



ANNUAL REPORT 2020







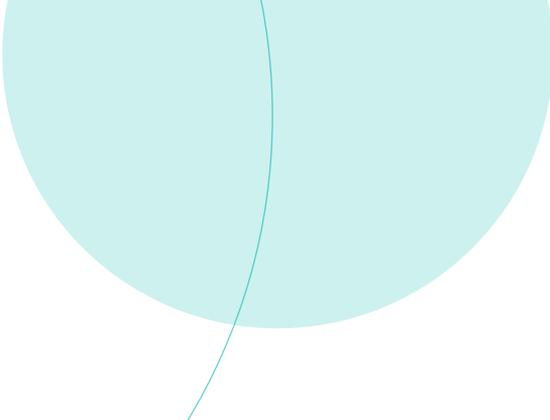
EXECUTIVE SUMMARY

The year 2020 was unique in ways that do not need to be further highlighted here (more on that later). It was also unique, however, as the 50th Anniversary of the founding of WAITRO. This Annual Report is also rather special since, in addition to the usual summary of Executive Board decisions, new members, and statistics, it also archives some key content from WAITRO://50, the Virtual Innovation Summit that replaced the planned Global Innovation Summit.

The Annual Report starts with a welcome and introduction from WAITRO leadership in the form of brief articles by the President and Secretary General, respectively, followed by a brief overview of WAITRO (inspired by the Annual Report of our progenitors at UNIDO). Chapter 1 gives an overview of the WAITRO response to Covid-19, along with links to access the results in detail. Chapter 2 reports on part of the Virtual Innovation Summit: interviews with key contributors to WAITRO over the first fifty years. We stress that these are lightly-edited interviews, not essays, incorporating all the spontaneity that would be expected from that format. We put them here because these people represent a thread of continuity woven through the constantly changing WAITRO leadership. Capturing their ideas and, indeed, their ongoing passion for WAITRO and its mission, is one of our valuable achievements in 2020. We hope it will be of interest now, and a touchstone and archive for the future.

Likewise, in Chapter 3, we summarize our new concept to spur innovation between WAITRO members in a particular focus area relevant to the UN sustainable development goals: the 2020 WAITRO Innovation Award. This chapter is a complete description of WAITRO's first seed funding addressing the area of water (SDG6), from its goals and process to the applicants, finalists and winners. As a bonus, the Chair of the Scientific Advisory Board of the Innovation Award, Will Sarni, contributed an article highlighting why water is a "wicked problem". Again, this is more content than would typically be expected in a WAITRO Annual Report, but we hope that it serves as a record and example of how WAITRO can make real contributions to this, and other, "wicked" problems.

The rest of the Annual Report is more conventional, with a summary of Capacity Development efforts in 2020 in Chapter 4, a brief list of WAITRO's Strategic Plan goals and objectives (available in full elsewhere), and some Annexes containing statistical information. One addition is a "good practices" article from the Regional Focal Point for Latin America and the Caribbean. Many regional workshops are taking place and this suggests a system for making the most of them and capturing their output. As always, the Secretariat is happy to receive your feedback, whether you agree or disagree.



CONTENTS



01

INTRODUCTION

- 01 Foreword by the Secretary General
- 03 Letter from the President

04

WAITRO AT A GLANCE

07

WAITRO RESPONSE TO COVID-19 PANDEMIC

09

50TH ANNIVERSARY OF WAITRO

- 15 The WAITRO-UNIDO Connection
- 19 The Successes and Challenges of WAITRO
- 24 Roundtable Discussion: Witnesses to 50 Years
of WAITRO Chaired by Moses Mengu

35

SOLVING WATER-RELATED CHALLENGES AROUND THE GLOBE

- 36 The WAITRO Innovation Award 2020
- 38 Wicked Problems, Innovation and Disruptive Innovation
- 41 The WAITRO Innovation Award 2020: Water
- 43 The Award Winners

54

EVENTS AND CAPACITY DEVELOPMENT

- 55 Strengthening International Collaborations Within the Horizon Framework
- 56 Good Practices in Capacity Development: Experiences of The Regional Focal Point for Latin America and The Caribbean
- 62 Events in Brief

70

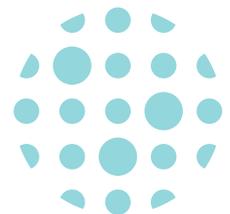
THE STRATEGIC PLAN

73

ANNEXES

- 74 Annex 1 Organizational Structure
- 79 Annex 2 Global Outreach
- 81 Annex 3 General Assembly

WAITRO



INTRODUCTION



Dr. Eckart Bierdümpel

Foreword by the Secretary General

Dear members and friends of WAITRO,

2020 turned out to be very different from what was planned and expected earlier. Almost everybody worldwide was affected by the pandemic in one way or another and WAITRO is no exception. First of all, we had to re-organize all meetings. For example, the two Board Meetings, which were planned for last year to be held at LEITAT in Barcelona and at RSS in Amman had to be converted into online meetings. On one hand it saved us quite some traveling back and forth, but on the other hand it also took more time than anticipated, especially at the beginning: it took us three online meetings over a period of almost three months to cover all the topics that we would usually discuss in just one conventional Board meeting.

With the pandemic unfolding, we also had to change a few activities. For example, the Fellowship Program had to be suspended, because international travel was no longer an option and, unfortunately, is still not. On the other hand, we reacted quickly to the COVID-19 pandemic, conducting two surveys and publishing reports on specific COVID-19 efforts by WAITRO member organizations and their challenges. Furthermore, several planned Capacity Development workshops couldn't be held as planned, but the WAITRO Secretariat facilitated several online workshops instead.

The WAITRO Executive Board had to take one particularly important and painful decision: we were all excited about the first WAITRO Global Innovation Summit to be held in conjunction with the 25th General Assembly. Two years after the last meeting, all members of the Global Innovation Family WAITRO were looking forward to meeting in person in South Africa to celebrate the 50th anniversary of WAITRO towards the end of 2020. The planning for the big event had progressed quite well, but with the pandemic raging worldwide and getting worse day by day, it soon became clear that a physical meeting was not a viable option. Finally, in June, the Executive Board decided to postpone the physical meeting. According to the by-laws of WAITRO, however, the 25th General Assembly had to be held in 2020. Furthermore, there was a significant degree of enthusiasm for doing something to commemorate the 50th anniversary of the founding of WAITRO. It was therefore decided to reschedule the General Assembly as an online event, to combine it thematically with the topic of the Innovation Award (water) and to celebrate the 50th anniversary virtually, exactly on the days WAITRO was founded 50 years ago during a meeting at UNIDO (October 28th - 30th 1970).

Both the workload and the cost of doing this was substantially underestimated. It was quite a bit of work to combine everything in rather short time into a 3-day virtual meeting. The event was called “WAITRO://50 The Virtual Innovation Summit” and a detailed report on it is part of this Annual Report as in spite of being virtual, it still was the highlight of the year and considered quite a success with more than one thousand registrations from all over the world.

The WAITRO Innovation Award was an integral part of the Virtual Innovation Summit. Five finalists on the focus topic of water were selected by the Scientific Advisory Board to give video-on-demand pitches at WAITRO://50 and, for the first time in WAITRO’s history, two projects were awarded US\$25,000 each to seed their research. One was selected by the Scientific Board and another one as a public choice by the participants at the virtual summit. An extensive coverage of the Innovation Award and the project ideas brought forward, is part of this Annual Report.

Although online only, the General Assembly (GA) brought together 35 representatives out of 79 WAITRO member organizations in good standing at the time of the GA. In spite of the pandemic, the number of active WAITRO members has increased by 18 in 2020 alone! Major decisions during the General Assembly were the approval of the WAITRO Strategic Plan 2030 and Work Program 2021-2022 (available as a separate document), the adjustment of the membership fee, which will be waived until the end of 2022 and three changes to the Constitution of WAITRO.

Looking back, I think we can be quite satisfied how WAITRO weathered the pandemic in 2020. At the time of writing, the pandemic is still heavily influencing life in most countries of the world, but with the different vaccines being produced and deployed, we see some light at the end of the tunnel although the rate of vaccination differs a lot between countries.

But rest assured, at the WAITRO office we will continue to offer services to our members although they are quite different in times of pandemic. And with the Strategic Plan and Work Program we strive towards improving WAITRO further and making it still more attractive for its members.

Stay safe!

Letter from the President



HRH Princess Sumaya bint El Hassan

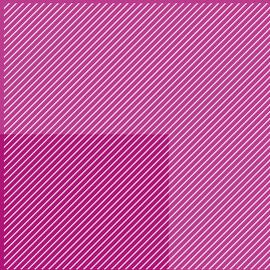
What a difference a year can make. As we reflect on one of the most challenging periods in our shared global history, we must acknowledge the suffering of so many, which will continue for some time to come, and we must recognize the vast social, economic, and geographic imbalances that this pandemic has highlighted and has made so much worse. But we must also allow ourselves to celebrate the great human achievement of finding a pathway out of our pain. Science, that remarkable gift to our collective human race, has answered a call that no other discipline could respond to.

Now, we must hope that our collective leaders and our diverse nations recognize the need to apply these most important bounties of scientific ingenuity - the vaccines that seem miraculous to many - with equality, fairness, and generosity. Covid-19 has given us further proof that our planet is a shared space, and on it we must build a cohesive future. Our hopes are indeed borderless.

It was an apt period for us to proudly celebrate 50 years of WAITRO in 2020. Our motto of indispensability for the future has never been more relevant. As we strive to support the achievement of Agenda 2030, our ongoing global crisis has confirmed the need to support research and technical talent in all parts of the world. It has re-emphasized the utter futility of deeming knowledge or scientific capability to be purely national concerns. The research that produced a range of vaccines in an unprecedentedly short period of time was carried out across the world. The talented individuals who achieved so much against the odds hailed from an even greater list of countries. Talent knows no borders and it is our deep desire and stated mission to ensure that talent is nurtured regardless of where it springs from.

Our recent experience has taught us to share more openly, to communicate more virtually and to interact more equally. I was immensely proud of the success of our first virtual General Assembly, and humbled by the breadth of talent and commitment that it brought forward. Let us take this reinvigorated communication as a strength to emerge with from this awful crisis. We shall continue to grow, to learn, to share and to nurture, so that WAITRO plays its essential role in the next 50 years of research and technological growth and innovation.

Finally, I would like to thank you all for allowing the very great honor to serve as WAITRO president for a second two-year term. I hope that as we emerge from this appalling pandemic and face together a future of critical and acute challenges, we may look back on this period as one that confirmed our mission and cemented our resolve. Let us ensure that all who have suffered have not done so in vain.



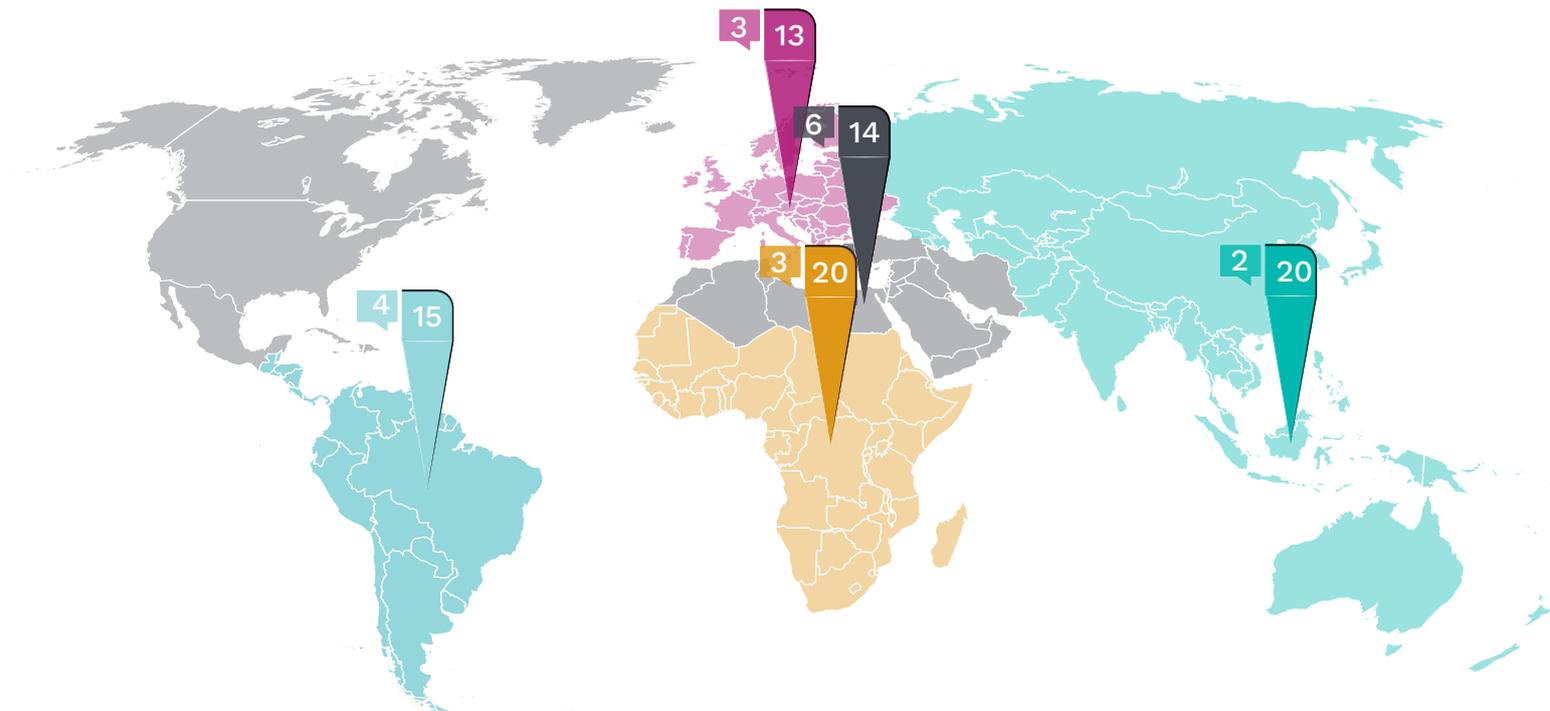
WAITRO AT A GLANCE



WAITRO AT A GLANCE

WAITRO was founded in 1970.

As of December 2020, WAITRO has 81 member organizations from 45 countries.



15
members
in Latin America
and Caribbean

13
members
in Europe

20
members
in Sub-Saharan Africa

14
members
in Middle East
& North Africa

20
members
in Asia & the Pacific

New members 2020:
UCR, Costa Rica
CES, Colombia
UDES, Colombia
FCR, Chile

New members 2020:
AINIA, Spain
IVL, Sweden
TWI, UK

New members 2020:
IBBUL, Nigeria
SIRDC, Zimbabwe
KEMRI, Kenya

New members 2020:
CERTE, Tunisia
University of Petra, Jordan
TIMS, Egypt
NRC, Egypt
KEMRI, Kenya
Qatar University, Qatar

New members 2020:
(UNSW-) CTET, China
TTI, Pakistan

GENERAL ASSEMBLY

All member organizations meet every 2 years. Next regular meeting in 2022.

WAITRO SECRETARIAT

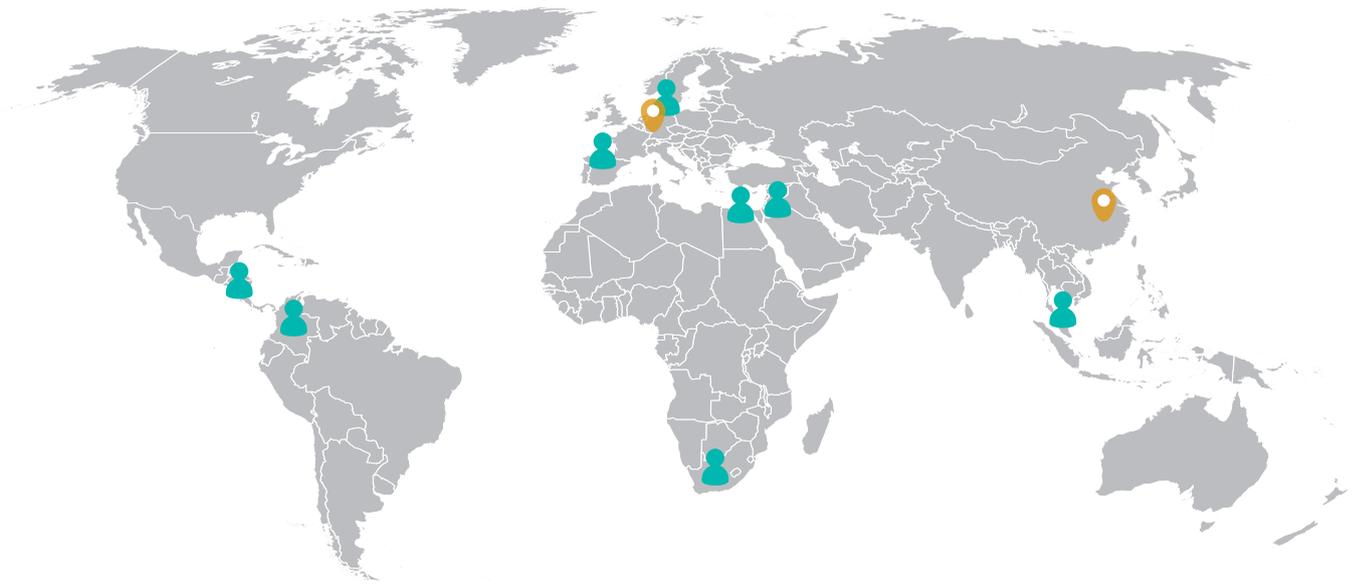
The WAITRO Secretariat employs 13 staff members in two Offices. One Office is located with the Secretary General in Sankt Augustin, Germany, and another office is located in Jiangsu Industrial Technology Research Institute (JITRI), Nanjing, China.

EXECUTIVE BOARD

President, First and Second Vice Presidents
Five Regional Representatives

- Europe
- Latin America and Caribbean
- Africa
- Middle East and North Africa
- Asia-Pacific

Meets at least twice each year
Next meeting: October 2021

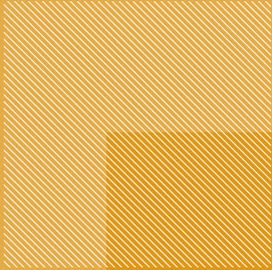


MISSION STATEMENT

To foster innovation on a global scale and drive sustainable development by empowering member organizations and facilitating collaboration across borders and boundaries.

VISION STATEMENT

A global innovation ecosystem, in which research and technology organizations (incl. universities) collaborate, share knowledge, develop, and disseminate innovative technologies in partnership with the private and public sectors to deliver sustainable impact to societies and economies.



01

WAITRO RESPONSE
TO COVID-19 PANDEMIC

L

Since the beginning of 2020, COVID-19 has been impacting the daily lives of millions of people and businesses around the globe. WAITRO is no exception. COVID-19 has drastically changed the day-to-day work of research organizations, both in terms of administration and in terms of strategic direction. As the largest global network of research and technology organizations, WAITRO members are harnessing their expertise and capacities to help combat the pandemic. WAITRO did its best to channel efforts and facilitate continuous, smooth, collaborative innovation.

In 2020, the WAITRO Secretariat conducted two surveys and published two reports related to COVID-19 specific efforts conducted by WAITRO member organizations and challenges they are faced with.

COVID-19 REPORTS

KEY FINDINGS

- 97% of WAITRO member organizations are actively supporting the worldwide efforts to combat COVID-19. The actions are versatile and range from developing confinement exit strategies through producing facemasks, detergents, and hand sanitizers to providing support in testing and diagnosis.
- An estimated 40% of WAITRO members are not able to work remotely. Poor internet connection, missing equipment and missing digital infrastructure are the top three barriers to working remotely within a WAITRO organization.
- 52% of WAITRO members estimate the long-term impact of COVID-19 on collaborative research and innovation to be positive.
- 63% of WAITRO members estimate the long-term impact of COVID-19 on the role of frugal innovation to be positive.
- 73% of WAITRO members estimate the long-term impact of COVID-19 on the importance of knowledge and technology transfer to be positive.

The follow-up report published in November 2020 was mostly in-line with the initial report. It found that while RTOs are strongly affected by COVID-19 (decrease in sales in certain sector markets, difficulties in acquiring new business), the pandemic also led to windows of opportunities for new partnerships and access to new markets.

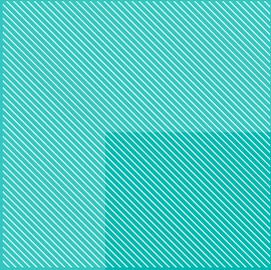
SUPPORT BY THE WAITRO SECRETARIAT

How is the WAITRO Secretariat supporting RTOs in the fight against the pandemic? The support is mainly two-fold. First, it is of utmost importance to us to continue our Capacity Development Program throughout times of travel restrictions. Therefore, the WAITRO Secretariat has facilitated various online Capacity Development workshops tailored to the needs of WAITRO member organizations. Moreover, the 25th WAITRO General Assembly not only went virtual but also reached more people than ever before.

A second support mechanism was the launch of the SAIRA Open Access Hub to Fight COVID-19 with the goal to provide the public and private sectors with access to important research outcomes and technologies. The new Open Access Hub facilitates a structured distribution of research, technologies, insights, and best practices on COVID-19, moderated by a panel of expert reviewers from WAITRO member organizations. While every single contribution is highly valued (21 in 2020), the Open Access Hub has been moderately successful so far. In order to maximize value, more contributions are necessary.

The WAITRO Secretariat and WAITRO member organizations will continue to offer their best support for society and jointly help the fight against the ongoing pandemic.

<https://saira.eco/open-access-covid-19/>



02

50TH ANNIVERSARY
OF WAITRO

L



One of the Grand Plans of the new WAITRO Secretariat when it started in 2019 was to expand the scope of the popular biennial General Assembly into a “Global Innovation Summit” that would bring together the Global Innovation Family to discuss research priorities, learn from one another, and showcase the products and impacts of international collaborative research. The inaugural run of the WAITRO Innovation Award (see elsewhere) would be timed to anchor part of the Summit by culminating a year-long development and selection process with the award itself, and the General Assembly would be co-located with it. The location for the summit was therefore Pretoria, South Africa and WAITRO member Council for Scientific and Industrial Research (CSIR) would partner in the organization of the Summit and to raise local funding to support it.

In early 2019, the Executive Board agreed that focusing on just one SDG would make the Innovation Summit more valuable, and the subject of water was chosen (SDG6, and of particular relevance to Southern Africa). An organizational structure was defined including a scientific advisory board responsible for the technical program but, before preparations could be advanced any further, 2020 revealed itself as the *annus horribilis* for international cooperation, and almost all travel ground to a halt because of the Covid-19 pandemic.

Realizing by April that a Global Innovation Summit in South Africa in December was close to impossible but faced with the Constitutional need for a General Assembly before the end of 2020, the Secretariat moved to keep the momentum already established with the WAITRO Innovation Award and move the entire event into the cloud, creating the first WAITRO Virtual Innovation Summit. This resulted in a three-day meeting using the online Meetyoo platform, which was far more work than anyone anticipated and also far more costly.

