AMSIC Newsletter

October 2021
Issue 11

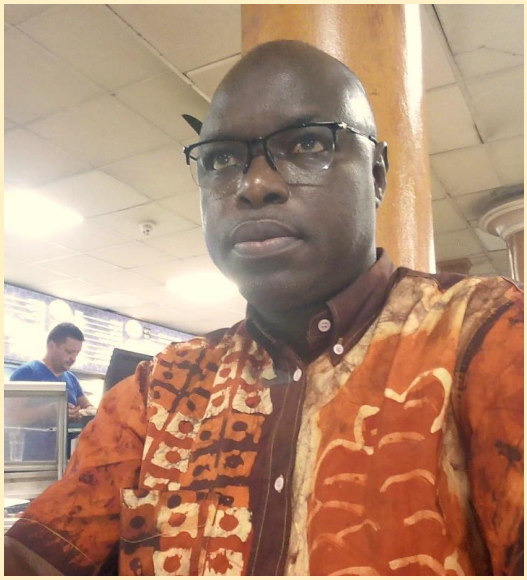
Published by the African Membrane Society in two issues yearly.
English & French versions are now available.

AMSIC invites the world filtration community to Africa

Dakar, Sénégal
November 2 - 5, 2021

Editorial

Highlights



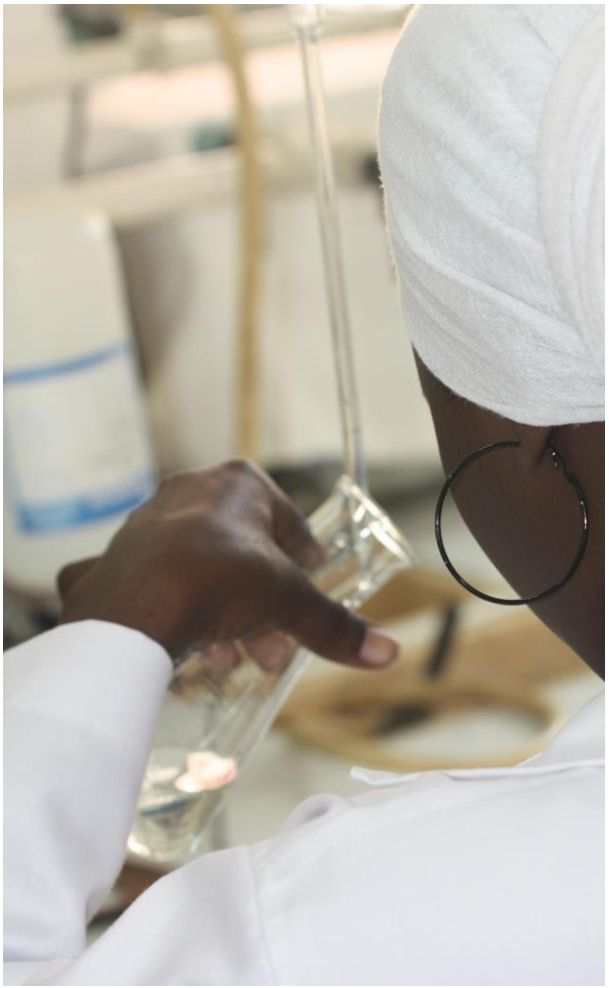
Editorial by Prof. Mady Cissé

Full Professor CAMES
Agri-food expert
Food Industry Engineer
Dr in Food Sciences
Dr in Agri-Food Process Engineering
École Supérieure Polytechnique /UCAD

Ecole Supérieure Polytechnique de Dakar

The École Supérieure Polytechnique (ESP), ex ENSUT (Ecole Nationale Superieure Universitaire de Technologie), ex IUT (Institut Universitaire de Technologie), ex IP (Institut Polytechnique), is a public institution with an inter-African vocation of the University Cheikh Anta DIOP of Dakar (UCAD). It was created by Law No. 94-78 of November 24, 1994. ESP, which is one of the finest engineering schools in West Africa, will be the institutional host of AMSIC-3 organized at the Museum of Black Civilizations, November 2-5, 2021. In this context, we thought it was important to describe its organization and demonstrate its commitment to train skilled students motivated to take on 21st century Africa's pressing challenges.

The ESP is a public establishment with legal personality and financial, administrative and financial autonomy. It is headed by a Director and a Director of Studies appointed by the Board of Directors headed by the Rector of UCAD. Prof Falilou Mbacké Sambe is the current School Director.



