

Photo: Plastic Whale  
See page 40/41 for full story



# CIRCULAR IS GOING GLOBAL

JOIN HOLLAND'S FLOW

PARTNER-UP FOR CIRCULAR COLLABORATION IN THE NETHERLANDS



1 / BIOMASS & FOOD



2 / PLASTICS



3 / MANUFACTURING INDUSTRY



4 / CONSTRUCTION SECTOR



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# FOREWORD

by Stientje van Veldhoven

State Secretary for Infrastructure and Water Management

Dutch expertise in circular economy is in demand, a fact I was recently reminded of during a major trade mission to China in April. Among those accompanying me were representatives of a wide range of Dutch companies and knowledge institutions specialised in the field. It was fascinating to see a Dutch tracking system for electronic waste in action in China, as well as vast industrial estates in Guangzhou being set up for circular operations using Dutch know-how. The scale is Chinese, but the knowledge is Dutch: an excellent combination and a great example of international cooperation.

It is inspiring to see these examples at first hand. In many places I see businesses, public authorities and institutions working to create an economy that revolves around reuse. An economy without waste - an enormous yet crucial transition. The world's population is set to reach 10 billion in 2050. The good news is that people are becoming more prosperous.

But this is causing a massive growth in demand for raw materials. In the past 100 years, we have been using 37 times more materials and 27 times more minerals. And these figures are still rising. We are really going to have to do things differently if we want to avoid burdening the next generations that follow with irreversible problems.

A lot has happened already. Early this year I was presented with five transition agendas. They contain concrete plans for promoting participation and implementation, by showing how we can do things differently, stop burning plastic, use textiles for longer and turn old textiles into useable fibres.

These agendas will guide the transformation of our economy. Our aim is to be fully circular by 2050, and that is something we are achieving step by step. This long-term goal is key, but we need to stay focused on the practical issues if we are to keep people and businesses on board. How can we make manufacturers responsible for their products? How should we

work together in the supply chain? What successful projects can serve as examples and what can we learn from them? What legislation is proving an obstacle and what funding is needed?

I see that more and more companies are keen to take part and that they are identifying opportunities for doing so. I want to help them as much as possible. It is all about working together and sharing knowledge, both nationally and internationally. And showing what can be done. That is why we have published this brochure. We hope it will inspire. It is an invitation to get together and move towards a circular, waste-free economy.

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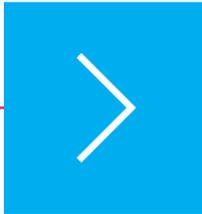
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# THE URGENT NEED FOR A CIRCULAR ECONOMY

## From linear to circular

For a long time, our economy has been 'linear'. This means that raw materials are extracted from the earth, used to make a product, and what remains after its use is thrown away (e.g. packaging).

To ensure that everyone has enough to eat and can buy the goods they need, like clothing and electrical devices, our economies need to become circular. In a circular economy there is no waste. That is because products are better designed and materials are reused as much as possible. If new raw materials are needed, they must be obtained sustainably, without placing an unacceptable burden on the environment and without exhausting natural resources. This challenge will require technological, social and system innovations.

### National Circular Economy programme

To realise a circular economy in the Netherlands by 2050, the Dutch government has launched a government-wide programme in September 2016. It includes various measures to support the transition to a circular economy. For example, legislation and regulations are being changed and new, circular business models are being supported. International cooperation is stimulated as changes are needed in Europe and worldwide to create a circular economy in the Netherlands.

### Focus on five sectors

The Dutch government has selected five economic sectors and value chains that will receive priority: biomass and food, plastics, manufacturing industry, construction sector and consumer goods. These five priorities are important to the Dutch economy and have a big impact on the environment. Much is already being done in these sectors to move towards a circular economy, both in the Netherlands and in Europe.

Various cities and regions in the Netherlands have also taken the initiative to close local and regional loops. They are developing policies, circular hubs and promote circular innovations, in close cooperation with frontrunner companies and knowledge institutes.

By using our raw materials efficiently, we will be able to continue to live, work and recreate in the future, both here and in other parts of the world, in a healthy and clean environment with a strong economy.

More information [www.government.nl/topics/circular-economy](http://www.government.nl/topics/circular-economy)



## INTRODUCTION

At Holland Circular Hotspot we believe that creating a circular economy calls for a profound transformation in the way we work and produce, and the way we design, teach, invest, and buy. That's why we strive to connect the global circular community, by inspiring cross-sectoral collaborations, stimulating the exchange of knowledge and innovations, and boosting circular entrepreneurship.

### Stimulating circular collaborations

To make the transition to a complete circular economy, cross-sectoral partnerships are inevitable. At Holland Circular Hotspot we stimulate international partnerships by connecting governments, knowledge institutions and businesses. We also serve as a portal for foreign companies with specific questions or requests. Thanks to our

extensive network we can always create a match with the right experts.

### Sharing innovation and knowledge

The Netherlands has a history of creating inventive, circular business models. At Holland Circular Hotspot we aim to share and present our innovations, knowledge and experiences and inspire international entrepreneurs and knowledge institutions with successful circular initiatives. At the same time, we are eager to learn from the experiences of other circular experts around the world.

### Boosting circular entrepreneurship

There are many European subsidies and regulations designed to support and stimulate the development of the circular economy. At Holland Circular Hotspot we help Dutch companies and organisations find the right

financial programmes that help them create successful circular businesses.

In this magazine we showcase a selection of the Netherlands most interesting circular innovations and initiatives around the five Dutch priority sectors. Not just to provide a catalogue of opportunities, but also to give insight in the diversity of circular solutions and support available in the Netherlands. We hope you feel inspired to contact us, and let us help you find your perfect circular partner

So, join the global circular community at Holland Circular Hotspot. We look forward to welcoming you at our website [www.hollandcircularhotspot.nl](http://www.hollandcircularhotspot.nl) or at one of our events.

Together, we make our future circular.

Goal 2050: use biomass to reduce our CO2 emissions and dependence on fossil fuels

BIOMASS & FOOD



Biomass (dead, biodegradable plant material and animal fats) is an essential raw material in the circular economy. It is used for food and animal feed and also for making all kinds of other products, like textiles, paper, chemicals, and energy. It is therefore crucial for reducing our CO2 emissions and dependence on fossil fuels. Using biomass will make the economy greener (bio-based economy), especially if driven by sectors that make a big contribution to exports.





**Phosphate recovered from Amsterdam's wastewater would save 400,000 euros and fertilise 10,000 football fields per year**



**Wat je van ons terug krijgt**

FOS-korrels helpen uw planten verder ontwikkelen. Met FOS bent u verzekerd van een zeer goede meststof. Daarnaast tuint u milieubewust. FOS is namelijk een gerecycleerd product uit de afvalwaterketen.



# FosVaasje

## Your urine as fertiliser

Urine contains valuable raw materials. That is why Waternet works with major events and venues to collect urine for the FosVaasje project.

### Wastewater

We all flush our urine through the toilet, which ends up in the sewer together with other waste water. Huge amounts of energy and chemicals are required to transport and purify sewage. The system is neither sustainable nor circular, as valuable substances are not recovered from the urine.

Step one in recovering the raw materials in urine is the construction of a new infrastructure: special

toilets to collect pure urine, a dual piping system, and a separate processing installation. Waterless urinals which collect pure urine already exist, for example at the AFAS Live in Amsterdam. For entrepreneurs such a system reduces utility costs considerably. For Waternet, separate collection of urine would halve the energy consumption and size of current sewage treatment plants.

### Fertility drugs

As of January 2018, Waternet is also participating in the 'Mothers for Mothers' urine collection scheme, to help couples who have difficulty conceiving. By extracting the hCG hormone (human chorionic gonadotropin) from the urine of pregnant women, pharmaceutical companies are able to produce fertility drugs. After the hCG

extraction, Waternet uses the urine for the FosVaasje project.

### Phosphate

Phosphorus is the main raw material extracted from urine. When magnesium is added, struvite is formed, a phosphate fertiliser. Phosphate, a finite resource, is currently mined. However, the mines are expected to become depleted within 50 years. By re-using phosphate from waste water as raw material, mining will be redundant and the loop is closed.

### International collaboration

Since 2013, Waternet has been collecting phosphate using a struvite reactor called the FosVaasje, which takes in urine after a fermentation process. In 2016, Waternet collected 80,000 litres of urine. If phosphate were

recovered from Amsterdam's wastewater in a year, it would save 400,000 euros and fertilise 10,000 football fields.

The company also wants to collaborate internationally with local water recycle organisations in cities like Singapore, Buenos Aires, Copenhagen, New York, and Berlin.

[www.waternet.nl/en/about-us/who-we-are](http://www.waternet.nl/en/about-us/who-we-are)



**Substantial reduction of hazardous medical waste and pharmaceuticals in surface water**

# Pharmafilter



## Converting hospital waste water

The Pharmafilter is a circular innovation with an infrastructure that simplifies working processes. When using the Pharmafilter system, installation and products, hospitals become cleaner and safer, making care easier and more pleasant for patients, staff and visitors.

### Operation Pharmafilter

The Pharmafilter is cleaner, easier and more efficient for both patients and nursing staff due to the use of biodegradable disposables and the in-department grinding and removal of waste via the sewage system. This also lowers the chance of human contact with contaminated material.

### Fermentation, filtration and oxidation

On the nursing ward, biodegradable bedpans and urinals with contents, hospital waste and leftover food are fed into a 'Tonto' grinder. This waste and the waste water from the hospital travel through the existing sewerage system to the Pharmafilter installation. The liquid and solid substances are separated during the process and treated separately. In a bioreactor, active sludge removes heavy metals, nitrogen and phosphates from the liquid substance. Then a membrane takes care of bacteria and viruses.

After this, multiple oxidation burns the dissolved impurities. Finally, activated carbon filters out the last traces of medicines, X-ray contrast medium and hormone disrupting substances.

After purification by the Pharmafilter system, recycled water can then be used for various applications in the hospital setting. Almost all organic waste, including faeces and bioplastics, is converted into biogas. The remaining waste is disinfected in the installation and undergoes three separate treatments (fermentation, decontamination and ozone). After which the residue is safe to handle.

### Reducing medical waste

The idea for Pharmafilter came about in 2008, when Eduardo van den Berg pondered: What if waiting times at hospital elevators could be cut by eliminating the transportation of waste containers simply by flushing waste through the toilet?

Together with the Water Board and the Applied Water Research Foundation (STOWA), Pharmafilter director Van den Berg researched the idea for the Reinier de Graaf Hospital in Delft. After reviewing all waste streams, he realised the existing sewer system could act as a drainage channel to process dirty water and waste in a single system. This substantially reduces hazardous medical waste and pharmaceuticals in surface water.

### Partners

Partners in the Pharmafilter project are the Reinier de Graaf Hospital, Delfland Water Authority, and the Applied Water Research Foundation (STOWA). Pharmafilter BV is a contractor. The Pharmafilter pilot project at the Reinier de Graaf Hospital was possible thanks to a subsidy from the European Fund for the Environment (Life) and the Netherlands Enterprise Agency for Sustainability and Innovation (Ministry of Economic Affairs).

### International expansion

The Pharmafilter system is currently operating in five Dutch hospitals and the company is finalising contracts with three new hospitals in the Netherlands. Furthermore, the organisation has expanded its operations to Ireland and Germany.

### Prizes

The project was awarded with environmental and innovation prizes, including:

- EEP Award (European Environmental Press award)
- Vernufteling engineering prize
- Aquatech Innovation Award
- Herman Wijffels Innovation Award
- Amstel, Gooi and Vechtstreek Water Authority Water Innovation Prize

[www.pharmafilter.nl/en](http://www.pharmafilter.nl/en)



Smarter protein production provides an answer to increasing food and feed demands



# Protix

## Nature and technology working together for food in balance with nature

With a rapidly increasing world population and limited resources for food production, we must look for smarter methods of producing much needed proteins. Protix tackles the challenges of food security for both humans and animals, and reduces organic waste in the process.

The Dutch company has developed a sustainable and circular way to harness the power of insects for the production of insect-based products. These products include insect-based meals and high-concentration protein products that can be used in the production for aquaculture and animal feed, food, and pharmaceuticals.

Protix uses an innovative way to breed the larvae of the black soldier fly. The larvae eat food leftovers and store it as proteins. After its life cycle the larvae is used as a source to produce protein powder. In turn, the powder is, for instance, used to feed cultivated salmon. In the past, the salmon were fed with fish powder made from other fish - which was unsustainable.

Protix's technology provides an answer to increasing food and feed demands on limited land surface. The technology also helps to dispose food leftovers in an effective manner, creating value from waste.

The World Economic Forum acknowledged Protix by presenting them the Technology Pioneer Award.

[www.protix.eu](http://www.protix.eu)



Substituting the beef with mushrooms saves 50 to 90 litres of fresh water per bitterbal in the production process



# Rotterzwam

## Spread ideas, inspire others

Who would have thought coffee grounds could be circular? In fact, they are ideal as a fertile substrate for growing oyster mushrooms.

Rotterdam-based Rotterzwam collects coffee grounds from local pubs, large corporations and restaurants. They mix coffee husks and mushroom spawn in a bag that is hung in a special grow room. The oyster mushrooms are fully grown and harvested in six weeks. The mushrooms are then sold to restaurants, shops and private customers in the city. The entire process is sustainable and local - an outstanding example of the circular economy.

### Sustainable snacks

One of the products their mushrooms are used for is the typical Dutch 'Bitterbal' snack. Normally this snack contains meat, but Rotterzwam created a vegetarian version made from mushrooms. Substituting the main ingredient beef with mushrooms saves 50 to 90 litres of fresh water per bitterbal in the production process. Making it healthy, delicious and environmental-friendly at the same time.

