



Water scarcity: future threats and possible solutions

Highlights from the Veolia Institute Foresight Committee's 2023 annual meeting

The Veolia Institute

Thinking together to illuminate the future

Conceived as a platform for discussion and collective thinking, the Veolia Institute has been exploring the future at the interface between society and the environment since its foundation in 2001. Drawing on its connections to the global intellectual ecosystem, it facilitates multi-stakeholder analysis to explore emerging trends, particularly the environmental and societal challenges for the decades ahead.

Over the years, the Veolia Institute has built up a high-level network of experts, scientists, researchers, members of prestigious universities, NGOs, international organisations around the world. The Institute pursues its mission through its high-level publications and conferences, its foresight working groups and its diversified network of experts.



Foresight Committee meeting - october 2023

First row from left to right : Harvey V. Fineberg, Dinah Louda, Pierre-Marc Johnson, Mamphela Ramphela, Philippe Kourilsky

Second row from the left : Lamia Meziane, Katialine Burgorgue, Gérard Payen, Nicolas Renard, Jean-Pierre Tardieu, Laurence Aurélie, Emilio Gabbrielli, Karine Rougé, Miriam Balaban, Pierre Ribaute.

Editorial



There is no denying that water is an essential resource for life. However, the question remains as to whether it is adequately preserved. Indeed, the global population continues to grow, and water demands are increasing exponentially. This observation is all the more concerning as our already limited supply of fresh water is being severely tested by climate change, pollution, overexploitation of resources, and ecosystem degradation. It is imperative that we acknowledge this reality and take action without delay.

The severe and silent crisis of water scarcity affects various sectors, including agriculture, industry, energy, health, and the environment. Entire regions are already suffering from water shortages, which lead to socio-economic conflicts, a deterioration in quality of life, and forced migrations.

Fortunately, solutions exist to address this issue. It is essential to rethink our approach to water management by adopting a holistic and sustainable approach. This entails promoting water-use efficiency, embracing innovative technologies such as seawater desalination and wastewater reuse, restoring aquatic ecosystems, and fostering cooperation between local, cross-border, and international actors.

In this context, solidarity between territories, the establishment of partnerships, and the sharing of knowledge are crucial elements in addressing the challenges of water scarcity. The responsibility lies with all members of society: governments, companies, civil society organizations, and citizens. It is necessary to work together by implementing concrete policies and measures to preserve this vital resource. This requires significant investments in water infrastructure, research and development, as well as education and awareness initiatives.

The time has come to take action, rethink our relationship with water, and collaborate to ensure a sustainable future for our planet and its inhabitants.

During its annual meeting, the Foresight Committee of the Veolia Institute addressed the issue of water scarcity by adopting a multidisciplinary approach. Distinguished experts from the scientific field, public political arena, private sector, and civil society contributed to dynamic and stimulating debates, which are at the core of the Veolia Institute's Foresight Committee.

Pierre-Marc JOHNSON

President of the Foresight Committee

The Foresight Committee

Drawing on the expertise and international reputation of its members, the Foresight Committee guides the Veolia Institute and steers its development. Each year, during its annual meeting, it invites a multidisciplinary panel of experts (academics, politicians, scientists, economists, etc) to engage in discussion on a given topic.



Harvey V. FINEBERG

President of the Gordon and Betty Moore Foundation

“ The validation process requires the consent of so many different user groups, including farmers. Would or could it be less expensive to desalinate to different levels, one sufficient for agriculture and another for human consumption? ”



Pierre-Marc JOHNSON

Chair of the Foresight Committee, former Prime Minister of Québec, Of Counsel Lavery attorneys Montreal

“ While the convention on climate change has been defined in universal terms, the issue of access to water is not. We can assume that this explains the lack of progress, even timid, in this direction. ”

“ Governments do not necessarily even agree within themselves on the responses to be given to their population, even though they should, at least in Western democracies, be the custodians of a vision. ”



Philippe KOURILSKY

Emeritus Professor at the Collège de France, Honorary Director General of the Pasteur Institute

“ The drugs produced twenty years ago are not detectable in the water, are still with us and need to be removed precisely because no action was taken twenty years ago. ”



Mamphela RAMPHELE

Former Managing Director of the World Bank

“ Water is not a priority in polity terms in many parts of the African continent due to the disarticulation between the political leadership in the South. ”



Amartya SEN

Economist, Nobel Prize 1998, Professor at Harvard University

Absent from this meeting.



