

## SMART THERMAL NETWORK THANKS TO FLEMISH AND SWEDISH KNOW-HOW

*VITO/EnergyVille and the Swedish company NODA are collaborating on a way to turn citywide thermal networks into smart networks.*

Cities are the perfect place to build affordable thermal networks that use waste heat to heat water. Such thermal networks can cover the cooling and heating needs of large groups of users, and bring local heat demand into balance with supply. The result is a more efficient energy supply thanks to the optimum use of renewable energy sources.

**Dirk Vanhoudt of VITO/EnergyVille:**

"The aim is to increase efficiency by better predicting the demand for heating and cooling. This is done with an intelligent control algorithm: VITO/EnergyVille is developing the code, NODA is providing the hardware and software platform. The technology is being tested in two locations, each with a different profile: the Dutch city of Heerlen and the Swedish city of Växjö."

**Markus Bergkvist of NODA:** "At 28 °C, the water temperature in Heerlen is relatively low; in Växjö, the water is warmer, because there we make use of cogeneration running on wood chips and wood pellets. The collaboration between VITO and NODA is part of STORM, a Horizon 2020 project to make thermal networks more intelligent. Our technology should be ready for the market by the end of 2018."

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# vito VISION

VITO VISION – VOLUME 2015 – MAY EDITION

SALIVA TEST MEASURES  
STRESS IN CHILDREN

FLEMISH SMEs PUT  
INGENIOUS WATER  
CONCEPTS INTO PRACTICE

BIOPLASTICS KEEP OUR  
FOOD FRESH





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## VITO VISION NEW STYLE!

Dear Reader,

Here at VITO, we are constantly working on the society of tomorrow. Along with business, government and end users, we devise new technologies, identify missing links and develop innovative, ready-to-use solutions. Our goal: a sustainable and prosperous economy and society, in Flanders and worldwide.

Because our research is so relevant, we want our communications to be clear and accessible to a wide audience. Our newly-updated magazine gives you insight into our research and how it finds its way into very diverse applications. This issue contains articles on a saliva test for detecting the effects of stress in children, intelligent thermal energy storage in underground silos, the drinking water of the future and more; these are all examples of how VITO is helping society progress.

You can expect this new-style VITO VISION three times a year.

We hope that you find this edition interesting and informative!

*Dirk Fransaer*  
Managing Director VITO

## FERTILE DELTA

The Nile Delta is one of the largest river deltas on our planet. It begins north of Cairo and spreads out into a vast triangular region that is larger than the whole of Flanders: the coastline along the Mediterranean Sea alone is 240 kilometres long. Thanks to the fertile Nile silt, agriculture is possible all year round. In this razor-sharp satellite image of the Delta, each pixel covers an area of 100 square metres.

Seen from the air, Earth reveals many of its secrets, resulting in spectacular imagery. This particular image of the Nile Delta was captured by PROBA-V, a European Space Agency (ESA) miniaturised satellite fully built by a Belgian consortium. It takes daily global images of land use and vegetation.

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# SALIVA TEST DETECTS IMPACT OF STRESS IN CHILDREN

VITO RESEARCHER PATRICK DE BOEVER: GRAND CHALLENGES EXPLORATIONS LAUREATE



## WHO IS PATRICK DE BOEVER?

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- > Master of Bioscience Engineering at Ghent University;
- > Doctor of Applied Biological Sciences at Ghent University;
- > At VITO, project manager for the Environmental Risk and Health unit and responsible for health monitoring and medical technology projects;
- > Lecturer in molecular epidemiology at Hasselt University;
- > Involved in several Flemish and international environmental and health projects.

*What happens in early childhood can matter for a lifetime. Protracted stress due to poverty, abuse and neglect has a significant effect on the physical and mental development of young children. In collaboration with Tulane University in New Orleans, VITO project manager and researcher Patrick De Boever is working on a new kind of preventive children's healthcare: the biological detection of stress. Will a simple saliva strip soon be all that is needed to monitor our health?*

When we are exposed to stress, our body responds with a faster heart rate, higher blood pressure and the production of stress hormones. If this situation persists, our bodily functions are severely disrupted and health problems can develop. In adults, the characteristics of chronic stress and its effects have been fairly well documented. This is more challenging at a younger age. Furthermore, health effects, such as deviations from normal neurological development, cannot be easily studied. Patrick De Boever of VITO: "Due to the absence of appropriate indicators, the impact of stress often goes unrecognised as an underlying cause of, for example, disrupted development. No biological test is able to make a reliable diagnosis. Our research aims to change this."

