IWA SPECIALIST GROUP ON WETLANDS FOR WATER POLLUTION CONTROL

NEWSLETTER #56

WETLAND SYSTEMS FOR WATER POLLUTION CONTROL

the international water association

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Contents:

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Contributions from everyone are welcome!

INTRODUCTION

Dear Members,

This Newsletter No. 56 of the IWA Specialist Group on Wetland Systems for Water Pollution Control contains fresh contributions from our SG members across the globe. In this newsletter, we try to bring ourselves back to a sense of routine and normality with our regular interview series, updates on recent activities, overviews of past and upcoming events, as well as some exciting new initiatives from our Young Water Professionals.

We have two special highlight stories in this edition. First and foremost, our own Marcos von Sperling has received the IWA Global Water Award 2021! Congratulations Marcos on this prestigious achievement, and sincere thanks for your continued contributions to our field!

Secondly, we are happy to welcome co-chairs of the newly established Working Group (WG) on Nature-Based Solutions for Water and Sanitation. Katharine Cross of Water-Cities (Thailand), and Anacleto Rizzo of Iridra srl (Italy) to the Management Committee. The WG builds on the recent work of the Science for Nature and People Partnership (SNAPP) project.

We also welcome Tahra Al-Rashdi to the Management Committee as YWP Affiliate for the Middle East and Africa region. She is a PhD student in the Department of Soil, Water, and Engineering at the Sultan Qaboos University in the Sultanate of Oman. Her PhD research is on the use of vertical flow treatment wetlands for sludge dewatering.

IWA Specialist Groups are very much about networking, and although the residual effects of the pandemic have prevented us from meeting in person, we are looking to 2022 with a sense of hope and excitement for in-person events and activities to resume. We are also looking forward to developing new training initiatives in our SG through summer schools and webinars in 2022. We invite you to participate in these events and to contribute your own ideas, so we can regain momentum within our SG and rekindle connections and ideas that have been put on hold the past two years.

Warm regards,

Jaime and Pedro (co-chairs)
Laura and Stevo (YWP newsletter team)

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(open position)	North America	—	—
(open position)	South America	—	—

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HIGHLIGHT STORY

Marcos von Sperling receives the IWA Global Water Award 2021!

Jaime Nivala[1] and Pedro Carvalho[2]

1. INRAE, France
2. Aarhus University, Denmark

Professor Marcos von Sperling, active participant of our IWA Wetlands Specialist Group, received, on 24 May 2021, the IWA Global Water Award, which is the most prestigious prize given by the association, and is awarded every two years to a water professional in recognition of his/her contributions to the industry.

The award was presented (digitally, due to the pandemic), at the opening of the World Water Congress 2021, by the president of the association, Tom Mollenkopf:

"*Inspirational academic Marcos von Sperling has won the acclaimed IWA Global Water Award, during a presentation at IWA's Digital World Water Congress. The award recognizes an innovative leader who has made a significant contribution to a world in which water is wisely managed. Professor von Sperling, who works at Universidade Federal de Minas Gerais in Brazil, won the award for his work on wastewater and water pollution. Marcos' research has focused on innovative solutions which have practical application. His research, which has influenced policy in Latin America and beyond, has inspired many students, researchers and policy-makers*."

Marcos von Sperling making his speech upon receipt of the IWA Global Water Award at the Digital World Water Congress (24 May 2021)

Further details can be found in the following links:

https://iwa-network.org/news/four-inspiring-water-leaders-win-prestigious-iwa-awards/

https://www.youtube.com/watch?v=GLe8VPtGTQI&list=PL6u1Pjpf8O0Zv_-6IxKiM1bCKyTTX4_ag&t=3199s

Marcos von Sperling is a full professor at the Federal University of Minas Gerais, Brazil, has a PhD in Environmental Engineering (Imperial College London) and works for more than 40 years in the field of wastewater treatment. He is an IWA Fellow, and a frequent participant of the IWA wetlands conferences, both as delegate and as member of scientific committees. Newsletter 52 (August 2018) included an interview with Marcos, in the classical series of interviews conducted by Frank van Dien. Marcos is the main author and coordinator of the "*Biological Wastewater Treatment Series*", with seven volumes, all published as open access by IWA Publishing (https://www.iwapublishing.com/open-access-ebooks/3567). Volume 7 of this series is well known by the wetland community, and include the participation of several experts:

Dotro, G., Langergraber, G., Molle, P., Nivala, J., Puigagut, J., Stein, O., Von Sperling, M. (2017). Treatment wetlands. Volume 7. Biological Wastewater Treatment Series. IWA Publishing. 154p. https://iwaponline.com/ebooks/book/330/Treatment-Wetlands

HIGHLIGHT STORY

New Working Group – Nature Based Solutions for Water and Sanitation

Katharine Cross[1] and Anacleto Rizzo[2]

1. Water Cities, Thailand
2. Iridra srl, Italy

A new IWA working group is being launched focusing on Nature Based Solutions for Water and Sanitation (NBS WG). The scope of the NBS WG is to build on the work of the recent NBS Task Group which supported the Science for Nature and People Partnership (SNAPP) project on "Sanitation for and by Nature". The SNAPP project examined how water and wastewater utilities and their regulators can implement NBS into wastewater treatment facilities and nature-based solutions for urban runoff management, while also providing benefits to both people and nature. The TG provided technical input and peer review of the publication on NBS for Wastewater Treatment and a web-based tool for identifying water sanitation solutions.

The NBS WG aims to start as an activity of our IWA SG Wetland Systems for Water Pollution Control and aspires to be the IWA platform for promoting NBS, with the specific aim of exploring how SGs across IWA can come together on this topic, possibly in the form of an IWA cluster.

For more information, visit https://iwa-connect.org/group/working-group-on-nature-based-solutions-for-water-and-sanitation/timeline

If you are interested in the working group, please contact: Katharine Cross – katharine.cross@water-cities.org and Anacleto Rizzo rizzo@iridra.com

CONFERENCE UPDATE

17th International Conference of the IWA Specialist Group on Wetland Systems for Water Pollution Control – ICWS2022

Onanong Phewnil[1], Suthee Janyasuthiwong[1], John Bavor[2], Pedro Carvalho[3], Jaime Nivala[4]
[1]Kasetsart University, Thailand
[2]Western Sydney University School of Science, Australia
[3]Aarhus University, Denmark
[4]INRAE, France

Our bi-annual IWA SG conference is returning in 2022. Our colleagues at Kasetsart University will welcome us in Bangkok, Thailand from the 6 to 10 November 2022.

The organizing committee is working towards a physical meeting in Thailand. Ultimately, if needed, the conference will be held virtually.

The 17th International Conference on Wetland Systems for Water Pollution Control (ICWS2022) topics consist of:

1. **Wetlands, Water Quality and Biodiversity:** Influence of wetlands on water quality, biodiversity, and ecosystem services
2. **Use of Wetlands for Pollution Control:** agriculture, sludge treatment, industrial, stormwater, CSO, domestic, urban
3. **Wetlands and Water Reclamation:** Water reuse, reclamation, and water utilization
4. **Wetland Operation, Design and Innovation:** Design, implementation and system architecture and engineering, aeration, bioelectrochemical systems, hybrid systems
5. **Organic pollutants and emerging contaminants:** Persistent and emerging organic compounds, chemicals and agrochemicals, microplastics, including effects on wetlands, biodiversity and human
6. **Wetland Economics:** Benefits of wetlands such as agricultural, aquaculture, irrigation, ecotourism and waste utilization, ecosystems monetisation
7. **Social Impact and Community Well-being:** Social awareness and driving force on wetland management, public participation, education, policy, and planning
8. **Wetland Conservation and Restoration:** Using wetlands for remediation of deteriorated environment
9. **Wetlands and Climate Change:** Wetlands and the atmospheric change such as CO_2 reduction, methane emission and extreme weather events
10. **Modeling and Remote Sensing of Wetlands:** Design tools and modelling, data management, remote sensing, and spatial and temporal information

The call for abstracts is expected to open in January 2022 and abstract submission will be due in May 2022. Please keep an eye on the conference webpage for updates: www.icws2022.com. We expect that the website will be fully updated by the end of 2021.

MANAGEMENT COMMITTEE UPDATE

Bernhard Pucher[1], Pedro Carvalho[2], Jaime Nivala[3]
[1] Institute of Sanitary Engineering and Water Pollution Control, BOKU University, Vienna
[2] Aarhus University, Denmark
[3] INRAE, France

What are the needs of our SG, what emerging topics should be further discussed, and which tool is most appropriate? Those were the questions addressed at a virtual brainstorm session led by our co-chairs Jaime and Pedro in May 2021 with the participation of our Management Committee (MC). To structure this session a virtual white board divided in several sections was used to find ideas, needs and emerging topics. One the one hand available tools from the IWA, namely Task group, working group and IWA Cluster where addressed while on the other hand ideas for the improvement of the newsletter, webinar/workshop and miscellaneous where posted.

One of the main recurring suggestions was the inclusion of the TW community in the topic of nature-based solution (NBS), including different nuances from urban integration, water reuse and circular economy. In this regard, a lot has already happened since the brainstorm session. After the successful TG lead by Fabio Masi in the Sanitation by Nature project (SNAPP) a follow-up WG within our SG became a reality.

Another main topic, closely related, was water reuse. Here suggestions included further development of the topic within the SG, as well as presenting the SG outward as a group of experts on this topic and be included in the policy process. A workshop dedicated to the topic was organized within WETPOL2021.

In terms of our SG contribution to IWA clusters, several important topics were identified. Nature-based solutions, water reuse and resource recovery are not solely a topic of the SG for Wetlands for Water Pollution Control but include several other SG as well. To foster the strength of the IWA, interaction between the WGs is needed and will be developed.

A third topic occurring in several sections is the further development of modelling tools including the integration of experimentalists. One step was already done back in 2020 where a group of experts, mainly from the SG conducted a workshop on this topic. The outcome was presented in newsletter #55 (April 2021). While a cooperation of the facilitators is ongoing, a TG or WG on this topic would further support the model development and understanding.

From the contributions a need of available materials can be identified. This includes case study collections, design recommendations and explanations using multimedia tools as well as a collection of prior and recent publications of the SG with updates in each newsletter.

Webinars are identified as an appropriate tool to spread the knowledge within the SG. PhD students can gain in depth information from experts in their field. This can also include a platform for in depth-discussion which is often missing at conferences, especially when occurring virtually. Here a decision on a timeline and topics and facilitators needs to be done.

All those needs are perfectly summarized by one comment stating the need of a four-year vision for the SG. The brainstorm session presented here can thereby be seen as a starting point towards developing this vision and will be further developed in the future.

INTERVIEW

Interviewing Professor Hui Zhu

Frank van Dien
ECOFYT, The Netherlands

Frank van Dien: Dear Hui, I am really pleased to get to interview you, since Prof. Jamidu Katima from Tanzania said that you are the most interesting person he could choose from, in our little wetland universe! I have met you, a few times, like the majority of the people who have been interviewed so far, so I know that you are very productive, and you already have so many publications! Fifty or so? And I know that you are a very open person so interviewing you will be fun. But especially I am happy that, with you, we have the first Chinese lady in our series. And believe me, we are ever so curious about you! So now, for starters: Where in your life did things turn in the direction that resulted in your role in the world of Constructed (or Treatment) Wetlands?

Hui Zhu: It was not something special that guided me to join the constructed wetlands family. I started to do research on treatment wetlands in 2012, which was one year after I got my PhD. Like most of the young scientists, at the beginning of their career, I did research following the general direction of my research group. In my group, we started to do research on constructed wetlands in 2010 and at that time, the group leader, who was also my PhD supervisor, felt that we needed to put more people into this direction. Meanwhile I was pondering over my future planning. So, on a sunny afternoon, we talked and then I decided to start my journey to become a (constructed) wetlander. And that is how I started. For now, after nearly ten years of work experience, I can say: I definitely made the right decision.

Frank van Dien: So, I'd say: you smoothly rolled into it… And what has kept you working on wetland systems?

Hui Zhu: The first factor is my curiosity as a scientist. When I gradually joined the constructed wetland family, I saw many scientific issues to be explored and many technical obstacles to be conquered. So, with curiosity, I have been working on constructed wetlands these last nearly ten years, and for many years to come. Secondly, I have come to know so many great scientists in this field, I believe these people will together make the "world" of constructed wetlands more and more prosperous and I believe I will see some great breakthrough in this field, and maybe I am one of the people to make a big contribution someday, too.