Amy LUERS

Global Lead on Sustainability Science at Microsoft

Absent from this meeting.

The invited experts

To explore the theme of geopolitical trends and events, the Foresight Committee assembled the following panel of experts, whose diverse backgrounds and experiences brought a range of perspectives to the table:



Gérard PAYEN

Former water adviser to the UN Secretary General, Vice-president of the French Water Partnership, Member of the National Academy of technology of France and Honorary President of AquaFed

“The prerequisite for any progress is education of public opinion.”



Karine ROUGÉ

CEO Municipal Water Veolia North America

“99.9% of humans have some form of PFAS in their blood.”

“PFAS treatment is the focus of intense research and innovation concentrating the highest number of patents filed in 2022 for water.”



Miriam BALABAN

DS Secretary General, Editor-in-Chief *Desalination and Water Treatment*, Desalination Founding Editor

“Within the field of desalination, ocean brine mining has risen to great prominence. It is the extraction of useful elements from the wastewater that were previously thrown back into the sea once the water was purified. Now, this “waste” is being recognised as having value.”



Emilio GABRIELLI

Independent international advisor, global expert in water and sustainable development

“The public continues to react in a very different way to effluent from WWTP and fumes from cars, compared to brine from desalination plants.”



Seth SIEGEL

Author of the 2015 New York Times bestseller *Let There Be Water: Israel's Solution for a Water-Starved World*, lawyer, activist, and entrepreneur

“Where there are grievous shortages of water, it would take just a bit of technology and some intelligence to make a whole new secondary source of water available to populations.”



Julien ANCELE

CEO, 1001fontaines

“We firmly believe that the best way to achieve Sustainable Development Goal 6 is to have quality running water everywhere. Until this becomes a reality, 1001fontaines' vocation is to provide drinking water services to underserved populations, in the interests of public health.”



Eva LENEVEU

Public affairs Manager, 1001fontaines

“National and local policies have focused mainly on infrastructure development, neglecting the quality of the water produced and the services provided by that infrastructure.”



Pierre RIBAUTE

Executive Director of Veolia Water France

“We know that water flow will decrease by 20 to 40% by 2050, while water table replenishment will drop by 20 to 40%.”

Water demand and water availability by region: what can be expected?

Overview of public policy and the need for good governance



*Excerpts from the presentation by **Gérard Payen**, former water advisor to the Secretary-General of the United Nations and Honorary President of Aquafed*

« Individuals are not always aware of the water cycle, and in particular of the fact that only a small proportion of rainwater runs on the Earth's surface ("blue water"), while a large proportion returns to the atmosphere through evaporation. This blue water is withdrawn by different users: by cities (12%), by industry (16%) and above all by agriculture (72%), before returning to the natural environment or evaporating. Over the past century, water withdrawals have increased by 600%, two-thirds of which are attributable to agriculture, and a sixth to industry.

Local tensions over water resources are exacerbated by urban growth and climate change. Water is not the problem. There is plenty of it, even if it is unevenly distributed in space and time. The problem is how we manage water to meet all needs simultaneously and sustainably.

Water management is not just about water resources. It also includes universal access to safe drinking water and sanitation, controlling the pollution discharged by human activities and, last but not least, controlling the impact of water-related disasters. These are issues for which there are no individual solutions and which must be dealt with collectively. Water management is therefore a political issue. The technical solutions exist. With the same financial resources, some countries do much better than others. Above

all, water needs to be seen as a political priority, which is rarely the case.

