

# LETICIA CARVALHO

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"In the future,  
circularity, recovery  
of nutrients and energy  
from wastewater will  
be crucial"



 CRISTINA NOVO PÉREZ

**Wastewater treatment comes with challenges and opportunities. While untreated and inadequately treated wastewater threatens water bodies, its potential as a resource is yet to be realized.**

Earlier this year the United Nations Environment Programme (UNEP) and GRID-Arendal published the report *Wastewater. Turning problem to solution*, calling on governments and businesses to treat wastewater as a circular economy opportunity, instead of a problem. We asked Leticia Carvalho, Head of Marine and Freshwater Branch at UNEP, about the findings of the analysis and the work of the Global Wastewater Initiative, a multistakeholder platform for which UNEP provides secretariat services.

**Please tell us briefly about your career path and your current role at UNEP.**

I am the Head of the Marine and Freshwater Branch of the United Nations

Environment Programme. I am an international civil servant, Brazilian, oceanographer and policymaker, with more than 20 years of experience in environmental governance, sustainable development and multilateral negotiations. During my time at UNEP, I led the history-making plastic pollution policymaking, as well as mainstreamed ocean and freshwater ecosystem-based management into the relevant global and regional MEAs and governance arrangements, as well as spearheading ocean literacy and advocacy across UNEP and its Member States.

In my previous life, I led several multilateral agreements as lead negotiator and chairperson, including Law of the Sea, Biodiversity Beyond National Jurisdic-

tion, Regional Seas MEAs, International Maritime Organization Conventions, the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, the Minamata Convention on Mercury and Basel, Stockholm and Rotterdam Conventions on Chemicals and Waste Management. I was co-chair of the Strategic Approach to International Chemicals Management (2016-2018) and president of the Intergovernmental Network on Chemicals and Waste for Latin America and the Caribbean in the same period.

My practice lies squarely within the inter-agency negotiation, based on science-policy interface, related to the environment and health, climate, maritime

safety, and pollution, from source-to-sea, and along the life cycle of the production and consumption of harmful substances and products. Before UNEP, I held several positions at the Ministry of Environment of Brazil, including Director of Environmental Quality at Industry, responsible for chemicals and waste management and air quality regulations and industry engagement; and Deputy Director of Chemicals Safety. I also served as Special Adviser of the Government of Federal District - a singular mixed jurisdiction of state and city duties. My love for the ocean knows no bounds. As a young oceanographer, I spent more time at sea than many of the naval officers while mapping the continental shelf of Brazil to establish and define its exclusive economic zone from Uruguay to the Amazon. I braved many storms as the research vessel surveyed the fish populations, chemistry, and geology of depths up to 3,000 meters, which prepared me to take on any challenge!



## The GWWI has worked to change the paradigm of how wastewater is commonly seen, from simple waste to a valuable and rich resource



**The UN Global Wastewater Initiative (GWWI) has been in place for a decade now. What is your assessment of the GWWI's work over the past ten years?**

The GWWI has worked to change the paradigm of how wastewater is commonly seen, from simple waste to a valuable

and rich resource. This Initiative, for which UNEP provides secretariat services, now has over 100 members, and has implemented numerous projects for sustainable wastewater management on the ground in all corners of the world from Tanzania to Georgia, from the Caribbean to Morocco and Malaysia. The Initiative has also made inroads in terms of capacity-building and awareness-raising, elevating the profile of wastewater higher on the international agenda. Overall, I believe the GWWI has helped make progress, but the reality is that in 2022 only 58 per cent of all wastewater flows generated by households were safely treated before being released into the environment. Therefore, much more action, funding and commitments are needed for sustainable wastewater management to be a reality everywhere and for everyone.

**UNEP recently released the report *Wastewater. Turning problem to solution*. How did the idea of this report emerge?**

Back in 2010, UNEP and GRID-Arendal launched a report called *Sick Water: The Central Role of Wastewater Management in Sustainable Development - A Rapid Response Assessment*. It was a report aimed at highlighting the crucial role that

Gravel Filtration for Wastewater at CCBRT Hospital in Dar es Salaam, Tanzania.  
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## The opportunities for wastewater are many: there is five times more energy contained in wastewater than is needed to treat it



environmentally sound wastewater management plays in sustainable development. More than ten years later, with the Millennium Development Goals (MDGs) having come to an end in 2015, and as we enter the last 6 years to accomplish the Sustainable Development Goals (SDGs), we wanted to take stock of the progress made when it comes to wastewater management. The report looks at: progress made; what factors are preventing us from reaching better wastewater management; and case studies that shine a light on examples that are working. This is why we thought that such a publication is crucial now while we work hard to address the triple planetary crisis of climate change, biodiversity loss and pollution and waste. It also speaks to the crucial role that wastewater plays in areas such as climate change adaptation and sustainable nutrient management.