Professor Hui Zhu

1983 Born in Liaoning Province, China

2011 PhD in Environmental Science, Northeast Institute of Geography and Agroecology, CAS

2014 First constructed wetland design, Yongchun county , Fujian Province

2016 to date: Committee Member of the IWA-Young Water Professionals, China Chapter

2018 to date: Associate Editor of Wetlands

2018 to date: Permanent Professor

2019 to date: Deputy Head of Key Laboratory of Wetland Ecology and Environment, CAS

2019 to date: Deputy Head of Jilin Provincial Engineering Center of Constructed Wetlands Design in Cold Region

2019 to date: Professional Wetland Scientist certified by Society of Wetland Scientists

Frank van Dien: This sort of follows from my earlier description of you as a very productive person… The next question that comes up is: do you see these wetlands as an ultimate solution for domestic/ municipal wastewater? And if so, in general or just occasionally, i.e., when no sewer system is available?

Hui Zhu: I think it is too deterministic to say constructed wetland can be used as an ultimate solution for domestic/ municipal wastewater. I do not believe there is a "master key" in

the water treatment industry. There are thousands of contaminants from different pollution sources and the purification capacity of constructed wetlands for many emergent contaminants remains unknown. With people's increasing expectations on water quality improvement, the integration of multiple techniques would be the ultimate solution. However, when there is no sewer system available, constructed wetlands, the most typical natural based solution, can of course be considered as a major solution.

Frank van Dien: Let me ask you a rather basic question: what do you actually do?

Hui Zhu: I have been trying to improve the efficiency of constructed wetlands in poor environments, for example, cold regions with seasonally low temperatures, and saline-alkaline environments with salt stress. Sometimes people are astonished about my research, as they think it is not a good idea to work on constructed wetlands in Northeast China, but I would like to prove it is opposite. Recently, I also focus on reducing the greenhouse gas emission from constructed wetlands. Natural wetlands continue to shrink, while there will be more and more new constructed wetlands to be built. What is the contribution of constructed wetlands in global climate change? Can we explore strategies to reduce the carbon emission from constructed wetlands while maintaining their basic function in water purification? These are important questions for us. But with constructed wetlands this seems to be an area that gets less attention than with natural wetlands. So, that's what I do.

Frank van Dien: Can you tell me: what do you do, besides wetlands, what are your other interests?

Hui Zhu: My other research interests include biogeochemical processes of nutrients, heavy metals, trace elements, and other contaminants in farmland, wetlands and rivers, as well as the restoration of degraded wetlands. One direction that I kept doing for years besides constructed wetlands is the nonpoint source pollution from paddy fields. We explore the pollution mechanism, evaluate the pollution load, and develop strategies to reduce pollution at the source. Similar with my main research direction, i.e. constructed wetlands, I am also interested in how to reduce the greenhouse gas emissions from farmland. The above directions together with the constructed wetland work have almost filled my life. However, I always try to make some time for myself to enjoy life. I love my work, but I love life more. I find jogging very addictive; it helps us to release dopamine. I like travelling, it allows us to see the beauty and diversity of the world. I also like cooking very much, I develop new dishes very often and I find it lots of fun, exploring in the kitchen.

Frank van Dien: Oh! If you cook with the same passion as you do your wetland work… I wish we could experience that too! But next: what is the most promising application area for wetland systems, besides domestic/ municipal wastewater?

Hui Zhu: I will say agricultural wastewater, particularly non-point source pollution from farmland. That contributes much of the water pollution in most countries and the regions in the world. But it might be most difficult to introduce other water pollution treatment technologies and to layout the relevant devices around the farmland. Instead, constructed wetlands and ecological ditches are available whenever wanted.

Frank van Dien: Is there, to your knowledge, a Treatment Wetland that is an example for us all? Or just one that you can bring to our attention, for some specific reason?

Hui Zhu: Many constructed wetlands have left me with deep impressions. For example, Constructed wetlands in Wenhe National Wetland Park, Shandong, and constructed wetlands in Beijing Olympic Forest Park. The former is the biggest one in North China to the best of my knowledge. While the latter made great contribution for the 2008 Olympic Games.

Frank van Dien: What is the most needed area of further research and study for treatment wetlands?

Hui Zhu: 1) Develop strategies to enhance the purification efficiency of constructed wetlands remains important in the future research, especially for regions with poor environment, such as cold regions, salinized areas, etc. Also, for regions with an high population density and shortage of land resource, only highly efficient constructed wetlands are feasible as there might be not enough land to build large constructed wetlands. Then the only way is to increase their efficiency.

2) To increase the multiple ecological service functions of constructed wetlands might be a tendency in the following 5-10 years. Unlike natural wetlands, constructed wetlands have their figurability, as they are artificial. We are living in a challenging world. Food shortage, biodiversity loss, climatic anomalies, extreme precipitation and the consequent flood disasters will pose threat to people in many countries and regions. Therefore, as an artificial ecosystem with figurability, constructed wetlands are supposed to play an important role in serving multiple functions such as biodiversity maintenance, carbon fixation, flood regulation, etc, apart from their main function for water purification. For now, I feel the relevant research is not enough.

3) The post-evaluation related to the operation and management of constructed wetlands might also need more attention. For scientists, we usually focus more on the basic theory and technique development. While engineers focus on how to build a good quality wetlands. While, if the constructed wetlands are good enough and if the management of the constructed wetlands is scientific and reasonable, those are more important for the investors (i.e. governments, companies, etc.). I have seen some constructed wetlands that look good but do not work well, either due to poor design or due to the behindhand management. I know there are quite a few construction standards or guidelines for constructed wetlands in different countries, but they only provide a standard for the first phase, however I also worry about the post phase, and maybe building some post-evaluation systems could be beneficial.

Interviewing Professor Hui Zhu

What does this world need most at the moment?

1) Peace, common development and prosperity;

2) defeat the COVID-19 pandemic.

What does the world need most at the moment, concerning water?

1) Water quality improvement;

2) storm water and flood management, as more extreme rainfall happens

Frank van Dien: Pfou…. Hui! I get to understand why you work so hard! You just covered all the area's thinkable, I guess - and you want it solved in your lifetime, don't you? I must say: I admire your wide perspective and how well you put these issues in words… How could we get to more cooperation in research? Would you have an answer to that?

Hui Zhu: 1) Publication of the latest theory or technology is always a good way for scientific communication and for creating potential cooperation. So, a thriving publishing industry is always important.

2) Academic conference is another good way. Unfortunately, COVID-19 pandemic has disrupted the plan for many academic conferences. I feel this will block the progress of science research to some extent. Virtual meetings are available of course, but for me, I feel it is not as effective as face-to-face communication. Similarly, the exchange of researchers between different countries is important to create cooperation, but it is also affected by the pandemic. Let's hope the world will recover soon.

Frank van Dien: Yes…. So right…. My last question is: who would you like to be interviewed next time?

Hui Zhu: I will recommend Professor Yaqian Zhao who works at the University College Dublin, as he is one of the most artistic scientists in the constructed wetlands field that I know.

INTERVIEW

Young Water Professional Alba Caney-Martí

Stevo Lavrnic[1] and Laura Delgado-González[2]
[1]University of Bologna, Italy
[2]INRAE, France

Stevo & Laura: Tel us something about yourself?

Alba: When I try to define myself, I find it difficult, so I usually think of my colleagues, whom I admire, and with whom I founded an NGO called Connecta Natura. We are a group of people, mostly from the Valencian Community (Spain), working on environmental projects related to agroecology and ecosystem restoration, learning from each other. Imagine us working in the field and having a tasty paella for lunch in an olive grove in the mountains overlooking the Mediterranean Sea, with wetland systems in between.

YWP Alba Caney-Martí

PhD student and Scientific project member

University of Natural Resources and Life Science (BOKU), Vienna. Institute of Sanitary Engineering and Water Pollution Control (SIG)

Stevo & Laura: Can you tell us something about a project you are working on?

Alba: WATERAGRI is a European project funded by Horizon 2020 program, which includes nine countries from Boreal, Continental and Pannonian biogeographical regions. The project aims to reintroduce and improve sustainable solutions for water management and nutrient recycling to increase the resilience of agricultural fields to meet the present and future challenges of climate change and population growth. The reintroduction of nature-based solutions, such as constructed wetlands, bio-inspired drainage systems or the application of biochar, in agricultural fields, will enable better management of excess and shortage of water and nutrient recovery from agricultural catchments. Besides, a modelling framework will also be developed to support management decisions based on model predictions and remotely sensed and in situ measured data. The framework will include simplified models to describe the behaviour of a solution in relation to hydrology and/or nutrient management as decision support.

Stevo & Laura: Can you tell us a bit more about your job description and daily duties?

Alba: My role in the project is directly related to the simplified models. I am responsible for developing the simplified models with the support of the other partners. I am now focused on two solutions; farm constructed wetlands for water retention and nutrient removal; and tracer methods for water flux quantification in agricultural fields. My tasks range from field sampling, sample analysis, other data collection and testing of the simplest models that can provide valuable information for farm managers.

Stevo & Laura: Since when have you been working with wetland systems and how did you develop an interest for them?

Alba: In the summer of 2012, I saw my first CW on a permaculture farm in the Netherlands. It treated all wastewater (to check the picture), which was recirculated and used for flushing the toilet and the washing machine. I was surprised to see that they had such a useful and well-integrated system that I had not learned during my studies. During a stay in Guatemala in 2013, I realized that such systems, with low operation and maintenance requirements, would be suitable for communities and would solve many environmental

and social problems. But it was in 2014 when I actively worked on them. That year I designed and built a horizontal constructed wetland in the region of Cusco, Peru, for my bachelor thesis. Then I decided to study a master's degree specialized in water treatment and modelling, taking me to Austria. Here I did my master's thesis with Günter Langergraber on the influence of different design options on the performance of vertical flow treatment wetlands using the HYDRUS Wetland module for simulation.

Viewing the plan of the wetland in Winterswijk, the Netherlands.

Stevo & Laura: What aspect of wetland systems do you find particularly interesting?

Alba: It's definitely its versatility that excited me from the very beginning. They can be adapted to different climates and treatment purposes, and communities with fewer resources and technical skills can also implement them. I find it fascinating.

Stevo & Laura: Have you already participated in the SG conferences? If yes, what is your best memory of it? If not, are you considering joining the next one?

Alba: Yes, I met many people whom I admired and quoted in my thesis and my first paper. The small but stable wetland community showed me that constructed wetlands were not a fad and that cooperation far outweighed competition.

Yes, I am already thinking about the abstract to hand in for the next one. Specially to meet with all the PhD students that I met at the Constructed Wetlands for Water Pollution Control Course, organized by Aarhus University last September.

INTERVIEW

Young Water Professional Marco Hartl

Stevo Lavrnic[1] and Laura Delgado-González[2]
[1]University of Bologna, Italy
[2]INRAE, France

Stevo & Laura: Tel us something about yourself?

Marco: Originally, I am from a touristic town in the Austrian mountains, imagine the film set of "Sound of Music". Hence I grew up skiing, snowboarding and building tree houses in the forest. There are even some very pretty and special mountain wetlands there.

YWP Marco Hartl

Ecological Engineer, Technical Lead

alchemia-nova GmbH, Institute for circular economy & nature-based solutions (https://www.alchemia-nova.net/)

Stevo & Laura: Can you tell us something about a project you are working on?

Marco: At the moment, I am mainly working on a H2020 project called HOUSEFUL (houseful.eu) which is about closing water and nutrient cycles at building scale. At the moment we are in the construction phase at the Austrian demonstration site "Cambium" in Fehring, Styria (2 more practical demo sites are near Barcelona and one theoretical site in Vienna), where we sewer mine the domestic wastewater from a 70 PE eco-village which was established in the buildings and grounds of a closed military boot camp. The water is led to a 4-chamber septic tank and the pre-treated water is further purified with our vertECO© system within a wintergarden which also serves for plant breeding. The effluent will further be hygienised through an ozonation unit and reused as fertigation water in the onsite agriculture. During the 1 year monitoring phase we will have a special focus on pathogens and through a collaboration with Medical University Graz also examine antibiotic resistances. During cold season the winter garden will be heated with hot water from the microbial activity in a so-called "Biomeiler" (compost heater) which we just recently built with locally sourced green clippings, wood chips and manure. The wastewater solids i.e. the sludge in the septic tank will be treated in a sludge treatment wetland and reused in the local agriculture as well. Additionally, a household scale anaerobic digestion system by the Israeli consortium partner Homebiogas will be implemented, to valorise household organic waste into cooking gas.