The mission of the École Supérieure Polytechnique (ESP), as part of initial training and continuing education, is to:

- ✓ Deliver theoretical and hands-on training programs of senior technicians; operational engineers; managers; and design engineers.
- ✓ Provide higher education and carry out research activities in order to prepare directly for managerial functions in: production; applied research and services.
- ✓ Organize teaching and research activities aimed at continuous improvement, adaptation and participation in scientific and technological development.
- ✓ Carry out expertise as part of training for public and private companies.

The ESP offers diplomas at levels Bac +2 (University degree in technology), Bac +3 (License), master's degree, engineer-technologist, design engineer and doctorate. The number of students is around 4,500, of which 51% are women and 10% are foreigners from 22 countries. Senegal's historical campus UCAD counts 80,000 students among which 37% are women. ESP recruits the best candidates in the country and the fact that female students now represent the majority group is a significant accomplishment. Furthermore, the recent school statistics indicate that the proportion of women is over 60% in disciplines such as management, chemical engineering and applied biology, 41% in computer engineering, but the gender gap remains wide in mechanical engineering where they only account for 15% of participants.

From AMSIC's perspectives, it is important to partner with an institution that is committed to promote gender equity in terms of access to education, thus widening job and career path opportunities.

In terms of filtration programs, the school has several ongoing research initiatives including those led by the Laboratory of Electrochemistry and Membrane Processes. One of its goals is to optimize the exploitation of local natural resources by conducting microfiltration experimentation. In partnership with the French Agricultural Research Center for International Development (CIRAD) in Montpellier, pressure-driven membrane processes and osmotic evaporation techniques have been implemented to process agricultural products and to extract valuable components exhibiting nutritive and health benefits – such as Bissap/Hibiscus drink, prickly pear. By serving as institutional host of AMSIC-3, ESP aims to share its best practices with other participants while expanding its engagement in sustainable membrane filtration programs.

AMSIC Vice president Prof. Raja Ben Amar received a National Distinction in Tunisia

The Call to join the Senior Women in Business incubator program opened in Tunisia in the beginning of 2021. This initiative was sponsored by three institutions including

Global Project partners, the Chambre Nationale des Femmes Chefs d'entreprises (National Chamber of Entrepreneurial Female Leaders) and The Next Women-Tunisie.

Results were announced during the International Women's Day, on March 8th. AMSIC was thrilled to learn that its Vice President Prof. Raja BEN AMAR was among the nine female researchers who received this prestigious award. Her business project focuses on developing novel filtration membranes for water treatment and the recovery of valuable compounds from waste streams. Her start-up company will be supported by the sponsors over a three-month period, starting March 15.

We congratulate Prof. Raja for winning this national recognition and wish her the very best for the next steps.

It is exciting and inspiring to see AMSIC members accomplishing such impressive body of work in Africa (Tunisia in this case) and then being celebrated for their accomplishments. Raja is a relentless and enthusiastic scientist and I hope this will inspire our female junior researchers to follow her footsteps. It is proof that one can simultaneously pursue high quality research activities and entrepreneurial activities in some countries in Africa nowadays.

Congratulation to Sarah Irki for defending her thesis under the direction of Prof. Nachida Kasbadji Merzouk

Advisor: Dr. Nachida Kasbadji Merzouk

Co-advisor: Prof. Hanini Salah

University: Biomaterials and Transport Phenomena Laboratory (LBMPT), Department of Chemical Engineering and Environment, Yahia Fares University of Médéa, Médéa 26000, Algeria

Title: Modelling of the coupling of desalination plants with thermal solar energy system

Abstract: Algeria is relatively well positioned to leverage its capacities and resources, especially nearby its extended Mediterranean coast, where the stress on freshwater resources is particularly high; in addition, the government started digging water wells in deserts in order to solve the problems of water shortage. This increased water supply on a small footprint makes the adoption of solar desalination by vacuum membrane distillation an attractive solution, especially during the dry season. This work aims to develop models able to describe and predict the thermal performance of solar collector coupled with vacuum membrane distillation (VMD) unit in order to determine the evolution of the temperature in the solar collector and the membrane module of the VMD, these models will be used to evaluate the distillate flow rates during the year. The global solar radiation data recorded on an inclined surface as well as ambient temperatures data can be accommodated in the program. First, the models were validated with experimental data studies from appropriate literature and then they were used to predict the unit's performance under different operating conditions in the city of Algiers. The results obtained from the proposed models showed that the distillate flux water reached 27 kg/h.m^2 for the city of Ghardaïa, this rate is high than that obtained in Bouzaréah, which does exceed 7 kg / h m^2.