WAITRO://50 VIRTUAL INNOVATION SUMMIT

In terms of design, the Summit featured a foyer with welcome videos, documents for download, and an exhibition by key WAITRO partners that was open for all three days. Three “breakout rooms” contained both videos on demand (VoD) and live, interactive sessions. While the former could be accessed anytime, thereby ending the phenomenon of conference jetlag, the live sessions were each repeated so that, as far as possible, members in all time zones could participate without getting up in the middle of the night. A central “virtual auditorium” held further VoDs from the Scientific Advisory Board on the focus topic of water, and also two live panel discussions. Finally, a showroom contained multiple VoDs celebrating the 50th anniversary of WAITRO (formally on October 30th 2020), which also marked the date of the 25th WAITRO General Assembly, complete with online voting. One breakout room was entirely devoted to the GA, with VoD on every proposal for attendees to view at their leisure, and also VoD and documentary support for each candidate for election to the Executive Board. Two live question and answer sessions with the Secretariat were reserved for discussion of GA matters.

The result, however, was a resounding success. Over one thousand registrants were recorded over the three-day period from all over the world...





There follows a brief summary of key content from WAITRO://50, the important interviews, retrospectives, and ideas about the relevance of WAITRO to the focus subject of water.

WATER SESSIONS

Title	Topics
Water and the SDGs: Innovation and Impact (video on demand)	Keynote: “The Cross-Cutting Role of Water in Achieving the SDGs” by Joakim Harlin, Head of Freshwater Ecosystem Unit in UNEP Panel Discussion: “Innovative Technologies, Business and Economic Models to achieve SDGs”
Rebuild Better: An opportunity for a sustainable, resilient and equitable society (video on demand)	Keynote: “Rebuild Better: Why We Can’ t Return to Normal” by Bianca Nijhof, Netherlands Water Partnership Panel Discussion: “Circular Economy Strategies”
Innovative solutions to solve energy, water and food nexus stress (live)	Panel Discussion: “Energy Water Food Nexus Solutions”
The critical role of the private sector in solving wicked water challenges (live)	Panel Discussion: “The Role of the Private Sector in Innovation and in the Cross-cutting Role of Water in Achieving the SDGs”

CAPACITY DEVELOPMENT AT WAITRO://50

For the 50th anniversary of WAITRO, the WAITRO Secretariat was committed to integrating our members and their capacities as much as possible into our WAITRO://50 Virtual Innovation Summit. Members had expressed their desire to actively shape the Virtual Innovation Summit, which is why the WAITRO Secretariat announced a Call open to all members who were interested in sharing their expertise to host their own online capacity development workshop during the event.

The aim was to create a more inclusive program by enabling WAITRO Members to use the Summit platform to conduct their own workshops on topics relevant to them and the wider WAITRO community. The online format of the event had the huge advantage of offering the Members spots for online workshops as well as technical and financial support where needed. The goal of these workshops was not only to provide the membership with more possibilities for active participation within WAITRO but also to enable learning between members. Therefore, it was important to focus on topics that would attract a broad audience, keeping the extraordinary circumstances of the pandemic in mind.

A variety of proposals were submitted, from which the WAITRO Secretariat selected three workshop proposals that were focused on topics relevant to the wider WAITRO community that could also fit well within the Virtual Innovation Summit platform, including RTO Engagement with Industry in Times of COVID 19, Efficient Remote Work and Joint Efforts of RTOs to Facilitate Sustainable Development. The Fraunhofer-Gesellschaft, the Danish Technological Institute (DTI) and the Swedish Environmental Research Institute (IVL) conducted these outstanding workshops. They pre-recorded and uploaded videos onto the online event platform, so participants could watch them from all around the world independent of time zone differences. During the event, they also offered two Q&A sessions each (one in the morning and one in the afternoon), so that the Summit participants had the chance to “engage live” with the speakers. That way, all participants had the opportunity to join, regardless their geographical location.

The second virtual workshop, organized by the Danish Technological Institute (DTI), was on meeting the changing conditions following the Covid-19 crisis. Considering the way all businesses and RTOs have been affected by the Covid-19 pandemic, the facilitator, Knud Erik Hilding-Hamann, introduced methods to unlock new potentials for RTOs. He discussed how to support business affected by the actual crisis either on site or remotely. Some of the topics specifically addressed were: lack of Covid-19 protection supplies, dramatically reduced demand in key markets, new restrictions, and other issues.

To gain a better understanding of the challenges that WAITRO members were facing due to the COVID-19 pandemic, a survey was conducted before the workshop. Based on results from the survey, a Q&A session was designed to best address the needs articulated by members.

The workshop, held by the Fraunhofer-Gesellschaft, on efficient remote work was facilitated by Annika Gehrman and Sylvia Raabe. They gave important insights into Fraunhofer’s experience and current practice with regard to remote work. This workshop was a perfect occasion to engage in an active conversation about the pros and cons of remote work. Many questions were asked from the audience, who were almost all exclusively working remotely at that time because of the pandemic. Together with the facilitators, the participants reflected on the lessons learned in the context of COVID-19 and discuss how work would evolve in new ways and affect their organizations.

A valuable outcome of this workshop, including the survey, was the report made by Knud Erik Hilding-Hamann (DTI), together with the WAITRO Secretariat. One of the most outstanding findings was that even if WAITRO members had experienced difficulties regarding sales in certain markets and acquisition of new clients, many of them had been able to deal with the pandemic restrictions and satisfy their needs of supply chains through public or private partnerships, clearly showing the resilience of the WAITRO membership. You can find the report on the WAITRO website.¹

¹ <https://waitro.org/activities/meeting-the-changing-conditions-covid-19/>

The Swedish Environmental Research Institute IVL facilitated the third workshop entitled ‘Joint Efforts of Research and Technology Organizations (RTOs) to Facilitate Sustainable Development with a Focus on Realizing Circular Water Management Solutions’. The trainers, Dr. Mathias Gustavsson, Östen Ekengren, Yanjing Zhu, Staffan Filipsson, Rupali Deshmukh, and Gao Si, addressed cooperation between research institutes and the private and public sectors, with the aim of designing and realizing sustainable solutions for water management. The workshop fitted perfectly into the overall theme of the summit, ‘Water’. Presentations were made on specific case studies in China, Sweden and India, including a reflection on sustainable development support in the post Covid-19 era.

WAITRO was delighted with the huge success and acceptance of the online Capacity Development Workshops. Supporting staff and researchers to train other WAITRO’s Members maximized the benefit of WAITRO’s rich pool of R&D expertise and empowered WAITRO Members to apply their expertise, skills and know-how. As WAITRO unites RTOs from all over the world, this event was a rewarding experience for the integration and development of Members.

SUMMARY OF WORKSHOPS AT WAITRO://50

Title	Speaker
Efficient Remote Work – Best practices	Annika Gehrmann and Sylvia Raabe – Fraunhofer-Gesellschaft
Meeting the changing conditions following the COVID-19 crisis	Knud Erik Hilding-Hamann –Danish Technological Institute
Facilitating Sustainable Development with a focus on realizing circular water management solutions	Dr. Mathias Gustavsson, Östen Ekengren, Yanjing Zhu, Staffan Filipsson, Rupali Deshmukh, Gao Si – IVL
New Technologies & Innovation - Drive the recovery and development in the post pandemic era	Raymond Tavares, Jun Yang - UNIDO

The WAITRO-UNIDO Connection

Interview with Bernardo Calzadilla-Sarmiento Managing Director, Directorate of Digitalization, Technology and Agribusiness, UNIDO.

Dr. Calzadilla-Sarmiento is the Managing Director of Digitalization, Technology and Agribusiness at UNIDO. Except for three years at the ISO - International Organization for Standardization, Bernardo has held various positions in UNIDO since 1991. He is a graduate of the Vienna University of Economics and Business with a PhD in Economics, Regulation & Decentralization and the Harvard Kennedy School in Trade Policy.



Today we will be speaking about the special relationship between WAITRO and UNIDO. WAITRO was founded under the auspices of UNIDO in 1970. How did the establishment of WAITRO contribute to UNIDO's mission?

UNIDO was established in 1966 and one of its first actions in the area of technology and innovation was the creation of WAITRO. UNIDO only became a specialized agency in 1985, with the core mission to promote the acceleration of *Inclusive and Sustainable Industrial Development* known as ISID. This mission is also embedded in SDG-9.

With the establishment of WAITRO, we were in the phase of technology promotion; there was a lot of demand for technology from developing countries, and there was a need to integrate industrial research with industrial development. So, in the initial years, UNIDO endeavored to support WAITRO in selected projects and asked WAITRO to advise UNIDO how best to catalyze industrial research activities. Over the last 50 years, WAITRO has become a large organization with the capacity to support many of UNIDO's functions and priorities. In particular, the new innovation hub, SAIRA, has enabled new collaborations, not just between WAITRO members but also with UNIDO. Also, we have started to promote together the opportunities and challenges brought by the 4th Industrial Revolution for innovation and entrepreneurship, so that we can support the structural transformation and job creation in developing countries. Ultimately, improvements in the standard of working and achievement of SDGs depend on this.

In 2008, UNIDO and WAITRO again signed an MOU. How do you think the relationship has changed since then? And how do you see progress in the future?

Indeed, in 2008, we signed an MOU to foster our relationship, especially in one specific area, the creation of Labnet as a reference point for industrial research. It is important to have a hub for laboratory information for testing laboratories so that products meet the technical requirements and quality standards of importing countries.

In recent years, UNIDO and WAITRO have maintained a continuous dialogue on expanding this collaboration. In 2016, the Director General of UNIDO, Mr Li Yong, and the former Secretary General of WAITRO, Rohani Hashim, reached an agreement to establish a strategic partnership to promote standards, quality, and innovation, and this was the beginning of our journey into the promotion of Industry 4.0. Also, in 2019, we had the honor of receiving Secretary General Dr. Eckart Bierduempel in order to continue forging this collaboration. Already at that time, the vision was there to prepare this 50th anniversary event, which was supposed to be in South Africa. Today we have to have it in a virtual format, but we nonetheless continue to strengthen our technical cooperation policies and we keep collaborating within different industry sectors.

We also foster innovation by providing appropriate tools and methods for the assessment of innovation management, related to training professionals and teachers. WAITRO has a lot of potential to harness the open innovation and industrial research, also thanks to the innovative features of the new innovation hub SAIRA. And for the 50th anniversary, we can confidently say that the two organizations will enter a new stage of collaboration and continue to improve our services.

So, as you already mentioned, WAITRO turns 50 this year, which is very exciting. From what you've witnessed of WAITRO's activities over the years, what strikes you as the most important and most significant?

UNIDO strongly commends WAITRO's achievements, particularly its contribution to fostering innovation. We very much appreciate the number of collaborative research projects that have been conducted by WAITRO globally. I think a very important feature that was present from the beginning is the forging of real South-South cooperation at the stakeholder level. Now, with the arrival of the Fourth Industrial Revolution, WAITRO can go even further as an early adopter of digital platforms.

I admire the role of WAITRO in bringing together research institutions, but also now its relationship with companies, because ultimately success comes from working with companies, startups, NGOs, and other government agencies. Also important is making connections to investment, in particular impact investors to support the transfer of technology and to implement new solutions on a global scale.

UNIDO certainly overlaps with WAITRO because we are in the same business. More than ever, we have also seen that digital transformation has become central, so UNIDO also has a number of specific programs there. One good example is our program for country partnerships, which is using an innovative model to accelerate ISID in member countries. Most important is to work in a multi-stakeholder partnership, and to do fundraising in addition to technical cooperation. In many countries at the core of this program, we have been supporting industrial parks and special economic zones. A special economic zone creates a production and innovation ecosystem. Once the ecosystem exists, customers can come in and find their niche, but you need to create this ecosystem first.

To master the grand challenges of our time, global collaboration is needed more than ever. What do you think is the specific role of collaboration between developing and developed countries?

This is such a timely and important question. Recently, we already had a tense situation with trade polarization affecting multilateral cooperation. The combination of the pandemic and trade tensions raise questions about our multilateral system, and we start to see protectionism. In the early stages of COVID-19, you may recall that we had a disruption in health but also a disruption of the value chain, and this led to some protectionism because some countries did not want to allow their health goods, their protective equipment to be sold abroad. We are lucky to have established the 2030 development agenda and the SDGs, because these keep our momentum and maintain a framework in which we can work. The new normal, however, has to lie in digital cooperation, and also has to lead to a recovery that focuses on being Green. At the beginning of the pandemic we saw pictures from cities in lockdown where the skies were blue and because everything became quiet in the human area, animals had returned to the city. When we allow it, nature can recover itself. So the new normal has to be green but also has to ensure that nobody is left behind.

On the topic of sustainable development. What do you think is crucial to promote sustainable development in developing countries? And how would you see WAITRO's role in this?

Sustainable development is the pathway to achieve peace and prosperity. There are 17 SDGs and we need to try to achieve them all together by creating synergies in relation to the environment. It is important for developing countries to have long term interest so that they can achieve a sustained, stable, and healthy development of their national economies. The role of WAITRO can be that technology digitalization is becoming more central than ever and developing countries, in particular, need help. They need not only to implement policies but they need help to implement a digital infrastructure; they need to have the skills in place, and also they need to know how to get the necessary advice. WAITRO's role can be to help its members reach out to young people, to new startups to help the participation of women. The most important elements of ISID can be advanced by non-material resources, by information and by linking science, technology and innovation. I think that after 50 years, the role of WAITRO is more important than ever. It will play a critical role in converging resources, partnerships, and international cooperation. Real multilateral partnerships and knowledge exchange are essential to respond to the crisis and innovation is needed to respond to the needs of people and not only recover but transform our societies to a better future.

The final question is, as the managing director of the Directorate of Digitalization Technology and Agriculture at UNIDO, what lessons have you learned being part of a global organization?

I have 25 years of experience in global development with UNIDO. I started with the government of Bolivia in planning, and then moved into standardization, with ISO. I have experienced the process of globalization. One of the most important elements is to see how we can grow together, how countries can work together, because development is not something that happens in just one place; it is all interlinked. We need to take advantage of new technologies to help the countries leapfrog their development but you need to have multiple elements in place, such as digital infrastructure, or you may leapfrog to the same place. It is not enough to develop skills without infrastructure and infrastructure is not useful if it is not accessible.

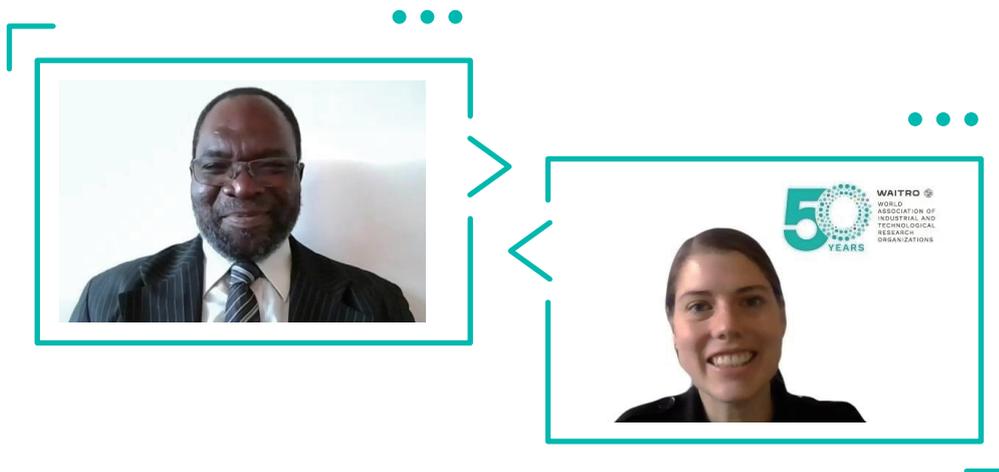
In many parts of the developing world, in Latin America for example, there is good quality digital infrastructure but it is too expensive for SMEs. We need to make sure that not only the infrastructure is there, but the skills are there too and that we have an ecosystem that also allows for the important element of cooperation. My experience relates to a period where we had a great deal of globalization, but we are now starting on completely new processes. Industry 4.0 is evolving, we have cloud computing, we are moving into quantum computing and artificial intelligence. So things evolve very fast. It is important to have a collaborative approach and partnerships to bring everybody on board so that nobody is left behind.

This is the 50th anniversary of WAITRO but we are also celebrating 75 years of the United Nations. When we look back from the future, I would like to see that we worked together, that we have grown together, and that we built a foundation to meet the challenges of a peaceful future. Thank you so much.

Thank you very much.

The Successes and Challenges of WAITRO

An Interview with MOSES MENGU



Moses Dachariga Mengu is a Senior Project Leader at the Danish Technological Institute (DTI) and has a long and distinguished career in research and innovation management. His academic qualifications include Bachelor in Geography, University Ghana, 1971; Master of Science in Planning, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, 1973; and Master of Science in Information Science, The City University, London, 1978. He was a parliamentary candidate in Ghana's 1978 general elections and has been a member of the national commission on science and technical information for Government of Ghana, and a member of the national commission on building codes of the Ghana Standards Board. He has also been a member of several professional associations including the the Ghana Institute of Planners, Institute Information Scientists (UK), and the Association for Science-Led Development in Africa. He is most well-known by the WAITRO Global Innovation Family, however, as a tireless supporter in a variety of roles since 1974. He was interviewed by Julia Wiethuechter of Fraunhofer Gessellschaft for the WAITRO 50th Anniversary Virtual Innovation Summit.

JW: How did you become involved with WAITRO?

MM: My journey started in Ghana, my home country, when I joined the Council for Scientific and Industrial Research (CSIR) as a research officer in 1974. My responsibilities included being the coordinator of relations between CSIR and other international organizations, including WAITRO, of which CSIR was a founding member.

Almost 10 years later, the Secretariat had moved from Vancouver, Canada to the Netherlands and then to Sweden. The Executive Board decided that someone from a developing country should be attached to the Secretariat and, since I was already in contact with the Secretary General and acting as the focal point in Africa, I was selected to be that person. Then, in September 1986, I followed the Secretariat to Denmark.

Which different roles did you have at WAITRO?

When I joined the Secretariat in 1983 there was a part-time Secretary General and I was referred to as a Senior Expert. Then in September 1986, I moved with the Secretariat to Denmark and was appointed as Deputy Secretary General, responsible for developing programs. I played that role until the Secretariat moved to Malaysia in 2002. Then, when I was working in Africa, I was appointed to be the African Regional Representative (RR) on the executive board of WAITRO from 2004 to about 2006. In 2007, I came back to DTI and was then asked to establish a European Regional Focal Point (RFP). So I became the RFP for Europe from 2007 to 2017. So I've really never left WAITRO since 1974.

Can you tell me a little bit about what the early programs that WAITRO was focused on?

One of the principal reasons for establishing the Association was so that it could develop collaborative research between its member RTOs. Then there is the WAITRO training program to build the capacity of its members in developing countries, achieved through linking up the Directors of new Research Institutes in developing countries with corresponding Institutes in industrialized countries. This was one of WAITRO's key activities.

The General Assembly meetings were held in conjunction with international seminars, which focused on topics relevant to RTOs all across the world and provided a forum for discussing new ideas and new challenges for RTOs. This has been one of WAITRO's best programs throughout the years.

In 1971 there was no internet, so getting information on what was going on in technology development and technology transfer around the world was difficult. Getting to know funding agencies, their programs, and available opportunities was not easy, especially in developing countries. So WAITRO was like an Information Office, collecting and disseminating information to its members through publications such as the WAITRO Communiqué (later changed to the WAITRO Newsletter).

Another program that WAITRO engaged in was to represent RTOs within the international community, especially within the UN community. So WAITRO was a contact point for RTOs, and with many of the United Nations and other international agencies.

One thing I noticed when I looked at the history of WAITRO is that in the beginning there were quite a few members from the United States and they left along the way. Do you know why?

For most of them, especially those in the United States, the UK, and France, the main reason was that their business model changed. In the early 1970s, most of them were public funded government institutions with a "do good" agenda that they all worked towards. By the early 1980s this changed. Some began to get funding from private industry and were more committed to their industrial clients. Others were working for their ministries of defense. Many of them had different business agendas and therefore didn't find collaboration with WAITRO to be an advantage.

Then, many of the Directors of the RTOs which had joined together to form WAITRO in 1970 began to retire, and some of their successors were less interested in WAITRO activities. In cases where retiring directors developed successors and left behind good information, those organizations continued their involvement.

Other problems include some developed countries beginning to suffer from "donor fatigue" and becoming less willing to fund international activities. A number of governments withdrew resources, leaving their RTOs unable to support WAITRO. There were also some geopolitical differences, but on the whole I don't think these were very important.

Can you talk a little bit about the relationship between WAITRO and the different UN agencies?

UNIDO (The United Nations Industrial Development Organization) was the founding body for WAITRO, but it worked in collaboration with UNDP (The UN Development Program) and UNESCO (The United Nations Educational, Scientific and Cultural Organization). The custom in the UN system was that if one of these specialist agencies established a new Association then it would automatically gain “consultative status” with the UN. This meant that WAITRO could be represented in UN forums along with international bodies and other UN members.

Apart from that, the UN had a number of science and technology bodies. One of them was the United Nations Fund for Science and Technology for Development, which was intended to support developing countries. This body helped WAITRO until it was disbanded in the early 1990s, then its role was taken over by the UN Center for Science and Technology for Development, which was an inter-governmental agency coordinating activities among UN member states. This body was eventually replaced by UNCTAD, the UN Center for Trade and Development, which today is called the WTO (World Trade Organization). So the UN agencies were themselves changing and WAITRO’s connection to the UN system got weaker, but the linkages with UNIDO and UNESCO have been maintained.

Today, WAITRO is linked to the UN system through another agency called ECOSOC, the United Nations, Economic and Social Commission. This body is responsible for maintaining relations between the UN system, NGOs and Associations like WAITRO. So WAITRO still has strong links to the UN system that it can leverage for making a global impact.

You played a crucial role in the 1980s when WAITRO went through a particularly trying time because it lost the support of its host organization, TNO in the Netherlands. How did the Association persevere?

What happened was that the Secretary General of WAITRO, Dr Gerritsen from TNO, retired at the end of 1981 so TNO asked the WAITRO Executive Board to look for a new host. Unfortunately, there was no time to find one, so one of the Executive Board members, Mr. Hans-Georg Lindgren, from Sweden, offered to establish a temporary Secretariat office in Stockholm. There were no government funds supporting WAITRO and only very few members paid fees at the time, so it was difficult to fund the office. Mr. Lindgren had retired from his organization and agreed to run the Secretariat without a salary, but they needed somebody who could work full time planning activities. The Executive Board decided that someone from a developing country should join the secretariat.

There were no office facilities and it was very difficult to get funds for simple things like making photocopies or mailing. We depended on a number of benevolent institutions in Stockholm like the Swedish Environmental Research Institute (IVL) and the Swedish Institute for Building Documentation (BYGGDOK). Fortunately, the Secretariat was able to get the Swedish Institute (SI) to provide a stipend to cover my living expenses in Stockholm, while my home Institute in Ghana, The CSIR, agreed to give me leave with pay for two years. After this, I got a research fellowship from the IDRC in Canada until the Secretariat moved to Denmark and our fortunes changed for the better. Those years from 1982 to 1986 were indeed an extremely trying period for WAITRO.

From your perspective, what are the greatest accomplishments of WAITRO?

There are many areas where WAITRO has made an impact. Project collaboration between RTOs is one of the main reasons WAITRO was started. For example, in 1982 The WAITRO Secretariat promoted a research project between the Swedish Metallurgical Research Institute (MEFOS) and the Central Metallurgical Research and Development Institute (CMRDI) in Egypt, which ultimately revamped the entire Egyptian metallurgical industry.