### Sharing know-how

Rather than shun the competition, Rotterzwam is keen to share their know-how actively with others and encourage everyone to take up mushroom cultivation. Almost every month, they host a free webinar on a wide range of mushroom topics.

Through educating other entrepreneurs and encouraging them to start cultivating mushrooms at other locations, the company hopes to spread their innovative idea and inspire others.

### Mushroom Learning Network

A way to educate would-be growers and have experienced growers share their knowledge at the same time, is through the Mushroom Learning Network. Rotterzwam co-hosts this event, which takes place in a northern European city every year. During this two-day meeting, participants can exchange ideas on various topics concerning mushroom cultivation -from the growing process to the financial and business side.

Although Rotterzwam's mushrooms are grown and sold locally, their idea

is shared globally. The company's goal is to partner up with the world and create sustainable collaborations for the circular economy.

[www.mushroom-cultivation.com](http://www.mushroom-cultivation.com)





Creating a meat substitute to curb the cravings of meat lovers



# The Vegetarian Butcher

## Aims to become world's biggest

Jaap Korteweg decided to become a vegetarian after outbreaks of swine fever and mad cow disease in the 1990s. He had been asked if the cadavers could be stored in his cooling houses.

### Taste and bite

However, he missed the taste and the bite of meat, so he set about developing a substitute. It took 10 years of research and development to successfully mimic the bite and structure of meat.

### World's biggest butcher

In cooperation with top chef Paul Bom, consultant Niko Koffeman, and a dedicated team, he worked on creating a meat substitute with the same taste and experience. The aim being that meat lovers should not have to give up anything when they decide not to eat meat. Korteweg's ambition is to become the world's biggest butcher.

### Golden Meatball

In 2010, The Vegetarian Butcher products were only sold in one shop. Eight years on, they can be found in over 4000 outlets in 15 countries. In 2015, Jaap won the title Entrepreneur of the Year and the Triodos bank's HartHoofd prize. The Vegetarian Butcher products even compete against real meat, winning third prize in the Telegraaf newspaper's Golden Meatball competition. In 2017, The Vegetarian Butcher was hailed the Marketing Scale Up Company of the Year. In April 2018 The Vegetarian Butcher opened its own restaurant, called De Vleesch Lobby (The Meat Lobby), in the centre of The Hague.

### The Vegetarian Butcher factory

Today, The Vegetarian Butcher also has its own factory. It supplies Small Footprint burgers to Dutch chainstore Hema and collaborates with renowned food manufacturer Unox. The concept for The Vegetarian Butcher has spread as far away as Israel, Greece and Finland.

[www.thevegetarianbutcher.com](http://www.thevegetarianbutcher.com)



**In the Netherlands, food waste accounts for 3.5 percent of greenhouse gasses and adds to household and industrial waste**

# Surplus Food Factory

## Salvages food waste

**A third to half of worldwide food production goes to waste. It's not just food and money being wasted. In the Netherlands, food waste accounts for 3.5 percent of greenhouse gasses and adds to household and industrial waste. Producers, manufacturers, restaurants, supermarkets and consumers alike need to rethink processes and develop circular systems to tackle food waste.**

## Salvaging foodstuffs

Following a challenge to the food industry to tackle food waste, Plus supermarket, Foodsquad and Hutten innovation centre joined forces with Wageningen University (WUR) and Rabobank to develop

the Surplus Food Factory (De Verspillingsfabriek). The factory salvages foodstuffs, which would otherwise be thrown away. These are checked in, washed, cut and weighed, before being added to set recipes in the production kitchen. No e-numbers or preservatives are added, as the Surplus Food Factory only uses natural ingredients in its recipes, which are extensively tested refined into the final products.

## Long shelf life

Its product range is destined for both retail and the catering sector and meets the strict requirements with regard to food hygiene, safety and shelf life. An extra pasteurisation step in the process is required to ensure a long shelf life. Then the product is labelled and stored for transport.

## Knowledge platform

Although prevention of food waste altogether would be preferable, the next best solution is to repurpose foodstuffs for human consumption. Circular enterprise is still in the early stages and cooperation between knowledge institutes and companies is key. That is why Surplus Food Factory is committed to providing a knowledge platform for entrepreneurs in the food industry, to inspire and inform them about innovative ways to tackle food waste.

[www.deverspillingsfabriek.nl/en](http://www.deverspillingsfabriek.nl/en)





**Turning 1.8 million euro per year of waste costs into a source of income**



# Vitens

## Water as a source of the Circular Economy

Vitens supplies clean drinking water to 5.7 million Dutch people. The company primarily uses groundwater extracted from water-collection areas. Some of these collection areas are situated on agricultural land, making the water generally more difficult to purify. Vitens' circular ideas have led to healthy soil, clean sources, and sustainable farmland.

Natural replenishment means that the availability of groundwater is no longer a concern. However, obtainable clean groundwater is an issue because of pollution. This is especially the case with agricultural land, which contains nitrates and pesticides. Vitens has developed a method to retain the food-producing capabilities of the land, while still producing clean drinking water extracted from the groundwater under farmland.

### Natural soil improvement

Vitens produces 337 million m<sup>3</sup> drinking water per year. In the process about 60,000 tons of byproducts - such as calcium, iron, and humic substances - are released. Back in 2012, Vitens sets itself the goal of using these residual flows as valuable raw materials. Together with parties like Wageningen University innovative processes were developed to separate these byproducts and use them as natural soil improvers. This new way of working has turned a cost item of 1.8 million euro per year into a source of income, enabling the development of new innovations.

### Win-win situation

Now that Vitens can produce natural soil improvers such as humic substances and chalk pellets, it is able to cooperate productively with farmers, with whom it shares the same catchment area. It's a win-win situation for both parties resulting in healthy soil, better crop yields, and high-quality drinking water.

[www.vitens.com/organisation](http://www.vitens.com/organisation)



Full use of organic residual streams could achieve a 50-75 percent cut in CO2 emissions of the chemical industry



# Waste2Aromatics

## Converts organic waste into raw materials

Organic waste streams are currently composted, digested or incinerated. The waste management industry would like to see these waste streams used as building blocks for the chemical industry.

Together with various waste management companies, the chemical industry, and other relevant supply chain partners, TNO is shaping this transition through its Waste2Aromatics project. The reuse of waste by which an economic system maximises the reusability of products and raw materials while minimising value destruction is a significant step towards circularity.

### Using organic residual streams

TNO is working on technology development for the production of bio-aromatics at Biorizon Shared Research Center. Aromatic compounds are among the most important resources for the chemical industry, but currently almost all aromatic building blocks are made from fossil oil. Each year, 90-100 megatons of these compounds are used in the

manufacture of various products such as plastics, lubricants, coatings and packaging. In one of Biorizon's projects, Waste2Aromatics, it has been determined that waste streams such as manure, SSO (sourced separate organics, e.g. vegetable, garden and fruit waste), sieve fractions, and diaper fill can be suitable feedstocks for the production of furans (and levulinic acid,) which can be converted into aromatic compounds. If the chemical industry were to make full use of such organic residual streams, it could achieve, in theory, a 50-75 percent cut in CO2 emissions. This is motivating many companies, such as Coca-Cola, Unilever and LEGO, to explore alternative - sustainable - raw materials.

### Seeking partners for a pilot plant

TNO is currently working towards a pilot plant to convert organic residual streams into building blocks for bio-aromatics. "We are seeking partners that can supply waste for this plant and chemical companies that would be prepared to use the building blocks we produce," says TNO's Monique Wekking. "Cooperation like this can mean increased economies of scale, while providing access to even more practical knowledge from the supply chain."

[www.tno.nl/en/focus-areas/circular-economy-environment](http://www.tno.nl/en/focus-areas/circular-economy-environment)



Transforming organic waste into green energy, water, fertiliser and raw materials for paper and textiles

# The Waste Transformers

## Turn organic waste into green energy

Once small businesses become aware of the problem of waste, they have few options to solve it. That was until Lara van Druten came up with an innovative solution: Waste Transformers. The goal is to transform collective organic waste into green energy, water, fertiliser and upcycle it into raw materials for paper and textiles, all on-site where the waste is produced.

The Waste Transformers began by transforming organic waste into energy and fertiliser at Amsterdam hotspot Westergasfabriek located at a former gas works. Local residents can subscribe to the energy and the fertiliser makes the park bloom even more. The Waste Transformers and partners

guarantee the energy is 100% local and green. The solution can be applied on-site at any location which produces 600 to 3500 kilos of organic waste per day. Its 'Business in a Box' model even provides local employment in developing countries with support and training from The Waste Transformers.

### Sierra Leone

The Waste Transformers with local partner Masada are placing 40 Waste Transformers in and around Freetown in Sierra Leone. It recently won first prize at the West African Forum for Climate & Clean Energy Financing (WAFCCFEF-3) for its 20-million-euro 'business plan with a high-impact approach to resource recovery and energy production'.

### Former prison Bijlmerbajes

The Waste Transformers has won the tender with OMA Architects and AM Project Developers to redevelop

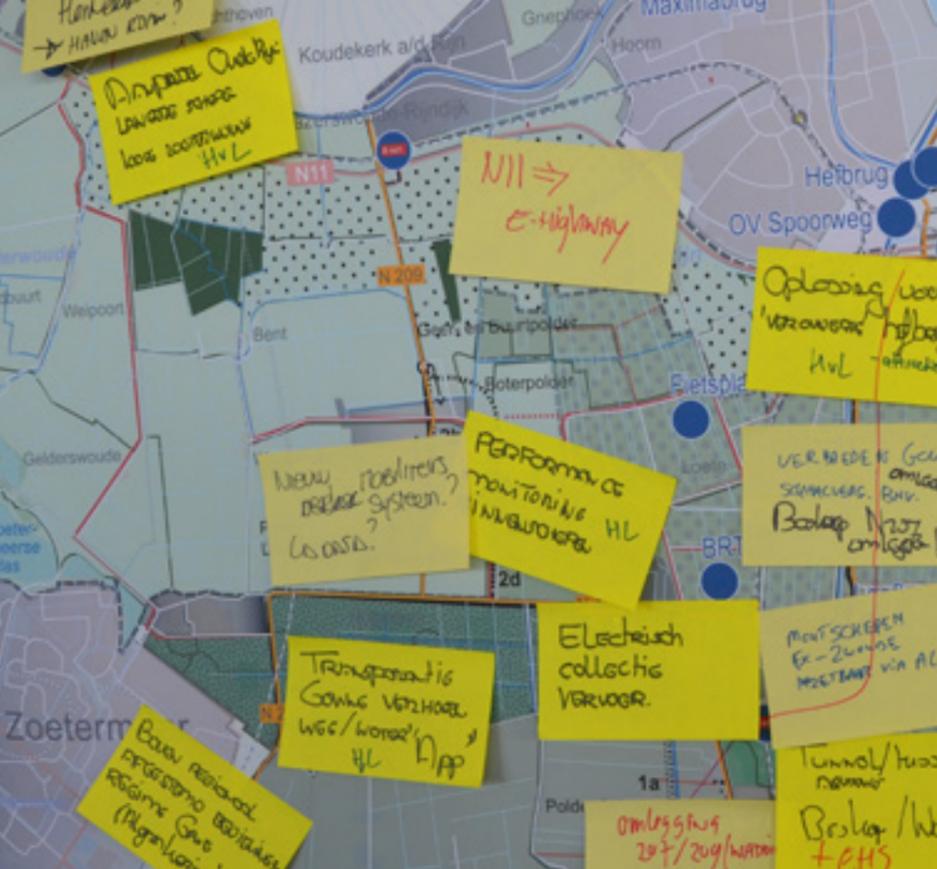
the defunct former Amsterdam prison Bijlmerbajes into a biowaste fueled hub. One of the prison towers has been redeveloped into a green urban vertical park. The organic waste from the hotel, 1350 apartments and offices is transformed into green and clean energy for the building. The vertical park will grow and bloom on the fertiliser produced by the Waste Transformer.

### Hong Kong

With the support of the Netherlands Enterprise Agency and the Dutch Consul General in Hong Kong, The Waste Transformers explored the feasibility of placing an installation in Hong Kong. The first installation is already under construction.

[www.thewastetransformers.com](http://www.thewastetransformers.com)





A connecting hub for companies, entrepreneurs and knowledge institutions in the region working for the circular economy



# Heineken Green Circles

## Creating Green Circles

Heineken Nederland is one of the pioneers of Green Circles (Groene Cirkels), a partnership to make the region around the Heineken brewery a global example for a circular economy and sustainable area development. The driving force behind this collaboration is the development of Heineken's Zoeterwoude brewery into a circular climate neutral company.

### Nature as the starting point

A climate neutral Heineken brewery in a climate neutral chain, a sustainable economy and a pleasant living environment where knowledge is developed for a circular society. These are the ambitions that Green Circles is committed to. It does this by taking nature as a starting point and realise programmes on the topics of energy, water, raw materials, mobility, and living environment.

The partners in the Green Circles initiative are multinational: Heineken, governmentals province of South Holland and Rijnland District Water Control Board and knowledge partners Wageningen Environmental Research (Alterra) and Naturalis Biodiversity Center.

### Regional connecting hub

Green Circles serves as a connecting hub for companies, entrepreneurs and knowledge institutions in the region working for the circular economy. The parties work together to realise their own sustainable ambitions and the common ambitions within Green Circles. By connecting the parties, the province's sustainability ambitions are accelerated and unique, world-class projects are developed.

### Reuse of residual flows

Heineken Zoeterwoude has a lot of experience with reuse of its waste streams and currently recycles 97% of it with its suppliers and customers. Green Circles is researching how the residual and by-products of the brewery, such as waste stream, bostel or phosphate, can be reintroduced into the cycle. Green Circles will use this knowledge to improve the reuse of residual flows, with and for companies in the province of Zuid-Holland.

