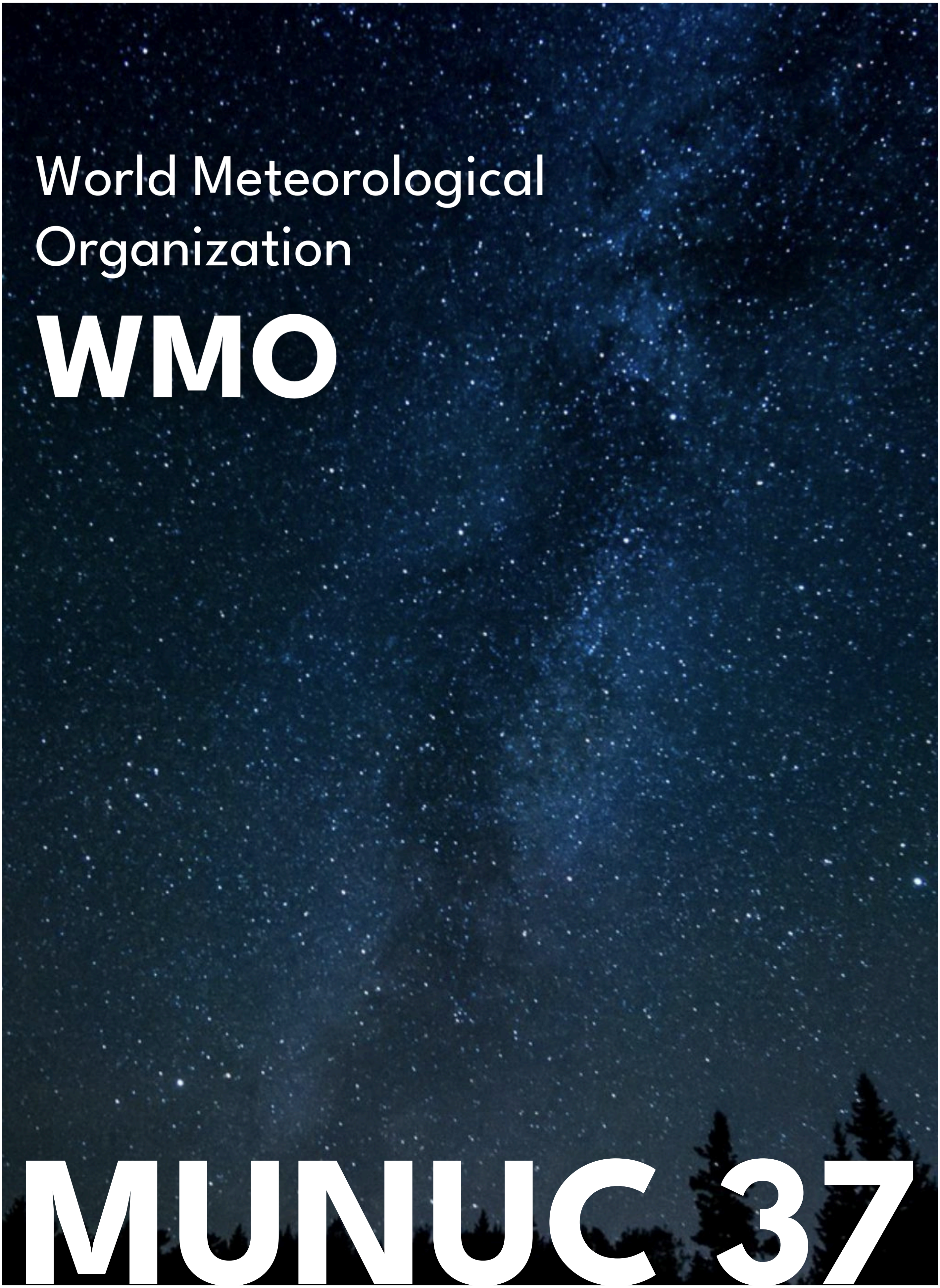

World Meteorological Organization

WMO

MUNUC 37

Model United Nations of the University of Chicago

Chair Letter

Hello delegates,

My name is Alexander Puch, and I am a third-year biological chemistry major. I will be one of your two chairs in the WMO (World Meteorological Organization) at MUNUC 37. In the past, I was involved in MUNUC 36 as a chair in the UNHCR (United Nations High Commissioner for Refugees) and MUNUC 35 as an assistant chair in the cabinet of Florvil Hippolyte.

In the WMO this year, we will be discussing two topics - the prediction and monitoring of natural disasters, as well as water scarcity and access. In recent years, great strides have been made in the prediction and monitoring of natural disasters. The prediction of natural disasters has become much easier with the help of systems to monitor the weather, as well as advances in seismology to predict geological disasters such as earthquakes and volcano eruptions. With the advancement of communication systems around the world, early warning systems are able to notify citizens of incoming disasters far before they occur. Still, there is much room for improvement. The vast majority - 90% - of natural disasters are water-related, and many of these disasters, such as floods and droughts, can be prevented or mitigated. There is also the issue of how best to use the data gathered during natural disasters to effectively respond to them and prepare for later disasters, possibly involving big data or other new technologies. Furthermore, there is the consideration of how to determine which areas of disaster prediction and response can actually be improved, and where there is little progress that can be made with current technology. In this committee, delegates will need to balance disaster preparation, monitoring, and response, as well as determine which disasters deserve the most attention.

The second topic, global water scarcity and access, has become much more important with the rise of climate change in recent decades, as higher temperatures have made droughts and other water shortages more common. However, water shortages are not a new problem, and their causes have not exclusively been climate-related. One of the most common ways that water shortages happen is the contamination or expending of fresh water sources. One example of this was the destruction of the Aral sea, a massive freshwater lake in central Asia, due to overuse for irrigation in the twentieth century. This led to crop failure, water contamination, and an ecosystem collapse in the region. In its discussion of water scarcity and access, the WMO must consider both climate change-related and unrelated causes of water scarcity.

For researching these topics, I would recommend Wikipedia as a great place to start. WMO's website, as well as other UN sites, are also very helpful. The CIA world factbook is also useful for learning about one's own country. If you have any questions, do not hesitate to contact me at aepuch@uchicago.edu. I am greatly looking forward to meeting you and observing how you respond to these two topics during MUNUC 37.

Sincerely,

Alexander E. Puch

Dear Delegates,

My name is Christopher Rios, and I am excited to welcome you all to MUNUC 37 and the World Meteorological Organization (WMO) committee! I will be one of your Chairs, along with Issac and Alexander. A bit about me: I'm a third-year student from Austin, Texas, currently majoring in Political Science and Public Policy. I only recently got into Model UN last year when my friend asked me to help him with his committee, which led to my role as an Assistant Chair (AC) on the United Nations High Commissioner for Refugees committee (UNHCR) at MUNUC 36. Outside of Model UN, I work in the Student Advocacy Office as a financial-aid caseworker, I enjoy running along Chicago's Lakefront Trail, and trying different restaurants in various neighborhoods.

We are thrilled to lead you through this particularly interesting part of the World Meteorological Organization's (WMO) essential work. From natural disaster prediction and monitoring to addressing global water scarcity and access, we are excited to see how the committee progresses as you make strategic decisions independently and as a team with your fellow delegates.

We aim to make this WMO committee at MUNUC exciting, engaging, and inclusive. You'll learn about critical issues with real-world impacts while having fun. Our topics include the prediction and monitoring of natural disasters and global water scarcity and access, both crucial in the face of climate change. If you have any questions about MUNUC, the committee, or anything else, please don't hesitate to reach out. We can't wait to see you all at the conference!

Your Chair,

Christopher Rios

rios2@uchicago.edu

Dear Delegates,

Welcome to MUNUC 37 and the Windy City of Chicago! My name is Isaac Yoo, and I am more than excited to be one of your co-chairs for the World Meteorological Organization or WMO, for short. In this committee, we will be tackling the ongoing climate and metrological issues and topics that continue to shape the world around us.

A quick introduction: I am a third-year at the College studying History and Economics and I am in my third year as part of MUNUC. Unlike you all, I actually had no prior MUN experience before joining MUNUC my first year as an Assistant Chair for EPCOT and chairing UNHCR last year — experiences that I enjoyed a whole lot more than I anticipated. I also chair a crisis committee surrounding the reign of Shaka Zulu as part of ChoMUN, UChicago's intercollegiate conference.

As part of this committee, we will be focusing on two main issues: the methodologies and technologies employed in the monitoring and prediction of natural disasters and global water scarcity and access. The increasing frequency and intensity of natural disasters, coupled with the growing challenge of ensuring equitable water distribution, pose significant threats to global stability and human well-being. Advancements in monitoring and predictive technologies offer promising solutions to these pressing issues, yet their implementation and accessibility remain uneven across different regions. Thus, we hope that as you attempt to formulate inventive, new solutions and navigate the complexities of these issues, you are able to gain a new perspective and insight about this crucial aspect of international politics and cooperation — all while enjoying yourself, of course!

My excitement for this committee cannot be overstated and I look forward to meeting and getting to know each and every one of you throughout conference weekend. Feel free to reach out with any questions or concerns.

