VEOLIA

# PLANET

#January 2017

## New pollutions, new solutions

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# JANUARY 2017

Antoine Frérot
**Chairman and CEO of Veolia**

## July 28, 2016

**Veolia signs a groundbreaking contract with Sinopec, the leading Chinese oil and gas company** and the fourth-largest group worldwide. Within the framework of this extraordinary 3.27 billion-euro, 25-year contract our Group will manage the entire water cycle at the Beijing Yanshan petrochemical complex: cooling water, demineralized water, industrial water, drinking water, chilled water, wastewater, etc. This complex treats over ten million metric tons of crude oil per year and produces 94 varieties of petrochemical products. The main aims of the task entrusted to us are, on the one hand, to optimize the site's water consumption and recycle a greater proportion of the water used during petroleum refining; and on the other hand, reinforce the wastewater treatment to meet the most exacting environmental standards in the world. Reducing the water footprint of this site is a key issue in this arid region of China hit by severe water shortages, as the oil and gas industry consumes huge volumes of water, from extraction to refining the petroleum.

## October 14, 2016

**Inauguration of ServO, the control center for the largest water service in France.** ServO (pronounced "brain" in French) is a name that perfectly expresses the purpose of the brand new smart management facilities recently acquired by the Syndicat des Eaux d'Île-de-France water authority. This service's water distribution network stretches over 8,600 km and serves 4.5 million residents. At the cutting edge of the latest technologies, ServO continuously centralizes, analyzes and synthesizes the substantial flows of data from the factories, the network, operating history, call-outs, subscription requests, etc. To date, this "control and command tower" has processed 1,250 billion items of data. Across an extremely complex and highly urbanized territory, it serves as a decision-making aid, which is essential to further improving the continuity of the water supply, consumer safety, risk prevention and management, a reduction in environmental impacts, and cost control. This innovation represents a major step forward in the everyday running of large-scale urban water services, as well as their resilience in the event of a crisis: it heralds the control centers of the future for major water services.

## November 2016

**Entry into force of the Paris Agreement and COP 22.** With the entry into force of the Paris Agreement and the organization of COP 22 in Marrakech, the time has come for action, a time to implement the decisions made during COP 21 in December 2015. The financial question lies at the heart of this new step in combating greenhouse gas emissions. Money is anything but neutral in the fight against climate change! Today, almost 90% of the world's $CO_2$ emissions are not subject to any pricing whatsoever. Polluting therefore costs nothing, whereas cleaning up is expensive. An economic system of this kind that actually encourages greenhouse gas emissions cannot claim to reduce them! If we want to win the climate battle and return to a 2°C trajectory, we must establish a suitable and motivating financial framework that is dissuasive for polluters and incentivizing for those combating pollution. This is why Veolia is calling for robust, predictable and adequate carbon pricing. This measure would allow investment to be focused on low-carbon solutions, thus making them more competitive and attractive, and consequently promoting their wide-scale deployment. In fact, the financial factor has great potential to encourage economic players to reduce their greenhouse gas emissions!

# CONTRIBUTORS

## Editor-in-chief
## Clément Leveaux

**Communications Director**
**Veolia Water technologies**

Our planet is going through profound changes.
The consequences linked to climate change are shaking up our frames of reference and constantly testing our capacity to adapt.
Using fossil fuels requires ever more technical means and resources, especially water. The development of nuclear power in the sixties and seventies is now raising the question of dismantling aging facilities and treating radioactive waste.
Demographic pressure and the emergence of certain pathologies are leading to the development of new molecules, whose impact on the environment is not yet to fully measurable.
In the pages of this issue of Planet, you will discover the solutions developed by Veolia to tackle risks or emerging pollution.
The greatest successes are always a team effort, so a huge thank you to our experts and the entire editorial team.

**Best wishes for 2017 and happy reading!**



## Also in this issue

### Maria Neira

**Director, Department of Public Health, Environmental and Social Determinants, World Health Organization**
Maria began her career as a doctor on the ground – specializing in endocrinology and metabolic disorders – and medical coordinator for Médecins sans Frontières. She worked with refugees in El Salvador and Honduras, and then as a Public Health Advisor in Mozambique and Rwanda. She was then successively Vice-Minister of Health and President of the Spanish Food Safety Agency.

### Jean-Philippe Hermine

**VP Strategic Environmental Planning, Renault**
He has held this post since July 1, 2011, in charge of defining and implementing the Group's environmental policy for products and production across all brands and sectors of activity. He is also the CEO of Renault-Environnement, a holding company that manages Renault's interests in two subsidiaries in the field of recycling: one specializes in vehicle end-of-life, the other has a global metal waste recovery business line.

### Elizabeth Girardi-Schoen

**Vice President of Global Environment and Sustainability at Teva Pharmaceuticals**
Graduating in chemical engineering from Manhattan College and the City College of New York, Elizabeth spent a large part of her early career with Pfizer laboratories, where she successfully saw through an environment, health and safety (EHS) excellence program. She has pursued this area, joining Teva where she today heads the international implementation of the group's EHS program.

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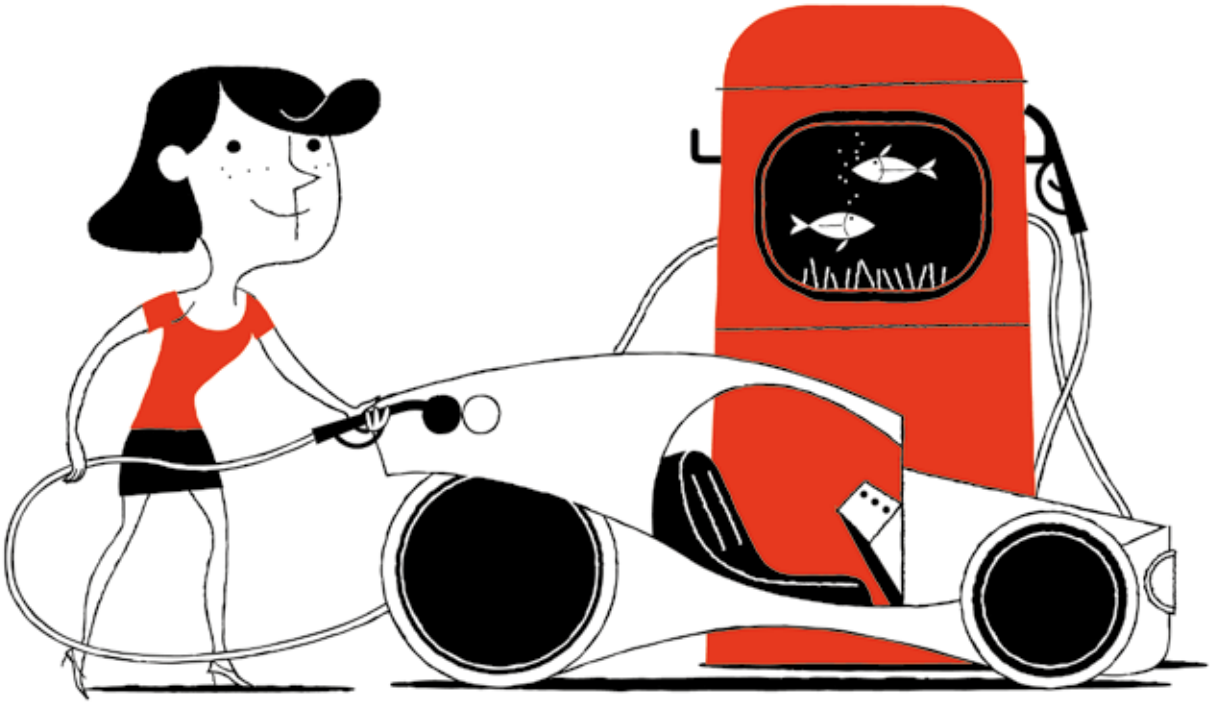

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VEOLIA

# CURRENT



## Micropollutants: **hunted down at source**

Pharmaceuticals, heavy metals, PCBs, hormones, and so on. The list of substances likely to have a toxic action in natural environments, even in very low quantities, is long. These contaminants represent a major scientific challenge in terms of ecotoxicity, public health, soil pollution and drinking water and wastewater management. In September, France officially launched its new 2016-2021 plan for combating micropollutants. Announced at the opening of the first international conference on the risks linked to pharmaceutical residues in the environment – ICRAPHE – organized in Paris, this strategic plan aims to eliminate all discharges of priority hazardous substances by 2021, as required by the 2000 water framework directive. Through 14 levers and 39 actions, it sets a threefold aim: reducing emissions at source, consolidating knowledge to adapt the fight, and listing and prioritizing the pharmaceuticals to be targeted.

## $340 billion/year*

this is the annual economic cost in the United States of health-related damage attributable to endocrine disruptors (obesity, diabetes, fertility and neurobehavioral disorders), according to an analysis published in *The Lancet Diabetes and Endocrinology* (10/18/2016)

*€308 billion

## New Orleans, **a resilience pioneer**

"In the last year, we've made tremendous progress, completing or executing on more than seventy-five percent of actions outlined in the Resilient New Orleans strategy." With these words, the Mayor of New Orleans, Mitch Landrieu, welcomed its partners Veolia, Swiss Re and the Rockefeller Foundation (100 Resilient Cities network) in September. To mark the first anniversary of *Resilient New Orleans*, the city's global resilience strategy, a conference entitled *The Resilient New Orleans One-year Progress Update* allowed Veolia and Swiss Re to present their joint project, which falls within the first worldwide public-private partnership for resilience. The main aims are to optimize prevention costs and to reduce post-event losses along with the recovery time after a shock. For four months, 30 Veolia and Swiss Re experts, in collaboration with the city's teams, analyzed 200 drinking water, wastewater and storm sewer facilities with the end purpose of determining their vulnerability and recommending suitable measures in terms of resistance to extreme events. "We're on our way toward becoming one of the most resilient cities in the world by 2018, our City's 300th anniversary," concluded Mitch Landrieu.

## Endocrine disruptors, **classification and divisions**

"Known," "presumed," "suspected"... The criteria suggested by the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) to describe endocrine disruptors (EDs) are much more precise than those proposed by the European Commission. These three categories would make it possible to "better take into account the uncertainties" linked to these substances suspected of impairing human reproduction and being responsible for neurological disorders. In June 2016, the European Commission only determined a single category of EDs – those known as such – which disappointed the scientific community, NGOs and manufacturers. According to ANSES, only a "graduated approach" would make it possible to "facilitate expert judgment." A European Parliament vote and a public consultation still have to approve – or otherwise – the position adopted by the Commission, but France, along with Sweden, intends to defend adopting a definition that includes presumed or suspected EDs.