The studies of fermented foods in Africa, which started around 1990, helped several Institutes in Africa upgrade, including creating accredited laboratories in Ghana, Burkina Faso and Benin. Hundreds of scientific publications were produced, and probably over 40 PhDs were trained from different African countries.

There were other projects that made an impact at a local level. In Malaysia, the Secretariat started a program of poverty alleviation in developing countries, helping local communities to develop projects in Indonesia, Nigeria, Colombia and other places. These local level projects had a great impact on the communities that were involved.

For WAITRO member RTOs, The “best practices project” was one of its biggest achievements. This project developed a methodology for benchmarking RTOs, and a number of members used the results as a basis for making changes to their organizational systems.

Even after all these years, you are still very active in WAITRO. What motivates you to remain so committed?

I think it is the personal networks and connections with individuals and organizations. It becomes a love story between you and the people that you have been so close with. I think this is the biggest motivation. The other is that since 1974, WAITRO has been the basis for building my professional expertise, international standing, and personal development. Yes, I would say that my relationship with WAITRO is a kind of love affair.

Apart from you, what do you think holds the global innovation family together, even through challenging times?

The need for RTOs to have counterparts around the world with which they can work and which face similar challenges. There are other institutions for universities and so forth and a number of regional associations but, for organizations that are engaged in research, WAITRO is the only global association. Furthermore, WAITRO provides a forum where its members can work as equals, irrespective of whence they come. Members from poor countries are able to sit in the same forum and discuss things equally with members from large industrial countries. Members from a small RTO in Ghana, Burkina Faso, or Botswana can sit side-by-side with large RTOs such as TNO, Fraunhofer, or SINTEF.

I would also say that the personal relations that are built by the members; the directors and presidents who attend these WAITRO meetings, create a very strong bond. This bond facilitates other business relations and collaboration among them. These things are what keep the global innovation family together.

Through your involvement with WAITRO, what lessons have you learned on the role of international cooperation in science and technology?

I think the first lesson that I've learned is about mutual collaboration among researchers. When you can put them in one room, face to face, they build confidence and trust in one another. WAITRO brings people face to face and this is what all organizations that work internationally need.

Also, international collaboration does not succeed overnight. Most of the successful projects that I've mentioned took several years to build before they could be called a success. The fermentation project took nearly 25 years, the best practices project took 15 to 20 years, the metallurgical project a similar period. For international collaboration to take root, it takes time.

Can you say why we still need WAITRO today?

I remember that in 1978, or thereabouts, in a General Assembly meeting, somebody said that if WAITRO had not been founded in 1970, it would need to be founded at that time. And this statement has been repeated in several General Assembly meetings; roughly every 10 years, somebody says that if WAITRO did not exist, they would need to invent it. This means that its validity is still as strong as it was in 1970.

So how do you see the future of the association?

Well, very bright! Most Associations like WAITRO do not last for more than a generation but WAITRO has existed for 50 years, which must mean that it is a very relevant and well-functioning organization.

WAITRO was born with very laudable objectives, but unfortunately it didn't come up with a very solid business model in the sense of financial sustainability. So, in the future, WAITRO needs to refine its financial sustainability model and create clear value for its members. There are many ideas which cannot be implemented due to lack of resources.

Things have improved and the Secretariat is in a much better position. There are now more tools to work with, like the internet and easier international travel, that make it possible to realize a number of ideas which were not feasible 20 years ago.

In 1988, the WAITRO Secretariat developed an idea for a global technology park, something similar to the online resources that we have today. Unfortunately, it didn't find funding and lost that opportunity. Another idea was to establish an accreditation system for WAITRO members, similar to what universities do now with their ranking system. This would have provided WAITRO members with a kind of a benchmarking body and tool that they could compare themselves with and use to justify their existence to their funders. This has also not been implemented. So I think if WAITRO is able to implement some of these ideas that it had earlier on, it would make a big difference to how it is viewed by its members.

Any other recommendations or final remarks?

First, I have realized that the success of the Secretariat is very central to the entire operations of the Association, and the examples from Denmark and Malaysia show that the Secretariat needs a solid foundation. Moving from one place to another has tended to weaken the administration. It is said that a rolling stone gathers no moss, and if the Secretariat moves every few years, it will never settle down and be able to implement its programs. So going forward, I would say that as long as it can get funding, it should stay where it is in Germany and China for the foreseeable future.

I think another recommendation I would make is that the Secretariat should, as a matter of urgency, try to develop the business model that I talked about; a financial model that does not contradict with its non-profit objective status, but a model that enables it to maximize its opportunities to raise funding to support its programs.

The Secretariat should grow a crop of dedicated workers; people like you! You should take WAITRO activities as a profession. WAITRO can also harness the interest and the love that many people who have been linked with it in the past still have for it by establishing an Alumni association. In the past, the Secretariat had what we used to call the "Wise Men", which were retired RTO Directors who still had interest in the Association. They continued to come to WAITRO gatherings and advise the Secretariat and the Executive Board, attending Executive Board meetings and advising the Board on how to solve some of its problems. Most of them are retired, so they have a lot of time to help WAITRO achieve its objectives. I think this group should be established as quickly as possible.

My other recommendation is that when I started to collect stories for this 50th anniversary celebration, I realized that the recorded documents on WAITRO were very few and scattered. I think the Secretariat should use part of the website to serve as a kind of repository to collect documents, photographs and stories of past activities.

Thank you for these very valuable insights and all your contributions, not just with this interview. I am sure it will be very useful to everyone who watches it. Thank you very much!

Roundtable Discussion: Witnesses to 50 Years of WAITRO Chaired by Moses Mengu

**Moderator: Moses Mengu (MM), Senior Project Leader, DTI, Denmark.
Joined WAITRO in 1974, served WAITRO Secretariat 1983-2002.**

This is a panel of people who are very knowledgeable about WAITRO. It's meant for the benefit of our current members, and for those who in future might want to join the Association. We have a member from each of the WAITRO regions, Africa, Asia and Pacific, Europe, North America, Latin America and the Caribbean and the Middle East and North Africa (MENA). First of all let's go around with a brief introduction of the panelists:

- Prof. Adel Nofal (AN), Former President of the Central Metallurgical Research and Development Institute (CMRD (AN)), Egypt. Previously Regional Representative and WAITRO Executive Board Member for Middle East and North Africa (MENA).
- Liaquat Shah (LS), Former Executive Director of the Caribbean Industrial Research Institute, (CARIRI), Trinidad and Tobago, one of the founding institutes of WAITRO. Also a previous First Vice President of WAITRO and Regional Representative for Latin America and Caribbean.
- David Grier (DG), Former Chief Consultant, Saskatchewan Research Council, Canada. Previous Second and then First Vice President, and hosted the General Assembly in 2006 in Saskatoon, Canada.
- Prof. R.K. Khandal (RK), Former Executive Director, SRIRAM, India and WAITRO President 2010-14.
- Marianne Jessing (MJ), Project Manager, Danish Technological Institute. WAITRO Secretariat from 1993-2002. Hosted the General Assembly in Copenhagen in 2014.
- Prof. Eugenia J. Olguin (EO), Institute of Ecology- CONACYT, Mexico. Regional Representative for Latin America also the First Vice President, Second Vice President, and Interim President of WAITRO in 1998.
- Prof. Charles Kwesiga (CK), Executive Director, Uganda Industrial Research Institute, Uganda. President of WAITRO 2015-16.

MM: Professor Kwesiga, You have been in WAITRO for quite some time. What would you say was your best moment with the organization?

CK: Probably the most auspicious moment was when I was elected president of WAITRO in Copenhagen, Denmark, in August of 2014 because being from Africa, and from a third world country, rising through the ranks from Regional Representative to Second Vice President, First Vice President and eventually to President was a very glorious moment. I have made lifelong friendships in WAITRO, Profs Nofal and Ali Shah helped me revolutionize the oil industry in Uganda. David Grier got me started because it was at the Saskatoon conference that I was elected Regional Representative, I thank you all, very much.

MM: What in your opinion, can be done to develop more collaborative projects among African members and also among the African members and other WAITRO members from other regions of the world?

CK: A lot needs to be done because we're all starting from very different baselines. We need more collaboration, more guidance, so that Africans can also be at the high table of technological developments. Recently, I presided over a symposium that was discussing the Fourth Industrial Revolution, and I asked the audience that before we discuss the fourth industrial revolution, when do we intend to embrace the first? So we have quite a distance to go with exchange of ideas, collaboration, guidance, sharing experiences that will probably help us leapfrog over other stages of development that we have to go through.

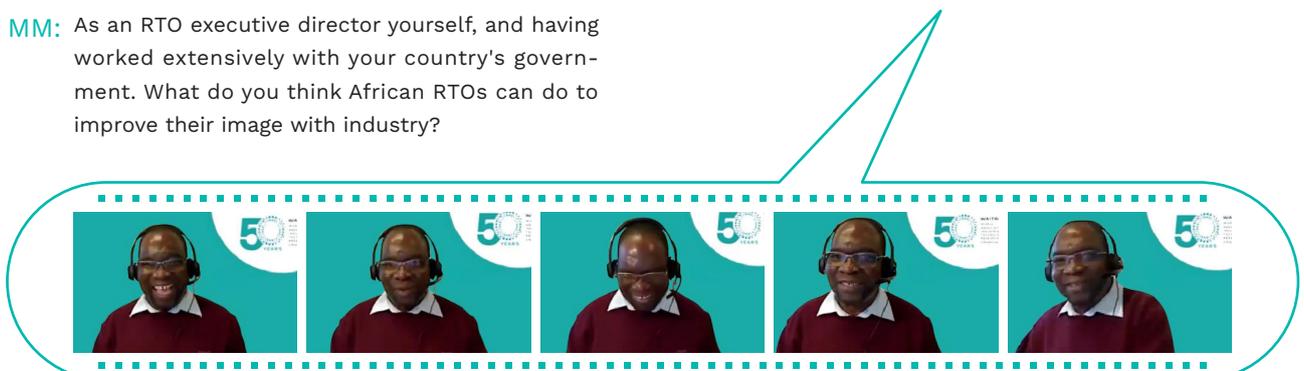
MM: As an RTO executive director yourself, and having worked extensively with your country's government. What do you think African RTOs can do to improve their image with industry?

CK: From my personal experience, we need to redefine our missions, understand the reality of our situation and seek collaborative efforts so that we can learn from those who have been there. As an example, I would like to invite all of you to an iconic project that we just commissioned this January to address machining and manufacturing, and skills development using state of the art technologies. We built it with a \$30 million grant from Chinese government, and it is truly a sight to behold. So I really encourage you to see the major projects that we are doing. Then we need to address the realities of technology transfer and idea exchange.

MM: You are probably one of the few executive directors in Africa able to raise such international funding for collaboration and for your own institutional development. What lessons do you have for other Waitro directors, how can they leverage international funding and investments for their Institutes in the same manner?

CK: The strategy is to attract the attention of the people who matter. Look for alliances that add value to your own strategy. Understand what an RTO is all about and how to sell the idea to the constituencies that you may depend on to deliver what you want. And, again, sharing experiences is important.

MM: Professor Khandal, you were President of WAITRO. Are there any events during your tenure that you would use as an example of the benefits that people can derive from WAITRO?





CK: I am grateful to you for inviting me to this august meeting. My first impression of WAITRO was from the General Assembly that Dr. Grier hosted in Canada. At the time, I was chairing a conference on radiation processing in Delhi and the then Secretary General of WAITRO happened to be looking for new RTOs to join WAITRO so I suggested that he come because there were so many prospective WAITRO members at that conference. The first time I visited Saskatchewan Research Council, I was fascinated by the way they function. Then later on I went to Denmark and saw DTI and I was impressed at how they function. In 2006 a lot of effort was invested to recruit North American and European members and I resolved that we should also work together to increase the membership starting from Asia.

Two projects come to mind: One project was between ASEAN countries, and the other project was called the Go Global Project, which was led by Netherlands funded by the EU but with partners from the UK, Italy and Denmark. The scope of the project was supposed to encompass RTOs from all parts of the world. I knew RTOs from Africa and already had a very strong relationship with ASEAN countries, so we organized Go Global so that people from Thailand, Malaysia, Indonesia, China, Ghana, Uganda, Nigeria, South Africa, and Botswana joined the program.

MM: If we go now to Mr. Liaquat Shah. What in your view has kept WAITRO and CARIRI together for all these years from 1970?

LS: One of the early WAITRO Presidents, Hollis Charles, was from CARIRI so in a way I grew up in the Global Innovation Family. Later, I joined the private sector as a CEO and I have been doing that for 20 years. Eventually I ended on the Executive Board and started to meet people, which made me think how could we move forward with membership.

Coming from a small island state, it is important to justify to the board of directors of my Institute, and to myself, why we are spending money to be part of this network. It is not just a question of what the network is, but of what we can contribute. I remember going to the first General Assembly, representing a country that most people could not find on a map. And when you sit in a small boat, you have to be careful, how you sit!

Most RTOs operate using state funds with some funding from the private sector. Funds you can earn from the private sector give you some latitude and independence for developing a strategy. Indeed, earning capacity is fundamental to the strategic growth of an RTO.

About 15 years ago, CARIRI started to pursue a course of linkages, through WAITRO and its members. It's not easy, resources are finite and it is virtually impossible to keep up with the speed of technological change, but linkages with other WAITRO members expand the capability that you can sell, and the funding mechanisms that you can exploit.

Another factor is public-private partnerships. These can be used to fund infrastructure and so on. These should be considered in every country but they are not. This is an area that I will talk about later. So WAITRO should be looking to see how it can connect these institutions. I got into trouble, a while back, at a public forum in Trinidad, when I said that CARIRI is strategic to our national interests, and I use it in the military sense of the word. I was talking about the global arena, and global economic competitiveness. So RTOs are strategic, but these linkages must have some basic infrastructure to succeed and must have some sort of funding.

I will quickly mention some specific capacity and infrastructure building. We sent 18 people over 5 years to the Sriram Institute for all kinds of training and Dr Khandal in particular was very open and generous. We visited CMRDI and Dr. Nofal. The National Metallurgical Industry Institute in India provided a very interesting model very early in the business. These functioned as virtual consultancies, giving my junior staff an opportunity to send information and samples and get back results so we could talk to private sectors, such as the oil industry. Outside of WAITRO, working with other Institutes was rather expensive. We were able to sell technology of machinery into Botswana, we had four to five collaborations with SIRIM Malaysia, and South Africa. We have ongoing projects about asphalt and essential oils.

Commercialization is often a nightmare for RTOs. With that in mind, we used all the experiences we gathered from SIRIM, CSIR and DTI to create a center for Enterprise Development. We had to be innovative in how we use our budget to accomplish this. We invested in specific types of training that that could be implemented for revenue generation almost immediately, for example we learned a method within two weeks for simple tests for fats and vitamin C that would have taken my young staff a year and a half to develop. If you earn the respect of the private sector then they will bring in projects. The point is that CARIRI is a working example of an Institute in a small country that developed real relationships through WAITRO that enabled it to compete.

MM: Thank you very much. Professor Eugenia Olguin, another stalwart of WAITRO for many years in terms of project development and project collaboration in the area of the environment and a champion for the role of women in WAITRO. What, in your view, were the reasons for establishing the climate and environment Special Interest Group (SIG) that you led and do you think that the reasons for establishing such groups within WAITRO are still relevant today?

EO: All my activities with WAITRO were related to environmental biotechnology, which is my field of expertise, but these special interest groups that you mentioned are extremely relevant now. They were very useful at the time because we established a network of Institutes around the world working on climate and water pollution, and we had support from WAITRO and DTI to organize two international conferences together with the International Society of Environmental Biotechnology.

So, both of them were very important occasion to network with several RTOs around the world, and to stress that WAITRO is also promoting research, because all these achievements in technology that other members of WAITRO have been talking about, can only be achieved if our Institutes are doing high quality research. In developing countries, 40 years ago research was always behind in our country but now we have a good quality scientific staff. For me, the key is to promote research to reach a self-sustaining capacity for development so that we are independent. So now it would be very relevant to re-establish these groups, especially in global climate change. This and water pollution are two most important issues and I would be more than happy to help.



With regard to what you mentioned about forming a women's chapter, it is most certainly relevant. In our Institutes, women are not reaching the very high levels for many reasons. We have to have equal opportunities. We should be pushing not only women in the academic and professional fields, but also the empowerment of women in small communities, so again I would be very willing to help with these two issues.

MM: Well, you have an ally because for the first time we have a female president of WAITRO, and not just an ordinary woman but Her Royal Highness Princess Sumaya of Jordan. So I think that you have an opportunity now to work with Her Royal Highness to realize that dream.

MM: Professor Nofal from CMRDI. Just like Prof. Olguin, you are one of the oldest WAITRO members and have played different roles within the association. What is your motivation for CMRDI staying so long in WAITRO?

AN: I will share with you our unique experience with WAITRO. Early on, we started working together with TNO in The Netherlands. Our late President, Professor Azim, was the Vice President of WAITRO and became President for two consecutive terms. We collaborated with TNO under the WAITRO umbrella and submitted a project to the Ministry of International Affairs in The Hague. We started to introduce new technologies to the foundry industry, together with our Dutch friends, to produce ductile iron; one of the most important engineering materials of the 21st century. We introduced the technology to different foundries and then we established a new experimental foundry. In Egypt, as in many developing countries, we have an acute problem with securing

spare parts because we need a wide spectrum of spare parts but in limited quantity, which does not justify the establishment of a commercial foundry. We thought to have an experimental foundry in our Institute, with the objective of carrying out research and development projects with industry, but then we started some very limited production. Sometimes one piece is required to save very expensive equipment from being scrapped because it is too old there are no spare parts on the market. With the help of the Dutch government this experimental foundry, with a capacity about 1000 tonnes per year, started to produce spare parts with strategic as well as economic importance.

Not only did we bridge the gap between research and production, but we also implemented the results of our research for alloy development to produce commercial products to replace imports. We now have more than 300 domestic customers. Then we started with our Dutch friends a sort of north-south-south cooperation, where together we train different foundry staff in our institute and our experimental foundry from Sudan and other countries. Success breeds success and we now work with other WAITRO members to introduce steelmaking and foundry technologies. We make the most of any opportunities to expand and strengthen our program, applying for funding both from our government and internationally. Our experimental foundry might now be the best-equipped experimental foundry in the world and we, CMRDI now have a lot of international projects in Canada, Germany, France, Poland, Holland, Belarus, South Korea and so on. We hope to establish an African foundry technology network in the future.



MM: So now we go to North America, and David, you were the leader of one of the biggest projects in WAITRO, the best practices project. Can you tell us what the best practice project was about, and how you think WAITRO members have benefited from it?

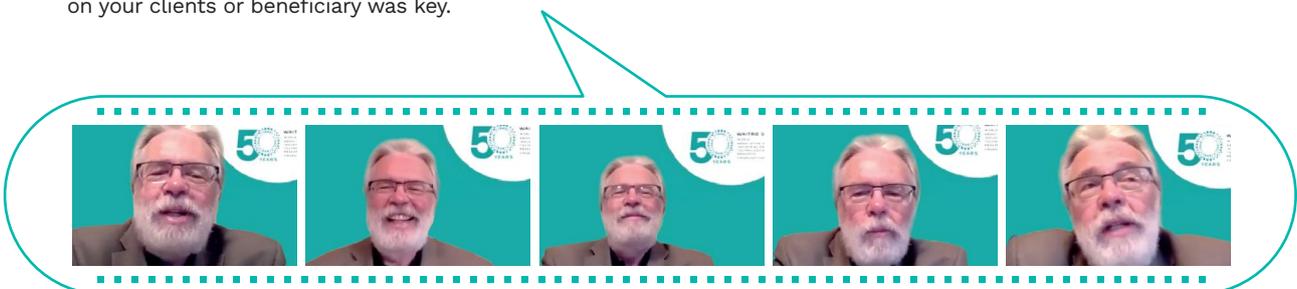
DG: First of all, we took a different approach to best practices. There is lots of literature on best practices and they typically go to an organization that is perceived as working well, study them, and conclude that, since it is a good organization, these things must be best practices. We took an industrial engineering approach where we divided up what is involved in managing RTO into processes, and then we went to 60 different RTOs and asked them how they managed those processes. We then used measurement criteria on each of those processes in that list to determine which one was the best. We think we thereby derived a set of best ways to run organizations like ourselves, based on measurement and research as opposed to assuming that if something looks good, it must be a good approach. The project lasted four years and we came up with an extensive list of best management practices in eight different areas.

One was that focusing on the client or the beneficiary is absolutely critical to success. The client is obviously paying you to do something, so you have to satisfy that one. It's a very direct relationship, but in the case of a government-funded RTO (or even a partially government-funded RTO) you also have to keep the government happy by serving the sector that you're there to serve. Just like Professor Adel was describing with his Metallurgical Institute and metallurgical companies, you have to make sure the clients are learning from whatever it is that you're doing to enhance that sector. Focusing on your clients or beneficiary was key.

Another one is amount of core funding at RTOs with which we talked went from 100% industry funded to the other extreme of 100% government funding. We found that the best practice was for 25% to 40% of funding to come from the owner of the RTO. If you spend too much effort trying to appease the government, you forget about your target sector; the reason you're there is to help improve your industry. But if you are too focused on industry, you may neglect the reasons why the government formed you in the first place. So a balance is necessary. Another best practice was to have a human resource system that rewards good performance, as opposed to rewarding years of service. Those are just three highlights, there are many more.

MM: Can you say a little bit about how the results were disseminated?

DG: The main dissemination mechanism was presenting at WAITRO conferences. The part that I really enjoyed was going to several RTOs and having an RTO-focused conference with the management team. We would describe a process and then ask people in the room how they do it and there is usually some discussion because of course there is some variety even within one organization. Then we would show what we found in our studies. If they were doing something different, they would immediately see the advantages and I really enjoyed that aspect of the work.



MM: And now we turn to my office neighbor, Marianne Jessing. Of course, you've been associated with the WAITRO Secretariat since about 1993. You organized a lot of meetings and I'm sure there are a lot of beautiful moments that you can remember. Just give us a few, and perhaps answer a more difficult question: what was the motivation for DTI to host the Secretariat for 15 years. And what benefit do you think DTI got from this?

AN: Well, DTI has been involved with WAITRO from the start; it was one of the founders when UNIDO established WAITRO in 1970 and has been heavily involved ever since. Some of you will of course remember Morten Knudsen, one of the founding fathers who wrote the Constitution. DTI stayed a member because it gave us wide outreach to partners that we would not have otherwise engaged with through, for instance, the training programs for developing countries. A lot of good connections were made that we later made use of in the fermentation projects in Western Africa.

You might have heard of our long-standing relationships with Burkina Faso and Ghana, of course thanks to Moses's very good connections, and to Nigeria and Benin, where we have been able to initiate projects that revitalized food production in these countries, developing starter cultures and so on that are now very marketable to the food industry. It is now recognized that fermentation is one of the best and healthiest preservation mechanisms for food, with no artificial additives. These projects have been going on for almost 20 years and have cemented the very strong relationship we've had with Africa.

We have also had the benefit of working together with many WAITRO members in Asia and with CARIRI and CIDET, and so on. I especially like that when we visit RTOs and pull out the best practices handbook, the pink book, people ask for a copy. It has helped to persuade new members to join because they could see that they would find good practice that they could use in their own organizations. So WAITRO has inspired its members to do better and also perhaps to broaden their activities.