### The strip that tells a story

De Boever's vision attracted the attention of *Grand Challenges Explorations (GCE)*, an international grant fund of the *Bill and Melinda Gates Foundation* ([www.gatesfoundation.org](http://www.gatesfoundation.org)). With the support of GCE, De Boever and his American colleague Stacy Drury, Professor of

Psychiatry and Behavioral Sciences at Tulane University in New Orleans, will be developing a method to measure the impact of stress on the neurological development of children. "We want to develop a test that is simple, fast and cheap. Therefore, we deliberately did not opt for a blood test or a brain scan, but for a saliva test. Obtaining saliva from young children is easy and the saliva contains DNA and RNA (Ribonucleic Acid) from the cell material that can be used to identify sensitive markers that tell us what the impact is of stress experienced in early childhood. A molecular analysis on a single saliva strip will tell us about the strategy the brain has developed to resist stress and to remain healthy in the long term," says De Boever.

The research builds on the 'Bucharest Early Intervention Project', an American research programme comparing the health and development of Romanian orphans to those of children who grew up in foster homes. The saliva samples from this project served as a basis for the work of Drury and De Boever. In a next step, the researchers want to confirm their initial findings in a larger group of children and expand the molecular analyses to create a more complete saliva profile.



### Calculated risk

The children of the 'Bucharest Early Intervention Project' will help the researchers to evaluate the applicability of saliva markers as proxies for neurological development. Subsequently, the researchers will expand their research and test additional target groups: children aged 0 to 15 years. Specifically, they will test children from the 'Neighbourhood Stress and Physiology among Children Study' from New Orleans and 'Environage' in Flanders, a birth cohort from Hasselt University. "It has been proven that even babies in the uterus are susceptible to stress. The effects can have a lasting impact on the developing brain, especially in this most fragile stage. Our concept has passed its first test in a small group of children. Research must now decide whether it is useful for other age groups," says De Boever.

A stress response is a primary and universal biological response. The researchers expect similar results in children exposed to less extreme conditions. If De Boever and Drury succeed, they may be adding an extra dimension to global health and paediatrics. "We consider the test as a first step on the diagnostic ladder. If a saliva test points to toxic stress and neurological disturbances, then a child should be followed up by specialised healthcare workers."

### Further research

The collaboration between VITO and Tulane University was formally launched in November 2014, when they were awarded the *Grand Challenges Explorations grant*, worth \$100 000. Tulane University provides medical and psychological expertise. VITO is respon-

sible for the technological development of the saliva test.

Regarding the future, De Boever says: "We aim at submitting a project proposal this fall to the US *National Institute of Mental Health* to obtain additional funding. Moreover, the *Grand Challenges Explorations* Committee has given us 18 months to strengthen our case and to apply for a new grant that could amount to 1 million dollars in the next round. We are exploring different channels to obtain the broadest possible support for the project."

## MEDICAL CHECK-UP IN AN INSTANT?

The new saliva test being developed by VITO and Tulane University is designed to detect the effects of stress in children. But nothing precludes the saliva strip from replacing a neurological check-up in the future.

"We hope to assess in a subsequent research phase whether a saliva test can give an overall picture of a person's neurological development," says VITO researcher Patrick De Boever. "Stress is only one of the many factors that affect neurological development."

De Boever says that a saliva test will be very useful because children worldwide are being confronted with extreme conditions. The aim is to develop an

easy test that can be done without advanced medical equipment, even in regions with few healthcare facilities. The saliva test has to show how the brain is developing, starting with newborns if possible. It will also allow an early detection of health risks that can lead to medical problems later in life."



