2026-2027
Model Arab League
BACKGROUND GUIDE

COUNCIL OF ENVIRONMENTAL AFFAIRS MINISTERS

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National Council on US-Arab Relations

Original draft by Ayra Imran, Chair of the Council of Environmental Affairs Ministers at the 2027 National University Model Arab League, with contributions from the dedicated staff and volunteers at the National Council on U.S.-Arab Relations

Esteemed Delegates,

Welcome to the 2026-2027 Council of Environmental Affairs Ministers! My name is Ayra Imran, and I am honored to be your chair this year. I am a junior at the University of Houston majoring in Environmental Science with a minor in Energy and Sustainability. I have enjoyed competing in Model Arab League at the Northeast Regional MAL, Bilateral Chamber MAL, and National University MAL. I have also had the privilege of chairing at the Bilateral Chamber Model Arab League conference. This council holds a special place in my heart because it allows for a safe environment to have important discussions on pressing and rapidly advancing issues.

The Council of Environmental Affairs Ministers is geared towards promoting sustainable development, addressing various ecological issues such as water scarcity, and coordinating environmental policy. In this docket, discussion will occur on AI and its relationship with water, microplastic pollution, energy inequity, and the environmental impacts of desalination. These topics are growing increasingly important in our changing world, and it is imperative that they are approached with respect. This guide is designed to give sufficient background information regarding these topics and their place in the Middle East & North Africa. However, all information and ideas in this guide are not meant to confine you. Look towards innovative technological, just, and sustainable solutions.

Model Arab League has been such a formative experience for me. The preparation leading up to the competitions and the competitions themselves are academically challenging, yet invigorating simultaneously. These experiences will not only allow you to improve your collaboration and public speaking skills, but also may leave you with a passion for problem solving and a curiosity about global issues. I can confidently say that participating in Model Arab League has helped me grow as a person, and I look forward to being able to create an environment for everyone to enjoy this year.

I hope these topics spark your interest and make you excited to engage in productive debate. It is important to remember to maintain respect towards fellow delegates. You should work to support each other in debate and collaborate on resolutions. This does not mean that you have to agree upon everything as a council. It is your job to uphold the values and ideals of your given country as you work together. I implore you to speak up and voice the stance of your country. Sometimes it may be uncomfortable, but that discomfort is a sign of growth. Feel the fear and do it anyway! Good luck in your preparations and competitions leading up to NUMAL! I am excited to see y'all in my council. If you have any questions, contact me at aimran26@cougarnet.uh.edu.

Best wishes,
Ayra Imran
Chair, Council of Environmental Affairs Minister

Topic I: Examining the impact of rapid AI development on water sources in the Arab League.

I. Introduction

A. General Background

Artificial intelligence (AI) is a rapidly evolving phenomenon worldwide. It relies on data, computation, and algorithms to complete tasks. AI is used in daily life as a helper or companion, but it can also be used on a larger scale in military and corporate settings. Billions of people interact with AI every day, and this widespread consumption requires a massive amount of resources to meet the demand. Not only does AI require vast amounts of data and specialized hardware, but it also consumes electricity and freshwater to keep the system operational. It is estimated that AI data centers have consumed 448 TWh of electricity and 9.3 trillion tons of water.[1] These numbers are expected to double in the coming years due to growing demand for AI.[2]

The United Nations (UN) has declared that the world is in an "era of water bankruptcy".[3] Due to rising temperatures and climate change, much of the global freshwater reserve is being depleted. Anthropogenic activity—human behavior that is linked to environmental changes—is at the core of this issue. Billions of people currently live in water-scarce conditions. Measures are being taken to tackle global water insecurity through the UN Sustainable Development Goal (SDG) 6. SDG 6 focuses on delivering equitable access to water and sanitation across all member states. Some of the efforts to reach the goals laid out in SDG 6 include nuclear energy, seawater desalination, wastewater management, resource management, and reducing pollution sources.[4] With so much pressure on current water resources, the addition of a new super-consumer, such as AI, will prove to be detrimental if it continues to function as it currently does.

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[1]Aczel M., Chamanara S., Matin M., Farsi A., Marwala T., Madani K. (2026) Environmental Cost of AI's Energy Use: Carbon, Water and Land Footprints, United Nations University Institute for Water, Environment and Health (UNU-INWEH), Richmond Hill, Ontario, Canada, doi: 10.53328/INR26RMA002

[2] Stanway, D., & Jacob, S. (2026, June 3). *AI to double data centre power and water consumption by 2030, UN researchers say*. Reuters. https://www.reuters.com/business/energy/ai-double-data-centre-power-water-consumption-by-2030-un-researchers-say-2026-06-03/

[3]Madani K. (2026) Global Water Bankruptcy: Living Beyond Our Hydrological Means in the Post-Crisis Era, United Nations University Institute for Water, Environment and Health (UNU-INWEH), Richmond Hill, Ontario, Canada, doi: 10.53328/INR26KAM001

[4]*The role of nuclear energy in SDG 6*. (n.d.). Rincón educativo, https://rinconeducativo.org/en/recursos-educativos/the-role-of-nuclear-energy-in-sdg-6/

B. History in the Arab World

The Middle East and North African (MENA) Region has long been considered the cradle of innovation. Some major innovations include agriculture, algebra, the written alphabet, higher education, and much more. The MENA region has provided a foundation that allows for the development of new technology such as AI. Artificial Intelligence in the region gained its start in the United Arab Emirates (UAE) through the creation of a national policy. The UAE appointed the world's first Minister of State for Artificial Intelligence and created the UAE Strategy for Artificial Intelligence, subsequently launching the modern AI era in the MENA region in 2017.[5] Two years later, the UAE established the first graduate-level research-based AI university, the Mohamed bin Zayed University of Artificial Intelligence.[6] In 2019, Saudi Arabia followed suit and created the Saudi Data and AI Authority. Egypt also established an Artificial Intelligence Council and a National AI Strategy.[7] Much like the UAE's strategy, Saudi Arabia's authority and Egypt's initiatives were the first steps in establishing a technological transformation based on AI in the MENA region.

After the COVID-19 pandemic, there was an investment boom in AI across the MENA region. AI has been utilized in different ways to diversify the region's economy and reduce its reliance on oil. In 2024, investment in AI increased by 66% in countries such as the UAE, Egypt, Saudi Arabia, Qatar, and Jordan.[8] Approximately 236 data centers are operating in the MENA region, and this number is expected to double by 2030. These data centers are located all across the Arab League.[9] The rapid development of AI is heavily influenced by the desire to control vital AI resources. Countries that possess the infrastructure to compute can impose specific terms of access, data governance, and pricing on countries that cannot afford to build their own systems. They can also influence the bias and language of that system.[10]

AI is a powerful tool and will be fundamental to economic growth and diversification in the MENA region. Arab League countries created policies on data protection and the implementation of privacy frameworks long before AI became widespread. Tunisia was the first country in the Arab League to introduce a personal data protection law (PDPL) in 2004.[11]

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[5] Tobin, S., Jayabalasingham, B., & Huggett, S. (2019). A brief historical overview of artificial intelligence research. *Information Services and Use*. https://doi.org/10.3233_ISU-190060
[6] *Five Year Anniversary*. (2025). MBZUAI, https://mbzuai.ac.ae/five-year-anniversary/
[7] Rizk, N., Shah, O., & Rossoukh, R. (2024, March 18). *Beyond Robots: Artificial Intelligence in the Middle East*. Brandeis University, from https://www.brandeis.edu/crown/publications/crown-conversations/cc-20.html
[8] *FY 2024 Evolution of AI in MENA*. (2025, May). MAGNiTT, https://magnitt.com/research/evolution-of-ai-in-mena-2022-2024-5099
[9] *Data Centers - Database*. (2026). Data Center Map, from https://www.datacentermap.com/datacenters/
[10] Aczel M., Chamanara S., Matin M., Farsi A., Marwala T., Madani K. (2026) Environmental Cost of AI's Energy Use: Carbon, Water and Land Footprints, United Nations University Institute for Water, Environment and Health (UNU-INWEH), Richmond Hill, Ontario, Canada, doi: 10.53328/INR26RMA002
[11] Dessaints, A. (2026). *Tunisia's Data Protection Law (Law 2004-63): A Practical Compliance Guide for 2026*. DPO Consulting. https://www.dpo-consulting.com/blog/tunisia-data-protection-lsaw

Tunisia's law focuses on how data is collected, stored, and transferred. In 2016, Qatar introduced regulations that safeguard private data while maintaining relationships with foreign entities through Law No. 13. This law predates the MENA AI era, and was later revised through 14 Guidelines and enforced by the Qatari National Cyber Security Agency. Bahrain introduced its PDPL in 2018. In 2021, Comoros, Saudi Arabia, and the UAE followed suit. All these laws and guidelines comply with international standards for data protection, although there are some differences in the enforceability of these initiatives. The Gulf Cooperation Council (GCC) member states have taken a softer approach to enforcement by opting to create guidelines rather than binding regulations.[12] The Arab League is working on a unified approach to data protection through the Arab Convention on Personal Data Protection. This initiative was put forth by Algeria in 2021.[13] The convention is still active and working towards final draft language. Solid data protection foundations are crucial in countries that are working towards AI development to maintain public trust, ensure fairness within the algorithm, and protect privacy. With interest from foreign companies regarding AI, securing sovereignty and personal privacy is of the utmost priority for the league.