Stevo & Laura: Can you tell us a bit more about your job description and daily duties?

Marco: In the HOUSEFUL project I am the technical lead, which means that I am responsible for and overlook all the technical aspects of the project, including lab-scale optimization tests, reporting and now the above-mentioned installations and following monitoring. I hope I will be able to present some results in next year's IWA wetland conference! Apart from that I am also involved in the technical developments of the company and other H2020 projects, for example DIVAGRI where we develop "multifunctional" CWs for various contexts in different countries in Africa.

Stevo & Laura: Since when have you been working with wetland systems and how did you develop an interest for them?

Marco: I have been working with wetland systems since I stepped into the office of Günter Langergraber at BOKU University and asked him whether he would by any chance have a Master Thesis topic in the field available. Luckily, he had a very interesting on-going project on the first full-scale system of a novel two-stage vertical flow CW design, situated on the top of a mountain, and they still needed someone to shovel snow, and also conduct frequent monitoring campaigns and tracer tests. I fell for constructed wetlands a couple of years earlier, during my Bachelor study's ERASMUS semester at the Norwegian University of Life Sciences in Ås, Norway where I participated in an intensive 4-week course called Sustainable Sanitation led by Petter D. Jenssen. It was just fantastic to learn how such seemingly "simple" systems can foster these amazing processes and purify wastewater from all different kind of sources. As my first job after Uni I went for 15 months to the desert to work for BAUER and had the honour to coordinate a research project at the Nimr Water Treatment Plant which hosts the possibly biggest constructed wetland worldwide with around 500 ha of surface flow beds. It is just amazing how the system is able to purify 175,000 m³ "produced water" (wastewater from oil production) per day basically without energy consumption and at the same time act as a wildlife refuge in the middle of the Omani desert, with dozens of bird species living there all year long and many more to use this engineered ecosystem as a fuel stop when migrating back and forth between Asia and Africa.

Stevo & Laura: What aspect of wetland systems do you find particularly interesting?

Marco: The possibility to create a small engineered and to a certain degree controlled copy of natural wetland systems and guide the processes in the system through the design and operation. I am always amazed by the flexibility of the microbial communities to adapt to the provided conditions and consequently fulfil various tasks. At the moment I find it especially exciting to optimize the systems towards maximum reuse potential of the effluent for fertigation purposes. And then they have so many "co-benefits". They are just great.

Stevo & Laura: Have you already participated in the SG conferences? If yes, what is your best memory of it? If not, are you considering joining the next one?

Marco: Luckily, I was able to participate in Valencia in 2018. The best was to see everyone again whom I met at my first conference (WETPOL2017 in Big Sky, USA) and get to know even more wetland enthusiasts, spend time with them at the conference venue and of course also one or two bars. It also meant a lot to see the interest of people coming to see my presentation on the results of one of my PhD projects experiments (CWs in combination with microbial fuel/electrolysis cells, at UPC Barcelona and Ghent University). This community is just very special!

Stevo & Laura: Since when are you a member of the SG? Why do you think it is important to be involved in it as a YWP? / What have you gained with it?

Marco: I am an IWA member since 2017 and right away joined the wetland SG online. Since 2019 I am part of the SG Management Committee as a Young Water Professional Affiliate. It is a great platform to get engaged in the community and extend your knowledge and network even further, for example by becoming part of an interdisciplinary task force or working group which also involves other SGs. It is a great opportunity also for younger wetlanders to represent the community, to support the upcoming activities and events and thereby reach and involve even more motivated people.

REGIONAL UPDATES

ASIA UPDATE

The world's first large-scale modular constructed wetland completed in Nanjing, China, treating effluent from WWTP

Yaqian Zhao[1], Minwei Zhou[2], Yunfeng Wei[2]
[1]Regional Coordinator for China, IWA Specialist Group "Wetland Systems for Water Pollution Control"; Xi'an University of Technology, China
[2]Sino-Europe Constructed Wetland Research and Development Center, Jiangsu Hippo Co. Ltd, Changzhou city, China

The assembled modular constructed wetland (MCW) sewage treatment system, developed by Sino-Europe Constructed Wetland Research and Development Center (SECWR&DC) of Jiangsu Hippo Co. Ltd, was recently completed in Xingdian Town, Pukou District, Nanjing City, China. This is believed to be the world's first large-scale MCW sewage treatment system built on the basis of the previous practice of small-scale MCW system developed by the SECWR&DC.

Constructed wetland (CW) is an environmentally friendly sewage treatment technology developed in 1960s, which owns the advantages of low investment, convenient maintenance and management, and high environmental benefit. At present, CW has been increasingly used in China's sponge city construction, black and odorous water treatment, rural sewage treatment, and the effluent treatment/polishing of urban sewage treatment plants. In line with the China's green infrastructure implement, CW has the opportunity and trend of intensive and large-scale application. However, the low professionalism of CW construction and the substrate clogging of wetland operation have become the important factors to restrict the development of the CW technology.

Figure 1. Photograph of the MCW system

MCW can effectively solve the above problems. It aims to break through the traditional model of large-scale CW construction. It has the characteristics of factory production of wetland module pieces; construction site assembly; directional flow of water; local clogging and replacement, which greatly speed up the construction progress and promote the CW construction to semi-factory and industrialization. Obviously, it has a good application prospect in the practice while promoting CW technology.

To the best of our knowledge, the MCW in Nanjing is the first large-scale project of its kind in the world. The MCW system is to treat the effluent of kitchen and domestic sewage mixed wastewater with capacity of 800 m^3/day, from grade A (Chinese standard) to Class IV (Chinese surface water standard). The MCW is a multi-stage hybrid system with net wetland area of about 1,600 m^2. Compared with the conventional CW system, it saves an area of about 3,200 square meters, and has reserved land for the later stage development.

Figure 2. Construction of site

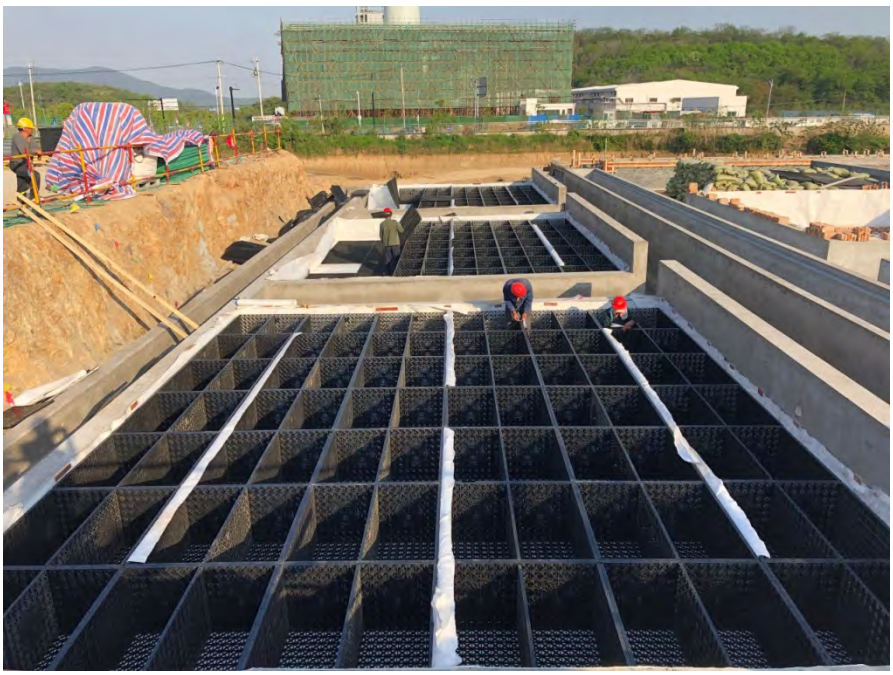

Figure 3. *In-situ* assembly of the MCW system

The patented technology of MCW variable box from Jiangsu Hippo Co. Ltd. and the combination of mixed substrates packing are applied in the project, which solves the problem of easy logging, prolongs the service life of wetland. Meanwhile, the installation is convenient, while the operation and maintenance costs are effectively saved. The project has been completed and entered the commissioning period.

Figure 4. Photograph of the MCW system in Sept 2021

https://www.thesourcemagazine.org/world-first-claim-for-chinese-modular-wetland/

Enhancing blue carbon effect for coastal wetlands by depressing greenhouse gases emissions

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Coastal wetlands can sequestrate and store large amounts of CO2 from the atmosphere, convert them into organic carbon through photosynthesis and food chains, and accumulate in sediments of wetlands as so-called blue carbon. However, through the effects of respiration, nitrification and denitrification, and methane fermentation, the wetlands will also release greenhouse gases (GHGs) such as CO2, CH4 and N2O. Therefore, wetlands might be either carbon sinks or sources on greenhouse effect. Five natural and artificial coastal wetlands in Taiwan, including Danshui River Estuary Mangrove Wetland (DREMW), Kaomei Saltmarsh Wetland (KSW), Chiku Mangrove Wetland (CMW), Yuanchungkan Mangrove Wetland Park (YMWP), and Datang Mangrove Constructed Wetland (DMCW) were investigated to assess their carbon sink. The results showed that the net carbon fluxes of the DREMW, KSW, CMW, and YMWP were calculated equal to +1343¸ +815, +2006, and +185 presenting carbon sink effects, respectively, while the value for DMCW was measured equal to -676 g CO2 eq m-2 yr-1 exhibiting carbon source function, which was because the DRBEMW, KSW, and CMW were natural wetlands, YMWP were created wetland receiving polluted river water as influent, and DMCW was treatment wetland using mariculture wastewater as its influent. High nitrogen contents in polluted river water and wastewater were the main source of GHG of N2O released from the artificial wetlands resulting in carbon source for greenhouse effect. In order to enhance the blue carbon effect for coastal wetlands, GHG emissions, especially for N2O, are required to be depressed by some environmental and ecological technologies.

A Decade of Constructed Wetlands for Wastewater Treatment in Indonesia

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Current status of wastewater treatment in Indonesia

The research of constructed wetlands (CWs) since around ten years ago in Indonesia started in 2009 to treat wastewater from a farmhouse in a research station in Jatinangor, West Java (Kurniadie, 2011) with a promising result that wastewater treated with vertical subsurface flow-CW still can be used for irrigation water and fisheries. The choice of CW types has also been researched from literatures in Malang, East Java (Suswati and Wibisono, 2013) with a perspective that CW performance is better when using a combination of plants than using only a single species of plant.

A pilot-scale project was built in South Jakarta, DKI Jakarta, to determine the performance of subsurface CW in urban areas (Hendrawan *et al.*, 2013) with the findings of high removal efficiency of up to 90% for seven parameters of pollutant in 22 days of observation. CW for industrial wastewater and restaurant wastewater has also been researched. Siswoyo *et al.* (2020) used free surface water CW batch to treat wastewater from tapioca industry in the northern part of Sleman, DI Yogyakarta, planted with water hyacinth (*Eichhornia crassipes*). The ability of CW to reduce BOD, COD, TSS, and cyanide were up to 97.9%, 84.4%, 45,6%, and 99,9%, respectively, for ten days of observation, which is excellent to overcome the problem of wastewater pollution from tapioca industry. Full-scale horizontal subsurface flow CWs in a cascade for restaurant, hostel, and public toilet use has also been researched (Perdana *et al.,* 2020), in Bali, in 2015, with six types of planted plants. There was high removal efficiency at certain times (up to 90.66%) for eight pollutant parameters in 4 months of observation during the dry season of May to August in Indonesia. Recently, Marleni *et al.* (2021) has researched household wastewater treatment using a combination of a sedimentation-filtration-phytoremediation chambers (HSSF-CWs) and a solar disinfection chamber in Magelang, Central Java which is written in the implementation of a household wastewater treatment section.

The demand of using constructed wetlands in Indonesia

Wastewater treatment in Indonesia has applied various technologies comprised of aerobic, anoxic, and anaerobic treatments. However, the demand for a treatment system that costs little and easy to operate and maintain and has few environmental impacts is still high. The constructed wetland is one of the treatments that offer moderate capital and operation costs, low energy consumption, simple maintenance, and preserving wildlife habitats (Keizer-Vlek *et al.*, 2014). As a tropical country, Indonesia has many varieties of macrophytes that are capable of treating water pollutants. According to a review by Arliyani, *et al.* (2021), the tropical plants which can remove certain pollutants in the Horizontal Sub Surface Flow (HSSF) and Vertical Sub Surface Flow (VSSF) can be seen in Table 1.