# FLEMISH SMEs STIMULATE INNOVATION IN EFFICIENT WATER TECHNOLOGY

OPEN CALL FOR PROPOSALS BY VITO AND VLAKWA OPENS DOOR TO MARKET LAUNCH

*How can Flemish businesses use water more wisely? Thanks to the open call for proposals by VITO and the Flanders Knowledge Center Water (Vlakwa), seven consortia received grants to allow innovative water projects to take root in a market context. Unique to the concept is that supply and demand are matched. Dirk Van der Stede (Vlakwa) and Carine van Hove (VITO): "Flemish SMEs are being given the opportunity to bring their expertise to the market, while prospective users can try out exciting new technologies."*

## Should companies be more innovative in their use of water?

**Dirk Van der Stede (Managing Director Vlakwa):** "There is still work to be done. In the run-up to the open call, we conducted a socio-economic study to identify the major challenges in key sectors: the metal, steel, chemical and energy sectors, but also the tank cleaning sector, the textile industry, the food and drinking water sector, and drinking establishments. That study showed that businesses are concerned about whether quality water will remain available and affordable. This fear is not unfounded: Flanders is faced with a water shortage. At the same time, the discharge standards are also a source of concern. We supplemented the results of the socio-economic study with the priorities of the Strategic Implementation Plan of the European Innovation Partnership Water. Thus, we now know better the actual needs of industry and we can focus our response accordingly. As is happening with this open call."

**Carine Van Hove (Coordinator VITO SME Centre):** "Flanders has a lot of innovative potential, but it still sometimes fails in translating research into practice and in matching supply to demand. The open call for proposals gives SMEs an easy way to test their sustainable water technologies, products or concepts at pilot scale and to bring them to the market with reduced risk. Conversely, prospective users are given the opportunity to try out exciting new technologies."

## Each consortium includes at least one provider of a sustainable innovation and one company that is looking for a solution to a specific problem. Are providers presently unable to find their way to new customers fast enough?

**Dirk Van der Stede:** "The innovations that providers are proposing are ready for the market but require the trust of the sector to fully break through. Therefore, buyers and sellers are equally represented in the consortium. They work together closely and thus can determine whether the proposed technology is promising. If problems arise in the implementation or adjustments are required, they can make the necessary changes together."

**Carine Van Hove:** "The proposed innovations must not just address the individual needs of a single company. The entire sector must be able to benefit from viable, clean technologies, products and concepts. Therefore, already when submitting their projects, SMEs must indicate how they aim to involve the rest of the sector in their story. For example, they may publish articles in professional journals, or organise an event or lecture in which they present the main aspects of their proposal. After completion of the project, the consortium also creates a project dossier which is placed on the Vlakwa website."

## What other criteria are used to assess the project proposals?

**Dirk Van der Stede:** "The innovations should lead to more efficient water management within the company. We guided a number of consortia until their ideas were technologically and economically mature enough to demonstrate. Vlakwa provided the practical tools for this, and in case of doubt, VITO assessed the innovation value of the technology. This process resulted in the selection of seven projects."

## They can count on the support of VITO and Vlakwa for one year. What budget is available?

**Dirk Van der Stede:** "This year's total budget is € 535 919. In 2014, the budget was still € 214 861, but only for three projects. The funds come from Vlakwa and VITO, as established in the Flemish Government's grant decree. We cover 66 % of the cost of each consortium. The remaining 34 % is handled by the consortium itself."

## Should the technology be able to support itself after that year?

**Carine Van Hove:** "If the project is a technological success after a year, we are also prepared to support the market launch. Thus, we also follow

the social and economic parameters closely. Together with the participants, we examine how they can tap into a new customer base with the proposed innovation and break into the sector. We also focus on the export opportunities. Thus, we investigate the applicability of the technology throughout the entire sector."

## This year marks the fourth edition of the open call for proposals. Will there be a fifth?

**Dirk Van der Stede:** "There will definitely be a sequel in 2016, although the format is not yet fully clear. That will depend on market conditions, the needs of industry and the subsidies granted."

**Carine Van Hove:** "The successful collaboration between VITO and Vlakwa – which goes back to Vlakwa's founding in 2010 – will surely continue. Vlakwa brings all stakeholders together around water; VITO conducts strategic research into sustainable chemistry. Thus, we complement each other perfectly."

