university of groningen

Developing knowledge and innovations together: towards a circular economy

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Developing knowledge and innovations together: towards a circular economy

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‘DEVELOPING INNOVATIONS TOGETHER: TOWARDS A CIRCULAR ECONOMY’

The reuse of products, parts and raw materials is becoming increasingly normal. It generates hardly any waste and minimizes CO_2 emissions. We are heading towards a circular economy. The transition to this economy will, of course, raise many questions. For example, how do we get people to make more sustainable choices? How can I make my company more sustainable? Can entrepreneurship be sustainable and still make money? And how do you ensure that waste is reused efficiently? Ready-made solutions are seldom available, so new knowledge is required.

In cases like this, Industry Relations can explore opportunities if collaboration programmes can be established together with the University of Groningen (UG). The UG is keen to establish links with the business community, non-profit organisations, knowledge institutions, educational institutions, government bodies and members of the public. Together, we can boost the innovative strengths of the Netherlands while at the same time achieving societal impact.

The circular economy is the main theme of this portfolio book. In fact, to be more precise, it is all about how we can jointly develop knowledge and innovations to accelerate the transition to that economy. These developments include all fields. The UG’s strength lies in the fact that the University has in-house expertise across all these fields. Not only are our researchers experts in their own disciplines, they also engage in interdisciplinary cooperation across various research centres. Does your organisation have questions about the circular economy or some other topic? The Industry Relations team is committed to finding and establishing links with all stakeholders and to engage with their various perspectives and ideas. So, don’t hesitate to get in touch. We would be happy to meet your organisation’s representatives and discuss the options!



Iris Vis
Dean of Industry Relations
University of Groningen

‘Een circulaire economie vraagt om een heldere visie, om intrinsieke motivatie en daadkracht. Om het maken van vooruitstrevende, bewuste keuzes. Om transparantie. Garanties. Om het loslaten van achterhaalde theorieën. Het vraagt om een transitie naar een totaal nieuwe dimensie: een nieuwe, innovatieve cyclus in een gesloten kringloop van zuivere grondstoffen die volledig en oneindig recyclebaar zijn. Pas dan is er niet meer sprake van alleen een duurzaam sausje, pas dan heb je echt een circulair systeem.’

Erik Toenhake, director of the DutchSpirit sustainable clothing brand
Source: www.duurzaam-ondernemen.nl, 30 September 2019

‘De circulaire economie staat steeds meer in de belangstelling. Afval en verspilling worden steeds meer taboe. Ondernemers knopen meer en meer het uiteinde van de ene keten aan het begin van een andere. Tegelijkertijd ontwikkelen ze daarbij nieuwe verdienmodellen. Maar circulaire economie gaat ook over minder en slimmer grondstoffen, duurzame energie, behoud van cultuur en biodiversiteit en welzijn. (...) Provincie Fryslân wil dat Fryslân in 2025 de meest gunstige ontwikkelregio van Nederland is op gebied van circulaire economie.’

Provincie Fryslân
Source: www.fryslan.nl

‘In order to tackle complex global challenges, a truly systemic approach is needed. Plastics, fibres, and food are among the most iconic materials in the global economy. Applying the principles of a circular economy to managing them represents significant potential for business, environmental, and societal benefits. Taking such a systemic approach to how we make, use, and reuse these materials offers the chance to move towards an economy that works in the long term.’

Ellen MacArthur Foundation, partner of the World Economic Forum and member of the Platform for Accelerating the Circular Economy
Source: www.ellenmacarthurfoundation.org

‘Noord-Nederland geeft het goede voorbeeld: het heeft de handen ineengeslagen. De waterstofparel zouden we moeten laten doorgroeien naar de rest van Nederland. En over de grenzen heen durven kijken. Het Noorden heeft de juiste snaar geraakt, maar moet die nog harder raken én opschalen.’

Diederik Samsom, former politician (Dutch Labour Party) and Head of Cabinet under Frans Timmermans, Vice President of the European Commission
Source: www.dvhn.nl, 31 October, 2019

‘De circulaire economie is essentieel om onze economie een duurzame weg in te laten slaan en de duurzame-ontwikkelingsdoelstellingen te realiseren. Uit dit verslag (verslag van het actieplan voor de circulaire economie - red) blijkt dat Europa als wegbereider de route voor de rest van de wereld aangeeft. Tegelijkertijd moet er nog veel worden gedaan om te waarborgen dat wij onze welvaart binnen de grenzen van onze planeet vergroten en de cirkel rond maken, zodat er geen kostbare hulpbronnen wordt verspild.’

Frans Timmermans, member and Vice President of the European Commission, responsible for the Climate Action portfolio (Commission – Von der Leyen)
Source: European Commission press release, 4 March 2019

‘With an economy, designed to grow rather than thrive, millions of people still fall short of their most basic of needs, while at the same time we are risking irreversible impact of climate breakdown and ecosystem collapse. We, the people of the early 21st century, are the first generation to see this, and probably the last with a real chance of turning it around.’

Kate Raworth, lecturer and researcher at the University of Oxford’s Environmental Change Institute, and author of a book entitled ‘Doughnut Economics’.
Source: www.ted.com, April 2018

‘Om onze ambities te verwezenlijken moeten we samenwerken. Dat doen we met Vereniging Circulair Friesland, het brede bedrijfsleven, andere overheden en het onderwijs. De denkkracht van de RUG/Campus Fryslân brengt ons verder en wijst ons de weg naar een circulaire, en daarmee een toekomstbestendige, economie.’

Sander de Rouwe, member of the Provincial Executive in Friesland
Source: www.rug.nl, 16 January, 2019

‘In een circulaire economie zijn we afgestapt van het idee dat producten en grondstoffen een lineair leven doorlopen van grondstofwinning naar productie naar afval.
In plaats daarvan stromen producten en materialen door een continu, cyclisch proces met zo min mogelijk uitval van grondstoffen. (...) Dat betekent dat we minder grondstoffen en materialen gebruiken en verbruiken, dat we andere grondstoffen en materialen gebruiken (bijvoorbeeld biomassa), dat we materialen en producten optimaal gebruiken (o.a. door reparatie en refurbishment) en producten intensief gebruiken (deel-, ruil-, verhuur- en leenplatforms).’

From **The Circular Economy Knowledge and Innovation Agenda,** October 2019



Here at the UG, students and researchers are conducting research in the Engineering and Technology Institute Groningen's (ENTEG) **biotechnological research groups' laboratory**. They focus on microbiologically-related aspects of the circular economy. For instance, in the foreground you can see two bioreactors that are fed with waste streams. They contain bacteria that produce biodegradable plastics and microalgae that synthesise high-quality hydrocarbons.

The University of Groningen: at the heart of society

1

The University of Groningen is at the heart of society. It is fully engaged with companies, non-profit organisations, government bodies, knowledge institutions and members of the public. The goal: contribute to a resilient society that tackles societal challenges.

Broad and distinctive

The University of Groningen (UG) distinguishes itself, both at the national and international level, by its strong links between education and research. The three main focus areas are: Energy, Healthy Ageing, and Sustainable Society. The University's eleven faculties develop knowledge in disciplines such as engineering, philosophy, law, social sciences and economics. Such unique breadth offers ample opportunities for multidisciplinary and interdisciplinary education and research, while providing a fertile environment for knowledge and innovation. Cooperation with partners is an important aspect; this can pave the way for the creation of new developments, products and services.

Establishing links

The UG's Industry Relations team works to establish links between the University and other parties. An important step of this process is that the partners – each on the basis of their own core qualities and core values – formulate a common goal to tackle societal challenges. This goal is then translated into a sustainable collaboration programme. The collaboration may focus on research, education, talent development or societal impact. They involve aspects such as knowledge sharing, question-driven fundamental research or the translation of knowledge into products or services. It could also include internal training programmes, student engagement and the establishment of new networking organisations.

Are you curious to find out about collaboration in the circular economy? You will read some highly interesting examples in **Chapter 2**!

Sustainable cooperation between the UG and its partners

OPPORTUNITIES FOR COLLABORATION:

Interdisciplinary and multidisciplinary fundamental question-driven research

The formation of consortia and networks, joint research applications to, for example, NWO, the NWA or the EU, or as part of the national Top Sectors policy

Talent development among students through placements and participation in research projects

Sharing knowledge and inspiring people

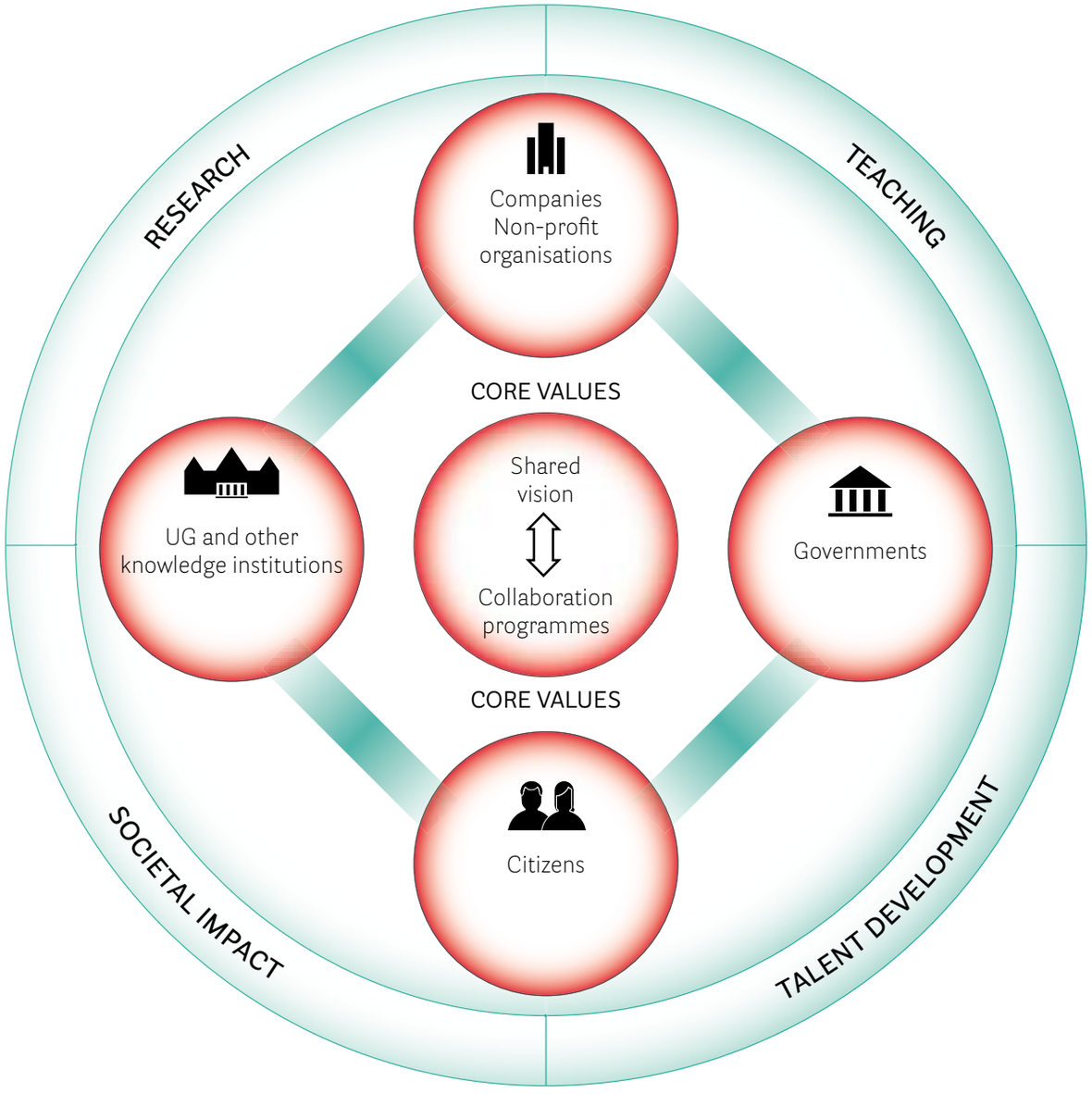
Transformation of knowledge into pilot projects, demo projects or end products and services