The fragmentation of national and global water governance is an obstacle. For example, numerous international organizations like WHO, FAO, UNEP, UN-Habitat or UN-Water are taking action on water, but each from a different angle without any effective coordination between them. Political decision-makers are also slow to take action despite the principles on water governance established by the OECD and the global UN Sustainable Development Goals adopted in 2015. The implementation of relevant and ambitious public policies requires the support of public opinion. But public support is not guaranteed. It depends on four major societal issues: misunderstandings and preconceptions about water-related issues, acceptance of the needs of other users and the constraints of collective action, inertia in the face of necessary change, and trust in public authorities.

Solutions do exist. But we need to take these societal challenges seriously and decide collectively to act. Today, the societal consensus is much higher for the climate than for water. The current challenge is to ensure that we all want to guarantee universal access to safe drinking water, sustainable management of water resources, control of water pollution and management of water-related disasters. »

Discussion of the committee

An anticipated change in public policies

“ Three important elements stand out: public education and awareness, water management and the adoption of clear objectives. Educating the public opinion is a prerequisite for any progress in water management, but it is necessary to go beyond mere awareness-raising and tackle the real problems with appropriate public policies. Also, although global water-related goals were set globally in 2015 (SDGs), they are still not integrated into national policies.

It is urgent that water becomes a priority on the political agenda and that these water-related policies

take into account social, economic and environmental factors, taking example from the successful policies of countries such as Morocco, South Africa, Singapore or Israel.

Meeting the world water challenges requires collective action and international cooperation. With the UN Water Conference in New York in 2023, we can hope that the days when water was not discussed at all at international level will give way to a time of regular discussions, joint decision-making and action. ”

Emerging pollutants and water scarcity



Excerpts from the presentation by **Karine Rougé**, CEO Municipal Water Veolia North America

« Emerging pollutants are chemical substances dangerous for the environment and human health. They are divided into four categories: persistent organic pollutants (examples: chemical substances such as PFAS or eternal pollutants), pharmaceutical and veterinary care products, endocrine-disrupting chemicals, and nanomaterials (ex microplastics). These pollutants are present in water, wastewater, soil and air, and they impact ecosystems. Some of them, like PFAS, are widespread and are associated with health problems such as reproductive disorders, developmental delays in children, and an increased risk of certain cancers.

Regulations concerning these pollutants differ in the United States and Europe. In the United States, the focus is mainly on drinking water, while in Europe, the goal is to ban the production and import of all eternal pollutants. However, the presence of PFAS in most products poses a serious challenge to this goal.

Meanwhile, in the United States, water resource depletion is worsening, and drought is a widespread problem - even in water-rich regions. This is

due to pumping technologies, economic growth and urban expansion that have accelerated water demand. Additionally, climate change has reduced the resource.

Communities are not all affected in the same way by PFAS. Low-income and colored communities often face problems accessing quality drinking water due to proximity to pollution sources such as industrial facilities, civilian airports, or military training areas. The lack of financial and technical resources prevents these communities from effectively combating water pollution. Initiatives such as the bipartisan infrastructure law and the Justice40 initiative aim to help these communities deal with emerging contaminants and promote environmental justice. However, funding for the treatment of emerging pollutants remains a challenge, and taxpayers often end up bearing a large part of the costs. Tariff increases are difficult to implement for local municipalities, which are already facing inequalities in water quality and access. Some households therefore choose to invest in their own water treatment systems, which leads to a fragmentation of water governance and reinforces inequalities in access to drinking water. »

Discussion of the committee

Lack of knowledge about the quality of drinking water in the United States

“ In most municipalities or counties, the water rate is more of a political decision than a true investment in water infrastructure. Responsibilities are spread among 80,000 public or private systems, and the people who work on these issues do not always have the knowledge, training, technology or understanding necessary to meet the requirements of a new regulation.

Three trends converge and exacerbate: fragmentation, difficulty in decision-making, and decline in

skills. The Biden administration is working to restore a certain degree of equality through its investments favoring small communities and disadvantaged communities.