Best of luck,

Isaac Yoo

isaacyoo@uchicago.edu

History of the Committee

The WMO Headquarters in Geneva, Switzerland.[1]

As a longstanding stalwart of international scientific cooperation and advancement, the World Meteorological Organization, or the WMO for short, has played an integral role in the history of the United Nations. The committee began to take shape in the late 19th century with the formation its predecessor, the International Meteorological Organization––or IMO–– in 1873[2]. The IMO was established as part of the first International Meteorological Congress held in Vienna and led by Professor Buys Ballot. Thereafter, a permanent

[1] Organization, World Meteorological. "WMO Headquarters." Flickr, August 27, 2024. https://www.flickr.com/photos/worldmeteorologicalorganization/20732642615.
[2] "History of IMO and WMO." 2023. World Meteorological Organization. October 16, 2023. https://wmo.int/about-wmo/history-of-imo-and-wmo.

Meteorological Committee was created and tasked with formulating the rules and regulations for an international organization dedicated to conducting meteorological research––and development and exchanging weather information across national borders.

After a couple of years and additional meetings of the Congress, the regulations and bylaws of the organization were completed in the 1878 Congress session held in Utrecht. The IMO was finalized and officially established in the 1879 session held in Rome. The newly minted IMO set much of the foundational framework for modern meteorological research and forecasting. They created uniform measurement practices and standards, opened up communication channels between different meteorological researchers and organizations across borders––and actively promoted weather observation and information sharing as a means for international cooperation.

While the IMO served an important function in the meteorological and scientific community, it was firmly established as a nongovernmental organization with no political or state affiliations–– something that soon began to seem outdated. By the 1930s, it became rather evident that the importance of meteorological research and information went beyond scientific purposes, especially with the rapid economic and technological development of the time. This led to the creation of a new World Meteorological Convention draft in 1939, known as the Berlin draft. The subsequent advent of WWII soon delayed its ratification, as the committee secretariat moved to neutral Switzerland and progress was mostly halted.

In 1947, a Conference of Directors meeting in Washington DC reopened discussions about a variety of issues such as codes, units, diagrams, symbols, instruments, observation methods, station networks, telecommunications, air navigation safety, climatological statistics, publications, documents, education, professional training, meteorological research, legal issues, and administrative matters. Additionally, the IMO established new working relationships with other international organizations like the International Civil Aviation Organization, the International Telecommunication Union and the International Ice Patrol.

Most importantly, however, the Washington DC conference helped finalize efforts to establish a new constitution for the committee, transitioning it to an intergovernmental entity. In the following years, further efforts as part of this transition, with the IMO being phased out in favor of the newly established WMO, which officially became a specialized agency of the greater United Nations in 1951 and becoming the leader in international cooperation in the fields of meteorology, hydrology, and geophysical sciences that we know today.

Topic A: Prediction and Monitoring of Natural Disasters

Statement of the Problem

Predicting and monitoring systems for natural disasters are crucial for enhancing our resilience to the disaster events. Advancements in technology and increased industrialization have greatly contributed to progress. Despite improvements, the threat of natural disasters remains substantial. These events continue to claim thousands of lives annually, highlighting the ongoing need for effective prediction and monitoring systems to minimize their impact.

Approximately 90% of natural disaster events are related to weather and water, including hurricanes, wildfires, floods, and droughts[3]. Effective early warning systems and weather monitoring can often prevent these types of disasters or at least mitigate their impacts. Nevertheless, a significant portion of the global population—about one-third—still lacks access to such systems[4]. This gap in disaster preparedness underscores the critical need to expand the reach of early warning systems.

The World Meteorological Organization (WMO) is addressing the gap in early warning systems to reduce both the human and economic toll of natural disasters. Their goal is to ensure that everyone has access to these systems, which can significantly improve disaster response outcomes and save lives. Additionally, the WMO is

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[3] "Climate Change and Water-Related Disasters." n.d. UNEP - UN Environment Programme. https://www.unep.org/topics/fresh-water/disasters-and-climate-change/climate-change-and-water-related-disasters#:~:text=Climate%20change%20is%20affecting%20the,%2C%20wildfires%2C%20pollution%20and%20floods.

[4] "WMO And the Early Warnings for All Initiative." 2024b. World Meteorological Organization. August 9, 2024. https://wmo.int/activities/early-warnings-all/wmo-and-early-warnings-all-initiative.

working to enhance the quality of these systems, as reports indicate that only half of the countries with early warning systems have ones that are considered adequate.[5]

The emergence of climate change adds another layer of urgency to the need for enhanced disaster prediction and monitoring. Climate change is expected to increase the frequency and intensity of natural disasters, making it imperative not only to predict and warn about these events but also to monitor and mitigate their effects. The impacts of more frequent and intense natural disasters include community displacement, substantial economic costs, and significant loss of human lives.

History of the Problem

The earliest methods of predicting and monitoring natural disasters were developed by ancient civilizations. Initially, they relied on observing animal behavior, weather changes, and lunar patterns. These methods were accessible to everyone, as they required only keen observation without any technology. The second approach involved spiritual predictions, based on the belief that greater entities communicated through oracles and shamans. Like the first method, spiritual prediction was also accessible to all. This widespread accessibility reflects a time when everyone faced the same challenges posed by natural disasters.

In ancient times, there was no inequality in access to methods for predicting natural disasters; however, this accessibility was only beneficial if the methods were effective. Spiritual prediction, based on the belief in greater powers, was purely a matter of chance and not a reliable method for monitoring and predicting natural

[5] "Climate Change Indicators: Weather and Climate." 2024. EPA. June 27, 2024. https://www.epa.gov/climate-indicators/weather-climate#:~:text=Rising%20global%20average%20temperature%20is,storms%2C%20floods%2C%20and%20droughts.

disasters, as it lacked empirical evidence.[6] In contrast, behavioral observation, while still limited, was more effective compared to spiritual prediction.

Behavioral observation, despite its limitations, was relatively effective for ancient civilizations in predicting natural disasters. The primary limitation of this method was its reliance on subjective interpretation and the variability in animal behavior, which could be influenced by numerous factors unrelated to impending disasters. Additionally, weather changes and lunar patterns could be misinterpreted or influenced by coincidental occurrences. Nevertheless, this method provided valuable early warning signs, as certain animal behaviors and environmental

changes often preceded natural events.[7] By paying close attention to these indicators, ancient communities could take precautionary measures, making behavioral observation a practical and useful tool for everyone at the time.

In the 19th century, significant progress was made in predicting and monitoring natural disasters. Advances in meteorology, seismology, volcanology, and hydrology, along with the development of new technologies and communication methods, laid the foundation for modern disaster prediction and management systems. These innovations enhanced the ability to forecast natural events, communicate warnings, and implement measures to mitigate their impact, ultimately saving lives and reducing economic losses.

One major advancement during the 19th century was the development of weather stations, which greatly improved environmental monitoring and weather forecasting. These stations facilitated long-term climate

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[6] King, Arienne, and Unknown. 2023. "Western Astrology." *World History Encyclopedia*, March. https://www.worldhistory.org/Western_Astrology/.

[7] Mott, Maryann. 2003. "Can Animals Sense Earthquakes?" Animals, November 11, 2003. https://www.nationalgeographic.com/animals/article/animals-sense-earthquakes#:~:text=One%20theory%20is%20that%20wild,the%20next%20one%20will%20hit.

measurements for specific areas, and their data could be shared with other weather stations through the newly invented telegraph. As technology to monitor and predict natural disasters became more prevalent, it underscored the need for further investment in technological advancements.

The 20th century saw a revolution in disaster monitoring due to technological innovations. The introduction of weather radar allowed meteorologists to detect and track weather phenomena with greater accuracy.[8] Additionally, the launch of the first weather satellite during this period enabled the global monitoring of weather patterns. The data collected from these technologies were utilized by the first computers to generate computational models, significantly improving predictions for various natural disasters such as hurricanes and floods.[9]

The introduction of weather satellites and advanced computational technology significantly improved weather predictions and contributed to a more equitable distribution of meteorological data. Before these innovations, the ability to predict and respond to natural disasters was heavily influenced by a country's financial resources. Wealthier nations, with access to superior technology, could implement more effective disaster management tools while less affluent countries often relied on outdated or less accurate methods.[10] This disparity meant that poorer nations faced higher vulnerability and less effective responses to natural disasters.