Guidelines on AI emerged after PDPLs were established in member states. The UAE implemented the AI Ethics Principle and Guidelines in 2022, and the Charter for the Development and Use of AI in 2024. Both regulations focus on the ethical use of AI. Saudi Arabia released Principles on AI Ethics and guidelines as well, both nonbinding pieces of literature for the public and corporations. Qatar took a different approach and released mandatory guidelines, especially for financial institutions. Many countries in the Arab League have participated in and hosted conferences on AI ethics and safety.[14] The Arab League itself has an AI Charter through the Arab League Educational, Cultural, and Scientific Organization (ALECSO). The purpose of the charter is to fill gaps in legislation that limit innovation for AI while protecting data and personal privacy within the league. It is also intended to safeguard citizens and promote sustainable development & innovation of AI.[15]

The large-scale development of water-dependent technology is alarming during an era of water scarcity. Unlike AI, a recent emergence, water insecurity has been a longstanding issue in the Arab League. The MENA region is characterized by its arid climate with unpredictable precipitation patterns. This issue has been exacerbated by rapid population growth, climate change, an increase in water-dependent agriculture, and interstate water management issues. The misuse of finite resources such as groundwater and rivers has led to these resources being

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[12] Smadi, M. (2026, May 11). *Global AI Regulation in Practice: How Four Forces Now Influence Every GCC Enterprise Investment in AI*. Perform by AI. https://performbyai.com/articles/global-ai-regulation-gcc-enterprise
[13] *Arab Meeting to Continue Studying Draft Arab Convention on Personal Data Protection*. (2024, May 22). Saudi Press Agency. https://www.spa.gov.sa/en/N2108703
[14] *The Middle East's Big Bet on Artificial Intelligence and Data Security.* (2025, September 24). Crowell & Moring. https://www.crowell.com/en/insights/client-alerts/the-middle-east-big-bet-on-artificial-intelligence-and-data-security
[15] Arab League Educational, Cultural and Scientific Organization. (2025). *ALECSO Charter on Artificial Intelligence Ethics*. ALECSO Press.

depleted. More specifically, many rivers in the MENA region are not confined to a single country, leading to issues and transboundary disputes. The Tigris-Euphrates River System crosses through Turkey, Iraq, and Syria. The land between these rivers is known for its rich, fertile soil and has housed many ancient empires, such as Mesopotamia, Sumer, Babylon, and Assyria. More recently, the rivers have been victims of a transboundary water dispute, which has led to an 80% reduction in Iraq's water supply since the 1960s.[16] It began with states engaging in large-scale dam construction. Other countries connected to the system have been building dams on both rivers and the tributaries flowing into them, reducing water flow. Additionally, Iraq and the surrounding areas have experienced a warming of an average of 0.4 degrees Celsius in the past years as well. All these factors combined have dwindled water resources in that region and have rendered Iraq's previously wet marshes in the South dry.[17]

Historically, water resources have also been impacted by conflict. In 2006, Israel attacked Lebanon, targeting water infrastructure such as pipes and irrigation systems. The genocide that is occurring in Palestine is another key example of water resources being put under stress. In 2008, the occupier carried out a bombardment in Gaza, including the Northern Gaza Sewage Plant, which led to major environmental devastation. Some Palestinians in Gaza went without water until the Spring of 2009.[18] In the Levant region, the Jordan River is a major source of water that has tributaries flowing in from Jordan, Lebanon, Palestine, and Syria. There is a weakening water supply coming from the river due to rising salinity, aridification, and pollution from irrigation runoff and sewage.[19] Some of the pollution can be connected to wastewater mismanagement in the West Bank that allows pollutants to flow into tributaries. The Palestinian Water Authority cannot manage hydrological resources properly due to the Israeli-Palestinian Joint Water Authority (JWC).[20] The JWC was meant to be a temporary solution spanning 5 years, but has been prolonged allowing Israel to retain control over Palestinian water collection and availability of water to them.[21] This is exacerbating the issue of water scarcity in Palestine and making attempts to address water scarcity futile.

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[16] de Leth, J. O. (2025, 8 August). *The Tigris and Euphrates in Iraq: 'The Land Between Two Rivers' Under Threat*. Fanack Water. https://water.fanack.com/publications/the-tigris-and-euphrates-in-iraq-the-land-between-two-rivers-under-threat/

[17] ibid.

[18] Wells, J. (2009). Water Crisis in the Middle East: An Opportunity for New Forms of Water Governance and Peace. *The Whitehead Journal of Diplomacy and International Relations*. https://blogs.shu.edu/journalofdiplomacy/files/archives/10%20Wessels_Layout%201.pdf

[19] ibid.

[20] Aviram, R. (2020, December 14). *Coping with Water Scarcity in the Jordan River Basin*. The Century Foundation. https://tcf.org/content/report/coping-water-scarcity-jordan-river-basin/

[21] ibid.

C. Finding a Solution to the Problem: Past, Present, and Future

Data centers put a lot of pressure on local water supplies. As previously established, the Arab League already lacks the supply to support the current water demand. Approximately 6.3% of the global population resides in the MENA region, yet they hold only 1.4% of the world's renewable freshwater. Currently, 12 of the 17 most water-scarce countries are located in the MENA region, and this trend is expected to worsen by 2050.[22] Data centers produce large amounts of heat that require water to cool the system. One of the most common cooling systems in data centers is the evaporative cooling system. This system works by pushing hot air produced by the mega computers through water-soaked membranes. When the hot air passes through the membranes, the water evaporates. The system is popular for its low reliance on energy compared to air cooling that depends on mechanical refrigeration. However, evaporative systems require water to be constantly replenished. In fact, a data center that relies on evaporative cooling can use up to 5 million gallons of water each day.[23] This can stress local water reserves and cause shortages. Water sources can also be polluted due to runoff from the cooling system.

The industry has been slowly moving away from the evaporative cooling system towards other methods. Liquid cooling—a thermal management method that uses circulating liquid—is the most popular option during this shift. 50% of new data centers will be using it in the next five years.[24] Most liquid cooling systems are closed loop, and that eliminates the need for constant water refills. Arab League member states use this system to cool in some data centers, but they may use different variations of liquid cooling. Specific design choices impact water consumption of the center. Currently, the Arab League does not have any recommendations on what type of cooling systems member states should use based on water consumption of those systems.

As the AI industry grows in the MENA region, new developments are constantly being made. Much of the water that data centers use comes from desalination plants. Despite the popularity of Reverse Osmosis (RO) Desalination in the MENA region, it is important to remember that it is an energy-intensive and polluting process. RO produces large amounts of brine that is laced with chemicals. When this brine is disposed of, it can interact with marine environments and weaken them. New technologies are emerging, such as regenerative desalination and

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[22] Zu'bi, R. A. (2024, July 9). *Water Shortages in MENA: A Trigger for Resilience & Innovation*. EcoMENA. https://www.ecomena.org/water-shortages-in-mena/

[23] Yañez-Barnuevo, M. (2025, June 25). *Data Centers and Water Consumption*. Environmental and Energy Study Insitute. https://www.eesi.org/articles/view/data-centers-and-water-consumption?_sp=7a1c8f94-8fcd-42de-bdb5-37b13d129337.1788452092474

[24] Tozzi, C. (2026, June 19). *Evaporative Cooling in Data Centers: Why the Industry Hesitates to Move On*. Data Center Knowledge. https://www.datacenterknowledge.com/cooling/evaporative-cooling-in-data-centers-why-the-industry-hesitates-to-move-on

electrodialysis.[25] Coupling these technologies with the implementation of new data centers could not only strengthen MENA's AI industry but also put it at the forefront of technological innovation. For example, Saudi Arabia has started to implement photovoltaic desalination plants in their large data centers. This takes pressure off the environment by reducing fossil fuel emissions from desalination. Another way systems are becoming more efficient in the Gulf is by using closed-loop systems, prioritizing onsite treatment of water to recycle it, using underground thermal storage, and waste-to-heat recovery to reduce energy and water demand.[26]

It is important to keep in mind that there will always be a tradeoff between different footprints when deciding which system is most effective. Focusing on reducing energy dependency when choosing a cooling system may inadvertently increase the water footprint and vice versa. Moving towards more sustainable alternatives for electricity may be a more effective option. The Arab League should place emphasis on a unified front when it comes to the rapidly developing AI industry. Policies on water usage and sustainability reports for data centers in the MENA region are lacking. Transparency from these centers, especially when they are linked to foreign entities, will help local policymakers assess the tradeoffs between technological advancement and water resources. For AI development to grow alongside the MENA region, there must be emphasis on implementing better water cooling technologies, desalination technology, and proper transparency from every data center.

II. Questions to Consider in Your Research

- What policies does your nation have on data protection, AI, and transparency?
- How is your nation currently meeting water demands? What barriers to demand is your nation currently facing?
- What are the current technologies your nation uses in data centers when it comes to cooling and water supply? Why has your member state decided to use certain technologies over others? Pay attention to the environment, climate, natural resources, & other things.
- Is there a reason that your member state uses the binding or nonbinding agreements it does?