Congratulations to Prof. Imen KHOUNI (from Tunisia), for receiving her habilitation to lead research programs

Imen KHOUNI is Dr /Ing. and an Assistant Professor at the Water Research and Technology Center, CERTE. Laboratory of Wastewater and the Environment. Techno-Park of Borj Cedria, Tunisia.

She defended her University habilitation on Saturday June 19, 2021 at the Faculté des Sciences de Sfax (Université de Sfax – Tunisia).

Her statement: “It was a very emotional moment for me. I especially want to acknowledge the members of my jury committee”:

- Mr. Sami MAALEJ, Professor at the faculty of science in Sfax, President of the jury.
- Mr. Neji GHARSALLAH, Professor at the faculty of science in Sfax, Referee.
- Mr. Tahar MECHICHI, Professor at the engineering school of Sfax, Referee.
- Mr. Mohamed CHAMKHA, Professor of biotechnology Centre of Sfax, Examiner.
- Mr. Ahmed GHRABI, Professor and General Director of Centre de Recherche et des Technologies des Eaux, Examiner.

Promotion of Prof. Soraya Phumzile MALINGA, from the University of Johannesburg, South Africa

Dr. Soraya P. Malinga was promoted to Associate Professor in the Department of Chemical Sciences, University of Johannesburg in August 2021. Due to her contribution in teaching and learning, research, leadership and administration and community engagement at her institution. Her research work has received recognition as she was honored under the distinguished young women scientists by the South African Women in Science Awards in collaboration with the Ministry of Science and Technology in 2018. She is active in several scientific bodies [Organization for Women in Science for the Developing World (OWSD), African Membrane Society (AMSIC), Water Institute of Southern Africa (WISA) and South African Chemical Institute (SACI)] and serves on several committees either as a reviewer for grants, publications international collaborations (Mali and India) and Industrial partnerships (ESKOM). Prof Malinga has participated in numerous roles at the faculty level to ensure that she adds value to the excellence and evolution of the University towards a greater future.

Misgina Tilahun TSEHAYE (PhD)
Postdoctoral researcher, Separation and Conversion Technology Unit
Flemish Institute for Technological Research (VITO)
Boeretang 200, 2400 Mol, Belgium
Email: misginabcen@gmail.com

https://fr.linkedin.com/in/misgina-tilahun-tsehaye-18151927

https://www.researchgate.net/profile/Misgina-Tilahun-Tsehaye

Dr. Misigna Tilahun TSEHAYE was born in Adiawala, Tigray, Ethiopia. He has a BSc degree in Biological and Chemical Engineering from Mekelle Institute of Technology (Mekelle University, Tigray, Ethiopia). For his Bachelor's thesis, he was involved in the design of a drinking water treatment plant for Mekelle city. As a result, he has been intrigued to expand his knowledge of using membrane technology for water purification and wastewater treatment. This was the driving force behind his decision to pursue a master's degree in membrane engineering. Fortunately, he was one of 11 students in the fifth batch of Erasmus Mundus's master program in membrane engineering (EM3E 2015/17). He studied courses at the Université Toulouse III - Paul Sabatier (Toulouse, France), University of Chemistry and Technology (Prague, Czech Republic), Universidade NOVA de Lisboa (Lisbon, Portugal). He completed his master's thesis focused on development of polyethersulfone-based composite nanofiltration membranes with stability to hydrogen peroxide at the Process Engineering for Sustainable Systems (ProcESS) unit (Department of Chemical Engineering, KU Leuven) under the supervision of Prof. Bart Van der Bruggen and Dr Svetlozar Velizarov. After finishing his master's degree, he worked for about eight months as a lecturer of chemical engineering at Wollo University, Ethiopia.

He received his Ph.D. degree from the University of Grenoble Alpes (LEPMI-Laboratory of electrochemistry and physico-chemistry of materials and interfaces, CNRS, France) in April 2021. The work was done as part of the FlowCamp project, which was funded by the European Union's Horizon 2020 research and innovation program via the Marie Skodowska-Curie Grant. The goal of the project was to develop and/or improve materials for three low-cost and high-efficiency redox flow batteries (RFBs). His thesis focused on the development of anion exchange membranes for aqueous organic redox and zinc slurry-air flow batteries, very attractive candidates for large-scale electricity storage because of their safety, economic feasibility and high storage capacity, under the supervision of Dr Fannie Alloin and Dr Cristina Iojoiu. The physicochemical properties and type of membrane in these batteries have a significant impact on their performance, lifespan, and cost.