# 99.7% of an offshore platform
## recycled in a single operation

**It's a first for an oil platform, and a feat of engineering to boot! Dismantling and recycling 99.7% of the 14,000-metric ton Yme platform located in the Norwegian North Sea in a single operation. This is the challenge taken up by Veolia, which took delivery of the 72-meter-long and 87-meter-high platform in September. The platform was lifted in a single operation and then cautiously transferred on one of the largest deep-sea barges in the world to Lutelandet decommissioning site, in the southwest of Norway. The end result will be the recovery of precious metals and the largest sections of the facilities, including a 54-bed hotel and a gym. A one-year project has begun...**

### Telex

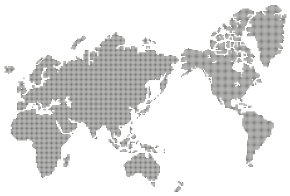
Veolia has won a £1-billion contract with the county of Hertfordshire (UK) for a thirty-year period. The end goal is to put in place residual waste management combining recycling and energy recovery.

Sinopec, the leading oil and gas company in China and Asia, has chosen Veolia to run the entire water cycle at its Yanshan petrochemical complex. This twenty-five-year contract represents a cumulative revenue of €3.27 billion.

All of the district heating networks located on the left bank of the River Vltava in Prague are now operated by Veolia. The aim is to supply 55,000 housing units along with municipal and tertiary buildings for an annual revenue of some €50 million.

## Habitat III adopts a New Urban Agenda

The UN Conference on Housing and Sustainable Urban Development, organized in Quito (Peru) from October 17 to 20, defined an agreement on the living and housing conditions of over half of humanity. The Member States signed a "New Urban Agenda" for more inclusive, safer, more resilient and more sustainable cities. Although it is non-binding, it puts forward concrete actions to fight social inequalities and stop the consequences of climate change, while guaranteeing access to essential services for urban populations. It also recognizes the role of local authorities in defining and implementing these solutions.



## After COP22, **the fight continues**

The 196 countries gathered in Marrakech from November 7 to 22 committed to defining by 2018 the application rules of the Paris Agreement, which has now been ratified by 111 countries plus the European Union and entered into force on November 4. Marrakech was set to be the moment for decisions on concrete actions. The question of funding climate action was widely discussed, in particular the allocation of climate funding intended for vulnerable countries, to the sum of $100 billion per year by 2020. This sum is not far from being reached, but the discussions faltered over its use. COP22 also gave rise to a "2050 Pathways Platform" signed by 22 States, 15 major cities, 17 regions and 196 companies who have committed to reducing their carbon emissions in the long term. Aware that the States will not be able to check global warming on their own, companies have also geared into action and are already rolling out low-carbon strategies. In this respect, Veolia organized two events – "Decentralized electrification and development" and "The circular economy: the example of plastic" – and became involved in the *Pathway to 1.5 °C: how to better align climate and development goals* initiative. This creates a springboard for discussions at COP23, which will be organized by Fiji and held in Bonn at the end of 2017.

## Drug residues **in the environment**

250 international researchers, gathered in Paris in September for the first international conference on risk assessment of pharmaceuticals in the environment (ICRAPHE), are sounding the alarm: thousands of drugs ingested by humans and animals – residues of antibiotics, anti-inflammatories, tranquilizers, hormones and other prescriptions – end up in waterways. These contaminants, with other pollutants, represent a major scientific challenge at once in terms of ecotoxicity, public health, soil pollution, crop dusting, and drinking water and wastewater management strategies. A summary of the most recent data was compiled for the occasion. The aim was to identify, define, measure and manage the environmental and health risks linked to drug residues from the medical and veterinary sectors.

## Plastic **is systemic**

Veolia has become a core partner of the Ellen MacArthur Foundation's initiative to promote a "New Plastics Economy," which aims to reduce the volume of plastic waste discarded into nature. This ambitious three-year action plan is bringing together leading companies and cities, sponsors, public decision makers, academics, students, NGOs and citizens to rethink the future of plastics. Based on an explicitly systemic and collaborative approach, it is organized into five interdependent and mutually reinforcing building blocks: the deployment of a dialogue mechanism, introduction of a global plastics protocol, priority given to innovation, creation of an evidence base and outreach to the general public.

## Nano **in the cortex**

Our brain is said to be permeable to pollution. According to a study by Lancaster University, published in the American journal *PNAS*, nanoparticles of magnetite – a highly magnetic iron oxide found in the atmosphere – were found in the encephalon of 37 people who died accidentally, whether suffering or not from neurodegenerative diseases, all living in polluted cities (Mexico and Manchester). These nanoparticles breathed in through the nose are thought to have reached the center of the brain via the olfactory nerve. In other words, pollution not only damages the heart, lungs and respiratory system, it also could contribute to the development of neurodegenerative diseases such as Alzheimer's. According to the study, magnetite could be involved in the appearance of chemicals in the brain that are behind the oxidation reactions associated with the development of neurodegenerative diseases. However, experts external to the study believe that it is still too early to establish a cause-and-effect link with Alzheimer's disease.

**26%**

**this is the chance of a building being flooded, over a thirty-year period, if it is built in a 100-year floodplain.**

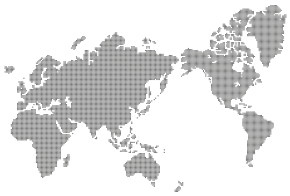
*Wall Street Journal* from 9/5/2016.


## Climate Chance **moves into action**

In Nantes (France), the first Climate Chance Summit, of which Veolia was a partner, brought together over 3,500 non-state actors from some sixty countries. The issue at stake was to develop constructive and precise proposals enabling States to strengthen their contribution to the fight against climate change from 2018 onward. For Ronan Dantec, an environmentalist senator and president of the organization Climate Chance, "this is an extremely important step to lend credibility to the scenario of limiting the temperature rise to 2°C, even 1.5°C. [The Summit] has shown non-state actors' willingness to commit (...) to access to funding for actors in the global South and to strengthening themed coalitions, because the latter will be in a position to participate in reassessing States' commitments."

“If we don’t act boldly, the bill that could come due will be mass migrations, and cities submerged and nations displaced, and food supplies decimated, and conflicts born of despair.”

Barack Obama,
President of the United States,
on the rostrum of the UN general assembly on September 20, 2016, exhorting the signatory countries of the Paris Climate Agreement to implement it as soon as possible so as not to leave these questions to future generations.



## Mercury within a hair's breadth

While nowadays we are able to detect mercury in organisms, until now we did not know how to identify the origin of a contamination by this powerful neurotoxic substance. This is what new techniques for detecting chemical forms of mercury in human hair along with the source of exposure are now offering. This would make it possible to assess the toxicological risk and put treatments in place. Researchers from the CNRS, the University of Bordeaux, Grenoble Alpes University, the ESRF, the European Synchrotron Radiation Facility in Grenoble, and the University of Illinois at Chicago were behind this discovery. The results published in *Environmental Science & Technology* open the way for identifying chemical forms of other known or presumed toxic metals in human tissue.



### Cell phones: **don't throw them away; recycle!**

Only 15% of the 25 million cell phones sold each year in France are collected and join repair, processing or recycling channels at the end of their life. These were the findings of a senatorial report published in October on the end-of-life of waste electrical and electronic equipment (WEEE), and more specifically cell phones. According to the document, smartphones – i.e. 84% of the cell phones sold nowadays – are virtually absent from WEEE collections. Almost 100 million uncollected telephones "sleep in the drawers of our fellow citizens," highlights the report, while others finish their life in unofficial channels, purchased at auction by brokers in the form of used equipment lots. This illegal traffic circumvents the regulations on transboundary waste movement. According to Interpol, 1.3 million metric tons of WEEE left the European Union in this way without the required authorization in 2012, often headed for Africa and Asia. Even though the repair, reuse or recycling of the millions of cell phones in circulation on the market could fuel a French sector and create jobs.

### Telex

Veolia was chosen by the Singaporean subsidiary of the Norwegian oil and gas company Aibel to provide a Customized Water Flood water treatment module – design, equipment and construction – for Woodside Petroleum Ltd and its Ngujima-Yin offshore production and storage platform, based off the northwest coast of Australia. The contract is worth several million US dollars.

## The goal of a 20% reduction

in energy consumption in the European Union by 2020 has already been exceeded in 2016! A summary can be found in the Joint Research Center's *Energy consumption and Energy efficiency trends in the EU-28, 2000-2014* report

### The Paris stock exchange **goes green**

In 2017, France will be the first State in the world to issue a green bond. The aim is to accelerate the development of these bonds to make Paris one of the benchmark financial centers in terms of supporting the energy transition. In practice, green bonds are debt securities serving to fund environmental projects. Those issued by France will support the third component of the Future Investment Program (PIA3), over 60% of whose assets will be allocated to actions contributing to green growth. The French Economy and Ecology ministries state that "several billion euros" in total are set to be raised via this mechanism.

## Paris Climate Agreement: record ratification

Three days ahead of the beginning of COP22 in Marrakech, from November 7 to 18, the Paris climate agreement entered into force, less than one year after its adoption by 192 countries during COP21. The ratification threshold – 55 States representing 55% of greenhouse gas emissions – was rapidly reached and 97 countries have ratified it to date. However, a report published on November 3 by the United Nations Environment Programme (UNEP) raises the alarm: according to forecasts, with the emission reduction commitments currently made by the States, the temperature increase will still be between 2.9 and 3.4°C by the end of the century. To limit this threat, the Paris Agreement contains provisions for these commitments to be revised on a five-year cyclical basis.

# INTERNATIONAL PROTECTION AGAINST THE HARMFUL EFFECTS OF HAZARDOUS CHEMICALS AND WASTE

*In the light of the growing number of toxic chemicals in nature (over 100,000 counted) as well as in objects used by man, the Johannesburg Summit in 2002 set the following goal: "Achieve by 2020 that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment." A review of the state of play, with a focus on China, an excellent example of rapid progress in this domain.*

## 50 YEARS OF AWARENESS

*The development of international regulation instruments to combat the impacts of chemicals is nothing new. It preceded the emergence of the environmentalist movement in the early seventies.*

**1962** **Publication in the United States of the work "Silent Spring,"** seen as a turning point in global awareness.

**1972** **United Nations Conference on the Human Environment** in Stockholm.

**1985** **The Vienna Convention for the Protection of the Ozone Layer**
A powerful kick-off for global environmental governance.

**1987** **The Montreal Protocol on Substances that Deplete the Ozone Layer**
Ban on the production and use of CFCs (chlorofluorocarbons) by the year 2000.

**1989** **Basel Convention** on the control of Transboundary Movements of Hazardous Wastes and their Disposal (entry into force in 1992).

**1998** **Rotterdam Convention on the trade of hazardous chemicals and pesticides,** targeting 22 pesticides and five chemicals (entry into force in 2004) and **Aarhus Protocol** concerning persistent organic pollutants (POPs) and heavy metals (entry into force in 2003).