Weather satellites played a crucial role in leveling the playing field by providing consistent, high-resolution data to all countries, regardless of their economic status. This democratization of information allowed nations with limited technological resources to access the same meteorological data as wealthier countries. However, while

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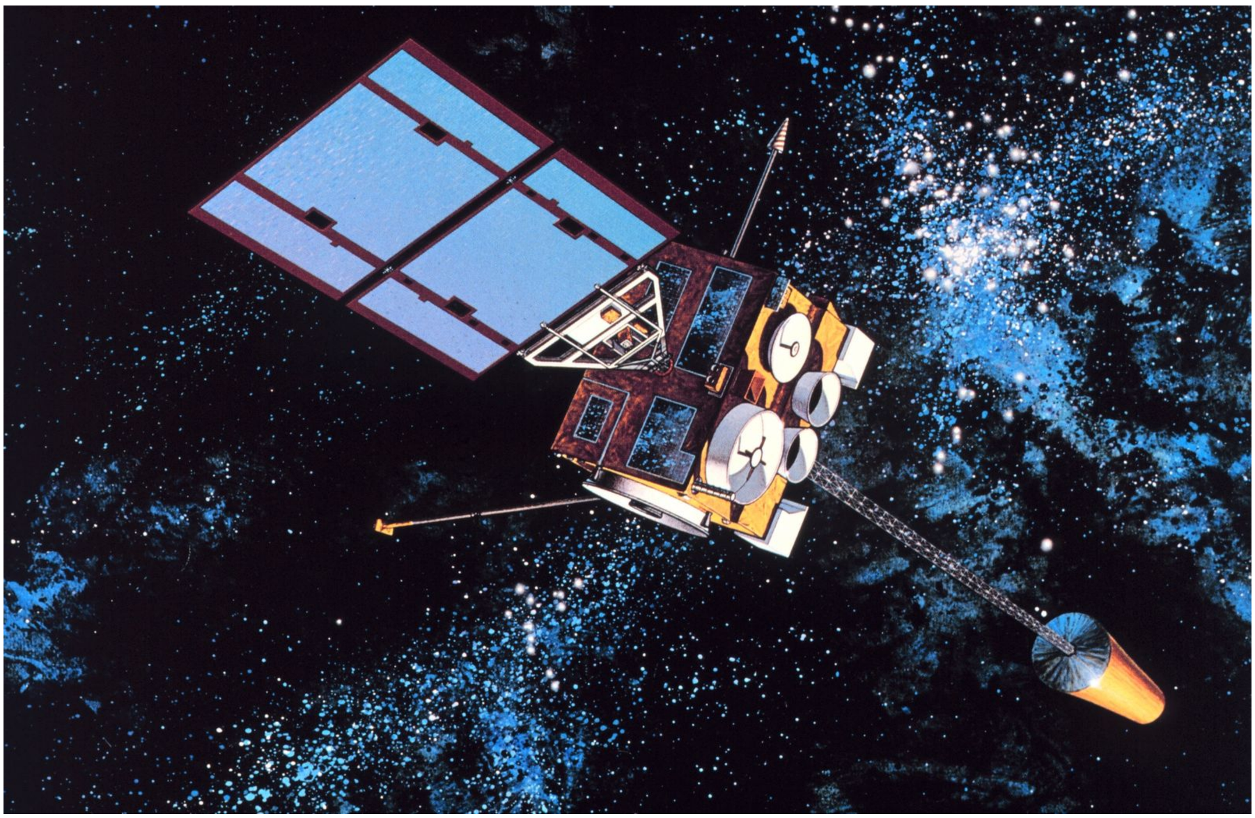
[8] "NOAA 200th." n.d. https://celebrating200years.noaa.gov/transformations/weather/radar.html.
[9] "National Weather Service at 150: 7 Tech Inventions That Improved Forecasting." 2020. National Oceanic and Atmospheric Administration. February 7, 2020. https://www.noaa.gov/stories/national-weather-service-at-150-7-tech-inventions-improved-forecasting.
[10] *Leveraging Technology and Innovation for Disaster Risk Management and Financing*. 2020. https://doi.org/10.1787/cd4ed15b-en.

the availability of data became more uniform, it did not fully resolve the underlying issue of unequal access to advanced and costly technologies needed to effectively utilize this information. As a result, disparities persist in how different countries can leverage technological innovations to manage and mitigate the impacts of natural disasters.[11]



The Geostationary Operation Environmental Satellite (GOES-8) Weather Satellite launched in 1994.[12]

[11] "Disaster Risk Management." n.d. World Bank. https://www.worldbank.org/en/topic/disasterriskmanagement.
[12] NOAA. 1994. "Graphic of GOES-I, the First of the GOES-next Spacecraft Became GOES-8 after a Successful Launch on April 13, 1994." Noaa.gov. 1994. https://www.noaa.gov/digital-collections/search/item?search_api_fulltext=goes%201994&page=0.

In the 21st century, two major innovations have significantly enhanced our ability to save lives and prepare for natural disasters. The first is the internet. Its introduction has created a global platform for instant communication, enabling governments to efficiently reach and inform communities that may be affected by natural disasters. This capability is crucial for disseminating warnings, coordinating response efforts, and providing real-time updates during emergencies. The widespread connectivity afforded by the internet allows for seamless communication between various agencies and the public, facilitating more effective disaster management and response[13].

The second major innovation is early warning systems. These systems utilize a combination of advanced technologies, such as satellites, sensors, and data analytics, to detect and predict natural disasters before they occur. By providing advance alerts for events like hurricanes, tsunamis, earthquakes, and floods, early warning systems offer crucial time for individuals and communities to prepare and take necessary precautions.[14] The benefits of these systems are manifold. They provide timely alerts that enable people to evacuate and prepare, significantly reducing the likelihood of casualties and injuries. Emergency services can mobilize resources and plan responses more effectively, leading to quicker and more coordinated disaster relief. Additionally, early warning systems raise public awareness about potential disasters, educating individuals on safety measures and preparedness actions. By mitigating the impact of natural disasters, these systems help reduce damage to property and infrastructure, and the data they collect contribute to better disaster planning and risk management.[15] The integration of early

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[13] Streger, Gustavo. 2024. "What Is the Role of the Internet in Natural Disasters and Emergencies?" Internet Society Foundation. July 16, 2024. https://www.isocfoundation.org/2024/07/what-is-the-role-of-the-internet-in-natural-disasters-and-emergencies/#:~:text=Disseminating%20information%20to%20spread%20awareness,recovery%20efforts%2C%20and%20preventative%20notifications.

[14] "Early Warning Systems." 2024. UNESCO. June 2024. https://www.unesco.org/en/disaster-risk-reduction/ews#:~:text=Early%20Warning%20Systems%20are%20%22an,reduce%20disaster%20risks%20in%20advance.

[15] "Early Warning Systems - PrepareCenter." 2024. PrepareCenter. April 3, 2024. https://preparecenter.org/topic/early-warning-systems/.

warning systems with modern communication tools like the Internet has transformed disaster preparedness and response, enhancing the resilience and safety of communities worldwide.

Despite the significant advancements provided by the internet and early warning systems, not all countries and communities have access to these crucial resources. In many developing regions and remote areas, the infrastructure needed for reliable internet access and sophisticated early warning systems is lacking.[16] This disparity means that while some communities benefit from timely alerts and efficient communication, others remain vulnerable and inadequately prepared for natural disasters. Limited access to technology and resources can hinder the ability to receive warnings, access emergency information, and implement effective response strategies. As a result, these underserved areas often experience higher rates of casualties and damage during disasters. Addressing these inequalities is essential for improving global disaster preparedness and ensuring that all communities, regardless of their technological infrastructure, can benefit from advancements in disaster prediction and management. Currently, this is one major issue that the WMO is trying to resolve, along with creating preventive measures against the effects of intensifying natural disasters due to climate change. As the WMO implements more early warning systems in various countries, they also aim to innovate the technology that monitors and predicts these disasters, ensuring that we are all prepared for future natural disasters[17].

[16] Loussert, Lara, Karima Ben Bih, Vladimir Tsirkunov, and Anna-Maria Bogdanova. 2024. "Scaling up Early Warning Systems for Communities in Fragile and Conflict Zones." *World Bank Blogs* (blog). March 16, 2024. https://blogs.worldbank.org/en/dev4peace/scaling-early-warning-systems-communities-fragile-and-conflict-zones#:~:text=Years%20of%20political%20instability%2C%20gang,on%20risks%20and%20disseminating%20alerts.

[17] "Early Warnings for All Officially Becomes WMO's Top Priority." 2023. World Meteorological Organization. June 1, 2023. https://public.wmo.int/media/news/early-warnings-all-officially-becomes-wmos-top-priority.

Past Actions

NASA technicians work on the first weather satellite TIROS-1 as part of the World Weather Watch, circa 1962.[18]

As one of its key functions as an international meteorological committee and organization, the WMO has taken numerous actions and measures in the past to combat the ever-looming threat that natural disasters

[18] Mersmann, Katy, and NASA. 2019. "Launch of TIROS 1, World's 1st Weather Satellite — This Week in Goddard History: March 31–April 6 - NASA." NASA. April 1, 2019. https://www.nasa.gov/history/launch-of-tiros-1-worlds-1st-weather-satellite-this-week-in-goddard-history-march-31-april-6/.

pose. As natural disasters of all types continue to grow in intensity, frequency, and abnormality, it is essential to look back at these past initiatives to guide future plans and actions to address this growing issue.

World Weather Watch

One of the first initiatives taken by the WMO to monitor the formation and development of natural disasters was the World Weather Watch (WWW).[19] Established in the early 1960s, the WWW program is often considered one of the WMO's crowning achievements. The program utilizes modern technology like satellite imagery, communication systems, and a vast network of ground stations, ships, weather buoys, and aircraft—a technologically and logistically complex system known as the WMO Integrated Processing and Prediction System (WIPPS). Using the WIPPS system, the WWW program is then able to analyze and monitor ongoing weather phenomena, predict and forecast future weather conditions and events, and relay and disseminate all weather information and data across the globe.

Further Weather Monitoring Programs

Programs like WWW set the stage for the formation of other weather monitoring initiatives like the Tropical Cyclone Programme (TCP) in 1980.[20] This program utilizes an integrated framework of regional and international information networks to monitor and forecast deadly tropical cyclones, enabling the WMO and local governments to issue timely warnings and enact appropriate response procedures and practices.