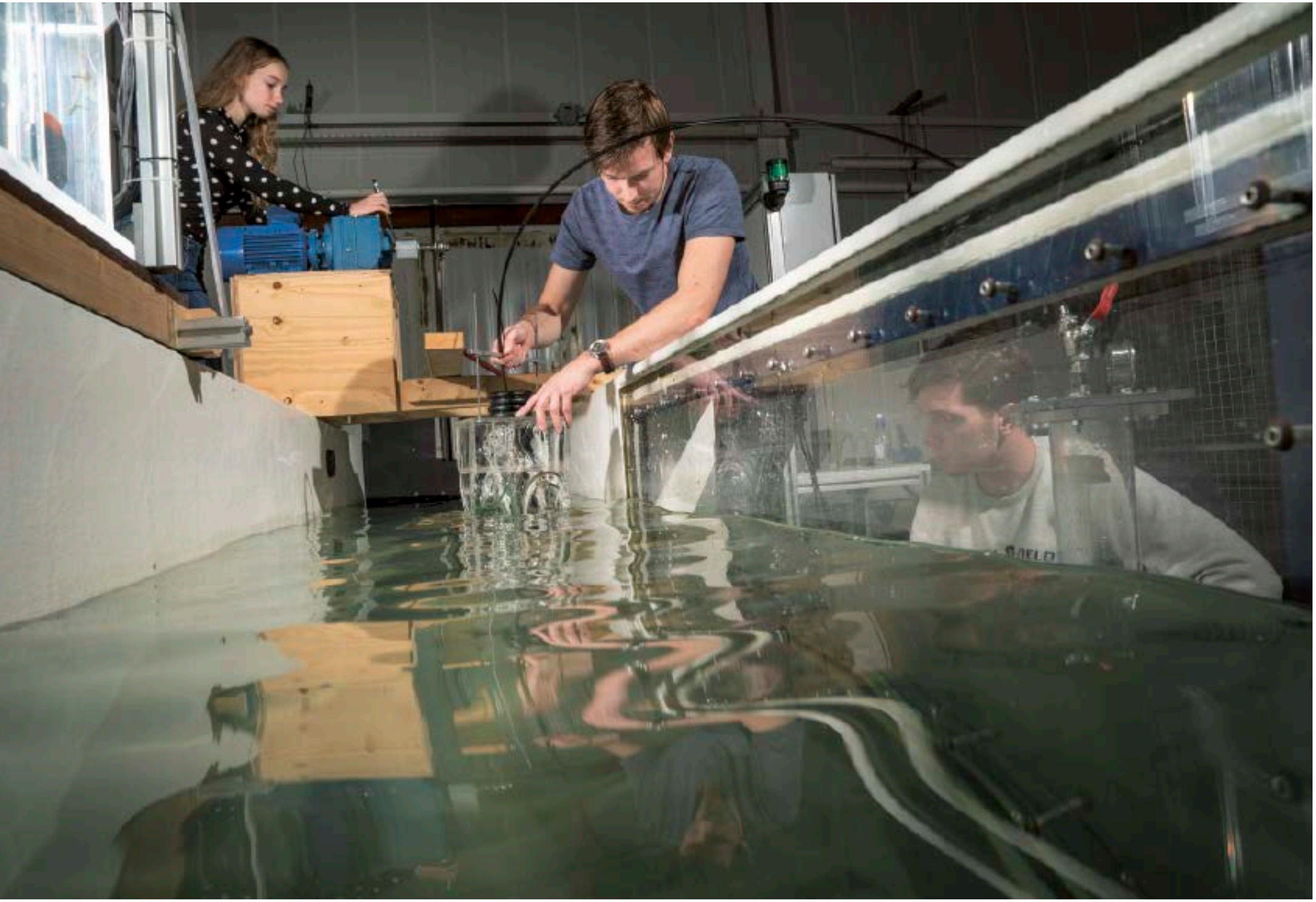
Joint infrastructure and facilities, working close to each other

Making results visible

Professionalisation of staff through training courses

Identifying and addressing societal challenges





The **Ocean Grazer** is a system for 'harvesting' and storing energy at sea. It is a hybrid, renewable solution that exploits several different energy sources (such as wind and waves), which it combines with innovative technology to store energy. This enables the Ocean Grazer to achieve the best possible balance between energy supply and demand, which offers the electrical grid great flexibility. The current focus is the development of the storage system, which can also be further refined into a stand-alone system. The photograph shows an initial test of the suction-anchor system used to anchor the Ocean Grazer to the seabed.

Examples of research projects

2

A circular economy is all about the reuse of products, parts and raw materials. There is no waste and the CO_2 emissions are minimal. The University of Groningen is blazing a pioneering trail here, on the path to this new way of working and living. Together with its partners, it is seeking solutions to novel and existing issues in our society.

Research projects

The University of Groningen (UG) is conducting broad-based research into the circular economy. On the one hand, its researchers are focusing on projects that could make a very tangible contribution to such an economy – through the development of new, sustainable products, materials and processes, for example. On the other hand, they are also exploring our society's future needs as it is making the transition to this new system. For instance, there are legal issues and opportunities to get people and companies involved in sustainable initiatives. You will find a small selection of these research projects on the following pages. Projects in which cooperation is an important factor – either with other scientists or with companies, non-profit organisations or members of the public, for example.

Are you curious to find out about the University's other projects in the field of the circular economy? Or would you like to know which other studies the UG carries out with its partners? Please visit **www.rug.nl/industry-relations** for inspiring examples.

Bioplastics – from cashew nuts to cycle paths

The research

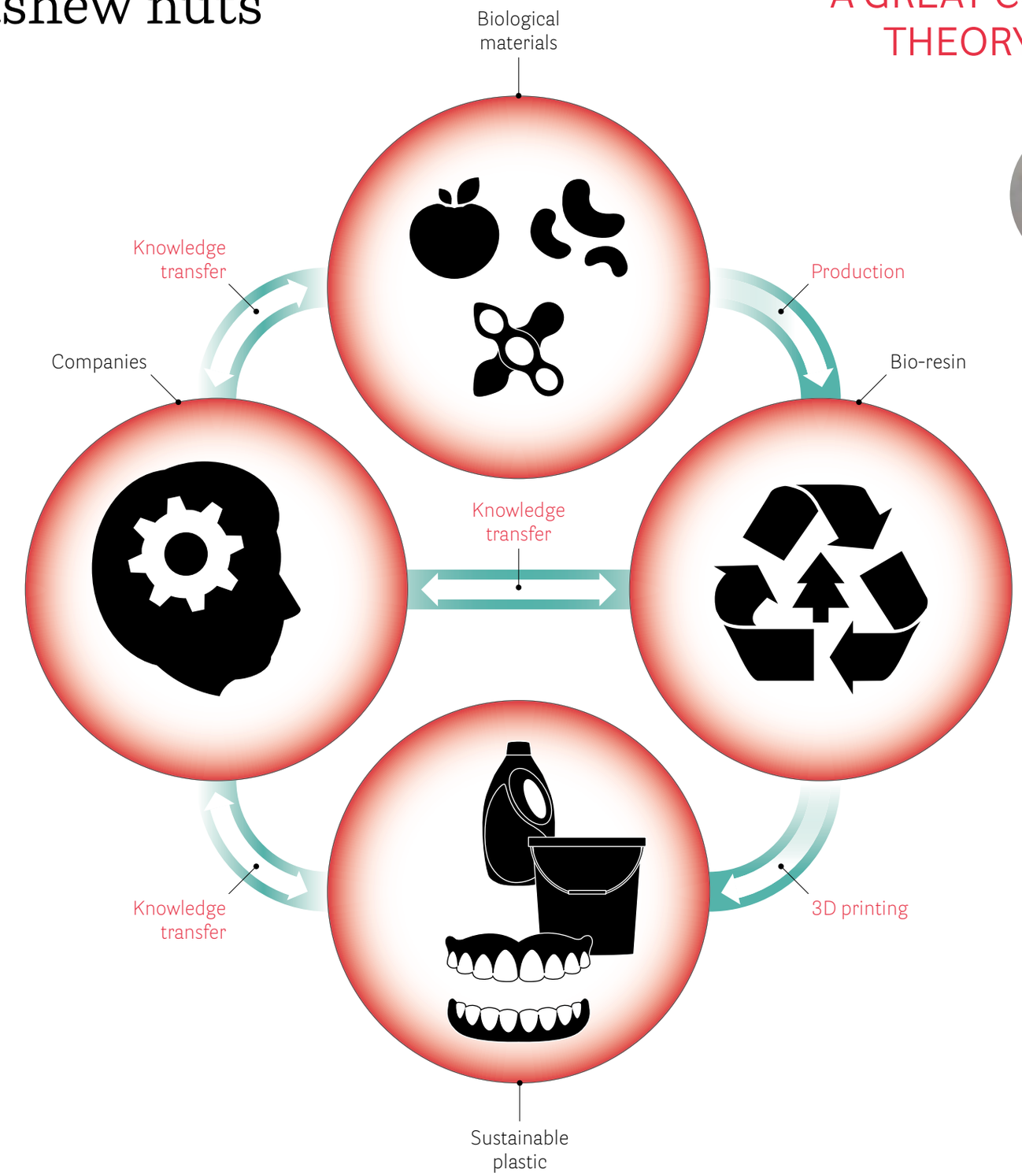
Ninety-five per cent of all plastics are made from fossil resources, such as oil. But various studies have shown that you can also make plastic from biological materials. The Zernike Institute for Advanced Materials (at the UG's Faculty of Science and Engineering) and NHL Stenden University of Applied Sciences are now taking the next step together. They hope to produce high-quality plastic from natural raw materials, such as the shells of cashew nuts, soybean oil or malic acid. This can then be used in production processes, such as 3D printing. An initial step in the development of sustainable plastic involves processing these biomaterials into a resin. The UG's research in this area has yielded positive results – the University is now producing this 'bio-resin' in one of its labs. This material is then used to supply NHL Stenden's 3D printers, in Emmen.

In everyday practice

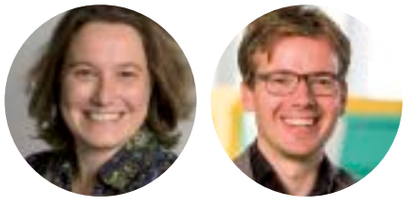
3D printers can use this bio-resin to print all kinds of products, such as dental prostheses and medical models of the body (or body parts). It's also possible to combine the resin with natural fibres, to make it stronger. It could then be used in cycle paths or for reinforcing houses and bridges, for example.

Joint opportunities

The researchers want their sustainable plastic to be of the same quality as plastic made from fossil resources. That is the only way to get companies interested in using this new variant. With this in mind, the researchers have asked various companies in the plastics industry to help them assess the quality of this material. Together, they can further improve the bio-resin until it is fully suitable for marketing.



'A GREAT COMBINATION OF THEORY AND PRACTICE'



Professor Katja Loos and associate professor Vincent Voet
The former is employed by the Zernike Institute for Advanced Materials (at the UG's Faculty of Science and Engineering), while the latter is a member of NHL Stenden University of Applied Sciences' Sustainable Plastics research group

'Our team's researchers and PhD students regularly travel between Groningen and Emmen, to test new ideas or to exchange knowledge. We design new materials in Groningen and test them in Emmen. So our research involves a great combination of theory and practice. The ultimate goal is to determine whether sustainable plastic can compete with current products, in terms of quality. In a few years, we hope to answer that question with a big fat "YES". That will not be the end of our collaborative venture. For instance, we want to further explore the recyclability of the bio-resins we have developed. Our collaborative venture will certainly continue!'

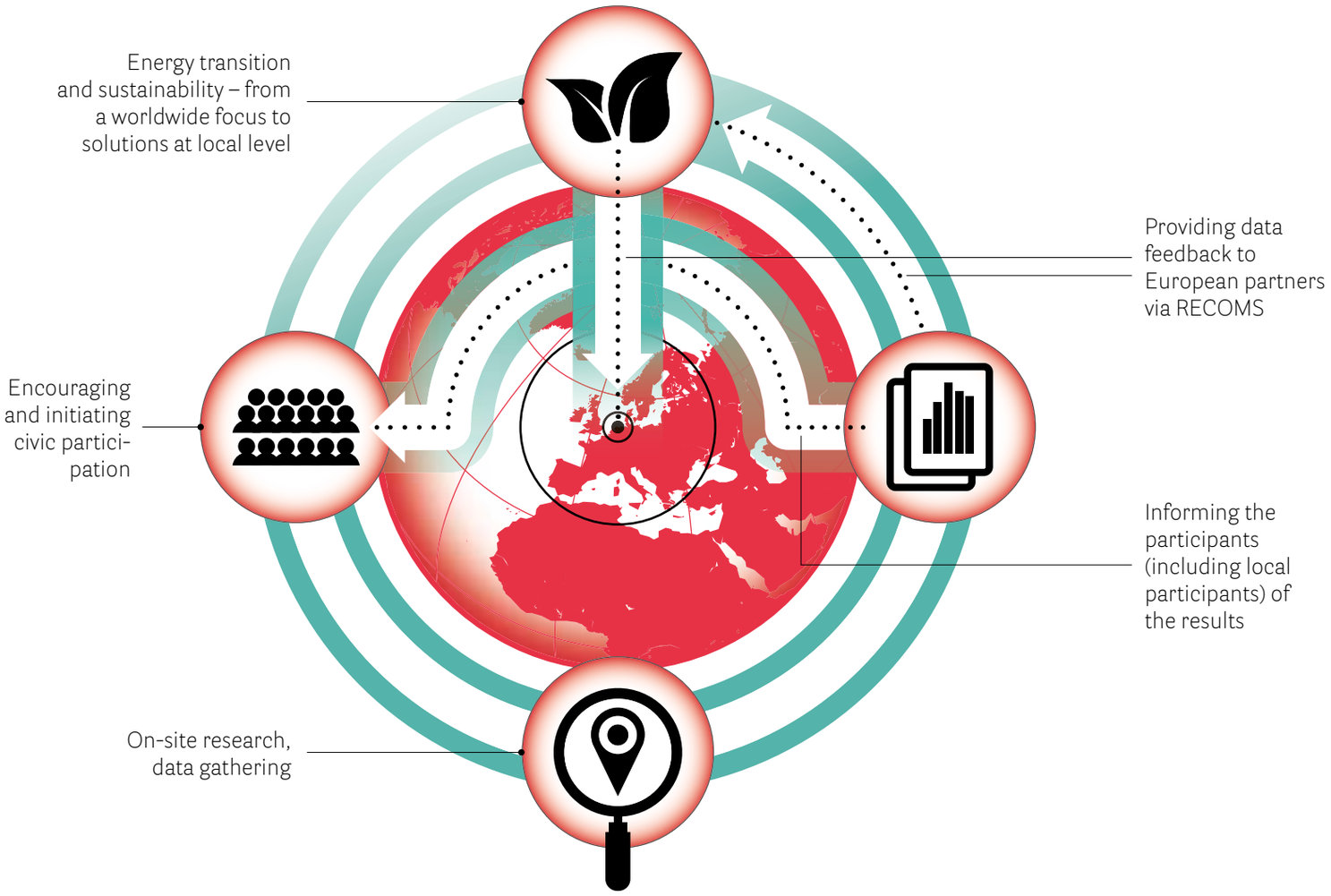
Project partners
The University of Groningen and NHL Stenden University of Applied Sciences (Emmen campus), as well as several companies from the plastics industry, including KNN Bioplastic, SymbioShape and Liqcreate.

