

# pit

The core of applied research

Sciencefiction in the North Sea  
Robots repairing a wind turbine

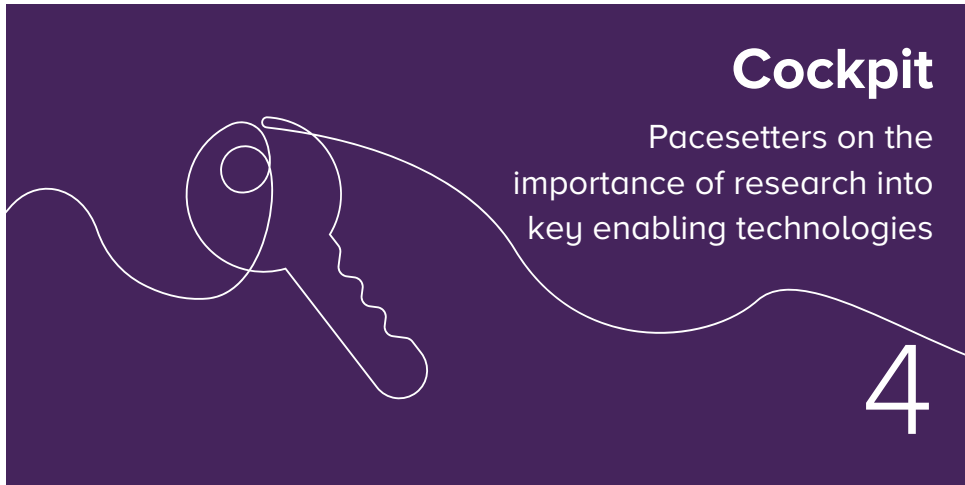
*Transition to a sustainable  
food system*



## PAAS business model

Circular by design

English  
edition



# Colophon

**Editor:** Alex Verkade, Taskforce for Applied Research SIA

**Project manager:** Anke Oomen

**Concept, print coordination and copy editing:** Schrijf- Schrijf

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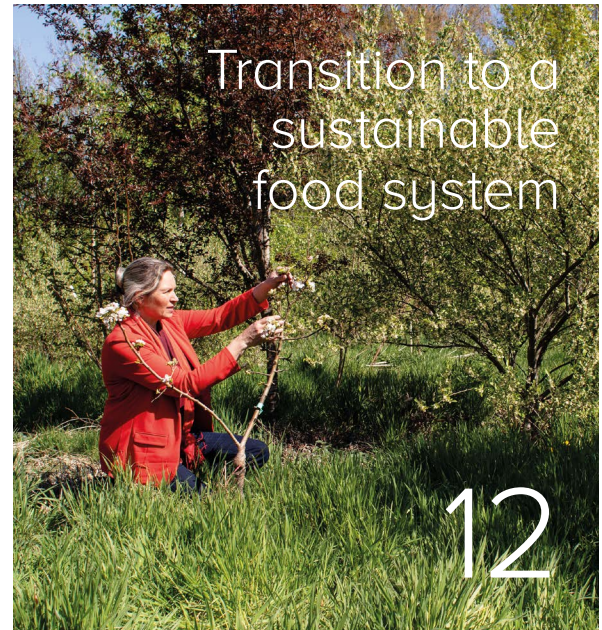
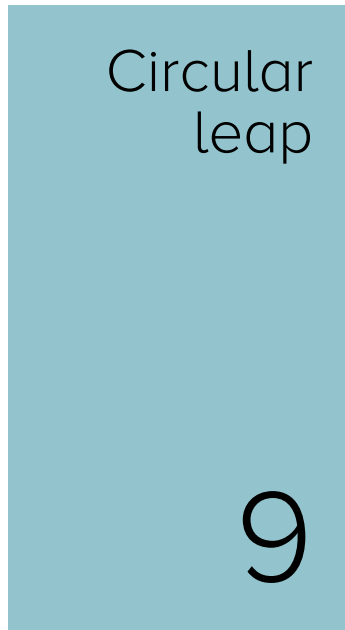
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[regieorgaan-sia.nl](http://regieorgaan-sia.nl) | [info@regieorgaan-sia.nl](mailto:info@regieorgaan-sia.nl)

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Dear reader,

It is my great pleasure to present this international edition of PIT. The magazine's title stands for *Praktijk, Innovatie en Toepassing* [in English: Practice, Innovation and Application]. Welcome to the world of applied research by the universities of applied sciences in the Netherlands.

This type of research is not merely a scientific exercise; the research carried out in collaboration with partners in the practice is a powerful engine of progress, innovation and change in society. It is research embedded in the real world, where connections are made between theoretical concepts and actual issues and challenges. Applied research enables us to find solutions for complex problems together with practitioners in the relevant field, and so make a real difference. While the challenges faced are regional, the efforts to address them benefit from international cooperation and knowledge exchange.

One of the instruments used by the Taskforce for Applied Research SIA to support the universities of applied sciences in the Netherlands, is the Towards Europe programme. An aim of this programme is to help the Dutch universities of applied sciences to formulate an international strategy and to build consortia for their research. But there is more to it than that. With the programme, SIA also encourages further international development of this type of research and the sharing of the knowledge it generates, for example through participation in Horizon Europe and the European Partnerships. These steps will open the doors to new possibilities and opportunities for universities of applied sciences, thus further improving the quality and impact of research in this country.

This magazine presents some examples of the innovative and impactful applied research being carried out by Dutch universities of applied sciences. It also serves as an invitation to establish new contacts, to develop closer collaboration, to learn from one another and to jointly work on creating a better future. I hope the stories here will inspire you to join us in a conversation about how, together, we can strengthen the role of applied research as a catalyst for positive change.

Yours sincerely,



**Mariska van der Giessen**  
**Director, Taskforce for**  
**Applied Science SIA**



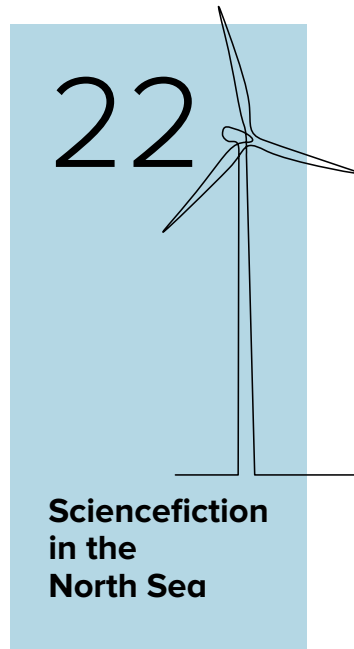
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## cockpit

The applied research conducted at universities of applied sciences makes an important contribution to the search for solutions to the major social and economic challenges facing the Netherlands. In this article, the directors of two of those institutions offer their views on the importance of applied research in the development of key technologies and the current state of play in applied research in the Netherlands. Where are we performing well and where is there room for improvement?