Building upon these advanced logistical frameworks and technological advancements, the WMO launched the Global Atmosphere Watch (GAW) program in 1989.[21] Through this program, the WMO has been

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[19] "World Weather Watch." 2023. World Meteorological Organization. October 19, 2023. https://wmo.int/world-weather-watch.
[20] "Tropical Cyclone Programme (TCP) | World Meteorological Organization." 2024. September 12, 2024. https://community.wmo.int/en/activity-areas/tropical-cyclone-programme-tcp.
[21] "Global Atmosphere Watch Programme (GAW) | World Meteorological Organization." 2024. September 12, 2024. https://community.wmo.int/en/activity-areas/gaw.

able to coordinate global atmospheric monitoring data and information from 100+ countries to create a comprehensive understanding of atmospheric conditions, composition, and its relationship with the hydrosphere and biosphere — along with the formation of natural disasters.

Early Warnings for All Initiative

Besides the monitoring and forecasting of major weather phenomena and natural disasters, the WMO has taken greater action to address response efforts and warning systems to these major weather events. For instance, in 2022, the WMO announced the start of the Early Warnings for All initiative, which aims to implement effective end-to-end warning systems worldwide by 2027.[22] Understanding the global need for faster and more accessible emergency response and warning systems, the WMO has begun to rapidly expand and improve existing technology networks like the Multi-Hazard Early Warning System (MHEWS). This is an integrated system that delivers key information about imminent natural disasters and weather related dangers to both affected populations and governments in order for them to act accordingly and mitigate as much human damage as possible. The MHEWS operates on four main pillars that focus on disaster risk knowledge; detection, observation, monitoring, analysis, and forecasting; warning dissemination and communication; and preparedness and response capabilities.

The WMO also launched the Climate Risk and Early Warning Systems (CREWS), which also aims to increase the availability, accessibility, and accuracy of early warning systems for natural disasters, with a particular focus on Least Developed Countries (LDCs) and Small Island Developing States (SIDS) — nations and countries that are often the most vulnerable to the growing threat that natural disasters and climate change pose.[23]

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[22] "WMO And the Early Warnings for All Initiative." 2024. World Meteorological Organization. July 19, 2024. https://wmo.int/activities/early-warnings-all/wmo-and-early-warnings-all-initiative#:~:text=A%20Multi%2DHazard%20Early%20Warning,can%20act%20to%20minimize%20impacts.

[23] "CREWS." 2024. July 31, 2024. https://crews-initiative.org/.

Possible Solutions

As the threat of natural disasters continues to loom large and only continues to grow, it is imperative that the WMO and other international organizations take further action to adequately track these dangerous weather phenomena and respond to their potentially damaging effects. The solutions presented below that are based on recent technological developments––along with their upsides and downsides––warrant further consideration and discussion. Please keep in mind, though, that these solutions are not exhaustive and are instead intended to serve as a basis point for further research and idea generation.

Utilizing Emerging Technologies

The utilization of new emerging technologies is a very important avenue for the WMO to tackle this emerging issue. New tools like supercomputing can be powerful tools for creating enhanced and more accurate climate models[24] to forecast the development of natural disasters like tropical cyclones, hurricanes, and tornadoes. While improved satellite technology is essential for tracking and monitoring these dangerous weather phenomena in real time. Artificial intelligence (AI), drones, the Internet of Things (IoT)[25], and other forms of immersive technology systems have also demonstrated a capability to effectively collect weather data and use existing weather data patterns. This allows for the better prediction and forecast of natural disasters and other dangerous weather phenomena.[26]

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[24] "World Meteorological Congress Sets New Strategic Priorities for an Era of Rapid Climate, Societal and Technological Change." 2023. World Meteorological Organization. June 6, 2023. https://wmo.int/news/media-centre/world-meteorological-congress-sets-new-strategic-priorities-era-of-rapid-climate-societal-and.

[25] "Harnessing Emerging Technologies for Disaster Risk Reduction." 2024. World Meteorological Organization. February 21, 2024. https://wmo.int/media/magazine-article/harnessing-emerging-technologies-disaster-risk-reduction.

[26]Krichen, Moez, Mohamed S. Abdalzaher, Mohamed Elwekeil, and Mostafa M. Fouda. 2024. "Managing Natural Disasters: An Analysis of Technological Advancements, Opportunities, and Challenges." *Internet of Things and Cyber-Physical Systems* 4 (January): 99–109. https://doi.org/10.1016/j.iotcps.2023.09.002.

UN Secretary-General Antonio Guterres and former WMO Secretary-General Petteri Taalas announce the Early Warnings for All Initiative at COP27.[27]

In order to properly implement and develop these new technologies, the WMO has begun to explore partnerships with private tech corporations to utilize their wealth of resources and expertise. For instance, big tech has proven to be a valuable partner in advancing the WMO's Early Warnings for All initiative––with corporations like Microsoft improving telecommunication networks and increasing internet accessibility in high-risk regions like Turkey's rural countryside during its 2023 earthquake. Or with Amazon's expansive cloud services being used to store and distribute weather data for the WMO's new Information System 2.0 (WIS 2.0). Others like Alibaba have used their cloud capabilities along with AI technology for natural disaster prevention and public safety by monitoring typhoon conditions in Asia and coordinating the recall of fishing vessels during these dangerous

[27] Kiara Worth, and World Meteorological Organization. 2022. "WMO at COP27 - Action Plan Early Warning Systems High-Level Launch." Flickr.com. WMO. November 15, 2022. WMO at COP27 - Action Plan Early Warning Systems High-level launch.

conditions[28]. The use of these new forms of telecommunication, imaging, and computing technology, in conjunction with big private tech companies, is an avenue that warrants further consideration.

Strengthening International Cooperation

Beyond technological advancements, further initiatives should be taken to strengthen the existing international cooperation agreements. Agreements like the WMO Unified Data Policy or Resolution 1 have allowed the WMO to establish a comprehensive, global overview of the Earth's weather––as all constituent countries agree to share any and all collected information about all WMO-relevant Earth processes.[29] These include weather, climate, hydrology, ocean, atmospheric composition, cryosphere, space weather, etc. To help facilitate this dissemination of information, the WMO has also established a network of Regional Climate Centres (RCCs) and Regional Climate Outlook Forums (RCOFs)[30] that focus on weather data collection and regional cooperation, which contributes to the larger international database. Global cooperation through programs like these is essential for initiatives like Early Warnings for All that rely on the WMO's constituent nations to provide necessary weather information, technical assistance, and financial support to ensure that underserved populations receive adequate response systems against potentially catastrophic natural disasters.[31] As expansive and powerful as technological advancements become when tracking weather data––as is the case with any other international organization of its scale––the WMO is powerless without the scientific efforts and cooperation of nations and governments across the globecore.

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[28] "Big Tech and Artificial Intelligence Can Support Early Warnings for All." 2023. World Meteorological Organization. October 9, 2023. https://wmo.int/news/media-centre/big-tech-and-artificial-intelligence-can-support-early-warnings-all.

[29] World Meteorological Organization. 2022. "WMO Unified Data Policy." *Https://Library.Wmo.Int/Idurl/4/58009*. https://library.wmo.int/idurl/4/58009.

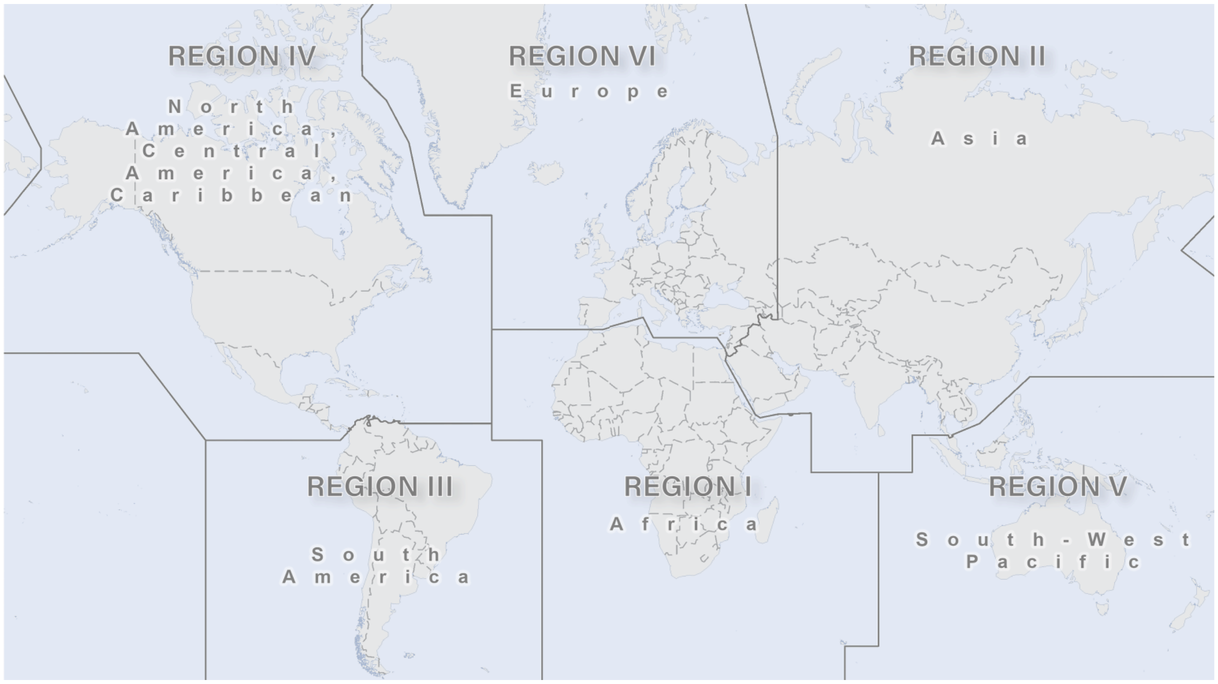
[30] "WMO Workshop on Global Review of Regional Climate Outlook Forums | World Meteorological Organization." 2017. September 5, 2017. https://community.wmo.int/en/activity-areas/climate/meetings/wmo-workshop-global-review-regional-climate-outlook-forums.