### Water stream of the future

In a large local farm in Zoeterwoude, 'Die Barle Farms', a futuristic water stream was created in 2015. This multi-functional water purification stream is a pilot for Green Circles. It is aimed to be an attractive way to ensure

good water quality, better taste and more biodiversity. Thanks to Green Circles, this process is a collaborative effort between the farm owner, the specialists from the local water board, biologists from the University of Wageningen, technologists from Heineken, and provincial policymakers. The multi-stakeholder partnership, a typical Dutch approach, is providing valuable insight into how to turn this water stream from an experiment into practice. As expected since this is a live experiment, a lot of hurdles are to be crossed. It can be a best practice for Holland and beyond.

### Green Corridor

Letter of Intent for a Green Corridor Green Circles is the motor behind an agreement that has been signed by a large number

of companies, governments, and research institutes to realise one of the first Green and sustainable corridors in Europe from the Heineken brewery to the Port of Rotterdam and the infrastructure in between. The partners develop projects around the circular themes such as emission-free water transport, bundling material flows, sustainable container terminal Alpherium, and a greener countryside.

The Green Circles initiative aims to be a world class example.

[www.groenecirkels.nl/en](http://www.groenecirkels.nl/en)

Goal 2050: only recycled and bio-based plastics

2

PLASTICS



Global use of plastic has increased 20-fold over the past 50 years. And it is expected to double again in the next 20 years. Worldwide, 299 million tons of plastics are produced every year, 20% of them in Europe. Most plastics are used in packaging: the rate in Europe is nearly 40%. At the same time, more and more bio-based and biodegradable plastics are entering the market, as an alternative to plastics made from fossil fuels like petroleum. The aim is to use only renewable (recycled and bio-based) plastics by 2050. But this can only be achieved if the technology exists. It depends, for example, on the quality of recycled plastic.



The carpet material can be fully recycled to its original form in an economically viable way



## DSM-Niaga

### Rolling out recyclable carpets and technology

Every year approximately 4.5 billion square metres of carpet is produced worldwide, making it a major contributor to landfill. In 2014, life science and material science company DSM and start-up Niaga set up a joint venture to develop fully recyclable carpets for the worldwide market. Now they are selling the technology they developed to other carpet manufacturers.

Chemical concern DSM and start-up Niaga (Again in reverse) have developed carpet material which can be fully restored to its original form in an economically viable way and without compromising on quality.

#### Cutting costs

The new technology not only also cuts production costs; it also reduces energy and water use compared to traditional methods.

Either pure polyester is used or polyester combined with wool or nylon fixed together with reversible adhesives, so that they can be separated after use. The polyester can then be turned into granules, which serve as the raw material for new carpet tiles. Niaga's mission is to redesign everyday products in collaborations with various manufacturers for fully recyclable alternatives.

#### Sharing technology

To further refine their technology, DSM-Niaga is collaborating with other manufactures. Together with Lacom GmbH, a world leader in laminate flooring, DSM-Niaga has developed a machine that uses 90% less energy than traditional lamination processes and reduces water use to zero.

[www.dsm-niaga.com](http://www.dsm-niaga.com)

**Fifty-eight percent of Interface's raw materials are recycled or bio-based**



# Interface

## Carpets made from disregarded fishnets

Interface is one of the world's largest carpet manufacturers and is a leader in producing sustainable carpets, pioneers in the development of bio-based and recycled materials. One of their current projects are carpets made from discarded fishing nets, the Net-Works project.

Throughout the world discarded fishing nets are creating serious environmental problems. Within the Net-Works programme, fishermen collect those nets from coastal areas in developing countries. Their supplier uses the fishing nets as raw material for yarn, which in turn are used by Interface to manufacture new carpets.

Using discarded fishing nets from poor coastal areas has many advantages. The project reduces the amount of scrapped fishnets, which are a danger to the local wildlife. Less new raw materials need to be used to manufacture carpet tiles. Lastly, selling nets are another stream of income for the local population, so they can save for future investments and education for their children.

Interface collaborates with the Zoological Society of London, an organisation specialised in marine conservation. Aquafil recycles the nets and turns them into new yarn for carpets production. Cooperation with partners from a totally different sector is a logical step in creating inclusive circular business models, addressing the United Nations Sustainable Development Goals.

In the same way, Interface has worked on developing bio-based alternatives for both the yarn and the backing of the carpet tile, all coming together in Conscient, a carpet tile with virtually no emissions, contributing to both a better indoor air quality and an inspiring interior.

### Sustainable production

Fifty-eight percent of Interface's raw materials are recycled or bio-based and the European production in the Netherlands is run on locally produced biogas from fish waste. The Interface factory uses a closed water loop system, and the company has reduced its CO2 emissions globally by 95% compared to 1996.

### Goals for 2020

The Net-Works programme is currently established in the Philippines and Cameroon. Interface's goal is to scale-up the project globally. By 2022, the company wants to:

- Create a healthier environment for one million people
- Protect one billion square metres of the ocean

- Give 10,000 families better access to finance

[www.net-works.com](http://www.net-works.com)



**Collaboration  
was a key point  
to make the  
circular ambitions  
a reality**



# Ioniqa

## Developing 'everlasting' plastic

Ioniqa Technologies discovered the key to creating 'an everlasting PET bottle' in its Eindhoven lab few years ago. The start-up developed an innovative process to convert all kinds and colours of plastic PET waste into a virgin, high-quality and colourless raw material. This process can be endlessly repeated, making the recovered raw material competitive, both in terms of quality and costs. Moreover, through this circular process oil is made redundant.

### The PET polyester chain

PET polyester (PET) is a popular type of plastic widely used in the production of water and soft drink bottles, packaging, clothing and carpets. On an annual basis, 61 million tons of PET polyester is produced worldwide: 90% is incinerated, dumped in rubbish tips or discarded in nature (ending up in the oceans) after use. Ioniqa's discovery provides a viable solution to ending pollution and creating a circular chain.

### Upscaling operations

After having done over 50 runs at its demonstration plant (Plant One) in the port of Rotterdam, Ioniqa has started the planning and building process for its first 10 kiloton plant, to be up and running in 2019. The main challenge will be to scale-up to volumes which make

a difference. To achieve this Ioniqa sought cooperation with companies in the waste and packaging sector, since business sensitivity is highly critical for start-ups. In April 2018, the Eindhoven University spinoff entered a partnership with Unilever and Indorama Ventures to pioneer this new technology at industrial scale and help these companies achieve their environmental commitments.

[www.ioniqa.com](http://www.ioniqa.com)





**Giving the public hands-on experience in turning their used plastic cups into new products**

# Perpetual Plastic Project

## Mobile lab recycles plastic in 3D printer

The Perpetual Plastic Project recycles and reuses plastics on site, raising awareness about plastic waste and inspiring behavioural change. The project's young entrepreneurs have developed a mobile lab which can turn plastic cups or bottles into 3D objects at any location.

### Festival start-up

The project was launched at Lowlands pop festival in 2012 as part of the Lowlab programme. After a presentation, festival visitors were invited to turn their used plastic cups into new products. The plastic was cleaned, dried and shred into pieces using

hand-driven machines before being fed into the 3D printer. This printing technology makes it possible to make almost anything from plastic waste.

### Raising awareness

The hands-on experience is not just a great way to engage festival visitors, the installation can also be used at other public events and trade fairs to raise awareness. The Perpetual Plastics team has also developed an educational package for schools to teach children about plastic waste and the circular economy.

### Educating the next generation

After attending various events, Perpetual Plastic noticed that children in particular were interested in the installation and waste recycle. Therefore, the

company developed teaching materials aimed at schools. The programme focuses on plastic litter and contains suggestions for reading materials as well as a transparent model of the machine. Through this scheme, Perpetual Plastic hopes to inspire schools to teach more about circular economy, sustainable community and the new economy.

### Giving waste value

The installation makes the circular economy tangible and visible, as well as giving waste value as ordinary people realise they can recycle their own disposable cups into anything they want.

[www.perpetualplasticproject.com](http://www.perpetualplasticproject.com)





**Phario invites product developers, compounders, parts manufacturers, system integrators and large brands with interest to join in**



# Phario

## Using bacteria to produce PHA bioplastic from waste water

The regional water authorities in the Netherlands no longer regard wastewater only as a waste product to be treated and processed, but also as a source of sustainable energy, raw materials and clean water. One of those raw materials is a bioplastic produced by bacteria from wastewater: PolyHydroxyAlkanoate or PHA. PHA has excellent proven technical properties and is biodegradable under certain conditions.

This fits in with regional water authorities' social transition towards a circular economy, which it is working on in the network organisation Energie- en Grondstoffenfabriek (Energy and Raw Material Factory).

### Bio-based and biodegradable plastic

The processes required for purifying sewage water breed the right bacteria for making PHA bioplastic. If you offer these bacteria enough food under the right conditions, they produce up to 40% to 50% of their own weight in PHA bioplastic.

This plastic has very good thermal and mechanical properties making it suitable for all kinds of applications. It is also biodegradable and more

importantly, it is globally scalable, as most classic waste water treatment plants can implement the same processes.

In the Phario pilot project in 2017, the Dutch regional water authorities successfully showed how to make a PHBV (a PHA variant) from sludge and fatty acids. PHBV has a 70% lower environmental impact than PHA of monocultures and a competitive market price in the PHA family.

### From start-up to scale-up

Once the pilot was completed, Phario focused on upscaling to the demonstration phase and building a commercial factory to produce around 5000 tons of PHBV per year with the potential to further scale up later on.

Due to PHBV's value proposition, Phario is looking to invest in creating more biodegradable applications with other innovative large market parties in its network, so that the market is further developed.

The project invites product developers, compounders, parts manufacturers, system integrators and large brands with interest to join in.

There is also another reason to connect to the market. The water authorities are a public, non-market party. They can provide the IP, the raw materials (sludge, fatty acids) and on-site utilities. However, to raise this development to an industrial scale, the project requires industrial partners and investors to develop downstream

processing and extraction methods and market parties with marketing skills.

[www.efgf.nl/english](http://www.efgf.nl/english)



Over 12,500 plastic fishing people caught 105,000 bottles and filled 2062 bin bags with plastic waste



# Plastic Whale

## Raising awareness about plastic soup

Plastic Whale strives to keep waterways free of plastic. The organisation takes tourists, school children and businesses on plastic fishing trips in boats made from plastic fished out of Amsterdam's canals. In turn, the plastic they fish out of the water is used to make new boats and more.

### Plastic soup

The fishing trips are more than just fun, they raise societal awareness about plastic soup: plastic litter from city streets which is polluting the world's seas via waterways. The Plastic Whale Foundation also organises free events making the general public more aware about the consumption of plastic. In addition, the foundation has developed an educational programme for schools to teach children about plastic soup and the problems it causes.

Plastic Whale teamed up with Vepa Project Furniture and LAMA

Concept to design a line of stylish and practical Plastic Whale Circular Furniture. The proceeds from the sale of the furniture are partly channelled back in the Plastic Whale Foundation projects.

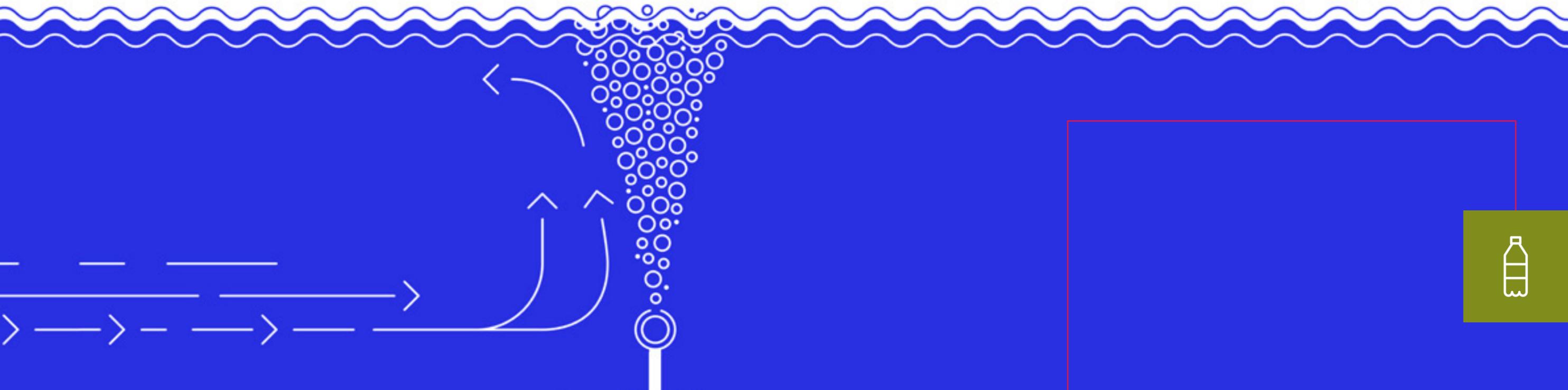
### Clearing waterways

Plastic Whale focuses on activating people and getting them involved. So far the Amsterdam organisation has a fleet of ten boats and now also offers tours in the port city of Rotterdam. In total, the organisation has taken over 12,500 people plastic fishing, caught 105,000 bottles, and filled 2062 bin bags with plastic waste.

### International impact

The Plastic Whale Foundation wants to have an international impact and has forged a partnership with SweepSmart in Bangalore, India, which collects and recycles waste to create local jobs with decent pay and conditions and reduce plastic waste at landfill sites. The Plastic Whale Foundation hopes it will be one of many worldwide.

[www.plasticwhale.com](http://www.plasticwhale.com)



# The Great Bubble Barrier

The Great Bubble Barrier stops plastic pollution in rivers close to the source before it reaches the oceans. By creating a curtain of air bubbles, plastic is prevented from flowing downstream without hindering fish or shipping.