Extra information
The researchers also cooperated with various companies to develop a sustainable ink for 3D printers. Fellow scientists and other interested parties can view the creative process at www.jove.com/video/58177.

RECOMS makes societal themes personal

The research

The UG's Faculty of Spatial Sciences helped to get the international RECOMS project up and running. This project focuses on communities and local initiatives, in which members of the public tackle major scientific themes, such as energy transition, climate change, and sustainability. RECOMS stands for 'resourceful communities'. Fifteen young researchers (fellows) from all over Europe are exploring communities of this kind in various European towns and cities. They are triggering people's awareness and exploring ways for communities to become more resilient.



In everyday practice

Groningen is one of the cities in which residents and RECOMS researchers joined forces. The year 2019 saw the launch of Energy of Groningen – a participatory activity focused on energy transition and sustainability. Visitors of the Noorderzon festival helped to develop ideas for an energy-neutral Groningen. Throughout the festival, their suggestions were added to an exhibition on this topic. Together with the residents of Groningen's De Oosterpoort neighbourhood, RECOMS also sought solutions and opportunities for people to become self-sufficient in terms of energy. The researchers involved in the Energy of Groningen event cooperated with the PeerGrouP theatre company to present their results in a creative, appealing, and informal way.

Joint opportunities

RECOMS consists of a consortium of 11 public, private and not-for-profit organisations spanning six European Union member states. By joining forces, they are able to support resourceful communities throughout Europe and enable members of the public themselves to take action on major societal themes such as climate change. In this way, these themes are transformed from seemingly remote issues to something much closer to home, in their own backyards.

'A MORE CREATIVE WAY OF WORKING'



Associate Professor Ina Horlings
Faculty of Spatial Sciences, University of Groningen

'Collaboration with local associations and companies are indispensable to the creation of viable, resourceful communities. It is important that researchers convey new information (such as research results) to residents in a comprehensible way. This can include creative options, such as exhibitions or theatre. The knowledge and creativity of members of the public themselves can also be a source of inspiration for the shared creation of new agenda's and storylines for the future. This involves a more creative way of working. Producing scientific publications is no longer enough.'

Project partners
The University of Groningen; Coventry University; the Flanders Research Institute for Agriculture, Fisheries and Food (ILVO); LUKE Natural Resources Institute; the University of Natural Resources and Life Sciences, Vienna; Munich University; the Directorate-General of the Ministry of Infrastructure and Water Management (RWS); PeerGrouP; Shared Assets; Green City and the Bavarian Forest National Park.

Bijzonderheden
After receiving a grant from the European Union, RECOMS started in 2018. Grant number: 765389. The project will last four years. For more information, see www.recoms.eu.

International cooperation on biofuel from residual waste

The research

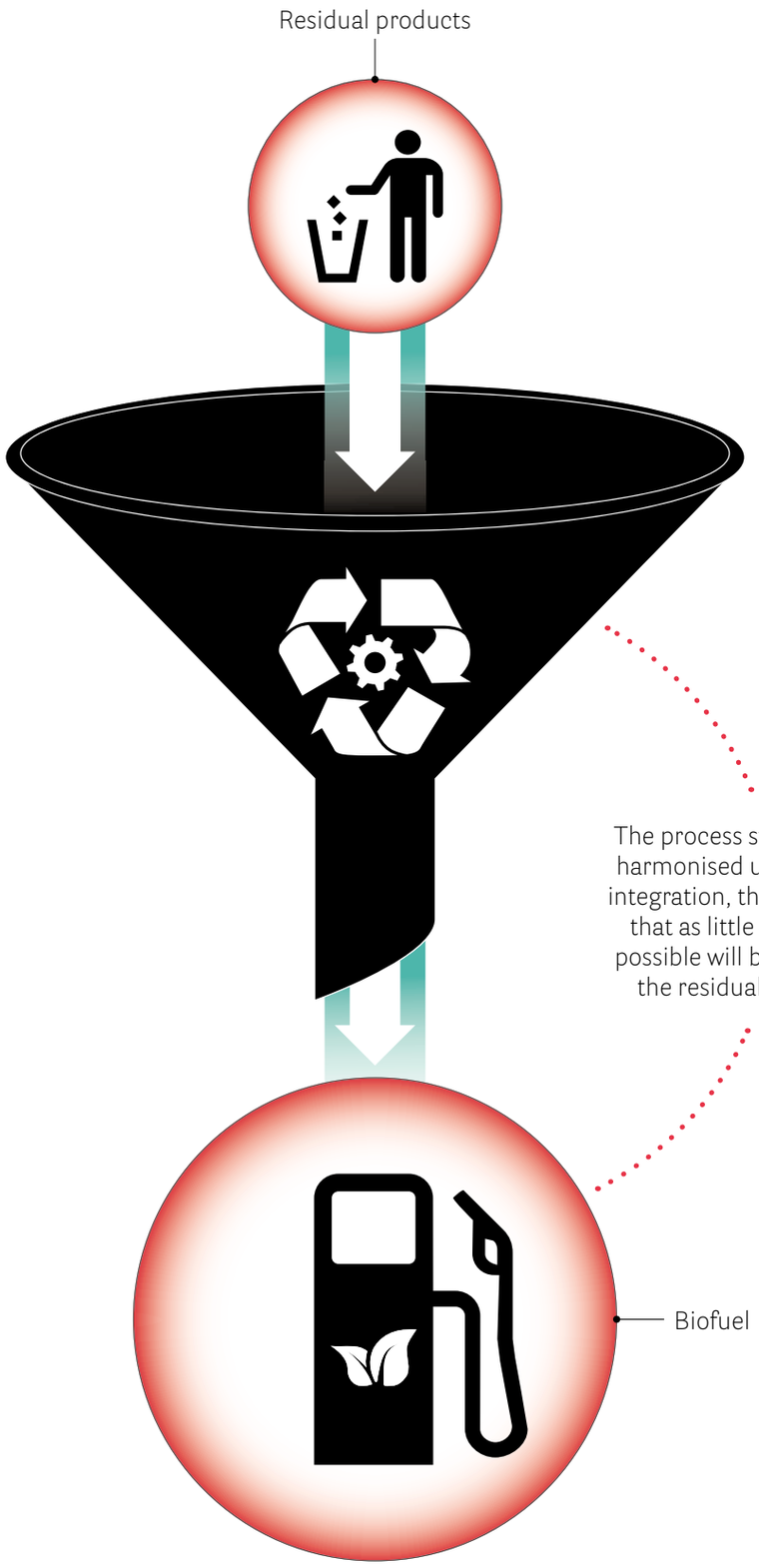
How can you produce diesel or kerosene from residual waste? This is the key question being tackled by the international ABC-Salt project, which was initiated by the UG's Faculty of Science and Engineering. The partners involved in this project are researching a range of topics, such as the best way to process residual material, like waste streams for the paper industry (lignin) or agricultural residues like straw. They have identified a promising option, which is to first dissolve the waste in molten salt. This stops it from sticking to the processing equipment and makes it easier to heat during the process in which it is converted to biofuel. The team is also exploring ways of making the individual steps in this process interlock more effectively, to ensure that as little energy as possible will be lost from the residual waste.

In everyday practice

Research into the development of biofuels from residual waste using molten salts is still at an early stage. In the upcoming years, the partners aim to demonstrate the feasibility of producing such fuels in a small-scale, experimental setting. At the end of this project, they hope to showcase a miniaturised version of the new production process in their lab. In simple terms, the idea is that you just feed residual waste into a machine and, after a few moments, biofuel drips out.

Joint opportunities

Partners from seven European member states are involved in this research project. Each of them is contributing their own particular expertise. The partners complement each other and learn from each other. Ultimately, they hope to develop a commercially viable production process. Together, they see plenty of opportunities to create a society in which we are less dependent on fossil fuels.



'POOLING EXPERTISE'



Professor Erik Heeres
Faculty of Science and Engineering, University of Groningen

'Our ultimate goal is to produce biofuels that are identical to current fuels in terms of their properties and chemical structure. Our partners will help to achieve this goal, by contributing their own expertise. For example, the Norwegian University of Life Sciences knows everything about molten salts, while RISE (a Swedish research organisation) is an expert in handling residual waste from paper production. We are also tackling related, non-technical issues. The Sapienza University of Rome is focusing on barriers to the introduction of biofuels, for example, and on whether people would be prepared to buy this fuel, if and when it becomes available.'

Project partners
The University of Groningen, Engineering and Technology Institute (ENTEG, part of the UG); the Norwegian University of Life Sciences; Ghent University; Sapienza University of Rome; Aston University; the BTG Biomass Technology Group; the German Aerospace Center; RISE and Ayming.

Extra information
In 2018, the ABC-Salt project, led by the UG, was awarded a € 4 million grant as part of the European Union's Horizon2020 programme. The project will last four years.

The rights and wrongs of online sharing platforms

The research

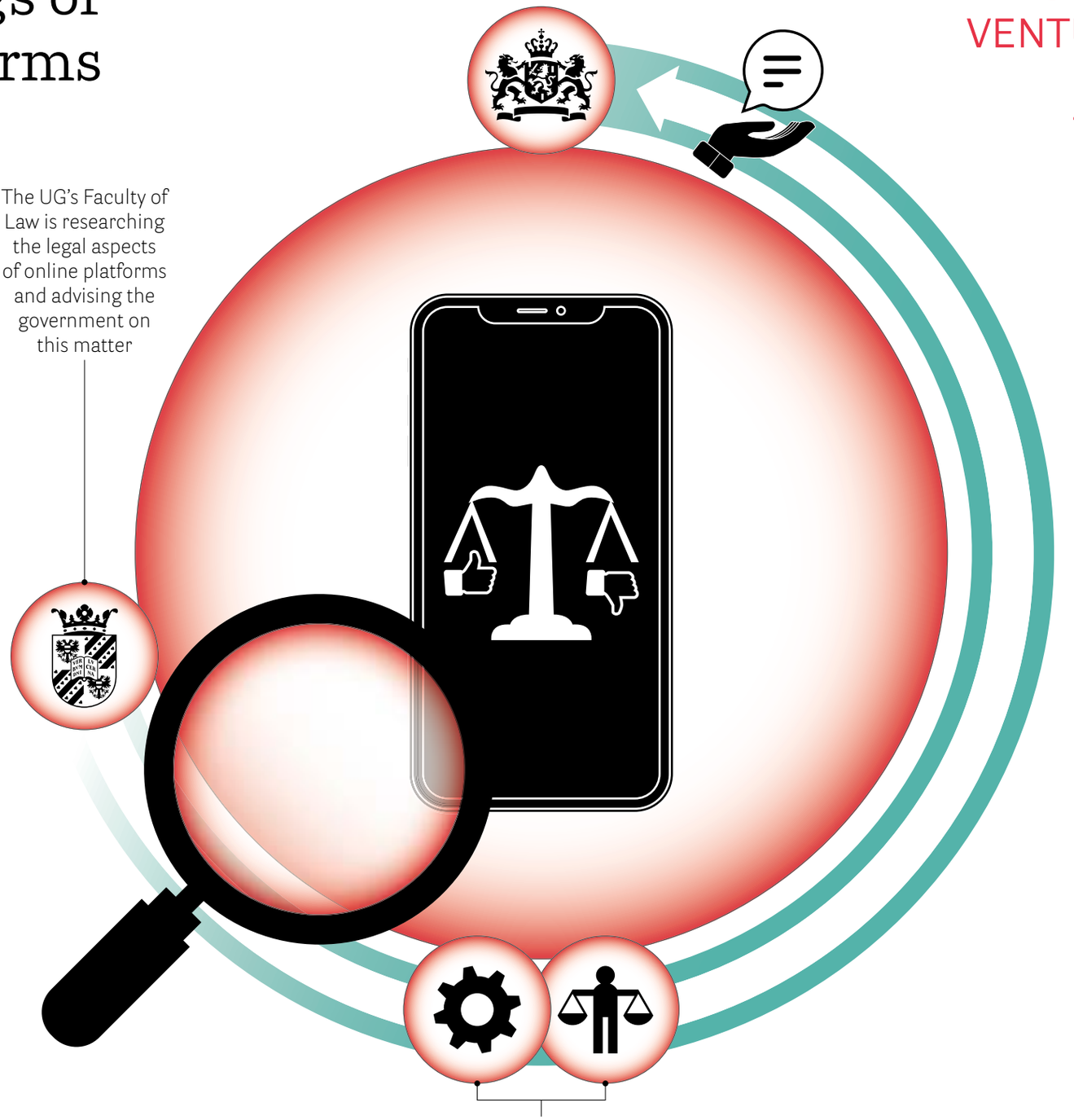
Using and reusing everything of value, as many times as possible, is part and parcel of a circular economy. The internet features all kinds of platforms to support this endeavour. For example, there are websites where you can borrow cars or tools, or lend them to others. On other sites, construction companies can search for suitable building materials saved from demolition sites. But what about the legal aspects of these online platforms? The UG's Faculty of Law is researching this issue, and advising the government and other parties. One relevant question is 'How can you guarantee safety and honesty online?' To what extent is this covered by existing legislation? Also, what needs to change?