**ANKA MULDER**

Chair of the Executive Board, Saxion University of Applied Sciences  
Member of HBO Theme Table Key Enabling Technologies plus Digitalisation

## More European cooperation is the next step

“ **W**hen it comes to research, people usually think of traditional universities. Fortunately, however, the research conducted by universities of applied sciences is achieving greater prominence and there is growing recognition of the importance of applied research. We are knowledge accelerators. Our research cycles are short and demand-driven. Companies with a problem come to us for help in finding a solution. It is also logical that they turn to us, since we are part of the lifeblood of a region and the work we do leaves its imprint everywhere.

Saxion invests heavily in applied research. Topics include investigating ways of enabling people to live a vigorous and independent life at home for as long as possible and developing scenarios for a sustainable lifestyle in the smart city of the future. Key technologies play an important role in addressing those issues. As they do in OBSerVeD, a project that we coordinate, in which an electronic nose that can smell disease in poultry is being developed. Infected animals give off a specific odour. If the smell sensor picks it up at an early stage, a farmer can quickly take appropriate measures, such as adapting the composition of the feed, and so avoid the need to administer extra antibiotics and prevent outbreaks of diseases in animals.

Partnerships with industry, research universities and other universities of applied sciences are important for projects like this. An example of this collaboration is TechForFuture, a centre of expertise for applied research into key enabling technologies



that we have jointly established with Windesheim. To improve their bargaining position in relation to business partners and the funders of research projects, universities of applied sciences need to pool their strengths. We're getting better at that. We initially depended entirely on the Taskforce for Applied Research SIA, but now also secure grants from the National Growth Fund and the Dutch Research Agenda.

The next step is to strengthen the cooperation at European level. As a university of applied sciences, we already participate in the European Universities Initiative. But there are opportunities to make an even greater impression on the European stage. We have a lot to offer, but we are reaching our limits and additional capacity is required if we are going to make the next step. And, as Joep mentioned, that means more money. Hopefully, a new government will also see the need for this and increase its funding.”

## JOEP HOUTERMAN

Chairman of the Executive Board, Fontys University of Applied Sciences

Chairman of HBO Theme Table Key Enabling Technologies plus Digitalisation

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# We're getting better **at pooling** our strengths

“ **A**ppplied research contributes directly to the development of small and medium-sized enterprises (SMEs) by stimulating innovation, providing solutions for specific problems and helping entrepreneurs to exploit new opportunities. Universities of applied sciences not only possess the knowledge and expertise to carry out this research and the necessary contacts with the business community, but remain constantly up to date with the latest developments in industry and the needs of companies.

At Fontys, for example, together with businesses in the agricultural sector we investigate ways in which they can employ key enabling technologies to improve the sustainability of their production processes. How they can deploy AI, robots, drones and sensors to reduce the use of artificial fertilisers and plant protection products and to optimise yields, for example. At the same time, we are working with manufacturing companies in Venlo, Eindhoven and Tilburg on the development of circular business models for products such as batteries. What does it take to produce a battery that can be disassembled into reusable components? These are very practical issues for which we search for solutions together with companies.

In terms of the volume of research, the universities of applied sciences are minor players. We can only carry out a limited number of studies with the funds available to us and we must therefore be selective. This calls for smarter collaboration and a pooling of our strengths. Fortunately, we are steadily improving in that respect, also in relation to key enabling technologies. For example, the battery project is a joint endeavour with other universities of applied sciences in which lectorates from five institutions are sharing their knowledge in areas such as technology, earning models and chain cooperation. Together with those institutions, we also want to further develop the applied research in the field of smart industry, covering aspects such data analysis and the digitalisation of processes.

We're also having more success in joining the appropriate networks devoted to specific societal themes. This is also a result of the pooling of our resources. Through greater collaboration, we not only increase our impact and visibility, but also optimise the disbursement of our funds. The government has promised to earmark € 100 million for applied research each year, for the next ten years. That is welcome news, but more money is needed if we are to make real progress.

# Lectorate platforms raise applied research to a higher plane



## MARIAN ADRIAANSEN

(HAN University of Applied Sciences)

- Lectorate for Innovation in Healthcare
- Chair, Lectorate Platform for Personalized Health



## MARIKE HETTINGA

(Windsheim University of Applied Sciences)

- Lectorate for ICT Innovations in Healthcare.
- Chair, Lectorate Platform for Use of Technology for Health and Well-being (PIT)



## HANNEKE TORIJ

(Rotterdam University of Applied Sciences)

- Lectorate for Midwifery and Natal Care
- Chair, National Lectorate Platform for Self-management

**There are more than seven hundred professors engaged in applied research. Not individually, but through collaboration. In lectorate platforms, for example, which also work closely together. This article takes a look behind the scenes of three lectorate platforms in the healthcare sector.**

Imagine. A student in the Social Work degree course at the HAN University of Applied Sciences is sitting in the lab. He is wearing a virtual reality headset and watching a horrifying scene of two parents fighting. The aim is to help students understand what a child who is a witness to domestic violence must be feeling. A futuristic example? Certainly, but not too far off if Marian Adriaansen, Professor of Innovation in Care at HAN, has her way.

“Virtual reality (VR) is a powerful educational tool,” says Adriaansen. “It enables students to experience for themselves the types of situation they could encounter in professional practice. It could also offer an alternative means of providing practical experience for students who are unable to secure a work placement or internship.”

Adriaansen is the chair of the Lectorate Platform for Personalized Health, which carries out practical research into the application of VR in the health sector in collaboration with developers, healthcare professionals and students. And not just for them, since VR is already being used by therapists treating patients dealing with traumas or post-traumatic stress disorder.

## COLLABORATION BETWEEN PROFESSORS

Collaboration between professors in the search for knowledge and solutions for issues facing practitioners is increasingly common. By seeking answers to the research questions professors receive in their own region and the innovations that result from them, professors strengthen the backbone of their region. The national lectorate platforms then connect the regional know-how, thus contributing to regional and national research and policy. Roughly half of the country's professors are members of one or more lectorate platforms, which have been established with funding from the Taskforce for Applied Research SIA. There are three lectorate platforms devoted to the theme of health and healthcare: the Platform for Personalized Health, the National Lectorate Platform for Self-Management and the Platform for Use of Technology for Health and Well-being. "In the last four years we've evolved into learning networks and centres of expertise where organisations of health professionals and patients, businesses and lectorates come together to form partnerships and share ideas for applied research," says Marike Hettinga, a professor at Windesheim University of Applied Sciences and the chair of the Platform for Use of Technology for Health and Well-being. "There is now great awareness of the work we do."