**2001** **Stockholm Convention on POPs**
(14 pesticides and seven industrial chemicals and byproducts) aiming to ban DDT, PCBs, dioxin, etc. (entry into force in 2004).

**2013** **Minamata Convention** prohibiting, as of 2020, the use of mercury in numerous products, due to its neurotoxic effects (entry into force 90 days after the 50th ratification. At the end of 2016, 32 countries have ratified it, including France).

## IN CHINA, ENVIRONMENTAL GOVERNANCE IS FLOURISHING

*Within twenty-five years, China has established a legal arsenal in line with environmental protection, with a clear acceleration since the 2000s. On an international scale, it has signed the main environmental protection conventions.*

**1992** **The Chinese constitution requires the State to protect and improve the human and ecological environment,** prevent pollution and other public nuisances, ensure the reasonable use of natural resources and protect rare plants and animals.

**1994** **Publication of China's Agenda 21 white paper.** China becomes an international example in terms of national sustainable development strategies.

**2008** **Circular Economy Promotion Law.**

**2010** **Law inspired by European Reach legislation on chemical management.** Chemicals are registered via a New Chemical Substance Notification and are subject to a procedure comprising: notification of tonnages used, reuse of ecotoxicological studies and approval of the results by an authority.

**2013** **More stringent controls on pollution-generating activities and heavier punishments in the event of failure to comply.** Infringements are punishable by up to seven years' imprisonment and fines.

**2014** **Reform of the environmental law that requires companies to communicate the quantities of pollutants that they emit,** increases the fines imposed on offenders and allows NGOs, under certain conditions, to take direct action against violators.

**2016** **Drafting of the law on polluted soils and sites.**
Priority is given to soil pollution due to heavy metals.

## AN EVER-LONGER BLACKLIST...

Mercury is the latest addition to the list of chemicals recognized as being the most dangerous for the environment and health. They are also known by the name of POPs (persistent organic pollutants). They are gradually being banned on a global scale or, at the very least, extremely strictly regulated since the ratification of the Stockholm Convention.

## AND NOW, E-WASTE

During COP-7 of the Basel, Rotterdam and Stockholm Conventions in May 2015, the States decided to include electronic waste in the "club" of hazardous products, as this waste contains many substances that are harmful to man and the environment: lead, phosphorus, mercury, beryllium, refrigerant fluids, PVC, etc.

Sources: http://www.mercuryconvention.org/Countries/tabid/3428/Default.aspx www.sentinelle-droit-international.fr http://reach-info.ineris.fr/focus/polluants-organiques-persistants-pop http://blog.lefigaro.fr/green-business/2010/05/et-si-la-chine-nous-montrait-le-chemin-du-green-business.html http://www.franceagrimer.fr/content/download/46200/441326/file/Veille%20sanitaire%20Chine%20n%C2%B052%20du%2024%20juin%202016.pdf http://www.journaldelenvironnement.net/article/chine-la-peine-de-mort-pour-les-crimes-environnementaux,35223 http://www.usinenouvelle.com/article/ecologie-attention-la-chine-reglemente.N187394

# Emerging pollution: how can we rise to the new environmental and health challenges?

## We asked Maria Neira, Elizabeth Girardi-Schoen and Claude Laruelle.



Maria Neira,
Director, Department of Public Health, Environmental and Social Determinants of Health, World Health Organization (WHO)

Elizabeth Girardi-Schoen,
Vice President of Global Environment and Sustainability at Teva Pharmaceuticals

Claude Laruelle,
Veolia's CEO of Global Enterprises, Chairman of Veolia Water Technologies, and a member of Veolia's Executive Committee

*New substances are continually being added to the list of products that are hazardous to the environment and health. In this context, what are the pathways and priorities for both protecting the environment and continuing to promote innovation? Three key players in the debate discuss their points of view.*

**Maria Neira, how does the WHO identify emerging pollutants and their effects?**
WHO has the advantage of being able to rely on the most eminent scientists, coming from the most prestigious hospitals, universities and laboratories in the world. With the help of groups of experts on a national, regional and global level, and in collaboration with governments and national health systems, we fulfill a watchdog role. When a particular domain requires us to assemble experts, we implement proactive research programs. We have recently done this with endocrine disruptors. Last but not least, we monitor the scientific literature and publications by researchers.

**What areas do you monitor in particular?**
We are constantly looking to identify what is most important from the point of view of health impacts. At the moment, we are focusing on air quality and atmospheric pollutants. The latter are responsible for 6.5 million premature deaths a year and represent a global threat due to the surge in urbanization. Since early November, we have observed severe peaks in New Delhi, Tehran and London.
Another source of concern is electronic residue. Our digital world is generating an enormous amount of waste, which – in countries where waste treatment is not very well regulated – ends up in open landfill sites. It is processed by hand, without protection, in highly contaminated air, to recover and resell the heavy metals it contains. And then, as I said, we are also closely monitoring endocrine disruptors to see how we can limit their impact on our health. Finally, we have not forgotten about conventional risks such as drinking water contamination, radiation or a lack of sanitation. All of these environmental risks cause over 12 million deaths per year, which could be avoided through good preventive policies.

**How can the WHO influence legislation?**
It has to be said right away that we do not have any legal powers and cannot put people responsible for pollution in prison! However, we have political clout and, above all, a powerful tool: scientific data. In this way, we help create social demand so that citizens call for a better environment for themselves. We can also suggest standards along with technological changes, for example replacing certain fuels with other less-polluting ones. We are aware that industrialists are dealing with growing regulations and requirements. We maintain an ongoing dialogue with them to understand their constraints and attempt to influence them, in the positive sense of the word. Because there is also business to be done in sustainable development, and a whole market for clean production processes. Moreover, many industrialists have understood this and know that this movement is irreversible.

**"While we cannot put people responsible for pollution in prison [...] we have political clout and, above all, a powerful tool: scientific data."**
Maria Neira

**Elizabeth Girardi-Schoen, what is TEVA's vision on environmental issues?**
At TEVA we believe environment health and safety management (EHS) is incredibly important to the business both from a risk reduction point of view but also, much more importantly, in terms of our contribution to society. TEVA is committed to business practices that promote safe and environmentally responsible economic growth. In the past, as the TEVA has acquired a number of companies over time, there was not a uniform approach to how things were done; so for the last three years we've been building a global environment health and safety management system. This includes standards and specifications, but also an information management system, and metrics for measuring our performance. We believe this will drive excellence across our entire global organization, and it is part of what we call our journey to excellence.

**So in concrete terms how does TEVA go about reducing its environmental impacts?**
Waste is only waste if you cannot turn it into somebody else's product. Of course we should always look at how to generate less, but more important is to think about how the things that we do generate can be used for something else. For example, we use a lot of solvents that may not be reusable in the pharma industry because of the high quality standards that we have, but that same solvent can be very useful in another industry! So finding good partners that can use the material without requiring a lot of treatment is a good way to go about it. Of course for other waste, such as plastics, metal, paper, etc., it is more a matter of separation and recycling. And sometimes we have been reusing it ourselves, for instance in our packaging we try to use recycled content and we also make our packaging as recyclable as possible.

**How about pharmaceutical residues in the environment, and emerging pollutants such as endocrine disruptors?**
More than 80% of pharmaceutical residues in the environment come from normal patient use, which means they don't come from the production process but from patients who use these drugs to live better, healthier lives, before naturally excreting them (they are then dealt with by municipal plants). There has been an extensive amount of work to study the impacts of that, and WHO says the trace amounts of pharmaceuticals in the environment are not harmful at all to human health – though there is some uncertainty about the impacts of certain compounds on aquatic species.

**"More than 80% of pharmaceutical residues in the environment originate in patient use, which means they don't come from the production process."**
Elizabeth Girardi-Schoen

**How do you see the issue of the increasingly heavy regulations industry has to deal with?**
The environment, health and safety standards that we are implementing generally go well beyond what the law requests.
I would say that regulations often do not encourage recycling or other forms of environmental progress. For example, in light of the fear of spills there is a big regulatory drive for handling the waste closer to home where it is produced and not having it cross borders. However, if a country does not have the right technology to enable high-quality recycling, or energy-producing incineration, these rules force us to cross borders, which uses more energy and increases risk during transport. Yet even when the rules are hard we still try to make recycling happen.

**Claude Laruelle, how does Veolia help its industrial partners adapt to increasing health and environmental regulations?**
Avoiding health risks and reducing the environmental impact of industrial activities is one of Veolia's key missions. The Group develops and deploys unique technical processes to deal with the increasing number of difficult pollution sources. We enjoy a strong distinctive position in this field, as we are at once involved in the design, integration and operation of the technologies. This comprehensive expertise allows us to develop solutions tailored to the specific needs of our clients, support them as their issues at stake evolve over the long term, and thus guarantee facilities' environmental performance. For example, when the European Union tightened up the regulations on incineration, Veolia had to adapt its plants and develop a whole series of high-performance technologies, such as measurement tools at the chimney outlet and additional treatment stages to capture certain emerging pollutants, while limiting operating costs. We now offer this benchmark know-how to our clients and partners.

**What cutting-edge technologies have been developed by Veolia to tackle new pollutants?**
I'll mention two. We have long been involved in the field

**Our digital world is generating an enormous amount of waste,** which – in countries where waste treatment is not very well regulated – ends up in open landfill sites.

of endocrine disruptors in Switzerland – a country that is very much ahead when it comes to these questions. With the city of Lucerne and local scientists, within the context of protecting Lake Lucerne, we worked using one of our existing technologies, "Actiflo®," to which we have added activated carbon filtration steps. With the end result that these molecules are trapped extremely effectively, and we now have a promising industrial pilot operating in Lucerne.

The second example is mercury. This long-known toxic substance has made a return in recent years because it is involved in the production process for screens, which are multiplying in line with the exponential growth of the digital sector, and it also is a natural element in the use of unconventional hydrocarbons. We have therefore developed solutions to capture it in incinerators, and we are now experts in a whole range of filters and catalysts for trapping and recovering this metal.