MM: Some final questions to consider. The WAITRO Secretariat is drawing up a new strategic plan for 2021 onwards. From your experience, what do you think they should take into consideration for this new strategic plan? Secondly, most of us in this meeting are no longer working for a WAITRO member, but we still consider ourselves as WAITRO. How do you think WAITRO can engage these individual wise men and women? And how do you think we can work with current WAITRO members and the Secretariat? It becomes something of passion for us now. How do you think this group can be formalized in some way to assist WAITRO?

MM: Rounding up, briefly what do you think WAITRO can do to sustain its African membership?

CK: The future is bright, I think, but sustaining the interest very much depends on a number of things. First, it starts with the survival of the individual member organizations because research and development, at least in an African context, is not given the importance it deserves. When there are budgetary constraints, it is the last thing to be considered. So we have to work hard to show that RTOs are relevant entities that developing countries need. By developing technologies, we are the most relevant entities in the development of relevant skills. Once we show that, then we shall be taken seriously and made a priority. These things we can do through the collaborations that we have been talking about and by sharing experiences.

MM: I know that in the past, paying the membership fee was one of the major problems facing African RTOs that made them unable to continue their membership, but it is only \$500 a year. Why is this still a problem? It is not even the cost of a newspaper these days. What do you think we can do so that members will at least pay a small fee to be in the network?

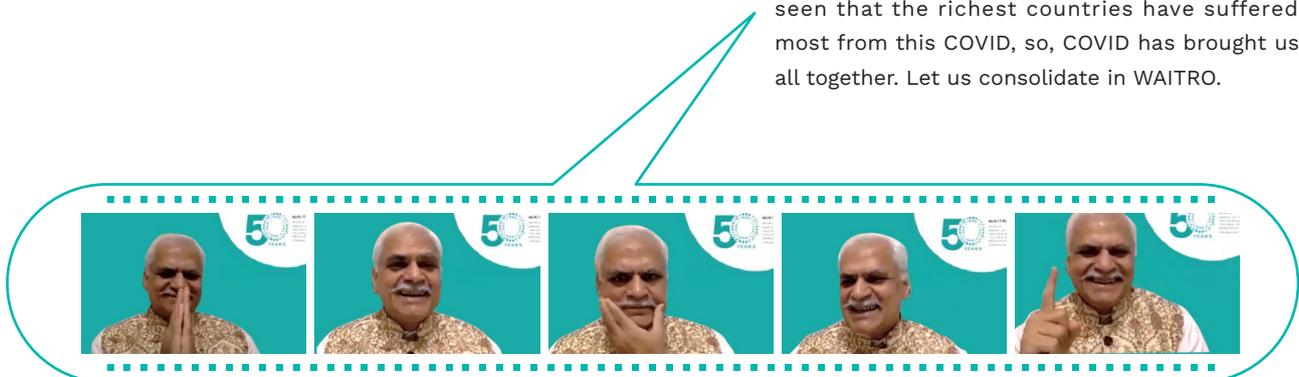
CK: I think that the individual members can learn from previous success. When I had the challenge of building the Petroleum Institute in Uganda, the first thing I did was to pick up the bureaucrats and politicians and take them to Trinidad and Tobago to show them how CARIRI worked with the private sector in oil and gas. That made a big difference by the time we flew back. Our Minister of Education said, “I have had an epiphany and I think we like the way you're going.” Exchanges like that can make a difference. When we are addressing government officials, it should not be to beg for support. We need to sell the idea of what we can offer.

MM: My second question, What, in your view, can we do to retain or to build this individual, “wise man” relationship where people can at least continue contributing today to business of the Association even when they are not linked to member Institutes?

CK: That has been a problem that really tried to have thought about because I recall that few of the people who were on the Executive Board when I joined stayed active after they retired. Recently I was looking at the past Presidents, some of whom I don't know because they were before my time. Initiatives like this are one way to go about it. You should encourage them to behave like alumni. Alumni can be still part and parcel of WAITRO.

RK: I have three suggestions to make. The first is that WAITRO is lacking in continuity. Today if you go to the website of WAITRO, you don't find all the past Presidents, all the Executive Board members, all the things that WAITRO did ... nothing is there. So, if you are looking as a prospective member, there is insufficient content. If WAITRO continues in this way, it will not reach great heights. We must have a website which is consolidated, which talks about its expertise, all of what WAITRO can offer. It should talk about the faces which are attached to it.

The second suggestion is how to utilize the assets of WAITRO. First of all we should recognize all our human resources, including us sitting here but there are so many more. Let us pull them together and use their expertise. The last point, but not the least, is that we should open up the membership, for example to technical universities. These days there are private universities, not just public. They are like RTOs and I am in touch with thousands of them in India. I can easily pick 10 - 20 of those private universities and make them member of WAITRO. This will provide twofold help: our experts will get direct contact with new researchers and the universities will gain access to new capabilities and expertise. We must also take some industries, particularly in renewable energy, because now the world is already going from green to blue to purple. For example, Unilever has said that it will make \$1.3 billion of home care products based on purple technology, not on green technology. Remember that the difference between Africa, Asia and Europe is decreasing because we have seen that the richest countries have suffered most from this COVID, so, COVID has brought us all together. Let us consolidate in WAITRO.



EO: First, regarding programs for climate change and water pollution. I fully agree that renewable energy is one of the major issues now for RTOs to develop. For example, we are working with biorefineries on how to use biomass to produce energy, for example biomass from algae in third generation biorefineries to produce bio ethanol. So, these are very relevant and hot topics to confront the major environmental issues that are now affecting not only climate change but also the economic and social aspects of all countries.

To support women, we could create a network comprising all of us working at RTOs as a kind of who's who with information on our fields of expertise. On the question of how the Secretariat could move forward, I think that the biggest step has been taken in reducing their fees, because that was one of our limitations. In many countries we have very limited funding resources for research and development and we need WAITRO as a support organization for getting more funds, not only from the international agencies but for making our governments to realize that we are worthy of funding as well as their many other expenditures.

MM: Let's move on. Professor Nofal. Now you can tell us what idea you have for your African network and how you think it can be implemented.

AN: I think it was very good and interesting to go north to ask for technical assistance but I'm a very strong believer that in Africa we have enough experience in different countries to work together. I believe that it's time to recognize our needs and put our very limited resources to use for better training, for technology transfer, and for research and development projects. We have an idea to establish an African foundry network. I believe that the foundry is the cornerstone of any industrial development and that's why we see foundries developing quickly in various African countries such as Nigeria, Ghana, Sudan, Ethiopia and Uganda.

We believe that funding such network would not be a problem, for example here in Cairo we can approach the Arab Fund for Technical Cooperation with African Countries, a very strong organization; we can approach to Arab African bank; we can approach the African Development Bank, we have special funding from our Minister of Foreign Affairs for technical partnerships with African countries. I have visited five or six African countries and I have in our database more than 120 African foundries of reasonable size, we can start with those. We already have high level training courses for them that can start immediately, and we also have technology transfer projects as we have been doing for 35 years in strategically and economically important concepts; we can start transferring these technologies to different African foundries. We can then approach the international conferences with joint research coming out of Africa together. Maybe I'm dreaming, but I've been dreaming for the last 30 years and I would like very much to see it realized before I leave.

MM: As a start, now that the WAITRO Secretariat is drawing up a new strategic plan, I would advise you to check into SAIRA and then make a project proposal that other WAITRO members from other regions can look at and see how we can move this concrete initiative forward. So I think your first step should be to put the idea on SAIRA and see if people respond.

AN: What is SAIRA? What does it stand for?

MM: SAIRA is a web platform built by the WAITRO Secretariat, a kind of a hub where you put your ideas for project collaborations and it's open to industry, to other RTOs all over the world, to funding agencies to look at it. Maybe after this the Secretariat can send you further details on SAIRA but you can also just Google it: www.saira.eco.

LS: Caribbean RTOs are reaching out to the rest of the world. There are so many common challenges and experiences amongst RTOs around the world and individually we are all duplicating the same thing with limited funds. The bottom line has to be technology acquisition; we need to serve the private sector. We have to be able to supply what they need and they are the ones who will fund us to assist in lobbying governments to hear us. We need to be something that they recognize as a force. I must commend some of the RTOs with whom we have cooperated, like DTI and SRIRAM that waived a lot of charges to work together and build a relationship when we asked to have projects.

The second point is that if these RTOs and their Boards of Directors are not committed to collaborating in a meaningful way, then it will not succeed. I know WAITRO has been addressing that. We need to find ways to help member Institutes to convince their governments of the value of RTOs and what they can do for them, especially in this time of economic trials and tribulations, to diversify their economies. The private sector all around us is trying to grab technology, but they don't know how. The RTOs linking through SAIRA can be a mechanism to help them.

Now, SAIRA can fulfill a need for member institutions, depending on their level of experience, to come together to work in partnerships and build confidence in one another.

When I approach big institutions I sometimes get told that CARIRI is too small and they are not interested, but others have a more positive response. Within the matrix of RTOs and WAITRO, We need to recognize that there are varying levels of interest. So, when we sign an agreement, we need to say whether it is about meaningful linkages or building capacity today. The cost of collaboration is decreasing because as RTOs become more technology-centric, data-centric and virtual, collaboration becomes easier! The biennial WAITRO assemblies have been useful and helped me meet a lot of people, but the space in between is too long.

I must mention, however, the same network that professor Nofal mentioned, the DTI program at Idea Advisory Service, which we have been working with for three years. That is something that goes into industry and identifies specifically, under the umbrella of innovation, what technology is required. I met with the executive director, David Tveit, and suggested that if they could use some module at CARIRI, a small place, we can build on it and develop a network to help people in industry identify more specific technology requirements, which could then help RTOs to use SAIRA to work on technology acquisition.

MM: I know you're not working now for CARIRI but SAIRA is open to everyone, even for individuals, so would it be possible for you to put a proposal like this on SAIRA? You can resuscitate the proposal, put it on SAIRA, and then see how many other WAITRO members would want to sign on, because it's a very useful idea how RTOs can work closely with industry.





LS: The last thing is this question of alumni. It's like taking gold mines of people and just moving them out over the horizon. I think that it should be seriously addressed by the current WAITRO Secretariat. What I'm talking more specifically about is a team of brainpower so we don't have to keep reinventing the wheel. I really feel very passionate about working together and listening and I must say, Moses, when you first contacted me I was skeptical but I am so happy that I responded.

MM: David, can you just tell us how you think WAITRO can revive or maintain the results of the Best Practices Project? What can we do to move forward with it?

DG: Well, the data collection process that all our results were based on happened 24 years ago, so it's a little out of date. I would think in those 24 years there's been lots of new practices that have been invented and I'm sure some of them are best practices if we go to discover them. I previously wrote a proposal to WAITRO for a way of doing it online because it is too expensive to travel to all these organizations all over the world and gather the data. We learned enough the first time to know what kind of information we want to collect and how to describe it. I think it's quite feasible to develop a questionnaire online to get people to tell us what new things they are doing and to provide the data that you need to measure those things. WAITRO could dig out that old proposal and try to implement it.

MM: Can I again suggest that you also try to use SAIRA for this? If you have an idea, perhaps they can build on it; an online process where RTOs themselves can put in the data they want and then techniques by which they can derive best practices by comparing themselves. Now we have the means to do this electronically so maybe it's a good idea for SAIRA.

DG: Until this moment I never heard of SAIRA so Step 1 is communication! Not being involved in an RTO for three years now I need to catch up.

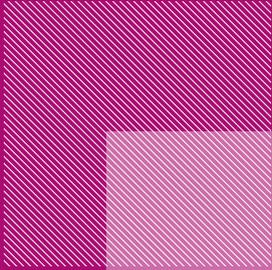
MM: You can do it as a hobby, a retirement hobby. You need something to keep you awake! Marianne, briefly, any recommendations that you think DTI can do to retain these relationships?

MJ: Well, I think that you have heard quite a few very good ideas such as the alumni, which I really recommend. As was said, a lot of knowledge has gone into WAITRO and there is no need to reinvent the wheel. All these organizations have had similar starting points and, rather than starting from the beginning every time someone is replaced, we might as well keep the talent in an Alumni Association to generate new ideas for new projects. People don't get ideas only while they're working they also get them after work.

MM: Thank you very much. We have exceeded our time but I think we would all agree that this has been a very worthwhile exercise.

AN: Just to add two seconds, people may be wondering why I am so enthusiastic about working with Africa and I have a story about the time I went to a conference in Harare, Zimbabwe. I was out in the evening and I started talking with a group of very young boys doing handicrafts and one of them asked me where I am from. I told them Egypt. And this young boy said "Egyptian? But we thought you were a foreigner!" Africa is one country and one nation so we should work together.

MM: Thank you very much. So I have to bring this session to a close now. Most importantly, let me thank you very much for taking part in this interview. It has been a very pleasant evening for me and I am sure for all the people in WAITRO who have been listening to this.



03

SOLVING
WATER-RELATED
CHALLENGES AROUND
THE GLOBE

L

THE WAITRO INNOVATION AWARD 2020

The Concept

The WAITRO Innovation Award (WIA) was envisaged as a competition, open to all active members of WAITRO, to be a highlight and anchor for the Global Innovation Summit proposed by the new Secretariat as part of their reinvention of WAITRO. The Award was proposed as a monetary prize to reward innovative ideas and to facilitate the implementation of projects likely to advance the UN Sustainable Development Goals (SDGs). Rather than a retrospective award for impact or quality, the WIA was envisioned to be an enabler of innovative ideas, germinated by one WAITRO member in response to a challenge posted by another member on SAIRA; both a recognition of quality in the WAITRO spirit of cross-border cooperation and as a small seed fund to enable some early results that would hopefully make enabling investment more likely. While awards for innovation were made at previous WAITRO events, such as the General Assembly, the year 2020 was the first time that such an award carried funding.

The objectives of the WIA were to create an incentive for members to use the SAIRA Open Innovation Hub to catalyze collaborations, to recognize important new ideas to enable sustainable development, to enhance the value of WAITRO for its members, and finally to position WAITRO as a key Association supporting innovation, tackling global challenges, and contributing to the SDGs. The WIA has a particular focus during each cycle supporting one of the SDGs; the Executive Board was tasked with defining this focus and agreed that the 2020 focus would be water resources. A Scientific Advisory Board (SAB) was subsequently convened to oversee the process, consisting of distinguished experts around the world and chaired by Will Sarni of The Water Foundry.²

² <https://www.waterfoundry.com/>

The Process

The Award process commenced with SAIRA matchmaking in early 2020, with the inevitable postponement of deadlines due to the early chaos of the Covid-19 pandemic resulting in a final deadline of June 30th. In 2020, ten proposals meeting the published criteria were received by the deadline. Five finalists were selected from the written proposals by the SAB according to published metrics:

Criterion	Description and quantifiable metrics.	Weight
Technical quality	Innovative product or service, ground-breaking within the borders of the country or region where the intended beneficiary is located.	30%
Impact on Sustainability Goals	Show how the idea can contribute to sustainable development and the SDGs. What concrete social impact does the idea have on the targeted populations/regions? Examples include potential to increase per capita income or improve quality of life (e.g. at least one of housing, food, water, energy, life expectancy, health, environmental quality, etc.), economic value created or significant contributions to productivity or competitiveness.	30%
Feasibility	Potential for long-term financial sustainability. Net Present Value (NPV), revenue or economic value created by the innovation. Feasibility that idea will be quickly implemented and achieve financial sustainability within 5 years.	20%
Team Strength	Quality of the technical team, commitment and ability to invest the time required to achieve success.	20%

Plans for a face-to-face Capacity Development meeting for proposal development during the summer fell afoul of international travel restrictions, and the process for the finalists was reduced to an online “pitch training session” with Dirk Lehmann³ and an online question and answer session with the SAB. After pitch training, each team had the opportunity to record a video presentation for an online pitch session at the Global Innovation Summit October 28th – 30th 2020, where delegates had the opportunity to ask additional questions of the teams.

The full value of the WAITRO Innovation Award is multi-dimensional. In addition to the monetary award, a further goal of the pitch session is to attract new categories of WAITRO members to the event: associate members and investment partners attracted by the value proposition of catching a first look at a unique set of new ideas generated from RTOs around the world. Success would mean that the WIA might be just a first step to securing much deeper investment from global stakeholders and thereby turning the ideas into significant impact on the SDGs. The Award process itself also provides valuable mentoring via the WAITRO Capacity Development Program to help develop the collaborative proposals. Finally, the Innovation Award process will be a win-win for WAITRO members and WAITRO Partners; the former benefit from support and mentoring to develop collaborations across national boundaries to solve problems in sustainability, while the latter benefit from an early look at, and opportunity to fund, unique and innovative solutions that can only come from the diversity of WAITRO membership.

³ More information about Dirk can be found here: <https://dirk-lehmann.com/>

WICKED PROBLEMS, INNOVATION AND DISRUPTIVE INNOVATION

As well as being the Chair of the WAITRO Innovation Award Scientific Advisory Board, Will is an internationally recognized thought leader on water strategy and innovation. He has been a water strategy advisor to private and public-sector enterprises and NGOs for his entire career. He has worked with multinational companies across a range of industry sectors in evaluating the technical viability and market potential of innovative water technologies, market entry strategies and M&A programs. He is the author of multiple books and articles on water business and strategy and is also on the Executive Council of NOAA's National Integrated Drought Information System (NIDIS); the Editorial Board of the Journal of Water Security and is a Technical Advisor for the Climate Bonds Initiative Nature- Based Solutions for Climate and Water Resilience.

It was an honor and exceptional experience to Chair the 2020 WAITRO Innovation Award. It is always inspiring to engage and support entrepreneurs who are committed to solving “wicked water problems”. The global reach and diversity of participants and ideas in the WAITRO 2020 Innovation Award program was inspiring, in particular during the rage of the pandemic.

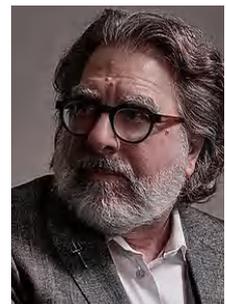
As I reflect on the program, a few thoughts on “wicked” water problems, innovation, and what needs to change to achieve sustainable, resilient and equitable access to water for economic development, business growth, social well-being and ecosystem health.

What is a “wicked problem”?

Almost all of my recent articles and presentations start with my introduction to wicked problems and how this changed my view of what needs to change with regards to water. The understanding of wicked problems and how it frames water challenges and solutions has been invaluable for me.

Several years ago, Tom Higley, a friend, entrepreneur, and founder of 10.10.10 and XGENESIS asked me if water was a “wicked problem”. I assumed he was asking whether the “water crisis” (not a term I care for but will use it for simplicity's sake) was a difficult challenge to solve. What I didn't realize was that “wicked problems” actually have a specific definition– one that water fits perfectly within.

As I read the articles that Tom forwarded, I became even more convinced water challenges should be framed as a “wicked problem”. One key article outlining the characteristics of a wicked problem was written by Rittel and Webber in 1973, a summary of which is provided below.



WILL SARNI
Founder and CEO
The Water Foundry
LLC

- There is no definitive formulation of a wicked problem, i.e. even the definition and scope of the problem is contested.
- Wicked problems have no ‘stopping rule’ , i.e. no definitive solution.
- Solutions to wicked problems are not true-or-false, but good-or-bad in the eyes of stakeholders. There is no immediate and no ultimate test of a solution to a wicked problem.
- Every (attempted) solution to a wicked problem is a ‘one-shot operation’ ; the results cannot be readily undone, and there is no opportunity to learn by trial-and-error.
- Wicked problems do not have a clear set of potential solutions, nor is there a well-described set of permissible operations to be incorporated into the plan.
- Every wicked problem is essentially unique.
- Every wicked problem can be considered to be a symptom of another problem. The existence of a discrepancy representing a wicked problem can be explained in numerous ways.
- The planner has no ‘right to be wrong’ in an experimental sense, i.e. there is no public tolerance of initiatives or experiments that fail.

Further to the point that water is a wicked problem, Eddy J. Moors, Ph.D. from the IHE Institute for Water Education framed the issues well.

“Water resource management has often been described as a wicked problem, especially because there are no easy solutions. It is wicked because there are unknown dimensions to the related science, with open questions such as: How much water is available? Where is the water coming from? How is this changing in time? What is causing these changes? In addition, there are in almost all cases, multiple stakeholders that deal with the management of water resources. This renders the decision-making difficult and sometimes even impossible. Examples

of wicked problems in the water sector are, among others, related to groundwater resources such as the use of the fossil groundwater under a large part of Africa, the fast decline of the groundwater table in the Middle East, but also the strategic management of the groundwater store under “de Veluwe” during prolonged periods of drought. All these issues have, besides a large natural science component, a strong socio-economic component as well.”

The University of Arizona Water Resources Research Center also provides insights on why water is a wicked problem from the perspective of water managers.

“Reframing water issues as wicked problems will be essential for moving forward to a healthy water future. It begins with considering issues and solutions at the system scale. Water projects can no longer be solely the domain of the water community. Creating a change in one part of the water system will change the entire system, including the dependent social and environmental systems, sometimes in unexpected ways. This will require yet another solution to address that situation. It is an adaptive, iterative exercise. Solutions to wicked problems are never one and done.

Water planners and managers play a central role in mitigating the negative consequences of wicked problems. They will be required to position efforts in new and more desirable directions. This will not be easy, quick, or solitary. It requires methodical, rigorous iteration focused on the system qualities of the problem. The interdisciplinary collaboration that captures a broader knowledge of science, economics, statistics, technology, psychology, politics and more is necessary for effective change.

Managing wicked problems is a new kind of work. It requires changing the questions, managing uncertainty, and creating resilience. It does not solve existing problems but instead drives to a desired future state.”

Most importantly, we need to disrupt the status quo. Not just innovation but true disruption. This brings me to a brief discussion on the distinction between innovation and disruptive innovation.

Innovation versus Disruption

Different types of innovation require different strategic approaches for industry and companies. According to the work of Christensen, Raynor, and McDonald, “disruption” describes a process whereby a smaller company with fewer resources is able to successfully challenge established incumbent businesses. “As incumbents focus on improving their products and services for their most demanding (and usually most profitable) customers, they exceed the needs of some segments and ignore the needs of others. Entrants that prove disruptive begin by successfully targeting those overlooked segments, gaining a foothold by delivering more-suitable functionality—frequently at a lower price. Incumbents, chasing higher profitability in more-demanding segments, tend not to respond vigorously. Entrants then move upmarket, delivering the performance that incumbents’ mainstream customers require while preserving the advantages that drove their early success.”

When mainstream customers start adopting the entrants’ offerings in volume, disruption has occurred.

Other key points from the authors.

- Disruption is a process. The term “disruptive innovation” is misleading when it is used to refer to a product or service at one fixed point, rather than to the evolution of that product or service over time. “Almost every innovation, disruptive or not, begins life as a small-scale experiment. Disrupters tend to focus on getting the business model, rather than merely the product, just right. Almost all water technologies start as a “small-scale experiment” aka, a pilot. The water sector has an abundance of pilots.
- Disrupters often build business models that are very different from those of incumbents. For the water sector, this is “water as a service” as opposed to selling technology and capital-intensive projects. WaaS includes performance contracting but also outsourcing water treatment operations and paying for the treatment.