## ON THE MAP

"As chairs of the three lectorate platforms, we meet every six to eight weeks to review the possibilities for joint research," says Hanneke Torij, a professor at Rotterdam University of Applied Sciences and chair of the National Lectorate Platform for Self-management. "And to discuss the contribution the lectorate platforms can make in addressing national issues relating to health and healthcare. Based on our individual portfolios, we also plan strategies for putting applied research even more clearly on the map. Lastly, we consult the Taskforce for Applied Research SIA to identify ways in which we can complement each other, for example by linking our networks. In this way, we help to create a strong system of applied research in the Netherlands."

## REMOTE CARE

An important topic for applied research in the healthcare field is digitalisation. eHealth applications, for example, offer a solution for patients who have a chronic medical condition but do not require hospital care. As many as one in three people in the Netherlands suffer from a chronic illness, and the number is rising. But with digital applications, healthcare professionals can monitor patients remotely on the basis of data collected by the patients themselves and provide online coaching for patients,

such as giving advice on nutrition or exercises they can do, and thus improve their quality of life.

There are already numerous examples of applied research into remote care. "The lectorate for Innovation in Care at the HAN University of Applied Sciences has developed an e-Health application for people with chronic back complaints," says Adriaansen. "It increases patients' ability to cope with their complaints and bear the pain in their daily lives." Windesheim's lectorate for ICT Innovations in Healthcare joined forces with Saxion University of Applied Sciences' lectorate for Technology, Health & Care to conduct research into remote cardiac care, and with the Connected Care Center at the Isala hospital in Zwolle to investigate methods of collecting, analysing and integrating data to facilitate remote care.


"In another research project we explored the potential of eHealth for community care," says Hettinga. "District nurses should also be allowed to prescribe eHealth applications for their patients. However, in this project we found that they often lacked sufficient information about the applications that are available and how can they be used in particular situations. To address that problem, we developed the Thuiszorg en Technologie [Home Care and Technology] app, in which district nurses can find information about the technologies available to them, such as personal alarms, devices for registering the intake of food and fluids, and GPS trackers. We also devised a card game that district nurses can play during team meetings to stimulate clinical reasoning in relation to healthcare technologies. We developed the game together with Deltion College, a secondary school for vocational education. Schools like this have an important role to play in terms of embedding the results of research in professional practice."

## PREVENTIVE CARE

The National Lectorate Platform for Self-management is devoted to increasing citizen empowerment and self-management. Torij: "Our research relates mainly to people and their formal and informal networks. Its strength lies in the consolidation of the combined knowledge, expertise and networks of the platform's members." Preventive care is another theme addressed by the platform, for example in the field lab Mama's Garden, a community set up in Rotterdam with the aim of improving the social network of parents. Students in secondary and third-level education are involved in the project both by working with the members of the community and by participating in the research. "The lessons we learn from this field lab are applied in other projects."



With his company Refurbkicks, Jean-Paul Tremio (right) gives sneakers a second life. His goal is to prevent sneakers from ending up in the rubbish dump. In the TextielLab, coach Claudia van Riet (left) and students help him in this mission.



*Rapid steps  
towards a circular*  
**manufacturing  
industry**



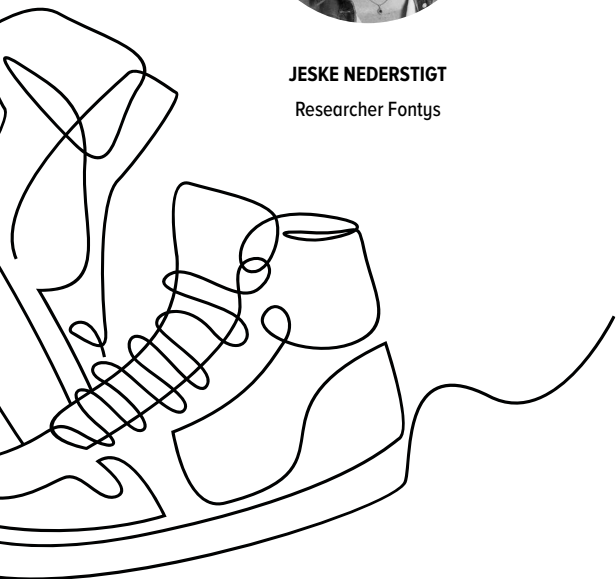
**An entrepreneur who refurbishes sneakers and sells them. A cleaning system for recyclable cups for the hospitality sector. A fashion library. The development of a circular city district. These are just some of the many initiatives by small and medium-sized businesses (SMEs), educational institutions and public authorities in the south of the Netherlands to promote the transition to a fully circular economy by 2050.**



**JIFKE SOL**  
Professor Circular Transitions  
Fontys



**JESKE NEDERSTIGT**  
Researcher Fontys



They are all examples of projects being carried out at four living labs on the basis of the concept of integral design, a method that incorporates every aspect of a production process from technology and affordability to consumer behaviour.

You know what needs to be done and you want to do it, but you don't know how. This must be how SMEs feel when they think about the transition to a fully circular economy by 2050. "In a change process, there are always front runners, followers and laggards," observes behavioural scientist Jeske Nederstigt. "When it comes to innovation, the front runners set the pace and the rest follow, but sometimes a long way behind. In terms of the transition to a circular economy, SMEs in the manufacturing sector bring up the rear and are seldom if ever the innovators."

"Closing product cycles is essential for the well-being of humans and the planet, but it is only possible with a radical redesign of production and consumption. The time for investment in circularity, the business model of the future, is now," asserts Jifke Sol, Professor of Circular Transitions at Fontys University of Applied Sciences and a driving force behind the research group De Circulaire Sprong (The Circular Leap). "Textiles, transport and logistics, construction and infrastructure, and food are all sectors that generate – sometimes serious – pollution and wastage. Stimulating recycling, in the textile and food sectors for example, and designing products in such a way that their

components can always be later reused in new products will greatly accelerate the transition to a circular economy. But SMEs need help in bringing about system change and that's exactly what the De Circulaire Sprong research group provides, in collaboration with no fewer than 25 partners."

#### **FROM DESIGN TO END USER**

In the south of the Netherlands, manufacturers are working with universities of applied sciences, public authorities and civil-society organisations on the development of circular innovations in four living labs. The living labs for the textiles and construction/infrastructure sectors are already up and running in a public-private partnership with the regional business development organisation Midpoint Brabant and with Brainport Smart District in Helmond.

The living labs for high-tech and food research are currently being set up. "What makes the living labs special is their focus on integral design," according to Nederstigt. "This is a method that incorporates research into every aspect of a design from technology and affordability to the legal aspects and, most importantly, the application of the end product, since what we often see in regular design processes is that the end user only enters into the equation as the final link."