III. Questions a Resolution Might Answer

- What are ways to promote transparency and unification in Arab data policy without infringing on sovereignty?
- How can the league tackle the tradeoff between the energy and water footprints when making decisions?
- How can AI be reined in without harming economic development and

[25] *Regenerative Desalination: Sustainable Solution for the MENA Region*. (2025, October 29). Fanack Water. https://water.fanack.com/regenerative-desalination-mena/
[26] *AI Data Centers And The Thirst For Water In MENA*. (2026, April 8). Fanack Water. https://water.fanack.com/ai-data-centers-water-use-mena/

discouraging foreign investment?
- What are new desalination methods that are feasible for the league to implement with AI centers?

IV. Additional Resources

UN University: Environmental Cost of AI's Energy Use

Hones in on the tradeoffs between energy, water, and carbon footprints on a global scale. It analyzes the large-scale impacts of rapid AI development on current resources.

Policy Center for the New South: The Water-Energy Nexus

Goes into depth on the causes of water insecurity in the MENA region. Focuses on improving water solutions through utilizing sustainable approaches.

ALECSO Charter on AI Ethics

Regional ethical and regulatory framework on Artificial Intelligence in the Arab League. Adopted by ALECSO in June of 2025. The purpose is to align values and improve technological sovereignty.

ESCWA Water Development Report 8

Highlights issues regarding water scarcity and climate change in the MENA region. Less than half of the MENA nations are on track to achieve SDG6 by 2030. The report makes recommendations to improve water security and sustainable management.

Topic II: Addressing the prevalence of microplastic pollution in the MENA region.

I. Introduction

A. General Background

Microplastics (MP) can be described as tiny plastic particles ranging between 1 nanometer and 5 millimeters in size. They can be divided into two distinct categories: primary and secondary. Primary microplastics are manufactured to be small. For instance, microplastics can be found in glitter from makeup, microbeads in toothpaste, or synthetic fibers. Secondary microplastics result from the breakdown of plastic products.[27] Most plastic is characterized by its non-natural chemical makeup and is a product of petroleum. Traditional plastic cannot truly decompose back into nature. Instead, it breaks down into micro and nano particles through physical wear and photodegradation. Plastic can remain intact for centuries because nature cannot break down its petroleum-based composition.[28]

The concern for microplastics stems from their widespread presence. The resilience of the particles means that they can be present everywhere. They have been detected in the most remote places, such as deep ocean trenches and mountain peaks. MPs have also been found in rain and dust.[29] These particles enter ecosystems by bypassing filtration systems and can be ingested by wildlife, causing a reduction in organism health. Additionally, microplastics pose a large threat to humans. They have been found inside the human body, including the blood, liver, kidneys, breast milk, saliva, and more. It was found that microplastics can enter cells as well.[30] Research on MPs is still emerging, and scientists are concerned that widespread MP pollution could have detrimental effects on the air, living organisms, water, and environments.

B. History in the Arab World

The beginning of the modern petroleum era in the Middle East and North African region occurred when Egypt in 1886 drilled the first exploratory well in the Gemsa region.[31] The establishment of the Dammam Field in Saudi Arabia in 1938 and the discovery of oil in Algeria

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[27] *Microplastics: Introduction*. (n.d.). Interstate Regulatory Technology Council. https://mp-1.itrcweb.org/introduction/

[28] *The Life Cycle of Plastics*. (2025, June 21). World Wildlife Fund. https://wwf.org.au/blogs/the-lifecycle-of-plastics/

[29] Ziani, K., Ioniță-Mîndrican, C. B., Mititelu, M., Neacșu, S. M., Negrei, C., Moroșan, E., Drăgănescu, D., & Preda, O. T. (2023). Microplastics: A Real Global Threat for Environment and Food Safety: A State of the Art Review. *Nutrients*, *15*(3), 617. https://doi.org/10.3390/nu15030617

[30] Dutchen, S. (2023). Microplastics Everywhere. *Harvard Medicine*. https://magazine.hms.harvard.edu/articles/microplastics-everywhere

[31] A Brief History of the Exploration History of the Gulf of Suez, Egypt. (2016). *Search and Discovery*.

in 1956 solidified the MENA region as an oil powerhouse.[32] These discoveries forever changed the economic landscape of the Arab League countries. Petrochemical production creates the building blocks for plastic manufacturing. The MENA region was responsible for 20% of petrochemicals globally in 2015.[33]

Historically, plastic manufacturing has depended on virgin materials in the Arab League, not recycled materials. The popularity of virgin plastic is rooted in the league's cheap and easy access to feedstock: petrochemicals. In 2025, the MENA region was responsible for more than 18.7 million tons (43%) of global polyethylene exports.[34] Polyethylene is the world's most common synthetic plastic material. It is commonly used in single-use plastic items.[35] Single-use plastic waste has been plaguing the League. Plastic waste accounts for 12-16% of municipal waste in the MENA region.[36] The previous metric exceeds the global average of plastic waste accounting for around 12% of the municipal waste.[37] The widespread use of single-use plastics derived from virgin materials, coupled with the weak recycling infrastructure in the MENA region, has exacerbated the issue of plastic & microplastic pollution in the Arab League. Poor waste management allows for plastics to infiltrate oceans, rivers, and other places where they break down into secondary MPs.

More recently, the Arab League has been making strides towards reducing plastic pollution. In 2022, Abu Dhabi banned the use of single-use plastic bags and other plastics, and cut consumption by 95%. The UAE's nationwide phase-out of single-use consumer plastic happened in 2024.[38] Circular economic initiatives that are meant to emphasize reusing and recycling are also gaining traction. Egypt established Law 202 of 2020, a waste management law that includes a comprehensive framework for plastic disposal. While Law 202 was a shift in the right direction regarding pollution mitigation strategies, Egypt allowed the investment of billions of dollars into

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[32] Sorkhabi, R. (2009, August 6). *The First Oil Discoveries in the Middle East*. GXP Publishing. https://geoexpro.com/the-first-oil-discoveries-in-the-middle-east/,Ghilès, F. (2025, March 31). *Focus is Key to Algeria's Energy Future — Frontier Energy Network*. Frontier Energy Network. https://www.frontierenergy.network/news/focus-is-key-to-algerias-energy-future

[33] Malihi, F. (2015, 3 June). *Growth of Petrochemical Industry in the MENA Region with Focus on Surfactants*. Fargol Consulting Group. https://www.researchgate.net/publication/284730141_Growth_of_Petrochemical_Industry_in_the_MENA_Region_with_Focus_on_Surfactants

[34] *Polyethylene Exports from the Middle East – Impact of Supply Disruption*. (2026, March 6). International Trader Publications Blog. https://blog.itpweb.com/polyethylene-exports-from-the-middle-east-disrupted/

[35] Britannica Editors (2026, July 9). *polyethylene*. *Encyclopedia Britannica.* https://www.britannica.com/science/polyethylene

[36] Zafar, S. (2026, February 27). *Everything You Need to Know About Recycling of Plastics*. EcoMENA. https://www.ecomena.org/recycling-reuse-plastics/

[37] *What a Waste 3.0*. (n.d.). World Bank Group. https://www.worldbank.org/en/publication/what-a-waste

[38] Husain, Z. (2025, December 17). *UAE Plastic Ban 2026: Expanded Restrictions on Single-Use Items Explained*. Gulf News. https://gulfnews.com/living-in-uae/ask-us/uae-single-use-plastic-ban-explained-what-changes-from-2026-1.500382836

the petrochemical industry in 2025.[39] Most legislation on plastic waste management in the Arab League targets the downstream instead of actively trying to address the upstream sector that produces plastic products.

Microplastics detected in the layers of mangrove sediments date back to the 1930s in the MENA region.[40] This accumulation increased alongside the rapid urbanization of the Arab League member states. It was not until the late 2010s that sampling expanded to the MENA region in the Red Sea, Mediterranean, and the Arabian Gulf.[41] On average, a resident in the MENA region can contribute 6 kg of plastic waste to water every year versus the global average of 0.21 kg per capita annually.[42] In 2017, it was estimated that the Nile River transports 84,792 tons of MPs per year.[43] Microplastics are ingested by fish sold in markets, which can severely weaken the growing blue economy—economic activities that are related to ocean and coastal resources—in the region. The blue economy in the MENA region has the potential to be valued at 300-500 billion USD by 2030 and could account for 10% of the region's GDP.[44] This sector is growing rapidly right now, but MP contamination can reduce reproductive rates in marine animals, degrade marine & coastal habitats, and disrupt the biological carbon pump which allows plankton to prosper.[45]

C. Finding a Solution to the Problem: Past, Present, and Future

The gap in infrastructure for recycling has long gone underutilized in the MENA region. MENA member states are in an economically advantageous position when it comes to plastic feedstock. What is weakening the MENA plastic industry is its inability to access quality plastic waste, which would allow it to rely less upon virgin plastic. League-wide cooperation to invest in advanced recycling assets that are efficient in feedstock recycling is something important to think

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[39] Global Problems, Local Solutions: MENA Communities Driving the Change Against Plastic Pollution. (2025, December). *Greenpeace Middle East and North Africa*.