[31] "Tackling Capacity Gaps in Early Warnings for All Delivery." 2024. World Meteorological Organization. May 28, 2024. https://wmo.int/media/update/tackling-capacity-gaps-early-warnings-all-delivery.

WMO has cooperative partnerships with various other international organizations, which vary in purpose and scope. For instance, the WMO has working partnerships with the multiple scientific branches of the European Union like the European Centre for Medium-range Weather Forecasts (ECMWF) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)[32] to share meteorological, hydrological, and oceanographic data throughout Europe. While the WMO's partnership with World Ocean Council (WOC)[33] is an essential component of the WMO's initiative for collecting and sharing ocean-related weather and climate data to improve maritime safety and climate services globally. The WMO's involvement and support for the Paris Agreement[34] and partnership with the Global Energy Interconnection Development and Cooperation Organization (GEIDCO)[35] have also been key components of the WMO's interest in preventing the effects of climate change and its effect on the formation and severity of natural disasters. Relationships like these with other international organizations, in addition to those with constituent nations and governments, are a matter of further discussion and consideration.

[32] "International Co-operation." 2024. Met Office. March 28, 2024. https://www.metoffice.gov.uk/services/government/international-development/international-co-operation.
[33] "WMO Signs Agreement With World Ocean Council." 2023. World Meteorological Organization. March 22, 2023. https://public.wmo.int/media/news/wmo-signs-agreement-world-ocean-council.
[34] "Goal 13: Climate Action." 2024. World Meteorological Organization. March 7, 2024. https://wmo.int/activities/sustainable-development-goals/goal-13-climate-action.
[35] "WMO Joins New Partnership on Renewable Energy." 2023. World Meteorological Organization. March 22, 2023. https://wmo.int/media/news/wmo-joins-new-partnership-renewable-energy.

Bloc Positions



Map of WMO-designated regions.[36]

Despite the growing threat of natural disasters being an undeniably global issue, it is important to note the distinct interests that different nations across the world have. Regions of the world differ drastically in terms of climate and weather conditions, as well as natural disasters and their severity and frequency, and thus, this committee should take these nuances into consideration when making decisions. The following information aims to bring forward some of these specific considerations and issues with regard to the specific regions designated by the WMO; however, please note that this list is merely a source of background information and is not intended to sway your position one way or the other, nor is it an exhaustive list of all potential bloc positions.[37]

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[36] "Regions." 2023. World Meteorological Organization. November 27, 2023. https://wmo.int/about-wmo/regions.
[37] Ibid.

Region I: Africa

As one of the regions most vulnerable to extreme weather conditions, African nations face a flurry of extreme and dangerous weather phenomena ranging from floods, droughts, heatwaves, tropical cyclones, severe storms, heavy rains, and forest fires.[38] Yet, despite the exigency of the looming threat of these natural disasters, up to 60% of the population continues to lack access to early warning systems––leaving them even more vulnerable to these dangerous weather events. Much of this is due to the socioeconomic diversity of the region, characterized by varying levels of economic activity and social mobility, with 34 of 46 recognized Least Developed Countries (LDCs) being located in the continent.[39]

This need for weather monitoring and response systems makes international cooperation within the region imperative, as the WMO Regional Office for Africa has partnered with regional institutions and stakeholders including ECA, AICCRA, AfDB, AU, and various United Nations agencies to make the region more prepared and responsive to rapidly intensifying weather events.[40]

Region II: Asia

As the largest and most populous continent in the world, Asia spans a vast array of different terrains, climates, and geographies and is home to around 4.75 billion people — approximately 60% of the world's population. The expansive nature of Asia makes it the most disaster-prone region, with the continent witnessing 3,612 recorded natural disasters, causing nearly a million deaths and $1.4 trillion in losses — nearly half of the world's total.[41]

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38 "Region I: Africa." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/africa.
39 Ibid.
40 Ibid.
41 "Region II: Asia." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/asia.

This vulnerability to natural disasters and extreme weather phenomena like typhoons is compounded by the socioeconomic trouble that many of the region's constituent nations face, with many of the region's LDC having to deal with significant food and energy security challenges, along with inadequate early warning systems. Thus, it is imperative that this committee continues to foster its collaborative efforts with regional and international partners like the United Nations Office for Disaster Risk Reduction (UNDRR), the International Telecommunication Union (ITU), the International Federation of Red Cross and Red Crescent Societies (IFRC) as well as the UN Economic and Social Commission for Asia and the Pacific (ESCAP) to share critical weather data and further develop enhanced early warning systems.

Region III: South America

South America is a region characterized by a great degree of weather variability, caused by its sheer geographic diversity, with its landscapes spanning from the Amazon rainforest to the glaciers at the southern tip, along with the estuary of La Plata to the snow-capped peaks of the Andes. This varied landscape, in conjunction with external weather phenomena like the El Niño-Southern Oscillation, makes the region highly vulnerable to dangerous natural disasters such as floods, droughts, severe storms, landslides, and forest fires, with much of the population lacking warning and response systems.[42]

As a result, the WMO's cooperation efforts with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the Inter-American Institute for Global Change Research (IAI), the Organization of American States (OAS), and Brazil's National Institute for Space Research (INPE) should be further pursued to alleviate these issues.

[42] "Region III: South America." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/south-america.

Region IV: North America, Central America, & the Caribbean

Represented by the Representative Office for North America, Central America and the Caribbean (NCAC), this region is susceptible to various extreme weather phenomena, tropical cyclones, droughts, floods, coastal surges, and tornadoes, along with the constant melting of ice in its Arctic polar regions. As a region consisting of both highly developed nations like the United States and a number of LDCs, the disparity in access to early warning systems and disaster response efforts is an important issue that this committee must take into consideration — especially for vulnerable populations in coastal and island regions.[43]

This committee should further explore its collaborative efforts with National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA), the Caribbean Meteorological Organization (CMO), the Coordination Centre for the Prevention of Natural Disasters in Central America (CEPREDENAC), the Caribbean Institute for Meteorology and Hydrology (CIMH), the Regional Committee on Hydraulic Resources (CRRH), the Caribbean Disaster Emergency Management Agency (CDEMA), and the United Nations Economic Commission for Latin America and the Caribbean (ECLAC).

Region V: Southwest Pacific

The Southwest Pacific region is the one most susceptible to the impacts of climate change, especially the intensification of natural disasters that comes with it. In the past five decades, the region has suffered 1,493 disasters, with a death toll of 66,951 deaths and an estimated $185.8 billion in economic losses, caused by everything from heatwaves and droughts to cyclones and floods. As a largely tropical region with a climate dictated

[43] "Region IV: North America, Central America, the Caribbean." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/north-america-central-america-caribbean.

by monsoons and trade winds, along with La Niña and El Niño cycles, it is essential that the region has adequate early warning systems created — a necessity that is lacking throughout the region.[44]

Therefore, the implementation of these warning systems, the sharing of weather data, and the monitoring of climate change impacts should be highly prioritized by this committee, along with its partnerships with the United Nations Office for Disaster Risk Reduction (UNDRR), the International Telecommunication Union (ITU), the International Federation of Red Cross and Red Crescent Societies (IFRC), and the UN Economic and Social Commission for Asia and the Pacific (ESCAP).

Region VI: Europe

Much like the other regions, the European region is one defined by its geographical, climatic, and socioeconomic diversity and disparity. The region encompasses both the frigid Nordic regions of Scandinavia and the warm, temperate climate of the Mediterranean, and the developed economies of Western Europe alongside their developing counterparts in the south and east. This diversity also applies to the sheer breadth of extreme weather conditions that the region faces, ranging from heavy rains and snowfall to heat waves and droughts.[45]

Hence, it is integral that this committee address these disparities in technology and economic resources and ensure that the region as a whole is prepared and aware of the dangers of imminent natural disasters. The WMO's Regional Office for Europe works to establish the National Meteorological and Hydrological Services (NMHSs) to foster weather data sharing and collaboration amongst European nations to create a comprehensive early warning system, while the committee also partners with the European Centre for Medium-Range Weather Forecasts (ECMWF), EUMETSAT, EUMETNET, and the European Union to establish a unified front against extreme weather events — an objective that this committee must work to advance.

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44 "Region V: South-West Pacific." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/south-west-pacific.

45 "Region VI: Europe." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/europe.

Glossary

Early Warning System (EWS): A network of tools and methods used to detect and predict natural disasters before they happen, providing alerts to people so they can prepare or evacuate.

Satellite Imagery: Images of Earth taken from satellites in space, used to monitor weather patterns and natural disasters from a global perspective.