- Some disruptive innovations succeed; some don’t. A third common mistake is to focus on the results achieved—to claim that a company is disruptive by virtue of its success. But success is not built into the definition of disruption: Not every disruptive path leads to success and not every success follows a disruptive path. The water sector is littered with disruptive innovations that fail for a range of reasons: the team, the business model, lack of adequate funding, etc.
- The mantra “Disrupt or be disrupted” can misguide us. Incumbent companies do need to respond to disruption if it’s occurring, but they should not over-react by dismantling a still-profitable business. Instead, they should continue to strengthen relationships with core customers by investing in sustaining innovations. In addition, they can create a new division focused solely on the growth opportunities that arise from the disruption. The success of this new enterprise depends in large part on keeping it separate from the core business. That means that for some time, incumbents will find themselves managing two very different operations – skunkworks.

Christensen, Raynor, and McDonald’s research indicate that using disruptive theory helps in making more accurate predictions of which fledgling businesses will succeed. This is invaluable when viewing the digital transformation of the water sector.

Final Thoughts

The water sector would benefit from understanding that water is a wicked problem and with it comes the need to engage all stakeholders to solve water problems such as scarcity, poor quality, inequity, etc. We need innovation as a process for evolutionary change along with truly disruptive water technologies and business models (e.g., water as a service). The water sector hasn’t yet seen a truly disruptive technology or business model (think what Uber was for the mobility sector), However, I believe we will over time in part due to programs that encourage innovation, such as the WAITRO Innovation Award.

The WAITRO Innovation Award 2020: Water

The Scientific Advisory Board



Dr.-Ing. Ursula Schließmann

Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB

Dr.Schließmann is head of the Environmental Technology business unit at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB and deputy head of the Fraunhofer Innovation Platform FIP-WEF@SU, Stellenbosch. She heads the office of the Fraunhofer Alliance SysWasser, which is dedicated to the development of conceptual systemic but also technical solutions for industry, cities and regions in the field of environment and climate impacts. She is a board member of the German Water Partnership industry association, where she is responsible for innovation and scientific cooperation.



Dr.Dave Grant

PepsiCo, USA

Dr. Grant is the Director of Global Water Stewardship at PepsiCo. He led the development and implementation of multi-country sustainable development strategies drawing on stakeholder engagement and change management skills to derive solutions that benefit both the business and external stakeholders.



Adam Lovell

Water Services Association of Australia (WSAA)

Adam Lovell is the Executive Director at the Water Services Association of Australia (WSAA), the peak body for the urban water industry. Mr. Lovell provides national leadership in policy positions for the Australian urban water sector on issues including industry reform, livable cities, water quality, climate change, customer engagement and asset management. Previous to joining WSAA in 2008, Adam was at Sydney Water for 11 years in leadership roles in the Science, Technology and Research area.



Rabi Mohtar

Texas A&M University, USA

Prof. Mohtar is the TEES Research Professor, Texas A&M University, and is a Fellow of the American Society of Agricultural and Biological Engineers (ASABE). Prof. Mohtar founded A&M's Water-Energy-Food Nexus Initiative and the Water-Energy-Food-Heath Nexus Renewable Resources Initiative at the American University of Beirut, where he currently serves as Dean of the Faculty of Agricultural and Food Sciences. He is also a Governor of the World Water Council and an Executive Board member of International Water Resources Association (IWRA).



Torkil Jønych Clausen

World Water Council.

Dr Torkil Jønych Clausen is currently Chair of the Scientific Programme Committee of the World Water Week in Stockholm, Governor of the World Water Council (WWC), and Senior Adviser to the Global Water Partnership (GWP). He serves as Chair of the Action Platform for Source-to-Sea Management, Chair of the Flood Management Programme of the World Meteorological Organization (WMO), Chair of the WWC Task Force on IWRM, Member of the Science Advisory Panel for the UN Global Environment Outlook 6 (GEO-6), and Chair of the Reference Group for the Africa Water and Climate Development Program (WACDEP).



Prof. Hongqiang Ren

Nanjing University, China

Prof. Ren is the Dean of the School of Environment at Nanjing University, China. He also serves as the Executive Director of the Yixing Environmental Research Institute, Nanjing University. His main areas of teaching and research are treatment, recycle and reuse of industrial and municipal wastewater. He has published 2 books and 219 peer-reviewed papers, and has 111 patents authorized by China, USA and other countries. His work on wastewater treatment technology and equipment has won two National Awards for Technological Invention of China and five provincial or ministerial technology awards.



Lic. Mariano Montero Zubillaga

Fomento Económico Mexicano, S.A.B. de C.V. (FEMSA) Foundation

Dr. Zubillaga is the Director of the FEMSA Foundation in Mexico. He started his career at FEMSA in Human Resources during the early seventies and rejoined FEMSA's workforce in 1994 as Executive President of Coca-Cola FEMSA Buenos Aires, the Company's first international operation. From 2000, he acted as General Director for Imbera and PTM. Under his leadership Imbera developed into the largest commercial beverage refrigeration company worldwide and PTM is now the Mexican leader in plastic products for materials handling.



Prof. Jean-Marie Kilesbye Onema

University of Lubumbashi, Democratic Republic of the Congo

Prof. Kilesbye-Onema is Vice President of the International Commission of Water Resources Systems of International Association of Hydrological Science, Associate Professor and the University of Lubumbashi and the Executive Manager of WaterNet, a regional network of university departments and research and training institutes in Africa specializing in water.

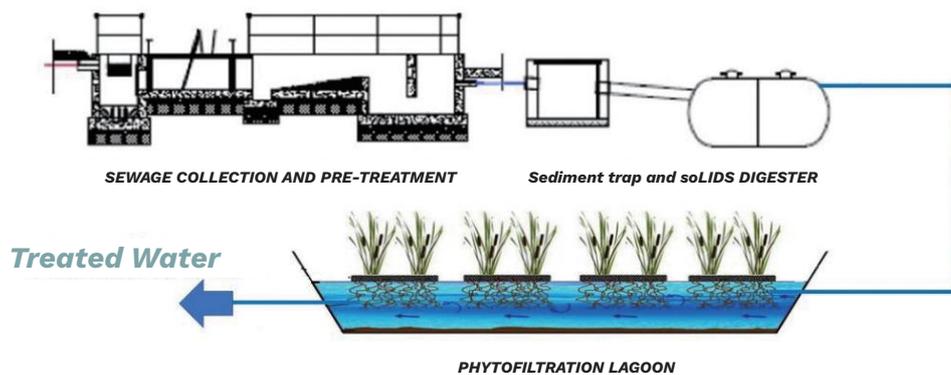
THE AWARD WINNERS

The SAB WAITRO Innovation Award.

TITLE: Phytotechnologies To Provide Clean Water In Small Communities

PARTNERS: Institute Of Ecology (INECOL) in Mexico, and The Thailand Institute Of Scientific And Technological Research (TISTR) in Thailand.

WAITRO members in Mexico and Thailand saw a common problem in how to provide clean water to small communities efficiently and at low cost, and found common interests in using plant-based systems to clean bacteria, nutrients, and possibly even viral contamination from waste water.



The phytofiltration concept developed by INECOL.

Rural Mexico lacks sufficient infrastructure for delivering water or for the treatment of wastewater. INECOL focuses on plant-based technologies that offer clean water at 50 – 90% cost savings as compared to conventional technology. One example is “phytofiltration lagoons”, which are shallow constructed lagoons that receive polluted water and treat it using aquatic plants. Early results have shown a reduction in chemical oxygen demand, nutrients and phosphates and biomass from the plants can be harvested every 45 days or so and converted into biogas. When the advent of COVID-19 highlighted the need for good hygiene everywhere, INECOL posted a challenge to SAIRA to look for partners in novel low-cost water treatment technologies using plant-based systems.



Constructed wetland using umbrella sedge plant developed by TISTR.

Across the planet, in parts of Thailand surface water quality is severely polluted. In small communities, the main source of water pollution comes from domestic wastewater and agriculture. Treatment in conventional septic tanks alone cannot remove phosphorous and nitrogen to a satisfactory level, and high levels of these elements can encourage toxic algal blooms. TISTR has studied natural sorbents such as shells, clay, and ceramic media to immobilize phosphorus while also serving as a biomass growth support in a “constructed wetland” concept, and they responded to the INECOL challenge.

INECOL, based in Veracruz, Mexico, was a new WAITRO member in 2019. TISTR is a longtime WAITRO member and is currently the WAITRO Regional Focal Point for Asia. The joint team is led by Prof. Eugenia J. Olguin, Senior Researcher at INECOL and Dr. Siriporn Larpkiattaworn, Director of Innomat at TISTR. Together they bring 40 years of experience in water treatment to the problem.

By the end of their “WAITRO Innovation Award” year, the team expects to have 3 demonstrations of phytotechnology water purification running in each country. They hope that these demonstrations will spur follow-on investments to commercialize the technologies. Each dollar invested in water and sanitation potentially provides a four dollar return from lower health costs, increased productivity, and fewer covid-19 deaths, so the WAITRO-supported project should be a prime candidate for the trend of “bankable” sustainability projects.

Why they won: This winner was directly selected by the SAB. The video interview between the SAB and the team secured the win. The INECOL-TISTR team was found to be especially passionate about their work and impressed the experts with both their vision and their ability to collaborate despite the limitations imposed by the pandemic. The proposal was found to be a great example of “collective action” in the innovation of natural treatment systems, and illustrated that water is a local challenge that is shared globally.

Members' WAITRO Innovation Award

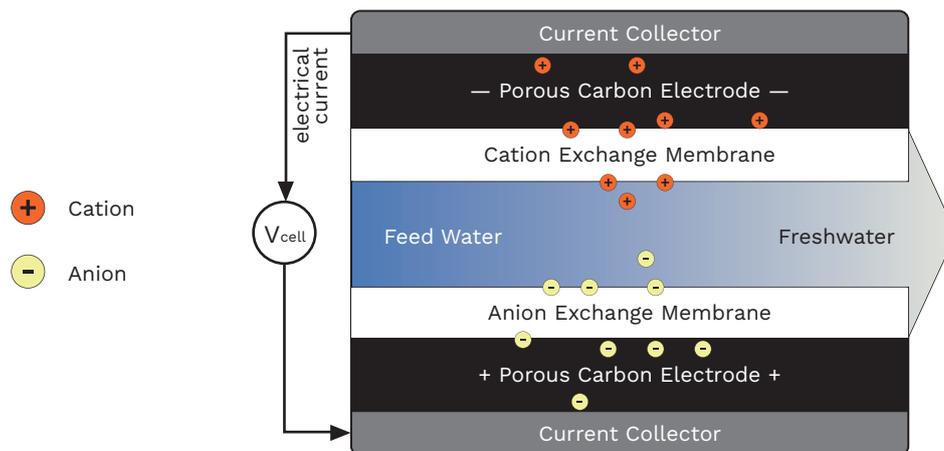
TITLE: Development of Low Cost Solar-Powered Water Treatment for Remote Communities

PARTNERS:

University of New South Wales, Victoria Province, Australia and UNSW Centre for Transformational Environmental Technologies (CTET), Yixing, Jiangsu Province, China.

In many remote communities, only subsurface groundwater is available for use. This water is often contaminated with salts, arsenic or even heavy metals such as uranium. Most purification processes involve high capital and operating costs and frequent maintenance. This is especially the case with state of the art membrane technologies such as reverse osmosis (RO) which is energy intensive, prone to fouling problems, and can produce water that is deficient in key mineral elements that are important to crops. Reliable power is often non-existent in remote locations.

The CTET and UNSW teams are developing membrane capacitive deionization (mCDI) as a robust, energy efficient and cost-effective technology for desalination of water. Unlike the other techniques, mCDI removes salt ions from a mixture at low pressure. Furthermore, energy release during electrode regeneration can charge a neighboring cell working in the ion electrosorption step so almost half the energy used for purification can be recovered.



Membrane CDI system proposed by CTET and UNSW

Since mCDI can be operated at less than 1.5V, the UNSW and CTET teams developed a prototype powered by photovoltaics and using patented energy recovery technology to reduce overall energy consumption. A Digital Twin of the unit has also been constructed enabling remote monitoring and control of the unit using state-of-the-art VR/AR technology

The CTET team have already installed a demonstration unit in north western China. The US\$25,000 WAITRO Innovation Award will be used to develop a second demonstration unit for treatment of brackish groundwater in Dubbo, New South Wales. The team is hoping to leverage the WAITRO Innovation Award to find additional partners throughout the Global Innovation Family with whom to grow a valuable business while solving critical problems of access to clean water in remote communities.

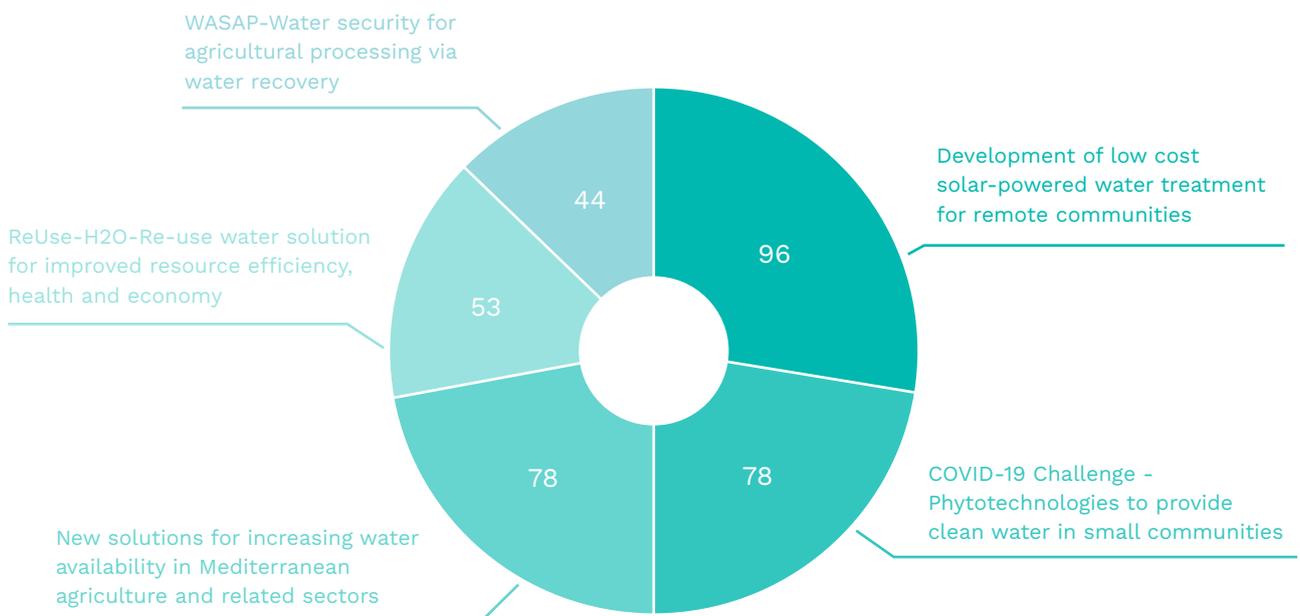
The team is led by Prof. T. David Waite, Chairman of CTET and Prof. John Fletcher, Head of Power and Energy Systems, School of Electrical Engineering and Telecommunications, UNSW Sydney.



Demonstration unit installed in Western China by CTET

Why they won:

Simple: they got the most online votes from 349 of the registered participants at the WAITRO://50 Virtual Innovation Summit who chose to vote, the participants who watched their VOD pitch and asked questions of the teams in the virtual lounge. The SAB choice ranked joint-second in the popular vote. The full voting results are shown below.



The Other Finalists

TITLE: ReUse-H2O – Re-Use Water Solution for Improved Resource Efficiency, Health and Economy.

PARTNERS: IVL Swedish Environmental Research Institute (IVL), Sweden; Agricultural Research Centre (ARC), Egypt; Danish Technological Institute (DTI), Denmark; Federal Institute of Industrial Research Oshodi (FIIRO), Nigeria.

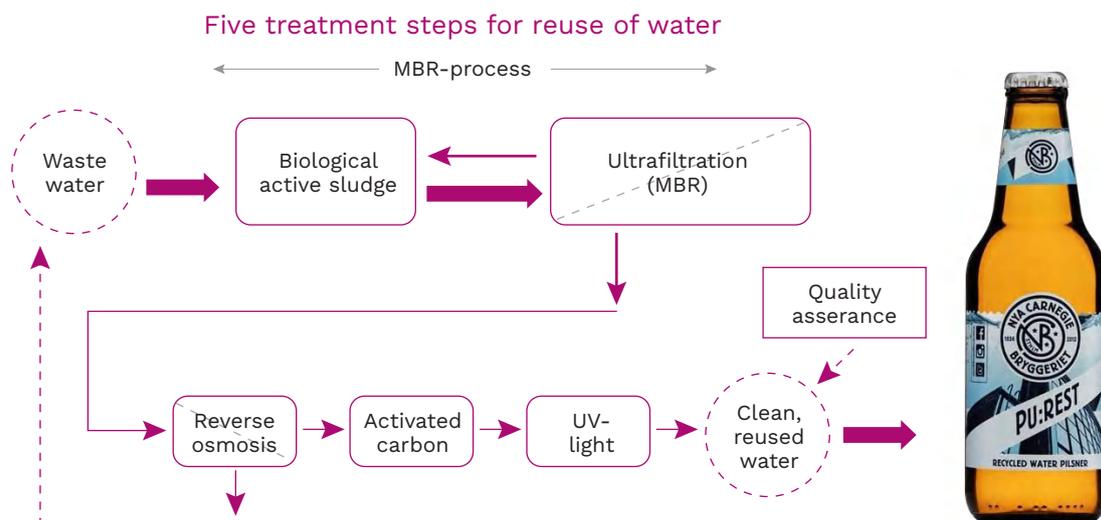
The project goal is to provide circular waste water solutions for efficient water and resource use in Sub-Saharan Africa and Middle East and North Africa regions also providing added benefits of improved health and sanitation.

The WAITRO Innovation Award proposal was to formulate a concept note for innovative water reuse that would be suitable for introduction in Nigeria and Egypt. The concept note would be used as a basis for sourcing funding and market interest to realize a feasibility study and subsequent realization of demonstration. In order to reach this objective of the concept note the proposal needed to be a joint effort and to include outreach activities to attract attention from stakeholders and market players in the respective countries and also internationally.

At present, IVL are working on projects in Sweden, EU, India and China. This proposed project would focus on solutions specifically aimed at Nigeria and Egypt, which are regions where these solutions could provide espe-

cially many benefits to support the 2030 Sustainable Development Agenda and the 17 SDGs.

The concept note would be developed as a joint effort of the team members including face to face collaboration in Nigeria and Egypt, enabling meetings with stakeholders and potential operators/owners, as well as workshops on the proposed solutions. The concept note would further consider that attitudinal argument against reuse of treated water should be met and information provided on safety, economic parameters and sustainability performance as compared to other solutions be given in order to remove attitudinal barriers. The results from the work supported by the WAITRO innovation award is considered to also have a wider relevance that could benefits other WAITRO members. Hopefully this concept could be initiated also in other regions. The exact water source and use were not initially defined, but the team pointed to previous success cleaning waste water to the point where it was suitable for beer production!



TITLE: SOBEK: New SOLUTIONS for increasing water availability in Mediterranean agriculturE and related sectors through a zero-Km perspective

PARTNERS: Leitat, Spain and the Agricultural Research Center, Egypt.

The Mediterranean region holds only 3% of global water resources but hosts over 50% of the world's water-poor populations. Countries like Egypt, Cyprus, Malta, San Marino, Libya, Israel, Jordan, Lebanon and Morocco are under extreme water stress (defined as an annual withdrawal to availability ratio > 80%) and Syria, Spain, Algeria, Tunisia, Italy, Portugal, Greece and Turkey are under high water stress (defined as the same ratio between 40-80%). Climate change, urbanization and population growth will only make this situation more critical, becoming a major threat to economic development and food availability.

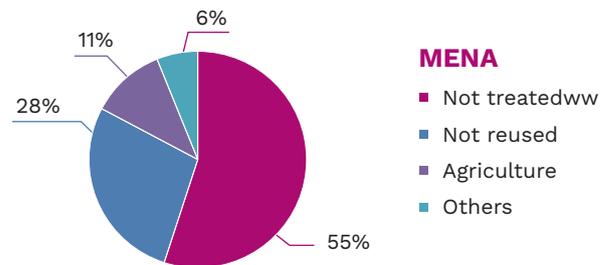
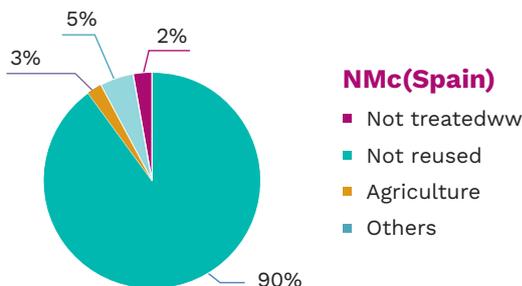
Indeed, water scarcity is the main cause of crop yields in Morocco, Tunisia or Algeria that are far lower than average yields in EU, affecting the competitiveness of their agriculture in countries where 20-40% of the workforce is dedicated to the land. Hence, the development of efficient water management technologies and policies is paramount for this region.

SOBEK proposes a 0KM strategy, meaning alternative water sources that will be specifically treated for agricultural irrigation in close proximity to their use. They propose to treat three different local sources (e.g. urban

wastewater from de-centralised wastewater treatment plants, impaired or contaminated groundwater and agro-industry effluents) by developing two innovative, low-energy technologies at pre-pilot scale.

The first proposed technology is Bio-ElectroWetland (BioEW), which combines the easy-handling and low operational costs of constructed wetlands with bioelectrochemical systems (operated as a microbial fuel cell) to provide electricity and improve the yield of chemical oxygen demand removal. The second is Solar Photo-Fenton (SPF), which improves the Fenton process ($Fe^{2+} + H_2O_2 \rightarrow Fe^{3+} + HO\cdot + OH^-$) by generating H_2O_2 with no need for external chemicals, increasing the removal of emerging pollutants (EP), while also disinfecting the water.

Current water reuse strategies are significantly limited due to the large distances between waste treatment plants and the water application sites. To overcome this limitation, SOBEK will shift the paradigm of water reuse to a decentralised "0Km" approach. Technologies proposed by SOBEK are expected to be first adopted by farmers, farmers' associations and agro-food companies which will reuse water for irrigation and production purposes.