In addition to the plants' variety, the climate is one of the factors that determines the success of wetlands. Indonesia has a temperature and humidity that is suitable for the growth of macrophytes plants. Indonesia has year-round sunlight and high average temperatures that boost vegetation productivity and diversity (Nelson *et al.*, 2007). Furthermore, ultraviolet radiation and solar heat can omit the pathogenic bacteria in the wastewater (Kurniadie, 2001; Marleni, *et al.*, 2021)

Table 1. Tropical plants to remove pollutants

COD	*Cyperus papyrus*		BOD	*Arundo donax*
	Canna indica			*Cyperus papyrus*
	Canna esculenta			*Canna indica*
	Scirpus grossus			*Typha latifolia*
	Typha domingensis			*Phragmites australis*
	Phragmites australis			
	Vetiveria zizanoides			
	Hedychium coronarium			
Fe	*Phragmites australis*		Cr	*Phragmites australis*
	Juncus effussus			*Juncus effussus*
				Typha latifolia
				Phragmites australis
				Canna indica
Cd	*Phragmites australis*		Zn	*Phragmites australis*
	Juncus effussus			*Juncus effussus*
Cu	*Typha latifolia*		Ni	*Phragmites australis*
	Phragmites australis			*Juncus effussus*
	Canna indica			*Typha latifolia*
				Phragmites australis
				Canna indica
Pb	*E. crassipes*			
	S. molesta			
	P. stratiotes			
	E. crassipes			
	Imperata cylindrica			

Implementation of a Household Wastewater Treatment in Magelang, Central Java

The research of household wastewater treatment using a combination of a sedimentation-filtration-phytoremediation chambers (HSSF-CWs) and a solar disinfection chamber in Magelang, Central Java has been done in 2019 (Figure 1 and Figure 2). The results showed that the removal efficiency of organic matters was high (up to 92%), and the system was also capable of removing ammonia at 57% and reducing pathogenic bacteria by 88%. The treated water quality fulfilled the quality standard for outdoor use, such as for irrigation and fisheries.

Figure 1. Combined CWs Treatment in a single house

Figure 2. Treated Effluent for Watering Garden

Outlook for the future

Although constructed wetlands (CWs) have been generally used in Indonesia, a more economical treatment system is still required. In CWs, plants roots are the most crucial part of pollutant removal; thus, the innovation to maximally support the growth of plants roots growth is required. Abed, *et al*. (2017) study show that Floating Treatment Wetlands (FTWs) are potentially less costly than conventionally constructed wetlands. FTWs also have a system that supports better root growth than conventional CWs. Another advantage of FTW is the use of floating mats for growing plants and macrophytes. The floating plants' mat moves up and down following the water level (Colares *et al.,* 2020), which allows roots to have close contact with water and have the possibility to absorb more pollutants. Considering all the advantages described above, therefore, the use of FTW in Indonesia has excellent prospects. Based on a literature search for a decade, only one study was found that discussed nutrient removal by FTW in Indonesia (Sugiarti *et al*., 2020).

Another research prospect is CWs treatment combination. Treatment combination can be in the form of planting different macrophytes, using different media types, and combining the constructed wetlands with other treatment units to increase the performance of CWs. In addition, many research still conducted their experiment in the laboratory or pilot scale mode (Colares *et al*., 2020). Thus, the future challenge is to apply all bench-tested systems on natural systems to gather data on how the components of CWs react with all factors in nature, such as climate. To develop the application of constructed wetlands in Indonesia, therefore all three aspects above should be considered.

References

Abed, S.N., Almuktar, S.A. and Scholz, M., 2017. Remediation of synthetic greywater in mesocosm—scale floating treatment wetlands. *Ecological Engineering*, 102, pp.303–319.

Arliyani, I., Tangahu, B. V and Mangkoedihardjo, S., 2021. Selection of Plants for Constructed Wetlands Based on Climate and Area in the Interest of Processing Pollutant Parameters on Leachate: A Review. *IOP Conference Series: Earth and Environmental Science*. [online] Available at: <https://iopscience.iop.org/article/10.1088/1755-1315/835/1/012003/meta>.

Colares, G.S., Dell'Osbel, N., Wiesel, P.G., Oliveira, G.A., Lemos, P.H.Z., da Silva, F.P., Lutterbeck, C.A., Kist, L.T., and Machado, Ê.L., 2020. Floating treatment wetlands: A review and bibliometric analysis. *Science of The Total Environment*, [online] 714, p.136776. https://www.sciencedirect.com/science/article/pii/S0048969720302862

Hendrawan, D.I., Widanarko, S., Moersidik, S.S., Triweko, R.W., 2013. The Performance of Subsurface Constructed Wetland for Domestic Wastewater Treatment. *IJERT*, 2(6), pp. 3374-3382

Keizer-Vlek, H.E., Verdonschot, P.F.M., Verdonschot, R.C.M. and Dekkers, D., 2014. The contribution of plant uptake to nutrient removal by floating treatment wetlands. *Ecological Engineering*, 73, pp.684–690.

Kurniadie, D., 2001. Constructed Wetlands to Treat House Wastewater. a Solution for Indonesia? *Bionatura*, 3(1).

Kurniadie, D., 2011. Wastewater Treatment Using Vertical Subsurface Flow Constructed Wetland in Indonesia. *American Journal of Environmental Sciences*, 7(1), pp. 15-19.

Marleni, N.N.N., Ermawati, R. and Istiqomah, N.A., 2021. Application of Combined Phytoremediation Greywater Treatment in A Single House. *Journal of the Civil Engineering Forum*, 7(1), pp. 47-58.

Nelson, M., Cattin, F., Tredwell, R., Depuy, G., Suraja, M., and Czech, A., 2007. Why there are no better systems than constructed wetlands to treat sewage water: Advantages, Issues, and Challenges. *Society*, (November).

Perdana, M.C., Hadisusanto, S., Purnama, I.L.S., 2020. Implementation of a Full-Scale Constructed Wetland to Treat Greywater from Tourism in Suluban Uluwatu Beach, Bali, Indonesia. *Heliyon*, 6(10), pp .1-9.

Siswoyo, E., Faisal, Kumalasari, N., Kasam, 2020. Constructed Wetlands dengan Tumbuhan Eceng Gondok (Eichhornia crassipes) sebagai Alternatif Pengolahan Air Limbah Industri Tapioka. *Jurnal Sains dan Teknologi Lingkungan,* 12(1). pp. 59-67.

Sugiarti, S., Setiadewi, N., Oktaviyani, D. and Rohaningsih, D., 2020. Penyisihan Nutrien Nitrogen Pada Limbah Cair Artifisial NPK Menggunakan Sistem Floating Treatment Wetlands (FTWs). *Jurnal Ilmu Lingkungan*, 18(3), pp.595–601.

Suswati, A.C.S.P. and Wibisono, G., 2013. Pengolahan Limbah Domestik dengan Teknologi Taman Tanaman Air (Constructed Wetlands). *Indonesian Green Technology Journal*, 2(2), pp. 70-77.

A new modular constructed wetland is the future of sewage treatment in rural China

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In the last decades, the water pollution caused by the random discharge of rural sewage and the use of dry toilets has attracted attention in China. With the progress of urbanization, rural wastewater treatment is an important part of new rural construction in China. Generally, the rural sewage is wastewater from toilet, washroom, bath, and house-feeding poultry and livestock. Comparing to the rural domestic wastewater, the rural sewage usually contains more organic and nitrogen pollutants. Besides, the life and work styles in the rural China leads to great varieties of quality and quantity of sewage, and the dispersed residence causes difficulties in collecting the sewage and high cost in pipe network construction. Currently, the treatment technologies for rural sewage in China is still those centralized treatment technologies for urban domestic wastewater. However, these technologies are not suitable for rural sewage in China due to their high cost in facility construction, operation and maintain.

A new modular constructed wetland (CW) system has been designed and developed to solve the problems in wastewater treatment in rural China. This CW system consists different modules: one septic-tank module, one inlet tank module, and one or more CW modules. The rural sewage influent is stabilized in the septic-tank module. Then, inlet tank module changed the continuous influent into intermittent by using pulse inlet. This also improves the oxygen level in the CW modules. The pollutants are removed in the CW and the effluent can reach the requirement in national Standard 1B (COD≤60 mg/L, NH_3-N≤8mg/L, TN≤20 mg/L, TP≤1mg/L).

These modular CW systems are suitable for the decentralized sewage systems in rural China. As designed, one CW module could meet the treatment requirement for one single household (2-4 persons, 1-2 m^3/d), and when 8-10 CW modules are employed, the system can meet the needs of sewage treatment for small villages (10-20 households). All the modules are produced and can be quickly installed in the field, with extremely low cost of construction. There are back-flush pipes integrated into the modular CW systems, which ensures the CW will not be blocked during the long-term operation. The low maintain fee and easy maintain routine further improves the applicability of this modular CW systems in the less developed rural area of China.

This new CW system has been used to in decentralized rural sewage treatment projects in Tangjiaba Village, Geleshan Twon, Jushilin Village, Bishan Town, and other rural areas in Chongqing, Sichuan Province, Jiangxi Provinces, etc. The advantages and successful application show that this new type of CW, integrated self-cleaning pulsed vertical flow constructed wetland, is an ideal technical for sewage treatment in the rural areas and the future of sewage treatment in rural China. This new CW is also perfect candidate technology for decentralized wastewater treatment in the developing countries.

EUROPE UPDATE

HYDRO 1 + 2: CW for Agroforestry fertigation Lesvos (Greece)

Fabio Masi[1] and Anacleto Rizzo[2]
[1]IRIDRA Srl, Firenze, Italy 1

HYDRO 1 and HYDRO 2 are two of the six pilots of the HYDROUSA project (www.hydrousa.org).

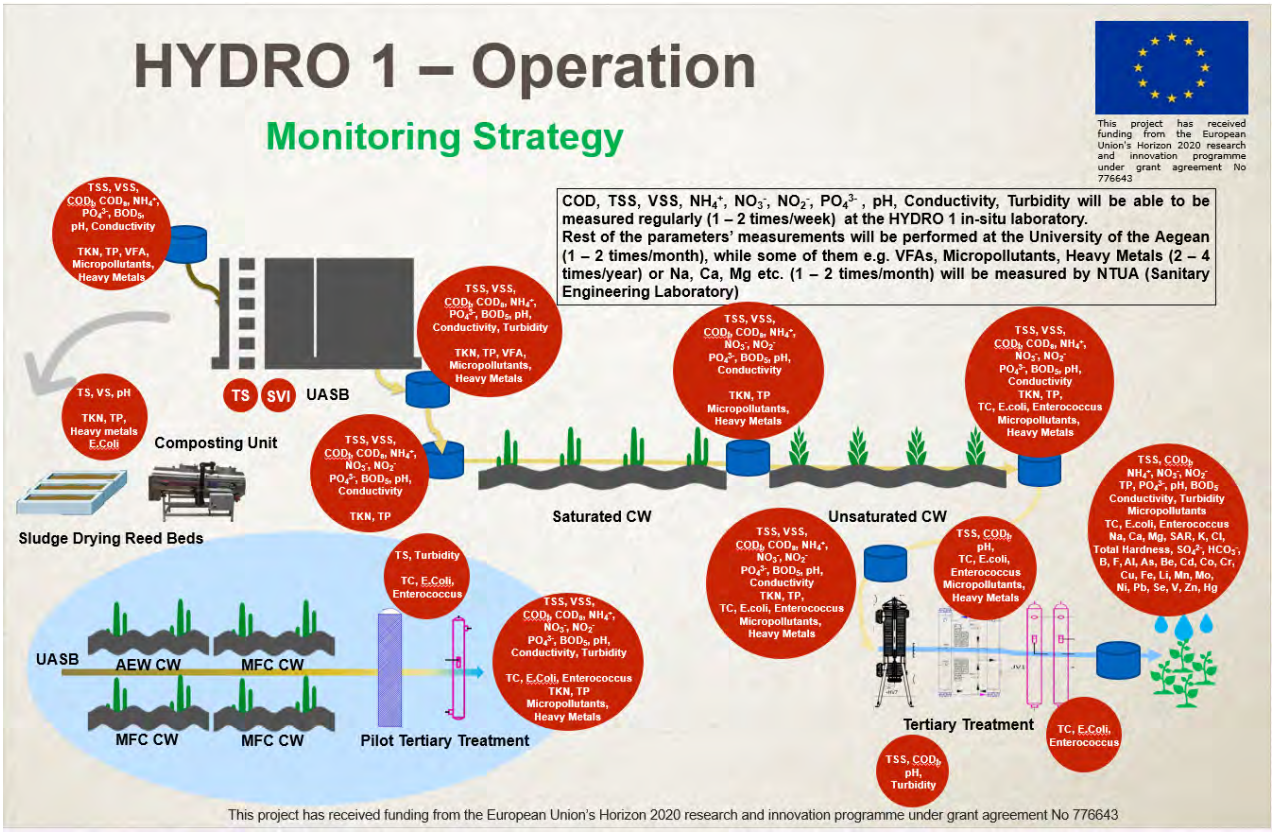
The aim of the Lesvos pilot site (HYDRO1+HYDRO 2) is to demonstrate the possibility to treat wastewater produced by a touristic site (high fluctuation in sewage production due to seasonality of touristic activities) and produce an effluent suitable for reuse in irrigation under strict Greek water quality standards and the new EU directive on wastewater reuse in agriculture. The treatment chain of the Lesvos pilot include: UASB + constructed wetlands + ultrafiltration + UV lamp.