**In your opinion, what strategy should be adopted when new pollutants appear?**

In general, you should proceed in three steps. Take the example of endocrine disruptors, which may be applied to all kinds of emerging pollutants, such as pharmaceutical residues. First of all, you must learn how to characterize them, in other words develop measurement technologies that often don't exist. Then, you have to separate and capture them as far upstream as possible, working with manufacturers, to prevent them from becoming diluted and much more difficult to recover. Finally, you have to treat them: ideally recycle or, at the very least, neutralize them. Today, we have certainly not completed these three steps. But the precedent of heavy metals in the nineties gives us cause for optimism: we acted in exactly this way and now the contamination of natural environments by these pollutants has become more rare. It will be the same thing for emerging pollutants, provided that society, from the consumer to the industrial producer through the public authorities, accepts the idea that this process has a cost, which may be steep during the emergence phase of these technologies. This cost should nonetheless be put into perspective in view of the resulting socio-economic consequences (R&D, investment, employment, etc.) ■

**"We enjoy a strong distinctive position in the field of difficult pollutions."**

Claude Laruelle

*Transforming everyday waste into green products or managing to stabilize or recover hazardous waste such as mercury... Our two engineers are making the circular economy a real industrial affair.*

# Above and beyond

**Meeting Veolia employees from all over the world.**



## Dieter Offenthaler

General Manager
Batrec Industrie AG,
Veolia subsidiary
Wimmis (Switzerland)

Dieter Offenthaler, a metallurgy engineer who has devoted a lot of time to studying metal recovery, aspires to "use his knowledge to reconcile industrial activity and environmental action." He even made it the subject of his doctoral thesis. It was therefore an entirely natural step for him to join Batrec Industrie, a Swiss subsidiary of the Veolia group and a global specialist in recycling hazardous waste, including mercury and batteries. Recruited as Production Manager in 2011, Dieter became the company's General Manager two years later, at a time when the mercury treatment market was undergoing profound changes.

"Due to extremely strict international regulations*, industrialists are now required to find substitute materials or only use mercury from recycling," he summarizes. "We were faced with the real challenge of finding a solution to safely bury the now unused mercury stocks." In eighteen months flat, Dieter and his team devised and developed an industrial "stabilization" process capable of transforming this highly polluting metal into an inert compound. An amazing feat, accompanied by a major overhaul of the company's business approach: "Our core activity is based on recovering waste from all over the world containing mercury and selling an extremely pure metal," states Dieter. "To guarantee the excellence of our services and meet the requirements of more restrictive legislation, we have put in place a specialist auditing, traceability and reporting system."

Under Dieter's direction, these successful initiatives now allow Batrec to control the entire mercury recycling process, remaining extremely vigilant with regard to the environmental impact. For his part, Dieter is proud to be helping "close the loop" when it comes to special waste treatment, in a sector in which it is still extremely difficult to promote the circular economy. His next challenge: anticipating the growing use of lithium-ion batteries and their recycling, especially by forming unprecedented partnerships. ■

* Driven by the Minamata Convention, which aims to reduce mercury emissions and waste, as well as regulate the extraction and use of this metal, which is ranked as one of the top ten chemicals of major public health concern.

## Caroline Boidin

Innovation Project Coordinator
Veolia United Kingdom & Ireland
London, United Kingdom

### Education

A general engineer, specializing in the field of energy, she holds a Masters in Environmental Management.

Caroline Boidin is naturally brimming with energy, a temperament that is very much in line with the spirit of Veolia's Innovation and Recycling department in the United Kingdom. The aim of this small team brimming with creativity – which she joined in late 2015 as part of an international business placement – is to optimize recycling and facilitate the development of innovative business. Caroline is discovering the workings of commercial innovation by finalizing the development of Cyclone TFR, a vehicle wash made by recycling dishwashing liquid past its sell-by-date. "I became involved after the pilot phase to coordinate the budgetary, regulatory and marketing aspects," explains this 25-year-old engineer, who is delighted to be enriching her project management experience.

This green product – one of the first from Veolia UK – came into being through an internal "idea-generating" program to promote the circular economy: "We were responsible for leading brainstorming sessions and gathering suggestions from Veolia UK and Ireland employees," continues Caroline. Each year, twenty or so projects are presented to a panel of Veolia's leaders and clients*. The challenge is to obtain the resources and skills required to transform them into marketable solutions.

Her way of supporting and promoting the ideas on which she is working is a promising sign of highly commendable qualities, according to her manager Mark Powell: "Caroline's commitment reaches well beyond her coordination responsibilities. As shown by the organization and project management improvements that she has introduced!" A task that the young woman carries out enthusiastically, aware "that the people who came up with the ideas have a variety of professional responsibilities; they cannot devote all their time to it." And she does all this without losing sight of Cyclone TFR's next challenges, such as gaining new clients and developing new products in 2017. After that, Caroline is planning to continue her international business placement as a project engineer to help launch other innovative businesses. With the same energy. ■

* This concept, known as the "Innovation Den," was inspired by a British reality TV show, in which entrepreneurial contestants have five minutes to pitch their idea and obtain funding from a jury of millionaires.


**Pangeo Program** We recruit young people with potential and develop their skills in our areas of expertise in our international subsidiaries, allowing them to successfully integrate into our Group on a permanent basis upon completion of their assignment.
www.pangeo.veolia.com

# Tianjin

## Cleanup helps restore confidence in Tianjin

*On the night of August 12 to 13, 2015, a powerful explosion swept through the chemical warehouses of the Chinese port of Tianjin and the surrounding residences. Concerned about imminent widescale toxic pollution, the authorities turned to Veolia, a locally established company renowned for its expertise in hazardous waste treatment. In total, the Group would collect and treat over 10,000 tons of polluted wastewater in just a few weeks.*

### It's hard to imagine the thoughts

of emergency workers as they raced toward the blast site, following news of a resounding explosion in Tianjin on August 12, 2015.

While the specific environmental dangers were not clear in the minutes following the incident, those with experience in hazardous waste knew to expect a serious challenge: two blasts had ripped through one of the six massive container terminals comprising •••

## Issue at stake

› A race against the clock to manage secondary pollution following a major chemical port explosion

## Objectives

› Assess, analyze and contain immediate hazards; transport and treat hazardous chemicals safely and expertly to ensure discharge compliance

## Veolia solution

› Over a period of six months, Veolia collected, transformed and treated over 10.000 tons of toxic sodium cyanide wastewater

Tianjin port, the maritime gateway which lies at the epicenter of China's chemical industry and deals with a large throughput of dangerous chemicals daily.
A team headed by Cai Ling, General Manager of Veolia's Hazardous Waste Integrated Treatment Center in Tianjin, was on the scene within hours of the news. "The first thing that came to my mind was the environmental impact the blast would bring if cleanup and treatment were not done in time, considering the hazardous chemicals that were stored at the location," says Cai Ling.
Veolia offers the most comprehensive hazardous waste treatment facilities in Tianjin, licensed to treat 48 of the 49 hazardous materials classified by the government (explosives are excluded from the facility's scope), and would play a key role in the emergency cleanup operation.
"We immediately began planning and making arrangements for related equipment, personnel and vehicles to assist in disaster relief operations," says Cai Ling.
As cleanup crews began arriving on the scene, the landscape was foreboding: over 111 types of hazardous cargo had been stored within the 54,000-$m^2$ immediate blast zone, including 800 metric tons of ammonium nitrate and 700 metric tons of scattered sodium cyanide. Burst water mains brought the fear of the chemicals spreading through the soil, and raised the issue of potential contamination of the city's water supplies. The government decided to seal off the explosion core area, require official permits for entry and impose hosing down for exit: authorities then commissioned several trusted firms, including Veolia, with the mammoth task of preventing a major environmental disaster.



## Tackling the toughest jobs

Veolia's Hazardous Waste Integrated Treatment Center in Tianjin has over 15 years of professional experience in operational management of hazardous waste and its facilities were dealing with cyanide-contaminated wastewater on a daily basis: but the scale of the Tianjin cleanup was unprecedented. For Veolia, the work in cleaning up an estimated 10.000 of tons of contaminated wastewater and scattered sodium cyanide from the disaster was rigorous and time-consuming. "The wastewater from the blast site was widely dispersed and the harsh terrain at the scene added much difficulty to the collection and cleanup work," says Cai Ling.
After collection, the cyanide wastewater was transported by dedicated transport vehicles to the company's two facilities – Phase 1 and Phase 2 – for treatment.
Each batch of wastewater collected from the blast site needed to undergo in-depth laboratory analyses and tests. An action plan was derived from the detailed data obtained from these analyses, and the cyanide wastewater was then treated, according to levels of concentration, by mature technologies including incineration or physico-chemical treatment.
Properly treated and handled under the guidance of the technical team, Veolia guaranteed strict discharge compliance with local environmental regulations. The work took around six months and was completed in early 2016.

## Tianjin's role

Tianjin's Binhai New Area – where the explosions took place on August 12, 2015 – has played a leading role in the transformation of the Chinese chemical industry, with billions of dollars invested and leading enterprises building advanced new plants. Within a year of its creation,

## The risks of progress

Over the past decade, China has developed one of the most stringent environmental regulatory frameworks in the world. Industrial water treatment, for example, illustrates this evolution. According to the firm KPMG, the water treatment chemicals market in China is expected to be worth US$ 3.3 billion per year by 2018. Water laws have become ever stricter since the passing of the first Water Pollution Prevention and Control Law in 1984 – tighter new regulations for chemical plant operators come into effect almost every year.
Since the Tianjin explosion, chemical industry modernization has continued at an even more accelerated pace. New laws further restrict the movement and treatment of hazardous waste while chemical safety law has been revised at a national and provincial level. Locally in Tianjin, initiatives from the local government have shut down 68 chemical firms running illegal or dangerous practices and rectified 3,606 safety violations in the last 12 months alone.

## Sodium Cyanide

Sodium cyanide is one of the most deadly poisons known to mankind. A potent inhibitor of oxygen transport, even tiny doses can suffocate living organisms to a quick death – and with a fatal dose measured in milligrams, the slightest release requires rapid response to avoid an environmental catastrophe.


## Cai Ling,

General Manager of Veolia's Hazardous Waste Integrated Treatment Center in Tianjin

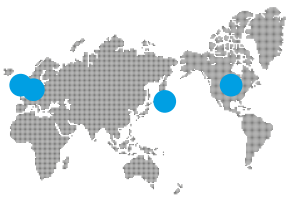
**Cai Ling is clearly proud of how Veolia acted immediately after the blast. "Veolia's ability to respond to the blast in a timely and professional manner made me feel deeply that Veolia is a socially responsible corporation with extensive expertise." A far cry from the stereotypical image, Cai Ling describes hazardous waste treatment as a profession combining technical expertise and tenacity. "The waste industry was traditionally perceived as an unappealing industry, with hazardous waste being dirty and dangerous," she states. "But it requires a high level of technical skills, strong risk prevention and control capability. What's more, you need refined management, patience, attention to detail, determination and perseverance to thrive in this sector."**

285 Fortune Global 500 companies had invested in the special zone, creating a center for China's advanced industrial reform and innovation.

Veolia is one of the companies that have contributed to this transformation. The Group provides high quality water and waste solutions for a number of chemical companies in Binhai New Area and more widely across Northern China.

Technical know-how is, of course, one reason for Veolia's success, but the company's global culture of health and safety is attractive to local authorities and companies under China's modern approach to industry and environment in this pristine industrial hub. ■

# United Kingdom



USA
France
Japan

## Nuclear: extreme robots

*In acquiring the US company Kurion in February 2016, Veolia has broadened its portfolio of services to the nuclear industry. Last December, Kurion, Asteralis and Alaron, the Group's companies specializing in facility cleanup and treatment of low and medium-level radioactive waste, were combined into a single entity under the Veolia name.*

> Remote Handling technicians performing final adjustments to the Dounreay Shaft Intervention Platform robotic arms, at Oxford Technologies Assembly, Integration & Test (AIT) facility in Abingdon, UK.