Today, in the United States, 350 million people do not know what their drinking water contains. One day, the number of lawsuits will explode and lead to major decisions. But it will still take several years to see true consistency on these points in the courts. ”

Developing alternative resources : interest, potential and limits of seawater desalination



Excerpts from the presentation by **Miriam Balaban**, Secretary General of the EDS, editor-in-chief of *Desalination and Water Treatment*, founding editor of *Desalination*, and **Emilio Gabbrielli**, independent international advisor, global expert in water and sustainable development



« Water desalination varies from region to region, being more expensive in the Mediterranean and the Gulf due to the high salinity of seawater. For the same reason the process is also easier in the United States off the Pacific coast than in southern Florida. Despite initial doubts, desalination is now considered a reality, although there is room for further improvements.

Different desalination technologies are available, but reverse osmosis is considered the most efficient. Desalination costs have decreased thanks to technological advances and energy recovery, making the process more affordable. Reverse osmosis has dominated other technologies in recent years due to its lower energy consumption. The quality of desalinated water is drinkable, but problems arise when water produced is not remineralized to stabilize it so that it becomes not corrosive in the distribution system. The discharge system needs to be properly designed to dispose safely of the brine produced during desalination.

Nevertheless, the exploitation of ocean brines has gained importance as the value of these «wastes» is now recognized (they contain magnesium, scandium, vanadium, gallium, boron, indium, lithium, molybdenum, and rubidium).

Desalination can be combined with renewable energies (tidal, solar, wind, etc.). Desalination technologies applied to treated effluent can produce fresh water which can be used to recharge the aquifer.

Despite mastering the technology, desalination sometimes still faces strong public opposition. Good communication and public awareness are essential for success in this field. Singapore and Israel are cited as good examples of countries that have successfully implemented desalination with the support of the public. »

Discussion of the committee

Obstacles to Desalination Expansion

“The factors limiting the expansion of water desalination despite increasing demand and decreasing costs are resistance to change in traditional public services and political opposition, which can be virulent in some countries.

It is important to establish different thresholds for desalination to meet specific needs, especially for agriculture and human consumption.

It is crucial to make desalination accessible to disadvantaged populations through small-scale facilities.”

Developing alternative resources: the promising future of water reuse



Excerpts from the presentation by **Seth Siegel**, Author of the 2015 New York Times bestseller *Let There Be Water: Israel's Solution for a Water-Starved World*, lawyer, activist, and entrepreneur

« In Israel, water has long been considered an opportunity. In the 1950s, when the country was bankrupt and absorbing a large number of refugees from North Africa, Iraq, and Europe, ideas emerged to treat wastewater and use it intelligently. Rather than being used directly as drinking water - which is difficult to accept by the local population, even though it is perfectly safe to drink - the treated water was used to irrigate crops not intended for human consumption, mainly cotton. Thus began a process that would extend over several decades and cost several billion dollars, encompassing water treatment and transport to agricultural areas.

At the same time, a map of the country was drawn up and a licensing obligation was imposed on farmers to ensure they did not (initially, as it turned out) irrigate those crops intended for human consumption with treated wastewater.

Today, Israel collects and treats 95% of its water, 85% of which is used for agriculture. The remaining 10% is used in the environment, to improve

river flow. This approach has saved freshwater reserves and improved water supply security.

In most developed countries, 70 to 75% of freshwater is used for agriculture. A few countries, such as Egypt, Ethiopia and Iran, devote up to 95% of their freshwater for agriculture. Regardless of country, if even 20 percent of the water now used for agriculture could be saved, these countries could improve their environment, strengthen their supply security, and improve the quality of their drinking water. There would be more drinking water available for more people and more uses.

Israel's example shows the importance of paying full price for water to promote a culture of conservation and enable public services to finance infrastructure and innovation.

Finally, in Israel, the circular economy is also at the heart of discussions with the use of by-products from wastewater, such as chicken fat transformed into biogas, to finance part of the wastewater treatment process. »

Discussion of the committee

Wastewater Reuse

“ South Africa is facing daunting water problems, whether it’s availability, quantity, or security of supply, particularly due to lack of forward-looking governance needed to solve water-related problems, not just wastewater but also piped water. For policymakers, there is very little to be gained and a lot to be lost (in citizens’ indignation) by increasing taxes or investing public money in a water distribution system that, however, raised no complaints because it was buried and therefore invisible.