The thesis work included the synthesis of monomers, polymers, and membranes, followed by ex-situ and in-situ characterizations of the membranes. Porous commercial and prepared anion exchange membranes

were ex-situ characterized and tested in the flow batteries, with the goal of first understanding the correlations between membrane properties and cell performances. Following that, various membrane synthesis and modification strategies were employed to prepare membranes with reduced active species crossover and improved battery performances. The findings not only advance our understanding of the relationship between membrane properties and cell performance, but they also have a significant impact on the deployment of low-cost and high-performance RFBs. The works have been presented at a number of international conferences, including the MELPRO 2020, UK RFBN Annual meeting 2020, Membrane Society of Australasia Annual Meeting 2020 and RedoxFlow2020. Furthermore, the findings have been published in reputable journals, such as Journal of Power Sources, Energies, Membranes and Molecules, with the remainders in the process of preparation.

Following the defense of his PhD thesis, he began postdoctoral research at the Flemish Institute for Technological Research (VITO, Belgium). He is currently developing novel membranes for green hydrogen production through water electrolysis.

Overall, both the Erasmus Mundus master's program and the Marie Curie-funded PhD program provided him life-changing experiences that seamlessly combined studying at some of Europe's best universities in the field of membrane technology while also providing excellent mobility/secondment opportunities at related companies. This has allowed him to gain not only practical experience in membrane preparation and characterization, but also to broaden his professional networks across various research groups, which is essential in research. He believes that membrane technology plays an important role in a wide range of applications, including water purification, energy storage and conversion, medical applications, process intensification and gas purification. Despite being a cutting-edge technology in the Western world, it has yet to be researched and implemented in developing (African) countries. To accomplish this, researchers, educational institutions, industries and the government work together. On this regard, the African Membrane Society (AMSIC) is working to bring membrane researchers from across the continent together. Misgina intends to help with knowledge transfer in order to lay the groundwork for future African membrane researchers. His research focuses on the development of membranes for redox flow batteries, water electrolysis, and water purification.

Selected publications:

Tsehaye, M.T.; Yang, X.; Janoschka, T.; Hager, M.D.; Schubert, U.S.; Alloin, F.; Iojoiu, C. Study of Anion Exchange Membrane Properties Incorporating N-spirocyclic Quaternary Ammonium Cations and Aqueous Organic Redox Flow Battery Performance. Membranes 2021, 11, 367. doi: 10.3390/membranes11050367

M.T. Tsehaye, F. Alloin, C. Iojoiu, R.A. Tufa, D. Aili, P. Fischer, S. Velizarov Membranes for zinc-air batteries: Recent progress, challenges and perspectives, J. Power Sources., 475 (2020), 10.1016/j.jpowsour.2020.228689

Tsehaye, M.T.; Alloin, F.; Iojoiu, C. Prospects for Anion-Exchange Membranes in Alkali Metal–Air Batteries. Energies 2019, 12, 4702. https://doi.org/10.3390/en12244702

M.T. Tsehaye, J. Wang, J. Zhu, S. Velizarov, B. Van der Bruggen, Development and characterization of polyethersulfone-based nanofiltration membrane with stability to hydrogen peroxide, J. Membr. Sci., 550 (2018), pp. 462-469, 10.1016/j.memsci.2018.01.022

Tsehaye, M. T., Velizarov, S., Van der Bruggen, B., Stability of polyethersulfone membranes to oxidative agents: A review, Polymer Degradation and Stability 157 (2018) 15-53. https://doi.org/10.1016/j.polymdegradstab.2018.09.004.

Zhu J., **Tsehaye M.T.**, Wang J., Uliana A., Tian M., Yuan S., Li J., (...), Van der Bruggen B, A rapid deposition of polydopamine coatings induced by iron (III) chloride/hydrogen peroxide for loose nanofiltration: (2018) Journal of Colloid and Interface Science, 523 , pp. 86-97.

Besha, A.T.; **Tsehaye, M.T.**; Aili, D.; Zhang, W.; Tufa, R.A. Design of Monovalent Ion Selective Membranes for Reducing the Impacts of Multivalent Ions in Reverse Electrodialysis. Membranes 2020, 10, 7. doi: 10.3390/membranes10010007

Besha, A.T.; **Tsehaye, M.T.**; Tiruye, G.A.; Gebreyohannes, A.Y.; Awoke, A.; Tufa, R.A. Deployable Membrane-Based Energy Technologies: the Ethiopian Prospect. Sustainability 2020, 12, 8792. doi: 10.3390/su12218792

11 Covid19 measures in Senegal

Covid19 Measures

Is AMSIC-3 a virtual, hybrid or in-person meeting?

To date, the in-person meeting format is prioritized, and there are also no restrictions from the Senegalese authorities to organize this venue in Dakar.