[40] Pulikkoden, A. K., Qashqari, M., Kannaiyan, N., AlAqad, K. M., Meleppura, R., Gopalan, J. V., Premlal, P., Manikandan, K. P., Maneja, R. H., Nazal, M., Qasem, A., Balkhi, H., Joydas, T. V., Rabaoui, L. J., Alhems, L. M., & Lozano-Cortés, D. (2026). Microplastics in Saudi Arabia: Environmental occurrence, research gaps, and challenges in extreme conditions. Journal of Hazardous Materials: Plastics. https://doi.org/10.1016/j.hazmp.2025.100018

[41] Heger MP, Vashold L, Palacios A, Alahmadi M, Bromhead M-A, Acerbi M (2022) Blue skies, blue seas: air pollution, marine plastics, and coastal erosion in the Middle East and North Africa. In MENA Development Report10.1051/epn:2006102

[42] Malli, A., Shehayeb, A., & Yehya, A. (2023). Occurrence and risks of microplastics in the ecosystems of the Middle East and North Africa (MENA). *Environmental Science and Pollution Research International*, *30*(24), 64800. https://doi.org/10.1007/s11356-023-27029-7, Ritchie, H. (2023, October 5). *How much plastic waste ends up in the ocean?* Our World in Data. https://ourworldindata.org/how-much-plastic-waste-ends-up-in-the-ocean

[43] Schmidt C, Krauth T, Wagner S. Export of plastic debris by rivers into the sea. Environ Sci Technol. 2017;51:12246–12253. doi: 10.1021/acs.est.7b02368.

[44] Zhou, Y. (2026, January). *The $500 Billion Ocean Opportunity: How the MENA Region Is Leading the Blue Economy Revolution*. ESG MENA. https://esgmena.com/mena-blue-economy-opportunity/

[45] Gupta, A., Ghosh, A., Yadav, A., Kirti, A., Lenka, S. S., Jena, S., Saha, U., Naser, S. S., Nandi, A., Sinha, A., Suar, M., Kaushik, N. K., Raina, V., & Verma, S. K. (2024). Microplastics: The imperative influencer in blueprint of blue economy. *Journal of Environmental Management*, *372*, 123300. https://doi.org/10.1016/j.jenvman.2024.123300

about. Arab League member states mostly use mechanical recycling that targets cardboard, but chemical recycling holds the potential to allow for more efficient processing and reusing of plastic. Finding a solution that targets plastic waste before it has the opportunity to enter the environment and break down into secondary microplastics will allow the Arab League to reduce future MP pollution.

Not only do Arab League countries lack the infrastructure for chemical recycling, but in countries that do, there is little awareness. In Oman, citizens were surveyed on whether or not they were aware of recycling opportunities, and only 20% were.[46] For initiatives to be successful, there needs to be a tone shift geared towards a circular economy—an economic model that addresses waste management by keeping resources in use for as long as possible. The League needs to emphasize the importance of recycling, reusing, and sustainability. This should not only be directed towards the consumer, but also toward corporations. Companies in the MENA region produce plastic goods that are often difficult to recycle due to a lack of standards and guidelines regarding manufacturing.[47] If the Arab League were able to enforce policies on waste management and recycling that made manufacturers responsible for the plastic products at the end of their life, but also incentivized consumers to return these products, it could reduce plastic pollution. Initiatives like these are environmental policy approaches called Extended Producer Responsibility. This type of program can apply to electronic waste, an overlooked category of recycling, and other complex products.

It is important to highlight the economic opportunities that lie within recycling as well. By 2030, there will be a global shortage of 25 million tons of recycled plastic.[48] This means there is a market opportunity for Arab League countries, which happen to have a lot of potential recyclable material. If this opportunity were to be seized, the GCC alone could see 50,000 new jobs and a market potential of six billion dollars (USD) per year.[49] The projection only applies to the GCC, which already has an upwards of 15% recycling rate.[50] Member states that have lower recycling rates, could see significant economic growth from bolstering the recycling industry.

Tackling plastic pollution once it enters the environment requires a different approach. Plastic pollution is so widespread within the Arab League across different ecoregions that it is difficult

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[46] *Waste Management in the Arab Region: Recycling on Trial*. (n.d.). Global Recycling. https://global-recycling.info/archives/2620

[47] Ozeir, F., Rahimi, S., & Gupta, A. (2020). *The $6 billion GCC recycling opportunity*. Strategy&. https://www.strategyand.pwc.com/m1/en/articles/2020/the-six-dollar-billion-gcc-recycling-opportunity.html

[48] Anouti, Y., Katiyar, D., & Mantri, J. (n.d.). *How the MENA region can win in the future plastics economy*. Strategy&. https://www.strategyand.pwc.com/m1/en/industries/energy-chemical-utility-management/future-plastics-economy.html

[49] Ozeir, F., Rahimi, S., & Gupta, A. (2020). *The $6 billion GCC recycling opportunity*. Strategy&. https://www.strategyand.pwc.com/m1/en/articles/2020/the-six-dollar-billion-gcc-recycling-opportunity.html

[50] Relic, I. (2026, July 23). *Designing Waste Systems that can Keep Pace with the Future*. Egis. https://www.egis-group.com/all-insights/designing-waste-systems-that-can-keep-pace-with-the-future

for a government or entity to implement top-down initiatives on existing pollution. Organic movements to clean up the environment have gained popularity. Lebanon attempted to launch a national waste treatment strategy six times, but due to ineffective enforcement, policies such as these do not yield strong outcomes.[51] The people of Lebanon experienced the brunt of the pollution. The Waste Management Coalition (WMC) in Lebanon was founded in 2017 and focuses on pathways to alternative solutions, networking to gain influence, and engaging the citizens through creativity and awareness.[52] The WMC faces roadblocks due to scarcity and a lack of funding. Another example of a grassroots initiative is the Surfrider Foundation Maroc. It operates on the coastlines of Morocco to reduce plastic pollution. They focus on direct action, collecting waste data to fill research gaps, youth involvement, advocacy work, and community engagement. The organization has made great strides, but it is limited by having to collaborate with private sector firms that greenwash and are incompatible with current waste management systems.[53] While funding is important for these organizations, it is important to keep in mind that these organizations will not take funds over their morals. The Arab League must find a way to work with organizations without placing pressure on them.

It is important to note the League's stance on addressing the upstream versus downstream portions of the plastic industry. There are currently ongoing talks regarding the UN Plastics Treaty, an internationally binding agreement between UN member states to end plastic pollution. Progress is slow on the treaty due to heavy influence from the fossil fuel and plastics industry.[54] During negotiations in 2024, multiple Arab League member states made the point known that they were not interested in tackling issues regarding plastic consumption.[55] The Arab League is not interested in adding caps to virgin plastic production because it is a profitable and economically essential industry.

The Arab League does not currently have a regionally binding framework on microplastics. However, there are many regional organizations that monitor microplastic levels such as regional marine conventions. The Jeddah Convention and the Kuwait Convention coordinate regional cooperation regarding joint studies to track the impact of temperatures and salinity on MP breakdown and monitor MP accumulation.[56] These conventions include countries that border the

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[51] Global Problems, Local Solutions: MENA Communities Driving the Change Against Plastic Pollution. (2025, December). *Greenpeace Middle East and North Africa*.

[52] ibid.

[53] Global Problems, Local Solutions: MENA Communities Driving the Change Against Plastic Pollution. (2025, December). *Greenpeace Middle East and North Africa*.

[54] *UN Plastics Treaty*. (n.d.). Global Plastics Laws. https://www.globalplasticlaws.org/un-global-plastics-treaty

[55] McDermott, J. (2025, December 1). *Negotiators fail to reach agreement on plastic pollution treaty at talks in South Korea*. PBS. https://www.pbs.org/newshour/world/negotiators-fail-to-reach-agreement-on-plastic-pollution-treaty-at-talks-in-south-korea

[56] Stöfen-O′Brien, A., Naji, A., Brooks, A. L., Jambeck, J. R., & Khan, F. R. (2022). Marine plastic debris in the Arabian/Persian Gulf: Challenges, opportunities and recommendations from a transdisciplinary perspective. *Marine Policy*, *136*, 104909. https://doi.org/10.1016/j.marpol.2021.104909

bodies of water they serve. This means that not all MENA member states are included in the maritime conventions that are currently active.

The most difficult part of handling microplastic pollution is dealing with existing MPs. Methods of detection and reduction are still being studied. There have been some recent emergences regarding the use of AI to detect, quantify, and learn how MPs function and move.[57] However, this is still a work in progress due to the costly and time-consuming manner of training the system. Microorganisms have been known to help in the biodegradation of MPs as well.[58] Unfortunately, they may not be effective due to the high salinity and temperatures in the MENA region. The most promising solution for reducing human interaction with MP pollution is through targeting drinking water. Using Reverse Osmosis (RO) desalination technology can trap MPs within the membrane and reduce the risk of ingestion. However, the buildup of MPs could decrease the productivity of the RO plant.[59] Effective solutions for reducing existing MP pollution are few. The Arab League should place its efforts into mitigating future MP pollution by dealing with factors that contribute to it.