What works and what doesn't? Applied research strengthens innovation and highlights successes. "Our research zooms in and out – on

design, application, collaboration, marketing, behaviour and so forth,” says Sol. “We also search for red lines at meta level. What can entrepreneurs, consumers, public authorities and the education sector learn from our research? What policies are required? How can we reconcile the short-term horizon of students with the long-term needs of businesses? By then sharing our findings with other regions, we can build on local, regional, national and global communities and accelerate the circular transition.”

### SMALL STORIES WITH A SNOWBALL EFFECT

Let's turn now to some examples of the projects in the living labs. In the field of textiles, students of Marketing Management collaborated with an entrepreneur in starting up a fashion library where people can borrow clothing. In another project, the company Refurbkicks refurbishes sneakers so that they can be sold again (see photo). Meanwhile, businesses and students are jointly investigating measures to improve sustainability at the football club Willem II, from the design of the stadium to the recycling of the players' kits.

The food lab is also taking off. Among other things, students are developing a cleaning system for a start-up that recycles coffee cups and salad containers for the hospitality sector. “The living labs deliver small wins,” says Sol. “Modest practical innovations. Publicising these stories has a snowball effect as they highlight the impact of practical circular innovations – including methods and new circular policy – and provide workable solutions and inspiration for others.”

The living lab for construction/infra has Brainport Smart District (BSD) as a partner. Sol: “BSD is the organisation behind the development of a smart district in the town of Helmond. Using the latest insights into every aspect of urban life, including technology, citizen participation, energy and water management, biodiversity and digitalisation, this project will create a sustainable living environment in the district. I have no doubt

“

**In regular design processes the end user only enters into the equation as the final link**

### RESEARCH GROUP CIRCULAR LEAP

**Aim:** systemic transition to a circular society

**Partners:** manufacturing industry, educational institutions, public authorities, civil-society organisations and intermediaries such as Brainport Smart District and Midpoint Brabant

**Participating educational institutions:** Fontys University of Applied Sciences and Avans University of Applied Sciences (Centre of Expertise for Sustainable Business)

**Duration:** 1st phase from December 2021 to 30 November 2025, to be extended by four years

**Funding:** € 8 million (Taskforce for Applied Research SIA) € 1 million (Fontys, Avans)

that it will be a beautiful neighbourhood to which everyone can contribute and from which we can learn.”

### IN IT TOGETHER

Sol used to be pessimistic about the future, but no longer. “There's so much potential in our society. When we look back in seven years, we will see these projects as ‘the babies’ of what has grown into a mature system. My hope is that the circular business model will have become deeply ingrained by then. That communities of businesses, educational institutions and civil-society organisations will have emerged and are creating the feeling that we're all in this together. Our alumni also have an important role to play in that respect. By ensuring their continued involvement when they've completed their studies, students will become agents of change and further expand the circular manufacturing network.”

# Applied research helps accelerate the transition to a sustainable food system



FREDERIKE PRAASTERINK, Professor of Future Food Systems, on a visit to the 'Den Food Bosch': a food forest in Sint Michielsgestel that was developed by students at the HAS green academy a few years ago.

## A radical transition is needed to develop a resilient, 'net positive' food system that is good for humans, animals and the planet and provides a fair reward for producers, according to Frederike Praasterink, Professor of Future Food Systems at the HAS green academy. Applied research plays an important role in making that transition.

Instead of a mound of spare ribs or a tender steak for dinner every day, ninety percent of a person's meal in 2050 will consist of plant-based ingredients such as seaweed, legumes, nuts and grains. That is if Professor Frederike Praasterink has her way, at least. "The current food system has brought us great benefits, including safe food and longer life, but they come at steadily higher price. The methods we use to produce food harm the environment, affect the climate and promote inequality. And those who benefit financially from them are not those who produce the food. Healthy food is also no longer affordable for people with a small income."

### PRACTICE AS A LIVING LAB

Radical change is required, says Praasterink. As programme manager of the Transition to a Sustainable Food System programme, which is part of the Dutch Research Agenda, she coordinates the work of a consortium of researchers from universities and universities of applied sciences [see text box] that is engaged in exploring ways of bringing about that change. The programme addresses two key questions: What is a sustainable food system? And what steering mechanisms can accelerate a transition to a sustainable food system in the Netherlands? "The consortium includes

researchers from numerous disciplines," says Praasterink, "who, in close cooperation with the practice, generate, build on and share new knowledge on topics ranging from regenerative agriculture and protein transition to circularity and true pricing. Furthermore, the researchers increasingly adopt an area-specific approach."

The consortium's research is arranged into five work packages covering a variety of themes. One of the work packages is devoted to determining the current state of play in the food transition in the Netherlands. In another, research projects are being carried out to promote more nature-inclusive agriculture, such as food forests and strip cropping, where the planting of trees, shrubs and edible plants can contribute to local and regional food production while at the same time restoring biodiversity and improving soil quality. The researchers are also developing future scenarios. "It's important that we reach a common ultimate vision," says Praasterink, "so at our computing centre we develop models to calculate the effects of the various scenarios for a future food system."

### DUTCH RESEARCH AGENDA PROGRAMME 'TRANSITION TO A SUSTAINABLE FOOD SYSTEM'

Transition to a Sustainable Food System is a joint programme of NWO and the Dutch Ministry of Agriculture, Nature and Food Quality. Between 2021 and 2024, forty-plus researchers from seven universities, three universities of applied sciences and the National Institute for Public Health and the Environment (RIVM) have been investigating ways of accelerating the transition to a sustainable food system in collaboration with more than twenty partners in the fields of agrifood and nature.

### NOW IS THE TIME

According to Praasterink, it is not often that a university of applied sciences takes the lead in an NWA research programme. "The fact that we're doing so here confirms that practical knowledge can make an important contribution to the transition. There is a growing realisation that knowledge is not linear, with insights only flowing from research to practice. Knowledge is shared in both directions.

Practical knowledge must also be absorbed in the research. An important aspect of this programme is to bring cohesion to all of the various perspectives, which is my responsibility as programme manager."

How confident is Praasterink that the radical transition to a sustainable food system can be achieved? "I'm very optimistic," she

“

There is a growing realisation that knowledge is not linear

says. "You can focus blindly on a particular problem, or work together on solutions. We're doing the latter. We have the momentum, both social and political, as well as nationally and internationally. You only have to look at the first global summit on this theme, the UN Food Systems Summit in 2021, to see that.

People understand that things can't go on as they are and want to be part of the solution. The narrative is changing."