In everyday practice

The pace of technological development is sometimes so rapid that the law is no longer in step with everyday practice. Take the online platform Airbnb, for example, which people use to rent or book private accommodation. As things stand, the law views Airbnb as a platform that provides information. This means that it is seen as an intermediary, so it cannot be held liable. These days, however, intermediaries like this do much more than just provide information. They also generate reviews, arrange payments and advertise. They have grown into major players in existing markets and often find ways to get around the rules. This creates conditions that favour unfair competition.

Joint opportunities

The government and the European Union – together with numerous partners, such as the University of Groningen – are in the process of amending laws and regulations to address the technological developments that contribute to a circular economy. However, this does not mean that companies with innovation plans will have to face uncertainty in the meantime. The European Union has placed the circular economy high on its agenda. Its economic policy offers plenty of scope for innovation. It is up to companies and lawyers to identify the opportunities offered by existing legislation, to ensure that legal relationships do not become distorted.



The UG's Faculty of Law is researching the legal aspects of online platforms and advising the government on this matter

Companies and lawyers are identifying the opportunities offered by existing legislation

'COLLABORATIVE VENTURE BETWEEN LAWYERS AND THE BUSINESS COMMUNITY'



Assistant Professor
Rosalie Koolhoven
Faculty of Law, University of Groningen

'The pace of technological development is sometimes so rapid that the law is no longer in step with what is going on within society at large. In the past, for instance, there were no internet platforms to act as intermediaries. This change means that the regulations need to be amended. In essence, this is the government's responsibility. However, lawyers also have an important part to play in this. Together with the business community, they can decide on the right approach to discussions about amending the rules. They can also help companies to interpret legislation and to explore the scope of existing rules. Together, you can achieve so much more.'

Environmentally friendly behaviour – a positive experience

The research

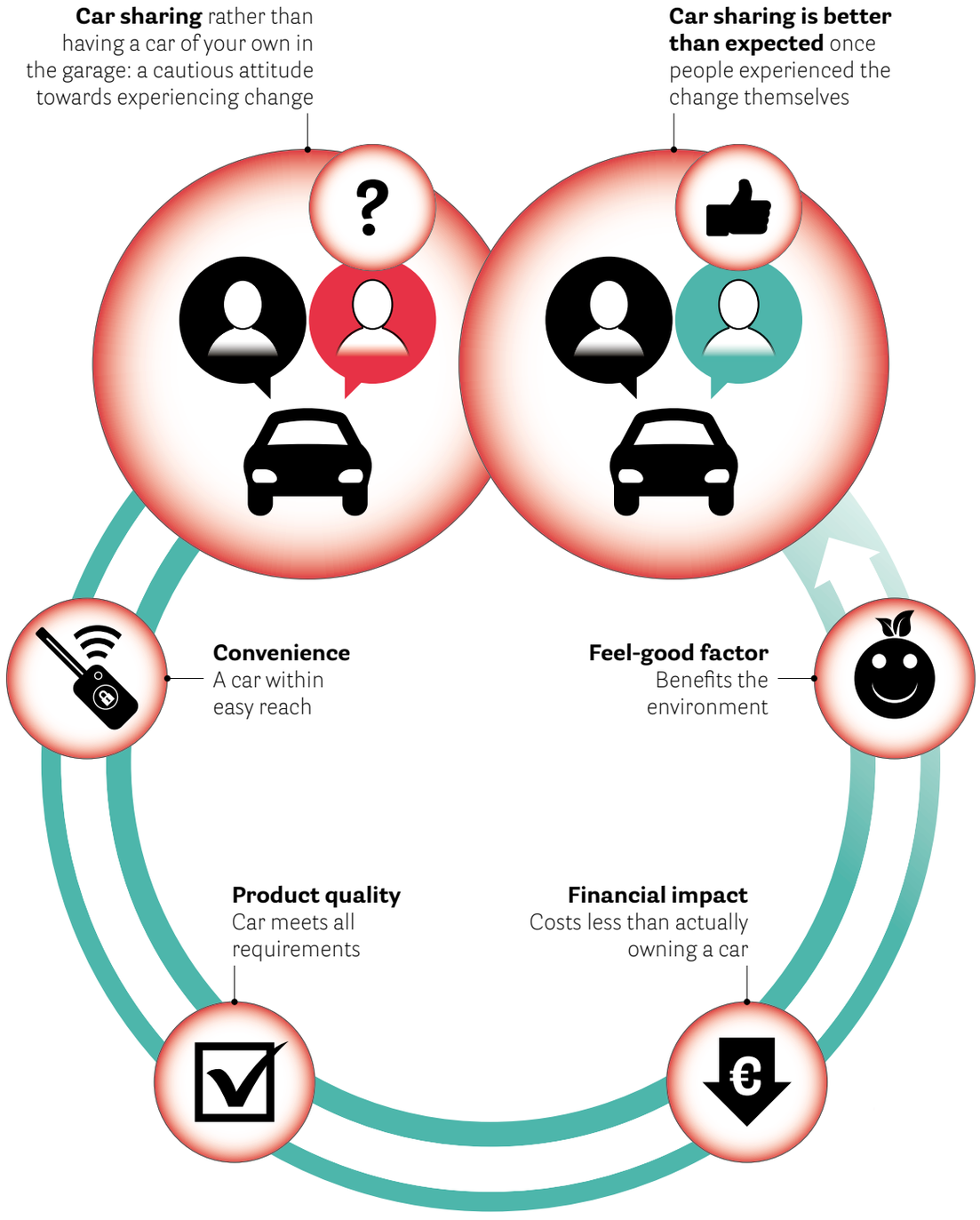
Making use of car sharing services, rather than having a car of your own in the garage. Buying organic products as opposed to conventionally farmed products. These activities aren't as easy as they sound. Environmentally-friendly behaviour often involves extra time, money or effort. How can you encourage people to make environmentally-friendly choices? The Environmental Psychology research group at the UG's Faculty of Behavioural and Social Sciences studies the factors that explain and predict pro-environmental behaviour, and test what strategies are effective in encouraging pro-environmental behaviour. The team's methods include questionnaires and interviews, field research and experiments, to understand how people make environmentally friendly decisions and choices.

In everyday practice

In practice, encouraging people to adopt environmentally-friendly behaviour is no simple matter. People tend to be overly pessimistic about new situations and overly optimistic about the status quo. So, basically, nothing changes. Research at the UG has shown that allowing people to experience change helps them to find out that the new situation is better than they expected. For example, one research project included a field study into traffic pricing policy, in which people were required to pay if they wanted to travel to the city centre by car. The preliminary responses were negative. But acceptance increased when it became apparent that the introduction of this measure resulted in fewer environmental problems and traffic jams.

Joint opportunities

The Environmental Psychology research group advises companies, the government, non-governmental organisations (NGOs), as well as specialists from various fields within the academic world, on people's pro-environmental behaviour. Together, they can develop sustainable products and new policies that actually appeal to members of the public, which is an essential step towards a circular economy.



'IT'S NOT JUST ABOUT COSTS'



Professor Linda Steg and PhD student Nadja Zeiske
Faculty of Behavioural and Social Sciences, University of Groningen

'Many people are motivated to act in an environmentally-friendly way, even if it takes a little more time or effort. You can achieve more if people become aware of the impact their behavioural change has, but it is important that this change should not involve too many drawbacks. For instance, we let our study participants commute to work using public transport for three weeks, free of charge. Policymakers expected that, afterwards, those involved would see public transport as more convenient and pleasant than they had before. However, in the province of Groningen, bus services are not regular, and it is often a long walk to the bus stop. The participants also thought that public transport was relatively expensive. In this case, the environmentally-friendly option was asking too much.'

Project partners
The University of Groningen and numerous companies, government bodies, NGOs and specialists from various fields within the academic world, the Municipality of Groningen, Enexis and Alliander.

Bijzonderheden
The interdisciplinary projects are supported by grants from bodies such as the Netherlands Organisation for Scientific Research and the European Union's Horizon2020 programme.

Accountants can play an important part in climate policy

The research

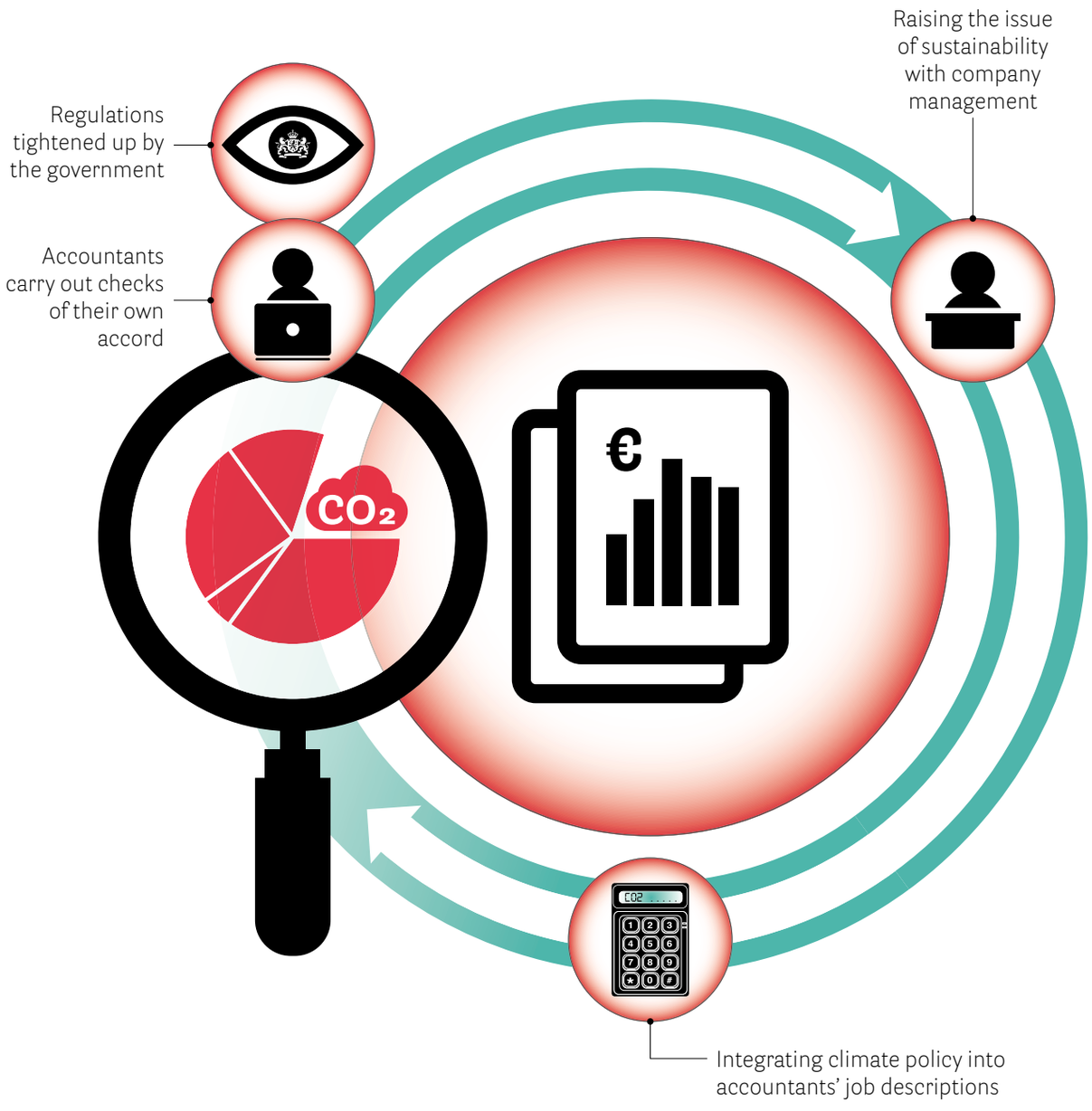
What part do accountants think they can play in their company's climate policy? The UG's Faculty of Economics and Business explored this question in cooperation with the Royal Netherlands Institute of Chartered Accountants (NBA). Of the accountants in business (accountants employed by a company) that were surveyed, 20 % indicated that they were involved in sustainability issues within their company, while 80% indicated that they were keen to do so. So, people are willing – but how do you get them to make a change? The UG and the NBA feel that it is up to the government to get the ball rolling. It needs to tighten up the regulations, by requiring companies to publish details of their climate policies and CO_2 emissions, for example. But accountants can also take action themselves. For instance, they could raise sustainability issues at work and help to develop ideas about the role of climate policy in their professional activities.