II. Questions to Consider in Your Research

- How does your member state interact with the petrochemicals industry?
- What infrastructure and policies does your member state have regarding recycling and waste management?
- Are there any grassroots initiatives regarding plastic pollution in your member state?
- What are your Member States' views on the current negotiations for the UN Plastics Treaty? Is there a specific reason your member state is taking that stance? If so, what is it?

III. Questions a Resolution Might Answer

- How can the Arab League create policy on recycling practices in other countries without infringing on sovereignty?
- What are ways the league can incentivize take-back policies?
- How can recycling be catalyzed into a booming industry in the Arab League?
- What are potential options to ensure that new infrastructure and initiatives are enforced and protected in conflict zones?

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[57] Almaabadi A., Alshahrani M., Sendy B., Almotairy H. M. Navigating microplastic-related challenges in the Arabian Gulf: Prospects of artificial intelligence and bioremediation. *Explora Environ Resour*. 2026;3(1):025370068. doi: 10.36922/EER025370068

[58] ibid.

[59] Malli, A., Shehayeb, A., & Yehya, A. (2023). Occurrence and risks of microplastics in the ecosystems of the Middle East and North Africa (MENA). *Environmental Science and Pollution Research International*, *30*(24), 64800. https://doi.org/10.1007/s11356-023-27029-7

IV. Additional Resources

Greenpeace MENA: Global Problem, Local Solutions

Entails case studies on specific grassroots actors in Tunisia, Lebanon, Saudi Arabia, Egypt, and Morocco. Emphasizes the different transferable qualities of initiatives that can be applied to solutions elsewhere.

Recycled Plastic: Circular Economy

Underscores the importance and benefits of investing in plastic waste infrastructure through circular economy initiatives. Presents research and policy gaps while proposing solutions to fill those gaps.

Navigating Microplastic-Related Challenges in the Arabian Gulf

Focuses on marine MP pollution. Takes a technical and scientific approach to detect, monitor, and possibly reduce MPs. Proposes a set of solutions for monitoring protocols and testing practices tailored to the region.

What a Waste 3.0

Addresses the global waste management issue through comprehensive figures and detailed explanations. Section 3.4 about the MENA region. Highlights low volume of waste MENA outputs, while emphasizing other important details.

Topic III: Combating loadshedding and generator overreliance with plans for affordable and reliable energy implementation.

I. Introduction

A. General Background

Globally, over 670 million people live without access to electricity as of 2025.[60] The World Bank's Multi Tier Framework defines access to electricity as a range from basic access for meeting utility needs to high capacity for running heavy appliances.[61] This means that even people who have electricity for only four hours per day are considered to have access.[62] This forces people to rely on dirty fuel sources such as dung, kerosene, and charcoal to meet needs. It also gives way for illegal activities to ensue. People can take advantage of these gaps in supply through unauthorized power distribution, price-gouging, electricity theft, and intimidation.[63] Instead of emphasizing energy access, attention should be drawn to energy equity, which is a concept that emphasizes access to reliable and affordable energy as a basic human right.[64] Improving energy equity will require investment and large-scale international support in the countries and regions that lack it.

Sustainable Development Goal 7 addresses issues regarding access to electricity. It underscores the importance of renewable and affordable energy solutions for economic growth and development.[65] However, the SDGs were created by the UN as global targets. They do not truly encapsulate the needs of each region, country, or community. When speaking specifically about SDG 7, there is a disconnect between the environment, people, and technology. There is also the issue of simply equating "renewable" to "sustainable" when speaking about energy. The issue lies in the fact that what is economically and politically sustainable for countries may not be environmentally sustainable. There will always be a tradeoff. Completely shifting a country's energy systems from fossil fuels to "cleaner" options for the sake of "sustainability" may prove to exacerbate the energy access issues. The renewable energy paradox—contradictions that show the transition to clean energy may have unprecedented systemic issues—highlights this

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[60] Safar, P., Joy, O., Moenandar, N., Pascale, P., & Blyth, L. (2025, June 25). *Energy access has improved, yet international financial support still needed to boost progress and address disparities*. World Health Organization (WHO). https://www.who.int/news/item/25-06-2025-energy-access-has-improved--yet-international-financial-support-still-needed-to-boost-progress-and-address-disparities

[61] *Definition: Access to Electricity*. (2021, November 8). Our World in Data. https://ourworldindata.org/definition-electricity-access#article-citation

[62] ibid.

[63] Rizk, T. A. (2018, August 30). *Generator mafias profit from Lebanese power supply gap*. By the East. https://www.bytheeast.com/2018/08/30/generator-mafias-profit-from-lebanese-power-supply-gap/

[64] *What is energy equity and why is it stalling globally?* (2023, July 3). World Economic Forum. https://www.weforum.org/stories/2023/07/energy-equity-stalling-report/

[65] *Goal 7: Affordable and clean energy*. (n.d.). The Global Goals. https://globalgoals.org/goals/7-affordable-and-clean-energy/

phenomenon.[66] Pursuing sustainability by conflating it with renewability can drive prices up, cause grid instability, and lead to an investment slowdown. It can also be unsustainable and difficult for countries to maintain and manage new infrastructure, leading to it not being utilized to its full potential. There are many nuances involving different terms concerning energy development. It is up to the individual countries and regions to go beyond and address these issues.

B. History in the Arab World

The MENA region is known for its energy dominance and access to fossil fuel resources. However, that is not the case for all countries in the region. There is a great distinction between the oil-rich and oil-poor countries. The net exporters of hydrocarbons can meet energy demand without relying heavily on imported energy, while the net importers depend on imports to meet their needs. Major oil and gas producers include Saudi Arabia, Qatar, the UAE, Oman, Kuwait, Iraq, Algeria, Libya, and Egypt. Morocco, a hydrocarbon-poor country, can only meet its energy needs through importing sources such as coal and this has pushed them to invest in renewable energy infrastructure. In 2023, natural gas and oil accounted for 97.4% of all primary energy supply in the MENA region.[67] The global total energy supply of natural gas and oil added up to only 53% (2023).[68] The lack of diversification of energy supply in the MENA region places immense pressure on the oil industry to meet needs.

Electricity demand in the MENA region has tripled since 2000.[69] Despite being dominant in the energy sector, the region is plagued by blackouts and loadshedding. Subsidized electricity costs in oil-rich countries enable wasteful and inefficient consumption patterns that deplete resources. A major factor in these blackouts is the weakening and aging of the grid infrastructure. In the summer of 2023, demand for electricity increased due to the heat. Power grids were not able to sustain the demand at that time, and many across the League collapsed. At this time, the Libyan government decided to increase loadshedding to reduce pressure on its weak grid. Egypt did the same and introduced rolling blackouts.[70] Having access to an electricity grid does not guarantee power. Another reason for blackouts is government instability. Electricité du Liban (EDL) is the governmental authority that provides electricity in Lebanon. Citizens can face blackouts for

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[66] Rafal Cieslik (2025). The Renewable Energy Paradox: Second-Generation Economic Challenges in the Global Energy Transition, European Research Studies Journal Volume XXVIII Issue 3, 971-991

[67] Hafner, M., Raimondi, P.P., Bonometti, B. (2023). The MENA Region: An Economic, Energy, and Historical Context. In: The Energy Sector and Energy Geopolitics in the MENA Region at a Crossroad. Perspectives on Development in the Middle East and North Africa (MENA) Region. Springer, Cham. https://doi.org/10.1007/978-3-031-30705-8_1

[68] *World Energy Mix*. (n.d.). International Energy Agency. https://www.iea.org/world/energy-mix

[69] IEA (2025), The Future of Electricity in the Middle East and North Africa, IEA, Paris https://www.iea.org/reports/the-future-of-electricity-in-the-middle-east-and-north-africa, Licence: CC BY 4.0

[70] *Power grids buckle across MENA countries in summer heatwave*. (2023, July 29). The New Arab. https://www.newarab.com/news/power-grids-buckle-across-mena-countries-summer-heatwave

anywhere from 3 to 20 hours a day.[71] This has allowed for the emergence of generator mafias. The 3,000 owners of these diesel generators can provide electricity to those who can afford it for almost 20 hours. Most people receive a lot less than half a day's worth of electricity. The owners of these generators provide electricity to whole buildings or neighborhoods, giving them monopoly power. In 2017, Lebanon imported $900 million worth of diesel to power these generators. In 2022, the number rose to $1.9 billion.[72] The implementation of off-grid solutions allowed the Lebanese people to become less dependent on these syndicates and the EDL.