Every minute, the equivalent of one full garbage truck of plastic trash is dumped in the sea. In total that is eight billion kilos per year. Eighty percent of those plastics come directly from use on land. The Bubble Barrier creates a wall of bubbles stopping plastics from passing, but allowing fish and ships through unimpeded. This solution can be used any time and anywhere and thanks to a network of global partners, will soon be removing the plastics from the waterways all over the world.

## Bubble screen

The Bubble Barrier creates a bubble screen by pumping air through a tube with holes located on the riverbed. Current solutions catch floating debris, but a huge proportion of debris travels underwater. The Great Bubble Barrier creates a bubble curtain from the riverbed to the surface. This upward flow of the bubble barrier brings waste to the surface of the water. The barrier uses the natural current to guide the plastic towards the riverbanks, making it accessible for removal.

## Easily scalable

This innovative concept is based on existing technology. It increases oxygen in the water and does not need changes in infrastructure or policies. It is also easily scalable.

## Tested

The concept has been extensively tested in collaboration with the Dutch government public works agency Rijkswaterstaat, Deltares and BAM / Van den Herik. After testing the concept in the flumes at Deltares in May 2017, a 180-metre-long Bubble Barrier was placed in the IJssel river at the Dutch city of Kampen in a three-week trial in November. During this test period the European research team proved that the Bubble Barrier works under all conditions. At present the Great Bubble Barrier is focussing on realising a permanent barrier in the Netherlands. In the future, the ambition is to implement this solution in Europe and Asia.

[www.thegreatbubblebarrier.com/en](http://www.thegreatbubblebarrier.com/en)

The wall of bubbles stops plastics but allows fish and ships to pass easily



In the first international Green Deal, North Sea Resources Roundabout (NSRR), participants ratified their cooperation to give products a new lease of life as secondary raw materials



# Van Werven Plastics Recycling

## Clean plastics as raw materials

Van Werven Plastic Recycling specialises in creating high-quality raw materials from post-consumer hard plastics, collected from construction waste, industrial waste and municipal recycling centres.

### Europe's largest mixed plastic recycling plant

The company has the edge on its competitors in the market as it has developed techniques to sort various types of plastics during the recycling process. Van Werven has a separate stand-alone machine for each type of plastic, as every material has its own properties.

The company employs 300 people who passionately process around 120,000 tons per year, making it Europe's largest recycling plant for mixed plastics. Its success can be attributed to its long-term partnerships with major parties for both the input of plastics and the output of high-quality raw materials. This guarantees the flow of materials and the exchange of knowhow leading to improved business practices.

### Award winning

The acclaimed recycling company has received awards from provincial to international levels for its ground-breaking work. Van Werven received the Sustainable Investment Award in October 2017 for its plastic recycling activities in the UK. The company is also active in Belgium and Ireland and wants to expand other countries. It plans to increase growth to 200,000 tons of production in 2020. Van Werven won the Dutch Circular Award 2018 in the Plastics category.

### International green deal

Van Werven is an active participant in the first international Green Deal, North Sea Resources Roundabout (NSRR). In 2016, participants from France, Flanders, the United Kingdom and the Netherlands ratified their cooperation in

Brussels to give products which previously went to waste a new lease of life as secondary raw materials. Managing Director Van Werven Plastic Recycling, Van der Giessen explains, "What is important to us is that recycled PVC is given a clear status. But we realise that this kind of process takes time. We have already done a lot of work and research, and that good work is being continued."

[www.recyclingplastics.eu](http://www.recyclingplastics.eu)

**Goal 2050: reuse  
and recycle  
critical materials**

**3**

## MANUFACTURING INDUSTRY



More and more products are being made, especially in sectors like the electronics, machine and car industries. This also means that more and more raw materials are being used. The extraction and processing of raw materials create problems for the environment, climate and sustainability. At the same time raw materials are becoming scarcer. And there are conflicts in many of the countries supplying them. The quality of raw materials is also declining.

The government wants to make the business community more aware of the vulnerability of natural resources. By 2050, many critical materials will have to be reused and recycled, including scarce raw materials like 'rare earth' metals. Reuse means putting a product to the same use again. For example, using second-hand parts in a new car. Recycling means turning materials into new raw materials. For example, by recycling plastic into pellets for making new plastic products.



**Moving up the chain: from equipment manufacturer to recycling director**

# Bollegraaf

## Automated circular solutions

While the world continues to recycle more and more, a company in the Netherlands makes sure that the recycling industry has the tools to make the task more efficient. Bollegraaf is one of the leading manufacturers of recycling equipment and dominates the US market.

Decades of experience with household waste and plastic recycling have made Bollegraaf Recycling Solutions the leading authority in this market. The company is a leader in process, technology & automation and robotics, developments in which it continuously and intensively invests.

Bollegraaf has both the know-how and scale and the organisational capacity to engage with large market parties as a serious discussion partner. Taking challenges into account, the company is able to successfully realise very large, integrated sorting facilities.

### How does it work?

Bollegraaf is increasingly adding a new dimension to their globally recognised pioneering role in

recycling. By continually and intensively investing in process technology & automation and robotics, the company is moving up the chain to the role of recycling director. That way, the recycle company creates a world of difference for and with their clients. The machines are not only manufactured to do sustainable work, they are, themselves 'green'. The devices are painted with water-based paint and have the lowest power consumption possible. In addition, the units have a long lifespan and maintain a high residual market value.

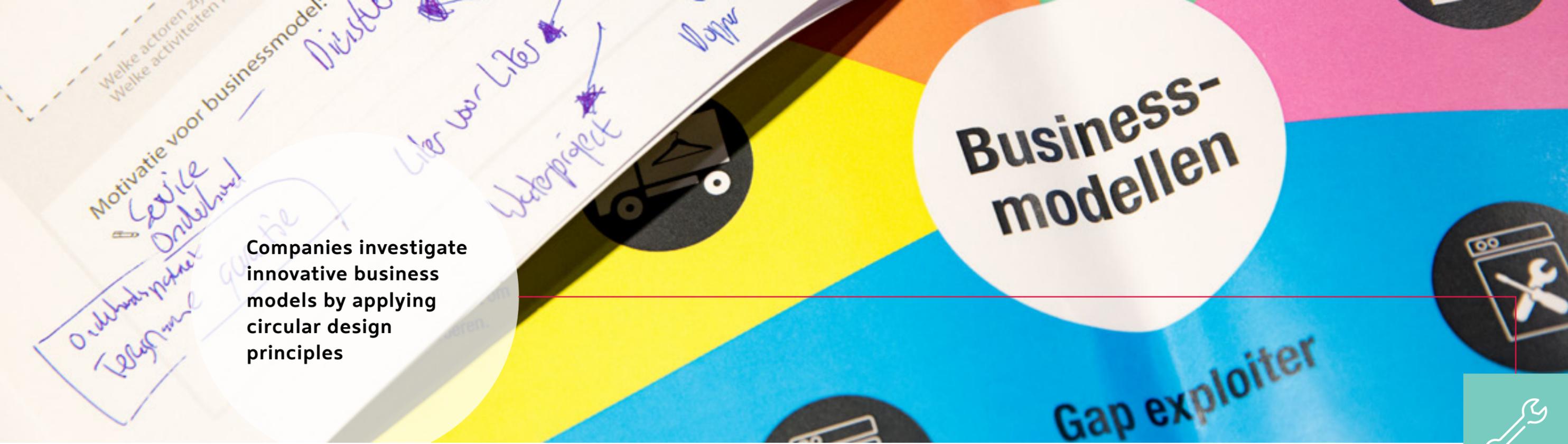
### International market

According to the latest EU law, member states are mandated to recycle or reuse 65% of their waste by 2020. As Europe becomes circular, Bollegraaf's technologies are spread to more and more countries with developing recycling infrastructure. However, their largest export market is not in Europe but on the other side of the Atlantic.

Exporting their recycling equipment throughout the world is not just financially rewarding for Bollegraaf. It also contributes to leaving a more sustainable planet for the next generation.

[www.bollegraaf.com](http://www.bollegraaf.com)





Companies investigate innovative business models by applying circular design principles

# CIRCO

## Creating business through circular design

CIRCO facilitates companies to develop circular products, services and business models, by connecting them to circular design principles. The outcome is a win-win situation, with more value and more sustainability for the participating companies.

**Circular Business Design Tracks**  
During three intensive one-day workshops, 10 companies discover new ways to employ circular methods in their business models. They investigate innovative business models and product design by applying circular design principles. Serious gaming is used to demonstrate the advantages of circular design and participants learn how to implement different circular strategies.

The CIRCO approach and tools are based upon the 'Products that Last' framework, developed by the Technical University Delft. The companies develop a concrete implementation plan for a circular product, service and/or business model. By the end of the CIRCO track, the companies will have a clear idea of the technical and

commercial feasibility of their project, the consequences for the company and the circular impact.

**Circular Design Class**  
Creative professionals play a key role in initiating circular business. During this one-day Circular Design Class, 10 - 15 creative professionals learn the ins and outs of circular design through interactive work methods. Participants practice the application, and are inspired to act as circular change agents.

**Community**  
In the last three years, CIRCO worked with over 200 companies and 150 creative professionals. And the coming years, the organisation is aiming for greater impact. CIRCO is also exploring opportunities to go international. In addition to the classes and

tracks, CIRCO acts as a platform for sharing knowledge and experiences, debating challenges and solutions and facilitating networking and collaboration within its community.

[www.circonl.nl/english](http://www.circonl.nl/english)





Around 4000 people were provided with extra income and over 50 tons of electronic waste were saved 'from the garbage dump'



# Closing the Loop

## For circular telecom

Closing the Loop (CTL) adds circularity to mobile phone usage. The company's services offset the impact of a phone's life cycle such as material usage and waste creation.

### Offsetting the material-footprint of a device

A circular service that is gaining traction fast is CTL's 'material offsetting'. Similar to carbon offsetting, it allows for the offset of a footprint, but in this case, it's the material footprint.

Put simply: when a new phone is purchased, a broken phone gets collected and recycled, on a 'One for One' basis. As with CO2 offsetting, a fee is paid to fund the collection. The result: new phones become material neutral. CTL thus puts circularity into practice for its customers.

The service is being offered by international partners such as A.S. Watson and Renewd.

### Waste-free reuse of phones

Reuse of mobile phones has grown

rapidly in recent years. Most phones are shipped to emerging markets for their second life. As these markets lack proper recycling facilities, one could argue that reuse leads to more e-waste in developing regions. To tackle this issue, CTL adds a service to reuse. By taking out - and recycling - the same quantity of dead phones from Asia and Africa, as the number of devices being shipped to these regions, CTL can make its customers' reuse policy waste-free. The service is being offered by international partners such as Sims Recycling Solutions and Infotheek.

Closing the Loop has provided around 4000 people in developing countries with extra income, and saved over 50 tons of electronic waste - some two million phones - 'from the garbage dump'.

They have helped clients such as Fairphone, ING, KPMG, Schiphol and the municipality of Amsterdam to make their telecom policy more sustainable.

### Big goals

CTL wants to make the telecom industry waste-free. It believes emerging markets offer the biggest chance of success and highest (social) return on investment, when it comes to circular business. That's why it invests in local collection and recycling in countries such as Ghana, which will also lead to more availability of urban mined materials. And as far as CTL is concerned, urban mining is the circular future.

[www.closingtheloop.eu](http://www.closingtheloop.eu)



**“A smart energy meter made from responsibly sourced, reusable materials”**

# Fair Meter

## Changing the world, one meter at a time

In 2013, the Dutch government and knowledge institutes and leading utilities companies Stedin and Alliander launched the Green Deal Fair Meter. The aim was to roll out smart meters to prepare households for a future-proof energy transition in a responsible way, with minimal ecological footprint and socially sound. The solution was Fair Meters.

### Ecological footprint

A Fair Meter is a smart energy meter, made from responsibly sourced, reusable materials, using ecological and ethical manufacturing processes. The objective is to attain maximal transparency in the whole production process whilst reducing the ecological footprint. This meant rethinking everything from sourcing the raw materials, manufacture and logistics to installation and responsible waste treatment, and reuse of meters for a second life where-ever possible. The origin of all the materials in the production process are listed on a resources label, called Material Passport. This is an extensive overview, as a smart electricity meter consists of almost 250 different materials! The Fair Meter is not fully there yet; it is a step by step process to redesign the smart meters and create transparency per material, so we are “on our way”. Currently, we have been able to create a new meter designs

with our suppliers Flonlskrae and Landis+Gyr. This significantly reduces the weight per meter and even erases some materials totally from the design. Over the millions of meters in the contract, this means tons of materials saved.

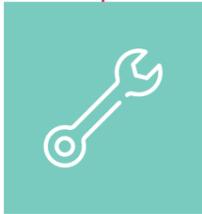
### Performance ladder

To develop a fair smart meter for household energy consumption, Stedin, and Alliander, focus on address all major issues that the electronics industry is facing today – energy intensity, labour conditions, use of critical, conflict or toxic materials, material scarcity and e-waste This resulted in a Fair Meter performance ladder which can be adapted to any procurement process. Other grid operators and purchasers of electronic products can copy this way of working. Currently, other (companies in) countries are also interested, including Sweden, Germany and Belgium.

### Sustainable energy system

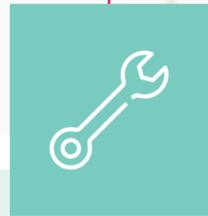
Now these ecologically sound meters are being installed in homes up and down the country, in preparation of a sustainable energy system in the future. Soon some customers will produce their own energy for instance from solar panels supplying their excess back to the grid, while others will be able to reduce their bills because they have a better insight into their energy use. Fair Meter will help as an intrinsic sustainable product. Our mission is: Fair Meter, changing the world, one meter at a time.

