**Musie Welldegerima Atsbha**

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**CV Summary**

*An environmental researcher holding a Ph.D. in Hydrology and Water Quality from Ben-Gurion University of the Negev, specializing in advanced water and wastewater treatment technologies aimed at nutrient recovery and promoting circular economy solutions. My research integrates cutting-edge separation techniques such as Bipolar Membrane Electrodialysis (BMED), Hollow Fiber Membrane Contactors (HFMC), Anaerobic Membrane Bioreactors (AnMBR), and zeolite-based ion exchange processes. These methods efficiently recover nutrients from complex wastewater streams, including pharmaceutical wastewater, AnMBR effluent, and human urine. I possess extensive experience in process modeling, pilot-scale testing, life cycle assessment (LCA), economic analyses, and collaborative projects with industry partners. My research focuses on developing scalable, cost-effective technologies to address critical contaminants, significantly advancing circular economy principles. I have authored six peer-reviewed articles, including three first-author papers derived from my Ph.D. research. My work has been published in high-impact journals (Impact Factor > 8), gaining rapid citations from the scientific community, and presented at major international conferences, including Euromembrane 2021 and the American Chemical Society (ACS Fall 2024). I have been recognized for successful collaborative research with pharmaceutical industry partners, notably Teva Pharmaceuticals. My scholarly achievements have earned me prestigious accolades such as the Dean's Prize of Excellence for Ph.D. research and a competitive international fellowship for short-term research at Arizona State University. Additionally, I am an active member of leading professional societies, including the American Chemical Society, European Membrane Society, African Membrane Society, and North American Membrane Society, highlighting global acknowledgment of my expertise and professional contributions. My educational background includes a B.Sc. in Chemical Engineering, a B.A. in Accounting and Finance, an M.Sc. in Hydrology and Water Quality, and a Ph.D. dedicated to sustainable desalination and wastewater treatment technologies.*

**Research interest**

- Circular Economy
- Wastewater treatment
- Membrane separation
- Desalination
- Bipolar membrane electrodialysis (BMED)
- Anaerobic Membrane Bioreactor (AnMBR)
- Ion exchange
- Environmental sustainability
- Process Modeling
- Economic analysis
- Scale-up design
- Process simulation ASPEN Plus

- Recovery of carbon dioxide ($CO_2$)
- Life Cycle Assessment
- Nutrient recovery as liquid fertilizer
- Pyrolysis and Gasification Processes

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**EDUCATION**

1. **Ph.D., Hydrology and Water Quality, Ben-Gurion University of the Negev** (Oct. 2022 – Expected 2025 (*Thesis submitted and approved by the school, pending the Ph.D. conferral*)
   Thesis title: Recovering high-purity nitrogen fertilizers from wastewater effluents by integrating ion exchange and membrane separation
   **Mentor: Prof. Oded Nir**

**2. M.Sc. in Hydrology and Water Quality, Ben-Gurion University of the Negev (**2020 - 2023)
- Thesis title: Ammonium recovery as liquid fertilizer from AnMBR-treated municipal wastewater using ion exchange zeolite and hollow fiber membrane contactor.
- Stream: Desalination and Water Treatment

**Mentor: Prof. Oded Nir**

**3. B.Sc., Chemical Engineering, Mekelle University (**2014 - 2019)
- Thesis Title: Wastepaper-based bioethanol production and process simulation using ASPEN Plus. Process units include: Heating, Cooling, Destillation, and Heat exchange.

**4. BA. Accounting and Finance, Mekelle University-College of Business and Economics, Ethiopia** 2016 – 2020

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**WORK EXPERIENCE**

### Assistant Research Technologist

Arizona State University, USA 2025 – Present
School of Sustainable Engineering and the Built Environment (SSEBE)
ASU profile: https://search.asu.edu/profile/5049377

### Graduate Researcher

Ben-Gurion University of the Negev, Israel 2020 - 2025

- Designed and executed innovative experimental processes to recover ammonia as liquid fertilizer from pharmaceutical wastewater using a Hollow Fiber Membrane Contactor, contributing to robust scale-up designs and economic evaluations based on industry scenarios.
- Developed and validated process models for pilot-scale system scale-up, integrating thermodynamic optimization to maximize nutrient recovery efficiency and liquid fertilizer concentration
- Collaborated with pharmaceutical industry (Teva) partner to develop a nitrogen recovery process from drug production waste streams, enhancing environmental sustainability and resource recovery.
- Led a comprehensive research project for designing a pilot-scale recovery of ammonium as liquid fertilizer from Anaerobic Membrane Bioreactor (AnMBR) effluent by integrating ion exchange and Membrane Contactor technology.