Almost 35 million people in the Arab League member states live without basic access to electricity. These people are mainly congregated in less developed or war-torn member states: 48% in Mauritania, 44% in Sudan, 31% in Djibouti, 46% in Somalia, 23% in Libya, 14% in Yemen, 11% in Syria, and 8% in Comoros.[73] Solutions are a lot more straightforward when it comes to electrification in urban areas. It makes transportation of supplies, distribution of electricity from the main grid, and contact much easier. Rural electrification is a different case, and where much more effort needs to be placed. In the same countries listed before, the percentage of people who live without access to basic electricity in rural areas are 46% in Sudan, 46% in Djibouti, 76% in Somalia, 19% in Yemen, 39% in Syria, and 12% in Comoros (rural data from Libya & Mauritania is from 2012, so it was not included).[74] All these countries have different roadblocks when it comes to electrification, but the people have similar solutions to this lack of access. Dirty fuel sources are used to fill this gap, but they can have detrimental impacts on health and living. Emissions from dirty fuel sources include fine particulate matter ($PM_{2.5}$) and black carbon. Dirty fuels contribute to 58% of black carbon emissions worldwide.[75] About three million people per year die due to diseases associated with indoor air pollution.[76] The ones facing the brunt of this are mainly women because they interact with the fumes in their homes all day from cooking using dirty fuels. Finding solutions to electrify the remaining population can drive economic development, productivity, improve livelihoods, and empower women.

C. Finding a Solution to the Problem: Past, Present, and Future

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[71] *After Beirut Blast, Lebanon's Electric Sector Must End Blackouts, Unplug 'Generator Mafia'*. (2020, August 10). Forbes. https://www.forbes.com/sites/robertbryce/2020/08/10/after-beirut-blast-lebanons-electric-sector-must-end-blackouts-unplug-generator-mafia/

[72] *Lebanon's Grid Has Collapsed. What Comes Next?* (2023, April 24). The Century Foundation. https://tcf.org/content/commentary/lebanons-grid-has-collapsed-what-comes-next/

[73] *Access to electricity (% of population) - Arab World*. (2023). World Bank Group - Data. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=1A

[74] ibid.

[75] *Clean Cooking: Why it Matters*. (2019, November 4). World Bank Group. https://www.worldbank.org/en/news/feature/2019/11/04/why-clean-cooking-matters

[76] *Household air pollution*. (2025, December 16). World Health Organization (WHO). https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

Lebanon's solar boom originated organically as a response to the failed national grid system and extreme prices. The solution operates off the main electrical grid of Lebanon. It has also facilitated a transition to renewable energy for the country. The Bchaaleh Microgrid in Lebanon brings reliable energy to 180 homes.[77] Bchaaleh is the first village in Lebanon to be powered by a solar microgrid 24 hours a day and 7 days a week. Originally, Bchaaleh depended on diesel generators and would frequently experience blackouts. Now, the microgrid provides 400,000 kilowatt hours per year to this village. It has reduced their energy cost by 35% and reduced CO_2 emissions by 180 tons.[78] The largest minigrid in Lebanon depends on diesel for fuel. It is important to understand that this minigrid is sustainable. The Electricité du Zahlé minigrid supplies uninterrupted power to 250,000 homes across Zahlé.[79] There is a tradeoff between environmental sustainability and economic & social sustainability. Lebanon is in a transition stage, and photovoltaic (PV) systems are expensive when being developed and later during maintenance. A country should not be fully dependent on one source for fuel. This can be seen with Israel's current assault on Lebanon, where photovoltaic systems are a key target of those attacks. In Debel, Israel destroyed solar panels that citizens rely on for their livelihoods and rendered the village without power.[80] Israel has carried out similar attacks in Palestine targeting power infrastructure that cause blackouts.[81]

When it comes to electrifying those who lack access currently, most times their electricity demand is on the lower side. They might need to charge a phone, turn on a light, power a stove & a fridge, but not much more. This is important to keep in mind when engaging in rural electrification. Some areas are sparsely populated, and providing an entire decentralized grid system will be too costly and sometimes unnecessary. Solar home systems (SHSs) can drive rural development by providing clean energy to communities that lack grid connection. They make sense for remote areas that are far from reaching grid access in the near future. SHSs are composed of PV panels, a charge controller, battery storage, and inverters. In 2013, Sudan launched a plan to electrify 1,100,000 homes in rural areas using SHSs by 2031.[82] In their pilot program of 100 homes, they found that it was important for residents to understand how to operate and maintain systems. It makes them self-sufficient. They also found that it was important to listen to feedback and responses. 95% of the citizens completed their monthly

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[77] *Bchaaleh Microgrid*. (n.d.). ME Green. https://megreen.energy/projects/bchaaleh?srsltid=AfmBOop_EYmAxpCspsknc2N1nahFK5-QlxrFcAAPpCop-1YzS4Z17m-b

[78] ibid.

[79] *Lebanon Built Solar Infrastructure to Replace Its Power Grid – Israel Is Bulldozing It*. (2026, April 5). Wired. https://www.wired.me/story/lebanon-built-solar-infrastructure-to-replace-its-power-grid-israel-is-bulldozing-it

[80] Saad, S., Mourtada, A., Beainy, A., Gebrael, J. B., Jouni, A., Yehya, N., & Issa, C.-R. (2025). Guidelines for Advancing Energy Communities in Lebanon. *Tessa Project*.

[81] *Israel's decision to cut off electricity supply to Gaza desalination plant cruel and unlawful*. (2025, March 10). Amnesty International. https://www.amnesty.org/en/latest/news/2025/03/israels-decision-to-cut-off-electricity-supply-to-gaza-desalination-plant-cruel-and-unlawful/

[82] Ahmed, A. A. (2015). *Rural Electrification with Solar Home Systems Project*. Republic of Sudan.

payments on the loan.[83] Despite the success of the pilot, there have been no updates since. Sudan has been at war since 2023, so it is likely that the plan has been abandoned.[84] Coupling productivity, self-sufficiency, and electrification can drive economic development in rural areas.

Most projects involving decentralized and off-grid solutions are backed by governments, organizations, grants, or subsidies. These systems are expensive on their own, but citizens are able to afford them with some help and understanding. The main driver of the success of these systems is understanding and respect between the provider and the community. Grasping what it is the community needs, implementing that solution, training the communities on how to operate and maintain their systems, and not penalizing when payments are late or defaulted upon once in a while can all strengthen the relationship between the provider and the community. For countries lacking stable grids or low access rates, decentralized solutions with a bottom-up approach can prove to be the most successful. In countries with these conditions, there can be great mistrust in the government, and that could weaken the communities' faith in the project. The Arab League currently lacks a mechanism that supports decentralized electrification solutions.

The Arab League launched the Arab Common Electricity Market, also known as the Pan Arab Electricity Market (PAEM), in 2017 to reduce costs, stabilize supply, and unlock clean energy potential. The initiative links power grids, streamlines clean energy trade, and cuts regional system costs. It was signed by the UAE, Saudi Arabia, Egypt, Jordan, Kuwait, Qatar, Morocco, Palestine, Syria, Libya, Sudan, and Yemen.[85] It could enhance the Arab League's position as a dominant clean energy exporter. PAEM has the ability to catalyze the Arab League into an era of green energy and create jobs across the MENA region if the roadblocks PAEM faces are addressed.[86]

The Arab League needs to expand its green energy sector and diversify its mix to keep up with rising demands. As water resources are diminishing, more energy will be needed for desalination. The MENA region is racing against time to meet needs and advance its infrastructure. PAEM is a great start, but ensuring that individual national grids are capable of strengthening this alliance rather than burdening it is vital for the health of this project. PAEM faces other obstacles as well, including heavy domestic subsidies that distort true market demand, tariff stacking from duplicated transmission charges, a lack of transparency, and

[83] ibid.
[84] Gohar, I. (2026, March 5). *A Timeline of Key Events in Sudan*. Arab Center Washington DC. https://arabcenterdc.org/resource/a-timeline-of-key-events-in-sudan/
[85] *Arab League Launches Common Electricity Market for Regional Integration*. (2024, December 3). Energetica India. https://www.energetica-india.net/news/arab-league-launches-common-electricity-market-for-regional-integration--
[86] Dione, O., & Um, P. N. (2024, December 10). *Bridging Borders with Energy: MENA's Path to Regional Energy Integration*. World Bank Group. https://www.worldbank.org/en/news/opinion/2024/12/10/bridging-borders-with-energy-mena-s-path-to-regional-energy-integration

non-unified regulatory frameworks across member states.[87] Working to solve these issues can help this project become more efficient.

II. Questions to Consider in Your Research

- Does your member state subsidize electricity costs for citizens? If so, by how much? How does it compare to other countries in the MENA region? Compare electricity consumption as well.
- What is the electricity mix, electrification rates, and status of grid infrastructure in your member state? Is there energy potential that remains untapped or underutilized?
- What in-state and interstate electricity solutions does your member state have ongoing?
- What are some major obstacles your member state faces or may face when trying to improve electrification, reliability, and affordability?

III. Questions a Resolution Might Answer

- How can the League effectively collaborate and improve electrification rates and decrease the use of dirty fuels?
- How can national grid improvement be done through the league?
- What are some ways PAEM's obstacles can be resolved to streamline the project?
- Is there a way for the league to improve its energy mix? If so, what renewable potential does the league have that is worth investing in? Consider nuclear, solar, hydropower, geothermal, green hydrogen, and other types of renewable energy. Look out for ongoing or developing projects that countries are investing in.

IV. Additional Resources

Arab Sustainable Development Report for SDG 7
Tracks progress made by the Arab League member states when it comes to UN Sustainable Development Goal 7. Gives background information, policy trends, and future recommendations for member states.