## Veolia's Nuclear Solutions business

line is a leader in the field of robotics, an efficient method of accessing and handling low and intermediate nuclear waste in settings with radiation levels that prevent human intervention.

## Protecting radiation workers

The aim of robotics is to address the challenges of radiation. "Our primary mission is keeping workers out of hazardous conditions," says Matthew Cole, Vice President of the Access Business Unit specializing in robotics. "Ionizing radiation is a particular hazard that is unique to the nuclear market. In other industries, it's possible to turn equipment on and off and reintroduce humans into the area once it is safe. Because the radiation hazard at nuclear facilities can be so extreme, it's often unsafe for humans to be present for any length of time."

To address the nuclear waste cleanup and facility decommissioning needs of its customers—primarily power companies or government organizations—Access creates equipment that enables tasks to be performed remotely. Frequently, this involves the use of robotics, although Matthew emphasizes that the approach is broader than that.

"We view ourselves as a remote handling solutions provider," says Matthew. "All facilities are unique and we need to determine how to get inside a tank or a nuclear facility to clean it up and create the set of tools and equipment to accomplish the job."

In addition to its expertise in robotics and equipment design, the Access team has developed an advanced understanding of the nuclear hazards environment: contamination, security, risks of leaks, quality of materials, and health effects of radiation. Specialized knowledge regarding control of contamination and materials is applied at high visibility sites such as Japan's Fukushima Daiichi nuclear power plant and the UK's huge Sellafield nuclear fuel reprocessing and nuclear decommissioning site.

**"We view ourselves as a remote handling solutions provider. All facilities are unique and we need to create the set of tools and equipment to accomplish the job."**

Matthew Cole
Vice President of Access

## Treating complexity

Access also has significant operations in the US, where it has particular expertise in long reach systems capable of handling large, heavy loads. In the UK, special capabilities have been developed around highly dexterous handling systems that enable the operator to execute precise movements in confined spaces. Access' arsenal includes tools for cutting, cleaning, handling, repackaging and inspecting to handle situations ranging from underwater repairs to fuel debris retrieval from damaged reactors.

Competitive advantage, however, is about more than offering a catalog of technologies and cutting-edge tools, notes Matthew. "Our most important quality is our experience. We not only deliver equipment, we deliver a decommissioning approach that leverages our expertise and experience. We've worked on such a wide variety of facilities and situations that we're able to quickly recognize good and bad solutions. In other words, the equipment itself can't solve the problems the market faces. Instead, our

**Engineers in the Remote Handling Control Room** at Oxford Technologies Assembly, Integration & Test (AIT) facility, using the 'DEXTER' Master-Slave manipulator and Virtual Reality system to validate remote handling tasks.

## Issues at stake

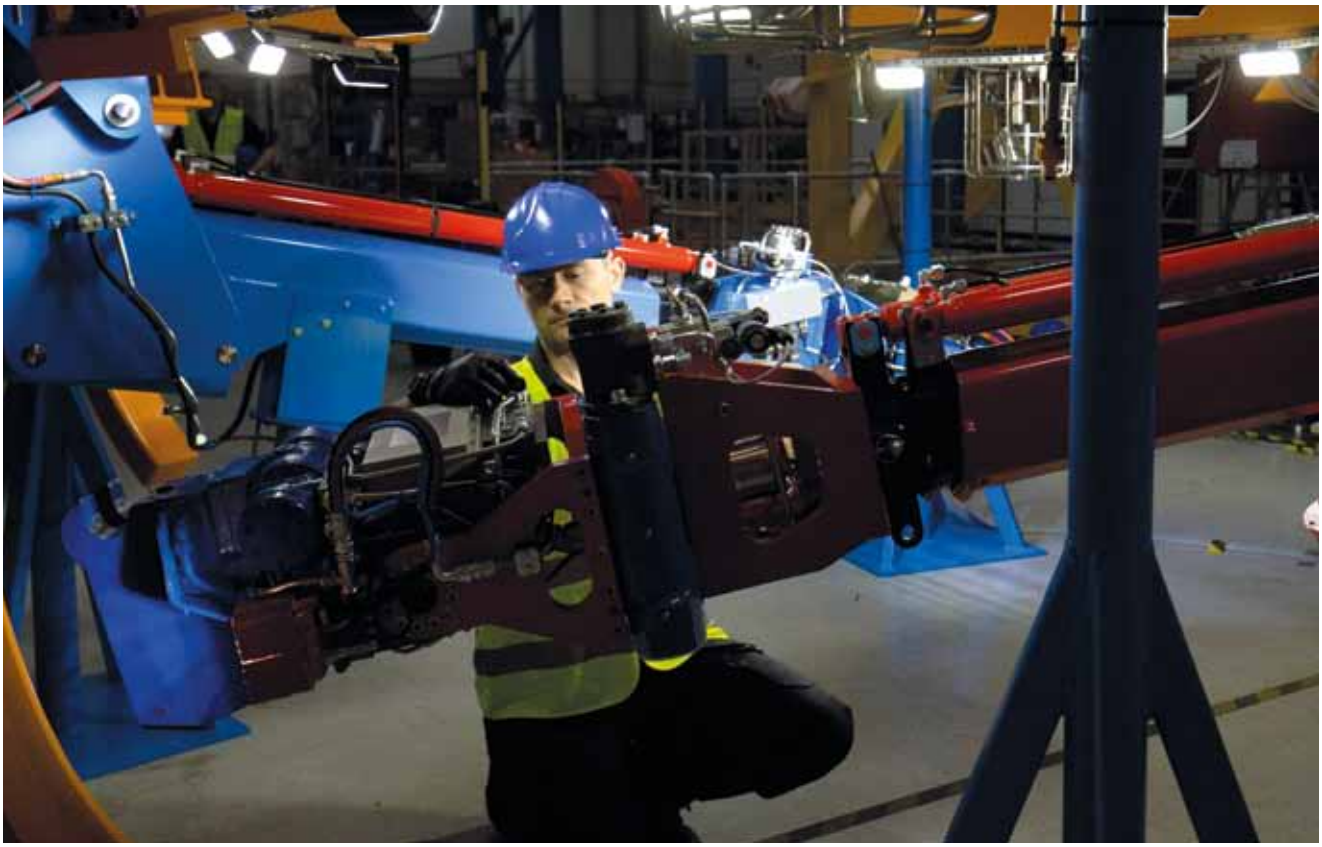
› Cleanup and decommissioning of legacy nuclear facilities adding to high volumes of low- and intermediate-level radioactive waste and treatment of this waste

## Objective

› Identify safe treatment solutions to enable cleanup and maintenance operations in high hazard environments

## Veolia solution

› Provide an integrated offering for the nuclear sector, based on a broad portfolio of cutting-edge technologies and customized services, notably including advanced robotics expertise





indisputable scientific and technological credentials in terms of properly integrating and deploying that equipment is what distinguishes us from our competitors."

## Unique know-how in managing sensitive sites

The Access team works in close collaboration with Veolia's other specialist subsidiaries, such as SARP Industries, Veolia Water Technologies and GRS Valtech. It rounds out an already solid offering in terms of sensitive site management and refines a global approach to the life cycle of low- and intermediate-level radioactive waste.
The services offered by Access to the nuclear sector are set to be developed to increase the safety of operations and maintenance in other strategic sectors of activity for the Group: decommissioning end-of-life facilities, particularly in the oil and gas sectors.
The team continues to innovate, looking at new technologies and approaches, developing software and engaging in virtual reality modeling. Additional projects are focused on new mechanical and hydraulic systems and assessing the radiation tolerance of equipment. The ultimate quest? Being able to replace a human with a machine having equal capabilities. "It's easy to underestimate a human's dexterity, intelligence, high visual acuity and ability to handle small and large items in this constrained environment," says Matthew. "And being able to do it cost-effectively. That's the Holy Grail." ■

## Nuclear cleanup: a high added-value market

The value of the global nuclear decommissioning market, including the disposal of radioactive waste, is projected to grow substantially. Many nuclear sites will be shut down and decommissioned in the next 30 years while others will be extended, requiring the treatment of contaminated equipment. We know that more than 50% of the global market is in the US, Japan, the UK and France, countries in which Veolia's expertise and skills are already recognized. With the creation of its Nuclear Solutions business line, Veolia is the only group offering a comprehensive range of services and technologies to clean up and decommission facilities and process low- and intermediate-level radioactive nuclear waste.

event

JANUARY 17-20, 2017, DAVOS (SWITZERLAND)

WORLD ECONOMIC FORUM

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THE EMERGENCE OF A MULTIPOLAR WORLD CANNOT BE AN EXCUSE FOR INDECISION AND INACTION. LEADERS FROM ALL WALKS OF LIFE MUST RESPOND COLLECTIVELY AND PUT FORWARD CONCRETE ACTIONS TO IMPROVE THE STATE OF THE WORLD.


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VEOLIA

# Dieuze



# The battery innovation

*On the strength of its partnership with the car manufacturer Renault, Veolia's subsidiary Euro Dieuze Industrie deploys innovative solutions for recycling electric car batteries. The end result: strategic metals are recovered for reuse in a wide range of industrial sectors.*

## We are in Dieuze in the Moselle

region of France. On a site spanning one and a half hectares, Veolia's subsidiary Euro Dieuze Industrie (EDI) processes between 5,000 and 6,000 metric tons of used batteries and portable accumulators (remote controls, telephones and smartphones, etc.) each year, i.e. 40% of the items collected on the French market. This collection is carried out by European eco-friendly waste management bodies as part of the Extended Producer Responsibility (EPR) scheme. However, the Moselle site, which was established in 1993 and has a staff of around thirty, has many other ambitions and is currently focusing specifically on the highly promising electric vehicle battery market.

## A scientific and commercial partnership

Both determined to accelerate their innovation programs, EDI and Renault set in motion a scientific and commercial cooperative project in 2011. Its scope covers the processing and recovery of used electric vehicle batteries. Denis Foy, EDI's Director since 2012, summarizes the situation. "We saw the domestic battery market, which had already been highly regulated for several years, reach maturity. Hence the idea of investing in research and development to ensure levers for growth." The development of this new business line allows EDI to kill two birds with one stone. It prevents toxic materials from being released into the natural environment. And it recycles a large share of the many precious metals found in •••


## Issue at stake

› The rise in sales of electric vehicles requires the development of a secure and competitive industrial battery recycling sector.

## Objective

› Optimize the treatment of end-of-life batteries to guarantee that pollutants are not dispersed into natural environments and allow strategic metals to be recovered.