- Applied thermodynamics principles to optimize membrane processes to maximize liquid fertilizer concentration
- Demonstrated proficiency in experimental design, data collection, and analysis, producing actionable insights to improve ammonia recovery processes in wastewater treatment applications.
- Applied strong design and execution skills by implementing a cost-effective ammonia recovery system using a combined Membrane Contactor and Bipolar Membrane Electrodialysis (BMED), reducing chemical consumption and environmental burden.
- Authored multiple peer-reviewed research papers, contributing to advancements in water treatment, nutrient recovery, and sustainable wastewater management.
- Presented research findings at international conferences such as Euromembrane 2021 and ACS Fall 2024, broadening expertise in chemical engineering and environmental sustainability.

### Exchange Researcher

Arizona State University(ASU), Arizona, USA Feb. 2024– Aug. 2024

- Designed, developed, and experimentally validated an integrated nutrient recovery system combining hollow fiber membrane contactors, ion exchange, and chemical precipitation to extract valuable nutrients from human urine, advancing sustainable circular economy solutions.
- Performed comprehensive Life Cycle Assessment (LCA) using SimaPro to rigorously quantify the environmental impacts and sustainability benefits of nutrient recovery processes, supporting data-driven decision-making.
- Led installation and optimization of experimental setups, including drafting detailed methodologies and protocols; managed conceptualization, formal analysis, data visualization, and curation to ensure robust research outcomes.
- Collaborated closely with multidisciplinary teams to enhance process scalability and techno-economic feasibility, aligning experimental research with sustainable engineering principles.

### Online Aspen Plus Simulation Mentor July. 2019 – Present

Lecture through YouTube Channel (the link to my YouTube channel: https://www.youtube.com/@simuas754)

- Developed detailed Aspen Plus process simulation models for co-pyrolysis and gasification of mixed plastic and biomass feedstocks to generate syngas.
- Modeled and optimized ethanol production processes from biomass, enhancing process efficiency and scale-up potential.
- Conducted techno-economic and life cycle assessments (LCA) for biomass co-pyrolysis scenarios aimed at sustainable heat and power generation.
- Provided mentorship and training to graduate students and professional engineers on advanced process simulation techniques and process design optimization.
- Diagnosed and troubleshooted complex simulation challenges, offering strategic solutions for process improvement.

### Summer Intern

**Desta Alcohol Factory P.L.C, Mekelle, Ethiopia** Jun. 2018 – Oct. 2018

- Gained hands-on experience in water treatment, ethanol production, distillation, fermentation, and boiler operations within an industrial setting.
- Acquired operational knowledge of factory heating and cooling systems, supporting process optimization efforts.
- Designed and proposed a byproduct utilization project converting excess alcohol into ink production, demonstrating innovative resource valorization.

- Strengthened project management, teamwork, and time management skills through cross-functional collaboration.

## Honors and awards

1. Dean's Prize of Excellence for PhD Students for the 2024-2025 academic year from Ben Gurion University of the Negev, a highly selective award granted to no more than 1% of doctoral candidates, with only a single recipient chosen from my research institute.
2. Winning financial support for conducting short-term research as an exchange student at Arizona State University, AZ, USA, through the ASU-BGU Collaboration: Date: 28 Jun 2023. Awarding institute: The Goldman Sonnenfeldt School of Sustainability and Climate Change, Ben Gurion University of the Negev.
3. Awarded the Negev Scholarship 2023, recognizing outstanding research excellence and a robust publication record among top-performing Ph.D. students
   Awarding institute: The Kreitman School of Advanced Graduate Studies at Ben Gurion University of the Negev

4. The 1st Moshe Mirilashvili Fellowship Food Security MERIT: Date: 23 March 2022. Awarding institute: The Moshe Mirilashvili Center for Food Security in Drylands, Ben Gurion University of the Negev.

## LIST OF SCIENTIFIC PUBLICATIONS:

1. **Atsbha, M.W.,** Oded Nir., 2025. Maximizing liquid fertilizer concentration during ammoniacal nitrogen recovery using hollow fiber membrane contactors. **J. Membr. Sci. Lett**. 5, 100103. https://doi.org/10.1016/j.memlet.2025.100103
2. **M.W. Atsbha,** O. Nir, T.H. Boyer, Multi-stage recovery of ammonia–potassium liquid fertilizer and phosphate mineral from real human urine, **Sep. Purif. Technol**. 359 (2025) 130598. https://doi.org/10.1016/j.seppur.2024.130598.