The thirsty elephant in the room:

Data from Spain and MENA countries show that most water is not re-used. [from "Informe sobre aguas residuales en España" Asociación Española de Abastecimientos de Agua y Saneamiento (AEAS), 2017 and "Water around the Mediterranean" REVOLVE (2017)]

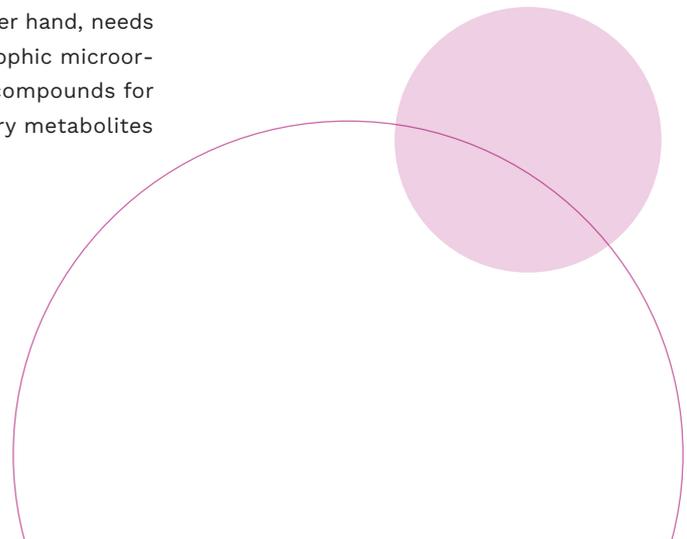
TITLE: Water Security for Agricultural Processing via Water Recovery - WASAP

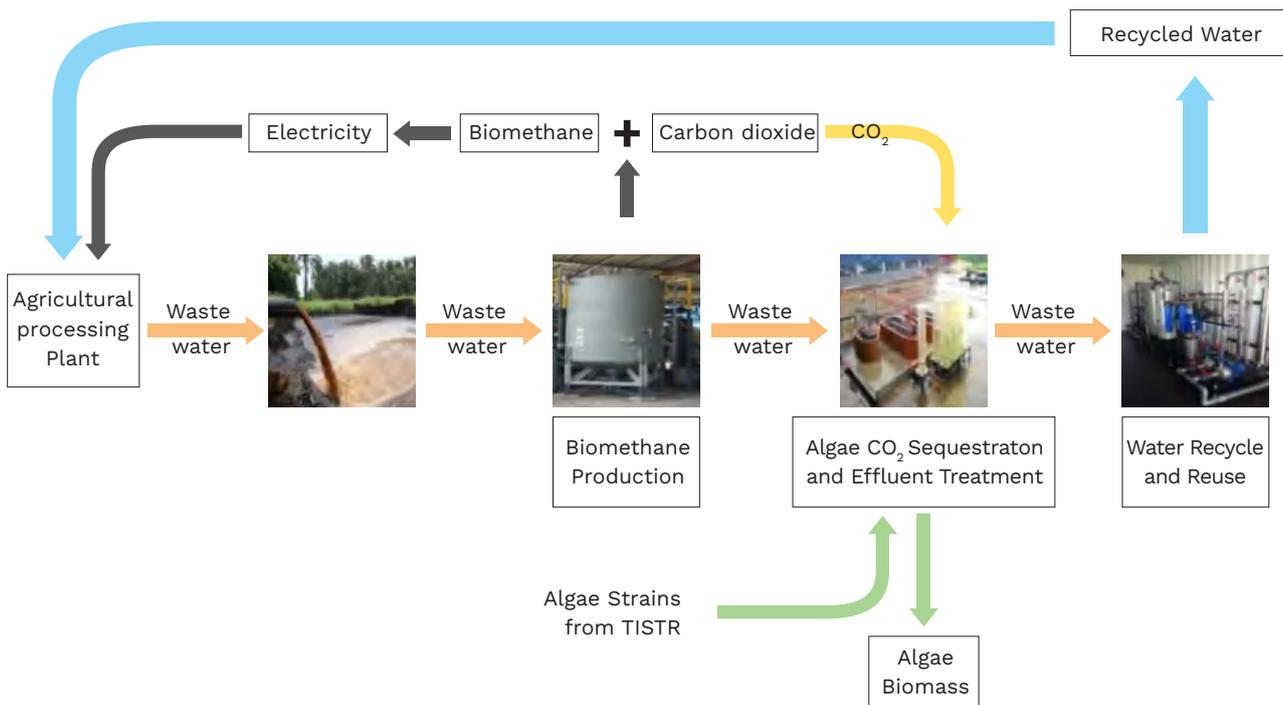
PARTNERS: Thailand Institute of Scientific and Technological Research –TISTR and Universiti Kebangsaan, Malaysia

The palm oil industry in Malaysia is a key economic contributor, contributing up to 7% of the GDP and employing almost one million people, but it uses enormous amounts of water so water security needs to be urgently addressed. So far, most initiatives in the agricultural processing industry focus solely on water treatment, with a few attempts to combine waste water treatment with value added process such as biogas production. No work has been done on water recovery with revenue generation, known as “bankable projects”. It is more sustainable for water recovery technology to produce valuable by-products, and more attractive for private investment.

Anaerobic digestion is suitable for wide range of wastewater with minimal modification and the production of methane gas that can be used as energy source. However, compounds remaining after anaerobic digestion need additional treatments prior to discharge, which can incur additional cost and lead to water wastage. Here is a need for treatment technology innovation. Microalgae can sequester CO₂, assimilate nutrients from wastewater and produce valuable biomolecules within their biomass. Subsequently, membrane technology can be applied for purification to the extent that the recovered water can be returned and reused in the processing systems.

The WASAP proposal would combine biological and membrane processes to recover water from industrial agricultural waste and at the same time generate valuable products to generate revenue. The work will involve anaerobic digestion and microalgae-based treatment technology, while final treatment will involve membrane technology. Anaerobic digestion for biomethane technology is considered a mature technology. Membrane technology has been being developed and successfully applied in commercial stage. Microalgae technology, on the other hand, needs further investigation and improvement. Microalgae are photoautotrophic microorganisms with a capability to sequester CO₂ and produce valuable compounds for examples, proteins, polysaccharides, pigments and other secondary metabolites which can be used in several applications.





Proposed framework on the integration of biogas production, CO₂ sequestration and water recovery

Thailand Institute of Scientific and Technological Research (TISTR) has more than 30 years of experience with microalgae technology and is equipped with more than 1,000 local strains of algal culture with indoor and outdoor facilities and cultivation capacity up to 400,000 liter scale. This expertise is complementary to the UKM research team, which has successfully developed a two-stage anaerobic digestion system and sustainable waste water membrane treatment technology. The technology has been successfully applied to CO₂ sequestration and also treatment of food processing wastewater.

It will be necessary to refine the developed wastewater treatment and apply suitable microalgal strains with high biomass productivity and by-products. Strain selection and modification of cultivation system are important steps to be applied for this challenge. The experiments will be conducted at TISTR facility with technology exchanging activity between UKM and TISTR for other involving processes to build a complete process for treatment of agriculture processing industry.

Milestones will include the application of selected microalgae for the application of an integrated system at UKM, and the development of suitable cultivation system in TISTR and UKM facility.

While the overall budget of \$800k vastly exceeds WAITRO's resources, the WAITRO Innovation Award could be used to advance the project collaboration between UKM and TISTR and act as a starting point for technology transfer between both parties. It would, therefore, be a stepping stone for a stronger collaboration between UKM and TISTR, allowing both parties to apply for more research and commercialization funding based on outcomes obtained from the WAITRO project.

Honorable Mentions

TITLE: Monitoring of small-scale harmful algal blooms (cHABs) in lentic water bodies using remote sensing techniques.

PARTNERS: Universidad CES, Medellín – Colombia and Corporación Centro de Ciencia y Tecnología de Antioquia – CTA, Medellín – Colombia.

LEAD RESEARCHER: Prof. Hilda María Palacio Betancur.

In Colombia, high concentrations of organic matter, together with high loads of nutrients from agricultural and livestock activities, generates environmental deterioration and accelerated eutrophication of artificial reservoirs, leading to the formation of algal blooms, especially cyanobacteria. High water temperatures and thermal stability, basic pH conditions and high turbidity exacerbate these problems. This has economic implications such as increased costs of water treatment, massive mortality of species of importance for food and commercialization, and restrictions on recreational use of aquatic ecosystems.

The phenomena can potentially be toxic, representing a health risk to water consumers and to users of aquatic environments for recreational activities

The proposal is to use the WAITRO Innovation Award to apply remote sensing techniques to open-access satellite images and photographs taken with drones, combined with laboratory analysis and algorithms to estimate the concentration of chlorophyll a, the main photosynthetic pigment of all phytoplankton species.

TITLE: Energy- and COst-effective water treatment technology to remove neonicotinoid insecticides from agriculture wastewater (ECONOID).

PARTNERS: The National Center of Biotechnological Innovations (CENIBiot) and The National Nanotechnology Laboratory (LANOTEC), both belonging to the National Center of High Technology (CENAT), Costa Rica; The Environmental Contamination Research Center (CICA), University of Costa Rica, and The Science and Technology Center of Antioquia (CTA), Colombia.

LEADER: Dr. rer. nat. J. Anibal Mora Villalobos

Widespread contamination from neonicotinoids can reach aquatic compartments and drinking water supplies, pose a serious threat to public health and the environment. Neonicotinoid pesticides are a class of chemicals that act as insecticides by exerting neurotoxic effects via irreversible binding to insect nicotinic acetylcholine receptors. Historically, they were seen as low toxic compounds, due in part to their limited potential to affect non-target organisms and predicted lower mammalian toxicity, but recent studies have produced evidence of their risks to humans and different ecosystems and species.

The main objectives are to design an adsorbent material for neonicotinoid retention and pretreatment, to optimize neonicotinoid degradation conditions using an efficient microbial consortium, and to design a viable system for neonicotinoid wastewater treatment on-farm comprising both the adsorbent and the microbial degrading consortium. The end result will be a proof of concept and confirmation of water detoxification using ecotoxicological tests.

TITLE: Developing Biochemical Treatment Unit for Removal of Pharmaceuticals from Treated Wastewater (Removal – Pharm)

PARTNERS: Royal Scientific Society (RSS), Jordan; Jiangsu Industrial Technology Research Institute (JITRI) - Wondux Innovation Center Nanjing Wondux Environmental Protection Technology Corp. Ltd. (Nanjing Wondux)

LEAD RESEARCHER: Lead Researcher: Dr Othman Almashaqbeh

We want to develop an efficient biochemical treatment system to remove Pharmaceuticals from the municipal wastewater.

The continuous discharging of pharmaceuticals and personal care products (PPCPs) from wastewater treatment plants into the water environment has negative impacts on human health worldwide. More than 95% of treated wastewater is currently reused in agriculture. As-Samra Wastewater Treatment Plant (WWTP) is the largest WWTP in Jordan. It currently serves more than 4 million people in the Amman-Zarqa basin. Consequently, the risk of transport of the PPCPs from treated wastewater to water resources and food chain is very high.

The main types of emerging contaminants are pharmaceuticals and personal care products (PPCPs), endocrine disrupting chemicals (EDCs), plasticisers (e.g. bisphenol-A), flame-retardants, fuel additives and other industrial organic. PPCPs compounds and their metabolites are interfering with the normal functioning of endocrine system, therefore, occurrence of these compounds in our water resources have a growing environmental and public health concerns (Daughton, 2001). Emergent pollutants such as pharmaceuticals and Personal Care Products (PPCPs) have been detected in the municipal raw wastewater entering treatment plants (influent & effluent) ranging from sub-ng/L to µg/L in Jordan. The As-Samra wastewater treatment plant in Jordan is unable to remove completely these compounds from raw wastewater.

The WAITRO Innovation Award will be used to develop a sustainable and efficient biochemical treatment system based on ozone and activated carbon to treat PPCPs in the effluent of As-Samra WWTP using batch, column and pilot experiments.

TITLE: Developing innovative cost-efficient inorganic-based absorbents and membranes for greywater treatment systems; A pilot plant project at the Syrian refugee camps in Jordan

PARTNERS: University of Petra (UOP), Royal Scientific Society (RSS), Swedish Environmental Research Institute (IVL).

Lead Researcher: Professor Mauyad Esaifan.

Water scarcity in Jordan has dramatically increased over the past ten years due to the forced migration of refugees from Syria and Iraq. The municipal water supplies in Jordan are based on groundwater aquifers that are overexploited to meet the annual water demand. The government of Jordan is resorting to wastewater treatment practices to decrease the gap between water supply and demand. According to the ministry of water and irrigation about 90 MCM per year of treated water are effectively discharged into the watercourses or are used directly in irrigation. This is expected to increase to 240 MCM in 2020. Therefore, the development of cost-effective alternative technologies or sorbent for waste or greywater treatment is highly needed.

The WAITRO Innovation Award will be used to develop cost-effective inorganic-based absorbents and membranes

synthesized by alkali-activation of naturally abundant aluminosilicate materials from Jordan. The inorganic membranes will be fabricated via electrospinning from a precursor prepared using alkali-activation of aluminosilicate materials. Two synthesis strategies will be conducted; (1) alkali-activation synthesis (80-100°C) and (2) the traditional hydrothermal process coupled with sol-gel alkali-activation synthesis (200-300°C). The absorbents and membranes will be environmentally friendly materials where no organic, toxic or harmful reagents are released. Moreover, the synthesis process utilizes inexpensive reactants at low temperature. The properties of the absorbents and membranes will be studied and the optimized synthesis parameters will be used to fabricate inorganic-based absorbents and membranes to study their efficiency in the treatment of greywater samples.

TITLE: FUNGI-WATER - Deployment of fungal enzyme machinery in the removal of persistent pollutants in municipal and industrial wastewaters in Jordan.

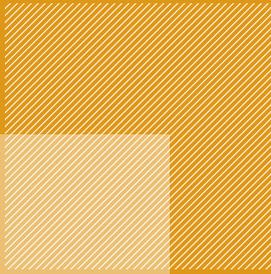
PARTNERS: Royal Scientific Society (RSS) – Jordan, Fraunhofer Institute for interfacial Engineering and Biotechnology (IGB) – Germany.

LEAD RESEARCHER: Dr.-Eng. Thomas Hahn

This project addresses olive mill wastewater in Jordan. Olive is the main agricultural crop in Jordan, with around 20 million olive trees are grown and more than 130,000 tons of olives produced annually, of which 80% is sent to mills for olive oil extraction and the rest (20%) are used for table olive processing. Currently, there are more than 140 three-phase olive mills, spread throughout Jordan discharging more than 250,000 m³ of olive mill water (OMW). Presently, most of this water is discharged without adequate treatment, thus threatening the quality of both surface and ground water. OMW is highly corrosive and it has high suspended solids that may cause clogging of the wastewater network. Also, due to its toxicity, it can kill the

microorganisms used in domestic wastewater treatment plants. On-site treatment is therefore highly desirable.

The idea for the WAITRO Innovation Award is to develop a robust fungi-based and modular solution for the removal of micropollutants from municipal and industrial wastewaters comparing commercially available fungi with microbiomes screened in Jordan with regard to the elimination efficiency. The fungi require immobilization on carriers which can be derived from easily available and cheap local sources (zeolites) or lignocellulose-containing local waste streams (for example saw dust, olive mill pomace).



04

**EVENTS AND
CAPACITY DEVELOPMENT**



STRENGTHENING INTERNATIONAL COLLABORATIONS WITHIN THE HORIZON FRAMEWORK

The WAITRO Capacity Development program aims to strengthen the capacity of individuals and institutions as well as enabling its members to be more responsive to global challenges and market needs. Competence in leadership, know-how, and advocacy is indispensable for RTOs to master the ever-changing conditions of conducting research and development. This is why, in 2020, WAITRO developed the Capacity Development Workshop Strengthening International Collaborations within the Horizon Framework.

We were able to welcome over 40 researchers from 20 member organizations from all over the world. Originally, it was planned to host the event in person in Barcelona, but that was not possible due to COVID-19, so the date and place of the workshop was changed to an online format. This reduced the potential for interaction created by putting everyone in the same room, but had the huge advantage of enabling us to admit more participants.

This was the first online workshop of such a size hosted by WAITRO and it received very positive feedback, which is why the WAITRO Secretariat decided to expand its online services and offer more members the opportunity to actively participate in WAITRO activities, independent of where they are.

The three days' workshop was designed to enable WAITRO members to participate in international research collaborations, in particular in the Horizon framework and to prepare WAITRO members for the shift from Horizon 2020 to Horizon Europe. The participants were split into two groups to better cater to their different experience levels. While some WAITRO members already had extensive experience participating in Horizon, for others this was a new landscape. Hence, we offered one workshop for beginners entitled 'Introduction to International Collaborations and Horizon Europe' and one for advanced and experienced proposal writers on 'Advanced Proposal Writing for Horizon Projects'.

We were able to win extremely experienced trainers for the different parts of the workshop. Amro Satti, from LEITAT in

Spain, led the workshop for the advanced group, and Alexandra May Hyldgaard, from the Danish Technological Institute (DTI), held two introductory workshops for the beginners group, which was split into two to account for the twelve different time zones of the global participants that extended from Thailand through Kenya to Colombia.

Additionally, Séan McCarthy, renowned European research strategy and implementation specialist with vast experience in all aspects of European research, kicked off the workshop with presentations and follow up discussions on "Getting Ready for Horizon Europe" as well as "How to Write a Competitive Proposal for Horizon 2020". The goal was to prepare both groups for the following hands-on sessions and more importantly for the upcoming framework change from Horizon 2020 to Horizon Europe.

To give the participants an immediate opportunity to put their learned skills into practice, a matchmaking event took place on the last day. Here, the WAITRO Secretariat closely collaborated with the liaison of the Regional Focal Point Europe, Laia Piñol. She reached out to all European WAITRO members to establish a "WAITRO Green Deal Core Group". European WAITRO Members who were looking into leading a proposal under the last Horizon 2020 call, the Green Deal, decided on seven topics for which they would lead a matchmaking session on the last day of the Capacity Development workshop.

This event was open to all WAITRO members and about 100 researchers and staff from WAITRO member organizations participated, including all workshop participants. Unfortunately, no consortium was formed after the matchmaking sessions this time around, however the participants provided the Secretariat with very positive feedback, which is why in 2021 the Secretariat is planning to continue with more matchmaking sessions and improved tools (especially SAIRA 2.0) to facilitate WAITRO members' participation in Horizon Europe. Using the feedback from this past event to their concepts will help more WAITRO-Horizon consortia to be formed and successfully apply for calls under the new EU research framework in the future.

GOOD PRACTICES IN CAPACITY DEVELOPMENT: EXPERIENCES OF THE REGIONAL FOCAL POINT FOR LATIN AMERICA AND THE CARIBBEAN

By:⁴

JAIME ARBOLEDA PALACIO, CTA Deputy Director - RFP

DURYS ESTHER RIOS, CTA-RFP Business Developer

IVAN DAVID OVIEDO RESTREPO, CTA-RFP Innovation Leader

1. INTRODUCTION

As the WAITRO Regional Focal Point for Latin America and the Caribbean, in 2020 the Antioquia Science and Technology Center (CTA) developed a capacity building strategy for RTOs in the region. In this article, we share some of our experiences with developing a uniform strategy for planning regional workshops and capturing output from them, in the hope that it will be of interest to other Regional Focal Points and encourage discussion of best practices across WAITRO. We will illustrate this strategy by sharing the detailed plans and results from one workshop.

The key to the success of our strategy has been that the speakers in each of the workshops be leaders and researchers of the RTOs themselves, allowing each RTO to exchange experiences to strengthen their capacities and knowledge on strategic and relevant issues. Bringing together speakers from regional RTOs to share their knowledge with others not only validates a sense of relevance to the WAITRO network at each member organization, but also allows them to showcase, position and publicize their strengths and areas of strategic interest to the entire region, thereby energizing collaboration across WAITRO.

We held four capacity development workshops during the year:

- Latin American RTO challenges in the formulation of projects under the H2020 methodology of the European Community.
- Capacity building in innovation and development of industry 4.0 technologies at RTO's: Success Story of the National Institute of Industrial Technology, Argentina.
- Appropriation of quality and dual learning in RTOs: Case Study National Institute for Professional Technical Training – INFOTEP, Dominican Republic
- Transformational Innovation: keys to capacity building in RTOs in Latin America and the Caribbean.

This document aims to share the systematization of these learnings through a good practice sheet prepared for one of the workshops carried out called Transformative Innovation: Keys to Capacity Building in THE RTOs of Latin America and the Caribbean.

⁴ Many thanks to Paul E. Burrows for his conceptual contributions to this article as well as for his style recommendations for the English version of this document.

2. STANDARDIZED PROCESS FOR SYSTEMATIC PLANNING

The RFP team developed a good practice sheet for strategic capacity building at WAITRO members in the region as shown in Figure 1. The standard form aims to systematize the planning, learning, and managing of the knowledge that is transferred and shared.

The tab structure consists of three components:

- The first component details the general information of the workshop: Title, date and time and information about the speaker where the academic and scientific trajectory of the exhibitor is presented.
- The second component details the goals and objectives of the workshop, what capacity is expected to be generated and the scope of the activity.
- The third component develops the conceptual view of the workshop and details what was presented, what was learned, and the main results in the process of knowledge transfer.

Logos of participating Institutions	
I. Workshop Overview	
Title	Date and Time
Digital Platform	Video del Workshop
Speaker information	
First and Last Name	Institution, position/role
Academic Experience	Work Experience
II. Workshop Scope Information	
Objectives	Target Audience
III. Capacity to be generated	
What was presented?	
Main results of the knowledge transfer process	
Bibliographic References	

Figure 1: Standardized planning sheet for WAITRO regional capacity development.

3. CONCEPTUALIZATION AND IMPLEMENTATION: TRANSFORMATIVE INNOVATION: KEYS TO CAPACITY BUILDING IN THE RTOS OF LATIN AMERICA AND THE CARIBBEAN.

In this section, one implementation of the systematic planning for capacity development is presented as a good practice example. Shown below is the planning sheet from one of last year's workshops; "Transformative Innovation: keys to capacity building in the RTOs of Latin America and the Caribbean."

What is transformative innovation, and why is it important for RTOs? The well-known "Innovator's Dilemma" book by Clayton Christensen distinguishes between "sustaining innovation" that improves existing technology and "disruptive innovation" that subverts and eventually replaces that technology. Transformative innovation introduces a third category that intentionally moves existing systems towards a new and sustainable path.

In the three horizons model of innovation, Incremental Innovation consists of small improvements in a product or service, such as cost reduction or lighter weight. This tends to improve and prolong existing systems, which are inherently unsustainable in today's world. Breakthrough Innovation refers to a meaningful change that gives consumers something demonstrably new and thereby produces a substantial competitive edge, but its effects tend to be unpredictable (or, at least, unpredictable). Transformative Innovation develops a new technology that creates a new industry or transforms the way people live and work. This kind of innovation often eliminates existing industries or, at a minimum, totally transforms them.

Transformative Innovation therefore represents a new approach to innovation, which has important implications for how we understand the role of science and technology and its relationship to society. What sets Transformative Innovation apart from previous approaches is the emphasis it places on a need for profound changes in the rules and standards that make up sociotechnical systems such as the national energy infrastructure, water, sanitation, transport and agriculture. These are systems that provide key services and on which we depend as a society. They tend to be complex systems and subsystems that make up various technologies, but they are also based on standards, rules, practices and cultures that in many cases determine levels and forms of inclusion (or exclusion) and care of (or damage to) the environment (Ramirez, 2020).

In this sense, the Transformative Innovation approach seeks to:

- Explicitly raise the social and environmental challenges facing society as public policy objectives.
- Redirect profound changes in sociotechnical systems, based on new sustainable routines and practices.
- Construct policies with actors of the current system (democratic and open spaces).
- Search process guided by the basic principle of improving social, economic and environmental realities.

The main principles of Transformative Innovation are directionality, collective participation, learning, experimentation and the development of niches, interdisciplinarity and anticipation of results and effects.

Experimentation is at the heart of the Transformative Innovation methodology. The social challenges for which we seek to innovate represent complex and persistent systemic problems and there is uncertainty about possible solutions. Therefore, they are approached by taking advance actions, supported by public policy – these are called experiments. Several features can help define experiments:

- Experiments should be considered to address systemic social, persistent and complex challenges (e.g. social health problems such as diabetes or over-car urban pollution).
- Experiments should be considered on a small scale and raised in a tight manner so that the process of intervention and learning is manageable.
- Experiments should be considered as strategic activities to build niches or to encourage their creation.
- Experiments should include "point actors" – those who are already experimenting with different visions and practices with the aim of empowering these actors with visions, concepts, seedlings of ideas that are able to produce replicable results. Actors whose voices are not traditionally heard or marginalized should also be included. Experimentation must generate second-level learning, which is why it is important that thoughtful processes are generated.