The effluent is reused in an Agroforestry site (HYDRO 2) for food production.

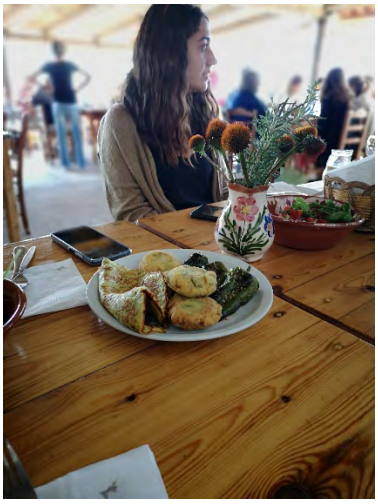
HYDRO 1 + HYDRO 2 and the very complex and accurate monitoring tools were designed by a multidisciplinary group involving different European partners (Aeris, Iridra, alchemia Nova, Agenso, NTUA, UNIVPM) and target to have a full circular economy approach for wastewater, recovering energy and sludge from UASB, water and nutrients from CWs, finally producing valuable food and biomasses in HYDRO 2.

The CW stage has the following characteristics: 1st stage saturated vertical subsurface downflow CW, VF1 SAT, with a bed of 17.5x14 m (245 m2); 2nd stage unsaturated intermittent load VF CW, VF2 UNSAT, which is divided in 3 beds to fit the local orography; the 3 beds host the 4 VF2 UNSAT lines for batch feeding (lines A, B, C, and D); each line sizes 18x8.5 m, i.e. about 150 m2; the total net surface of VF2 UNSAT is equal to about 600 m2. By the online sensors and lot of laboratory analysis the whole startup period, started in March 2021, has been monitored including all the summer period; the quality of the effluents has been all time appropriate for fertigation practices according to the WHO guidelines and EU directive on wastewater reuse.

These good results have been obtained even without using the UF device, due to the TSS level in the unsaturated VF CWs effluent is constantly very low and there are no reasons for turning on the ultrafiltration.



An unexpected and totally improvised 1st social experiment, a sort of tasting event, has been organised in September 2021 and offered by a kind local restaurateur, Blue Sardinas in Skala Eresou. All guests have been invited for lunch and they all knew since the very beginning that they were eating HYDRO 2 produces; at the end of the lunch, guests were asked about their appreciation of the food quality and they were all very satisfied and clapping at the Hydrousa project approaches and goals presentation. The delicious "zucchini balls" kindly cooked making use of the HYDRO 2 produces (pumpkins, zucchini, mint, onions) were such a great combo!



PhD summer course at Aarhus University, Denmark

Pedro N. Carvalho[1], Pascal Molle[2], Tom Headley[3], Hans Brix[1] and Carlos A. Arias[1]
[1] Aarhus University, Denmark
[2] INRAE, France
[3] WET Systems, Australia

Aarhus University organized one more edition of the biannual PhD summer course on Constructed Wetlands for Water Pollution Control. The 2021 edition took place between the 19th and 25th of September at the Universities' Marine Biological Station, located at the Rønbjerg Harbour. As many other activities it was also affected by the pandemic, which limited the physical attendance of participants travelling from outside Europe. Nevertheless, the course had 16 students originally coming from very different parts in the world such as Brazil, Thailand and Kazakhstan.

Hans Brix opened the course with the introduction lecture to constructed wetlands. Several topics were covered, among others, water quality and characteristics; biogeochemistry; wetland hydrology, hydraulics, design and kinetics; urban runoff, CSO, domestic and industrial systems; systems in the tropics and other case studies; P and emerging pollutants removal; intensive, willow and sludge systems. The classroom sessions were complemented by a full day field trip to 5 sites seeing more than 6 different types of wetland systems. The trip included also a visit to Kilian Water (a small company based in Denmark designing, building and installing wetland systems), providing a practitioner perspective of the field. This 2021 edition benefited from Pascal Mole's know-how including design details of the French systems, as well as with the online participation of Tom Headley, locked in Australia but always eager to share his experiences and recommendations with industrial and intensified systems. Aarhus University teaching team besides Hans, Carlos and Pedro, included lectures from Solvei Jensen, Emil Jespersen and Carlos Ramirez.

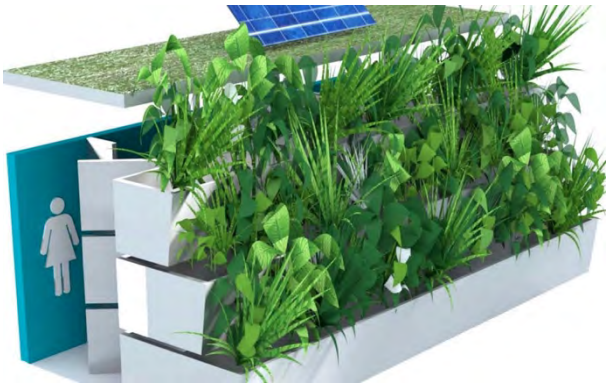
Figure 1. Figure of the group in the classroom and during the field trip.

The week included presentations by the different course participants. During the evenings, and in a relaxed environment, each student provided a brief overview of his/her research project. By the end of the intense week, new friendships and collaborations were established within this new generation of wetland scientists. After one more successful edition, a new version of the course can be expected for 2023.

LooPi®. Plant-based mobile unisex urinal for public spaces

Project coordinator: Theresa Heitzlhofer (alchemia-nova GmbH)

LooPi® is a self-sufficient unisex plant-based urinal for public spaces. The wastewater is cleaned via an integrated plant wall and then reused for flushing. Nutrients contained in urine are transformed into plant biomass and fertilizer. The overall aim is to bring LooPi® from TRL 4 (lab scale) to TRL 7 (prototype in operational environment).



LooPi® won the Green Concept Award 2021 in the category "Architecture and Tiny Houses".

The LooPi® consortium is comprised of 2 partners: ALCN (AT), BOKU (AT). Design partner: EOOS (AT).

National funding program: Stadt der Zukunft 6. Ausschreibung, BMK, Austria

Links: https://www.gp-award.com/en/konzepte/filter/architecture
https://www.gp-award.com/en/produkte/loopi
https://nachhaltigwirtschaften.at/de/sdz/news/2021/20210422-loopi-green-concept-award.php

NICE Kick-off Meeting

Audrey Chazottes and Rebeca Varela
CETIM, Spain

NICE ("Innovative and enhanced nature-based solutions for sustainable urban water cycle") kick-off meeting was held online on 28 and 29 June 2021, counting with the participation of the 14 consortium partners, as well as its EC Project Adviser from REA.

This first meeting was the opportunity for all partners to officially meet and to give an overview of this 4-year project, reminding the main R&D activities to be carried out and the 11 URLS to be deployed in Spain, France, Italy, Denmark, Poland, Egypt and Colombia.

All WPs were presented by their respective lead partner, the consortium focused on the upcoming tasks: setting-up of the management tools to ensure a smooth and efficient project implementation, definition of the NICE visual identity and website, preparation of a portfolio of innovative NBS, discussions on the R&D activities related to the NBS solutions deployed within the NICE project: green walls, vegetated rooftops, rain gardens, and hybrid subsurface wetlands.

Next consortium meeting, that may take place in November 2021, will allow all partners to look back at the tasks carried out in the first 6 months of the project and keep collaborating efficiently on this innovative project.

MULTISOURCE Kick-off Meeting

Jaime Nivala
INRAE, France

The kickoff meeting for MULTISOURCE (ModULar Tools for Integrating enhanced natural treatment SOlutions into Urban wateR CyclEs)" was held virtually from 21 – 23 June 2021. The project started in June 2021 and will run for 48 months.

The aim of MULTISOURCE is to create an innovative process for implementing enhanced natural treatment systems in urban water cycles, thus promoting multiple sources for urban water reuse and avoiding the discharge of polluted water without treatment.

Figure 1. Key components of the MULTISOURCE Project.

The MULTISOURCE consortium is comprised of 20 partners: INRAE (FR), Aarhus University (DK), Alchemia-Nova (AT), Ayuntamiento de Girona (ES), Citta Metropolitana di Milano (IT), Forum for Equitable Development (SI), Ho Chi Minh City University of Technology (VN), ICLEI (DE), ICRA (ES), INRAE Transfert (FR), INSA (FR), IRIDRA (IT), Métropole Lyon (FR), Montana State University (US), NIVA (NO), Oslo Kommune (NO), Rietland (BE), Universidad Federale de Santa Catarina (BR), UFZ (DE), Water Europe (BE). The first annual meeting is planned for June 2022 in Lyon, France.

MIDDLE EAST AND AFRICA UPDATE

Middle East & Africa Regional Report

Alexandros Stefanakis[1] and Tahra Al Rashdi[2]
[1]Regional Coordinator, [2]YWP affiliate

The Middle East and North Africa (MENA) region is the world's driest region with only 1% of the world's freshwater resources. Nature-based solutions are slowly expanding in the region. Despite the limited dissemination of wetland technology, it is the MENA region where we can find large Constructed Wetland facilities mostly for industrial applications. There are obvious opportunities to promote wetland technology and treated effluent reuse here, but only few countries have taken initiatives towards this direction. Below are some recent news on Constructed Wetland projects.

The world's largest Constructed Wetland in the world in Saudi Arabia

Alexandros Stefanakis
School of Chemical and Environmental Engineering, Technical University of Crete
German University of Technology in Oman

A new milestone constructed wetland facility is currently under development in the Kingdom of Saudi Arabia. The company ILF Consulting Engineers has developed the detailed design of the facility, prepared the tender document and evaluated the bids for the construction of a Constructed Wetland facility for the Red Sea Development Company.

The Red Sea Project is one of three giga-projects in the tourism sector in Saudi Arabia. The project site is located on an archipelago at the Western coast of Saudi Arabia. It consists of 200 kilometers coastline and more than 90 islands which so far have been undeveloped. It offers dormant volcanoes, desert areas, mountainous regions, natural treasures and a rich variety of wildlife both on land and in the sea. This location makes the Red Sea Project one of the world's most exquisite tourism destinations in a marine environment. The project is expected to be fully completed by 2030 with more than 8,000 hotel rooms in nearly 50 luxury

and hyper-luxury hotels on 22 developed islands and 6 inland sites. The infrastructure will be complemented by a new airport, a marina, numerous leisure and lifestyle facilities, as well as supporting logistics and utilities, including 75km of roads.

A high level of sustainability is considered for this project: it will completely rely on renewable energy supply, will have the world's largest battery storage facility, will use green concrete, will have an extensive smart digital destination management system, will apply a total ban on single use plastics and zero waste-to-landfill, towards the target of being 100% carbon neutral.

As part of the sustainability plan, the technology of Constructed Wetlands was selected for the treatment of the wastewater generated by this project. The CW system is designed for a daily wastewater volume of 16.000 m³/day from the facilities of the project with an estimated population exceeding 55,000 people.

The design includes preliminary works with screens, sand and grease removal and equalization tanks, and two stages with Vertical Flow Constructed Wetlands followed by polishing Surface Flow Constructed Wetlands and a final disinfection using UV units. Locally available reed species are used in the wetland beds. The CW is designed for an effluent quality that will allow the reuse in landscape irrigation in the project sites. The net treatment area of the wetland beds reaches 14 hectares (140,000 m²), making this wetland system the largest one applied for municipal wastewater treatment in the world.