In everyday practice

Partly based on the results of this research, the NBA set up the Green Brigade. As part of this project, accountants hold brainstorming sessions to decide how sustainability could be built into their job description. Here's a simple example. When accountants at a transport company check the annual figures, they can supplement the figures on fuel costs with details of the associated CO_2 emissions.

Joint opportunities

The Climate Act stipulates that, by 2030, Dutch CO_2 emissions must be 49% lower than they were in 1990. Accountants can play their part in this. Together, the UG and the NBA want to raise accountants' awareness of their role in companies' climate policies. These partners have now launched the second phase of the investigation, which involves the survey of the external accountants.



'COOPERATING ON CUTTING CO_2 EMISSIONS'



Professor Dick de Waard
Faculty of Economics and Business, University of Groningen

'The UG and the NBA held a joint climate conference. One of the speakers was the owner of a transport company. He said that, while he very much wanted to be CO_2 neutral, he wondered whether anyone was really willing to pay 10 cents more for a ride. A hush fell over the accountants seated in the auditorium. And that is exactly what we want – to create awareness. Sustainability largely comes down to numbers – the quantity of materials used, the energy bills and the fuel costs. Accountants play a major part in this. They don't have to save the world, but – with their help – we can cut those CO_2 emissions.'

Project partners
The University of Groningen and the Royal Netherlands Institute of Chartered Accountants.

Making City helps cities become energy neutral

The research

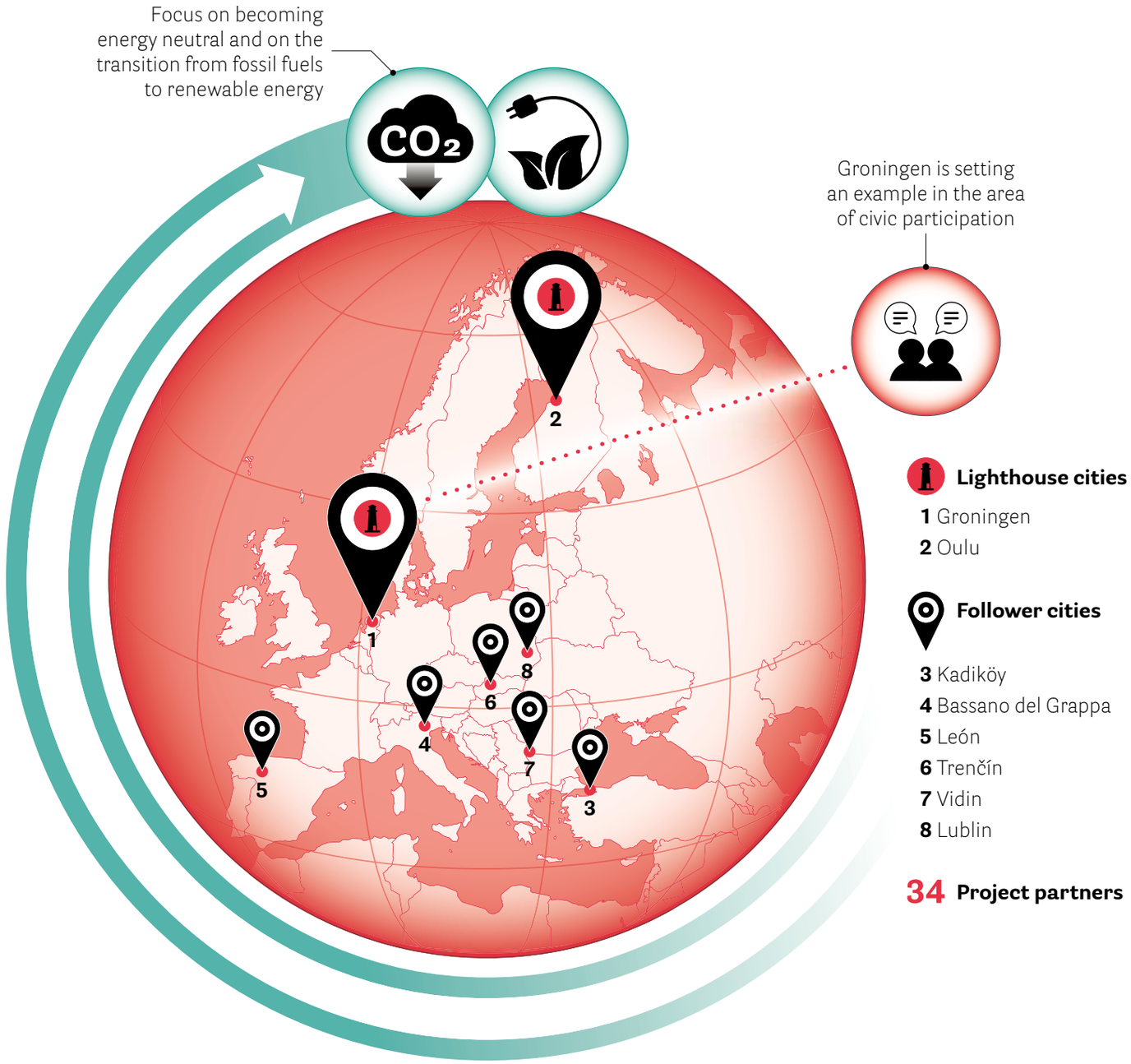
The Making City project is an international study into the measures that European cities can take to become energy neutral. For instance, they can create energy-positive districts (which generate more energy than they use) to compensate for city districts with a high energy consumption. Within the project, Groningen and Oulu (in Finland) are seen as 'lighthouse cities' – exemplary cities that are leading the way in the transition from fossil fuels to more renewable energy sources. The UG is one of 34 partners who are participating in the project. Researchers from the Faculty of Spatial Sciences provide advice and expertise on the energy transition of cities in general and of Groningen in particular. In addition to Oulu and Groningen, six other cities (follower cities) are participating in the project. These are Kadiköy (Turkey), Bassano del Grappa (Italy), Leon (Spain), Trenčin (Slovakia), Vidin (Bulgaria) and Lublin (Poland).

In everyday practice

The Making City partners want to see visible changes in practice. There must be a meeting of minds between the residents and the policies. The UG focusses primarily on generating visions and making plans that directly involve residents. This is already happening in the Paddepoel district of Groningen, where people are exploring ways of jointly making the neighbourhood more sustainable. In this connection, the UG is sharing its scientific expertise on how cities can get energy-related projects and plans off the ground. It is also providing information about projects in other cities.

Joint opportunities

The partners are each contributing their expertise. As a consortium, they are guiding the eight cities involved as they transition from fossil fuels to renewable energy. This collaborative venture creates opportunities for making these cities energy neutral and sets the stage for other cities to follow their example. Together, they are contributing to the European Union's long-term goal of being energy-neutral by 2050.



Lighthouse cities

1 Groningen
2 Oulu

Follower cities

3 Kadiköy
4 Bassano del Grappa
5 León
6 Trenčín
7 Vidin
8 Lublin

34 Project partners

'GRONINGEN IS AHEAD ON ENERGY POLICY'

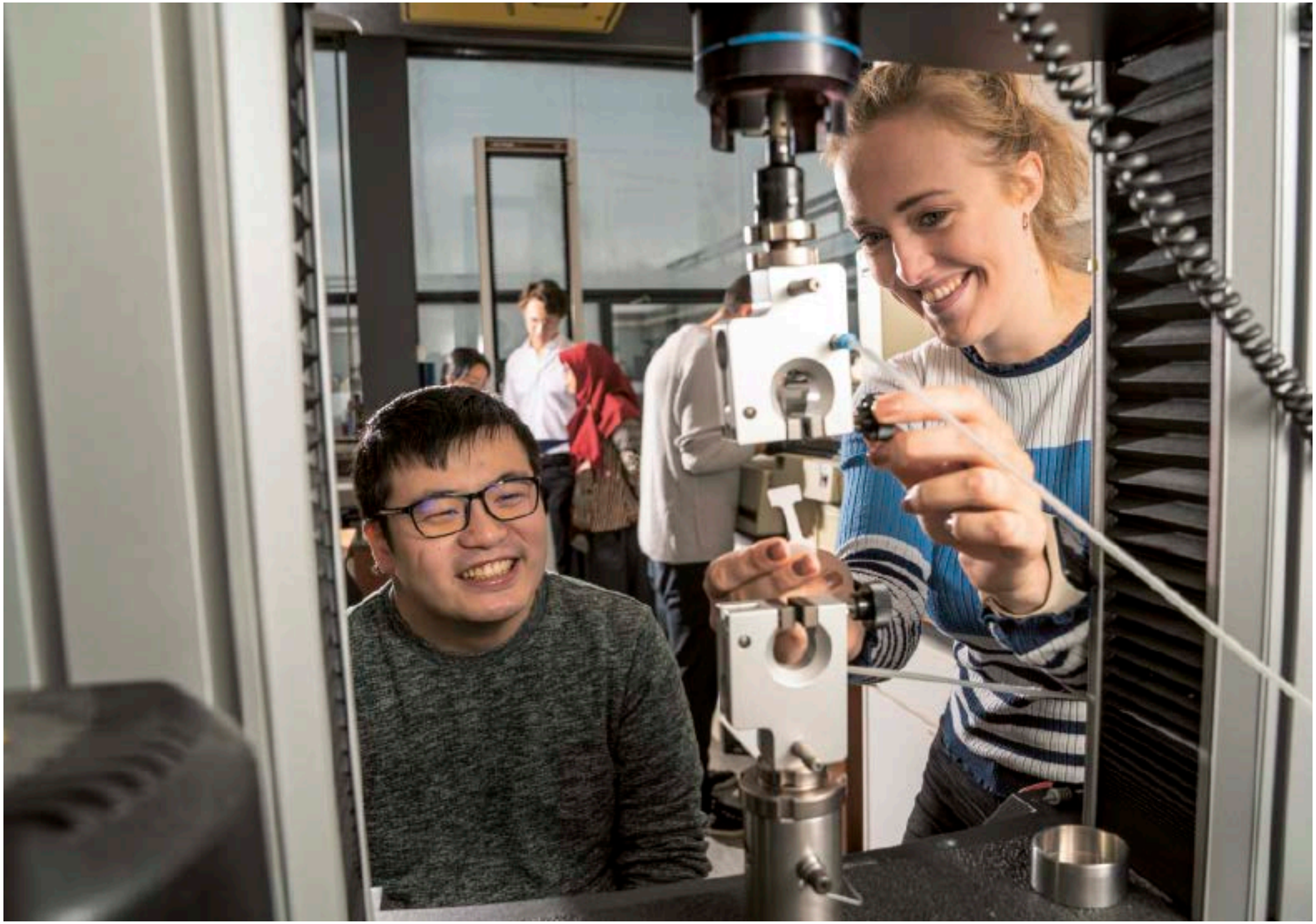


Assistant Professor Christian Zuidema
Faculty of Spatial Sciences, University of Groningen

'While many other European cities have limited policies for becoming energy neutral, Groningen is already applying its own policy. A unique feature of Groningen's strategy is that it makes residents an integral part of the energy transition, by means of a neighbourhood approach to energy and various neighbourhood initiatives. The UG sees to it that this knowledge and experience is shared among the project partners. Based on literature search, we put forward suggestions on how to become energy neutral. We also focus on which policy strategies work, and why. Cities make their own choices in this regard, but we help them to identify the options.'

Project partners
The University of Groningen and 33 partners, including the municipality of Groningen, Hanze University of Applied Sciences, Energy Valley, Grunneger Power, Nijestee, TNO (the Netherlands Organisation for Applied Scientific Research), Waarborg Vastgoed, CGI Nederland, WarmteStad and Sustainable Buildings.

Extra information
The Making City project is an international project funded by the European Union's Horizon 2020 grant programme.



PhD students, postdoctoral researchers and technicians working in the lab of the Macromolecular Chemistry and New Polymeric Materials research group (Loos Group). This group is part of the University of Groningen's **Zernike Institute for Advanced Materials**. The equipment in this lab is used to test the mechanical and thermal properties of sustainable polymers or polymers with new physical properties. The photograph shows a tensile tester, which is used to measure a material's maximum elongation and breaking strength.

Research and education

3

At the University of Groningen, the topic of the circular economy is firmly rooted in both research and education. Aside from research projects –a selection of which can be found in Chapter 2–, various research centres within the University are also focusing on the topic of sustainable society, including the circular economy. In addition, the University is offering a growing range of degree programmes and courses that feature the circular economy as a topic. These are not only accessible to students, they are also intended for professionals from the business community or from other organisations.

Carbohydrate research – with a view to greater sustainability and health

Healthy and sustainable alternatives to existing products – carbohydrates have plenty of potential in this regard. The Carbohydrate Competence Centre (CCC), a collaborative venture between the UG and Wageningen University & Research, is looking into what carbohydrates might have to offer.

Our diet includes carbohydrates in the form of sugars, fibres and starch. The body breaks down these substances, with the help of enzymes and intestinal bacteria. The CCC's director, Gert-Jan Euverink (who is also a professor at the University of Groningen's Faculty of Science and Engineering), explains the Centre's work as follows: 'A better understanding of the mechanisms of action between carbohydrates, enzymes and intestinal bacteria will enable us to modify products, to make them healthier and more sustainable.'