Where can we find information related to the COVID pandemic to determine whether to attend AMSIC-3 in person?

1-Traveling to Senegal is a personal endeavor and we fully respect everyone's decision. We will preserve a transparent and open communication to help those interested make informed choices.

2--Contact the Senegalese embassy (consulate) in your country of residence

3-Senegalese Ministry of Health shares daily briefs (French):

https://sante.sec.gouv.sn/actualites
https://sante.sec.gouv.sn/taxonomy/term/14

We (AMSIC organizers) will regularly communicate about COVID-19 status in Senegal between July and November 2021 on AMSIC website -stay tuned for more details.

What measures will be taken during AMSIC-3 to maintain a safe working environment?

1-We will follow key guidelines outlined by the World Health Organization and the Senegalese government, such as

- Advising social distancing of 6 feet for all AMSIC activities
- Wearing face masks during all indoor events
- Hand sanitizers will be available @ AMSIC venues (containing at least 70% alcohol)

2-Outdoor events will be prioritized.

3-For indoor activities, we will seek to secure open spaces (high ceilings, large rooms etc.), and well-ventilated areas (if possible, using room air cleaners).

Is it possible to obtain a PCR test in Senegal?

Yes, there are several locations (especially in Dakar) that offer PCR testing and deliver results within 24 hours. The Institut Pasteur is one of the well-recognized facilities.

Are there required vaccines when traveling to Senegal?

1- Check with the Senegalese embassy/consulate in your country of residence

2- Travelers are advised to

- bring proof of a negative PCR test obtained within 72 hours of your traveling dates.
- get yellow fever vaccine before traveling to Senegal (it can also be administered in Dakar)
- check with your healthcare specialist whether anti-malarial medication is needed.

- Here are further details about recommended or required* vaccines for Senegal as per the National Travel Health Network and Centre and the World Health Organization: hepatitis A, hepatitis B, typhoid, cholera, yellow fever*, rabies, meningitis, and tetanus.

What is the status of COVID pandemic in Senegal, as of July 11, 2021?

Source: Ministry of Health (Senegal)

COVID CATEGORIES	VALUES JUL. 11TH	VALUES AUG. 7TH	VALUES SEPT. 1ST	VALUES OCT. 2ND
Cumulative positive cases	46,175	66,898	72,920	73,800
Cumulative deaths	1,194	1,467	1,774	1,860
Daily positive cases	529	648	115	7
Positivity rate	19.5% (529 of 2,715 tests)	16% (648 OF 4,050)	3.80% (115 of 3032)	0.4% (7 of 1,717)
Serious cases (intensive care)	16	64	35	8
Vaccinated individuals	580,550	1,017,569	1,169,276	1,258,048

Other relevant information related to SARS-COV-2 in Senegal?

Senegal to plans to start building a COVID-19 vaccine plant in 2021 and aiming to manufacture 22 million doses per month by the end of 2022. This plant will be run by Institut Pasteur of Dakar, which is the only facility in Africa producing a vaccine (yellow fever shot) that is pre-qualified by WHO.

Find more details here: https://www.reuters.com/world/africa/senegal-build-covid-19-vaccine-plant-bid-expand-african-access-2021-07-09/

Are there food and dietary restrictions specific to Senegal?

-Consult your health care specialist and explain your traveling plan.

-Avoid drinking tap water and only request branded bottled water.

-It is preferred not to consume uncooked meals (salads, raw dishes), dairy products, especially outside of your hotel.

13 Membrane Tech. in Ethiopia

Development of Membrane Science and Technology in Ethiopia: Water and Wastewater Treatment Overview

Kibrom Alebel Gebru

BSc, M.Tech, Ph.D. in Chemical Engineering

Post-Doctoral Researcher in Membrane Separation Science and Technology, University of Duisburg-Essen, Germany

Background

Ethiopia is a landlocked country in the Horn of Africa. It shares borders with Eritrea to the north, Djibouti and Somaliland to the northeast, Somalia to the east, Kenya to the south, South Sudan to the west and Sudan to the northwest. Ethiopia, with a surface area of 1.1 million km^2, and a population of more than 112 million people (2019, World Bank), is the 12th most populous country in the world and the 2nd in Africa[1]. Ethiopia split by the Great Rift Valley, in the Horn of Africa and the Ethiopian highlands' water resources are the most important contributor to the Nile water basin, providing livelihoods for hundreds of millions of people both upstream within the country and downstream in Sudan and Egypt. In addition to the Blue Nile, other lakes and rivers form important water resources for Ethiopia and other neighboring countries such as South Sudan, Kenya, Somalia, Djibouti and Eritrea[2].