NORTH AMERICA UPDATE

Modular constructed wetlands for wastewater treatment and reuse in a middle high school in Mexico City

Mónica-Lucía Rodríguez-Estrada[1] and * and Víctor Manuel Luna Pabello[2]
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[2]Grupo Académico Interdisciplinario Ambiental. Facultad de Química. Universidad Nacional Autónoma de México, Av. Universidad 3000, Ciudad Universitaria, 04510, Ciudad de México, México (E-mail: lpvictor@unam.mx, victormlp@yahoo.com)

A modular constructed wetland (MCW) was designed to treat a mixture of yellow water (urine from men urinals) and gray water (from sinks and cleaning activities), in a middle higschool located in a zone with lack of tap water in Mexico City. The school was chosen using indicators such as: social vulnerability (margination, human development index and social backwardness); building typology and basic services; urban, territorial and technic aspects like available space, topography and street illumination.

The MCW configuration consists of four fiber glass rectangular units, which were assembled according to the space and the geometry of the site. The MCW is a horizontal subsurface flow wetland, with gravel and limestone as support materials; the vegetation is *Phragmites australis, Arundo donax, Cyperus haspan*, *Equisetum arvense, Zantedeschia aethiopica* and *Canna indica.* The effluent's quality must achieve mexican's regulation for water reuse with direct contact with people, so that it can be used for garden irrigation. Two environmental education workshops where implemented as a social strategy for the school population; one hundred students attend each workshop. This system can be adapted in other places where water can be treated *in situ*, mainly in ones with lack of tap water, and also be used as an educational strategy in order to replicate and build more MCW in Mexico City.

The MCW system treats near 400 L/day, its materials and operation are low cost, it was constructed on the surface of a garden, and the students were involved in the installation process. The project benefits nearly

14,000 students, teachers and workers, who can learn about constructed wetlands as a decentralized alternative for sustainable wastewater treatment.

The MCW operation began in October 2019 and has been in recirculation mode since the COVID-19 pandemic started. Maintenance is overseen by professors and students, and the system is ready to operate in normal mode as soon as in-person classes begin.

This project was financed by the Science, Education, Technology and Innovation Secretary of Mexico City (SECITI-CM/029/2019), and it is an example of an interdisciplinary team which includes researchers of Faculty of Chemistry of the National Autonomous University of Mexico; undergraduate and postgraduate students; a public institution and a private enterprise leading the project.

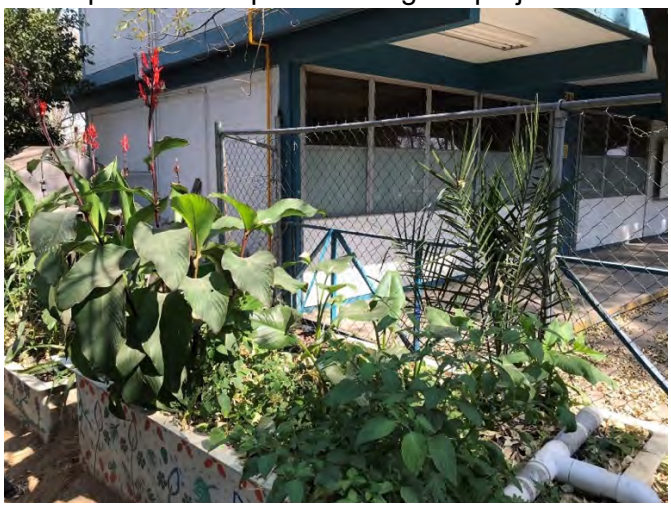


Figure 1. MCW in December, 2020.

Figure 2.MCW in December 2020.

Figure 3. Environmental educational workshop.

SOUTH AMERICA UPDATE

Project CARIBSAN

Chloé Dechelette and Camille Madec

International Office for Water in France (OiEau)

The majority of the Caribbean population lives near the fragile ecosystems of coastal areas, where sanitation infrastructure is often inadequate, leading to considerable pollutant discharges that are dangerous for human health and ecosystems.

CARIBSAN aims to promote treatment wetlands throughout the Caribbean (French West Indies, Cuba, Dominica and Saint Lucia). The project is co-funded by the European Union through the INTERREG Caraïbes programme, the French Development Agency and the Water Offices of Martinique and Guadeloupe. In the French West Indies (Guadeloupe and Martinique), wastewater treatment systems combine local plants (heliconia or "birds of paradise") with substrate to filter and purify wastewater. This system has demonstrated its effectiveness for several years. This nature-based technology has the advantage of being simpler and cheaper to build and manage than a conventional wastewater system and resistant to the climatic disturbances of tropical regions (notably cyclones).

Until December 2022, the CARIBSAN project will carry out preparatory training work on treatment wetland technology in the Caribbean territories. Since there is not just one nut numerous type of treatment wetland systems, CARIBSAN will support the five islands in choosing the most appropriate option. This support follows 3 steps:

- The development of a multi-criteria methodology to take into account various criteria to choose the emplacement and type of treatment wetland to build: energy availability, population density, volumes of wastewater to be treated, climate, temperature, soil type, regulatory context, locally available materials, socio-economic aspects, etc.
- The identification of the most suitable local plants for artificial wetland systems, based on criteria already established through pilot studies in the French West Indies and with the help of local experts (botanists, biodiversity protection associations) on each island. The question of whether treatment wetlands can be used as refuges of biodiversity will also be raised.
- The elaboration of detailed construction designs for treatment wetland systems, in order to enable their construction in the next phase of the project.

More information about implementing partners and funders of the CARIBSAN project

Designed and led by the Martinique Water Office (ODE Martinique), the CARIBSAN project (June 2021-December 2022, € 1.7 million) is being implemented by the French partners of the International Office for Water in France (OiEau), the Guadeloupe Water Office (ODE Guadeloupe), and the National Research Institute for Agriculture, Food and the Environment (INRAE), as well as by the partners in participating countries: the National Institute of Hydraulic Resources (INRH) in Cuba, the Caribbean Water and Sanitation Association (CAWASA), the Water & Sanitation Management Company in Saint Lucia (WASCO) and the Dominican Water and Sanitation Company (DOWASCO).

The CARIBSAN project is cofinanced by the European Union, through the INTERREG Caraïbes programme in respect of the European Regional Development Fund, the French Development Agency (Agence Française de Développement, AFD), and the Water Offices (ODE) of Martinique and Guadeloupe.

https://www.facebook.com/CARIBSAN

Evaluation of the removal efficiency of a constructed wetland to purify wastewater from the wet mill of coffee, Cauca, Colombia

A. Gómez- López, Juan C. Casas-Zapata, E. Rengifo
Research Group Science and Engineering of Environmental Systems (GCISA), University of Cauca, Colombia. (angelasg@unicauca.edu.co, jccasas@unicauca.edu.co)

Constructed wetlands have proven to be effective in removing diversity of pollutants in different latitudes. This research evaluated the efficiency of a constructed horizontal subsurface flow wetland in wastewater purification of the wet benefit of coffee (WBC) in terms of total suspended solids (TSS), chemical oxygen demand (COD), nitrites (NO_2^-) and phosphates (PO_4^{3-}); this system was installed as a secondary treatment for the purification of the wastewater generated by washing the harvested coffee in a coffee farm located in the Cauca's Department, Colombia.

The constructed wetland was sown with the species *Phragmites Australis* and is 1.5 m wide by 4 m long. The support material corresponds to medium and coarse gravel of effective sizes d10 of 32 mm and 128 mm respectively, having a gravel layer of 0.8 meters previously washed and a height of the water level of 0.20 m. In terms of the experimental stage, the experimental stage was developed in 9 stages in which samples were taken both at the entrance and output of the wetland, measuring the pH with multiparametric probe; after that, the samples were transported to the certified laboratory of the Regional Autonomous Corporation of Cauca (CRC) where the response variables, TSS, COD, nitrites and phosphates were analyzed. At the end of the experimental phase, a statistical, descriptive, exploratory and graphic analysis of the response variables was carried out implementing the IBM SPSS statistical package and Microsoft Excel 2016 and subsequently applied Wilcoxon's nonparametric hypothesis test on the medians of the distributions of the

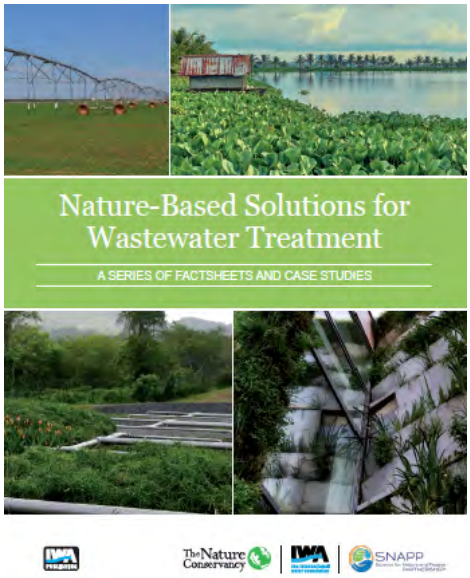
output concentrations in order to compare the parameters given in resolution 0631 of 2015 and WHO guides with respect to the experimental values.

Finally, the results showed that the distributions of the removal percentages were asymmetric to the left with predominance of the high removal efficiencies; thus, for TSS, COD, nitrites and phosphates, median percentages of 80.77%, 84.17%, 75%, and 84.67% respectively were obtained. Besides, the Wilcoxon test evaluated the output concentrations of COD and nutrients and threw p levels higher than alpha 5 %, which meant that the system must improve its stability. On the contrary, the Wilcoxon test probed that the TSS were adequately removed in all the evaluated period. The study carried out shows the feasibility of implementing constructed wetlands to adequately purify this type of wastewater.

RECENT PUBLICATIONS BY SG MEMBERS

Nature Based Solutions for Wastewater Treatment

Katharine Cross[1], Katharina Tondera[2], Anacleto Rizzo[3], Lisa Andrews[4], Bernhard Pucher[5], Darja Istenič[6], Nathan Karres[7], Robert McDonald[7]
[1] Water Cities, Thailand
[2] INRAE, France
[3] IRIDRA, Italy
[4] LMA Water Consulting+, The Netherlands
[5] BOKU University, Austria
[6] University of Ljubljana, Slovenia
[7] The Nature Conservancy, USA



The recently released IWA and TNC publication "Nature-Based Solutions for Wastewater Treatment" is a starting point to identify and compare NBS options that can be incorporated into domestic and municipal wastewater treatment processes, with an emphasis on the potential co-benefits.

Building on the evidence base, the compilation of factsheets and case studies in the publication detail a selection of NBS as part of the process of treating domestic wastewater, while also providing ecological and social co-benefits. Case studies are provided for most NBS options, illustrating how these nature-based wastewater treatment approaches have been applied in practice. See https://doi.org/10.2166/9781789062267

Circular Economy and Sustainability

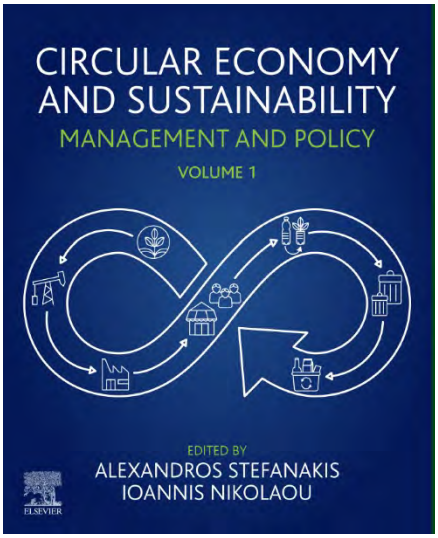
Alexandros Stefanakis
School of Chemical and Environmental Engineering, Technical University of Crete

A new two-volume book, edited by Assistant Professor Alexandros Stefanakis (School of Chemical and Environmental Engineering, Technical University of Crete) and Associate Professor Ioannis Nikolaou (Department of Environmental Engineering, Democritus University of Thrace), was recently published by Elsevier. The book on "Circular Economy and Sustainability" contains 63 chapters written by 198 authors from 33 different countries and all continents.