### YOUNG PEOPLE AS GAME CHANGERS

What is needed for success? Praasterink is emphatic. "Practical experiments. Giving a voice to the many bottom-up movements. Transdisciplinary cooperation. Knowledge sharing. A system approach. And courageous leadership. We must also listen more carefully to the views of young people. We have seen from the studies in which students participated that young people are more forward-thinking in their ideas on how to address societal challenges. The universities of applied sciences must take their ideas on board and teach them the skills that will enable them to become game changers in practice."

# The battle against the Ninja Slug



**Oyster farmers in the Netherlands face a serious threat from a small Japanese snail that preys on oysters by boring holes in their shell and sucking out their flesh. A group of oyster farmers sought the help of HZ University of Applied Sciences in tackling the problems caused by this underwater enemy. With varying success.**

Entrepreneur Jean Dhooge comes from a family of mussel and oyster farmers in the village of Yerseke in the province of Zeeland who have been plying their trade in the face of the vagaries of nature for 115 years. Today, one of the hazards they face is the Japanese oyster borer, a Japanese intruder that was first discovered in Zeeland's waters just over ten years ago.

"Initially, it was found in just one area," says Dhooge. "But like the coronavirus, the sea snail spread throughout the oyster farms." The entire oyster sector in Zeeland suffered a rapid decline in their yields. Dhooge: "In some beds, the oyster mortality rate rose to eighty percent or more. It was a disaster." Action was needed. Unless something was done, companies could be bankrupted or, even worse, the entire industry could go under.

## KNOW YOUR ENEMY

Twelve of Zeeland's oyster farms – including Dhooge's – saw in HZ University of Applied Sciences a partner to help tackle the problem. "We often commission research from the university," says Dhooge. "The researchers are practical people who come up with constructive ideas and communicate well. Our role as oyster farmers is confined to sharing our knowledge and reporting the results of tests. The collaboration is excellent." HZ's experts went to work in 2018, starting with a survey of studies carried out in other countries affected by the problem, including France and the United States, to learn whether they had been able to find a solution. They hadn't. The researchers also studied the creature's behaviour and discovered that the snail travelled about 2.2 metres over the sea floor every day, was mainly attracted to baby oysters – which have thin shells – and also feasted on mussel seed.

Entrepreneur JEAN DHOOGHE and GABRIELLE VERBEEKE from HZ University of Applied Sciences shaking the baskets of cultivated baby oysters in the Waterdunen nature reserve in Breskens, Zeeland.



### MUSSEL SEED AS A BARRIER

Armed with these findings, the researchers began the search for solutions together with the oyster farmers. They tested whether the oysters could be protected by erecting a barrier with mussel seed. The oyster borer could then satisfy its hunger with these small shellfish and would stay away from the oysters. Although it was a promising idea, it proved difficult to apply in practice, says Dhooge. "It only works if the seabed on which the oysters are growing is entirely denuded of oyster borers, which is almost impossible to achieve because they lie beneath the sand and are hard to find."

### OFF-BOTTOM OYSTER CULTIVATION

The researchers also tried a method that involves preventing the eggs of the oyster borer from hatching. Submerging them in acetic acid, quicklime or an ultrasonic bath

seemed to at least slow that process. But more research is needed to make the method feasible in practice. However, a technique that does work is to cultivate oysters on trestles raised above the sea floor. Dhooge:

"Oyster borers live on the seabed, so we now breed our baby oysters in baskets on trestles. After a year, when the shell is thick enough to protect them from the oyster borer, they are moved to the seabed to grow further. This method reduces the numbers of oysters lost to manageable proportions."

### A MEATY BITEFUL

The raised farming method has one drawback: the cultivation area is far smaller than on the

seabed. Dhooge: "There are no restrictions with the bottom culture of oysters, since it doesn't disturb anyone. With off-bottom cultivation, the trestles can form an obstacle for recreational and commercial vessels." Nevertheless, for the time being it is the

most effective solution, according to Dhooge. "With HZ, we are now investigating the optimal growing conditions for the oyster. We are also testing floating systems for automatically shaking the baskets, which is now done manually.

The shaking prevents the oysters from being overgrown with seaweed and slows the oyster's growth. Consequently, the oyster is meatier with a more succulent bite.



'More than a Club' is the motto of the Spanish football club FC Barcelona. A club in the Netherlands that is certainly entitled to adopt this slogan is SV Helios in Deventer. The football club is the backbone of a successful campaign to build a healthier community. The question now is how to expand this social innovation to other neighbourhoods in the Netherlands?

# Football club at the heart of a happy neighbourhood

A group of elderly residents being taken for a walk around the playing fields of SV Helios during the weekly sports activity.



Finn Brouwer is seldom to be found anywhere but at Helios. He helps to run the club's sports programme three times a week, often cooks meals for local residents, accompanies elderly persons to fall prevention classes and is currently editing a series of short films for a grant application. He feels at home there. "The club finds things for me to do and then allows me to do them in my own way," he says. "That makes me feel good about myself." It's a big change compared with five years ago. "I couldn't fit in at school or at work and suffered from depression." Finn is proud of his personal development. "I was living under round-the-clock care. Now I'm married and living with my wife and only receive counselling for one hour a month." He is also making the move from organised daytime activities to regular work, having been offered a job with the Solis Care Group under the 'Basisbaan programme'; a scheme in which municipalities employ people with little chance of securing regular employment to do work in the community. "We're currently reviewing what work I'm best suited for there."

### A CHANGING DISTRICT

Finn's story of great personal growth is not unique to him, according to Grace Brok, a social entrepreneur and the chair of SV Helios. "Ten years ago, I sat down with local residents to discuss cooperation with schools, businesses and shops in the neighbourhood. I saw the possibilities, since we have a fantastic clubhouse and playing fields that are not used during the day or in summer. Those discussions led to Buurtgeluk, an initiative to organise various activities to promote exercise, health and participation. Hundreds of people in the community now routinely attend the activities, sometimes after being referred to

us by their family doctor or other healthcare professionals. We encourage local residents to adopt a healthier lifestyle by providing information, organising physical activity and offering nutritious meals. They proceed at their own pace, one step at a time. With positive results. The participants take control of their lives again, regain their vitality and are able to continue living independently at home. This has a huge impact in terms of reducing healthcare costs."

### ANCHORING SUCCESS

One of the partners in Buurtgeluk is Saxion University of Applied Sciences, whose students gain practical experience and supervise activities in the project. "And at the GROZZerdam field lab (see text box) in Deventer, we are exploring ways of further deepening and strengthening the Buurtgeluk approach," says Harmieke van Os, Associate Professor of Personalised Care at Saxion. "What are the factors that make Buurtgeluk a success? And how can we permanently anchor the initiative in the district?" In the project Samen Slim Gezond [Smart Health Together], for example, researchers and students are investigating the feasibility of an app that can track the level of fitness of the participants and so help them to meet their targets.