3. **Atsbha, M.W**., R. Liu, O. Nir, Circular hybrid membrane process treating high-salinity ammonium-rich pharmaceutical wastewater, **Chemical Engineering Journal.** 497 (2024) 154690. https://doi.org/10.1016/j.cej.2024.154690.
4. **Atsbha, M.W**., Farkash, L., Bartal, G., Nir, O., 2023. Extracting liquid fertilizer from ammonia-laden pharmaceutical wastewater using Hollow fiber membrane contactors. **Journal of Clean Production**. 418, 138183. https://doi.org/10.1016/j.jclepro.2023.138183

5. Nir, O., Oren, Y., **Atsbha, M.W**., Chandra, A., Geller, Y., Chaudhary, M., Monat, L., Singh, P., & Zevenhoven, R. **(2022).** Reactive transport in membrane separation modeling: A perspective. **Chemical Engineering Research and Design**, 188, 342-353. https://doi.org/10.1016/j.cherd.2022.09.054
6. Nir, Oded., Sayeg, Shir., **Atsbha, M.W.,** Weinman, Amit., Lahav, Ori ., & Nativ, Paz. **(2022)** Removal, Reuse and Recovery of Carbon-Dioxide by Integrating Membrane Contactors in a High-pH Single-Pass Seawater Reverse Osmosis Process. Preprint. http://dx.doi.org/10.2139/ssrn.4011649
7. Nyambura, S.M., Li, C., Xu, J., Wang, J., Li, H., Zhang, Z., Bertrand, G. V., Ndumia, J.N., Li, X., **Atsbha, M.W.,** Chin, B.L.F., 2023. Techno-economic assessment of co-pyrolyzed kitchen waste and rice straw for co-generation of heat and power. **Sustainable Production and Consumption**. https://doi.org/10.1016/j.spc.2023.06.015

**List of Expected Publications:**

1. Ru Liu[1], **Atsbha, M.W.[1],** Oded Nir [*]. Ammonia–potassium-phosphate liquid fertilizer recovery from real anaerobic membrane bioreactor effluent by integrating ion exchange, bipolar membrane and hollow fiber membrane contactor. **In preparation.** ( [1] These authors contributed equally to the manuscript.)

2. **Atsbha, M.W.**, Oded Nir, Treavor H. Boyer*, and others…….., Environmental Life Cycle Impact Assessment of Total Nutrient (NPK) Recovery from Urine using Integrated Processes**. In preparation.**

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**List of Conferences Participation:**

1. **Name of Conference:** ACS Fall 2024 conference. **Venue of the conference:** Denver, USA. **Presenter:** Musie Welldegerima Atsbha (Oral presentation). **Title:** Enhancing liquid fertilizer concentration using high salinity to recover ammonia in hollow fiber membrane contactors by reducing water flux.(Link: https://scimeetings.acs.org/exhibit/Enhancing-liquid-fertilizer-concentration-using/4086998)
2. **Name of Conference:** ***Euromembrane2021 conference***. **Venue of the conference:** Copenhagen, Denmark. **Presenter:** Musie Welldegerima Atsbha (Oral presentation). **Title:** Recovery of nitrogen from pharmaceutical wastewater as fertilizer using hollow fiber liquid-liquid membrane contactors.
3. **Name of Conference:** ***The Sustainability, and the Environment Conference 2023***. **Venue of the conference:** The Goldman Sonnenfeldt School of Sustainability and Climate Change, Ben–Gurion University of the Negev, Beersheva, Israel. **Presenter:** Musie Welldegerima Atsbha (Poster presentation). **Title:** Ammonium recovery as liquid fertilizer from AnMBR-treated municipal wastewater using ion exchange zeolite and hollow fiber membrane contactor.
4. **Name of Conference:** ***The 5th Graduate Water Research in Israel (GWRI) Conference 2022***. **Venue of the conference:** Technion Institute of Technology, Haifa, Israel. **Presenter:** Musie Welldegerima Atsbha (Poster presentation). **Title:** Ammonium recovery as liquid fertilizer from AnMBR-treated municipal wastewater using ion exchange zeolite and hollow fiber membrane contactor.
5. **Name of Conference:** ***2024 AZ Water Annual Research Symposium***. **Venue of the conference:** Gateway Community College, Phoenix, Arizona, USA. **Attendee:** Musie Welldegerima Atsbha (participation).

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**List of Professional Association memberships**

1. **The American Chemical Society (ACS)**
2. **The European Membrane Society (EMS)**
3. **The African Membrane Society (AMSIC)**
4. **The North American Membrane Society (NAMS)**

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**List of References**

1. **Prof. Oded Nir** (My Ph.D Supervisor)
   Associate Professor, Zuckerberg Institute for Water Research, The Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Israel
   Phone: +972 58-727-1807
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2. **Prof. Treavor H. Boyer** (My Supervisor when I was an Exchange Student at ASU)
   Professor, School of Sustainable Engineering and the Built Environment,
   Arizona State University (ASU)
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3. **Dr. Haftom A. Weldekidan** (Collaborator on Process Simulation)
   CSIRO Research Fellow
   Mineral Resources Business Unit,
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