When wastewater is treated to an ultra-high level of purity, it no longer contains any contaminants and can even surpass, in terms of quality, the tap water usually supplied which often contains a wide range of pharmaceutical residues.

In case of severe shortages, there is no reason not to divert the treated water for reuse as drinking water, provided it is properly filtered. ”

1001fontaines in South-east Asia: an example of forward-looking civil society initiatives



Excerpts from the presentation by **Julien Ancele**, CEO and **Eva Leneveu**, Public Affairs manager of 1001fontaines



« 1001fontaines mission is to provide safe drinking water to vulnerable populations, particularly in communities far from urban centers.

In Cambodia, only 20% of rural area inhabitants have access to safe water, and even in cities, this figure barely reaches 55 to 60%. Existing solutions have failed to solve this problem, and many people continue to use rudimentary and untreated water sources, contributing to the spread of diseases.

Since the deployment of quality piping systems is time-consuming and costly in rural areas with low population density, 1001fontaines has developed a network of drinking water production kiosks, decentralized in villages and managed by local entrepreneurs. Water is produced and sold locally, avoiding high transportation costs and providing an affordable

service for the population. The national franchise model, including five technical support platforms for the kiosk network, ensures the continuity of services and enables entrepreneurs to manage the infrastructure efficiently and economically.

Thanks to this model, 1001fontaines has demonstrated that it is possible and financially viable to rely on decentralized rural services that can cover 25% of Cambodia with self-financed drinking water services. The system is self-sufficient and resilient to climate change, with a high operational rate even in cases of drought or extreme events. The organization works in partnership with local stakeholders, UNICEF and the Ministry of Rural Development to improve knowledge about the vulnerability of water sources. It also operates in Madagascar, where climate change also poses significant challenges. »

Discussion of the committee

Off-grid water supply: unclear regulations

“ By supplying drinking water to areas not connected to the mains water network, 1001fontaines operates in a grey area vis-à-vis local and national authorities, which essentially regulate connected systems or the commercial drinking

water sector. There is no official space for the type of solutions proposed by 1001fontaines, and the absence of clear regulations leaves the field open to informal players in the bottled water sector not subject to authorization or inspection. ”

Still 2 billion people without access to drinking water

“ Designing sustainable solutions for access to drinking water, to complement the development of piped water, is a necessity, but it's rare to see examples of initiatives succeeding in scaling up.

Collaborating with other players, working in partnership with businesses and public authorities to accelerate the adoption of these solutions could potentially strengthen 1001fontaines' role. ”

Main takeaways

Climate action is more consensual in our societies than water action...

... Access to running water is not an immediate consequence of a country's wealth, but rather of the level of political priority accorded to water. In many cases, water is the last priority in government budget negotiations. When water is recognized as a priority, the question remains whether it is adequately resourced and resourced.

Putting water issues at the top of the political agenda would help to ensure universal access to safe drinking water, sustainable management of water resources and control of water pollution.

Emerging pollutants are dangerous for the environment and human health...

... and are present in all environments (freshwater, wastewater, soil and air). These pollutants have an impact on ecosystems and are associated with numerous health problems (infertility, cancer, etc.). Financing the treatment of emerging pollutants is a challenge, and passing on these costs through tariff increases is difficult for local municipalities to implement, reinforcing inequalities in access to drinking water.

Resistance to change and political opposition are obstacles to public service innovation...

... and limit the expansion of **desalination** despite the mastery of the technology. Good communication and awareness-raising are essential to the successful deployment of this solution. Singapore and Israel are cited as successful examples of countries that have effectively implemented desalination.

... **wastewater reuse** faces both resistance to change on the part of utilities, and resistance from public opinion.

Yet Israel's example should inspire other countries, since their intelligent water management, which uses wastewater treatment techniques to irrigate crops not intended for human consumption, saves freshwater reserves, improves water supply security and promotes a culture of conservation, thereby reducing dependence on limited freshwater sources. In addition, the example of Israel highlights the importance of paying the full price for water to support infrastructure and encourage innovation in water management.

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