already dredging and then it may be relatively easy to link the dredging works to the lagoon and to include the revitalisation of the lagoon.

Research projects are a reason for change. Changes happen because knowledge is gained and awareness is created. We are creating awareness with students from the University of Ghana, and we could connect the research project to a real project. Through young people, the world is changing, and really changing for the better.

The project is very interdisciplinary. There are five universities on the team as well as post-docs from four universities. Its connected to the University of Ghana and TU Delft's faculties of civil engineering – which is myself – and policy and planning which looks at governance and design with structuring methods. The University of Amsterdam is involved in relation to the economics of Ecosystems Services, predominantly in terrestrial ecosystems but they also developed marine ecosystems. Ecologists from the Wageningen Marine University as well as IHE Delft are also connected.

The project is very much into the management of the integration. My role is dominated by process management, to integrate the different disciplines. We have research integration meetings with an engineer, ecologist, economist and governance expert. For them, it is new and not that easy.

For example, the engineer is not so satisfied because he wants to think and develop new engineering concepts and he feels it's difficult to develop something new, and now he has to negotiate primarily with the ecologist about the engineering. I need to tell him that's really the value of the project, to do things together.

Port of the Future

Alongside his active presence in academia, Tiedo is leading the 'Port of the Future', an ongoing research consortium which spawned from successful completion of Maasvlakte 2. One development which resulted from the consortium is the Port of the Future Serious Game. The board game and accompanying virtual environment is an exercise in *polderen*, a dialogue-driven model which involves all stakeholders of a project and was founded in the Netherlands.

Each player – or if played on a larger scale, each group – assumes the role of a different stakeholder such as the port owner, members of the nearby community, unions, NGOs or bankers. When the port wants to expand, players – or groups – choose from cards which describe diverse options for how the port's expansion can take shape. Members of the group must negotiate and agree on which cards will be chosen, and the group either gains or loses credits in the categories of People, Planet and Profit. If only Planet and Profit credits are gained, then in the end, there will be a lot opposition against the project.

The game was played at PIANC's 34th World Congress in Panama with young engineers from around the world to expose this way of collaborating, and it has also been played with real world stakeholders. Tiedo explains: 'We've played with real port developers, NGOs and government, and those people said to us 'we never talk to each other about port development'. And they were very glad that now, with this game, they had a reason to talk to each other.' The activity helps individuals realise and understand there are other interests to consider and they should be aware of and negotiate these interests. According to Tiedo, 'the game works quite well in the sense of creating awareness. I think it's a good investment to try to interest people in a different way of thinking'.

Parties – most of them involved in Maasvlakte 2 – helped develop the game including Deltares, Wageningen Marine University, Port of Rotterdam, Boskalis, Royal HanskoningDHV and the World Wide Fund for Nature, and support has been given from organisations including the Netherlands Embassy in Panama and PIANC.

It's also a good learning experience but I see it's by far the best way to move forward, to try to do this interdisciplinary research, but really interdisciplinary. Not everyone is doing their own research and scoring by themselves. That you try to score as a team and so far things are

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going well. In September we have our midterm assessment with the NWO (Netherlands Organisation for Scientific Research) to report and evaluate our scientific research findings. I think that's a good example of bringing scientific knowledge further.

If you do cross-disciplinary research – not disciplinary – that's where you can get your gains. You *have* to expand your horizon. That's the beauty of working for TU Delft and in the scientific arena: you can easily expand your horizon. In Delft, this can be done by connecting to 3mE (Mechanical, Maritime and Materials Engineering Department), transport and planning, both airport and port design, as well as departments in other universities. The charm of being in the private sector on one end and university on the other is trying to connect those worlds.

Are you continuing with other research initiatives bridges the worlds of academia and practice?

We have SmartPort Rotterdam which is focusing on scientific research between the users. It's very much demand-driven so it includes the port users, the port authority and the city of Rotterdam, and on the other side, universities, dominated by Erasmus University and TU Delft. They support writing scientific project proposals and also I have a few lines of research even after my retirement.

How do you manage the different interests of the private and academic arenas?