Natural Disasters: Severe and extreme weather events, such as hurricanes, floods, earthquakes, and wildfires, that can cause significant damage and loss of life.

Least Developed Countries (LDCs): Countries with low income, weak human resources, and economic vulnerability, which often have fewer resources to prepare for and respond to natural disasters.

Tropical Cyclone: A type of storm that forms over tropical oceans, characterized by strong winds, heavy rain, and thunderstorms, and can develop into hurricanes or typhoons.

Global Atmosphere Watch (GAW): A program coordinated by the WMO that monitors and collects data on the atmosphere to better understand and predict weather and climate changes.

Multi-Hazard Early Warning System (MHEWS): A system designed to provide warnings for multiple types of natural hazards, such as floods, earthquakes, and hurricanes, helping to minimize their impacts.

Climate Models: Computer simulations that use data to predict future climate conditions and the potential impact of natural disasters.

Supercomputing: The use of powerful computers to perform complex calculations and simulations quickly, often used in weather forecasting and climate modeling.

Artificial Intelligence (AI): The ability of computers to perform tasks that typically require human intelligence, such as learning from data and making decisions, used in predicting natural disasters.

Internet of Things (IoT): A network of physical devices, such as sensors and cameras, connected to the internet, which collect and share data to improve disaster monitoring and response.

Regional Climate Outlook Forums (RCOFs): Meetings where experts from different countries share weather and climate data to improve regional disaster preparedness and response, organized by the WMO.

Water Risk Assessment: The process of evaluating potential threats to water quality and availability, including contamination, overuse, and environmental changes.

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"World Meteorological Congress Sets New Strategic Priorities for an Era of Rapid Climate, Societal and Technological Change." 2023. World Meteorological Organization. June 6, 2023. https://wmo.int/news/media-centre/world-meteorological-congress-sets-new-strategic-priorities-era-of-rapid-climate-societal-and.

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TOPIC B: GLOBAL WATER SCARCITY AND ACCESS

Statement of the Problem

Children collect water from a muddy spring in Nigeria.[46]

Water is by far the most important molecule to human life. Beyond being necessary for hydration, water has countless uses, ranging from agriculture to hydroelectric power, all essential for civilization as we know it today. With over three million cubic meters of water consistently used each year, demand for the liquid is extremely high. It is therefore necessary to ensure that there is an efficient way to obtain massive amounts of it worldwide.[47]

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[46] Wikimedia Commons. 2018a. "Water Scarcity." Wikimedia Commons. January 10, 2018. https://commons.wikimedia.org/wiki/File:Water_scarcity.jpg.
[47] "Water Use Statistics - Worldometer." n.d. https://www.worldometers.info/water/.

Of all of the water on Earth, 97% is saltwater in the ocean, which is not readily drinkable. Of all freshwater, two thirds are either frozen in ice or below the surface in groundwater, meaning that only one percent of the water on Earth is directly accessible to drink.[48] Furthermore, even within the directly accessible freshwater, forty percent is severely polluted.[49]

Due to these restrictions on water supply, it is not surprising that each year, around 50% of the world's population faces severe water scarcity of some kind.[50] This can be caused by poor quality or lack of availability, and each year over two million people die from dehydration-related causes.[51] Lack of water can also cause problems in agriculture, leading to food insecurity and economic problems.

While the current situation is not ideal, it could easily become worse in the future due to many different causes. The first, and most obvious, potential source of water scarcity in the future is climate change. From 1998 to 2017, droughts rose by a third worldwide, and accounted for 45% of natural disaster-related deaths.[52] This is largely due to the fact that climate change makes wet areas wetter and dry areas drier. As temperatures continue to rise across the world, this will most likely continue to worsen. Unfortunately, this is most likely the most difficult source of water problems for the WMO to deal with, as it will require a commitment to reducing Carbon Dioxide (CO_2) emissions from many, if not all, governments in the world. This will be especially difficult because reducing CO_2 emissions is both economically problematic and does not produce immediate benefits. If the

48 Ibid.

49 United Nations Environment Programme. n.d. "Globally, 3 Billion People at Health Risk Due to Scarce Data on Water Quality." UNEP. https://www.unep.org/news-and-stories/story/globally-3-billion-people-health-risk-due-scarce-data-water-quality#:~:text=To%20fill%20the%20gap%2C%20UNEP%20used%20Earth%20Observation,more%20than%2040%20per%20cent%20were%20severely%20polluted.

50 "Water." 2024. World Meteorological Organization. June 5, 2024. https://wmo.int/topics/water.

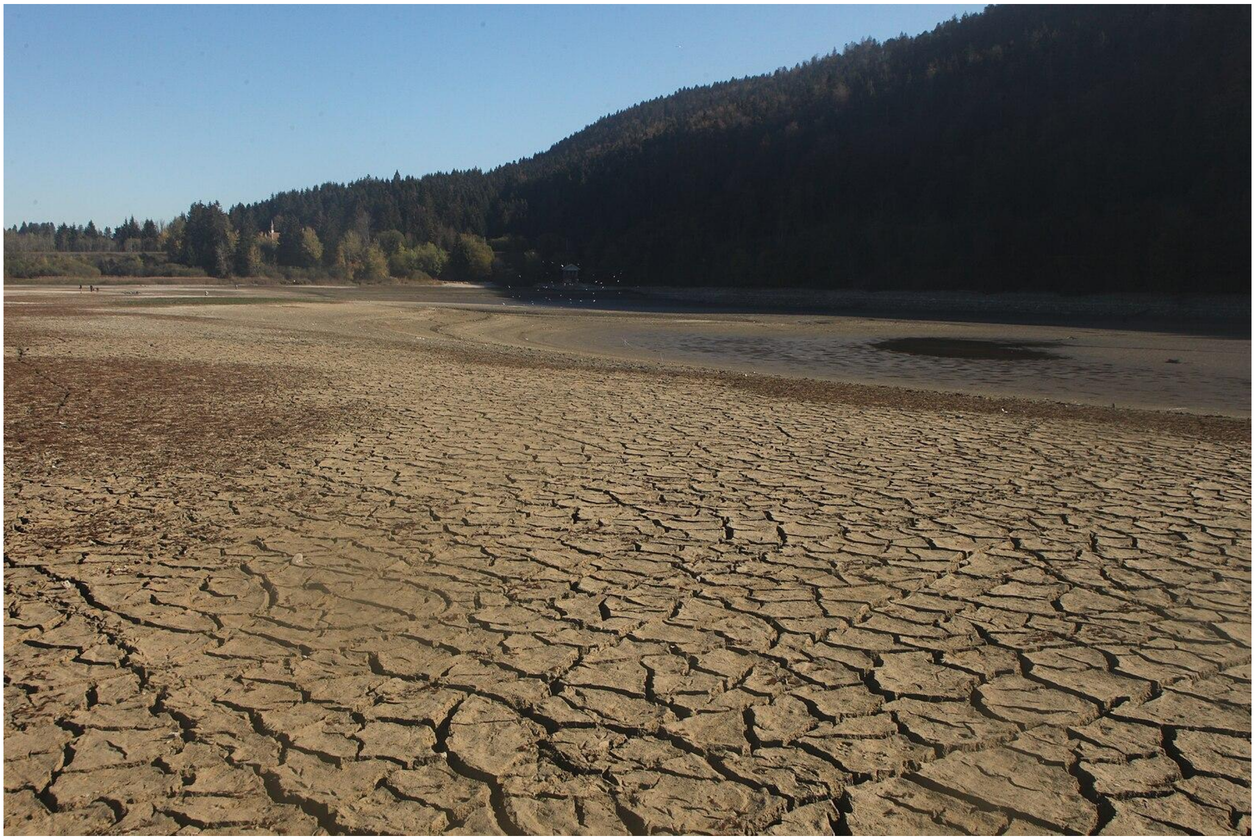
51 "Dehydration Statistics Statistics: Market Data Report 2024." n.d. https://worldmetrics.org/dehydration-statistics/.

52 "World 'At a Crossroads' as Droughts Increase Nearly a Third in a Generation." 2022. UN News. May 16, 2022. https://news.un.org/en/story/2022/05/1118142.

WMO is to tackle this problem directly, it will need to find ways to make cutting emissions more economically favorable in the short term, such as with renewable energy.

The second major contributor to water scarcity that could become even worse in the future is pollution of existing sources. This most commonly happens when waste products are continuously dumped into water sources, eventually rendering the water undrinkable or requiring more intensive purification.[53] The most widely-known type of water pollution is plastic pollution. Another type of water-polluting chemical that has gotten major press recently is PFAS (polyfluoroalkyl substances)[54]. However, perhaps the most harmful type of water pollution is the entrance of sewage and other biological waste products into water supplies. This can introduce harmful pathogens into the water supply, rendering the water undrinkable. Not only is this a dangerous type of contamination; it is also caused by many different sources, ranging from direct dumping of sewage to fertilizer runoff.[55] Much like global warming as a cause of water scarcity, pollution will be difficult to deal with for the reason of economic feasibility. To prevent pollution of water supplies, resource-efficient ways of safely disposing of waste, or ways to make waste less harmful, could be developed. Another way to deal with the pollution of water supplies could be the adoption of new purification systems, many of which are in development or already available now.