Broad spectrum

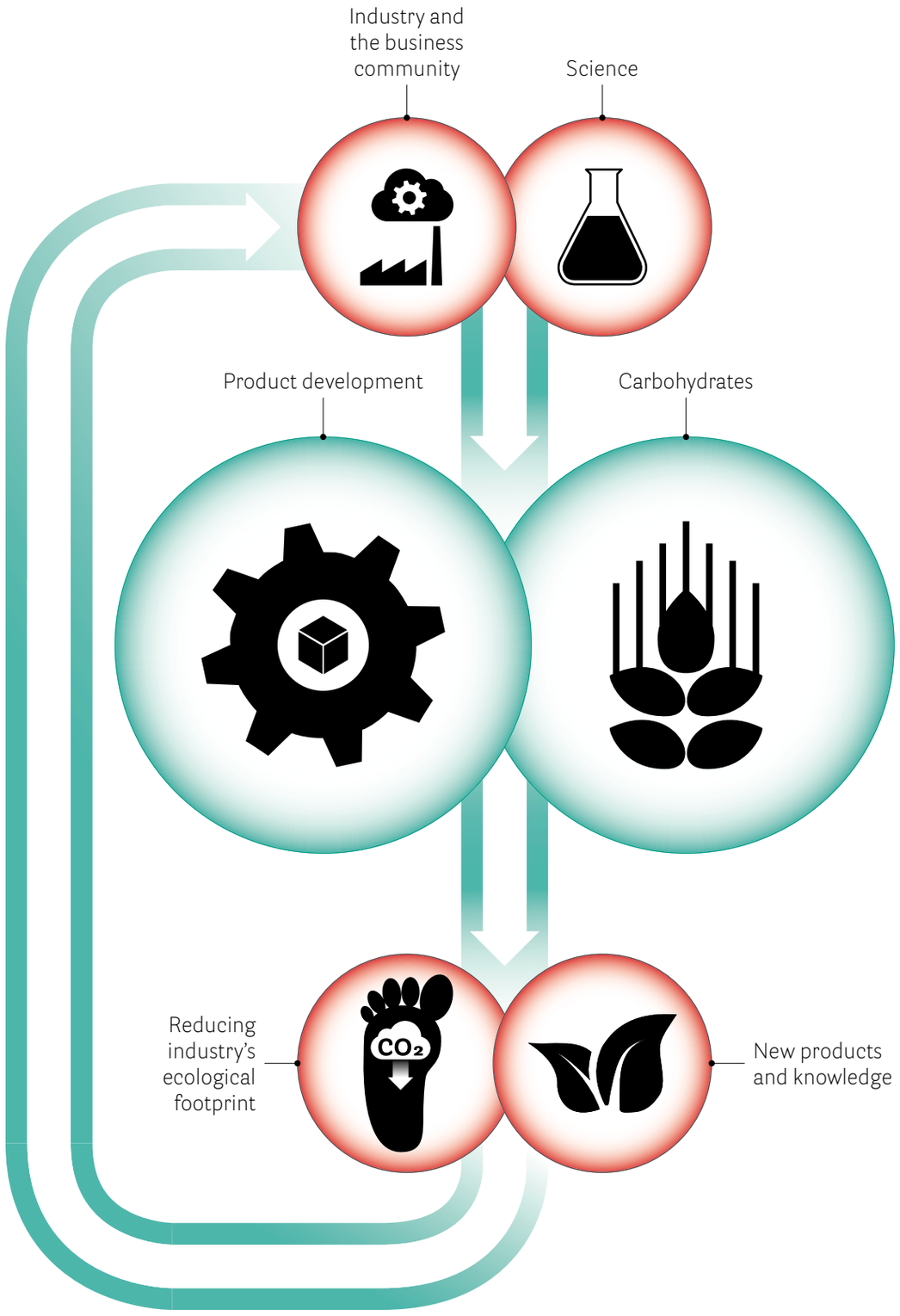
In addition to playing an important part in our diet, carbohydrates can also be used as biomaterials and biofuels. The CCC's research spans this entire spectrum. As an example of biomaterials, Prof. Euverink alludes to the production of bioplastics. 'Take disposable cutlery, for example. The traditional types are made from oil-based plastic, which has a huge environmental impact. One alternative is made from starch, which breaks down in compost heaps.'

Demand-driven

The CCC conducts various research projects in close cooperation with members of the business community. Gert-Jan Euverink explains that 'they help us to fund our mainline research and help to ensure that, together, we put the research results into practice and get them on the market as quickly as possible.' He is at pains to emphasize that the universities' independence – and that of their research – is always safeguarded. 'Even if research results are not suitable for the company involved, this material always remains available for use in education. This means that scientific innovation and, by extension, academic independence, are always protected.'

The future

What aspects of the CCC's research will be noticeable to society at large? In the long term, Prof. Euverink anticipates that there will be a marked reduction in the adverse effects caused by carbohydrates, such as for overweight and other health problems. 'The CCC will continue to focus on carbohydrates in food and on their impact in terms of human and animal health.' A second focus concerns curbing the industry's dependence on oil. One example of this is the above-mentioned production of bioplastics. 'In an ideal situation, research into the use of carbohydrates does not involve the degradation of these substances in an industrial process. This requires new, complex chemistry. The CCC wants to be actively involved in these developments, to make the Dutch market more sustainable.'



Research – Collaboration brings innovative solutions

The University of Groningen (UG) is concentrating on three main focus areas: Sustainable Society, Energy and Healthy Ageing. The topic of the circular economy has much in common with both Sustainable Society and Energy. But what do these two topics actually involve?

Sustainable Society

In the context of the Sustainable Society theme, the UG is striving to achieve a society with a sustainable future. A society like this would involve (a) economic prosperity, (b) social inclusiveness, cohesion and justice, (c) operating within ecological and climatic boundaries, and it would be achieved by means of (d) high-quality regulations and organisation within government bodies and the business community.

The UG's contribution to this effort focuses on societal challenges at the local, regional, national, and global scale. If links are established between societal stakeholders and University expertise, interesting cross-connections may emerge that could potentially benefit everyone involved. Here, the University transcends the borders of individual scientific disciplines: Indeed, the real keys to progress in this area are collaborative ventures between experts with different perspectives. One example of interdisciplinary cooperation is the Sustainable Cooperation for Resilient Societies (SCOOP) centre; another is the collaborative venture focused on the earthquakes affecting the Groningen region.

SUSTAINABLE COOPERATION FOR RESILIENT SOCIETIES (SCOOP)

THE PARTNERS INVOLVED
The University of Groningen and various other Dutch universities

WHAT DOES IT INVOLVE?
SCOOP is a research and training centre focusing on the interdisciplinary study of sustainable, collaborative relationships. The centre interconnects research groups from the areas of sociology, psychology, history, philosophy, public administration, research methods and statistics, with the key aim of putting scientific insights to use in everyday practice. More specifically, the emphasis is on long-term collaborative ventures in the areas of care, work and integration. In 2017, SCOOP was awarded € 18.8 million as part of the prestigious NWO Gravitation programme.

COOPERATION FOCUSED ON EARTHQUAKES AFFECTING THE GRONINGEN REGION

THE PARTNERS INVOLVED
The University of Groningen, the National Coordinator for Groningen (NCG), the Groningen Municipal Health Service (GGD), Hanze University of Applied Sciences, CMO-STAMM (knowledge centre for societal issues) and various ministries

WHAT DOES IT INVOLVE?
Since the 2012 earthquake in Huizinge, UG researchers have increasingly focused on earthquake problems in the province of Groningen. For example, they have mapped the area's subsurface geology, assessed local residents' psychosocial problems and developed economic models to calculate the associated collapse in property values. Over the course of time, various experts have joined the Knowledge Centre for Earthquakes and Sustainable Development, which merges knowledge and expertise and provides masterclasses for stakeholders. More recently, the centre has been further expanded to include various external parties. This led to the creation of the Liveable and Promising Groningen Knowledge Platform.

Energy

The fundamental question within the UG's research theme of Energy is 'how can we contribute to the transition to more renewable energy'? To answer this question, the University, incorporating the perspectives of several different disciplines, is collaborating with other knowledge institutes, government bodies, the business community and civil society organizations.

The UG's Groningen Energy and Sustainability Programme (GESP) plays a key role to this end, as the platform hosts discussions, and coordinates and implements energy-related teaching and research. Its goals include promoting interdisciplinary cooperation within the UG and fostering collaborative ventures with external parties. The UG's most important research activities in the area of energy and sustainability take place in three research centres – the Centre for Energy Economics Research (CEER), the Groningen Centre of Energy Law and Sustainability (GCELS) and the Energy and Sustainability Research Institute Groningen (ESRIG). These centres are also closely involved in teaching programmes on energy and sustainability.

CENTRE FOR ENERGY ECONOMIC RESEARCH (CEER)

UG FACULTY
Economics and Business

WHAT DOES IT HAVE TO OFFER?
CEER focuses on economic analyses of the role of energy in society. Its goal is to tackle economic issues concerning energy, often in the context of collaborative ventures with external partners. CEER is also closely involved in energy teaching, in the Bachelor's degree programme (the Energy Minor), the Master's degree programme (the Energy Focus Area), and in executive programmes (energy transition courses).

GRONINGEN CENTRE OF ENERGY LAW AND SUSTAINABILITY (GCELS)

UG FACULTY
Law

WHAT DOES IT HAVE TO OFFER?
Operating within the UG's Faculty of Law, GCELS coordinates legal research relating to the energy sector. This research covers the entire energy chain, from 'well to burner tip'. It also offers various forms of teaching, such as the Master's in Energy and Climate Law and two postgraduate courses: Energy Law on Location and an Advanced Master's degree programme in Energy Law. In terms of Bachelor's degree programmes, GCELS teaches the legal component of the Energy Minor.

ENERGY AND SUSTAINABLE RESEARCH INSTITUTE GRONINGEN (ESRIG)

UG FACULTY
Science and Engineering

WHAT DOES IT HAVE TO OFFER?
The Faculty of Science and Engineering's research into energy and other sustainability-related topics all takes place within the walls of the ESRIG research institute. These topics include the bio-based economy, circular systems based on new energy technologies, the sustainability of innovative food systems, waste management and managing the conservation of natural resources. Its mission is to contribute to renewable energy use in the upcoming century. The institute also teaches students, in the context of the Master's degree programme in Energy and Environmental Sciences. It also assists with the Energy Minor.

Are you curious to know more about the UG's societal research themes, including Sustainable Society and Energy? If so, visit **www.rug.nl/research/societal-themes**

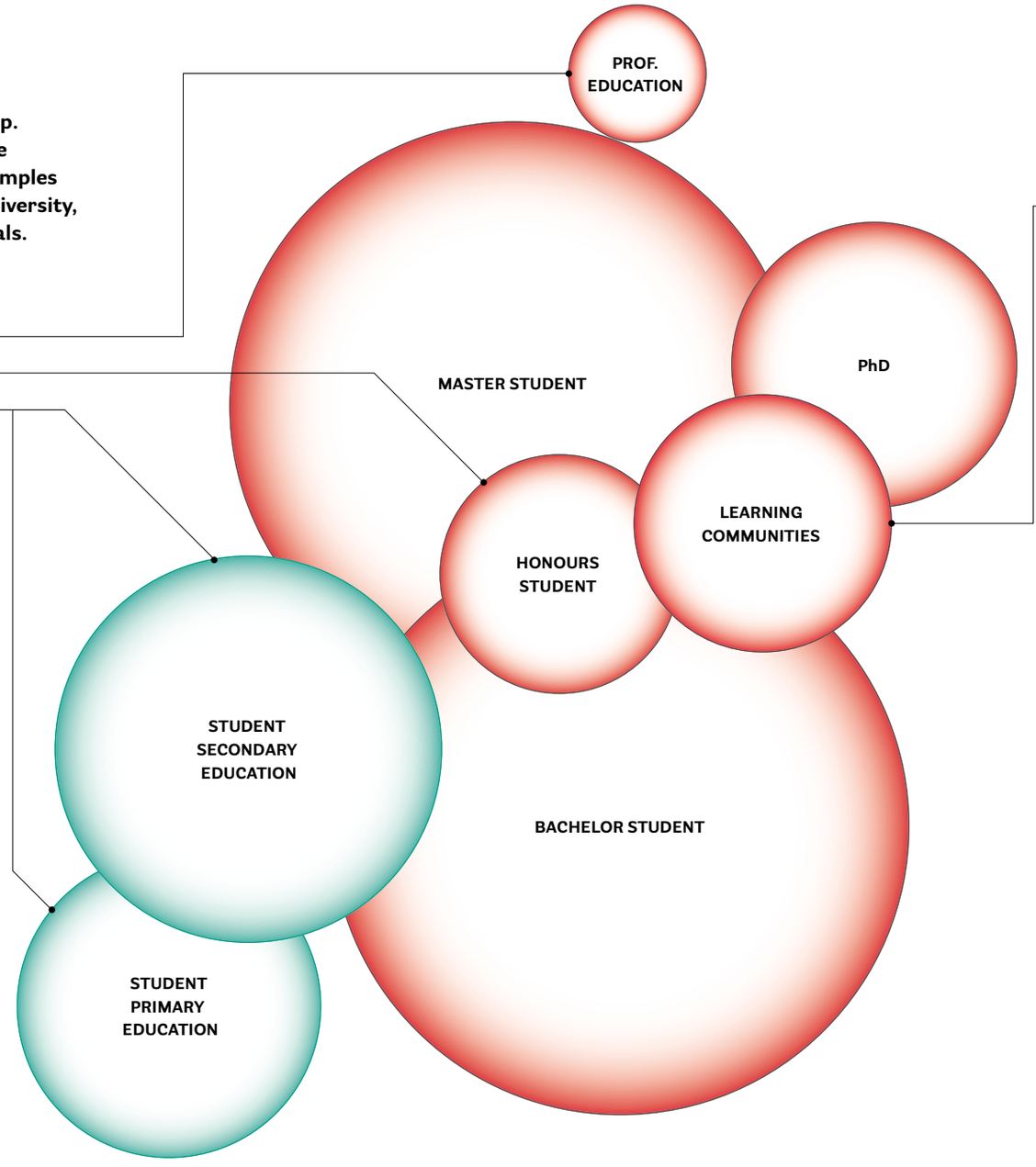
Education: lifelong learning

The University of Groningen offers young and old the opportunity to develop. Besides its 50 Bachelor's degree programmes and over 100 Master's degree programmes, the University has a wide range of training programmes. Examples are the so-called PhD programmes to obtain a doctorate, the Children's University, the "Scholierenacademie", the Senior Academy and courses for professionals. The University of Groningen is the place for lifelong learning!