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## VLAKWA CONNECTS PLAYERS IN WATER SECTOR

The Flemish Water Knowledge Center, an independent mediator, unites governments, researchers and entrepreneurial firms such as SMEs. It promotes rational water management, water reuse and water purification, and adds value to Flemish water expertise at home and abroad.

Vlakwa has an extensive network in the water sector, understands needs, and helps stakeholders to enter into partnerships. Thanks to this platform function, it contributes in an innovative way to the greening of the Flemish economy and the socio-economic development of Flanders. Vlakwa initiates, coordinates and facilitates research, development and demonstration projects, and puts Flemish priorities on the European agenda. It also acts as a central contact point for strategic advice and information.

[www.vlakwa.be](http://www.vlakwa.be)

## SPOTLIGHT ON: THREE SOLID WATER PROJECTS

The consortium LH2ORA, consisting of Actility Benelux, De Watergroep and snapTonic, uses **wireless technology to monitor underground water pipes**, which enables problems to be detected and water levels monitored cheaper and more quickly. The consortium is also being assisted by the Electronics and Informatics department (ETRO) at the Vrije Universiteit Brussel (VUB).

Purification and efficiency are the focus of DUWAHE<sup>2</sup>, the consortium consisting of water purifier Pantarein, student cooperative CORE and breweries Huyghe and Bosteels. Their goal is to make **water reuse for small**

**and medium-sized breweries** more affordable, recover waste water and optimise energy consumption.

The research project FYT-OPP is examining how **surface water can be treated to make it usable for organic farming**. Three partners are collaborating in the consortium: ECS, an expert in industrial water treatment, Delvano, which develops sprayers, and fruit grower O'Bio. Organic farming uses surface water for irrigation, but it must first be purified to remove pesticide and herbicide residues. Inagro is providing additional support.

Details of these and other selected projects – FOSCAP, TITRILYZER, FERMACID and INSTIS – can be found on [www.vlakwa.be](http://www.vlakwa.be)



Dirk Van der Stede (Vlakwa) - Carine Van Hove (VITO)







## BREEDING GROUND FOR MICROALGAE

Located in a greenhouse on the campus of Thomas More in Geel are four Sunbuilt photobioreactors that function as algae factories. Algae are the bio-feedstock par excellence: ideal as food and feed, and a source of valuable chemicals. Researchers from the university college and VITO are growing microalgae in the closed-tube system of the photobioreactors. They are separated from the water using a harvest module that also purifies the water for reuse. Then the researchers extract high-quality products such as dyes, proteins and omega fats from the algae. These can be used as a final product, but also as a new feedstock for food, feed and chemical products or biofuel. While the pilot plant is designed for research purposes, projects are already starting with industry and horticulturists.

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# A BARREL FULL OF ENERGY

NEW HEAT STORAGE SYSTEM DELIVERS SMART SOLUTION FOR VOLATILE ENERGY MARKET

*Heat storage offers opportunities to provide sustainable energy for businesses, residential areas and greenhouse horticulture – especially when applied on a large scale. That's the idea behind Ecovat, an affordable, ecological and economic energy storage system developed by Ecovat Renewable Energy Technologies with the support of VITO/EnergyVille. An underground barrel with as much water as 20 Olympic swimming pools could soon provide heat for 400 families, during a complete winter season.*

Thermal energy can be stored in different ways, for example in an aboveground buffer tank or using underground thermal energy storage. However, these systems have one disadvantage: a great deal of energy is lost in pumping the water. In the case of underground storage, for example, the water is pumped through heat exchangers, which lowers efficiency: about 40 % of the energy is lost. Ecovat puts an end to this efficiency loss. The new system can store the heat over a period of six months, with no more than 10 % energy loss.

### Still waters run deep

The design used by Ecovat differs fundamentally from other heat storage systems. "In fact, it is a gigantic underground silo, which can hold 60 000 m<sup>3</sup> of water," says Aris de Groot, creator and managing director of Ecovat. "The silo is open at the bottom to allow the groundwater to enter. Once inside, the water stays in its place. Therefore, the silo is divided into several horizontal segments, which can be charged and discharged at different temperatures. Ingeniously placed heat exchangers in

the walls of the silo add and extract the heat and cold. The water itself does not need to be pumped, while the temperature remains stable in the different layers of water."