“

**The club finds things for me to do and then allows me to do them in my own way**

Van Os: "The combined data of all the participants would also give us information about the effectiveness of particular activities."

### SOCIAL IMPACT

Saxion also wants to develop a social business case for Buurtgeluk, which could serve as a blueprint for similar initiatives elsewhere in the Netherlands. "We want to measure the project's impact," says Attila Németh, Professor of Modelling Societal Impact at Saxion. "When the social costs and benefits of Buurtgeluk have been identified, our research

group can underpin the findings with a literature search and data. Once you have a clear picture of what you're doing and why it works, you can ensure the continued success of an initiative and scale it up."

### PUTTING RESIDENTS CENTRE STAGE

Van Os hopes that the research will help to spread the Buurtgeluk philosophy throughout the Netherlands. An important requirement is that the real-world experiences of the residents take centre stage. They must not be impeded by the system world, by the partitions between organisations and different funding instruments. "The existing healthcare system is no longer sustainable, so we must find smarter solutions. Buurtgeluk is a concrete example of the paradigm shift from care to health. We're delighted that our institution can help to accomplish that."

### FROM DISEASE TO HEALTH

GROZ is an initiative launched with the aim of creating a new balance in the Dutch healthcare system. The title is an anagram of ZORG, the Dutch word for care, and refers to the envisaged shift in the focus in healthcare towards health (Gezondheid) and away from disease (Ziekte). The actual innovations in healthcare are being developed in four field labs, called 'GROZZerdammen', in Eindhoven, Utrecht, the Northern Meuse Valley region and Deventer. With universities of applied sciences as knowledge partners, each field lab makes its own particular contribution to realising the central mission of the Dutch Top Sector Life Sciences and Health, which is that by 2040, people in the Netherlands will live at least five years longer in good health.

# Ironing out the wrinkles in the **PaaS** business model

**Business models like Product-as-a-Service (PaaS) are badly needed to kick start the circular economy. But many PaaS initiatives appear to founder because banks struggle with the risks of the proposals presented to them. In a project within the Regional Attention and Action for Knowledge Circulation (RAAK) research programme, a consortium is exploring ways to remove obstacles between the banks and SMEs. Project leader Kees Schöller and Professor of Business Models Timber Haaker discuss the potential of PaaS and the problems the model faces.**

You've probably heard of Swapfiets. It's the company that leases the bicycles with a blue front tyre rather than selling them to its customers. Consequently, Swapfiets remains responsible for the bicycles during their entire lifetime. "It's a perfect example of a Product-as-a-Service business model," says Schöller. "Circular by design, and highly acclaimed with it. No surprise then that more and more SMEs are coming up with PaaS concepts." But problems arise when they approach the banks, because their risk assessment systems are unable to deal with PaaS. "Think of it as trying to push a square peg into a round hole. It can't be done. This is an intractable problem, that our consortium is trying to address."

## FROM QUESTION MARKS TO RISKS

A business model based on lease or hire. It sounds so simple. Haaker explains why it is nevertheless a problem for banks. "They have a great deal of experience with traditional lease constructions, for example with cars, where there is an enormous amount of data available to them. But new PaaS propositions quickly raise questions. Mitsubishi, for instance, wanted to start offering lifts as a service. But what if the building with the lift changes owner? Or the case of an SME in our consortium that wants to adopt the same approach with building facades.

That too raises questions, such as how long the cladding will last and what residual value it will have at the end of its useful life. Mitsubishi did in fact find a solution by acquiring building rights to retain ownership of the lifts. The point is that PaaS concepts can quickly include unusual details that lead to unforeseen risks. And that is precisely what banks are afraid of."

## JOINT SEARCH FOR STICKING POINTS

The consortium, formed in April 2022, studies the problems faced by banks and entrepreneurs. Schöller is enthusiastic about the progress it is making. "The parties are all very committed and well-informed. Consequently, there's real energy in the project and tough decisions are being made. Banks' processes are something of a black box whose contents are not fully transparent for outsiders. But it's gradually becoming easier to pinpoint precisely what the real sticking points are. One of them is beyond the banks' control and that is De Nederlandsche Bank's rules on risk management (compliance), which make it difficult for banks to adapt their systems."

## ANYTHING YOU CAN THINK OF

A company that wants to offer machinery as a service. A producer of playground equipment. A company that breeds insects in containers to

supply chicken feed as a service. The consortium includes fifteen entrepreneurs with exciting plans for PaaS. "They're a mix of greenhorns and veterans," says Schöller. "Some have advanced plans for their business, others are still developing their technology. We start by asking entrepreneurs what it is they need. What internal problems do they face? How good is the communication with the bank? We can then identify their problems and requirements, but also the differences and similarities between them."

## IT HAS TO COME FROM BOTH SIDES

There is a lot of optimism, but there is no quick fix for this problem, Schöller believes. "Our aim is to accelerate the process for banks and businesses by demonstrating the promise of circular business cases. If we demonstrate that the risks of specific aspects of a proposition can be controlled, it will be easier for banks to give a positive risk assessment. In the meantime, banks will hopefully also create systems that are better geared to assessing circular business models like PaaS."