PROFESSIONAL EDUCATION
The University of Groningen Business School (UGBS) is one of the institutes that support professionals in their professional development, aiming at both personal growth and organisational profits.

HONOURS STUDENT
The Honours College offers talented students the opportunity to challenge themselves even more by offering an extra programme that is followed in addition to their regular Bachelor's or Master's degree programme. An example is the Honours Master High Tech Systems and Materials. The main aim of the Honours Program is to develop talent and initiative.

PUPILS IN PRIMARY AND SECONDARY EDUCATION
The "Scholierenacademie" organises content-related activities for students in primary and secondary education, such as the web classes for grades 5 and 6 of pre-university education. During a four-week course they get to know the University's Bachelor's degree programmes, such as Business Administration, Art History or Artificial Intelligence.



LEARNING COMMUNITIES
Learning Communities are groups of students and teachers that collaborate in assignments that challenge them to share their expertise and learn from each other. The communities may take various shapes. They can vary in group size, subject and duration (subject, term or academic year, or after graduation as a circle of alumni).

'The Energy Law on Location postgraduate learning pathway is highly recommended. The themed lecture days are held at appropriate locations, which instantly brings the subject matter to life. This is a high-level degree programme. The lecturers (from academia and the world of everyday practice) always manage to fascinate their listeners and the themes are bang up to date. The degree programme is very much in keeping with the market's growing demand for legal advice on sustainable and often complex developments.'

Marjan I. Jaarsma
Real estate and energy lawyer, Jaarsma Legal and participant in post-academic course Energy Law on Location

'Because of its strong focus on interactions between people and the environment, I think the Master's degree programme in Environmental Psychology prepares students very well to contribute to a circular economy. Environmental psychologists can create effective interventions by looking at the underlying psychological processes of behaviour while maintaining well-being for individuals.'

Judith Takens
Master's student of Environmental Psychology

'Global Responsibility and Leadership (GRL) is a programme covering major topics that are fundamental to a sustainable, interconnected future. We learn to understand people and cultures, then attend a lecture covering economics and politics before gaining insights into technological/ environmental aspects of our future. All in all, as a student of GRL, you draw a necessarily holistic picture of humans in a globalized world and are forced to find solutions to real-world problems of personal interest, taking all those domains into consideration. Therefore, I can recommend this programme to anyone aiming to become an agent of change for a sustainable world – a world that works for everyone.'

Tabio Romanski
Bachelor's student of Global Responsibility and Leadership



The photograph shows the **Green Chemical Reaction Engineering Lab**, which is part of the UG's Engineering and Technology Institute Groningen (ENTEG). The research being carried out here involves the conversion of biomass into renewable chemicals and materials. One example is the conversion of agricultural residues, such as the production of aircraft fuel from straw. This involves the use of pyrolysis technology.

Infrastructure and facilities

4

The University of Groningen offers its researchers and knowledge partners a high-quality infrastructure and a wide variety of facilities. The same goes for research that is needed to prepare for a circular economy. This ranges from laboratories to pilot plants and from simulators to a campus where knowledge institutions, companies and other organisations meet. The possibilities are endless!

CSE – companies as the facilitators of a sustainable society

The Centre for Sustainable Entrepreneurship (CSE) is a UG research centre that aims to transform our society into a sustainable community that is independent of fossil fuels, such as oil and gas. This research centre also serves as a link between the world of education, the business community and academic research.

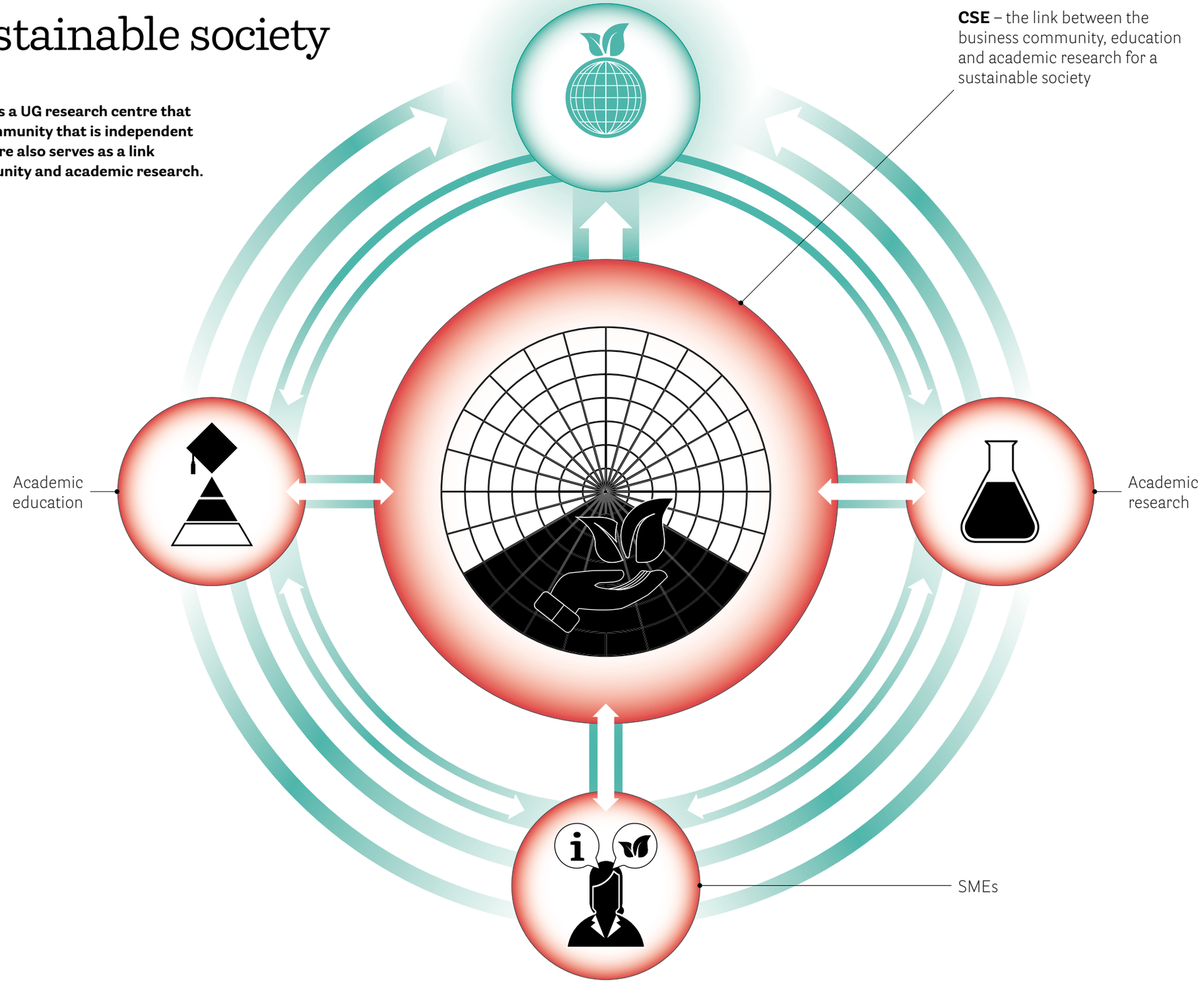
A contractor who wants to use sustainably produced timber and is prepared to pay that extra 10% or the owner of a transport company who opts for 'green gas'. According to Gjalt de Jong, the CSE's founder and director, that is where the transition to a sustainable society begins. 'We want to leverage academic knowledge to help small and medium-sized businesses in Friesland do business sustainably', says De Jong, who is also Professor of Sustainable Entrepreneurship in a Circular Economy.

Friesland – a unique case

Prof. De Jong is aware that there's a gap between companies' desire for sustainable entrepreneurship and knowing how to achieve it. The CSE is, therefore, sparking debate by touring around Friesland with a series of talk shows about the circular economy, named De Circulaire Elfstedentocht (The Circular Eleven Cities Tour). 'Agriculture plays a major part in Friesland's unique industrial mix. The province can achieve great things in this sector and become a true pioneer.'

Dilemmas in everyday practice

In the master programme Sustainable Entrepreneurship, which the CSE offers, students work on the dilemmas facing sustainable entrepreneurs. The CSE targets problems defined in the workplace. 'For example, how can companies based in the Wadden Islands handle more tourists without overwhelming the islands' vulnerable natural environment?', De Jong asks. One issue is that – for some people – sustainable enterprise bears the stigma that you can't make money from it. This outdated view is completely false. If it were up to him, De Jong would waste no time – he'd change that mindset right away. 'The way we use our world, you'd think we had another five planets in reserve. That really needs to change – and fast!'





Campus Fryslân's Living Lab is the stage for a co-creation process involving students, researchers, public organisations and private organisations. Together, they translate social issues into questions that can be tackled by academic research. Once the actual research work has been completed, its findings are converted into recommendations for the organisation (or organisations) involved.

CAMPUS FRYSLÂN: ‘GLOBAL CHALLENGES, LOCAL SOLUTIONS’

Campus Fryslân in Leeuwarden is the newest faculty at the University of Groningen. It covers a wide range of fields, such as sustainable entrepreneurship, multilingualism, culture, technology, tourism, public administration, nutrition and health. The Faculty blends these different disciplines to come up with local solutions to global challenges, which explains its motto: ‘Global challenges, local solutions’.
Campus Fryslân consists of three parts:

1) A University College offering an English-taught Bachelor’s degree programme in Global Responsibility & Leadership
2) A Master’s College offering 10 English-taught Master’s degree programmes, including one in Sustainable Entrepreneurship
3) A Graduate School in which around 50 PhD students are working on a wide variety of research projects

THE SOCIAL IMPACT OF SUSTAINABILITY

By 2050, all Dutch homes must be energy-neutral and must no longer use natural gas. For housing associations, this will involve measures such as fitting solar panels, installing better insulation and replacing gas stoves with electric hobs. Changes like these often have a great impact on tenants. Angela Greco, a researcher at Campus Fryslân, is cooperating with housing corporations to identify the social impact of sustainable housing. For instance, in the course of her conversations with residents, Ms Greco discovered that they needed someone to answer their questions but had no idea who they should approach. Together, Ms Greco and this group of residents came up with the idea of linking tenants to ‘experiential experts’ (people with practical knowledge gained from day-to-day involvement). ‘People are more inclined to get in touch with one of these ‘buddies’ than with someone who works for a housing corporation’. According to Angela Greco, the collaborative venture between the UG and the housing corporations has great value. ‘The corporations now have a better understanding of the social impact involved in making their houses more sustainable, while the UG has access to a vast source of information. As I see it, there are still many opportunities for further research.’

Facilities

1

GREEN OFFICE
augments and integrates sustainability within the UG by supporting, inspiring and connecting staff and students. Its goal is to make the theme of sustainability a matter of course in the UG's business operations and policy.

THE PARTNERS INVOLVED
The University of Groningen, student organisations (study associations and other bodies such as Enactus), the Municipality of Groningen, the Province of Groningen, the U4 Sustainability Network, Pint of Science, Studium Generale, other Green Offices in the Netherlands and various Science Shops.

2 3

CAMPUS GRONINGEN
is the innovation engine for the northern region of the Netherlands. It targets publicprivate partnerships – with links to the region – that focus on growth. The campus has two adjacent locations, the Healthy Aging Campus and the Zernike Campus Groningen, both of which are managed as a single ecosystem for the purposes of collaboration. It is a place where knowledge institutions, companies, facility providers and students can encounter one another. The natural growth of this campus is sustained by ongoing increases in scale, by the professionalisation of business park management, by the acquisition of companies and by attracting large investment funds.

THE PARTNERS INVOLVED
The University of Groningen, University Medical Center Groningen, Hanze University of Applied Sciences, the Province of Groningen, the Municipality of Groningen and more than 200 companies (including Avebe, Diagnoptics, BioBTX, Sustainable Buildings, BuildinG) and facility providers (such as Innolab Chemistry and Agrifood, Zernike NanoLab Groningen, ZAP, Energy Academy Europe, the d'ROOT datacentre and lab and the Start-up City incubator).