## Veolia solution

› A unique hydrometallurgical process for recovering precious metals contained in electric vehicle batteries, to encourage their reuse in various industrial applications.

...

an electric car battery. Copper, aluminum, cobalt, nickel, manganese and lithium are given a second lease of life in new industrial applications. For example, in metallurgy, for the creation of steel or specific alloys that will serve as the basis for a host of products: sheet metals, tools, special steels, etc. Also in chemical sectors such as the manufacture of metal salts, copper and cobalt sulfates, etc., where they will be precursors in multiple applications: glasswork, batteries, inks, electrochemistry, etc. Finally, with regard to lithium, the aim is to obtain a high-purity lithium carbonate that could be a precursor for the manufacture of new Li-ion batteries. "Bearing in mind that the Holy Grail for us would be to return the recovered materials to their original sector, namely the automobile industry," states Denis Foy.

Being chosen in 2013 as part of the French government's Future Investments program gave the project a significant boost. This recognition from the State allowed the Moselle site to develop its electric vehicle battery dismantling and recycling line on an industrial scale. EDI is already able to recover some 6,000 used batteries per year. The challenge was considerable. Knowledge of the upstream and downstream channels, a thorough grasp of the regulatory issues at stake linked to hazardous waste treatment, non-dissemination of toxic substances into the natural environment, demanding processes: all this indispensable know-how must be brought to bear in dismantling car batteries, each of which can weigh up to 300 kilograms. "For example, we have to manage extremely high voltages, reaching up to several hundred volts, within the framework of totally safe operations," illustrates Denis Foy, describing the first step in the process.

## Specific expertise

The process follows a clearly determined course. Once the diagnosis has been made and the safety measures taken by gradually reducing the battery's voltage, the component and cell deconstruction and grinding phase begins. Then EDI's highly specific expertise comes into play. It draws on a cold hydrometallurgical process to treat the residue and extract recyclable metals from it. To date, refiners remain the leading buyers of these recovered metals. "Some of the most strategic metals could see their cost soar as they become increasingly rare. Under these conditions, we might expect that in the future industrialists will look to secure their supply of these metals by buying them directly from the resource recovery sectors," anticipates Denis Foy.

Thanks to these innovative high-performance industrial facilities, Denis Foy is calm and confident about the site's future. The electric vehicle market, which remains small in comparison to total car sales, is finally taking off in France. Which should ensure a bright future ahead for Euro Dieuze Industrie. ■

### Key figures

€5 million/year: revenue

A 40% market share of domestic battery processing in France

The capacity to process 6,000 car batteries/year

130,000 metric tons: estimated battery processing market by 2030

In Europe, 274,000 personal and commercial all-electric vehicles registered between 2012 and the end of June 2016, i.e. almost 100,000 metric tons of batteries on the roads (Sources: AVERE France - http://www.avere-france.org/)

50% of car batteries and accumulators must be recycled, according to directive 2006/66/CE.

### Interview

Jean-Philippe Hermine,

VP Strategic Environmental Planning for the Renault Group

**What are the issues at stake for Renault in the partnership with Veolia?**

The partnership with Veolia provides a real co-benefit for several reasons. An electric car battery contains a lot of valuable elements, but it is expensive to process. We attach great importance to extending its lifespan as well as recovering its components after use to reduce the cost. Over and above electric vehicles' carbon assessment and their economic and environmental optimization, in the medium term we are looking to guarantee self-sufficiency in the supply of raw materials for our industry and local areas.

**What determines the choice of this kind of partner?**

We have confidence in Veolia's know-how and treatment capacities. Our partner boasts well-established industrial experience, which gives us the guarantee of a high-performance resource recovery sector.

**What does the circular economy represent in Renault's strategy?**

As a founding member of the Ellen MacArthur Foundation, Renault has made the circular economy a value of leadership in the automobile industry. We have already developed several partnerships relating to each stage in the vehicle's lifecycle. We are developing collection solutions to compile stocks of second-hand spare parts. Little by little, we are implementing "short loops" to recycle the raw materials used within the automobile sector. The partnership with Veolia falls in line with this ambition.

**"The Holy Grail for us would be to return the recovered materials to their original sector, namely the automobile industry."**

Denis Foy,

Director of Euro Dieuze Industrie

# RE-B-LIVE:
# State support for the circular economy

With a budget of almost 47 billion euros, the Future Investment Program (Programme Investissements d'Avenir – PIA) was set up by the French government to encourage innovation in France and create jobs that cannot be relocated. It was within this context that the research and development program launched by Veolia and Renault was chosen in 2013, under the name RE-B-LIVE, to "Recycle Li-Ion Batteries used in electric vehicles."

Over a three-year period, the developments made to the Dieuze site enjoyed support from the French Environment and Energy Management Agency (ADEME) to the sum of 1.1 million euros (out of a total of 3.3 million) in the form of subsidies and repayable advances. The challenge for the French government is to be able to encourage the emergence of a competitive car battery recycling and recovery sector, in line with the requirements of European Batteries directive 2006/66/CE.

# Mediteranean

## Microplastics: pollution adrift

Each year some eight million metric tons of plastic are discarded into the sea. Bottles, packaging and other waste gradually break down into miniscule fragments, which proliferate throughout the oceans. The capacity of microplastics to penetrate into and alter the environment is a major cause for concern. Ingested by fauna (plankton, fish, birds, etc.), they threaten the whole food chain. Their abundance also encourages the development of a "plastisphere," a new microbial ecosystem, whose function remains largely unknown. These vagabond residues are even suspected of carrying toxic and pathogenic organisms along with the current. In 2014, in order to study this emerging pollution and its impacts, scientists from the schooner Tara threw their sampling nets into the Mediterranean, which contains the highest density of microplastics in the world. Joining the expedition as on-board correspondent, the photojournalist Noëlie Pansiot followed a particularly fruitful "catch" of... plastic.

**Plastic mission:** between May and November 2014, the Tara Méditerranée expedition scoured 15,000 km of the Mediterranean Sea, with 16 scientists and crew on board.

**High-risk basin:** between a coastline saturated with inhabitants and the highest tourist numbers in the world, the Mediterranean Sea is highly exposed to pollution. 90% of the waste found in the sea – the vast majority of which is plastic – comes from the land.

**350:** the number of samples taken by Tara Méditerranée, using special surface nets. All of the hauls without exception contained plastic waste.

**Jeff Ghiglione,** a CNRS researcher, observes a microplastics sample. Once the expedition is over, the content of each catch is inventoried, with a view to a quantitative and qualitative study of the waste cataloged.

**On the lab's program:** studying the chemical characteristics of the plastic and organic pollutants linked to them. The microorganisms colonizing their surface are also closely observed, as well as the interactions between zooplankton and plastic.

**Pollution from beginning to end:** reduced into fragments, plastic affects the marine food chain. Plankton assimilates certain chemical compounds from it, before being eaten by fish... which is in turn consumed by humans, whose health may be affected by the pollutants transmitted in this way.

## Noëlie Pansiot: on the trail of the “plastisphere”

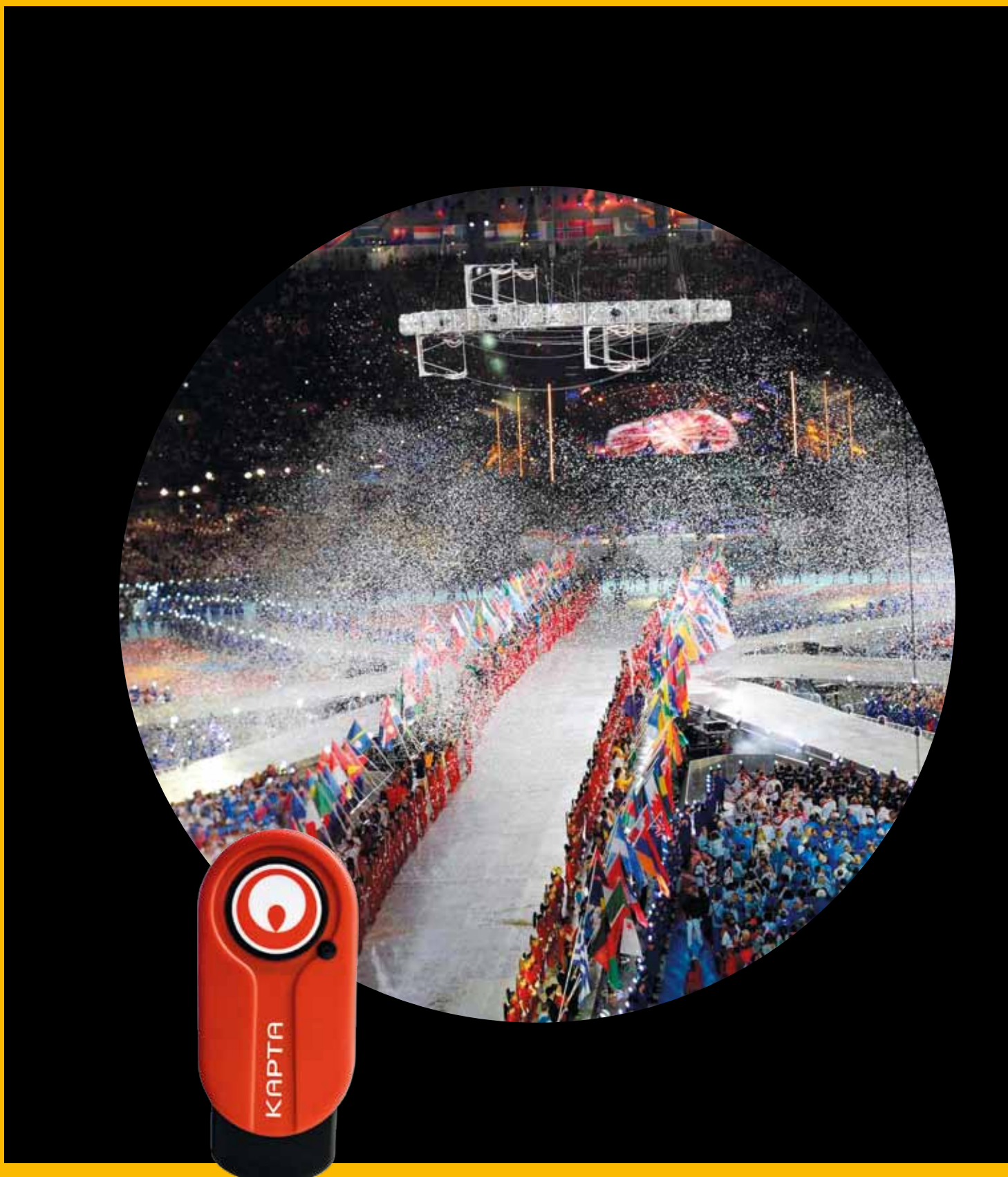
When she embarked on board the Tara Méditerranée, Noëlie Pansiot was counting on a unique experience. She was not disappointed: for several months, the young journalist followed an equally ambitious and revelatory mission. Noëlie was able to observe the omnipresence of waste. “I remember anchoring in the South of France, at Port-Cros. The island’s beaches were strewn with cotton buds. Probably thrown into toilets on the shoreline, they had escaped through the wastewater treatment plant gratings and washed up in this protected area.” A striking detail that highlights the urgency of action, especially in terms of our behavior. Noëlie is convinced that education is a priority that must “focus primarily on experience, beyond the classroom.” This echoes the spirit of the Tara exhibitions, which also look to raise awareness on the ground through partnerships with NGOs and meetings with the public. “During our stopovers, everyone donned their guide’s hat to welcome visitors and share with them the issues at stake in our research.” In this way, step by step, information helps to awaken people’s conscience. A path Noëlie Pansiot is pursuing: she will shortly be joining the Tara Pacific mission to follow the study of the biodiversity of coral reefs in South Asia, another ecosystem threatened by human activity.