[www.fairsmartmeter.com](http://www.fairsmartmeter.com)





By keeping vital parts in the chain, high-quality equipment with full warranty can be provided at a lower cost



# Philips Healthcare

## Refurbished Systems

With healthcare budgets under pressure and a global trend towards circular business models, refurbished medical products provide a solution that can deliver both social and economic value.

Through its Refurbished Systems business, Philips offers a choice of pre-owned systems that have been thoroughly refurbished, upgraded and quality tested. By keeping vital parts in the chain, the healthtech giant can provide high-quality equipment with full Philips warranty, at a lower cost.

### Take back

The supply for these refurbished systems is enabled by taking back medical equipment from installed base customers. Philips is able to create a win-win situation, because there is still significant value in these used systems that flows back to the customer.

### Premium performance at a more affordable price

Philips has a special refurbishment programme, Diamond Select Advance, under which they are able to offer state-of-the-art MRI systems with premium performance at a more affordable price. One of the first customers was the Gross Grönau radiology clinic at the University of Lübeck. This system includes a refurbished 3000 kg magnet with a serviceability guarantee of at

least 10 years. The MRI system can be upgraded and saves up to 50% energy consumption compared to similar systems.

### Essential enablers

**Business Models** - Philips Healthcare set up a general Magnetic Resonance Imaging Systems team to create synergy from its Refurbished Systems department. This team ensures the reuse of magnets and provides systems for which the usability assurance is equal to new systems.

**Design** - The smart modular design for reuse makes it possible to offer a high performance system at an affordable price.

**Cooperation** - The Diamond Select Advance programme is a direct result of close collaboration

between Refurbished Systems, the service organisation, the market and the end customer.

**Reverse Logistics** - Reverse Logistics includes the de-installation of systems by Philips-trained employees, and transport to a Refurbished Systems factory.

Philips Refurbished Systems offers not only MRI scanners but also refurbished CT scanners, interventional X-ray equipment and ultrasound equipment.

[www.philips.nl/healthcare](http://www.philips.nl/healthcare)

*\* Diamond Select Advance, previously known as Greenline programme*



**200,000 refurbished products are sold per year with a buy back guarantee after five years**

# SNEW

## Adding value to waste

Planet Earth's raw materials are running out. In 20 years' time, over 30% of all raw materials may have disappeared. In our consumer-driven society, innovative products are increasingly being manufactured without paying much attention to these depleting resources. With a fast-growing global population, this could have catastrophic consequences, even though there is enough in the waste yards to delay this for decades.

**"We have to start thinking circular! Let go of linear-thinking and you will see that solutions are available. Every industry can 'unmake' things."**  
Martijn van Engelen, CEO

SNEW approaches things differently, striving for a circular economy in which products are reused in one way or another. Such an economy is a necessary development for a sustainable future. The company has developed a unique and circular model in which the raw materials of existing equipment can be reused rather than disposed of. It has a vision and passion for the return of the raw materials that we have borrowed from the Earth, as well as to empower disadvantaged people.

Normally, end-of-life equipment is immediately recycled, which is not necessary and even burdens the Earth. In a circular system the raw materials of existing equipment are

reused instead of misused. Where the economic life of a product usually stops, SNEW continues. What is termed the '3R-concept®' (recollect, reuse and recycle), focusses on lengthening the lifecycle of a product.

As a first step, SNEW precisely identifies the equipment and then filters it for reuse. Following that, reusable equipment is refurbished and is offered again for use as 'As New'. Unusable equipment is dismantled and reduced to those raw parts which can be used again. Only when the equipment cannot be reused anymore, will it be recycled and reduced back to raw materials. This creates the full circle which will prevent the depletion of raw materials as well as minimising the massive problem of 'e-waste'.

### Fully track and traceable

SNEW sells over 200,000 refurbished products per year. Buyers also receive a buy back guarantee after five years for their discarded ICT appliances, thus reducing their e-waste and giving appliances a third life. All products are manufactured according to ISO and WEEE (Waste Electrical and Electronic Equipment) standards. As a result, the concept can also be applied to medical and household appliances. At the same time, all SNEW's activities are fully track and traceable.

[www.snew.eu](http://www.snew.eu)





**Making industrial saline waste water into clean water and minerals**

# ZERO BRINE

## Recovers minerals and water from industrial brines

ZERO BRINE advances circular economy business model solutions to eliminate industrial saline wastewater streams by recovering and reusing the minerals and water from the brine used in other industries. Thus 'closing the loop' and improving the environmental impacts of production.

ZERO BRINE is four-year Innovation Action (IA) project coordinated by TU Delft. The consortium contains 22 partners including research institutes, SMEs, construction companies and end-users from 10 different countries. ZERO BRINE aims to achieve the recovery of valuable substances such as calcium, sodium, magnesium salts and high quality water. To achieve this, they use various innovative technologies to treat concentrated saline effluents generated by process industries.

### Water and resource recovery

The climate conditions and the water stress have led to the use of alternative water resources, such as water reclamation and desalination. This ensures sufficient water supply. Islands, for example, lack freshwater availability and access to renewable energy sources.

In 2015, the predecessor of ZERO BRINE - SOL BRINE - and the National Technical University of Athens, were selected out of 4306 EU LIFE projects as the best project

implemented over the past 25 years, in the category Environment. The group was awarded the Green Award by the EU commissioner, Mr. Karmenu Vella.

The SOL-BRINE project is a closed loop solar-powered brine treatment system that was installed at a desalination plant in the Cyclades islands. It separates the desalination brine into two useful byproducts: dry salt and water. The water is reused in the process, while the salt is sold for industrial purposes. The project aims to eliminate the current practice of brine disposal. The results of SOL-BRINE scheme made a transition into the commercial sector. It is now managed by the Dutch company called SEALEAU B.V. who is the originator of ZERO BRINE project.

### Industrial wastewater treatment

In Rotterdam's Botlek industrial area, ZERO BRINE treats two salt waste water effluents at Evides' Demi Water Plant in a demonstration installation using residual heat from other industries. This together with three other pilot projects in Spain, Poland and Turkey, ZERO BRINE provides massive potential to replicate and deploy circular economy solutions in the field of industrial wastewater treatment.

[www.zerobrine.eu](http://www.zerobrine.eu)



**Goal 2050:  
buildings and  
other structures  
are built, (re)  
used, maintained  
and demolished  
sustainably**

4

## CONSTRUCTION SECTOR



It's estimated that the construction sector:

- uses 50% of all raw materials
- accounts for 40% of the total energy consumption
- uses 30% of total water consumption in the Netherlands.

40% of waste in the Netherlands is construction and demolition waste. The construction industry is also responsible for 35% of CO2 emissions. It is therefore stepping up efforts to save energy and cut emissions. There are many ways to use raw materials more efficiently and reduce waste. By 2050 buildings and other structures must be built, (re)used, maintained and demolished sustainably. They must be energy neutral and made of sustainable materials.



A bridge made of 100% bio-based composite materials

# Bio-based Bridge

## Reducing use of fossil raw materials

In October 2014, the Centre of Expertise Bio-based Economy started working with more than ten SME companies and three knowledge institutions on the development of a pedestrian bridge made entirely from bio-based composite materials. Two years later, the world's first biocomposite bridge opened on the Eindhoven University of Technology (TU/e) campus.

## Demonstrating the potential of biocomposites

The bridge over the Dommel River has a 14-metre-span. The temporary experiment demonstrates the potential of biocomposites as a sustainable alternative to existing environmentally harmful construction materials. This reduces dependence on non-sustainable materials like concrete, metal and finite fossil raw materials.

Willem Böttger, professor at Avans University of Applied Sciences, says, "Besides the fact that the bridge is a major milestone in environmental technology, I think one of the most important aspects is that so many different parties work together here. With two

universities, three colleges, three ROCs, over 15 companies, two municipalities, the province and more than 100 students, we have sown the importance of building a bio-circular structure. On to reaping the harvest."

## Stimulating regional agriculture

Fibres from industrial hemp and flax, which form the basis for the bridge material, were grown locally and can act as a stimulus for regional agriculture. By attaching the fibres to a core of organic PLA (polylactic acid) biofoam, the builders succeeded in developing the biocomposite. The strength of the beam was formed by sucking a bio resin into the fibre bundles from a vacuum and curing. With the help of 28 sensors, the intention is to measure the deflection of the bridge during the experiment.

## Prizewinning composite

The bridge is the result of the 4TU Lighthouse research project 'B3: Fully Bio-Based composite pedestrian Bridge' and was co-funded by the Innovation Alliance Foundation (SIA). In January 2018, the bridge won third prize for Biocomposite of the Year during the International Biocomposites Conference in Cologne.

[www.biobasedbrug.nl](http://www.biobasedbrug.nl)





**For the office wing 90% of the materials were of locally 'harvested' reused material**

# BlueCity

## Circular incubator

BlueCity in Rotterdam is a breeding ground for innovative companies that link their residual flows. Here pioneers of the circular economy are gathering together, leading the way and acting as an example to the world. Residual flows are interconnected and knowledge is shared. BlueCity offers production rooms, office space and event venues.

### Blue Economy

The name BlueCity is used because the breeding ground is largely based on the principles of the blue economy: working with what is locally available, assuming cooperation instead of competition and generating various income streams. They cross the circles

of the circular economy so that networks are created that they can connect to one another. All this is done by BlueCity with the same goal: continuous innovation, creating jobs, reducing the waste mountain by seeing 'waste' as a raw material and building social capital without depleting the environment.

For example, Aloha Bar-Restaurant's coffee grounds form the substrate for Rotterzwam's oyster mushrooms. The CO2 released during this process is used by Spireaux in the production of the alga spirulina. This alga is used to develop packaging materials in the BlueCity Lab. And the oyster mushrooms are, of course, used in dishes on Aloha's menu. A perfect circle.

## From swimming paradise to model city

BlueCity is located in the former tropical swimming paradise Tropicana in Rotterdam. Innovative, sustainable and circular entrepreneurs are now establishing their businesses between the slides and hot tubs, giving the remaining 12,000 square metres space new functions, meaning and value. In 2017, the office wing was completed in an old disco and the renovation of the changing rooms and machine rooms began. These are being turned into additional production areas and are due to be ready during the course of 2018.

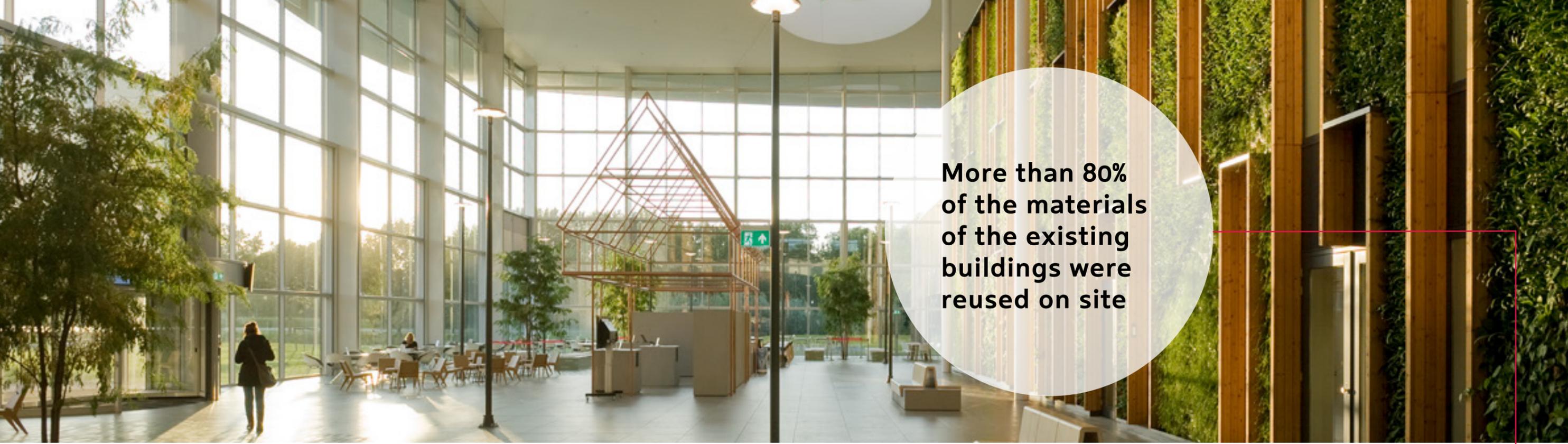
During the building of the office wing, the construction team – consisting of Superuse Studios, Coup, BIKbouw and Theo Mostert – used blue, circular principles:

90% of the materials were locally 'harvested' and reused. This saved a total of 60 tons of CO2 - the equivalent of driving eight times around the world and the amount which 2400 trees absorb in a year. A striking element in the former disco is the red cedar window frames. These frames, originating from a demolition site, form an impressive façade which is just right. For this transformation, the building was nominated for the Rotterdam Architecture Prize 2017 and received the ARC 17 Innovation Award.

[www.bluecity.nl](http://www.bluecity.nl)



Photo: Frank Hanswijk



**More than 80%  
of the materials  
of the existing  
buildings were  
reused on site**

# Liander/RAU

## Finding common ground in circular collaboration

Energy grid operator Liander and architecture group RAU find common ground in a sustainable redevelopment housing complex in the Dutch town of Duiven.

Liander has two goals, the first is achieving a fully CO2-neutral operation and the second is realising circularity of materials by 2023. Testament to this commitment is the Alliander/Liander building, in which several old offices were transformed into one new building. The role of the architect RAU was key due to its strong awareness regarding the design of sustainable buildings.

Using innovative methods, BREEAM-NL in-use advisory group created outstanding housing from a complex of five existing buildings, which have been extended and encased in a 'climate greenhouse' with a floating roof.