[53]"How Does Water Become Polluted?" 2016. American Geosciences Institute. November 17, 2016. https://www.americangeosciences.org/education/k5geosource/content/water/how-does-water-become-polluted.
[54]"PFAS Explained | US EPA." 2023. US EPA. October 25, 2023. https://www.epa.gov/pfas/pfas-explained.
[55]"Inputs and Impacts of Human Wastewater in Coastal Ecosystems." 2021. ScienceDaily. November 21, 2021. https://www.sciencedaily.com/releases/2021/11/211110170709.htm.



A riverbed in France lies dried out due to drought.[56]

The final major contributor to water scarcity is global industrialization, While industrialization has lifted billions out of poverty, it has also increased the demand for water, thereby increasing scarcity.[57] This is mainly due to the fact that more water is needed to sustain the higher living standards brought about by the process. This is shown in the statistic that in industrialized nations, more than half of water is used for industry, while in the world it is only about 20%[58]. Higher living standards can also mean higher levels of water use in the home. For example, in the United States, a rich and industrialized nation, less than 4% of household water use is for drinking[59]. Higher

[56] Wikimedia Commons. 2018. "File:Lac de l'Entonnoir - Img 49473.Jpg - Wikimedia Commons." Wikimedia.org. October 20, 2018. https://commons.wikimedia.org/wiki/File:Lac_de_l%27Entonnoir_-_img_49473.jpg.
[57] Roser, Max. 2023. "Extreme Poverty: How Far Have We Come, and How Far Do We Still Have to Go?" Our World in Data. December 28, 2023. https://ourworldindata.org/extreme-poverty-in-brief.
[58] "Water Use." n.d. https://www.worldometers.info/water/.
[59] Nnadi, Ernest. (2019). Multi-Benefits of Transitioning from Conventional to Sustainable Stormwater Management Approaches.

populations will also mean a higher demand for food, and in turn water, as well. The easiest way to sustain a high standard of living while also staving off water scarcity is finding ways to more efficiently use water, such as low-flow sinks and toilets. Other ways may include getting water from new sources, such as desalination, and improving supply chains to make water more easily accessible and evenly distributed.

In the end, water scarcity and access is a very broad topic, both in the causes of the problem, which range from climate change to higher living standards, as well as the solutions, which could range from short-term solutions such as supply chain improvement to long-term solutions such as renewable energy. In addressing the topic of water scarcity and access, the WMO must create a widely applicable and effective solution, while also keeping it feasible and without sacrifices that outweigh the benefits.

History of the Problem

Ever since the agricultural revolution, water scarcity has been a major problem. Most major ancient civilizations arose near rivers, as these provided sources of irrigation, transportation, and initially, fresh water. But, as these civilizations grew, these rivers became polluted, usually due to the dumping of waste and trash into the water supply. To fight this problem, civilizations began looking for new methods of hydration and sanitation. For example, Rome had a sewer system that emptied its waste into the Tiber river, and made aqueducts to bring clean water into the city.[60] Another common solution was to drink alcoholic beverages instead of water as the ethanol content would kill harmful pathogens.[61] During the Middle Ages, the water situation largely remained the same, though in some areas, such as Europe, it grew worse due to the decline of sewage systems, which led to

[60]"Ancient Roman Sewage System – Ancient-Rome.info." n.d. https://ancient-rome.info/ancient-roman-sewage-system/.
[61] Standage, Tom, *A History of the World in Six Glasses*

waste being dumped into the streets, and then washed into the water supplies by rain.[62] This situation largely remained until the sanitation revolution of the mid-19th and early 20th centuries, which involved the popularization of the flush toilet, which helped carry wastewater away from the cities, and the development of sewage treatment plants, which purified the wastewater.[63] In areas where such technologies were implemented, water quality improved drastically, and waterborne diseases, such as Cholera, were almost completely eliminated.[64]

The second half of the twentieth century saw the spread of sewage treatment worldwide, leading to much better water quality and a huge reduction in waterborne illness. For example, in 1953, over 140,000 people died of Cholera in Asia, and by 1967, it had been reduced to under 1,000[65]. Over the last 25 years, there has been even more expansion of water treatment, and 2.6 billion people have gained access during that time period. This still leaves, however, 663 million without access.[66] Unfortunately, though clean water has expanded greatly over the past century, the past century has also brought the rise of new reasons for water scarcity.

The most prominent cause of water scarcity that has emerged in the last century has been overuse. Following World War II, a massive baby boom was seen across the world.[67] This meant that agriculture would have to be expanded to accommodate a higher population. One of the main ways that food output was increased was irrigation, which is supplying water to agricultural land by digging channels. Unfortunately, crops cannot be

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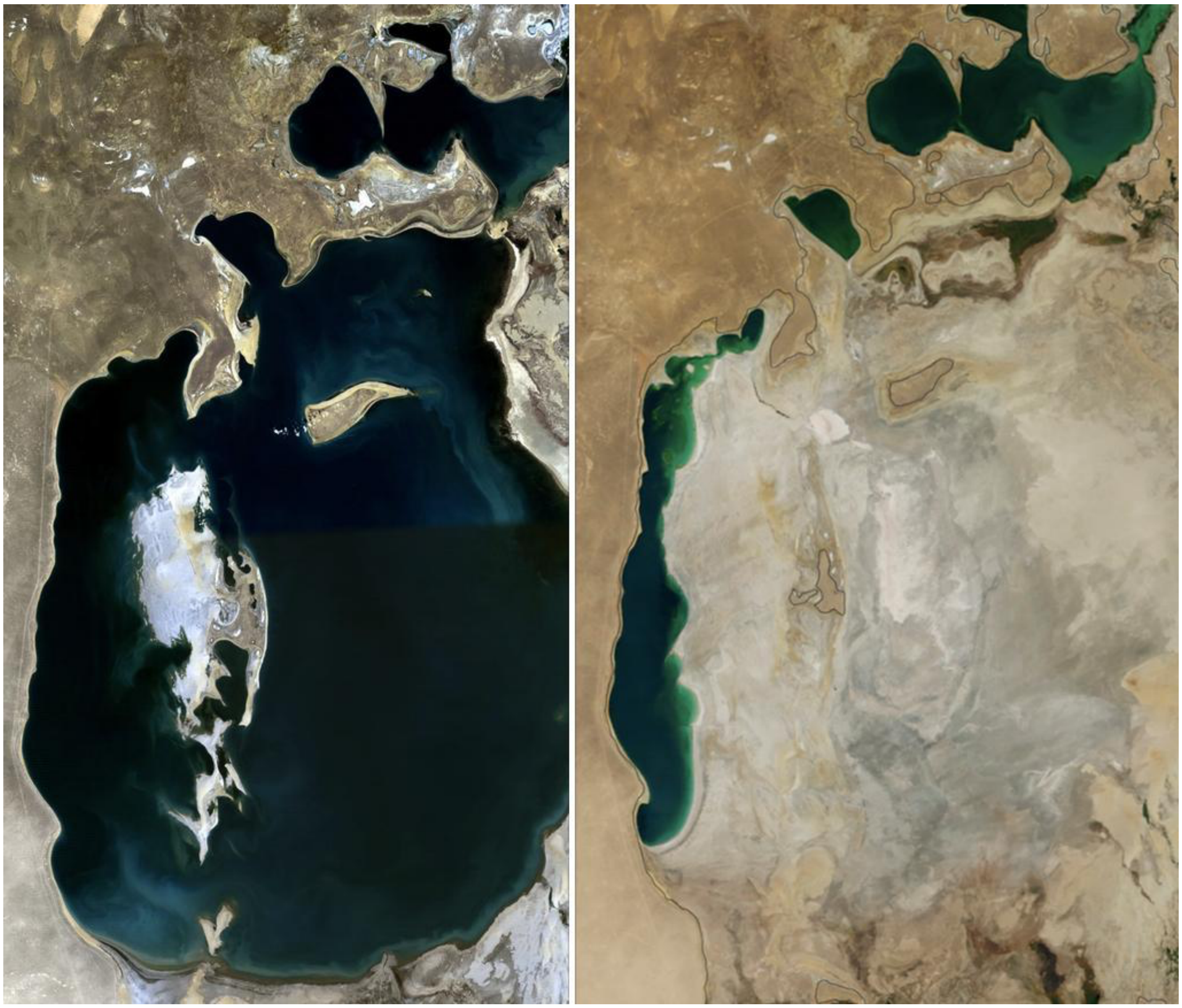
[62]Nathanson, Jerry A., and Archis Ambulkar. 2024. "Wastewater Treatment | Process, History, Importance, Systems, & Technologies." Encyclopedia Britannica. July 23, 2024. https://www.britannica.com/technology/wastewater-treatment.
[63] *Ibid*
[64]World Health Organization: WHO. 2023. "The cholera emergency is avoidable." *World Health Organization*, March 22, 2023. https://www.who.int/news/item/22-03-2023-the-cholera-emergency-is-avoidable.
[65]"Cholera Reported Deaths." n.d. Our World in Data. https://ourworldindata.org/grapher/number-of-reported-cholera-deaths.
[66]"See Where Access to Clean Water Is Getting Better—and Worse." n.d. National Geographic. https://www.nationalgeographic.com/clean-water-access-around-the-world/?sf22961007=1.
[67]Baby Boom. 2009. "Baby Boom | Definition, Cause, & Facts." Encyclopedia Britannica. March 10, 2009. https://www.britannica.com/topic/baby-boom-human-population.

effectively irrigated with salt water, and therefore this irrigation needed to be drawn from fresh water sources.[68] This water, of course, was water that could not be used for drinking, and in severe cases, it caused the collapse of entire water sources.