Guidelines for Advancing Energy Communities

A comprehensive framework on how to electrify communities using a decentralized solution in Lebanon. Most of the framework is easily transferable to other countries in the league that need to look towards decentralized solutions.

UN ESCWA: Energy Vulnerability in the Arab Region

[87] Transmission Pricing Methodologies for use in the Pan-Arab Electricity Market. (2024). *World Bank Group*.

A general summary of the energy landscape in the MENA region. Touches on many issues concerning energy, electrification, transportation, and environmentalism.

The Arab State of Renewable Energy: Investigating Progress in Arab Electricity Markets

Finds renewable energy development in Arab countries is hindered by heavily subsidized electricity markets and a lack of synchrony between policy and implementation. Underscores the importance of governments addressing specific barriers.

Topic IV: Assessing the environmental impacts of large-scale desalination and developing sustainable alternatives.

I. Introduction

A. General Background

Approximately 97% of Earth's water is saltwater in the oceans, leaving 3% as freshwater. Of that, 2% is trapped in ice & glaciers, meaning that only 1% accessible and safe for use.[88] Rising demands and diminishing supplies have taken water scarcity to a new level. Water is needed for human consumption, irrigation, energy systems, and much more. People are turning to more unconventional methods to meet needs. Desalination is the process of taking seawater, removing salts and minerals, and making it suitable for consumption.[89]

In theory, the desalination process seems like the solution to water shortages worldwide. However, there are many implications when it comes to the process. First, it requires large amounts of energy to operate. This creates a positive feedback loop because harnessing energy used in desalination requires a lot of water. When more water is desalinated, more energy will be used, and that requires even more water to be desalinated. Second, these systems can be expensive to build and operate. The smallest system can cost upwards of $15,000 USD. Mega-scale projects can cost anywhere from hundreds of millions to a billion dollars (USD).[90] Desalination projects also require ongoing costs that include energy consumption, membrane replacement, and maintenance. Lastly, the desalination process produces a byproduct composed of chlorine, salt, copper, and other minerals that can be double the salinity of the feedwater.[91]

There are two main types of desalination technology with their own pros and cons. Thermal desalination systems produce consumable water through evaporation and condensation while leaving impurities behind.[92] This system is popular in situations where high purity is desired, or the water being input has too much salinity. The process can be very energy-intensive and wasteful because a large amount of the thermal energy is dissipated. Reverse osmosis desalination relies on membrane-based technology.[93] Osmosis is the process of water flowing from an area with a low solute concentration to an area with a high solute concentration. Reverse

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[88] *Water Facts - Worldwide Water Supply | ARWEC| CCAO | Area Offices | California-Great Basin*. (2020, November 4). Bureau of Reclamation. https://www.usbr.gov/mp/arwec/water-facts-ww-water-sup.html

[89] *Desalination Basics*. (n.d.). Department of Energy. https://www.energy.gov/cmei/ito/desalination-basics

[90] Farag, S. (2026, July 1). *Seawater Desalination System Cost Guide 2026: From Portable to Industrial Scale*. AMPAC. https://www.ampac1.com/blog/seawater-desalination-systems-cost-guide-2026/

[91] Vollebregt, S. (2025, November 4). *What happens to brine from solar desalination?* Elemental Water Makers. https://www.elementalwatermakers.com/knowledge-base/solar-desalination/what-happens-to-brine-from-solar-desalination/

[92] *Desalination Basics*. (n.d.). Department of Energy. https://www.energy.gov/cmei/ito/desalination-basics

[93] *Desalination Basics*. (n.d.). Department of Energy. https://www.energy.gov/cmei/ito/desalination-basics

osmosis uses pumps to reverse that. RO is not very effective in desalinating water with high salinity. This could lead to issues when speaking specifically about RO desalination in Arab League member states.

B. History in the Arab World

The MENA region has been arid and has had a problem with water scarcity for thousands of years. Early solutions date back to the Byzantine era. In a small village on the edge of the Syrian desert called Shallalah Saghirah, the villagers met some of their water needs through a *qanat*. A qanat can be defined as a subsurface canal that is designed to collect groundwater and provide water to agricultural fields, and they can stretch long distances.[94] It allows for water to be transported over long distances without evaporating. Across the MENA region, the qanat has many different names, including *foggara* in Algeria, *falaj* in Oman & the UAE, *karez* in Iraq, *khettara* in Morocco, and *uyun* in Saudi Arabia.[95] The qanat system was largely abandoned because of falling water tables, difficult upkeep, and low water output.[96] Despite all this, the qanat has the potential to be an environmentally friendly and sustainable way of extracting groundwater. They also have great longevity when maintained properly.

In 1999, the qanat in Shallalah Saghirah still flowed 1,500 years after its construction. The qanat was in bad condition after 2000 because of disputes between villagers over siphons and a weak leadership system. More recently, the Shahallah Saghirah Qanat was rehabilitated and still flows. Many issues concerning water scarcity are accompanied by hydropolitics. Since 2005, over one hundred thousand people have had to abandon their homes in Northern Iraq due to water shortages. The village of Jafaron in Iraq had to be abandoned because 44 of its 52 karez dried up.[97] UNESCO estimated that one single karez can provide water for 9,000 people and irrigate 200 hectares of farmland.[98] The karez systems in that area were drying up due to overexploitation from modern pumps, neglect, and political instability. It is imperative to understand that when utilizing nonrenewable resources such as aquifers or rivers, they cannot produce more than they are able to recharge. In Oman, the falaj is part of a larger *aflaj*, an integrated system that catches and delivers water. The aflaj system is millennia old, but it still provides 30-50% of the freshwater used in Oman.[99]

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[94] Wells, J. (2009). Water Crisis in the Middle East: An Opportunity for New Forms of Water Governance and Peace. *The Whitehead Journal of Diplomacy and International Relations*.
[95] *Qanat*. (n.d.). Wikipedia. https://en.wikipedia.org/wiki/Qanat
[96] Wells, J. (2009). Water Crisis in the Middle East: An Opportunity for New Forms of Water Governance and Peace. *The Whitehead Journal of Diplomacy and International Relations.*
[97] *Water shortage fueling displacement of people in northern Iraq, UNESCO study finds*. (2009, October 19). United Nations Educational, Scientific, and Cultural Organization. https://portal.unesco.org/en/ev.php-URL_ID=46631&URL_DO=DO_TOPIC&URL_SECTION=201.html
[98] ibid.
[99] *Aflaj Irrigation Systems of Oman*. (n.d.). UNESCO: World Heritage Convention. https://whc.unesco.org/en/list/1207/

Modern solutions began with the introduction of desalination in Jeddah, Saudi Arabia, in 1907. This system produced 135 cubic meters of water per day. The system was later replaced with a more efficient system in 1928. Kuwait established a multi-stage flash distillation plant, a type of thermal desalination, in the 1960s. Thermal desalination remained dominant until the 2000s.[100] Reverse osmosis gained popularity due to lower dependency on energy compared to thermal desalination technologies. This allowed Arab League countries to save the oil burned for water generation so that it could be sold or used for other purposes. In 2021, Saudi Arabia's Saline Water Conversion Corporation set a record for the least energy-dependent desalination plant. The plant only used 2.27 kilowatt hours per cubic meter of treated water.[101]

Although the region is characterized by its water scarcity, the consumption of water remains high compared to the rest of the world. The price of water for municipal and agricultural purposes in the Arab League is heavily subsidized. The per capita use of water in the GCC is 560 liters per day versus the global average of 180 liters per day. During the 2022 World Cup, Qatar used about 10,000 liters of desalinated water on each football pitch per day.[102] Wasteful consumption patterns combined with low prices that fail to cover the operational costs of supply put water resources under added pressure.

C. Finding a Solution to the Problem: Past, Present, and Future

As desalination becomes an increasingly popular method of producing, discourse surrounding the implications of it has grown as well. Since desalination demand is so high for countries in the MENA region, they release much more brine than the rest of the world. In 2018, it was estimated that there were 15,906 operational desalination plants globally, with 48% of desalination capacity located in the MENA region.[103] Those plants produced 95 million cubic meters per day of water and 142 million cubic meters per day of brine. Over 55% of brine produced globally was in Qatar, Saudi Arabia, UAE, and Kuwait.[104] This means that about 100 million cubic meters of brine was produced per day in the MENA region alone.