**"In many cases, sustainable wastewater management means decentralizing away from conventional and expensive treatment systems"**

### What findings would you highlight from the report?

Despite some good news and progress when it comes to wastewater management and sanitation provision, there is still much more to do to meet the targets under SDG 6, "Clean Water and Sanitation for All". The report highlights that today, almost half of the wastewater produced daily around the world enters rivers, lakes, and seas without treatment or adequate treatment. Unfortunately, only a small percentage, about 11 per cent, is reused. If we want to make a difference in the way water and wastewater are managed, we need to radically change these trends starting by reducing the volume of wastewater produced, preventing, and reducing contamination, and efficiently treating wastewater to capture the resources that can be safely reused. I think the opportunities for wastewater are many: for example, the nutrients recovered from wastewater are important fertilizers and soil improvers for crops. And there is five times more energy contained in wastewater than is needed to treat it. This energy can produce enough electricity for around half a billion people per year! This is why sustainable wastewater management is also an exciting climate solution. Who'd ever think you could say wastewater is exciting!

**The infrastructure required for wastewater collection and treatment can be expensive, yet there is a range of lower-cost nature-based solutions which may be suitable in some contexts. Should there be more emphasis on alternate solutions where appropriate?**

Absolutely. In many cases, to effectively protect freshwater and marine ecosystems through sustainable wastewater management means decentralizing away from conventional, and expensive systems by using alternative, low-cost solutions, and technologies. These are, for example, constructed wetlands, and smaller, community-based treatment plants, or smart sanitation systems that use little energy to collect and treat wastewater. Nature-based solutions such as constructed wetlands, vertical flow treatment wetlands, green walls, willow systems, and others are



less expensive, more agile to install and maintain, and less energy-intensive. They can do marvels where funds are short, or where there is a need for an effective solution tailored to the local needs.

**Wastewater reuse is gaining traction across the world driven largely by water scarcity. What barriers remain, and how can they be overcome?**

A shortage of financial resources often hinders the possibility of making progress when it comes to adequate, safe, wastewater treatment. In many instances, especially with conventional wastewater treatment systems, the costs to maintain them and upgrade them are high. Another barrier is the uptake of wastewater reuse. Reusing wastewater is a reality in only a few places around the world. However, as you said, in a world where the

demand for water is higher and higher, and where climate change impacts more than ever the availability of water, there is a need for governments and citizens to embrace wastewater reuse. Another barrier remains the lack of knowledge and adequate awareness that wastewater can be safe water. We are resistant to the idea of eating fruits or vegetables produced with safely treated wastewater, but when done right, we shouldn't be. Finally, most of us forget about wastewater after we flush the toilet; out of sight is out of mind and this cannot be the case. These are among the barriers that we have identified and discussed more in detail in the publication.

**The report presents case studies from across the world. Could you highlight one of them that particularly impressed you?**

I really enjoyed reading the two case studies related to beer produced with recycled water and urine-derived fertilizer. In the first case, the National Water Agency of Singapore collaborated with a private beverage company to produce and bring to the market a beer made from 100 per cent recycled water. In the second case, on the Swedish island of Gotland, a local university and a private company joined forces to recover urine and convert it into natural fertilizers to irrigate barley fields. These are ambitious yet tangible projects that show the power and potential of wastewater. Imagine, with the combination of technology, funding, and policies, we could get these kinds of amazing results and resources everywhere!

**Looking forward, what are the long-term goals and priorities for the UN Global Wastewater Initiative, and what impact do you hope to achieve in the coming years?**

I think the future is clear: reuse of unconventional water resources such as wastewater and others will be paramount and can help achieve water security. Circularity, and recovery of nutrients and energy from wastewater will be crucial. And, for that to happen, there is an enormous amount of work to be done by all stakeholders. The GWWI will continue to lead this change together with its great partners, and welcome new players of course, including from the private sector, investors, researchers, innovators, and many more that we expect will join us in this important journey.

**"In the future, reuse of unconventional water resources such as wastewater and others will be paramount and can help achieve water security"**



Wastewater Sedimentation Ponds at UN Complex Nairobi.  
Credit: Riccardo Zennaro, UNEP.