### Organic design

The complex accommodates 850 flexible workplaces for 1550 employees, according to the principles of the new world of work. The concept consists of maintaining and adapting existing buildings from an economic, aesthetic and ecological point of view. The energy consumption has been reduced and the comfort of the working environment increased. The combination of the glass atrium with air heating (BaOpt principle), a submerged heat pump and 10,000 square metres

of solar cells results in a positive energy balance. The surplus of energy is shared with surrounding companies.

Possibly even more important than the energy aspect, is the team's comprehensive approach to material (re)use. More than 80% of the materials of the existing buildings were reused on site. New materials are recyclable. Rainwater is collected from the roof for cooling and to flush the toilets. Large circular openings in the roof allow light to penetrate the structure. A green facade, trees and plants are a central component of the CO2 and moisture management and thus contribute to a natural and healthy indoor climate in the complex.

### Belief in a sustainable future

Rau's mission is to make a positive contribution to society and planet Earth. To Rau, architecture demonstrates and creates awareness of how human activities influence the built environment. A truly sustainable building is not just one that incorporates energy efficient technology and fulfils the standards of given sustainable certificates. Rau's ambition exceeds the boundaries of the architectural challenge itself: The company aims to deliver added value and quality of life on Earth. It believes architecture must ensure that activities on Earth add value to the future instead of consuming resources that can't be replaced.

### 'Architecture through dialogue'

The architecture of RAU is by definition the result of a unique

design process. 'Unique' because each project differs from each other and is influenced by its participants, their personal inputs and the conditions given by the specific location. Its integrated planning method allows it to deliver the best possible building for the users, the clients and the location.

[www.rau.eu/portfolio/liander](http://www.rau.eu/portfolio/liander)



Using material passports, we can reuse building materials and eliminate waste



Madaster  
Launch  
Amsterdam  
17-02-17

# Madaster

## Attaching circular value to building materials

Madaster's mission is to facilitate a circular economy where waste can be eliminated by providing materials with an identity. The Madaster Platform is designed as a public, online library of materials and products in the built environment. The platform facilitates registration, organisation, storage and exchange of data. Madaster carefully focuses on privacy, security and continuity.

### Improved insight for better use of materials

Our planet is a closed system where all materials have value and should not be wasted. By giving materials an identity, they can be used in the economy. Through registration and documentation using material passports, we can reuse materials in a circular economy and eliminate waste. Thus retaining the composition, quality, reusability and construction throughout the lifetime of the object.

The Madaster Platform facilitates registration, documentation and valuation of materials used in the built environment to such extent that the material consumption of our economy can last for future generations through circularity. Building dossiers can be passed on

to a building's new users. Madaster also facilitates data exchange to producers and marketplaces to support refurbishment, reuse and monetisation of materials and products.

### Integrated apps

Madaster makes information registered about materials and products available to individuals and organisations through a sustainable service that is compliant with data privacy and security requirements. Data uploaded to the platform is owned by the entity that owns the real estate object and is only shared at request of the owner. Usage is paid for via an annual subscription fee based on the metrics of the real estate registered.

The Madaster Platform supports automated processing of Building Information Models to simplify the registration of materials and products. The more details, the more the owner benefits through integrated apps and rapportage like the Madaster Circularity Indicator and the Financial Valuation reports on materials.

### International developments

Currently Madaster supports the Dutch real estate market. However, it intends to expand its scope soon to include other countries such as Switzerland and Belgium and other sectors such as infrastructure and products.

[www.madaster.com/en](http://www.madaster.com/en)





The flexible construction method, enables environmental waste sites to be adapted, relocated and reused over time

# Modulo Resource and Recovery Centres

## Circular and modular environmental waste depots

Modulo Milieustraten develops and produces innovative, modular and circular environmental waste sites. Thanks to the flexible construction method, user-friendly sustainable environmental waste sites are built that can be adapted, relocated and reused over time. With maximum space utilisation under the platform and at minimal cost.

### Innovative, modular, circular

Around every 10 years environmental waste sites have to adapt to new legislation and regulations, as well as environmental and demographic developments. Modulo's flexible design makes it possible to make adjustments to the modular waste site according to demands.

The innovative modular construction accommodates dual usage of the surface area through the hollow underside of the platform. The construction is used for the storage of waste and raw materials, sorting and processing of products and materials, repair of products, recycling activities, office and education space, start-ups and circular initiatives.

In addition to the circular flexible construction design, the construction itself is sustainable because the concrete elements are produced from secondary raw materials (eco granules) and are themselves 100% reusable.

### Resource and recovery centres

Modulo has international ambitions in Europe and beyond to advise and supervise local partners and municipal and national governments on setting up Recycling, Upcycling, Resource and Recovery Centres. The concept is has a worldwide patent. First Modulo carries out a Country-City-Scan into the existing culture and situation on the ground, paying particular attention to informal and formal collection practices. It is key to involve all parties from start.

Then the right partners with the right experience and complementary knowhow are sought via a matchmaking process preferably in consultation with the municipality, the embassy or national governments. Experience proves that public-private-partnerships or public-private-mix work best when processes are well supervised and knowledge is shared.

### Business scenarios

In the first year, the partners are taught trends and best practices on site and remotely. Potential business scenarios are looked out together and the local team is supervised until the first project is realised. This can take two to five years, depending on the municipal or national project integration.

Eventually responsibility is handed over to the local organisation. Modulo's waste collection solutions act as a circular beacon for the responsible collection of raw materials. The patent provides local governments and their partners protected status affording them the opportunity to develop integrated systems in their local setting.

[www.modulo-milieustraten.nl](http://www.modulo-milieustraten.nl)





The focus on the well-being of people results in an inspiring, healthy and productive work environment



# Park 20|20

## World's first Cradle to Cradle inspired work environment

Park 20|20 in the Municipality of Haarlemmermeer, near Amsterdam, is the world's first fully operating Cradle to Cradle inspired working environment. It is presently under development by Delta Development Group, VolkerWessels and Reggeborgh Groep.

### Park 20|20

Park 20|20 is a uniquely sustainable business park consisting of approximately 88,000 square metres of offices and 3500 square metres of facilities. In its development, one of the most important aspects focuses on the well-being of people resulting in an inspiring, healthy and productive work environment. The park runs entirely on renewable energy and other sustainable assets include heat and cold storage, photovoltaic cells, together with a water purification system via helophyte filters.

### Cradle to Cradle

Cradle to Cradle recognises that nature follows an ingenious cycle in which waste does not exist. By taking into account how a building could be disassembled (circular

design) during the design phase, a circular approach can be applied to the work environment. This is what is happening at Park 20|20, where the materials used are biodegradable or can be reused for different products with another life.

Through the Park 20|20 materials innovation programme, the development team has been better able to identify and target manufacturers and distributors of Cradle to Cradle Certified™ materials early in the design and concept phases. This improves collaboration and the innovative application of their products to meet project needs.

Additionally, the programme engages companies with substantial circular potential to introduce the Cradle to Cradle

Certification standard as a viable option, further improving their health and circularity. This enhances access to healthy, circular products for the greater European and global construction industry. Via this programme the Park 20|20 team has assembled the world's largest collection of Cradle to Cradle Certified™ materials and enabled many products to achieve Cradle to Cradle Certification.

### Focus points

For Park 20|20 the focus lies on the following aspects:

- 1 Design for disassembly - It is important that buildings are made of reusable materials. For example, buildings are not worthless after their life cycle, but rather a valuable asset.

- 2 Productivity and health - Research shows that buildings at Park 20|20 increase productivity and reduce absenteeism.
- 3 Materials passport - A materials passport is created for each individual building, indicating what and where certain materials are applied, how much has been used and how the building can be dismantled.
- 4 Lease products - The products are rented instead of purchased. This ensures lower acquisition costs for a building.

[www.park2020.com](http://www.park2020.com)





**Rijkswaterstaat has the ambition to reduce the use of primary raw materials by 50%**

# Rijkswaterstaat

## Circular innovations

As the largest client in the construction sector, Rijkswaterstaat uses a lot of raw materials, particularly sand and soil. These materials are widely available and do not get exhausted quickly. However, the government agency needs large quantities of it. The extraction and transport of these materials effect the climate considerably. Rijkswaterstaat has the ambition to reduce the use of primary raw materials by 50% and to work circularly by 2030.

**High-quality reuse**  
Rijkswaterstaat uses large amounts of recycled material. For example, construction waste is used for foundations on highways. But that is not 100% circular yet. The material eventually ends up on the waste heap. Therefore, they developed the principle of 'high-quality reuse', in which waste always becomes a full-fledged raw material.

**Biomass**  
Biomass is also part of Rijkswaterstaat's vision to work circular by 2030. They increasingly use bio-based materials for construction and maintenance. Think of traffic signs, lampposts, street benches - all made from organic waste like tree or grass cuttings. It also increases biodiversity, for example improving

the habitat of bees. To accomplish this, Rijkswaterstaat works together with contractors - thus contributing towards a more sustainable and circular society.

**Circular design**  
In order to keep materials in circulation as long as possible, it is important to think beyond just the initial design of a road or structure and about its future reuse. Rijkswaterstaat thinks carefully about the future reuse and transportability of raw materials and objects. They want to increasingly use circular design principles - such as modular or adaptive design - for the renovation or new construction of roads or buildings.

Rijkswaterstaat's goal is to reuse raw materials at a high level,

work without producing waste and contribute to climate change mitigation. To achieve this, the institution started to collaborate with designers, contractors, knowledge institutions and co-governments in various projects. In doing so Rijkswaterstaat gathers knowledge, develops tools and gains practical experience.

[www.rijkswaterstaat.nl/english](http://www.rijkswaterstaat.nl/english)





**Recovered cementstone can be reused directly CO2-free in the production of new concrete**

# SmartCrusher

## Recycles concrete sustainably

The name says it all - SmartCrusher is a clever innovation for the construction industry. It not only breaks down disused concrete, it separates its constituents into sand and stone, producing high quality raw materials to be reused in new concrete. Dutch innovators Koos Schenk and Alef Schippers created the machine together with Rutte Groep to enable effective concrete recycling, while reducing CO2 emissions at the same time.

### Durable, but not sustainable

Concrete has been used as a reliable building material since ancient times; however the production of concrete is not sustainable, with one kilogram CO2 emitted for every kilogram of cement produced. This makes the production of the world's most popular construction material responsible for huge quantities of greenhouse gas emissions.

### Reusing raw materials

The challenge is to break it down into reusable raw materials. Up to now concrete crushing machines have only been able to grind all raw materials together limiting the possibilities for its reuse. These crushed pieces of concrete can only replace the pebbles in new concrete, but this does nothing to reduce CO2 emissions during the production process. Smartcrusher separates the unused cement stone from the concrete rubble during the crushing process

### Reducing CO2 emissions

As the cement stone does not need to be remade, it can therefore be reused directly CO2-free in the production of new concrete. The sand and pebbles which are left over can also be reused. Innovator Schenk says the quality of these materials is actually better.

### Closing the loop

In 2013, Consultancy CE Delft calculated that the concrete industry could reduce its CO2 emissions significantly through more efficient use of raw materials. Schenk believes Smartcrusher could even be used to close the loop in the cement industry. "This method produces more whilst using less energy, roughly 10 percent of a conventional machine. The mobile machine can be implemented on site using electricity from sustainable sources," he says.

### Prizewinning innovation

Smartcrusher has come a long way since it won the ASN Bank World Prize in the 'Sustainable energy, nature and environment' category in 2014. Last year at the UN Climate Conference in Bonn (COP23) the innovation was hailed as one of the 'needed Game Changers'. Earlier this year, it won the Circular Award Construction 2018, awarded as part of the drive to make the Netherlands 100% circular by 2050.

[www.slimbreker.nl](http://www.slimbreker.nl)





# Venlo City Hall

The city of Venlo opened their new city hall in 2016, designed according to the cradle-to-cradle principles. The iconic building has been visited by over 25,000 people ever since.

The result is a healthy working environment, combined with sustainable innovation. Raw materials and parts used have a 'passport', detailing their production and origin. The building is therefore in essence a huge raw-materials databank. When a service or product reaches the end of its useful life, these materials can easily be retrieved for high-grade reuse.

## Self-sufficient

The Venlo city office generates its own energy. Through using thermal-energy-storage, solar panels, solar boilers and other energy efficient measures, the structure is energy self-sufficient. Moreover, rainwater is purified to reduce the consumption of clean drinking water. The building's green façade purifies the air outside and a greenhouse on the roof provides natural ventilation. By doing so, the indoor climate is even better than outside. The interior of the office has 'green' walls that regulate humidity, oxygen level and acoustics.

## Social value

The Municipality of Venlo office building generates social value by offering its employees a pleasant, bright and natural

work environment. By lowering absenteeism due to illness by just 1%, the municipality saves €480,000 per year - not even taking into account the increase in productivity due to the pleasant work environment.

## Design process

During the tender phase, the municipality of Venlo selected a design vision instead of a detailed plan. On the one hand to prevent market parties from having to spend a lot of time and resources to complete the tender registration, but especially because the client (in this case Venlo) was not involved in the first phase. This method led to the creation of a team who were in the right (circular) mindset. This group also had the willingness to make the cradle-to-cradle (C2C) and circular ambitions of Venlo a reality.

Collaboration was a key point. Several sessions took place to achieve a clear understanding of the C2C starting points. The architect and other parties - project management, technical consultants and C2C advisor - were essential to achieve the desired result.

## C2C ExpoLAB

The C2C ExpoLAB supported the municipality of Venlo during the entire process, from the Schedule of Requirements, to design, tender and realisation. The organisation is also involved in various projects at home and abroad.