### Prototype in the starting blocks

A first prototype of the Ecovat will be operational before the summer. It has a capacity of 1 500 m<sup>3</sup>: thus full capacity is far from being achieved. "But it will meet the energy needs of our passive office building in Uden where we have our headquarters," says de Groot.

Construction of full-capacity silos should then follow quickly. "An Ecovat can be connected to industrial zones and residential neighbourhoods. One silo can meet the heating needs of about 400 homes," expects de Groot. "But greenhouse horticulture can also benefit substantially from the technology. Ecovat can meet the heat demand of greenhouses without relying on polluting fossil fuels."

### Ice-cellar in the desert

Investors are already enthusiastic about the new technology. De Groot is in discussions with partners in the Netherlands and Belgium. And Ecovat will soon be opening facilities in IncubaThor, the business incubator in Genk. Aris de Groot: "In this way we want to further strengthen our ties with the Belgian market. But Ecovat also offers opportunities in other regions of the world. There is interest among other places in Qatar for example, the Ecovat can be used for cold storage and in Vietnam, the Ecovat can serve as a cold storage warehouse for local agriculture."

## ECONOMIC ENERGY STORAGE

VITO/EnergyVille is supporting Ecovat with know-how on the intelligent control of energy flows. Intelligent algorithms on the supply and demand of heat and cold served as the basis for the technology behind Ecovat. "This technology offers opportunities in the increasingly volatile energy market," explains Fjo De Ridder of VITO/EnergyVille. "In the Netherlands, for example, the price of energy is negative 3 % of the time. This means you are paid to purchase energy. In such a market situation, Ecovat can help to replenish the energy buffer. The energy in the Ecovat can then be resold when energy prices are high. Ecovat allows to consume energy, perhaps even more so than is the case now, when it is cheap."

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# HOW CAN WE GUARANTEE THE DRINKING WATER SUPPLY OF TOMORROW?

VITO AND DE WATERGROEP WORK TOGETHER ON SOLUTIONS FOR WATER SCARCITY



*A water shortage is coming, even to Flanders. The increasing use of ground and surface water and climate change are putting pressure on our drinking water supply. OperAqua, a partnership of VITO and De Watergroep, is looking for solutions.*

Groundwater use by industry, agriculture and individuals is high. With the exception of the Kempen area, where much groundwater is available, we are already seeing operational shortages everywhere in Flanders in times of drought. Surface water is also being used more intensively. During prolonged droughts, there is too little water; in the case of intense rainfall, there is too much water and flooding takes place. There is also the changing climate: wetter winters and drier summers. This is a serious concern for drinking water producer De Watergroep, which purifies both groundwater and surface water into drinkable tap water. At the request of De Watergroep, a VITO research team has been working since 2013 on the challenges faced by the drinking water sector in Flanders.

**“STORING RAINWATER IN WATER-BEARING LAYERS HELPS TO COVER WATER SCARCITY DURING DRY PERIODS”**



Reservoir at De Blankaart

## Catchment De Blankaart under pressure

The VITO researchers studied the catchment near the De Blankaart nature reserve, in West Flanders, between Oostvleteren and Diksmuide. Here De Watergroep manages a gigantic reservoir with a capacity of no less than 3 million m<sup>3</sup>. The basin is fed by water that is pumped from the Yser and the surrounding canals and waterways that are connected with the pond in the nature reserve. The incoming surface water is treated into drinking water at the production centre adjacent to the reservoir.

The production centre's profitability has been under pressure for some time, especially during dry periods. This can be seen from an analysis of the water balance for the years 2006 and 2012. When it is too dry, no water may be pumped from the nature reserve to protect its biodiversity. During these periods, the Yser is also not a suitable source of water: pollutant concentrations are too high, and shipping may not be compromised. “In any case, during dry periods, the production centre must adjust,” says Jan Bronders of VITO. “We are advising De Watergroep on how best to tackle this problem, for example by making smarter use of locks and canals. We also calculated how much water De Watergroep should stockpile to cover dryer periods.”