Ethiopia has been one of the fastest growing countries in the world, both in relation to economic development and demographic dynamics. However, due to urbanization and industrialization the pressure on existing natural resources rises rapidly. Moreover, because of Ethiopia's geographical location and its diverse territory, the country is often faced by natural calamities such as periods of prolonged droughts. These challenges would be overcome with the development of an accelerated infrastructure that enables a sustainable and safe use of water.

Addis Ababa, Ethiopia

Water Quality and Sanitation

Water is one of the most important resources on the earth. Recently, fresh water supplies have been reducing at an alarming rate. In view of the rising global population and the growing concern of environmental pollution, water purification has to be made more efficient and more cost-effective[3,4]. Reports indicated that half of the world's population will face water-stress by 2025. In Africa, approximately 40% of the population is facing lack of access to clean water[5]. Water scarcity is emerging as a major challenge for many African countries and projections show that the stipulation will be deteriorated by 2025. It is also reported that 75% of Africa's drinking water comes from groundwater and is often used with little or no purification. Almost all sub-Saharan African countries including Ethiopia will be below the required level of water supply, for all, in a few years[6,7]. In Ethiopia over 60 % (¾ are children) of the communicable diseases are due to poor environmental health conditions arising from unsafe and inadequate water supply. According to water.org, half of Ethiopia's population lack access to safe drinking water and about 97 million people lack access to improved sanitation. Moreover, nearly 80 % of the rural and 20% of urban population have no access to safe water. Further, 46% of children deaths (less than 5 years) are because of diarrhea in which water related diseases occupy a high proportion[8]. Contamination of water resources in the presence of organic and inorganic pollutants such as heavy metals, pharmaceuticals, trace elements, pesticides and etc. remain a serious issue due to their persistency, toxicity, and bioaccumulation capability.

It is known that the Rift Valley with 6300 km is a fault between the Arabian and African plates starting from the Jordan Valley down through Sudan, Ethiopia, Uganda, Kenya and Tanzania. Mainly, the Ethiopian Rift Valley is characterized by its volcanic and geothermal activity, which makes lakes alkaline and causes high contents of metals in groundwater. For this reason, the Ethiopian Rift Valley, groundwater is mainly contaminated with fluoride, having concentrations up to 26 mg/L which is above the maximum permissible limit. It is also reported that about 14 million peoples in Ethiopia are affected by the presence of excessive fluoride in drinking water 9. Moreover, there are naturally available salty lakes and rivers in the country. Lake Karum, Afar region, northern part of the country is one example of salty lakes 10 where the people of the region are suffering from getting access to clean water due to lack of desalination technologies. Similarly, there are contaminated sources of drinking water in many other parts of the country where the consumers are being always at risk.

Ethiopia in the Horn of Africa

Although Ethiopia is known to have abundant water resources, it is considered as 'water stressed' country due to rapid population growth and lack of proper management. It is estimated that the renewable annual groundwater per year range from 13.5 to 28 billion m^3, of which only about 2.6 billion m^3 are currently exploitable. The Government of Ethiopia aims to increase access to safe water supply and basic sanitation in rural and urban areas and to invest more resources into water related infrastructure. For example, under the "One WASH" National Program, it is ambitiously planned to increase access to safe water supply to 98 and 100 % for rural and urban areas, respectively.

The Obelisk of Axum in Axum, Tigray, Ethiopia

Blue Nile Falls, Blue Nile river, Bahir Dar, Ethiopia

Water and Waste Water Treatment Facilities

In the past years, the country has made progress in ensuring access to safe drinking water. Nevertheless, a significant increase of access to safely managed drinking water in absolute numbers, the constantly high population growth diminished some of the progresses made. The portion of population having at least limited access to drinking water in their households is estimated to be around 70 %. Nevertheless, the supply and quality standards vary. With a mere 7% of the population having access to improved sanitation infrastructure, international donors and the government are putting more emphasis on progressing within this sector.

For instance, recently the Ethiopian authorities have approved the development of a decentralized wastewater treatment plant in the capital city Addis Ababa[11]. Lifequest World Corp subsidiary Biopipe Global has signed a MOU with the Water Development Commission of the Ministry of Water, Irrigation and Energy of Ethiopia to install a $15m^3$ sewage treatment plant.

On the other hand, the saint mother Teresa's missionaries of charity center in Ethiopia has installed reverse osmosis plant in Semera, Afar Region to allow the center to distribute clean purified drinking water to the community [12]. The small desalination plant is consisted of a 20 inch tall building with water cooling towers on the roof and inside which is integrated with solar and wind turbine power to power to remove 98% of the salts. The RO membranes are coupled with UV light to completely disinfect the treated water.