I. Workshop Overview

- **Title:**
Transformational Innovation: keys to capacity building in RTOs in Latin America and the Caribbean.
- **Date and Time:**
Wednesday, September 30, 2020 10:00 am (local time Colombia)
- **Digital Platform:**
Microsoft TEAMS Platform
- **Workshop Video (Spanish version):**
<https://youtu.be/zQQ934UoGAY>
- **Speaker information**



- **Institution, position/role**
Developer of Business and Technology, Corporation Center for Science and Technology of Antioquia-CTA (Medellin, Colombia).
- **Academic Experience**
Economist, Specialist in Management Strategy and Prospective, master's in administration and Project Management Professional – PMP.
- **Work Experience**
Dedicated to the management of Science, Technology and Innovation initiatives. She has managed research projects and educational, cultural, entrepreneurship and innovation strategies and social appropriation of the Science, Technology and Innovation. Through the projects executed, she has influenced public policy, promoted networking, and designed programs, tools, models and methodologies.

II. Workshop Scope Information

- **Objectives**
The objective was to provide conceptual tools to RTOs in the region to use to develop strategies that allow them to exploit the concept of transformative innovation and discover how to link it to their projects and organizational strategies.
- **Target Audience**
Researchers and staff of WAITRO RTOs in the Latin America and Caribbean Region and the general public.
- **Capacity to be generated**
The capacity to be generated in the RTOs in the region is as follows:
 - Understand the concept and importance of transformative innovation.
 - Identify their field of application and usage.
 - Identify how they can develop this capacity within each of them and the way to strengthen their processes of generation and transfer of knowledge.

Conceptual Development

Durys Ríos raised the following question as the center of her conference: Why should Research and Technology Organizations be interested in Transformative Innovation?

To answer this question, she contextualized the concept of transformative innovation as follows:

The United Nations has recognized in Science, Technology and Innovation (ST&I) as a key mechanism for the implementation of the Sustainable Development Goals (SDGs), and also that the transformation of ST&I policy is necessary to achieve different results; to do this, in addition to politics it is necessary to have institutions that support and legitimize the required process of change.

In this sense, a third framework of ST&I policy, known as the Framework of Transformative Innovation, has emerged.

- *Framework 1: 1950s to 1980s.* Through the ST&I, sought to overcome market failures as a result of low investment in R&D. Objective: to provide market incentives for R&D (subsidies, tax exemptions, intellectual property regime, etc.).
- *Framework 2: Late 1980s to today.* Seeks better use of knowledge, to support commercialization and to close the ST&I gap. For this purpose, ST&I policies focus on the creation of national, regional and sectoral systems of innovation, connecting together companies, governments and universities.
- *Framework 3: From today to the future.* This is the third transformative innovation framework that is still in development. (Hub Latin American and Caribbean Transformative Innovation Policy, 2020). CTA links the Latin American Transformative Innovation Hub to work together with 10 organizations in Colombia, Mexico and Chile with ideas and methods based on Framework 3 to develop a new approach to science, technology and innovation policy to address the region's social and environmental challenges. The main objective of the HUB is to develop

different activities to consolidate approaches to transformative innovation policy in the regional context. This involves working on the development of experiments, demonstrative cases, projects and pedagogical programmes, among other actions that generate knowledge about transformative innovation and the impact of public policy on science, technology and innovation in the regional context.

WHAT DID WE LEARN?

What were the main results of the knowledge transfer process and their implications for WAITRO RTOs? One of the most important things to be learned was the concept of Transformative Innovation, and its importance to the science, technology and innovation systems of each country in the region.

A second important conclusion was that the implementation of the concept requires shared efforts between the government, universities and RTOs to address the concepts of sustainability and thus achieving the SDGs using Science, Technology and Innovation in each country (Latin American and Caribbean Hub of Transformative Innovation Policy, 2020).

In short, to answer the question: Why should WAITRO RTOs be interested in Transformative Innovation? RTO's in Latin America and the Caribbean should establish a medium- and long-term work plan in the implementation of this concept and take on the following observations and challenges:

- Research and development do not automatically lead to human well-being, so it is necessary to accompany them with sociotechnical transformative changes that generate a path to sustainability.
- Creation of visions for the future requires work in multiple directions over a range of options that enable critical assessment and learning.
- Generate paths to sustainability: building transition areas, supporting diversity and opening up to alternatives. Build niche small-scale transformative processes.

- Strategically manage the concept of niches, which are defined as the establishment of large-scale social experiments (learning) and enlargement (creation of intermediaries).
- Ensure collaborations between different disciplines and knowledge to understand and seek solutions to complex sociotechnical problems, exploring different alternatives through experiments where the goal is not only economic growth.

Bibliography:

- Boni, A., Gianchi, S., Mollas Gallart, J. (2019). Key principles for a formative evaluation of transformative innovation policies. TIPC Policy Documents, No. 1, March 2019.
- Schot, J., Boni, A., Ramirez, M., Steward, F. (2018). 'Addressing SDGs through Transformative Innovation Policy', TIPC Research Briefing 2018 01.
- Van den Bosch, S., Rotmans, J. (2008). Deepening, Broadening and Scaling up. A Framework for Steering Transition Experiment.
- Delft, Rotterdam: Knowledge Centre for Sustainable System Innovations and Transitions, TNO Strategy and Policy.
- Schot, J., Kivimaa, P., Torrens, J. (2019). Transforming experimentation: experimental policy interventions and their transformative scopes. TIPC Policy Documents, No. 1, April 2019.
- Schot, J., Ramirez, M., Arroyave Bermúdez, A., Bernal Hernández, P., Marín, M., Romero Goyeneche, O., Alvial Palavicino, C. (2020). Transforming our world: Implementing the sustainable development goals. TIPC Extended policy report on the Colombian. Misión de Sabios. (Extended version). Science and Policy Research Unit, University of Sussex and Centre for Global Challenges, Utrecht University.
- Schot, J., Ramirez, M., Arroyave Bermúdez, A., Bernal Hernández, P., Marín, M., Romero Goyeneche, O., Alvial Palavicino, C. (2020). Transforming our world: implementation of the Sustainable Development Goals. Extended report for the Mission of Wise Men. Transformative Innovation Policy Consortium. Science and Policy Research Unit, University of Sussex and Centre for Global Challenges, Utrecht University.
- Schot, J., Steinmueller, W.E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, 47(9), pp.1554-1567.

EVENTS IN BRIEF

WAITRO pursues its mission globally by providing a range of services according to the needs and interests of its member organizations. Regional Focal Points (RFPs) play an essential role by supporting WAITRO to promote cooperation between and within regions. Currently we support five RFPs in Africa, Asia & the Pacific, MENA, Europe, and Latin America and the Caribbean. Each RFP is selected for a period of two years,

Nowadays there are big challenges facing the world due to Covid-19 epidemic, in particular travel restrictions. Despite the challenges, in 2020 our five active RFPs kept participating in WAITRO via online activities, events, meetings, workshops and training. Their efforts help keep WAITRO a force to be reckoned with in the world.

Above, we presented details about a handful of events held in 2020 as we gradually learned the best way to organize online in the face of travel disruptions. Other smaller, regional workshops kept the Global Innovation Family busy throughout the year, a selection of which are presented below:

Workshops:

the third meeting of the Arab working group

- **Time (Period):** Jun. 23rd,2020
- **Place:** Online
- TIMS participated in the meeting with a discussion mainly about
 - Supporting the industry of energy and rationalization.
 - Industry academic support for environmental compliance.
 - Supporting the ideas and small companies to produce small industries in different areas.
 - Capacity building

Regional Workshop on Technology Transfer : Renewable Energy Technologies for Climate Change Mitigation

- **Time (Period):** Sept.24th -Sept.25th,2020
- **Place:** online
- Asia-Pacific is one of the most vulnerable regions to climate change and greenhouse gas emission. Technologies of renewable energy that can reduce carbon intensity are key factors for greenhouse gas reduction, energy efficient building, and low-carbon transportation. However, there are challenges for industry in their adaptation of technologies, especially local supplies, raw materials, and skills for equipment.

This regional workshop aimed to gather the policy makers, international and national experts, institutional and financial mechanisms, and business sector to have a discussion on case studies and best practices in renewable energy technology transfer, adoption, and deployment. The workshop was jointly organized by Asian and Pacific Centre for Transfer of Technology (APCTT) of the UN-ESCAP, Ministry of Higher Education, Science, Research and Innovation (MHESI)

- **Relevant Members :** TISTR (Host), NFI, CSIR, LIPI, UPSI, IROST, CARIRI (Participants)

Green Deal Matchmaking event

- **Time (Period):** Oct.9th,2020
- **Place:** online
- The matchmaking event, led by LEITAT (Laia Piñol), gathered around 70 attendees. Seven sessions were held in parallel for seven different topics of the Green Deal call of the Horizon 2020. Some WAITRO partners volunteered to moderate the sessions (DTI, TWI, LEITAT, AINIA, THGA, HUD). In these sessions, the different topics were presented and discussed among the attendees. The potential roles and opportunities were detected. A summary document was produced with the minutes to gather the relevant information generated during the session.

Before this event, a Green Deal Working Group was created among WAITRO members. This group enable to meet the European members, know, and gather their interests. The members of the group are: The University of Huddersfield, ITG, DTI, AINIA, TWI, IVL, THGA and Fraunhofer.

Forum on challenges and challenges of Latin American RTOs for the formulation of projects under the H2020 methodology.

- **Time (Period):** Nov.4th 2020
- **Place:** online
- The objective of this forum was to bring together the CES University (Colombia), the INTI (Argentina) and the CTA (Colombia) to talk about the challenges faced by the RTOs of Latin America and the Caribbean in the formulation of projects under the H2020 framework.
- **Relevant Members:** CTA, CIB, CES University, INECOL, INFOTEP, INTI and CIDET.

Workshop on capabilities in innovation and development of industry 4.0 technologies at RTO's: Case Study INTI Argentina.

- **Time (Period):** Dec.1st,2020
- **Place:** online
- The objective of this workshop was to present the capacities, good practices and lessons learned by INTI Argentina in R + D + i and the appropriation of technologies from Industry 4.0 to its processes and development of new services for the industry.
- **Relevant Members:** CTA, CIB, Universidad CES, INECOL, INFOTEP, INTI, CIDET, University ITM and others.

Projects

WAITRO Collaborative Project : WAITRO Online Informational Session for Asia and the Pacific Members

- **Time (Period):** Mar. 12th, 2020
- During the Session, SAIRA Matchmaking Platform, WAITRO website and Intranet were introduced to participants to understand the steps of application of those WAITRO opportunities.
- **Relevant Members :** JITRI, TISTR, SIRIM Berhad, CSIR, MWA, UPSI, NF

Collaborative Research Project in Europe: Eur3ka

- The Horizon 2020 project Eur3ka was submitted under one of the extraordinary calls targeting medical solutions to cope with the consequences of the COVID-19 pandemic. The project was awarded in August 2020 and will run for 24 months. Among many European industry and research partners are three WAITRO members DTI, Fraunhofer and TNO. Eur3ka brings together different actors from different sectors to create a more resilient manufacturing sector in order to improve and secure the production of medical supplies as well as equipment needed during the current and future pandemics. The overall ambition is to enhance the resilience of supply chains within the manufacturing sector producing medical supplies as well as develop plug and play solutions that can be easily implemented in the case of an extraordinary event such as a pandemic.

Collaborative Research Project in Europe: BIOMAC

- The BIOMACHorizon 220-project submitted for review in January 2020 together with WAITRO-partners (DTI and Fraunhofer) and was awarded in October 2020. During a period of three years, the consortium will develop a one-shop-stop solution for technical and non-technical services necessary to upscale new bio-based materials concepts, that will continue beyond the project period. This one-shop-stop aims especially at promoting the collaboration and knowledge transfer to SMEs, levelling the deployment and commercialisation of the results. Furthermore, it intends to support R&D intensive SMEs in bringing their results to the market. Overall, the BIOMAC project will contribute to boost and sustain innovation in the field of European bio-economy industries by reducing the time-to-market.

Collaborative Research Project in Europe : SEPARESCUE

- After a successful first stage submission the final proposal for the SEPARESCUE project was submitted in September 2020 under the H2020 topic CE-SC5-24-2020. The evaluation is expected in December 2020. The consortium led by WAITRO member DTI covers a wide range of different European partners (including Fraunhofer) covering different regions and sectors. The project intends to improve the recyclability of multi-layer packaging, contributing to develop a circular value chain around multi-layer packaging. The SEPARESCUE process combines three industrially proven technologies, namely, plasma etching, and supercritical that will help to separate the different layers so they can be recycled more easily.

Collaborative Research Project :Electronically Controlled Gravity Feed Infusion Set

- The Uganda Industrial Research Institute (UIRI) together with the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) were awarded 150,000€ through the German African Innovation Incentive Award. Their project, Electronically Controlled Gravity Feed Infusion Set, was facilitated through WAITRO and the F4D-Program, SAIRA's predecessor, back in 2016.

Proposals

NINFA

Fostering international collaboration for the Implementation of nature-based solutions for sustainable water management research and innovation action

The NINFA proposal was submitted under the SC5-27-2020 topic under the Greening the economy in line with the Sustainable Development Goals (SDGs) call in which international cooperation is encouraged. This was led by LEITAT in collaboration with WAITRO partners (i.e. DTI, CTA, WAITRO). The main goal of NINFA is to stimulate the implementation of NBS for sustainable water management in cities, by delivering digital tools and guidelines among other instruments. That will be developed by capitalising upon existing projects, experiences, tools and literature and will be (co)created and validated by different stakeholders from Living Labs (LL) in EU and beyond, considering a wide range of environmental, climatic, societal, economic and political contexts.

Relevant Members: LEITAT- CTA - DTI and other 14 non WAITRO institutions.

TRANS-IO-Circular

Towards A Novel Sustainable Innovation Oriented Circular Economy

The TRANS-IO-Circular proposal was submitted under the SC5-25-2020 topic under the Greening the economy in line with the Sustainable Development Goals (SDGs) call in which international cooperation is encouraged, in particular with Africa. This was led by FRAUNHOFER in collaboration with WAITRO partners (i.e. LEITAT, DTI, CTA, TISTR, RMRDC). This proposal will develop a methodology to assess the current state of transition towards the circular economy in two relevant economic sectors: i) construction and demolition and ii) Information and communications technology, considering plastic within these two sectors. With the developed methodology, possible transition scenarios to a circular economy as well as their outcomes and impacts will be also analysed.

Relevant Members: Franhoufer - LEITAT- TISTR, CTA and other 25 non WAITRO institutions.

SOILGUARD

Sustainable soil management to unleash soil biodiversity potential and increase environmental, economic and social wellbeing

The SOILGUARD proposal was submitted under the SFS-21-2020 topic under the H2020-SFS-2018-2020 call in which international cooperation was encouraged. It was led by LEITAT and will last for 48 months (4 years). The main goal of SOILGUARD is to deliver evidence-based knowledge regarding the benefits of sustainable soil management practices for soil biodiversity and its potential to deliver ecosystem services across different biomes, biogeographical regions and under specific stressors. The project focuses in EU countries, Cameroon, Thailand and Argentina. Partner collaboration opportunity was posted in SAIRA. SOILGUARD was invited for funding in December 2020.

Relevant Members : LEITAT, DTI, TISTR, the University of Yaoundé

SATISFASHION

Scaling-up Alternative Textile to Impulse Sustainable Fashion

SATISFASHION aims to make the fashion industry more circular. It will do so by developing new bio-based textile fibres that can be mechanically and chemically recycled. Moreover, garments developed with these fibres will shed significantly less microfibres into water and air. The project will also develop new circular business models and will establish responsible research and innovation principles in fashion value chains. The proposal was submitted for the CE-FNR-14-2020 topic under the Food and Natural Resources call (H2020-FNR-2020) in which international cooperation was encouraged. The preparation of the proposal was led by LEITAT in collaboration with key industry players and WAITRO partners (i.e. TISTR and JITRI). LEITAT is mostly involved in recycling and upcycling processes, as well as strategies to mitigate microfibre release. TISTR is mostly involved in sustainable sugar sourcing for biopolymers production. Finally, JITRI is mostly involved in mechanical recycling processes and prototype development. Besides Europe and Asia, the project also counts on apparel brands from North America. Partner collaboration opportunity was posted in SAIRA. Unfortunately, the proposal was not successful at evaluation stage. However, it implied one opportunity of being WAITRO members and its connectivity

Relevant Members : LEITAT, TISTR, JITRI

TLSIP

Thailand-Spain Joint Call for R&D&I Proposal

Since November 2020, there has been the TCELS-CDTI 2nd Call for Proposals under the TLSIP. The proposals must include proponents from Thailand and Spain. The Thai side could be RTOs, Universities, SMEs/Startups, while Spain side must have at least 1 company, or including other RTOs/Universities but optionally and on their self-funded. TCELS or CDTI are the funding provider to the successful proposals. The thematic areas are on regenerative medicines, functional foods, natural products, etc.

Hifas da Terra, a biotechnological company (under LEITAT's connection), focused on research and innovation with a high degree of specialization in the development of nutraceuticals from medicinal mushrooms. LEITAT and Hifas da Terra are wishing to discuss with TISTR to develop a joint proposal based on the development of new food supplements formulations based on available bioactive ingredients from medicinal mushrooms to fight SARS-CoV-2.

Relevant Members : LEITAT (+company: Hifas da Terra), TISTR

H COUNTER PERISH

COUNTER PERISH proposal was submitted under the RUR-07-2020 topic under the H2020-RUR-2018-2020 call. This was led by DTI in collaboration with WAITRO partners (i.e. FRAUNHOFER, LEITAT). COUNTER PERISH is designed to deliver three overall objectives: i) reducing food losses and waste in the EU by 20%, ii) bringing novel technologies into play to reduce food losses and waste, and iii) securing commitment and collaboration from the entire value-chain in a multi-actor approach.

RoboTIP

Enabling Robot deployment through Truly Impactful Pilots – on the reserve list

The Horizon 2020-proposal RoboTIP was submitted in June 2020 under the topic ICT-46-2020 aims at developing an industry driven approach to large-scale piloting of innovative robotic technologies. The consortium encompasses besides a variety of European Partners, three WAITRO members being DTI, Fraunhofer and TNO. RoboTIP addresses different challenges within manufacturing industry concerning competitiveness and keeping up with emerging technologies. In four larger scale pilots the consortium will demonstrate how new robotic technologies, accompanied by an IT architecture and non-technical support tools, can help manufacturing companies in transition from product-centric to capability-centric.

AgroSava

The AgroSava proposal was submitted under the CE-SFS-36-2020 topic with CSIC in Spain as coordinator and WAITRO partners DTI and BITRI. The AgroSava project's main objective is to realize bush as a valuable bio-resource with sustainable economic, environmental and social value, stimulating its harvesting and reversing encroachment. Bush encroachment is crippling savannah-based ecosystems across Southern Africa; it depletes available water reserves, diminishes and weakens productive farmland and displaces subsistence farmers to live in abject poverty on the edge of townships. In AgroSava, superheated steam bioprocessed bush will be used to create a range of enriched soil enhancement products, animal feed supplements, low cost environmentally friendly construction materials and biochemical rich condensate streams.

AJILE

The AJILE proposal was submitted under the Ocean Innovation Challenge (UNDP) on April 2020. AJILE was led by LEITAT in collaboration with WAITRO partners (i.e. ARC and RMRDC).

AJILE project aims to reduce river and ocean water contamination by developing an innovative anti-N-loss fertiliser that minimizes the loss of nitrogen and other nutrients and maximises uptake by crops, which will be cost-effective and easy-to-implement, facilitating its wide application in Africa and other regions. The anti-N-loss fertiliser will be based on biochar, an organic soil amendment obtained from organic waste pyrolysis, with high adsorption capacity. AJILE innovation comes from the design: biochar will be impregnated with (chemical/organic/bio) fertiliser, thus ensuring its slow release, reducing nutrient leaching and ensuring its availability for plant uptake.

Relationship building

Collaboration For an Economy of Abundance

- **Time (Period):** May 20th , 2020
- **Place:** Online

Focus on public-private collaboration networks as well as technical and logistic challenges of the development of emergency ventilators:

- The new economic dynamics in Colombia and Spain: how sectors grow and decline and how inter-institutional collaboration can result into an economy of abundance (cooperate to win).
- Socialization of the experiences of InnspiraMED in Medellín and LEITAT in Barcelona, in the development of very low-cost mechanical ventilators, to reinforce the capacities of the health systems in both countries and which have had the participation of government actors, industry and academia.
- Collaboration networks, technical and logistical challenges for the development of ventilators, learning about how industry, academia and the government can collaborate to obtain new products in record time.

Official UPSI EDU Innovation YouTube

- In May 2020, The Research Management and Innovation Centre (RMIC) of Universiti Pendidikan Sultan Idris (UPSI), a member from Malaysia, has launched the "Official UPSI EDU Innovation YouTube". It was an online channel to promote and disseminate UPSI's VDOs on innovative products, research outcomes, knowledge sharing sessions, and teaching strategies. TISTR was acknowledged this news by the contact staff of RMIC-UPSI and helped circulating e-mail to the members in Asia and the Pacific region to know and get more subscribes.
- **Relevant Members:** UPSI of Malaysia

Future prospects for wind energy

- **Time (Period):** Jun. 29th,2020
- **Place:** Online
highlighting the close relationship between the project and developments current and future, with a special focus on the training departments and units that have been created with various scientific institutions and colleges to develop curricula for wind engineering within institutions in Egypt and Tunisia. The wind engineering centers that were established in the College of Engineering - Arab Academy of Sciences was shown.
- **Relevant members:** TIMS

Webinar on Technology Platform : Towards Affordable & Cost Effective Digitalization Process

- **Time (Period):** Jul.16th,2020
- **Place:** online
- With the operational stress brought about by the pandemic, it has become more crucial than ever for Malaysia's industry players to be able to reap the benefits of Industry 4.0 technologies and ensure their business continuity. This is where digitalization, particularly of the manufacturing processes, is key.
To help better understanding the current situation of Malaysia, one of the Industry 4.0 pioneer countries in the region, SIRIM Berhad, hosted an online forum. The forum created the opportunity to explore more about the technology platforms for Industry 4.0 in Malaysia with SIRIM, together with its partners such as Hitachi Asia (Malaysia), Huawei Malaysia, and Bosch Rexroth. The panelists shared their field experience and the future trends of technology platforms with all participants.
- **Relevant Members :** SIRIM Berhad (Host) Other members from Africa, Asia and the Pacific, Middle East and North African

International Conference on Circular Economy and Technology Transfer for Small and Medium Sized Enterprises

- **Time (Period):** Sept. 23rd,2020
- **Place:** online
- Under the raising framework of circular economy, Bio-Circular-Green (BCG) Economy has been initiated by the government of Thailand for the integration of biological usage, economic activity, and environmental wellbeing in a sustainable context. Moreover, the biodiversity of ASEAN was well to adopt the BCG model into its regional strategy together with SDGs. With emphasis on this issue, Asian and Pacific Centre for Transfer of Technology (APCTT) of the UN-ESCAP, Ministry of Higher Educational, Science, Research and Innovation (MHESI), and TISTR jointly organized the "International Conference on Circular Economy and Technology Transfer for Small and Medium Sized Enterprises" as a platform of sharing on BCG model for sustainability, climate change, mitigation and adaptation to support SMEs in taking up inclusive BCG technologies.
- **Relevant Members :** TISTR (host), NFI, CSIR, LIPI, UKM, IROST

the 7th China Jiangsu Conference for International Technology Transfer and Commercialization (CITTC) with the theme "Networking Online, Partnership for Innovation."