### Bio

Noëlie Pansiot is a photojournalist and assistant director. Since 2009, she has concentrated on reports on the ground and organizing documentary series, which have taken her from the Peruvian jungle to the islands of Oceania, via the shores of Canada.

### Find out more

Since 2003, the Tara Expeditions Foundation has been working in favor of the environment and research with a legendary boat, Tara, built for extreme conditions. The Foundation organizes expeditions to study and understand the impact of climate change on our oceans. Initiatives have been made to raise environmental awareness among the general public and young people. Last but not least, it lobbies political and economic decision makers, encouraging them to develop concrete solutions to protect the environment.


KAPTA

# SECURITY TARGET

**The threat of terrorism and cybercrime are among the emerging risks against which Veolia must protect itself on a daily basis.**
**A closer look at the actions implemented by the Group to ensure the security of its own and its clients' facilities.**

## As an operator of essential services,

the safety of employees, consumers and facilities is a priority for Veolia. For this reason, the Group created a Security division in 2013. "It was a decision made by the CEO, Antoine Frérot, who wanted to make security one of the Group's key values," states Jean-Louis Fiamenghi, the former head of the elite French police unit RAID, and now Veolia's Security Director. The priority given to security within the Group was reinforced even further after the attacks committed in France in 2015 and 2016.

## Risk management

Above all, risks must be prioritized. The first concern relates to members of staff working in relatively unsafe countries. Following the attacks in Karachi (Pakistan) in 2002, which caused the death of eleven employees from the Naval Construction Division (NCD), measures have been taken by many companies to strengthen their teams' safety. This applies not only during working hours, but also in the wider context of their mission, at the hotel or even during their leisure time.
To ensure the security of missions by Veolia's employees and expatriates, the Group's Security division notably carries out risk mapping on a country-by-country basis, in collaboration with the French Ministry of Foreign Affairs. For Veolia, over thirty countries have thus been identified as at-risk areas, threatened by terrorism, delinquency or public order troubles, especially in the event of unstable political regimes.
The Group works in close concertation with the French embassies' security attachés. "We have our own security plan, linked to that of the French embassy, which concerns all listed nationals," states Jean-Louis Fiamenghi. "But not all of our employees are French, hence this internal plan." If the situation deteriorates, for example during an attempted coup, as was the case in Burkina Faso in 2015, employees are assembled at predetermined sites to best organize their evacuation, always in liaison with the embassy.

## Constant checks

Veolia also implements measures to protect essential services, namely drinking water production and delivery. This particularly involves securing sites by means of extremely strict access control procedures, as well as continuously controlling the quality of the water and protecting IT systems. Incidentally, guaranteeing the security of essential services will become compulsory as of 2018 for operators such as Veolia and European States (see boxed text).
In France, the Group regularly takes part in prefectural safety exercises to check the responsiveness of the company

### Three questions for Jean-Louis Fiamenghi,
**Veolia's Security Director**

**"We pay very close attention to cybercrime"**

**What are the main safety issues for Veolia?**
You have to differentiate between safety, linked to accidental risk (earthquake, sanitary issue, etc.), and security, which is associated more with malicious acts. It goes without saying that we work a great deal on protecting our employees and the risk associated with terrorism, as well as many other risks. These may concern, for example, financial fraud, such as the famous "social engineering" attack, in which a well-informed contact manages to convince a high-level person to transfer funds to a foreign account for an industrial purchase that proves to be bogus. Today, we have put in place procedures to thwart these attempts.

**What other risks are taken into account?**
We pay very close attention to questions concerning cybercrime, which we handle in collaboration with the French Network and Information Security Agency (ANSSI), placed under the direct authority of the French Prime Minister. This is an area that is constantly evolving. We are putting in place a plan designed to warn us of cyber attacks, along with protective measures. The rise in connected objects makes it the issue of the future in terms of cybercrime. It is up to us to prepare for it.

**How can members of staff contribute to security within the Group?**
We train them regularly in the security basics. For example, about passwords and changing them regularly, or protecting software. Employees traveling to at-risk countries must fulfill certain obligations beforehand: indicate their travel details, the address of their hotel and their itinerary in situ, and follow training on the behavior to adopt in these areas.


and the authorities in the event of a terrorist attack. Accordingly, a simulation of an attack on the Paris water system was conducted in 2015 ahead of COP 21. Sensors placed in facilities immediately detected the intrusion. Once the pollutant injection site was identified, the RAID police unit performed a drill simulating an anti-terrorist operation.

## "Kapta" for real-time action

To combat both accidental pollution and terrorist acts targeting water networks, Endetec – Veolia's subsidiary specializing in environmental •••

## "NIS Directive"

### Europe is looking to improve the security of essential services

**The European Union is obliging Member States and operators of essential services to take measures to ensure the security of water, transport and energy networks.**

In the European Area, each State is required to comply with the "Network and Information Security" (NIS) directive to the letter to organize the security of their essential services. Intended to "ensure a high common level of network and information security across the Union," it was approved on December 18, 2015, and must be transposed into national legislation before the second quarter of 2018.

This directive sets out the security rules for operators of essential services: drinking water, energy and transport providers, banks and financial markets, and digital communication infrastructure. Broadly speaking, the directive particularly encourages them to take the appropriate technical measures to manage risk, audit the effectiveness of the security policies implemented, and meet the requirements of the competent national authorities. To this end, operators must inform the latter of any serious incidents affecting a high number of people over a long period or affecting a wide area.

In addition to their obligation to define strategic objectives along with control and regulatory measures, Member States must create a competent national authority to implement the NIS directive. They will also be required to cooperate on these security questions.

To find out more:
the NIS directive on ANSSI's website:
https://www.ssi.gouv.fr/actualite/adoption-de-la-directive-network-and-information-security-nis-lanssi-pilote-de-la-transposition-en-france/



monitoring – has developed a sensor known as "Kapta" (cf. interview with Cyrille Lemoine). It has the advantage of detecting virtually all of the key water quality parameters, whether this concerns chlorine concentration, conductivity, temperature or pressure. "These parameters form a sort of water quality fingerprint," states Cyrille Lemoine, Endetec's Vice-President. "For example, a drop in pressure signifies valve movements, whereas chlorine is the prime indicator of contamination." Kapta is extremely easy to use. It resembles a screw as wide as a €2 coin that is attached to the conduit pipe saddle. However, this sensor is only one link in the network security chain. The information that it measures is automatically sent to a data analysis and processing algorithm making it possible to spot abnormal events and identify their origin.

"When we know that the danger is heightened, for example during a major event such as the Olympic Games, we need simply increase the sensitivity of the algorithms and accelerate the data processing speed," explains Cyrille Lemoine. "The frequency of analysis increases from the routine 2 ½ hours to every half or even quarter of an hour, but the system remains the same. We guarantee everyday safety, which we can switch to security surveillance, while being certain that our system is always operational." The next step is marketing a complementary probe measuring turbidity and organic matter, the final two key parameters of water quality. ■

## Three questions for Cyrille Lemoine,

**VP Business Development and Innovation, Endetec**

### "We are developing a simple and inexpensive surveillance solution for water networks"

**Are water networks vulnerable?**

To answer your question, I'll take the example of the town of Nokia in Finland, which experienced an incident in its drinking water network in 2007: it was contaminated with a flow of sludge from the wastewater treatment plant. The local authorities were unable to respond rapidly and a third of the population, i.e. 8,000 people, suffered from gastroenteritis (200 had to be hospitalized). The network was cut off for four months for work, with considerable economic consequences.

**How long have you been working on a solution to improve network security?**

In 2006, Veolia initiated a major research project on network risks. At the same time, the French Ministry of Defense's Directorate General of Armaments was also working on this issue. Between 2008 and 2012, the European Union then launched the Sécur'eau[1] program regarding the security and decontamination of drinking water distribution systems following a deliberate contamination. This program chose the technical solution developed by Veolia's subsidiary Endetec: a sensor capable of measuring water quality known as "Kapta." With this choice, the EU is adopting a different approach to the United States. The latter has opted to put in place equipment capable of detecting many different types of pollution in sensitive locations. However, these sensors are expensive, as well as complicated to maintain. What's more, we have recently seen that terrorism does not necessarily attack sensitive locations, but often populations where they are.

**What sets "Kapta" apart?**

Its role is to indicate the existence of contamination. It is inexpensive and may be widely deployed in water networks, both for detecting accidental contamination as well as a malicious act. This early warning system allows us to act rapidly and prevent the population from drinking contaminated water. It also makes it possible to carry out additional tests as quickly as possible to determine the incriminated substances.

1- www.secureau.eu



In Australia, Aboriginal communities are often faced with difficulties such as isolation, restricted access to education and employment, disparities in healthcare quality, and many social challenges such as drug use and a higher disability rate than non-indigenous Australians. It is therefore urgent to take measures to reduce inequalities between the indigenous and non-indigenous populations. Like the partnership established between Veolia and the NGO Outback Academy Australia, which champions the social inclusion of indigenous communuties through employment, training and promotion of their traditions and culture.

# Reconciliation the Australian way

For over thirty years, the Outback Academy Australia has been developing its networks and experience to boost employment in indigenous areas. Among the many actions that it undertakes, two relate to environmental management: a joint initiative with the public agency for managing the national parks in the State of Victoria, Parks Victoria, and support for the inhabitants of Roelands Village (see boxed text). Each of these actions is based on skills acquisition for the benefit of the native communities. A commitment that Veolia shares through its activities and that motivates the Group's support for the Academy. "Sustainable partnerships can only be successfully created by strengthening the ties with the indigenous communities with whom we live and work," states Anja Bonnard, Credit Supervisor and Community Ambassador for Veolia in Australia and New Zealand for the past three years.