In 2014 the USAID Ethiopia has also installed a new desalination technology in the Afdera Woreda, Afar region through its Water, sanitation and hygiene Transformation for Enhanced Resilience activity[13]. The Afdera plant has a capacity to refine 120,000 liters/day and can supply fresh water for about 7,000 people. Studies show that the raw water has 6,000 ppm of dissolved salt, which is much greater than the maximum permissible limit. This desalination technology has the potential to reduce the salt to less than 500 ppm.

In addition, there are efforts to install wastewater treatment plants in different parts of the country such as, the construction of Chefe sub–catchment waste water treatment plant in the Oromia region; construction of WWTP via biological treatment with MBR membranes in Tulu Dimtu, Bole Arabbisa, Genet Menafesha and Oromia; Mekelle drinking water project in the capital of the regional state of Tigray in northern Ethiopia; and the Government of Ethiopia has received financing from European Union via the African Development Bank to install wastewater treatment plants for the Industrial Parks in the country.

Though, there are similar efforts to address the challenges of getting access to clean water in other parts of the country by governmental and non-governmental organizations, it needs breaking through activities in terms of introducing advanced treatment technologies such as membranes is very important factor. The development of membrane science and technology are at infant stage in the country and needs a due focus both from research and market point of view. This could be considered as an opportunity to the membrane producing companies and membrane professionals to look at the untapped market and research area in Ethiopia. The opportunities and challenges on the development of water and wastewater treatment technologies such as membranes are roughly summarized below.

Opportunities

- Membrane Science and Technology courses has already started at postgraduate level in some of the Ethiopian Universities like Adigrat University
- Increasing the number of Ethiopian membrane science and technology professionals at MSc, PhD and PostDoc levels and ongoing researches in the field
- Ethiopia as a head quarter for the African union and its proximity to the red sea can be considered as a hub for international markets and researches in the area of membrane science and technology
- The Government of Ethiopia aims to increase access to safe water supply in rural and urban areas and to invest more resources into water related infrastructures
- New wastewater treatment facilities are to be set up in all major Ethiopian cities with the only significant existing one in Addis Ababa being upgraded as part of the strategic sanitation initiatives of the World Bank.
- With the private sector largely at the helm and the rising demand for advanced treatment technologies allows membrane suppliers and experts to tap into newly developing markets.

Challenges

- Lack of skilled labor and professionals in the area of membrane science and technology
- Lack of research centers in the area of membrane science and technology
- Foreign exchange difficulty is a challenge for foreign investors and local contractors.

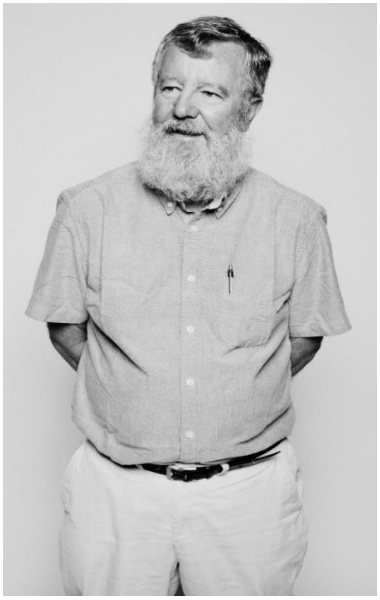
References

1. Afar Ethiopia Reverse Osmosis Project • The RAW Foundation.
2. Besha, A. T., Tsehaye, M. T., Tiruye, G. A., Gebreyohannes, A. Y., Awoke, A., & Tufa, R. A. (2020). Deployable membrane-based energy technologies: The Ethiopian prospect. Sustainability (Switzerland), 12(21), 1–34. https://doi.org/10.3390/su12218792
3. Boussouga, Y. A., Frey, H., & Schäfer, A. I. (2021). Removal of arsenic(V) by nanofiltration: Impact of water salinity, pH and organic matter. Journal of Membrane Science, 618(September 2020). https://doi.org/10.1016/j.memsci.2020.118631
4. Cleaning wastewater to address Ethiopia's water problems. (2020).
5. Contributors, W. (2020). Ethiopia - Wikipedia. In Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/wiki/Ethiopia
6. CSA-ICF International. (2016). Drinking Water Quality in Ethiopia. December, 1–57.
7. Desalination Plant Opens in Afdera Archive - U. (2014).
8. Meride, Y., & Ayenew, B. (2016). Drinking water quality assessment and its effects on residents' health in Wondo genet campus, Ethiopia. Environmental Systems Research, 5(1), 1–8. https://doi.org/10.1186/s40068-016-0053-6
9. Moreno, A. G., & Moreno, A. G. (2018). Renewables-driven membrane distillation for drinking water purification: Main Ethiopian Rift Valley case study.
10. Travails, S. (2010). Africa ' s Water Quality. March.
11. UNDESA. (2019). DESA | United Nations. https://www.un.org/en/desa
12. Wang, R., Liu, Y., Li, B., Hsiao, B. S., & Chu, B. (2012). Electrospun nanofibrous membranes for high flux microfiltration. Journal of Membrane Science, 392–393, 167–174. https://doi.org/10.1016/j.memsci.2011.12.019
13. Wolde, A. M., Jemal, K., Woldearegay, G. M., & Tullu, K. D. (2020). Quality and safety of municipal drinking water in Addis Ababa City, Ethiopia. Environmental Health and Preventive Medicine, 25(1), 1–6. https://doi.org/10.1186/s12199-020-00847-8