- **Time (Period):** 11th Nov.2020-13th. Nov.2020
- **Place:** China &Online
Through pre-recorded video on "Experiences and Future Prospects of Global Agricultural Innovation Cooperation" during the webinar on Belt and Road Agricultural Innovation Cooperation, and shared ideas on effective ways to strengthen open cooperation in Belt and Road agricultural innovation partnerships.
- **Relevant members:** ARC

Webinar on Living with the Virus - The Way Forward.

- **Time (Period):** Nov. 26th,2020

As COVID 19 pandemic has coaxed people into confined spaces at our homes/ workstations as well as consolidated us to start our journey living with the virus in a daily basis, there is a new drift in our mental, physical and emotional health in this era, both positive and negative.

With the concern, SRI and PHD Chamber of Commerce and Industry of India organized a webinar on “Living with the Virus - The Way Forward” in 2020. The key discussion points included on positive changes in attitude, physical, mental, emotional improve and health, and coping in the challenging time. TISTR helped promote the webinar by circulating the e-mail of announcement and invitation to other members in the region.

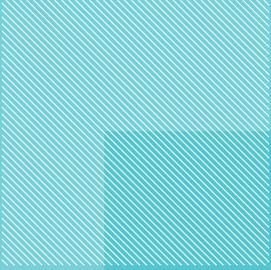
- **Relevant Members:** Shriram Institute for Industrial Research (SRI)

Research in Times of Crisis

- **Place:** virtual event

Medellín Investiga is a program created with the purpose of promoting and encouraging research in higher education students and researchers. It also aims to promote a culture that values and manages knowledge and the development of research through the generation of spaces for appropriation and dissemination of science and. This way, it contributes to strengthening access, quality and relevance of the Medellín higher education system for the construction of an innovative and competitive city at the regional, national and international levels.





05

THE STRATEGIC PLAN



WAITRO reached its 50th anniversary in 2020 and its achievements in benchmarking (best practices), partnering to enable collaboration, and building capacity amongst its members have been recognized and celebrated. Much has changed, however, since WAITRO was created by UNIDO in 1970. Some modifications and new approaches to its strategy are therefore required to put the Association on a path to success for the next fifty years. The full strategic plan, available on the WAITRO website,⁵ outlines the vision of the Executive Board and Secretariat for what WAITRO can become over the next decade, and details goals and objectives for the next two years of WAITRO’s development. WAITRO’s new strategic plan aligns with the 2030 UN Agenda and prepares and enables its membership to contribute to the SDGs. A brief summary of the agreed goals and objectives is presented here.

STRATEGIC GOALS AND OBJECTIVES

WAITRO IN 2030

<p style="text-align: center;">STRATEGIC GOAL1</p> <hr style="width: 20%; margin: auto;"/> <p>WAITRO will be an association with a diverse, globally represented and engaged membership.</p>	<p style="text-align: center;">STRATEGIC GOAL2</p> <hr style="width: 20%; margin: auto;"/> <p>WAITRO will be a hub for collaboration and innovation for sustainable development.</p>	<p style="text-align: center;">STRATEGIC GOAL3</p> <hr style="width: 20%; margin: auto;"/> <p>WAITRO will be a provider for capacity development and accreditation.</p>	<p style="text-align: center;">STRATEGIC GOAL4</p> <hr style="width: 20%; margin: auto;"/> <p>WAITRO will be an advocate for and influencer of sustainable innovation.</p>
---	---	--	---

We hope that WAITRO in 2030 can be described as four goals.

STRATEGIC GOAL 1: BECOME AN ASSOCIATION WITH A DIVERSE, GLOBALLY REPRESENTED AND ENGAGED MEMBERSHIP

Objective 1.1	Increase the number of Full Member organizations, and increase the engagement of individuals at those organizations.
Objective 1.2	Increase the number of Associate Members from all regions.
Objective 1.3	Improve WAITRO’s transparency and accountability.

⁵ <https://waitro.org/wp-content/uploads/2021/04/WAITRO-Strategic-Plan-2030.pdf>

STRATEGIC GOAL 2: BECOME A COLLABORATIVE INNOVATION HUB FOR SUSTAINABLE DEVELOPMENT

Objective 2.1	Facilitate the participation of member organizations in publicly-funded collaborations.
Objective 2.2	Facilitate collaboration and technology transfer between (full) member organizations and the private sector (incl. associate members).
Objective 2.3	Foster collaborations to support the development and deployment of innovative technologies with high impact on sustainable development.

STRATEGIC GOAL 3: BECOME A PROVIDER OF CAPACITY DEVELOPMENT AND ACCREDITATION

Objective 3.1	Improve the operational practices and business performance of WAITRO members and enhance scientific research and technological capacities of individuals.
Objective 3.2	Strengthen and validate the capabilities of member organizations and establish “WAITRO Certified” as a brand of value.
Objective 3.3	Augment international experience of researchers and staff of member organizations.

STRATEGIC GOAL 4: BECOME AN ADVOCATE FOR AND INFLUENCER OF SUSTAINABLE INNOVATION

Objective 4.1	Become a respected global advocate for the impact of science, technology and innovation on sustainable development.
Objective 4.2	Position WAITRO to be an influential organization in the global policy and strategy market.
Objective 4.3	Position WAITRO as a consultant at the intersection of science, technology, and innovation and sustainable development.



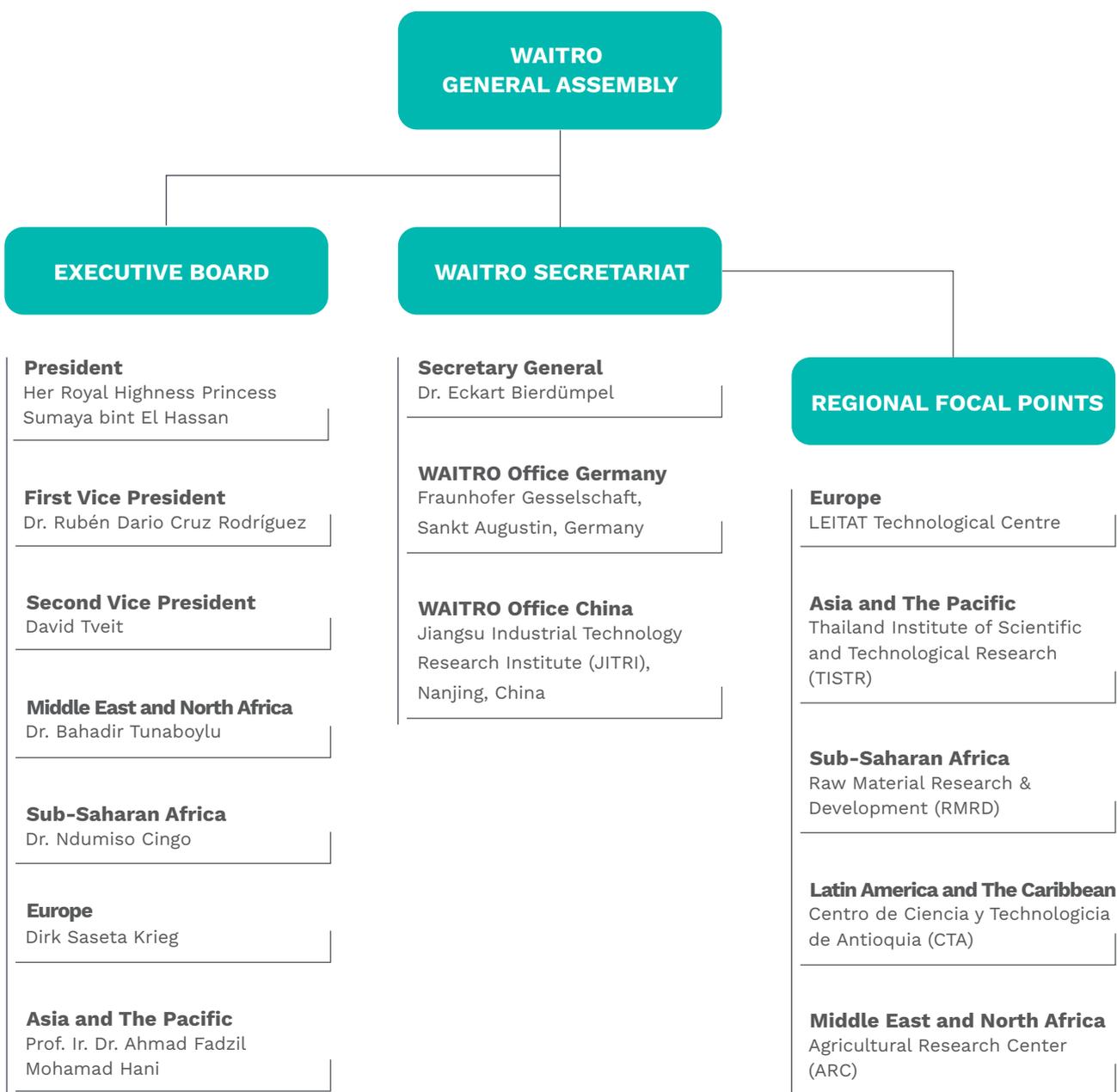
06

ANNEXES



ANNEX 1

ORGANIZATIONAL STRUCTURE⁶



⁶ As of 31st December 2020

Executive Board



President

Her Royal Highness Princess
Sumaya bint El Hassan



First Vice President

Dr. Rubén Dario Cruz
Rodríguez



Second Vice President

David Tveit



Middle East and North Africa

Dr. Bahadir Tunaboylu



Sub-Saharan Africa

Ndumiso Cingo



Europe

Dirk Saseta Krieg



Asia and the Pacific

Prof. Ir. Dr. Ahmad Fadzil
Mohamad Hani



Latin America and the Caribbean

Dr. Randall Loaiza

Secretariat



Secretary General
Dr. Eckart Bierdümpel



Director
- WAITRO Office Germany
Dominik Reinertz



Strategy & Analysis
Jerome Harrison



Communication
& Social Media
Mona Kern



Director
- WAITRO Office China
Paul E. Burrows



Program Coordinator
Duan Ran



Program Manager
Capacity Development
Anna Wohrab



**Alumni Network
& Partnerships**
Julia Wiethüchter



Legal Advice
Linn Sommerhof



Design
Johanna Engelbach



IT Solutions
Dikshita Kalita



Policy Strategy
Nala Müller



**Program Support & Assistant to
Director of WAITRO Office China**
Jiang Yiwen

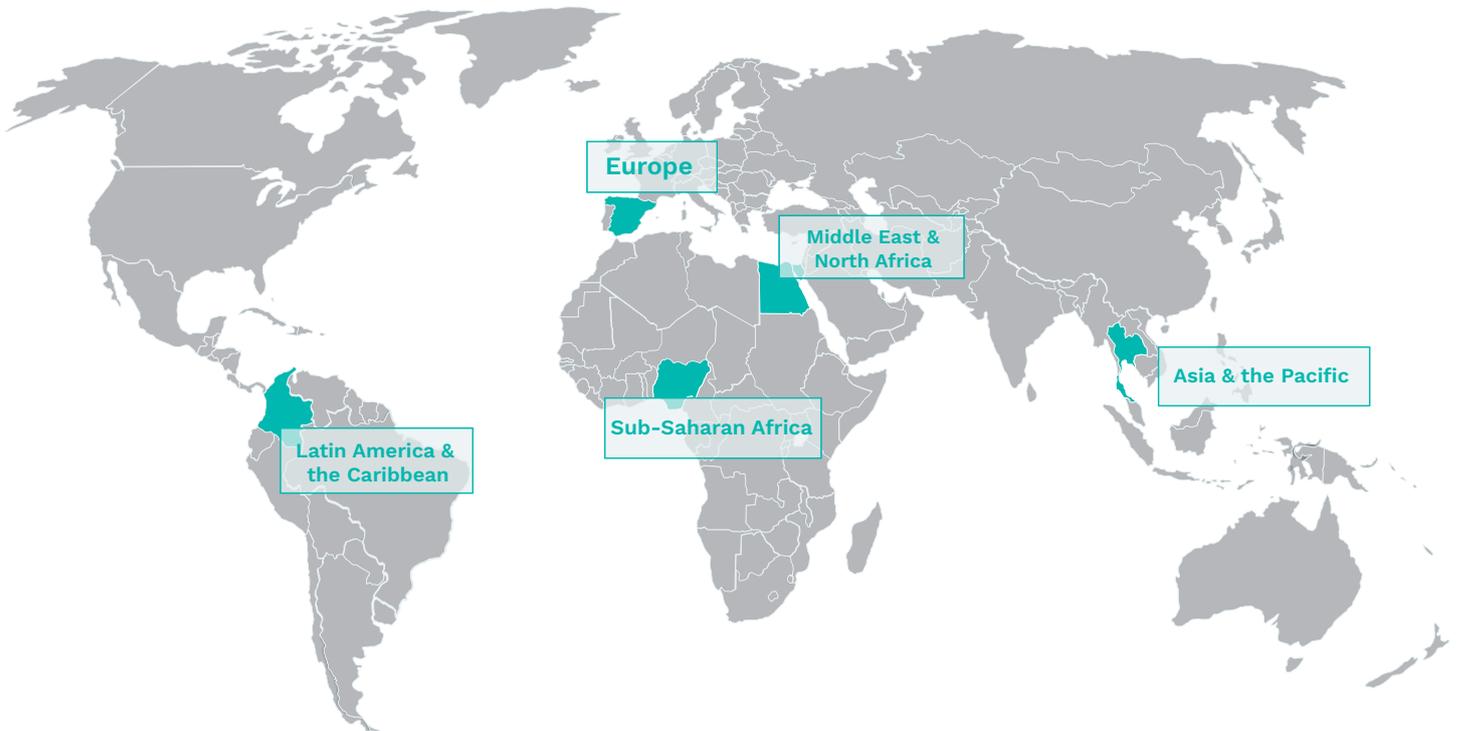


Communication & Strategy
Liu Ye



**Program Manager
- Fellowship**
Yao Xin

Regional Focal Points



Latin America and The Caribbean
Centro de Ciencia y Tecnología de Antioquia (CTA)



Europe
Leitat Technological Centre



Middle East and North Africa
Agricultural Research Center (ARC)



Sub-Saharan Africa
Raw Material Research & Development (RMRD)



Asia and The Pacific
Thailand Institute of Scientific and Technological Research (TISTR)

ANNEX 2 GLOBAL OUTREACH

WAITRO Website



Social Media



Global Solidarity Day 2020

On May 22nd 2020, in the midst of the pandemic and on the Global Day of Solidarity, the WAITRO Secretariat has started a call to join the initiative by the UN SDG Action Campaign. A few days earlier, a message was sent to all WAITRO members, asking them to virtually assemble in a call to online to take a colorful photo with as many people of the Global Innovation Family as possible. Then, on the Global Day of Solidarity, more than 50 participants

from many WAITRO member organizations, 15 countries and four continents met online. Not only could the network of WAITRO spread a message and a picture for solidarity; it was most of all a great opportunity for WAITRO members who have not seen each other in person in a long time to talk and catch up with each other. The Secretariat thanks everyone who has joined of the call and WAITRO's act of solidarity!



ANNEX 3 GENERAL ASSEMBLY

The 25th WAITRO General Assembly

The General Assembly of WAITRO takes place every two years, traditionally in conjunction with a conference that has now become the Global Innovation Summit. In 2020, the 25th General Assembly took place in the cloud using Zoom, due to restrictions on international travel, with motions presented via video on demand and voting accomplished via a secure online platform open for 24 hours prior to the online meeting. 35 out of 79 WAITRO member organizations in good standing were represented at the live meeting and a total of 46 members used the online tool to vote, satisfying the quorum of one third of the membership required for the General Assembly to make decisions.

The President of WAITRO, HRH Princess Sumaya bint el Hassan opened the meeting. The agenda was approved, as well as the minutes from the 24th General Assembly, by show of hands (unanimous). As recommended by the WAITRO Executive Board, Moses Mengu, former Secretary General of WAITRO was elected as Returning Officer in order to conduct the elections of the General Assembly.

RE-ELECTED FOR A SECOND TERM

President: HRH Princess Sumaya bint El Hassan

First Vice President: Rubén Darío Cruz Rodríguez

Second Vice President: David Tveit

Regional Representatives

- **Asia & the Pacific:** Ahmad Fadzil Bin Mohamad Hani
- **Europe:** Dirk Saseta
- **Latin America & the Caribbean:** Randall Loaiza

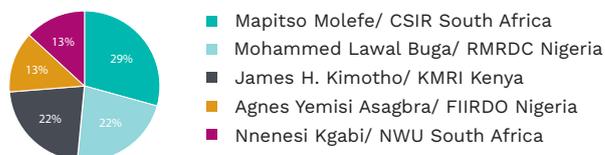
Secretary General Eckart Bierdämpel and the head of the WAITRO Office, China, Paul Burrows, served as the Nomination Committee.

The Delegates approved the report of the Executive Board, which included a list of new members added in 2019-20, an overview of the capacity development seminars and workshops held, information on SAIRA (the open innovation hub for sustainable development and the open access hub to fight COVID-19) the rebranding of WAITRO, the new website and intranet, the Innovation Award, the status of the WAITRO Fellowship Program, relationship building with different institutions and organizations and the representation of WAITRO in international fora. WAITRO Strategic Plan 2030 and Work Program 2021-2022 was also presented. Both were approved by show of hands online.

NEWLY ELECTED FOR A FIRST TERM

- **Africa:** Mapitso Molefe
- **Middle East and North Africa:** Emad Ewais.

Regional Representative for Africa



Regional Representative for The Middle East & North Africa



Two motions concerned administrative issues.

First, the Secretary General proposed a new membership fee structure. From 2021 onwards, the four levels of WAITRO membership fee will be readjusted to scale from \$250 to \$2,000, depending on the gross national income of the member's country. This effectively lowers the membership fee for members from most countries. The fee will be waived for the current term of the WAITRO Secretariat, which ends on December 31st, 2022. Unless a different proposal is accepted, WAITRO members will be charged the new membership fees from 2023 onwards in order to remain in good standing.

The second proposal clarified the membership categories defined in the WAITRO Constitution and corrected a contradiction regarding the role of the Executive Board. The proposal:

Deletes Section 3 entirely.

Amends Section 6.1, 6.2 and 6.4 to read:

6.1

Full membership shall be open to non-profit or not-for-profit organizations involved in research or development relevant to industrial technology. In exceptional cases, for-profit companies that operate a substantial portion of their business as an RTO should be considered for full membership.

6.2

Associate membership shall be open to for-profit organizations with a commercial interest in industrial research, including corporations, banks and investment funds.

6.3

[unchanged]

6.4

WAITRO partner shall be open to non-governmental organizations and other organizations with goals synergistic to those of WAITRO, where such organizations can bring added value to WAITRO products and services.

Amends Section 10 to read:

10.1

The Executive Board shall comprise the President, Vice Presidents, Regional Representatives and other members proposed by the President. The terms of office of all members shall be two years and the Board shall be under the chairmanship of the President of the Association. The first Vice President shall be Vice Chairman of the Board.

10.2

The President and the Vice Presidents shall each come from different geographic regions. The President and the Secretary General shall not be from the same member organization.

10.3

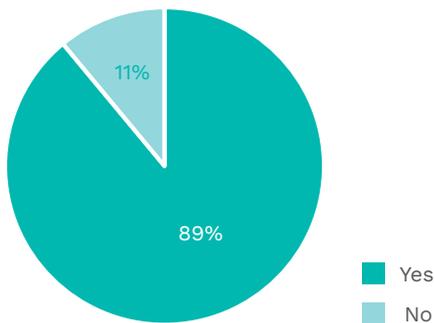
The Executive Board may further consist of members appointed by the President to recognize exceptional contributions and to attract new members.

10.4

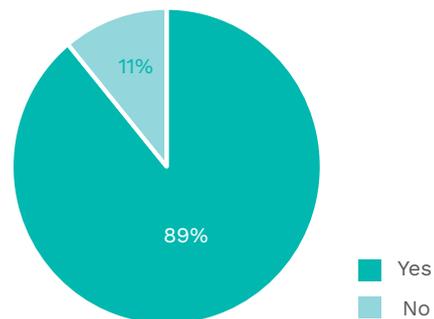
Each member of the Executive Board shall have one vote at meetings of the Board. In case of a tie, the President shall have the casting vote.

The delegates approved both proposals as follows:

Vote for the Amendment of the Constitution



Vote for Membership Fee

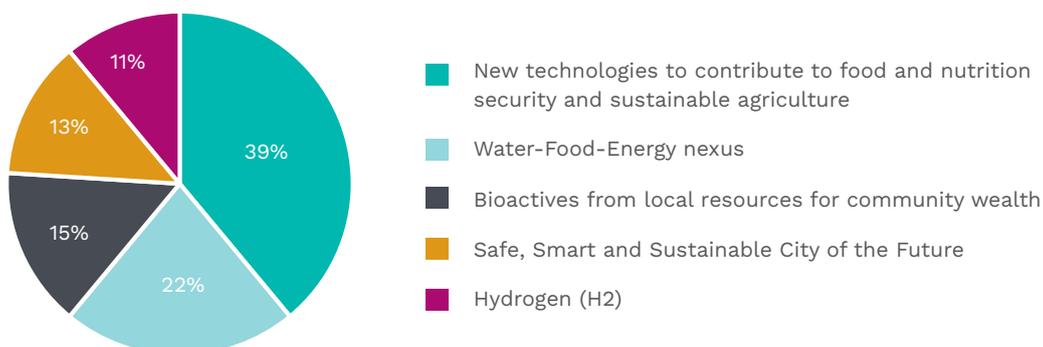


The delegates were also asked to decide on their preferred topic for the WAITRO Innovation Award 2021, choosing from five topics that were proposed by the Executive Board:

- Bioactives from local resources for community wealth.
- New technologies for food and nutrition security and sustainable agriculture.
- Water-Food-Energy nexus.
- Safe, Smart and Sustainable City of the Future.
- Hydrogen (H2).

A one paragraph description of each topic was given in an online paper. The delegates chose topic #2, voting as follows:

Topic for the Innovation Award



The majority of the General Assembly also agreed to hold the 26th General Assembly, in conjunction with the Global Innovation Summit that was previously planned for 2020, in South Africa in late 2021, conditional on the travel restrictions due to the COVID-19 pandemic being sufficiently relaxed that a physical meeting could take place. By the time this Report went to press, it had become clear that it is highly unlikely that a physical meeting for all WAITRO members could take place in 2021. For that reason it was decided by the Executive Board to skip the additional meeting so that the 26th General Assembly will be held in 2022 – this time hopefully in person and not online.

Finally, the President gave delegates the opportunity to raise any other business that they wished to discuss and, since there was none, closed the meeting.

Published by the WAITRO Secretariat with contributions from the Regional Focal Points.

Editors: Paul E.Burrows, Jiang Yiwen.

Principal Authors: Paul E.Burrows, Dominik Reinertz, Anna Wohlrab, Dr.Eckart

Bierdümpel, Her Royal Highness Princess Sumaya bint El Hassan

Design Contributions: Johanna Engelbach

Production By: Luye Design Institute, Nanjing, China



@ waitro_org



@ waitro_org



@ WAITRO



WAITRO



www.waitro.org