A desalination plant's water recovery ratio (RR) shows the proportion of water input that is converted to usable water.[105] The amount of intake water that is converted to brine can be

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[100] *When Did Water Desalination Begin in the Gulf Cooperation Council Countries?* (2025, January 3). Pulitzer Center. https://pulitzercenter.org/stories/when-did-water-desalination-begin-gulf-cooperation-council-countries
[101] Chibani, A. (2026, April 28). *The Costs and Benefits of Water Desalination in the Gulf*. Arab Center Washington DC. https://arabcenterdc.org/resource/the-costs-and-benefits-of-water-desalination-in-the-gulf/
[102] ibid.
[103] Jones, E., Qadir, M., Van Vliet, M. T., Smakhtin, V., & Kang, S. (2019). The state of desalination and brine production: A global outlook. *Science of The Total Environment*, *657*, 1343-1356. https://doi.org/10.1016/j.scitotenv.2018.12.076
[104] Jones, E., Qadir, M., Van Vliet, M. T., Smakhtin, V., & Kang, S. (2019). The state of desalination and brine production: A global outlook. *Science of The Total Environment*, *657*, 1343-1356. https://doi.org/10.1016/j.scitotenv.2018.12.076
[105] ibid.

calculated as 1-RR. The recovery ratio is controlled by a multitude of factors, including the type of desalination technology and the quality of intake water. Different types of desalination technology yield a higher RR. Membrane-based solutions are linked to a much higher RR than other solutions. The MENA region is already moving towards a future dominated by membrane-based and reverse osmosis desalination technology. It is much more difficult to keep the RR high when the feedwater has a high salinity. The water in the Gulf is 25% saltier than normal seawater.[106] RO technologies do not prove to be as efficient in areas with higher salinity. This could help explain why the Arab League produces such large amounts of brine. No matter what solutions are employed, the fact remains that the Gulf and surrounding waters are very salty, and that has a great impact on the recovery ratio.

Brine has a high salinity and temperature when released into marine environments. It can have twice the amount of salt compared to normal seawater. The brine can also be accompanied by high levels of noise and vibration, and changes in auditory environments can have an impact on marine life.[107] When discharged, brine can alter food chains, inhibit the growth of organisms, and fatally dehydrate them. Over time, it can change reproductive cycles, reduce biodiversity, displace species, cause hypoxia, and degrade the ecosystem. Countries in the MENA region are trying to find ways to minimize the effects of brine discharge. Jordan's Aqaba-Amman desalination plant plans to dispose of the byproduct safely, eject no chemicals into the environment, and keep emissions low. When it comes to disposing of the brine, they are looking to eject it at high speeds, which has been proven to raise salinity levels by only a little.[108] However, the high levels of turbidity associated with this output can disturb the seabed by raising sediment and destroying the habitat. Other countries in the Gulf have looked to deploy offshore diffusers to spread brine and use multiple discharge points to avoid salt buildup. Bahrain and Qatar have also explored diluting brine with cooler water to reduce temperature.[109] These solutions are just a temporary workaround that do not address the actual issue of toxic waste management.

The Arab League addresses issues related to marine protection through the Arab Seas and Marine Environment programs. However, marine standards related to brine and desalination are largely left up to individual countries. Many countries in the league require an Environmental

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[106] Jones, E., Qadir, M., Van Vliet, M. T., Smakhtin, V., & Kang, S. (2019). The state of desalination and brine production: A global outlook. *Science of The Total Environment*, *657*, 1343-1356. https://doi.org/10.1016/j.scitotenv.2018.12.076

[107] Flöder, Sabine, et al. Impacts of Salinity on Marine Ecosystems. *Global Change Biology 29*, no. 3 (2023). https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.16859.

[108] Kaplan-Muller, N., Danielski, E., Healy, R., Lannan, S., Smith, A., Young, K., Kinsella, K., & Smith, E. C. (2026, June 24). *Desalination in the Middle East and North Africa*. Tearline. https://www.tearline.mil/public_page/desalination-in-the-middle-east-and-north-africa

[109] Stagstrup, J. (2025, August 13). *A Gulf Between Law and Practice? Marine Environment Protection and Desalination Discharges in the Persian Gulf*. European Journal of International Law: Talk! https://www.ejiltalk.org/a-gulf-between-the-law-and-practice-marine-environment-protection-and-desalination-discharges-in-the-persian-gulf/

Impact Assessment (EIA) to be carried out before the construction of a plant. Most member states are parties to the United Nations Convention on the Law of the Sea (UNCLOS), which requires them to protect marine environments.[110] UNCLOS also states that no state that shares borders with a body of water with other nations should face an issue on its own. UNCLOS promotes collaboration between parties, and collaboration may be the only way to ensure that marine environments are protected securely.

Regional cooperation has occurred between Arab League member states. The countries surrounding the Arabian Gulf and Gulf of Oman adopted the Kuwait Regional Convention for the Protection of the Marine Environment (Kuwait Convention). The Kuwait Convention operates similarly to UNCLOS when addressing collaboration and efforts between states. The main part of the Kuwait Convention entailed an Action Plan focused on the health of the Gulf, which established a framework for environmental collaboration called the Regional Organization for the Protection of the Marine Environment (ROPME).[111] ROPME has seen a lot of success in protecting marine environments. For example, ROPME has provided coordination during the implementation of the Kuwait Action Plan.[112] However, it has seemingly stalled when it comes to measures regarding desalination and brine discharge since the 1990s. The Kuwait Convention was built with a protocol on how to deal with land-based pollution that includes regional regulations and measures that need to be implemented to address it. ROPME's ability to take regional action has been stunted by the organization's being limited to monitoring.[113] For the Arab League to ensure the safety of the environment, member states must collaborate on ways to streamline monitoring and action processes.

Energy usage of desalination plants alongside the growing demand for water is an issue to pay attention to. As demand for water increases, demand for energy does too. Reducing reliance on fossil fuels and grid reliance to power desalination plants is worth looking into. This can also be helpful to reduce load on the power grid and in situations where member states do not retain control over fuel coming into their nation. Israel controls the electricity supply that Palestine receives. Since October of 2023, Gaza has been in a blackout because Israel cut off their supply.[114] This forced the one power plant in Gaza to shut down. In November of 2024, the Southern Sea Desalination Plant in Gaza became the only facility to be reconnected to power.

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[110] *United Nations Convention on the Law of the Sea*. (n.d.). the United Nations. https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf
[111] ibid.
[112] *Establishment of ROPME*. (n.d.). ROPME. https://ropme.org/about-ropme/establishment-of-ropme/
[113] Hosseini, H., Saadaoui, I., Moheimani, N., Al Saidi, M., Al Jamali, F., Al Jabri, H., & Hamadou, R. B. (2021). Marine health of the Arabian Gulf: Drivers of pollution and assessment approaches focusing on desalination activities. *Marine Pollution Bulletin*, *164*, 112085. https://doi.org/10.1016/j.marpolbul.2021.112085
[114] *Israel's decision to cut off electricity supply to the Gaza desalination plant is cruel and unlawful*. (2025, March 10). Amnesty International. https://www.amnesty.org/en/latest/news/2025/03/israels-decision-to-cut-off-electricity-supply-to-gaza-desalination-plant-cruel-and-unlawful/

Palestinians depend on their occupier to get access to clean water, and supply can be shut off at any moment. Design changes to reduce reliance on grid-based power are worth looking into.

The Arab League is home to a diverse array of ecosystems from steppes to mangroves. Marine environments depend on the interactions between different species and organisms, and must be protected. Member states should focus on refining the desalination process to protect marine life. With large amounts of feedwater being taken from the seas, organisms come in and are killed during the process due to system design choices. Finding ways to decrease the carbon footprint of the plant and eliminate the positive feedback loop will prove to be beneficial in the long run. However, desalination technologies and the effectiveness of the varying technologies differ based on the surrounding environment. Due to this, coming up with a comprehensive and standardized plan for brine treatment and disposal could be difficult. The Arab League should not grow solely dependent on desalination to meet needs. Older techniques of retrieving water, such as using a qanat, may be worth looking into. The infrastructure remains, but it would require repair and upkeep. This technology could reduce dependence on desalination for drinking water and small-scale farming irrigation. Desalination has the potential to solve issues related to water scarcity and has made a significant impact, but there are still improvements to be made.

II. Questions to Consider in Your Research

- What infrastructure for water supply does your country currently have? Where are the desalination plants located? Keep an eye on the salinity of the body of water and the RR of the plants (if available).
- How are water prices subsidized in your country? Does this have an impact on demand? Are there any initiatives to address wasteful water consumption?
- Does your country have EIA regulations or some other authority that monitors brine discharge?
- Is your country a part of a regional organization dedicated to marine protection? Has this organization taken any steps regarding brine or desalination?

III. Questions a Resolution Might Answer

- How can Arab League countries work together to develop unified practices on desalination despite being on many different bodies of saltwater?
- What are the ways that solutions developed can benefit and be applied to countries in active conflict?
- How can qanat technology be renewed and applied effectively in today's world?
- What monitoring methods can be used to ensure the health of the environment?

IV. Additional Resources

The State of Desalination and Brine Production: A Global Outlook

A general background on desalination and the brine associated with it. Focuses on the whole world. Discusses the role of unconventional water resources, desalination technology & trends, challenges, and opportunities.

Water Crisis in the Middle East: An Opportunity for New Forms of Water Governance and Peace

Goes in depth on water disputes, the history of the qanat, and different solutions to the water crisis. Places an emphasis on changing demand patterns through industry shifts.

Marine Health of the Arabian Gulf: Drivers of Pollution and Assessment Approaches Focusing on Desalination Activities

Discusses the different anthropogenic activities negatively impacting the Arabian Gulf. Looks at national and regional policy and approaches used in the past that address marine pollution. Makes recommendations for solutions that could be used in the future.

Kuwait Regional Convention

Agreement among Gulf States to cooperate in protecting the marine environment from pollution, especially from oil and other harmful substances. Established joint measures, national standards, and a regional organization to prevent, control, and respond to marine pollution emergencies.