In memoriam -- Prof Chris A. Buckley (1949 – 2021)

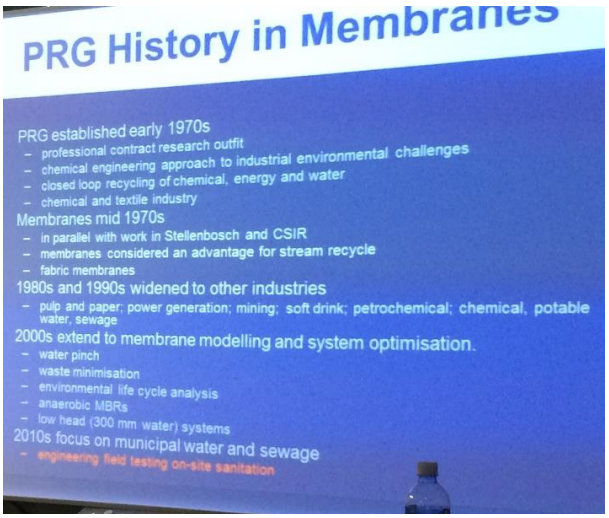
We are deeply saddened by the loss of Professor Chris Buckley who passed away on May 27th, 2021 after an enduring fight against a difficult disease. He was leading the Pollution Research Group at the University of Kwazulu-Natal and was actively engaged in the field of water, sanitation and hygiene.

https://washcentre.ukzn.ac.za/chris-buckley/



Chris was a well-known, iconic figure in the international Water and Sanitation field, and touched the lives of so many, both personally and professionally. He was one of those unique people that always managed to inspire everyone with his astonishing general knowledge, and deep understanding of science and engineering. Chris's compassion, patience and dedication to students and young researchers resulted in the completion of over 100 Masters and PhD graduates, the majority of whom are now well-established professionals in the water and sanitation sector. Each one of them carries a piece of Chris's passion, determination to solve problems, and his love for life and learning. His charismatic personality, radiant smile and mischievous sense of humour will forever be remembered.

Excerpt from Prof Buckley's Memorial Page
https://washcentre.ukzn.ac.za/chris-buckley-tribute-page/



Prof C. Buckley at UNISA (Nano-WS) during AMSIC-2, in the city of Johannesburg, Aug. 2018.

It was a delight to listen to his lecture and learn about South Africa's active academic and industrial contribution to modern membrane technologies over the past 50 years. He introduced us to his filtration-based new toilet system for small communities and aimed at reducing water consumption, also mitigate human waste and environmental pollution. When Edward NXUMALO (Prof. congress chair, AMSIC-2) and I offered him to present, he accepted without hesitation. Our intent was to invite him again as an Honorary Guest of AMSIC-3. We were therefore touched to hear about his passing for he was a bright and generous soul. Thank you, Chris A. Buckley, for sharing your extensive knowledge with others, for transforming so many people's life and for your support to the voiceless. You will be dearly missed. AMSIC would like to extend its deepest condolences to his family and friends around the globe.

Abdoulaye Doucouré

Want to learn about AMSIC?

Visit:

http://www.sam-ptf.com/index.html

Become AMSIC member?

Send application to AMSIC President, Dr. Abdoulaye Doucouré:
ablodoucoure@hotmail.com

AMSIC Newsletter Submissions

Please send news, announcements, and other contributions for the newsletter to the editor, Ms. Sara Chergaoui:
chergaouisara@gmail.com

Your contribution shall be included in the next issue of the newsletter.