**KEES SCHÖLLER**  
Project leader/researcher



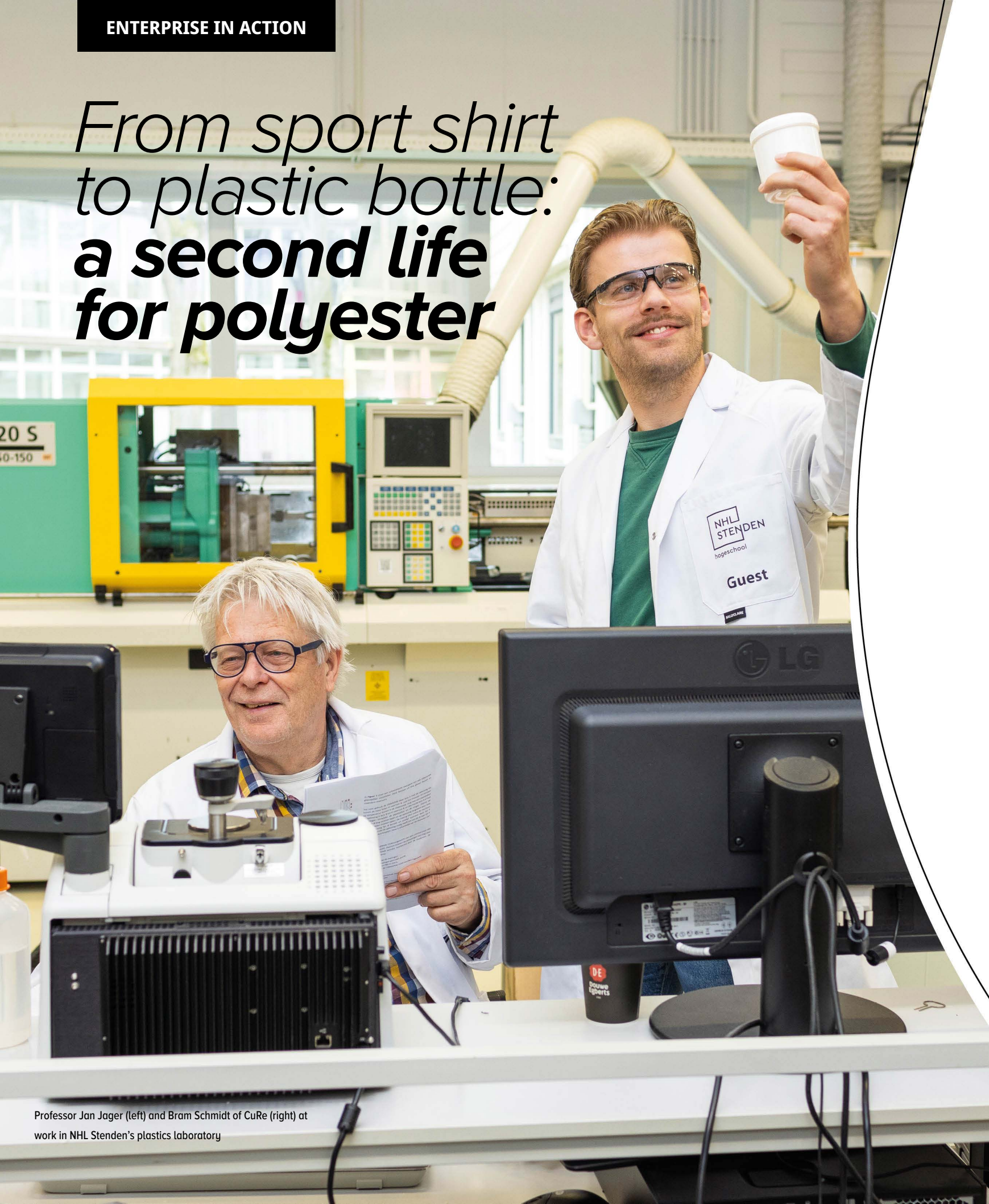
**TIMBER HAAKER**  
Professor of Business Models

The consortium is led by the lectorate for Business Models at Saxion University of Applied Sciences and consists of banks, universities of applied sciences and other knowledge institutes, development agencies and SMEs.

Together they conduct design-based research with a focus on finding ways to improve the funding possibilities for circular business models. The results are widely disseminated in the form of a concrete step-by-step plan and inspiring practical case studies for SMEs. The aim is to increase the success rate of applications for funding of circular business ideas.

Leasing of bicycle racks: ideal for universities of applied sciences and universities. "With this approach, institutions can determine how many bicycle stalls racks needed each year on the basis of the number of students," says John Wermink of Falco Straatmeubilair (in the photo), who is a member of Saxion's consortium.

# *From sport shirt to plastic bottle: a second life for polyester*



Professor Jan Jager (left) and Bram Schmidt of CuRe (right) at work in NHL Stenden's plastics laboratory

**As much as 91% of the worldwide polyester waste cannot be recycled. Why not? Because it is contaminated, for example with dyes. Marco Brons, the director of CuRe Technology, wants to bring an end to this wastage and has come up with an energy-efficient chemical technique for recycling contaminated polyester. Together with students from NHL Stenden University of Applied Sciences, CuRe is working intensively to refine and upscale the promising method.**

**A** sweater containing cotton and sewing thread as well as polyester. A carpet with glue residues and dyes. At CuRe Technology's pilot plant in Emmen, researchers are constantly searching for viable methods of removing miscellaneous contaminants from polyester products. The company's director Marco Brons, the brain behind the technique, explains how it works. "Using a chemical process, we cut the lengthy polyester molecules into small pieces so that the contamination can be removed. That sounds easy, but almost every type of contaminant calls for a slightly different method. We already apply some methods in practice. We currently recycle coloured PET bottles for Coca-Cola, textiles for Ikea and mattresses for Auping. We're powering ahead."

#### **DEALING CAREFULLY WITH EXPENSIVE TEXTILE FIBRES**

Brons brooded for years on the idea of recycling contaminated polyester because, as an expert in plastic recycling, he found it intolerable that 64 billion kilos of used polyester was simply burned in a furnace. "I feel that we must be more careful in how we deal with all those fantastic molecules in textile fibres produced from the expensive oil extracted from our planet. I worked for a long time at a large plastics company, where I saw many possibilities for handling plastic differently. But innovation is difficult in a large and hierarchical company. What you need is a small team that's able to make quick decisions and change

course rapidly. In other words, a speed boat, not an oil tanker." He found this lean and agile combination when, years later, he started his own business. In 2018, he formed a joint venture with Morssinkhof and Cumapol, two plastic recycling companies which recognised the promise of Brons' method. And that's how CuRe – whose name also refers to the English word for heal or make better – came about.

#### **STUDENTS FORGE NEW ROUTES**

NHL Stenden has been another important partner for Brons from the outset. "It was through the institution's Professor of Circular Plastics Jan Jager that I was able to conduct the first tests in NHL Stenden's lab in 2018, because CuRe didn't have its own factory at that time. Jan and I knew one another from our time working at the same plastics company. He is now closely involved in the further development of the CuRe method. Whenever we come up against a recycling problem, I discuss it with him and his chemistry students set out to find a solution. One example is the separation of cotton from polyester, which is crucial since the fabric is used in most clothing. Students think of methods and routes for achieving this goal and we test and implement them in our pilot plant. I find their uninhibited thought processes very refreshing."

#### **PROGRESSION FROM CLASSROOM TO LAB**

Former student Bram Schmidt was CuRe's first employee. He did his graduation project at the company in 2020 when he investigated



**MARCO BRONS**  
Director of CuRe

the conditions under which colours can be removed from textiles most effectively. CuRe still uses his solutions. Five more students from NHL Stenden have followed Bram's path into the company. Besides exchanging ideas, CuRe's employees and researchers also regularly share equipment and laboratory space. Brons: "The great thing is that if we can't find the answer, NHL Stenden has close relations with other knowledge institutions in the region through the 'University of the North' network so there is no duplication of work, ideas or procurement."

Where will CuRe be in five years' time? "By then we will have expanded to other parts of the world. We are already preparing activities in Asia and America. Wherever there is waste, or textiles or glass products are made, we'll be there. Our ultimate goal is to be able to recycle all the polyester waste into high-value applied textiles. Around eighty percent of that waste could be recycled within the relatively short term. For the other twenty percent, a lot of work still needs to be done."