The culture is of course completely different but in the end you try to match those agendas as well as you can. It's on one hand very inspiring to be in the commercial sector which is very active and needs to produce. It's the one world where there is no time to think and reflect. In the other world, there is abundant time to think and reflect, and that's almost contradictory. How can you balance those two things? I think it's really great because the one can inspire the other. I've always experienced it as very rewarding to be able to work in both worlds. The important thing is that you connect those worlds. I think that's the most important task of my successor, Mark van Koningsveld.

It seems you've gone to great lengths to bridge these two worlds in your work. Is that a choice you've made because of your own interests or has it come more naturally?

For me, it came more natural but I have had many discussions with people that are almost in the same situation and they experience it to be difficult. They feel like they don't have enough time to live in both worlds and that they should make choices. I believe I was a pioneer in trying to link those two worlds.

How has your simultaneous work in academia or practice benefit the other?

I've made pleas to people within the port to recruit young people that can have a dual objective. Let them make a career either in university or in the ports.

Give them one day a week in university and also make them fit for eventually a tenure track, that they can do a PhD or become a university associate professor or professor if that better matches their talents and ambitions. There are a few people that understand it and can cope with those two worlds which seem to be completely different but I think it should be advocated more.

After I worked at the port, the Port of Rotterdam is changing its attitude. They say 'knowledge is more important than it was before and we need to be able connect to your PhDs. We need to hire people that can understand and talk to your PhDs'. In the past, these worlds were still too far apart. If the port wants to improve, it must make this shift towards being a smart port and make progress in regards to knowledge which is extremely important. It's too complicated today to do it the 'old way', you need people that are able to communicate with researchers. The world is improving. It's changing and I like that.

Will inherent differences between your background and your successor's background lead to any adjustments to the Ports and Waterways curriculum?

Since I'm retired, the Port of Rotterdam picked up my way of linking academia and practice. With TU Delft, the Port of Rotterdam made a contract for five years with my successor, Mark van Koningsveld, to create the 'Second Tiedo'. So that's very nice to be honoured in that way, that they want somebody like you again.

It's a little bit charming when he comes to a meeting with the port and then introduces himself 'I'm the new Tiedo'. I think Mark is extremely knowledgeable and very smart, and he may certainly do things differently but that is also a good thing.

Do you have any advice for your successor in your role at TU Delft?

I've had nice discussions with him about his legacy and also about how his role can be within university and how to link to other bright professors. And that you should try to cooperate and not compete. That's still a real struggle within universities because there is so much pressure on competition because they want individuals to score. Individuals must have high scholar indexes and that does not really invite directly for cooperation between scientific groups.

I've never had much interest in scholar indexes. I became a professor too late to become a big star with a high scholar index, and for me that was not the most important part of the work. But today's young professors at university are very much pushed to excel in terms of their academic scores.

There is an inherently conflicting interest of cooperating and maybe giving some credit to other people or simply scoring with the scientific results by yourself. Hopefully that approach will change when people are pushed more to cooperate. Usually in funded projects – in the European Union and also the NWO (Netherlands Organisation for Scientific Research) – you are forced to cooperate with other universities and other experts. If you

don't, then you won't get the funding easily. So there is a mechanism already in place to force them to cooperate but that's still a struggle for those in university. They want to score in their own fields while I think we should score by *connecting* different fields. Then the value of your own project is that you make something interdisciplinary which means you must change your way of designing.

I tell ecologists that their role is completely changing. In the past, the ecologists were usually attracted to the project in the end when the ideas were already there. But now, the ecologist needs to be involved upfront. You can design *after* there is an *understanding* the system. You have to *start* with people that *understand* the system, so it's the ecologist is the one that starts the process. The ecologist also has to shift towards holistic thinking. It's not all about one animal. It's not all about one species. It's about the integrity of your natural system.

Would you say there has been improvement within the sector?

There is a long way to go. Some of the sector is doing extremely well and others are still far behind. I think this will still be the case for the next decade. It will be possible to recognise the traditional approach to port development but also the new approach. Of course the new approach will be winning in the end by far, but it takes time and you can change the world quicker by creating more awareness by showing examples and pilot projects. That's what's so beautiful about university, students and young people get to try it out.

Do you have students exploring this new approach to port development?

I have a new student doing site selection for new port development in Myanmar. He is aiming to select locations from the ecosystems services (ES) perspective. First he is making an inventory of all the ES of locations and then tries to score in those services against all the ecosystem effects of port development. I think that's a new way of designing. It's only a matter of time before this will be easier with tools. Tools must still be developed to have assessment procedures, but these tools are well on their way.