[www.stadskantoorvenlo.nl/en](http://www.stadskantoorvenlo.nl/en)



Goal 2050: all consumer goods are made from universally available raw materials

5



Discarded consumer goods are already separated and recycled on a large scale in the Netherlands. But about half of them are still incinerated or landfilled: 80% of waste in the Netherlands (about eight million tons a year) is generated by people and businesses. The government wants all consumer goods to be sustainable and made from universally available raw materials by 2050. Waste products must be recycled and used to make new products. There should be no waste left over.

CONSUMER GOODS



Auping managed to cut down gas by 90%, water by 60% & electricity by 30%



# Auping

## Circular mattresses with ambition

Dutch bed and mattresses manufacturer Royal Auping is considered to be one of the leaders in circular economy in the Netherlands. The company's goal is to have a production process in which every fibre gets reused. Every used mattress will be returned to the factory and ultimately recycled into new mattresses.

Auping adopted the Cradle-to-Cradle system, focusing on three principles:

1. Products are manufactured from 100% reusable materials;
2. Energy use is sustainable and any usage of fossil sourced energy is kept to a minimum;
3. Employee wellbeing is paramount; Auping strives to be a good employer and a transparent partner for other companies.

### Sustainability every step of the way

Besides this, Auping also looks at the sustainability of its whole manufacturing process and products. Their bed frames are painted with a water-based varnish. The manufacturer has saved 120,000 transport

kilometres per year by centralising their production plant in the Dutch city of Deventer. The manufacturing process starts when they receive an order from the customer, cutting out bulk production and saving on storage space.

The Deventer plant uses the smart industry scheme. It has a wood factory to produce bed frames, a steel factory to make mesh bases and a sewing studio for their mattresses. Centralising everything not only keeps the kilometres in transportation to a minimum, but it also integrates the various manufacturing processes.

By integrating all these steps, Auping managed to cut down its energy usage: reducing gas

by 90%, water by 60% and electricity by 30%.

### Take Back System

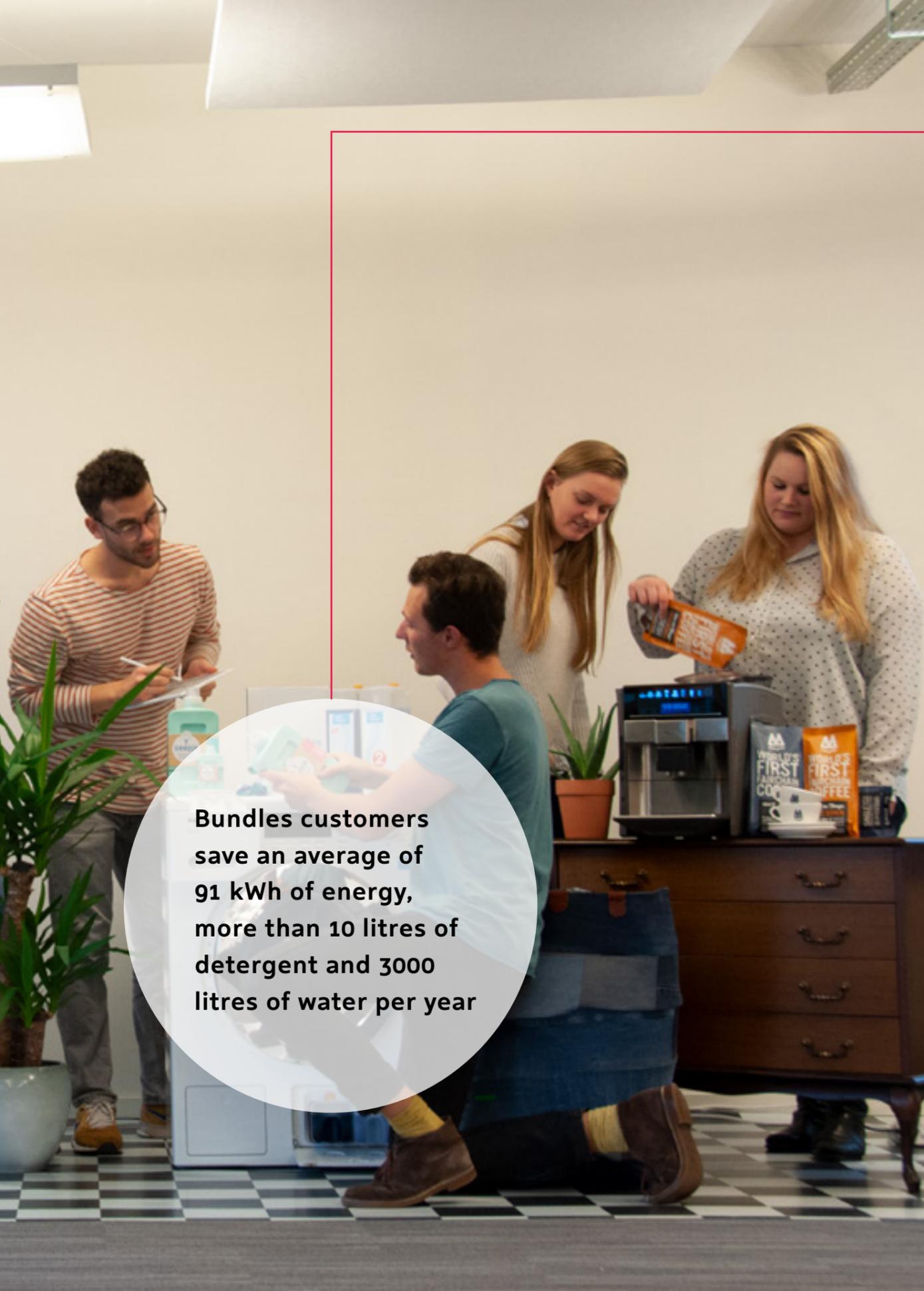
In recent years, Auping has developed and launched the Auping Take Back System. Customers return old mattresses when they buy a new one. Auping enables the recycling of the components from these old mattresses, which are then used by other companies for wall insulation or judo mats. These mattresses will not end up in waste incinerators, like 1.2 million others do each year.

Auping is exploring opportunities for 'circular lease or services' for companies, hotels and consumers. This means that Auping remains the owner of the bed and responsible for its

components until the end of life. Thus stimulating the development of products with a long lifespan.

[www.auping.com/en](http://www.auping.com/en)





**Bundles customers save an average of 91 kWh of energy, more than 10 litres of detergent and 3000 litres of water per year**

# Bundles

## Washing without waste

Dutch company Bundles introduced a pay-per-wash business model for washing machines. Households pay per laundry and receive tips and tools to lower their washing expenses and improve washing results - through a mobile app.

### Sustainable machines

The start-up installs Miele washing machines at the customer's home. Miele currently manufactures sustainable washing machines and dryers. Together with the sustainable production, the company points out how easy it is to reuse the machines and the possibilities to recycle machine parts. Through its collaboration with Bundles, Miele is stimulated to design more circular (ungradable, disassembling, long lifespan, etc.), in order to reduce the costs of the wash-subscription. Bundles and Miele will ensure that the machines will get a new lease of life after their initial lifespan. However, Bundles does more than simply renting and servicing washing machines.

### Product as a service

Pay-for-performance schemes stimulate the usage of raw materials and are for that reason a boost for the circular economy. Buying a product the traditional way disrupts the circular opportunities of a product. So you do not own a Bundle washing machine, but are part of a wider service: cleaning

your clothes in a cost effective and sustainable manner. To achieve this, Bundles has launched the Was-app (Wash app) which gives you tips on how to conserve energy, water and soap. Miele washing machines are connected to the internet and therefore are able to search for the most effective proportion between the washing load and amount of soap. Due to the long life of the machines Bundles uses, more than 2000 disposable machines were saved together with more than 1000 users. Bundles customers also save an average of 91 kWh of energy per year, more than 10 litres of detergent and more than 3000 litres of water through efficient equipment and advice. That is equivalent to 220 tons of CO<sub>2</sub> or the amount of CO<sub>2</sub> absorbed by more than 12,000 trees in a year.

### Ambition

Optimising product use by connecting products to the web and apps is the future, according to Bundles. The software can also be linked to kitchen equipment, boilers and solar panels. In particular, products with high usage costs and high service expenses are suitable to the upgrade market. In the end, Bundles can relay its data back to the manufacturer, which can use it as a source to further develop their products.

[www.bundles.nl/en](http://www.bundles.nl/en)





**A completely circular product range of safety shoes is expected to be ready by 2019**

# EMMA Safety Footwear

## Circular safety shoes

Together, FBBasic, HAVEP and EMMA Safety Footwear have developed a fully circular line of work and safety clothing (HAVEP) and safety footwear (EMMA Safety Footwear) for almost all sectors and industries. FBBasic supports HAVEP and EMMA with their circular products and concepts.

### Development

EMMA Safety Footwear has started a journey. A road with bumps and obstacles, but with a rewarding destination: the journey leads to a circular economy where products are designed for re-use, made and returned, in order to recycle the raw materials after use. EMMA Safety Footwear has produced the world's first circular safety shoe. In collaboration with FBBasic, EMMA Safety Footwear is working towards a completely circular product range, which is expected to be completely ready in 2019. The first six models are currently available to consumers via one of the affiliated dealers. In addition, EMMA Safety Footwear can take back your used safety shoes by means of a 'reverse logistics system', so that the materials from your used shoes can begin the recycling process to new products and applications. In this way, valuable raw materials are no longer wasted!

### Reverse logistics

FBBasic's daughter COFA built a reverse logistics system, which currently provides nationwide coverage in the Netherlands and Belgium; negotiations in Germany, and Switzerland are currently taking place. In this system, returned products are included in a materials bank. Next use applications are made of the products that have been returned, based on both recycled components and raw materials. Some of the follow-on products are supplied with a materials passport, which is developed for EMMA Safety Footwear's shoes, so that identification and follow-up of the products remains possible and value is maintained. The cooperating companies focus on Social Return on Investment (SROI), by employing people with a distance to the labour market in production, reverse logistics, sorting and production of follow-on products. EMMA Safety Footwear, together with FBBasic, has developed a long-term roadmap for the transition of both products and business operations.

### The Positive Footprint

Design and production of safety shoes for usage in a circular economy while ensuring decent work, both nationally and internationally. That is our mission. But this journey does not end with a circular shoe. Because every action you take leaves a footprint in the world. We challenge

consumers and industries to not just be 'less bad', but to move from negative to positive footprints. Everyone can do it, so join us. We call this movement: The Positive Footprint. More and more companies in the safety sector are joining this platform, which EMMA Safety Footwear has started internationally.

[www.thepositivefootprint.com](http://www.thepositivefootprint.com)





The first ever ethical phone in the world with conflict-free minerals and Fairtrade gold

# Fairphone

## A durable, ethical and smart mobile phone

For most people, buying a new phone every two years has become the rule rather than the exception. That has an enormous impact on both society and the environment, not least because a lot of the raw materials are mined in conflict zones.

### Growing in popularity

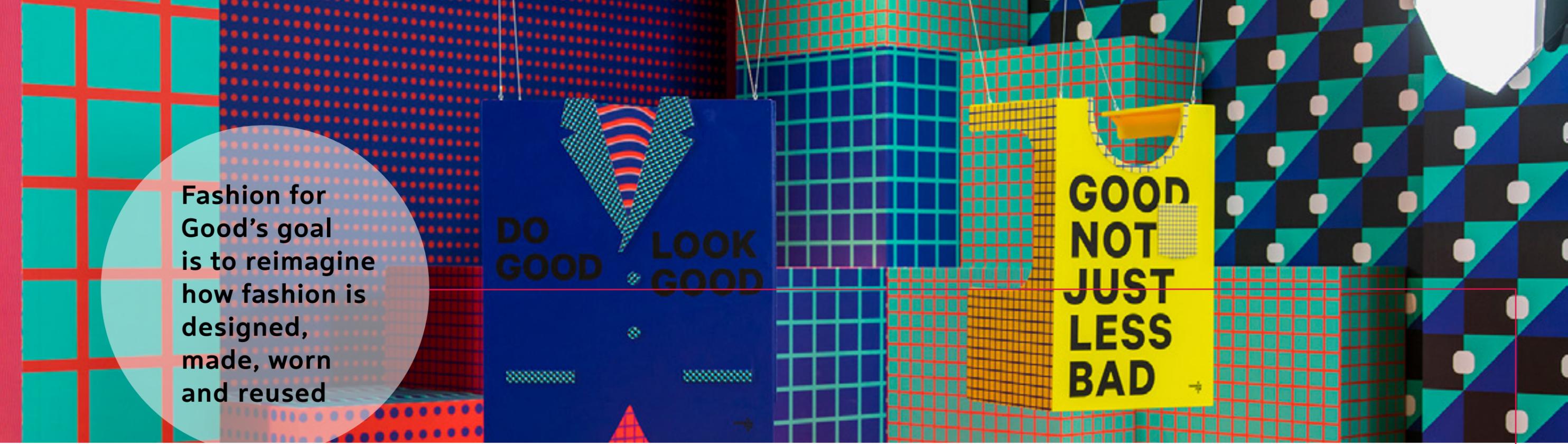
Fairphone developed the first ever ethical phone in the world with conflict-free minerals and Fairtrade gold in their supply chain. With the launch of Fairphone 2 in 2015, the company made a breakthrough in design and aims to break with the two-year cycle of the average smartphone and extend its lifespan. It has not always been easy to convince consumers to keep hold of a phone for that length of time. However, for this purpose, Fairphone is keeping repairs to the smartphone comparatively simple, making spare parts easy to get a hold of and software relatively future-proof. The company has already sold more than 150,000 devices altogether across Europe.

### 'Leading sustainable change'

Greenpeace recently published the Guide to Greener Electronics and put Fairphone at the top of the list leading on sustainable change in the industry.