# Sciencefiction in the North Sea

**The government is investing heavily in renewable energy to make the country's energy supply sustainable by 2050. But the large-scale roll-out of offshore wind farms also presents challenges. For example, how to carry out maintenance on thousands of wind turbines situated a long way off the coast? The AIRTuB project offers a futuristic solution.**

Repairing a wind turbine at sea is a major operation. Specially trained mechanics have to sail out to the turbine and then, hanging from ropes high above the water, carry out the repairs. This is not a task to be performed in bad weather, so maintenance and repairs are only carried out on calm days in spring and summer. So what happens if a wind turbine breaks down in the autumn?

There is a serious risk that it will come to a standstill for months. This could cause serious problems in the future, both financial and for the energy supply, when there are thousands of offshore wind turbines. Especially if faults occur in a number of the turbines at the same time.

## JUST LIKE IN A FILM

It is therefore essential to find an easier and more flexible method of carrying out maintenance on offshore wind farms. The AIRTuB project has found a solution straight out of a science fiction film. A drone drops a robot onto a blade of the immobile turbine. The robot then crawls autonomously around the blade to detect and repair any surface damage. Day and night, the robot can do its work when there is no wind blowing. Another advantage is that there is no longer any need to deploy scarce specialist mechanics.

AIRTuB stands for Automatic Inspection and Repair of Turbine Blades. HZ University of Applied Sciences (HZ) is collaborating in the project with energy companies and organisations specialising in drones, robots and the maintenance of wind turbines. Other universities of applied sciences that are partners in the project are Inholland, Hanze UAS in Groningen, Saxion and Avans.

## STUDENTS COME AND GO

HZ built the first prototype of the robot in what was a promising project that awakened the curiosity of many students. "Of course, robots are cool," says an excited Jos Gusing, AIRTuB's technical coordinator, whose company MaromeTech provides support for companies engaged in technological innovation. "Courses that involve working with drones and robots appeal to students and that is an important factor in their decision to opt for study programmes such as mechatronics, mechanical engineering, electrical engineering and computer science and engineering. It therefore makes sense to involve students closely in this sort of project as it shows the new generation how enjoyable working in the engineering and energy sector can be. It's also crucial in view of the shortage of good engineers and technicians. I therefore meet regularly with the relevant universities of applied sciences and

secondary Vocational Education and Training (VET) colleges to discuss projects in which we can involve their students." With some success, since around a hundred and fifty students from both HZ and Scalda (VET college) have worked on the AIRTuB project up to now.

## DETECTING DAMAGE

What is the prototype of the robot currently able to do? "The ultrasonic sensors on the robot are already able to detect 'subcutaneous' damage to a turbine blade," explains Jeroen Verschelling, AIRTuB's technical director. "The layers of plastic in the blade can be damaged by rain, hail or lightning and eventually split apart. That needs to be spotted in time. The ultrasonic testing technique is already used for the maintenance and inspection of aircraft wings, for example. But those tests are conducted on the ground, while for wind turbines the work has to be done at a considerable height. Our drone and robot currently jointly weigh over forty kilos, which is far too heavy. We still need to make improvements in that respect."

## WHATEVER THE WEATHER

Besides detecting damage, the robot can also print a thin coating on a damaged turbine blade with a 3D print head. "Various weather conditions cause wear and tear to turbine



The researchers unveiled the prototypes of the drone and the robot at the end of 2022 in the Royal Netherlands Aerospace Centre (NLR).

blades,” Verschelling explains. “To give an impression, the point of a turbine blade covers a distance of one to two million kilometres a year. And the blades are becoming steadily larger, the latest version measuring 110 metres in length. That is a large surface area to be maintained. Allowing the wear to continue for too long causes aerodynamic losses which result in less energy being generated.” The 3D print head works perfectly in the lab, so the next step for the researchers is to modify it for outdoor conditions, and more specifically for resistance to the effects of salty air.

#### IN ITS OWN NEST

The future of the drone-robot combination depends entirely on what comes next. “It’s still too risky for offshore maintenance companies to step into the project. We first have to refine the prototypes and eliminate the teething problems,” says Verschelling. “Only then will it be really interesting for companies.” High on the agenda is the development of a docking station for the invention: a ‘nest’ in the wind turbine for the drone, so that it can fly out to carry out repairs as soon as a fault occurs, or to carry out preventive inspections when there is no wind. “The idea is that there will also be charging stations for both devices in the nest,” Verschelling explains. “We have a great test location in a warehouse in Vlissingen, where a number of turbine blades are stored for experiments in a controlled environment. All going well, on completion of the project we’ll be able to take the finished product out to sea.” And then science fiction really will have become reality.



Photography: Rob Remmerswaal

pit **stop**

# Fancy a nice chat?

**Social robots are increasingly used as a support tool for health professionals. Working with writers from the Nijmegen-based literary collective Wintertuin and health professionals, researchers from Utrecht School of the Arts (HKU) and the Vrije Universiteit Amsterdam investigated how robots can communicate in a genuinely meaningful way with people with dementia. The result was some enjoyable interactions with Memo the robot.**



“Do you prefer to go to the beach or to the woods?” Or on a deeper level, “What does it mean to be human?” These are questions that the robot Memo put to residents with dementia in a nursing home. Thanks to the narrative techniques of the writers from Wintertuin, in the course of the Robotstories research project the questions asked and the responses given by Memo became increasingly human-like. But Memo was still sometimes ponderous, sometime failing to react to a surprise counter-question from a resident.

“That was a little embarrassing, because our objective was a meaningful interaction between them,” says Jorrit Thijn, one of the researchers from the HKU. “At the same time, the residents grew in their role and adapted well to the robot. Memo therefore

showed that robots can help in getting people with dementia to talk about new subjects and their memories. Robots could soon be able to help healthcare professionals and family members to converse with people with dementia about more challenging subjects.”

Pattie Meijdam, a care worker at the AxionContinu nursing home, also sees the significance of the interaction with Memo. “For people with dementia, Memo offers comfort, diversion and a sympathetic ear. Interaction with a robot can help them to shed their inhibitions and find relief from their situation. It was also nice to see that the residents found Memo friendly and adorable. The four clients who participated in the project did not want the conversation with Memo to end. One of them even said: ‘I can’t wait to meet him again’.”

**“I can’t wait to meet him again”**

## THE DIALOGUE CONTINUES

In a follow-up study, the partners in Robotstories plan to collaborate with a company specialising in medical robots for a study into speech synthesis designed to give the robot the correct intonation and so prevent awkward situations. Another goal is to develop a method by which family members and health professionals themselves can develop a meaningful dialogue with Memo.