How do you think the Ports and Waterways sector, and dredging industry as a whole, is stacking up to the task of sustainability?

We still need to create a lot of awareness. For example, I had a student doing his Master's thesis on the design of a marina in Mauritius. Mauritius is a beautiful island with coral reefs but they don't have many marinas because there was no acceptance for marinas due to environmental deterioration. So I gave him my message: 'design a marina with coral reefs and mangroves'. Then he was puzzled and asked 'how can I design a marina with coral reefs and mangroves?', but this set him into thinking. He then came onto the path of ES and he made an inventory of the different locations dominated by coral reefs, mangroves or river inlets in Mauritius, and he valued those different habitat types. He looked at all the elements of a marina – like a jetty – and what it would need. He scored the requirements for the infrastructure against the opportunities for ES of coral reefs and mangroves. I think that was a very good exercise. He received a high grade and now he's working for Royal HaskoningDHV and is part of the PIANC international

It's changing and I like that.

working group on Ecosystem Services. He is expanding the thinking of alternative concepts to people in the real world. You need patience but if you do the right thing, then in the end it will come.

One may think they are doing something well for nature but knowledge can be lacking. Much more knowledge is needed to do it well, so to make a point, we may need to become a little bit more *extreme*. Another example I'm working on now is Navigation with Nature. In this new navigational concept, the students – which are engineers – have to adapt the ship to the river and not the river to the ship. It's a completely new way of thinking from traditional engineering. You have to understand the river, the meandering and natural character of the river. When there is more water, more cargo can be carried, and when there is less water, different kinds of ships are used. Ships which are very flexible and made of polyesters, and can consist of modules that are deeper for use when there is more water and less deep for when there is less water. The other aspect is to integrate technology and users, and use big data in the concept. The boats on the river have smart phones so they can measure and share data.

These boats are on rivers which are not in Europe because European rivers are man-made and are more or less ruined nature-wise. This is a concept for rivers in South America and Myanmar which is also where we are trying to prove this concept through exchanging and gathering knowledge about currents, water depth and user experiences. Modern technology can support the shippers by using models – like SOBEK from Deltares – that learn from the day-to-day data and generate prediction models for the next days. The shipper can download the data and knows where the river is going to be navigable. That means things can be changed and the ship can be adapted to the river.

Traditional aides of navigation are not needed nor the channels that are dredged to keep them in place. The system itself knows where the gullies are, how deep the ship can go and how deep it will be the day after tomorrow. Of course this may be a little bit disappointing for dredgers because they want to dredge and make infrastructure but I think they have to get past that way of thinking. If you think along these new concepts, there would still be lots of work for dredgers and contractors, but it will be different.

How then might the role of dredgers evolve with an approach like this?

Don't worry about it, there will be a lot of dredging! Sea level rise and climate change will make extreme efforts necessary. We need a lot of engineers and a lot of dredgers in the future but it will be different. Even in the Netherlands, if we see a sea level rise of two metres...we will not give up and will still protect ourselves. Dredgers will need to think differently. They need to follow nature instead of trying to shape nature. Working with Nature – and Building with Nature – is an extremely complicated concept. Not everyone understands it well enough. There are still too many people that think Working with Nature is using soft solutions and building with clay and sand. But it's much more than that. It's just a completely different approach where nature is really leading in the design. But we are on our way. And you cannot blame engineers or companies that they are only thinking half way in their philosophies. It just means we need to create more awareness and bring more examples.

Does the education of the Ports and Waterways sector need to shift to remain competitive in the future? Is the Building with Nature concept seeping into education?

The education is extremely good. We have the course in civil engineering but I still run into people that don't really grasp the philosophy that you really have to make nature leading in the design. If the answer is 'it's not possible', then that's not a good answer.

Of course it's very difficult to do so and you have to make it a little more extreme, such as designing with coral reefs and mangroves. You have to make a design that the ship is adapted to the river and you don't jump into river training methods. You don't jump into dredging and making groynes to try to force nature. No... you should be more creative. You should use underwater robotics *and* big data *and* all your users *and* new technology *and* autonomous ships which can be completely different. Why do autonomous ships need to be so *big* that they can only sail in *deeper* water? So be *smarter*!

Resumé

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