[www.fairphone.com](http://www.fairphone.com)





**Fashion for Good's goal is to reimagine how fashion is designed, made, worn and reused**

# Fashion for Good

Fashion for Good is the global initiative that is here to make all fashion good. The Dutch organisation is a global platform for innovation and made possible through collaboration and community. Based in circular economy thinking, Fashion for Good is the hub, accelerator and collaboration platform for the fashion industry.

Fashion for Good is founded on the principle of collaboration and aims to create tools that are open-source, such as its Good Fashion Guide, which provides practical tips for brands wishing to embrace circular apparel principles. It operates from its first hub in Amsterdam, which also houses a Circular Apparel Community co-working space and a visitor-facing Experience.

## Sustainable production methods

At the core of Fashion for Good is the Innovation Platform, which includes:

- Fashion for Good-Plug and Play Accelerator: Fashion for Good works with Plug and Play, a leading Silicon Valley accelerator, we give promising start-up innovators the expertise and access to funding they need in order to grow.
- Scaling Programme: Fashion for Good supports innovations that have passed the proof-of-concept phase. A dedicated team helps them scale by offering bespoke support and access to expertise, customers and capital.
- Good Fashion Fund: This fund will catalyse access to finance where this is required to shift at scale to more sustainable production methods.

The consortium sparks and scales innovation by offering practical action through support and funding. They also share best practice and lessons learned in open-source roadmaps and fosters sector-wide collaboration for the entire apparel industry to change. The organisation invites brands, producers, retailers, suppliers, non-profit organisations, innovators and funders to jointly transform the industry.

## Partners

Fashion for Good was launched in 2017 with the C&A Foundation as a founding partner. Its programmes are supported by corporate partners adidas, C&A, Galeries Lafayette Group, Kering, Target, Zalando, as well as organisations including the Cradle-to-Cradle Products Innovation Institute, the Ellen MacArthur Foundation, IDH - the Sustainable

Trade Initiative, Impact Hub Amsterdam, McDonough Innovation, Plug and Play and the Sustainable Apparel Coalition.

## The future

Fashion for Good's goal is to reimagine how fashion is designed, made, worn and reused. The firm wants to achieve this by harnessing the power of innovation, practical action and cross-sector collaboration. At the core of their mission is the exploration of new circular business models. In this way, the group will revolutionise the fashion industry so that people, companies and the planet can flourish together.

[www.fashionforgood.com](http://www.fashionforgood.com)





Automatically sorting of mixed post-consumer textiles solves a major bottleneck in textile recycling

# Fibersort

## Processing textile fibres for reuse

Over 20 million tons of post-consumer textiles end up in landfill sites across Europe and North America every year, simply because these items have reached the end of their first-use phase. This excess provides an incredible opportunity to apply circular strategies to the textile industry to capture the inherent value of textiles, displace the use of virgin fibres upstream and eliminate textile waste downstream.

**Textile-to-textile recycling**  
Fibersort is a technology that automatically sorts large volumes of mixed post-consumer textiles according to type of fibre. Once sorted, these materials become reliable, consistent input materials for high-value textile-to-textile recyclers.

**“By automatically sorting finished textile products according to composition, Fibersort solves a key bottleneck in returning non-rewearable garments to the supply chain.”**

Traci Kinden

**Tipping point**  
High-value recycling technologies can transition low value waste into new high-value textiles, and they are a critical link in the circular supply chain. Therefore, Fibersort is a key technology that will enable textile resources to cycle repeatedly through the supply chain. Once commercialised, it will create a tipping point for a new, circular textile industry.

The Fibersort Project Partners and a broad range of industry stakeholders are working together to commercialise the equipment and publicly release information that will accelerate the transition to circularity. The Fibersort project is made possible through Interreg NWE funding, a programme that fosters transnational cooperation within Northwestern Europe.

Fibersort is actively seeking textile collectors and sorters, recycling technologies, brands and retailers, and other circular textile projects to join the team of collaborators.

[www.circle-economy.com/textiles](http://www.circle-economy.com/textiles)





**Every returned pair of jeans is recycled into a new product**

# MUD Jeans

## Giving jeans a third life

Dutch fashion entrepreneur Bert van Son decided to put a stop to the environmental impact of jeans manufacturing. To achieve this he introduced MUD Jeans: a sustainable way to produce jeans.

Environmental agencies have calculated that 8000 litres of water is required for the manufacture of one pair of jeans. In addition, the cotton industry which produces the denim for jeans is responsible for a quarter of the world's pesticide usage.

### Lease scheme

These numbers shocked Van Son and he decided to take action by setting up the MUD Jeans production line. His brand uses fabrics that contain 40% recycled denim, a true innovation. However, the most innovative part is his lease scheme.

By leasing out its jeans, MUD Jeans keeps its product inside its manufacturing cycle. Every returned pair of jeans is recycled

into a new product and the customer receives a new pair of jeans.

### Upcycled and recycled

When turned in, the old jeans are upcycled into 'vintage jeans'. After that product cycle, the jeans will be reused in other clothing products. MUD Jeans works with a factory in Valencia (Spain) which tears old jeans apart to make new yarn out of it. They can use up to 40% of recycled cotton to make new jeans, which is pretty innovative.

In 2016 MUD Jeans organised the Recycle Tour, travelling to Spain with 3000 returned MUD Jeans to show the world how denim was recycled. In 2018 they followed recycled denim fabrics from Tunis to the factory Yousstex in Sousse and back to Almere in the Netherlands, to experience how the jeans are made.

[www.mudjeans.eu](http://www.mudjeans.eu)





The textile is made 100% recycled material, without the use of water or chemicals during production

# ReBlend and Ahrend

## Responsible seating furniture

Every year, about the same amount of textile disappears into waste and incineration as is produced from new materials. Why don't we take discarded clothing and textiles and recycle them into raw materials for new textiles, instead of incinerating them? With this objective, ReBlend started an initiative in 2013 in collaboration with Ahrend.

### Circular in the Chain

The goal is to build bridges between textile waste, designers and textile manufacturers so that movement to a circular world is supported and accelerated.

### High-quality applications

ReBlend began as an initiative to investigate whether textile waste, which now disappears in low-value applications such as cleaning rags and filling material, can also be used for new yarns and textiles of high quality. In the Netherlands, 200 million kilos of textiles are lost every year to low-value applications. While at the same time the production of new textiles has enormous negative ecological impact. ReBlend keeps textiles in the chain and uses it as a raw material for high-quality textiles, for both fashion and interior. In

August 2014, the first prototype was launched, the Ahrend 2020 office chair upholstered using ReBlend fabric. "Clients have been pleasantly surprised that such an attractive fabric can be produced from discarded material," ReBlend says. The textile used is 100% recycled material, without the use of water or chemicals during production. Since then, a wall panel using ReBlend textiles has also been launched.

### Lasting Impact

The underlying reason behind the first initiative and the current development is the fact that there is an extreme imbalance between the short use of textiles and the lasting impact of the materials. ReBlend wants to develop yarns and textiles in collaboration with designers, producers and fashion

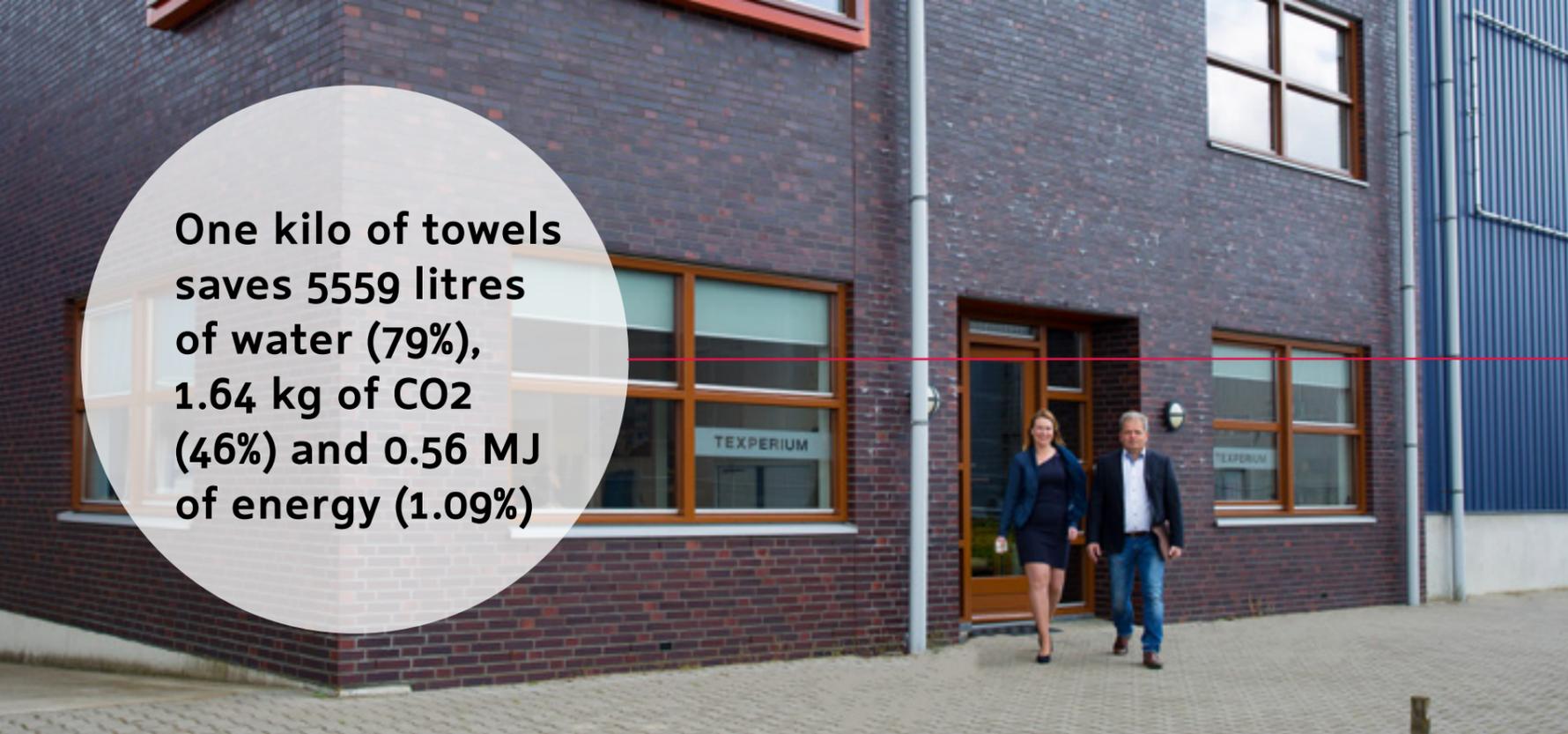
labels which provide the same comfort and quality using only recycled material.

[www.ahrend.com/en/csr/reblend](http://www.ahrend.com/en/csr/reblend)





One kilo of towels saves 5559 litres of water (79%), 1.64 kg of CO2 (46%) and 0.56 MJ of energy (1.09%)



# Texperium

## Sustainable towels for the Dutch Ministry of Defence

Open innovation centre  
Texperium is an innovator of post-consumer textile recycling. One of their circular projects was to develop towels made from recycled materials for the Dutch Ministry of Defence.

The Dutch company started this unique project with the Ministry of Defence back in 2014. The project's goal was to make a significant contribution to the reduction of the mountains of textile waste.

### Environmental savings

Texperium collaborated with a group of Belgian and Dutch parties. The group jointly developed a towel with used textile consisting of recycled cotton. The environmental savings were impressive: one kilo of towel saves 5559 litres of water (79%), 1.64 kg of CO2 (46%) and 0.56 MJ of energy (1.09%). Originally the towels were made from viscose, but the company now uses Tencel that makes the towel even more durable.

### Bio-based substitutes

Texperium is constantly experimenting with the development of textiles using new types of recycled materials. They are currently working on the development of curtain fabrics made with post-consumer materials like workwear, bed and bathroom textiles, and shoes. The Dutch company is working on bio-based substitutes for synthetic components, replacing fibreglass with flax or hemp fibres.

### Circular economy movement

Only 1% of clothing is recycled in a circular manner. For textiles from other sectors this figure is just as low, especially compared with other types of raw materials such as paper, tin or plastic.

Textiles seem to be mainly driven by price, this is the largest barrier. Texperium wants to stimulate cooperation and also wants to ensure that ecology is in balance with the economy. Therefore the company wants to collaborate with other companies who want to participate in these developments and who also have the ambition to take part in the circular economy movement.

[www.texperium.eu/en](http://www.texperium.eu/en)





**MORE  
SHOWCASES?**

Visit [www.hollandcircularhotspot.nl/en/showcases](http://www.hollandcircularhotspot.nl/en/showcases) for a complete overview and regular updates

*Opening of circular hotspot C-Bèta, May 2018  
Photo by JW Kaldenbach*



## COLOPHON

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**Netherlands Enterprise Agency**  
Ministry of Economic Affairs and Climate Policy  
PO Box 93144  
2509 AC The Hague  
[www.rvo.nl](http://www.rvo.nl)

**Coordination**  
Diana de Graaf, De Graaf & Co

**Design**  
GH+O Communicatie en Creatie

**Editor**  
Holland Branding

**Holland Circular Hotspot (HCH)**  
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**Website**  
[www.hollandcircularhotspot.nl](http://www.hollandcircularhotspot.nl)

**Email**  
[info@HollandCircularHotspot.nl](mailto:info@HollandCircularHotspot.nl)

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### Office Locations C-Bèta

Rijnlanderweg 916  
2153 MN Hoofddorp,  
The Netherlands  
[www.c-beta.nl](http://www.c-beta.nl)

### Blue City

Maasboulevard 100  
3063 NS Rotterdam,  
The Netherlands  
[www.bluecity.nl](http://www.bluecity.nl)

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