This year, the partners are conducting a similar analysis in catchment area De Gavers in Harelbeke. Gisèle Peleman, Head of Water Technology for De Watergroep: “We are preparing ourselves for the future by making our drinking water ‘climate proof’. The

VITO study for De Blankaart gives us insight into the obstacles, and the final report will be a great help in increasing the availability of water at catchment scale. This is why we are also having our water production centre De Gavers in Harelbeke-Stasegem modelled by VITO: we are planning an expansion of production capacity there.”

## The Australian scenario

When searching for solutions, the partners find inspiration abroad. In extremely dry areas, in Australia's outback for example, there is the practice of storing excess surface water in an aquifer. Such an underground layer saves the water for drier times when it can be pumped to the surface for use. This could also be a solution for Flanders. “Climate scenarios predict even wetter winters and drier summers for Flanders by 2050. This can have significant consequences with regards to the ‘water surplus’. We can use the rainwater surplus, available during rainy periods, to replenish the water-bearing layers. The stored water can then be pumped during dry periods, and, as such, reduce water shortage,” says Bronders.

According to De Watergroep, it should be possible in Flanders to store purified surface water in an aquifer, on one condition, says Tom Diez, Head of Mining & Environment for De Watergroep: “We want to avoid the need to purify the water after pumping it to the surface because its quality was lowered during underground storage.” Bronders adds: “The possibility of storing water in an aquifer is primarily dependent on the underground geological characteristics and

the storage volume. Since we are not able to look underground, we perform simulations using computer models of the chemical reactions that take place there.”

The existing aquifer shows promise at two locations and additional research is in order: at Meerbeek in Flemish Brabant and at As in Limburg. “It still has to be determined whether we will actually use these locations,” says Tom Diez. “A suitable aquifer must not only have sufficient water storage capacity, but also the right environment to maintain water quality. Only when we are sure that the theoretical balance is good, can we proceed with the practical implementation.”

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# BIOPLASTICS KEEP OUR FOOD FRESH

## FLEMISH KNOW-HOW SUPPORTS PACKAGING BASED ON PLANT RESIDUES

*Are there sustainable alternatives to plastic food packaging? The bio-based packaging material PBS already looks very promising. VITO and the Flemish SME Topchim provided the knowledge to refine the properties of PBS. The packaging and food industry has already shown interest.*

Packaging materials such as polyethylene and polypropylene ensure that our food remains fresh and flavourful. But they are produced from fossil fuels. Their use is not only harmful to the environment and climate, but fossil fuels are also becoming increasingly scarce. The European Commission therefore is supporting research into alternatives that do not contain fossil fuels.

The European FP7 project (Seventh Framework Programme) Succipack assembled research and industrial partners from France, Greece, Italy, Spain, the Czech Republic and Belgium around one common goal: develop a packaging material that is sustainable, yet meets the highest standards concerning shelf life and taste. With polybutylene succinate (PBS), the research consortium has found such an innovative material.

### Made from plant waste

The PBS developed at Succipack is bio-based: it is made from plant waste. While it is not the only bio-based packaging material, it does have special properties, explains Bert Verheyde of VITO: "A unique feature is that it is

not only renewable, but it also has chemical properties similar to traditional packaging materials such as polyethylene and polypropylene. This makes it more suitable for keeping food fresh than other bioplastics such as polylactic acid." PBS appears to score well with respect to critical properties such as permeability, susceptibility to hydrolysis (degradation due to moisture) and impact on flavour.

"PBS is also much easier than polylactic acid to extract from organic waste streams," adds Leo Vonck of Topchim. "The barrier properties of PBS also score better." And precisely these barrier properties of the packaging keep our food fresh for a long time.

### Ensuring food quality

The barrier properties of PBS still needed further improvement, however. Good packaging keeps oxygen out and moisture in, ensuring that the food does not spoil or dry out. In order to achieve this effect, most traditional packaging, such as polyethylene, but also PET, is constructed of several layers.

Bert Verheyde: "PBS required a different approach. We start with pure PBS. Then two coatings are applied: one coating keeps out the oxygen, the other retains the moisture. This makes the barrier properties optimal."