Within the framework of this partnership, Veolia also supports the Red Dust Heelers, a wheelchair basketball team in Australia's national wheelchair basketball league working alongside Aborigines with a disability. According to Anja Bonnard, this multicultural group has an exemplary impact on marginalized communities: "The programs run by the Red Dust Heelers go beyond purely sports activities. They encourage young people to get involved in all aspects of community life to help them rise above any kind of disability."

## Reconciliation: a wide-ranging program

**The initiatives carried out by Veolia** fall within a vast national program known as the Reconciliation Action Plan. Since 2014, it has been promoting actions to improve the employment and social inclusion of Aboriginal communities. For a better understanding of Veolia's actions to promote "reconciliation," visit http://www.veolia.com/anz/about-us/about-us/partnering.

**Supporting communities** Since late 2015, the partnership with the Outback Academy Australia has led Veolia to assist the Roelands Village community in Western Australia in developing its environmental management: treating water and managing waste and energy.

**Paralympic spirit** Several members of the Red Dust Heelers represented Australia at the Rio 2016 Paralympic Games, including Brad Ness, who had the honor of being chosen to carry the flag for the national team.

# The mercury expert

*Through its subsidiary Sarp Industries (Sarpi), Veolia has developed a set of technologies for recycling, neutralizing and eliminating mercury, a highly toxic metal, since 2012.*



The international Minamata Convention on Mercury[1] signed by France in 2013 decrees the curtailment of the production and use of mercury, along with a reduction in its content in emissions into the air and waste discharged into water and soil. This mercury – derived from a wide variety of sources, including dental amalgams, batteries and energy-saving lamps – must therefore be collected and treated.

There are two treatment options available to date: purification and neutralization. Purification is carried out using conventional distillation methods, under draconian impermeability conditions to prevent any leaks. This yields mercury purified to 99.9999%, which can be reused for industrial applications. Neutralization makes it possible to transform mercury into a mercury salt, which is less toxic than the metallic form. "We have invented and patented a mercury stabilization process," states Thierry Gosset, Sarpi's Technical Director. "By adding sulfur residues to the liquid mercury, we obtain mercury sulfide, similar to what we find in natural rock. It can then be stocked in salt mines in Germany."

Despite increasingly better organized collections, non-hazardous waste containing mercury is regularly incinerated. Some mercury is therefore found in its combustion fumes. "These mercury emissions are now measured four times a year, but European regulations will soon require continuous measurement," explains Thierry Gosset. "We will then become aware of the existence of occasional mercury emissions beyond the limits. We have therefore developed a system for continually treating mercury in the incinerators." Its principle: as soon as an increase in mercury in the fumes is measured, bromine-based chemicals that oxidize mercury are injected. This oxidized mercury is then captured by activated carbon. Veolia today applies this process to its own incinerators, and has begun marketing it in Europe. ■

*1 http://www.mercuryconvention.org/Portals/11/documents/Booklets/1400281_F_WEB.pdf*

**1,960** metric tons* of mercury were emitted in 2010 due to human activity, over 60% of which was from gold panning and coal combustion (UNEP, Global Mercury Assessment 2013).

**5** micrograms of mercury per kilogram of body weight (height/weight ratio for humans): this is the provisional tolerable weekly dose set by the World Health Organization (WHO).

** Despite an improvement in the mercury data available, the assessment of emissions is still subject to uncertainty and ranges from 1,010 to 4,070 metric tons.*

## SARPI: A UNIQUE EXPERTISE

**Mercury waste is collected from battery and lamp drop-off points used by European consumers and from dentists. Then Veolia, through its subsidiary Sarpi, treats this mercury in its Wimmis (Switzerland) factory in the strictest compliance with environmental and safety rules. Part of the mercury treated is purified and reused in industry; the other part is neutralized and stocked in secure salt mines. The mercury that escapes this collection and ends up in waste may also be treated: Sarpi retrieves it from the very heart of the incinerators using a new patented technology.**


**1** **Waste delivery**
Some mercury may be present in the waste introduced into the incinerator, despite collection efforts. During incineration, mercury emissions, which are very strictly regulated, are discharged into the air.

**2** **Waste combustion**
Calcium bromide is injected at high temperature into the afterburner. It oxidizes metallic mercury into positive mercury ions, which can then be captured by activated carbon in [5].

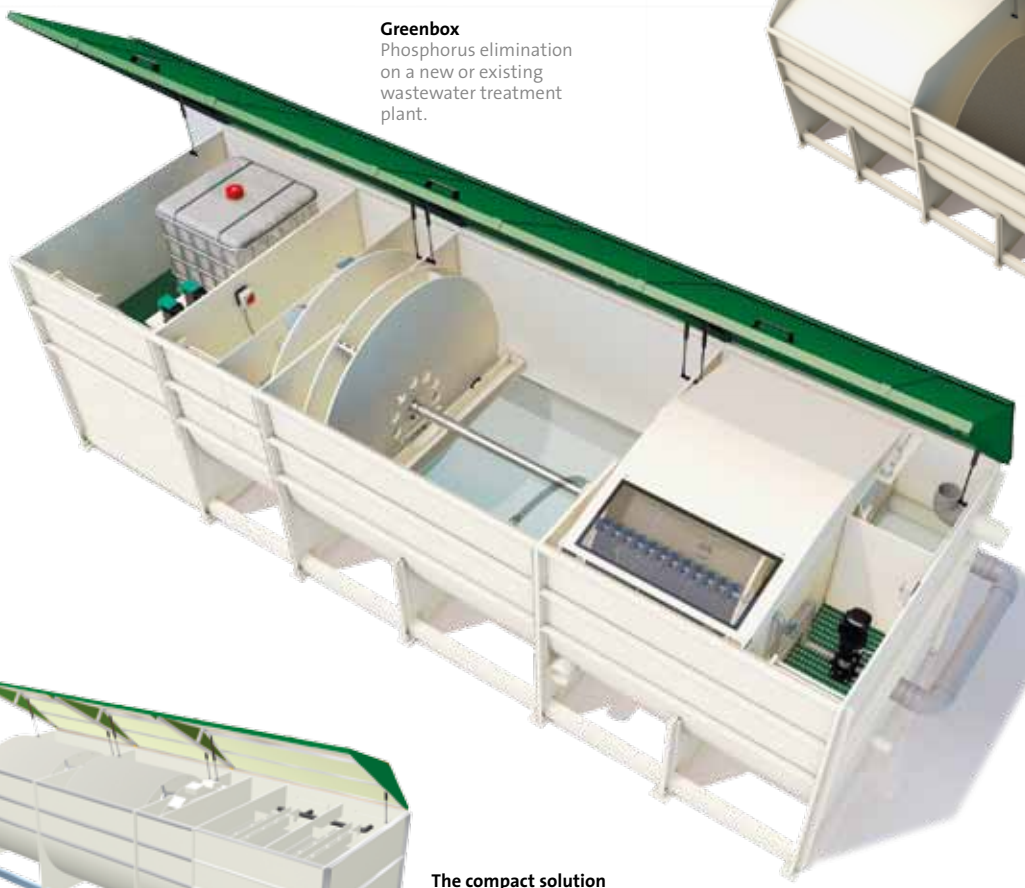
**3** **Upstream mercury measurement**
Measuring metallic mercury and oxidized mercury upstream of fume treatment using activated carbon [4] makes it possible to assess the quantities to be treated, and therefore gauge the injection of calcium bromide in [2].


**4** **Mercury capture**
The incineration fumes are treated using activated carbon, which captures the oxidized mercury. However, activated carbon does not capture metallic mercury. This is why calcium bromide is injected in [2] to capture the metallic mercury.

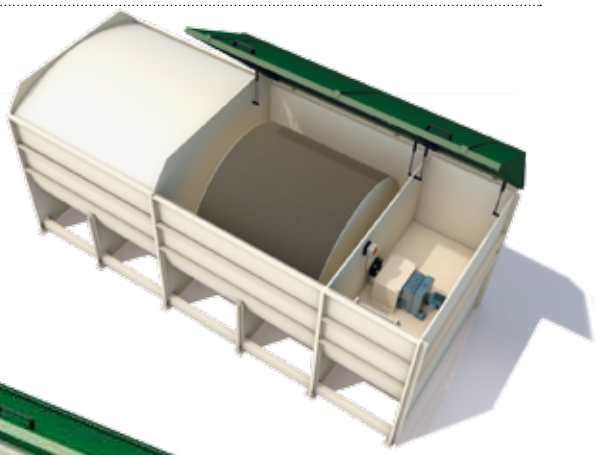
**5** **Downstream mercury measurement**
Downstream of the fume treatment, at the chimney outlet, the mercury is measured to check that the emissions are below the authorized values.

# Futurist





**Greenbox**
Phosphorus elimination on a new or existing wastewater treatment plant.



**Ecodisk® Denit**
This solution meets even more stringent effluent quality requirements with regard to total nitrogen.



**The compact solution**
The solution for small and medium-sized wastewater treatment plants.

**WWTP without borders**
Ecodisk® is all-terrain equipment that fits in anywhere. From Alpine peaks to Tahitian resorts, PMT has sold 1,500 items of equipment in 45 countries since 1998. The company is now targeting markets such as Africa, while continuing to develop its technology: in particular, an energy self-sufficient version is being studied.

## Ecodisk®, Plug and Play wastewater treatment

The company PMT, a Veolia subsidiary, has invented Ecodisk®, a compact, robust and ecological treatment unit, designed to treat the wastewater from small and medium-sized municipalities, tourist complexes, campsites, site facilities, etc. located in rural or semi-urban environments (from 100 to 10,000 population equivalent). The solution is based on rotating "biodisks," colonized by bacteria responsible for decontaminating the effluent. For more comprehensive wastewater treatment, simply add pretreatment, denitrification or dephosphatation modules or a secondary treatment to reuse the filtered water. The preassembled equipment can be installed in a semi-buried container or a building, with no other structure than a concrete slab. Irrespective of the configuration, Ecodisk® is distinguished by its minimal energy consumption, reveals Goulven Inial, PMT's Managing Director: "The energy needs required for the different processes are supplied by a single motor, whose power does not exceed 1.5 kW." Performance that – combined with the use of high-end components and the stability of the biological treatment – guarantee longevity and tranquility: the bacteria adapt very well to major load variations, while no special qualifications are required to maintain the system. "Our solution may be easily operated by the hotel's gardener," summarizes Goulven Inial. Install Ecodisk® and nature will do the rest.

event

# MARCH 22, 2017

# WORLD WATER DAY

# WASTEWATER

ACCORDING TO THE UN, A THIRD OF THE WORLD'S POPULATION DOESN'T HAVE ACCESS TO DRINKING WATER. THIS YEAR, MARCH 22 IS DEDICATED TO WASTEWATER. ITS REUSE IS ONE OF THE SOLUTIONS TO ADDRESS THE INCREASING SCARCITY OF THE RESOURCE.

HTTP://WWW.UN.ORG/FR/EVENTS/WATERDAY/

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