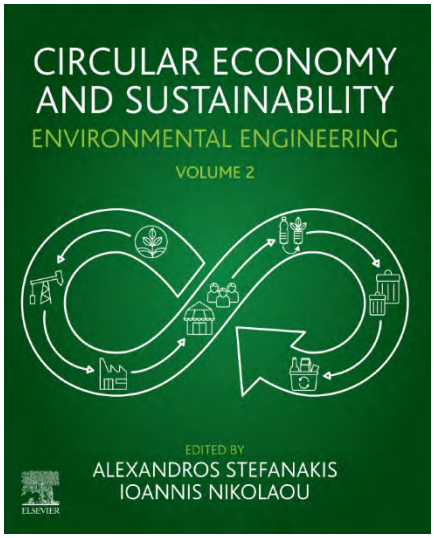
The concept of circular economy provides the necessary conditions to encourage economic and social actors to adopt strategies toward sustainability. However, the increasing complexity of sustainability aspects means that traditional engineering and management/economics alone cannot face the new challenges and reach the appropriate solutions. The role of engineering and management is crucial in building a sustainable society by developing a circular economy that establishes and protects strong social and cultural structures, based on cross-disciplinary knowledge and diverse skills. Thus, this book highlights the interconnection between the two concepts of circular economy and sustainability, built on three main pillars: (i) environmental engineering, (ii) business, management, and economy, and (iii) society.

While the first volume (Management and Policy) studies the strategies, policies and business models to achieve a circular economy, the second volume (Environmental Engineering) investigates the role of sustainable technologies and nature-based solutions such as constructed wetlands in the proposed approach to reframe circular economy, ascribing to it a new content in the field of waste management and resource recovery and expanding it in the water and wastewater sector.

Volume 1: Management and Policy



Volume 2: Environmental Engineering



Nature Based Solutions for Wastewater Treatment

Gladys Vidal
Water Resources Center for Agriculture and Mining - CRHIAM of the Universidad Concepción

Climate change is putting heavy pressure on the entire planet. The need to introduce changes in the management of the management of water volumes in the face of sudden changes in shortages or floods is prevailing. On the other hand, the concentration of cities built under a paradigm without climate change has influenced the planning of non-flexible cities for the new conditions imposed by climate change.

The "Nature Based Solutions" (NbS) projects new spaces to rethink our environment. The ability of plants to photosynthesize, among other properties, allows the capture of CO_2 and these new forms of cooperation, between the existing gray infrastructure, with the benefits of green infrastructure proposed by the NbS. On the other hand, the purification mechanisms of these systems through the metabolism of plants and the bacterial consortium of their roots (rhizomes), allows multiple physical, chemical and biological interactions of their components (water, vegetation, soil and microorganisms), which reduces the content of pollutants such as organic matter, nutrients (nitrogen and phosphorus) and toxic substances present in various discharges. For this reason, NbS can be projected, when appropriate, in purification systems for point discharges in rural areas with low population density and also for diffuse discharges.

On the other hand, NbS are a fundamental part of action for climate and biodiversity. Authoritative research indicates that Nature-Based Solutions can provide more than a third of the cost-effective climate mitigation needed between now and 2030 to stabilize warming below 2 °C, achieving nature's mitigation potential of 10-12 gigatons of CO_2 per year. Proper investment in nature-based solutions will help reduce the financial consequences of climate change and contribute to the creation of new jobs, the resilience of

livelihoods and the reduction of people's poverty. NbS contribute directly to the achievement of the Sustainable Development Goals (SDGs): they support vital ecosystem services, biodiversity and access to fresh water, improved livelihoods, healthy diets and food security from sustainable food systems.

The United Nations has put NbS on the agenda with the aim of mitigating climate action and supporting sustainable development. For this they have proposed 5 main points *:

1. Increase and mainstream NbS within national governance, climate action and climate policy instruments, including nationally determined contributions, adaptation communications, long-term strategies for low-gas emissions development greenhouse, spatial planning, national development plans, construction plans;

2. Improve regional and international cooperation, in a way that fosters ambition, transparency and the integrity of the environment and is supported by popular campaigns and mobilizations, forming synergies with regional and international development cooperation agendas and initiatives that help to meet the SDGs; This includes encouraging the establishment of a Group of Friends for NbS (GOF4NBS) following the Climate Action Summit in September 2019;

3. Generate the necessary changes in national and international governance and finance to value nature and harness the potential of nature-based solutions; ensure that financial mechanisms are supported with appropriate regulations that are applied at the national and sub-national levels, including the promotion and adoption of green supply chains; avoid financing for deforestation and other activities that damage ecosystems; increased public and private funding for investment in nature-based solutions; promoting green finance and innovative incentives to promote nature-based solutions;

4. Expand NbS for mitigation, resilience and adaptation in key areas, ensuring people's livelihoods against climate threats, including a) conservation and restoration of forests and other terrestrial ecosystems, b) conservation and restoration of freshwater resources, as well as marine and ocean ecosystems, c) sustainable agriculture and food systems, and d) ensure the systemic role of nature in sustainable development in ways that end the loss of biodiversity and optimize the contribution of nature to resilient livelihoods, green infrastructure, sustainable settlements and only rural transitions.

In this context, the book “Solutions based on nature for the decontamination of punctual and diffuse discharges” edited by Drs. Gladys Vidal, Gloria Gómez and Ma. Cristina Diez was launched by the Water Resources Center for Agriculture and Mining - CRHIAM of the Universidad Concepción (Chile) on July 13th, 2021 (via zoom).

The information provided in this book series has been organized into the following five chapters: 1) Retention ponds to control runoff, 2) Constructed wetlands for the recovery of natural wetlands in urban contexts: experiences and lessons learned from the water system de Bogotá (Colombia), 3) Bio-purification system for the treatment of pesticides, 4) Wetlands constructed for the treatment of sewage in rural areas with low population density and 5) Towards sustainability in the treatment of sewage through the use of microbial fuel cells embedded in constructed wetlands.

The presentation of this work was in charge of the Professor of the Department of Civil and Environmental Engineering of the Polytechnic, University of Catalonia (Barcelona, Spain), Dr. Joan García, who began with a presentation on how these solutions are presented as an opportunity to face the problems related to the water management, especially in the climate change scenario. "Solutions based on nature have to be efficient, and that means that they must be locally adapted to the resources, to the way of doing things, to the native peoples," said the researcher.

For her part, Dr. Vidal emphasized the opportunities that the incorporation of nature-based solutions into the environment opens up and its positive impact on ecosystems and biodiversity. “When we understand well and deeply the definition of what nature-based solutions are, we realize that they are built from a perspective of contributing to sustainability, and when we want to meet this, we are meeting the 17 Sustainable Development goals”.

Meanwhile, Dr. Ma. Cristina Diez highlighted the experiences of ancient civilizations and indigenous peoples in the implementation of these solutions. “Since ancient times, water resources is one of the main element, its quality and quantity are fundamental for the conservation. We must learn from our native peoples and past civilizations about how to make nature give us sustainability for our development and future generations”.

Finally, it is important to point out that the book, also presents incipient research of the blue sky type to project its use as an action to mitigate climate change and protect water resources, conserving the biodiversity of ecosystems and contribute through the quality of water to care the health and well-being of the population.

The text can be read and downloaded free of charge at: https://www.crhiam.cl/publicaciones/libros/. The book was written in Spanish.

RECENT EVENTS

5th Pan-American Conference on Wetland Systems

Pablo Heleno Sezerino

Universidade Federal de Santa Catarina (UFSC), Florianópolis,Brazil

The 5th Panamerican Conference on Treatment Wetlands and the 5th Brazilian Constructed Wetlands Symposium (www.conferenciahumedales2020.com.br) were held in Florianópolis, South Brazil, in April 28-30 via virtual manner due the COVID-19 pandemic. More than 190 scholars, experts and technical staff from over 12 different countries attended both events. The theme of both events was centered on the role of constructed wetlands applied to wastewater treatment and water pollution control.

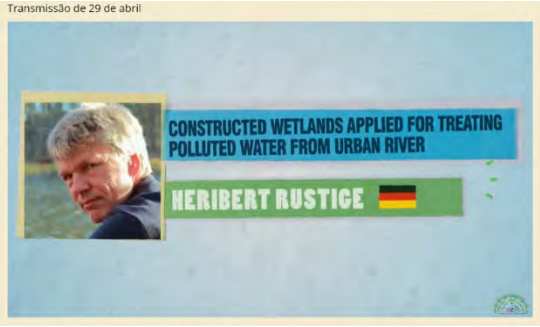
(Photo Credit: GESAD/UFSC)

These events consisted of five keynote speeches, five plenary speeches, 22 oral presentations, 61 published papers (https://wetlandsbrasil.com.br/simposios/) and a virtual visiting. Both conferences were jointly organized by Red Panamericana de Sistemas de Humedales – HUPANAM, Grupo Wetlands Brasil, AARHUS Universitet, Decentralized Sanitation Research Group – GESAD and Federal University of Santa Catarina – UFSC.

Dr. Pascal Molle delivered a keynote lecture.

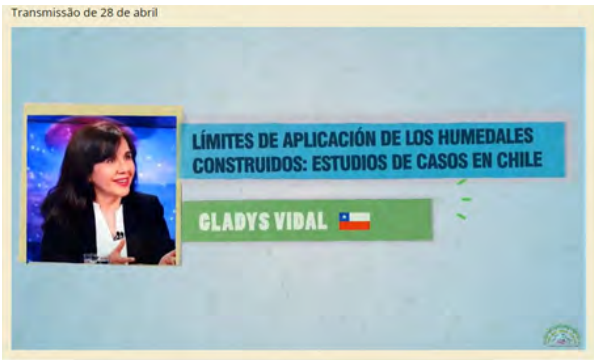
Photo of Dr. Maria Alejandra, Dr. Pascal Molle and Dr. Pablo Sezerino during the questions session. (Photo Credit: GESAD/UFSC)

Professor Marcos von Sperling delivered a keynote lecture. Photo of Professor von Sperling and Dr. Pablo Sezerino during the questions session. (Photo Credit: GESAD/UFSC). (Photo Credit: GESAD/UFSC)



Keynote speeches (Photo Credit: GESAD/UFSC)

Virtual visiting with Dr. Heike Hoffman (above) and Engineer Camila Haiml (below). (Photo Credit: Rotaria do Brasil) Plenary sessions (Photo Credit: GESAD/UFSC)



Closing session with Dr. Pablo Sezerino, Dr. Catiane Pelissari (left) and the staff (Photo Credit: GESAD/UFSC)

9th International Symposium on Wetland Pollutant Dynamics and Control

Günter Langergraber and Bernhard Pucher
Institute of Sanitary Engineering and Water Pollution Control, BOKU University, Vienna

The 9th International Symposium for Wetland Systems for Water Pollution Control (WETPOL) took place (virtually) at BOKU University in Vienna from 13-17 September 2021 (http://wetpol.com/). To support the WETPOL objective – bringing together natural and engineered wetland point of views – the symposium was co-organised by the Institute of Sanitary Engineering and Water Pollution Control (Günter Langergraber and Bernhard Pucher) and the Institute of Hydrobiology and Aquatic Ecosystem Management (Thomas Hein and Gabriele Weigelhofer).

The planning for WETPOL 2021 started when Diederik Rousseau and Gijs Du Laing approached us late night somewhere in Aarhus during WETPOL 2019. Organic catering, reusable cutlery and sufficient supply with beverages were discussed until we were forced to change everything due to the pandemic. At a certain point the decision was made to go full virtual in order to be as inclusive as possible and to stay save. This decision payed off: 225 participants from 40 countries where present during the conference week. The chosen virtual conference tool talque gave us the freedom to give each of the participants the possibility to watch sessions live or on demand and to directly interact with others. Virtual coffee tables after the sessions brought together speakers and interested persons to further discuss occurring topics and share one or two virtual beers during after the last session. The full content is still available on the conference platform *talque* for all participants.

The program included 16 general sessions, 11 submitted special sessions and 29 posters. In total, 133 talks provided an insight in the ongoing wetland research. Seven workshops presented ongoing project work and discussed emerging topics. From the program two main topics can be identified, namely agricultural drainage and diffuse pollution control as well as the topic of nature-bases solutions (NBS) in an urban context.

Four keynotes showcased highlights from ongoing research on natural and treatment wetlands: Natasa Atanasova (University of Ljubljana) presented the potential of NBS to support water management in the urban environment. Gilles Pinay (CNRS France) focused on the riparian zone and diffuse nitrogen pollution control. Kela Weber (Royal Military Colleague) took us on a safari into the biofilm to expand our understanding of dimensionality and structure of microbial community (including a rare sighting of the water bear). Last but not least, Myrto Nikolakopoulou (EASN – Technology Innovation Service) presented the functional role of emergent macrophytes in managing nutrient pollution in freshwater ecosystems.