4

INNOLAB CHEMISTRY
encourages and supports entrepreneurship and offers almost everything needed to get innovative projects off the ground. Aside from access to lab facilities, it also provides support in the areas of business development and strategy and with legal and financial issues. Innolab Chemistry also has an Agrifood department, which focuses on sustainable innovations in food production.

THE PARTNERS INVOLVED
The University of Groningen, Triad, Syncom, RUG Houdstermaatschappij (the UG holding company) and Campus Groningen. Agrifood also includes Avebe and the Province of Groningen.

5

ZERNIKE ADVANCED PROCESSING (ZAP)
is a unique test facility for biobased experiments in the northern region of the Netherlands. ZAP responds to the rising tide of signals that we need to quickly cut our use of fossil resources. By fostering innovative activities throughout the region, ZAP is helping to boost employment in the biobased industry.

THE PARTNERS INVOLVED
The University of Groningen, Hanze University of Applied Sciences and Noorderpoort.

6

NEW ENERGY COALITION
is a network and knowledge coalition that is committed to a smart and successful transition to the renewable energy system of the future. By connecting parties to one another, it is laying the groundwork for the breakthroughs needed to make the energy transition a success. New Energy Coalition also encourages joint activities and helps to advance ongoing energy projects.

THE PARTNERS INVOLVED
The University of Groningen, Hanze University of Applied Sciences, Alliander, DNV GL, EBN, Energy College, GasTerra, Gasunie, Groningen Seaports, NAM, NHN, Renewable Energy Hamburg, Wetsus, Stork, the Province of Drenthe, the Province of Groningen, the Province of Friesland and the Municipality of Alkmaar.

7

NORTHERN KNOWLEDGE
is a 'knowledge transfer office' for knowledge institutes and companies in the northern region of the Netherlands. For this purpose, the UG, the UMCG and the Hanze UAS Groningen have joined forces in the areas of valorisation and entrepreneurship. Northern Knowledge's services focus on patent management, expertise in the area of intellectual property, screening and scouting, facilitating business people and supporting business development.

THE PARTNERS INVOLVED
The University of Groningen, University Medical Center Groningen and Hanze University of Applied Sciences.

8

CHEMPORT EUROPE
is an ecosystem for innovation in the greening of chemicals and materials in the northern region of the Netherlands. Companies, government bodies and knowledge institutes are cooperating to achieve a shared ambition – changing the nature of chemical processes.
THE PARTNERS INVOLVED
The University of Groningen, Hanze University of Applied Sciences, University Medical Center Groningen, Van Hall Larenstein University of Applied Sciences and NHL Stenden University of Applied Sciences, plus some 50 companies including Avebe, FrieslandCampina, ChemCom Industries, Delamine and BioBTX.

9

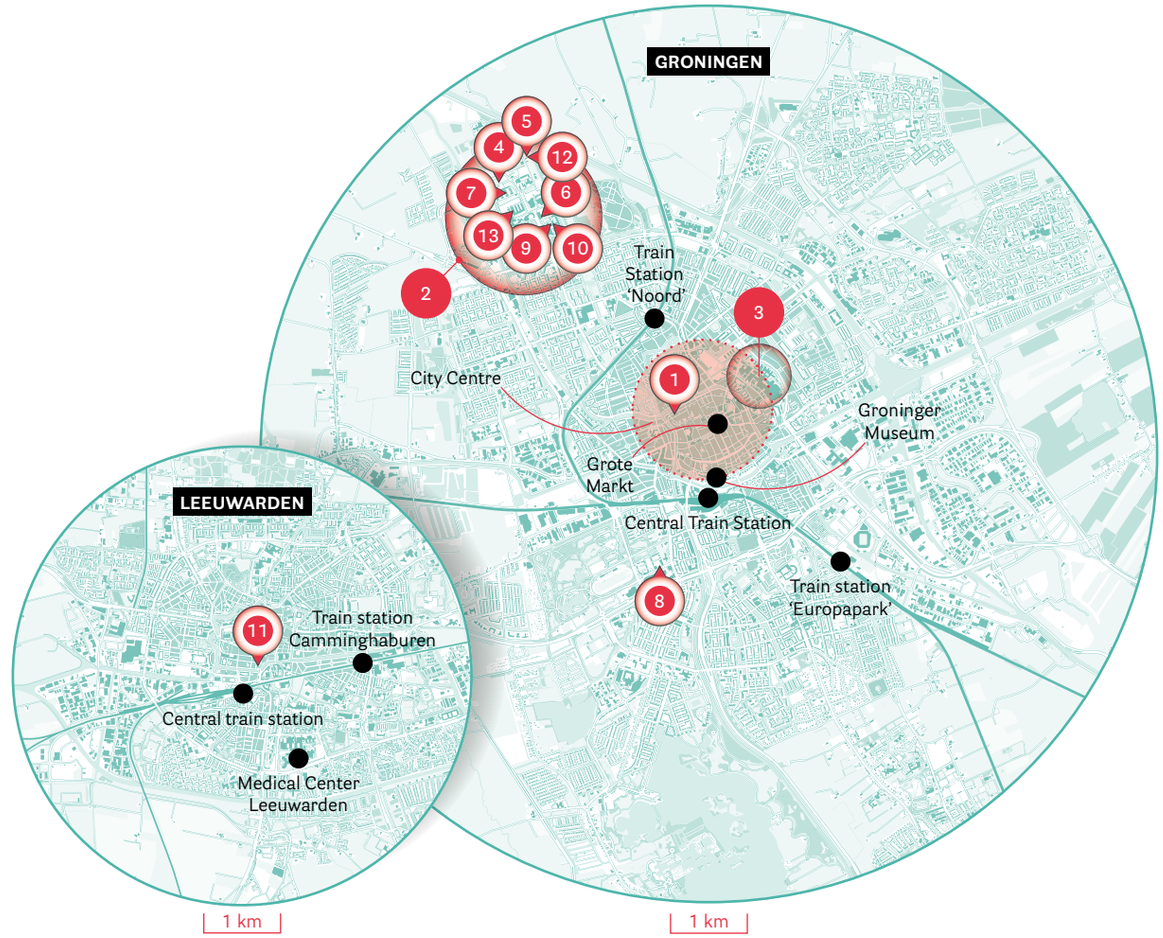
CARBOHYDRATE COMPETENCE CENTRE (CCC) aims to generate, develop and share knowledge in the field of carbohydrate research, to promote worldwide product innovations and to help bring about a healthy and sustainable society. Founded in 2008 by the UG and Wageningen University & Research, the CCC works closely with the business community to bring innovative products to the market.

THE PARTNERS INVOLVED
The University of Groningen, Wageningen University & Research, Utrecht University, Maastricht University, Hanze University of Applied Sciences, Van Hall Larenstein University of Applied Sciences, University Medical Center Groningen, TNO, NWO, the Municipality of Groningen and the Province of Groningen, plus a wide range of companies such as Avebe, NOM, FrieslandCampina, Royal Cosun, HZPC, Nutreco and Smurfit Kappa.

10

GRONINGEN ENGINEERING BUSINESS CENTRE (GEBC)
is a partnership between northern companies and the UG's Faculty of Science and Engineering. The focus of this collaborative venture is to develop and maintain a sustainable relationship in the field of engineering. The goal is to foster and facilitate research, development and innovation at companies in the northern region of the Netherlands.

THE PARTNERS INVOLVED
The University of Groningen, Samenwerkende Bedrijven Eemsdelta (SBE), BioBased Business Cooperation Groningen, Life Cooperation Groningen & Drenthe, SUSPACC (Sustainable Product and Chemicals Cluster) Drenthe, EMMTEC, Innovationcluster Drachten and the Region of Smart Factories (all business clusters



11

CENTRE FOR SUSTAINABLE ENTREPRENEURSHIP (CSE)
believes that we will be able to retain our valuable systems. Sustainable entrepreneurs are generating new business models that involve a substantially reduced environmental impact. This, in turn, improves the quality of society. The CSE's goal is to help create a circular society.

THE PARTNERS INVOLVED
The University of Groningen, the Municipality of Leeuwarden, the Province of Friesland, the Circular Friesland Association and SMEs such as Omrin and Caparis.

12

HIVE.MOBILITY
is a unique spot in – and for – the northern region of the Netherlands, where a large number of organisations (government bodies, knowledge institutions and the business community) are cooperating to develop smart, green solutions in the area of mobility for passenger transport and freight transport. The aim of their joint venture is to create a safe, pleasant and an (in economic terms) easily accessible environment.

THE PARTNERS INVOLVED
The University of Groningen, the Province of Groningen, the Municipality of Groningen, Hanze University of Applied Sciences and Noorderpoort, in cooperation with companies and non-profit organizations.

13

BIO ECONOMY REGION NORTHERN NETHERLANDS
is a partnership between the four northern universities of applied sciences and the University of Groningen, with the aim of allowing the northern region of the Netherlands to maintain and further expand its position within the biobased economy. One critically important aspect in this regard is the region's capacity to convert knowledge into industrial applications.

THE PARTNERS INVOLVED The University of Groningen, Hanze University of Applied Sciences, NHL Stenden University of Applied Sciences and Van Hall Larenstein University of Applied Sciences.

BioBTX is a technology developer that focuses on sustainable raw materials for the chemical industry. The pilot plant shown in the photograph converts biomass and waste plastic that is unsuitable for recycling into basic molecular building blocks. That cuts down on CO_2 emissions. Since 2012, BioBTX has been cooperating closely with the UG. Students, PhD students and postdoctoral researchers conduct research in areas such as catalytic pyrolysis, for example. Joint projects with the UG also generate new knowledge about the process surrounding BioBTX.

About the University of Groningen

5

The UG in figures

GENERAL

11
FACULTIES
Economics and Business, Behavioural and Social Sciences, Theology and Religious Studies, Arts, Medical Sciences, Law, Spatial Sciences, Science and Engineering, Philosophy, University College Groningen and Campus Fryslân

6.100 FTE
IN STAFF
(INCLUDING UMCG)

>120
NATIONALITIES,
STUDYING OR WORKING
AT THE UG

(Figures for 2019)

RESEARCH

3.400 FTE
IN ACADEMIC STAFF
(1/3 FROM ABROAD)

370
PROFESSORS

9.000
ACADEMIC
PUBLICATIONS

500
PHD CEREMONIES

16
PATENT APPLICATIONS

(Figures for 2018)

EDUCATION

32.700
STUDENTS
(24% OF WHOM ARE
INTERNATIONAL)

50
BACHELOR'S DEGREE
PROGRAMMES
(including 36 taught in English)

>100
MASTER'S DEGREE
PROGRAMMES AND
MASTER'S TRACKS
(>90 of which are taught in English)

(Cijfers 2019)



At the laboratory facilities for Traffic– part of the department of **Psychology** at the UG's Faculty of Behavioural and Social Sciences – a driving simulator is located. This simulator is used for a variety of purposes, including research into ways of encouraging more sustainable driving behaviour.

Prijzen



2019
SPINOZA PRIZE
Amina Helmi
Astronomy

2016
NOBEL PRIZE
Ben Feringa
Chemistry

2016
SPINOZA PRIZE
Lodi Nauta
History of Philosophy

2016
SPINOZA PRIZE
Bart van Wees
Applied Physics

2015
SPINOZA PRIZE
Cisca Wijmenga
Human Genetics

2014
SPINOZA PRIZE
Theunis Piersma
Migratory Bird Ecology

2004
SPINOZA PRIZE
Ben Feringa
Chemistry

2000
SPINOZA PRIZE
Dirkje Postma
Pathophysiology of Breathing

1996
SPINOZA PRIZE
George Sawatzky
Physics



1953
NOBEL PRIZE
Frits Zernike
Physics

Trivia

- After Leiden University, the University of Groningen (1614) is the oldest remaining university in the Netherlands.
- The UG has some famous alumni, such as: Aletta Jacobs (the first female student graduated in the Netherlands), Job Cohen (a politician), Epke Zonderland (a professional gymnast), Wubbo Ockels (the first Dutch astronaut) and Wim Duisenberg (the first President of the European Central Bank).
- After the University Medical Center Groningen, the UG is the largest employer in the province of Groningen.
- The UG's Energy Academy Europe is the most sustainable teaching building in the Netherlands.
- The UG has 432,500 m^2 of facility floorspace, including high-tech laboratories, study facilities and IT facilities (Center for Information Technology).
- The UG is eighth on the GreenMetric World Universities Ranking. This list is based on an assessment of the sustainability policies of 780 universities.
- In 2019, the UG generated a total of approximately 1,290 megawatts from solar panels. This corresponds to the amount of electricity needed for 430 households.
- The UG's CO_2 emissions have fallen by 51% since 2015. This decrease can largely be ascribed to the fact that, in 2018, the University fully compensated for the electricity it purchased in the form of GVO (Guarantee of Origin) Certificates for wind electricity generated in the Netherlands and the EU.

CONTACT

The www.rug.nl/industry-relations website gives brief descriptions of the research projects being carried out by UG researchers and students, in collaboration with other knowledge institutions, the business community, government bodies, non-profit organisations and members of the public. The website also provides further details about the Industry Relations team.

Do you have any questions, comments, or suggestions? If so, please contact the Industry Relations team.

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