### Close cooperation

VITO specialises in the application of these coatings. "We use advanced plasma technology for this," says Bert Verheyde. "That is why we were approached by the coordinator of Succipack. But our expertise in adhesion processes alone was not enough to participate in the project. We also needed a partner to develop the coating, which is how we came in contact with Topchim."

This Flemish SME is a well-known name in the development of ecological coatings for packaging. These coatings not only offer an environmentally friendly and affordable alternative, they also meet all safety regulations concerning direct and indirect contact with food. Leo Vonck of Topchim:

"The technical expertise that we have in-house was the perfect complement to the experience of VITO. We developed the coating; VITO gave the PBS a surface treatment that allowed successful application of the coating. And as soon as the coatings were applied, our colleagues from the French research institute CTCPA examined the barrier properties for their effectiveness. A nice symbiosis."

However, plastics are not the main area of expertise at Topchim. "We focus principally on paper and cardboard packaging for food products. With Succipack, we are able to expand our years of experience in coatings to plastics."

## "WE HAVE SHOWN THAT THERE IS AN ALTERNATIVE TO PACKAGING MATERIALS BASED ON FOSSIL FUELS."

### Viable alternative

The results of Succipack are promising. "We have shown that there is an alternative to packaging materials based on fossil fuels," explains Leo Vonck. "Industrial tests prove that PBS can be realised in practice."

Further research is still needed to prepare PBS for the market. Bert Verheyde: "The research results have been made available to industrial companies. They recognise the material's great potential. For example, the consortium partners in the food sector are working hard on practical applications for ready-made meals, seafood, vegetables and cheese. There have been discussions with various industry players, and we have already received questions from the Flemish packaging consortium Pack4Food."

The market for bio-based plastics is now heavily dominated by the United States and Asian countries such as Japan. With the Succipack project, Europe is catching up. In any case, it is a growing market that, thanks to Succipack, will only become larger. "At this time sustainable materials represent less than 5 % of the total amount of packaging materials," says Bert Verheyde. "Succipack can provide a boost to this market share."

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Leo Vonck (Topchim) - Bert Verheyde (VITO)

## WHAT IS PBS?

Polybutylene succinate (PBS) is a bioplastic that can be extracted from plant waste.

It is obtained through the fermentation of organic sources such as grain, corn and beets. Atmospheric CO<sub>2</sub> is used for the synthesis. This is a more sustainable approach than that is used to produce polylactic acid, another bioplastic.

PBS can be used for a wide range of applications between -20 °C and 100 °C. It has a melting point of around 110 °C.

PBS could become an important bio-based packaging material in the coming years. Expected production capacity for 2015 is 200 000 tonnes.





KAROLIEN VANBROEKHOVEN  
WINS AWARD IN QATAR

## “MOBILITY OF EXPERTS IS CRUCIAL FOR QATAR”

Karolien Vanbroekhoven, Programme Manager at VITO, received an award for a study on the conversion of CO<sub>2</sub> into useful chemicals at the renowned Qatar Foundation Annual Research Conference (ARC).

### ARC is an annual world forum for groundbreaking research. How was your experience at the congress?

I was team leader of the research group Bioprocesses and Bioelectrochemistry, and in fact I was substituting for a researcher who had just become a father. The conference was an amazing adventure: all kinds of meetings, events, networking – even at the embassy ... And in between, of course, hard work: attending presentations and discussion sessions, but mainly handling your own preparations. The award that a colleague and I accepted – best Regular Poster Presentation was its official title – was the icing on the cake.

“THE CONFERENCE  
WAS AN AMAZING  
ADVENTURE.”

### Your team conducts research on the conversion of CO<sub>2</sub> into chemicals as a sustainable raw material. Why was the ARC jury so enthusiastic?

We want to use CO<sub>2</sub> as a new raw material: using electricity, we initiate electrochemical processes that convert CO<sub>2</sub> into interesting chemicals. We hope eventually to be able to offer an alternative to non-renewable fossil fuels. The jury above all praised the innovative aspect of the research. It is still in an experimental phase, but we were able to present it in a vivid way. For example, during my presentation I was able to demonstrate some electrodes from the lab: that certainly played a role. In these electrodes – a kind of conductor – we replace the traditional catalyst with a microorganism that reduces CO<sub>2</sub> and uses electricity as fuel.