One important program point at every wetland conference are the fieldtrips. As it was not an option to just skip this, the BOKU Team went out on their own first group excursion for more than one year and prepared videos of the trips. In total three videos have been prepared. In the first video we took the participants around Vienna presenting implemented NBS such as green roofs, vertical greening systems and green urban drainage systems. The second video took us to three locations to wetlands treating wastewater on the countryside. We visited a classical one stage vertical flow wetland, followed by a two-stage vertical wetland. The third system was an indoor treatment wetland for greywater at a farmhouse. A third video showcased the facilities of Wassercluster Lunz.

An important aspect at every conference is social networking. Especially young researcher should be introduced and included. Therefore, together with the Young Water Professionals (YWPs) of the IWA Specialist Group on Wetland Systems for Water Pollution Control two events were organized specifically dedicated to the young and the young at heart professionals in the field. On Wednesday a virtual mixer took place, informally presenting the YWP and provide faces and information on this group. This event was followed by a workshop the next day morning to further investigate the needs of YWP in the field and how to better engage this group in the SG activities.

Overall, the virtual edition of WETPOL 2021 was a full success, despite its remote character. Still, we all look forward to meeting each other again in person. This might be possible at the next WETPOL conference that is planned for 11-15 September 2023. The 10th edition brings participants back to Ghent where the WETPOL series started in 2005.

Young Water Professional Session at WETPOL2021

Bernhard Pucher[1], Marco Hartl[2], Laura Delgado[3]
[1] Institute of Sanitary Engineering and Water Pollution Control, BOKU University, Vienna
[2] Alchemia-Nova, Institute for Circular Economy & Nature-Based Solutions, Vienna
[3] INRAE, Lyon

Since the IWA SG Conference in Gdansk 2016 the Young Water Professionals (YWP) have a fixed spot within the SG. In the SG MC each regional member has also a YWP assigned to. This supports the development and engagement of the young scientists. With the IWA SG Conference 2020 being postponed we took the opportunity to plan a YWP event for WETPOL 2021. Together with the organisers from BOKU University, Vienna, two sessions fully dedicated to the young generation in the field were scheduled. The main event was a workshop to present the IWA SG and their YWP program to new colleagues and discuss future steps to foster integration of new YWP as well as to improve participation of YWPs on SG activities. It also covered the planning towards an in person event in Bangkok 2022.

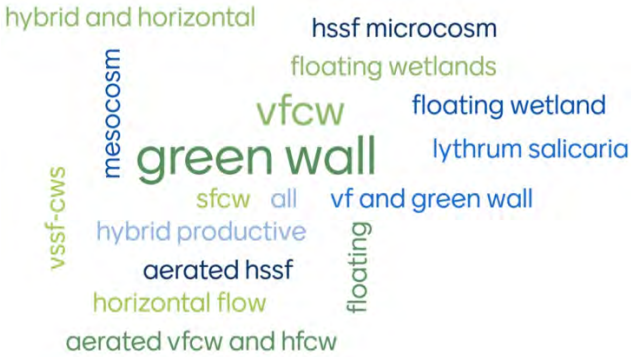


Figure 1: What type of treatment wetland fits you most

Figure 2: What is the main topic of your research

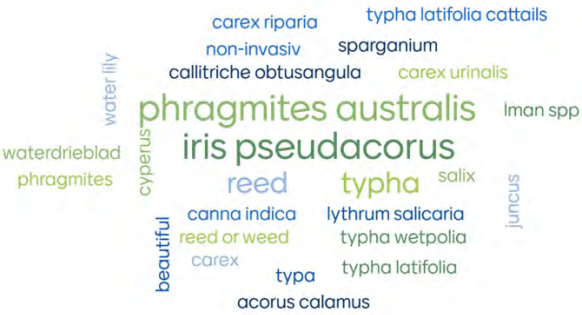


Figure 3: What wetland plant are your

Figure 4: What's your country of occupation

Figure 5: How old are you if we may

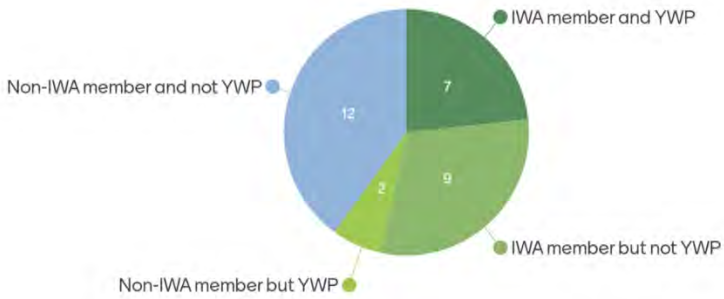


Figure 6: Status on your IWA membership

To break the ice a virtual social mixer took place the evening before the workshop. In total 30 participants (mainly young ones and some still feeling young at heart) took the opportunity to get a short introduction on the IWA SG and YWP before small groups were formed to better get to know each other. After several rounds

of those breakout sessions, we gathered back in the main call room and enjoyed stories and cold beverages for another hour.

On the following day, the main workshop started with a brief introduction by our co-chair Jaime Nivala followed by a presentation of the SG YWP by Anacleto Rizzo. Afterwards the crowd was split into sub-groups, each taken care of by a dedicated YWP, to further discuss needs and opportunities by being involved in this group.

One main topic addressed the visibility of the SG and their YWP. Although there is an up to date Facebook page, other social media channels should be used as well (e.g. LinkedIn). Besides being present in everyone's newsfeed, regular events such as workshops, webinars or discussion panels open to a broad audience were identified as important tools to enhance the visibility and engage new young colleagues. Especially the inclusion and engagement of YWP in regular planning tasks can be highly benefitting. In addition, a mentoring- or buddy program to better connect established and young colleagues will be appreciated.

For the next conference in Bangkok 2022 a YWP dedicated session and workshop is the main goal. Therefore, it is important that this should not overlay with the general program of the conference.

The workshop had over 30 participants and was engaging and fruitful. The social mixer the day before actually broke the ice for the next day and everyone felt welcome and gave great input. Find below some information of the participants.

UPCOMING EVENTS

10th International Symposium on Wetland Pollutant Dynamics and Control – WETPOL2023

Diederik Rousseau

Department of Green Chemistry and Technology, Ghent University

The International Symposium on Wetland Pollutant Dynamics and Control, also known as WETPOL, will return to its origin for celebrating the 10th edition. The date is already set, 10-15 September 2023, save the date in your calendars!

The conference will be held at the Bruges Meeting & Convention Centre, Bruges, Belgium.

NEWS FROM IWA HEADQUARTERS

Submissions open - IWA World Water Congress & Exhibition

The IWA World Water Congress & Exhibition is the global event for water professionals covering the full water cycle. As the Congress rotates through cities and countries each event has an extra emphasis on issues of specific interest to the region. The upcoming edition taking place in Copenhagen will have as key focus the digital economy, smart and liveable cities, entrepreneurship and diffusion of innovation, climate change adaptation , community and customer engagement, and sustainability.

https://worldwatercongress.org/programme/.

Deadline: 31 December 2021 (abstracts, trainings, workshops)

IWA at COP26

"Water was more visible than ever in Glasgow compared to previous COPs. The UN-managed area known as the 'Blue Zone' featured a dedicated Water Pavilion for the first time. Water was also a central topic at the Resilience Hub. These provided a focus for valuable exchanges and partnership-building activities. **And IWA was also more visible than ever**. Prominent participation in events at these venues included various chairing and speaking roles for myself and our Climate Smart Utilities team. This did indeed create great opportunities for us to build and strengthen bridges that will help extend the reach and impact of our initiatives."

- Kala Vairavamoorthy, IWA Executive Director

NEWS FROM IWA PUBLISHING

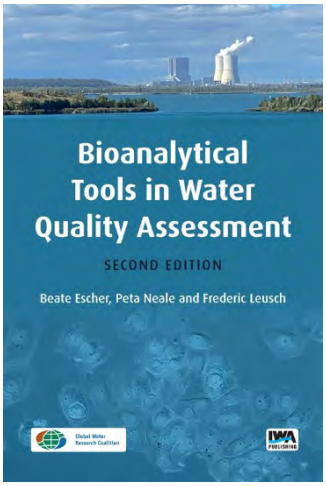
New Publications

Selected books

BIOANALYTICAL TOOLS IN WATER QUALITY ASSESSMENT
BEATE ESCHER; PETA NEALE; FREDERIC LEUSCH
ISBN: 9781789061987
June 2021 • 462 pages • Paperback

IWA Members price: £86.00/ US$ 129.00/ € 108.00

Also available as an Open Access ePDF
https://doi.org/10.2166/9781789061987

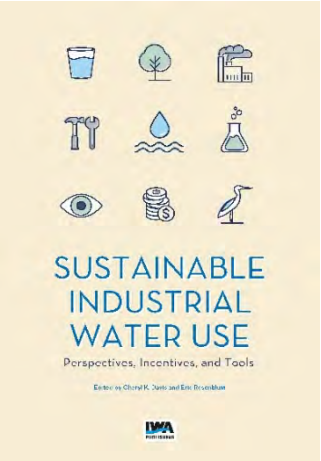


The book focuses on applications to water quality assessment ranging from wastewater to drinking water, including recycled water, as well as treatment processes and advanced water treatment. Emerging applications for other environmental matrices are also included. Bioanalytical Tools in Water Quality Assessment, Second Edition not only demonstrates applications but also fills in the background knowledge in toxicology/ecotoxicology needed to appreciate these applications. Each chapter summarizes fundamental material in a targeted way so that information can be applied to better understand the use of bioanalytical tools in water quality assessment.

SUSTAINABLE INDUSTRIAL WATER USE: PERSPECTIVES, INCENTIVES, AND TOOLS
CHERYL DAVIS; ERIC ROSENBLUM
ISBN: 9781789060669
February 2021 • 450 pages • Paperback

IWA Members price: £90.00 / US$ 135.00 / € 113.00

Also available as an Open Access ePDF
https://doi.org/10.2166/9781789060676



This new anthology brings together the voices of the executives, plant managers, investors, inventors, regulators, policymakers and advocates leading industry to sustainable water use. They discuss how they redesign facilities to operate in water-short areas, change the rules to encourage responsible water use, and bridge the gap between companies and communities. They also report on the risks facing industry, and the tools they use to measure, treat, and reuse water more sustainably.

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To learn more, visit the IWA Learn platform: https://iwa-network.org/iwa-learn/

BECOME A MEMBER OF THE IWA SPECIALIST GROUP ON WETLAND SYSTEMS FOR WATER POLLUTION CONTROL

The IWA Specialist Group (SG) on Wetland Systems for Water Pollution Control is a dynamic and international SG whose members come from a diverse range of backgrounds including practitioners and scientists from academia, consulting, and public organizations. The SG focusses on the following core issues: 1) to improve the understanding of the fundamental interactions amongst water, soil, plants and microorganisms inside wetland systems for water pollution control; 2) to explore innovative applications and realize the full potential of wetland technology worldwide; 3) to mainstream wetland technology within the larger field of wastewater treatment and water pollution control, and to define international guidance for proper design, implementation, and operation of treatment wetland systems; and 4) to facilitate and promote research activities for the mainstreaming, development, and advancement of treatment wetland technology worldwide.

For IWA members, who already have Connect login details, please go to https://iwa-connect.org/group/wetland-systems-for-water-pollution-control/ and simply click on “Join Group” button on the top right.

For new friends, please register to join IWA by visiting https://iwa-connect.org/subscribe and then follow the link above to join the Wetland Systems for Water Pollution Control Specialist Group.

WRITE TO THE WETLAND SYSTEMS FOR WATER POLLUTION CONTROL SG

Our newsletter is an opportunity to share information, points of view, policy developments, research activities, and events worldwide. Our editorial team encourages SG members to contribute to future editions of the newsletter with information on any relevant projects, conferences, or workshops. Contributions should not exceed three pages, and can be in the form of short papers, reports on recent events, descriptions of new projects. The main objective of newsletter contributions is to foster communication, collaboration, and knowledge exchange amongst our members.

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If you would like to contribute to a webinar on the use of wetlands for water pollution control or have an interesting story you would like included in a future newsletter, please contact us.

the international water association

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