### VITO deliberately opts for internationalisation, hence the choice to participate in the ARC. How is the cooperation with the research and business communities in the Middle East?

The region is making great strides, but it is still very difficult to attract top researchers. We hope with our presence at the ARC to support the exchange of experts between Belgium and Qatar. We made interesting and promising contacts: with the Qatar Foundation itself, but also with various government agencies, universities and private companies. We want to continue to build on this in the coming months and years.

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## KALEIDOSCOPE



# 50 %

In Europe, half of all trips shorter than 5 kilometres are made by car. In 2014, in order to include more physical exercise in our daily mobility pattern, the European Union launched the PASTA-project. For this project, VITO will conduct a large-scale survey in Antwerp this year. Based on the results, VITO wants to formulate concrete advice for a healthier movement pattern.

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## VIRTUAL BICYCLE PROJECT FOR SENIORS RECEIVES AWARD

Researchers from VITO and KU Leuven were honoured by the Kempen Innovation Council with the biennial Janssen Open Innovation Award. In cooperation with residential care centre Witte Meren in Mol, they developed a smart exercise bike that allows elderly people to virtually cycle through their residence. The project not only keeps seniors active, it also promotes social contact in the care centre. Witte Meren is now looking for a commercial partner to promote the project in other residential care centres.

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## EUROPEAN LIFE PRIZE FOR AIR QUALITY PROJECT ATMOSYS

ATMOSYS, a project of VITO, the Flemish Environment Agency (VMM) and the Belgian Interregional Environment Agency (IRCEL) that maps Belgian air quality, has been named one of the 22 best European environmental projects of 2014. The award was won by LIFE, the environmental, nature conservation and climate action programme of the European Commission. From 2010 to 2013, VITO and VMM developed various air models and an application that gives users an annual overview of the air quality in Belgium. The maps clearly show that cities and busy roads in particular are hotspots for air pollutants such as nitrogen dioxide and particulate matter. “The annual maps are especially intended to raise awareness, among both policy-makers and the public,” says Lisa Blyth of VITO.

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## VITO RIDES BLUE BIKE

Blue Bike, the sustainable bicycle-sharing system with hubs in 44 Belgian train stations, will now also be used on the VITO site in Mol. To encourage bike commuting between the train station of Mol and the site, VITO bought 500 Blue Bike vouchers as a test. These 500 vouchers will offer the same number of employees and visitors a trip using a communal bike. The VITO personnel can request a test ride voucher for themselves, or offer one to visitors at the VITO site. Choosing Blue Bike fits with VITO's ambitions regarding sustainable commuting.

www.blue-bike.be



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LITRES FUEL  
SAVING/DAY



The mining trucks in China and Mongolia that are provided with green energy by EnergyVille weigh 400 tonnes - the impressive equivalent of 20 regular trucks combined. These four-wheeled giants are already powered by electricity, but still consume massive amounts of energy/fuel. By means of an innovative storage system, which stores kinetic energy generated while braking, the vehicle can accelerate using electrical reserves. By using this method, these trucks, using a daily average of 3 000 liters of fuel, can save up to 8 %. EnergyVille and the Chinese Beijing Dongfeng Locomotive Electrical Factory (DFLE) even want to reduce the mining vehicles' consumption to zero in the near future.

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## VITO PROMOTES GEOTHERMAL ENERGY IN THE KEMPEN

VITO, the Kempen regional Chamber of Commerce and Industry, and IOK (Intermunicipal Development Agency for the Kempen) are exploring the potential of deep geothermal energy in the Kempen. Geothermal energy is heat stored in the earth's crust, some 2 to 3 km deep. Like wind and solar energy, geothermal energy is a local, renewable energy, with the added benefit that it is continuously available. According to the project partners, the Kempen region has great deep-geothermal potential, which offers prospects for entrepreneurship, job creation and economic progress. The research project, part of the ERDF project “910: Geothermal Energy 2020”, is receiving a € 260 000 grant from the European Regional Development Fund and is supported by the Flemish government and the province of Antwerp. Geothermal energy and heat grids are also important research topics at EnergyVille, where VITO, KULeuven and Imec collaborate on energy issues.

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