Satellite imagery shows the depletion of the Aral Sea from 1989 to 2014.[69]

[68]"Water Salinity and Plant Irrigation." n.d. Agriculture and Food. https://www.agric.wa.gov.au/water-management/water-salinity-and-plant-irrigation.
[69] NASA. 2014. "English: A Comparison of the Aral Sea in 1989 (Left) and 2014 (Right)." Wikimedia Commons. September 30, 2014. https://commons.wikimedia.org/wiki/File:AralSea1989_2014.jpg.

The most infamous example of this was the destruction of the Aral Sea, which was once the world's fourth-largest freshwater lake.[70] This began in the 1960s due to its use in Soviet irrigation.[71] Initially, this decreased the water level and increased salinity, leading to the disappearance of freshwater fish from the lake. By the end of the 20th century, most of the remaining water was used up, leaving 90% of what used to be the Aral sea a dry desert, and the remaining 10% polluted and saline.[72] All 24 of the lake's endemic fish species are presumed extinct, and this has caused the collapse of the area's fishing industry.[73] The agriculture that the Aral Sea's water was once used to support has collapsed as well.[74] While there are projects underway to restore the Aral Sea, it will be very difficult to bring it back to what it once was, and the disappearance of the lake is a cautionary tale about the effects that overuse of water sources can have.

To this day, agriculture represents the majority of freshwater consumption in the world, and it will be difficult to find ways to cut it without damaging the food supply. There are, however, ways theorized to do it, such as using crops that can survive with less water, and if agriculture's use of water could be effectively reduced, it could free large amounts for drinking.

The other major problem causing water scarcity that emerged in the 20th century was climate change. While climate change began with the adoption of coal power in the late 19th century, the release of CO_2 into the atmosphere ballooned after World War II from 4.26 billion tonnes in 1945 to 25.50 billion in 2000.[75] As the

[70]"Waiting for the Sea." n.d. BBC News. https://www.bbc.co.uk/news/resources/idt-a0c4856e-1019-4937-96fd-8714d70a48f7.
[71]Aral Sea. 2024. "Aral Sea | Description, History, Map, Shrinking, & Facts." Encyclopedia Britannica. June 21, 2024. https://www.britannica.com/place/Aral-Sea.
[72]*Pulitzer Center*. 2018. "Once Written Off for Dead, the Aral Sea Is Now Full of Life," March 16, 2018. https://pulitzercenter.org/stories/once-written-dead-aral-sea-now-full-life.
[73]"National Geographic ScienceBlogs: The Death of the Aral Sea - Pacific Institute." 2021. Pacific Institute. March 14, 2021. https://pacinst.org/national-geographic-scienceblogs-the-death-of-the-aral-sea/.
[74]"Aral Sea Catastrophe |." n.d. https://intlpollution.commons.gc.cuny.edu/aral-sea-catastrophe/.
[75]Ritchie, Hannah, and Max Roser. 2024a. "CO_2 Emissions." Our World in Data. January 22, 2024. https://ourworldindata.org/co2-emissions.

worldwide temperature rises, soil becomes increasingly dry, increasing demand for water for agriculture, and in turn causing the available water to decline.[76] Climate change also impacts the water cycle, making wet areas wetter and dry areas drier. This has led to expansion of deserts, such as the Sarhara, which has grown at least 10% since 1920.[77] The wet areas that become wetter can also be negatively impacted by climate change, as greater rainfall can cause greater fertilizer runoff, which contaminates water supplies.[78] Responding to this problem could either include mitigation, such as delivering water to areas experiencing drought, or trying to stop climate change itself, such as through renewable energy.

Today, pollution, climate change, and water overuse remain major causes of water scarcity. One of these, pollution, has been a problem since the beginning of agricultural society, and while it has drastically declined, it remains a major problem hindering water access worldwide. The other two, climate change and water overuse, became much more prevalent in the 20th century as humanity grew and became a major influence on Earth's ecology. In tackling the issue of water scarcity and access, the WMO must look over the past, learning from the successes and mistakes that have already occurred to plan for the future.

Past Actions

The WMO's primary purpose in the UN is to predict and monitor natural disasters, most of which are water-related.[79] As such, the WMO has long dealt with water problems, and the most significant natural disaster

[76]Stallard, Mark Poynting and Esme. 2024. "How Climate Change Worsens Heatwaves, Droughts, Wildfires and Floods." June 17, 2024. https://www.bbc.com/news/science-environment-58073295.
[77]Weisberger, Mindy. 2018. "The Sahara Desert Is Growing. Here's What That Means." *Livescience.Com*, March 29, 2018. https://www.livescience.com/62168-sahara-desert-expanding.html.
[78]"How Climate Change Impacts Water Access." n.d. https://education.nationalgeographic.org/resource/how-climate-change-impacts-water-access/.
[79]"Climate Change and Water-Related Disasters." n.d. UNEP - UN Environment Programme. https://www.unep.org/topics/fresh-water/disasters-and-climate-change/climate-change-and-water-related-disasters#:~:text=Over%2090%20per%20cent%20of%20%E2%80%9Cnatural%E2%80%9D%20disasters%20are,including%20drought%20and%20aridification%2C%20wildfires%2C%20pollution%20and%20floods.

related to water scarcity is drought. Over the years, the WMO has mostly responded to this problem by establishing programs and monitoring systems, often in collaboration with other UN agencies. It will be useful for the organization to look over its past actions before deciding what it does in the future.

Integrated Drought Management Programme

The most significant initiative launched by the WMO that directly deals with water scarcity is the Integrated Drought Management Programme (IDMP), which is run by the WMO and the Global Water Partnership (GWP).[80] This initiative seeks to work with local authorities to adopt effective drought management measures by providing guidance and scientific knowledge, which allows the organization to have an impact without infringing on national sovereignty. This programme has three pillars of drought management, which are monitoring and early warning; mitigation, preparedness, and response; and vulnerability and impact assessment[81]. It also seeks to orient drought management beyond mitigation to the long term. The IDMP has four regional programs, which are based in Central and Eastern Europe; West Africa; the Horn of Africa; and Central Asia and the Caucasus. However, it also operates in other areas, such as South Asia and the Americas.[82] Though, due to its non-invasive nature in working with local authorities, expanding this to other areas could be feasible. The programme is also supported by thirty expert institutions around the world[83].

WMO Integrated Processing and Prediction System

Another major effort by the WMO to deal with droughts has been WIPPS (WMO Integrated Processing and Prediction System), which is a network of operational systems around the world that acquires meteorological data

[80]"Drought." 2024. World Meteorological Organization. April 29, 2024. https://wmo.int/topics/drought
[81]"About – Integrated Drought Management Programme." n.d. https://www.droughtmanagement.info/about/.
[82]"Activities – Integrated Drought Management Programme." n.d. https://www.droughtmanagement.info/idmp-activities/.
[83]"Integrated Drought Management Programme." 2024. World Meteorological Organization. January 23, 2024. https://wmo.int/activities/integrated-drought-management-programme-idmp/integrated-drought-management-programme.

and circulates it among WMO member nations.[84] This has allowed WMO member nations, especially those with less resources, access to greater amounts of meteorological data, which is useful in predicting and monitoring droughts and other natural disasters. This and programs like it will be most useful for immediate response to and mitigation of droughts.

Intergovernmental Panel On Climate Change

Another WMO initiative comes in the form of the the Intergovernmental Panel on Climate Change (IPCC) which was founded by the WMO and the United Nations Environment Program in 1988. In 2007, the IPCC received the Nobel Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations that are needed to counteract such change."[85] The IPCC is the UN's primary body for climate science, and while it does not directly conduct any of its own research[86], it pools research from thousands of scientific papers to determine what has been learned about climate change, and then uses them to prepare reports in "assessment cycles" of around 5-7 years[87]. These reports include what has been learned about climate change, as well as the effects it has had and new recommendations for responding to it[88]. For example, in its last report in 2023, the IPCC established that despite legislation to counteract greenhouse gas emissions, such emissions have continued to increase, and some damage is most likely inevitable and irreversible[89]. Currently, the

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[84] "WMO Integrated Processing and Prediction System (WIPPS)." 2024. World Meteorological Organization. July 5, 2024. https://wmo.int/activities/wmo-integrated-processing-and-prediction-system-wipps.

[85] "The Nobel Peace Prize 2007." n.d. NobelPrize.Org. https://www.nobelprize.org/prizes/peace/2007/summary/.

[86] "About — IPCC." n.d. IPCC. https://www.ipcc.ch/about/.

[87] "IPCC Approves Outlines of the First Two Reports in the Seventh Assessment Cycle — IPCC." 2024. IPCC. August 2, 2024. https://www.ipcc.ch/2024/08/02/ipcc-approves-outlines-of-the-first-two-reports-in-the-seventh-assessment-cycle/.

[88] "Preparing Reports — IPCC." n.d. IPCC. https://www.ipcc.ch/about/preparingreports/.

[89] "AR6 Synthesis Report: Summary for Policymakers Headline Statements." n.d. IPCC. https://www.ipcc.ch/report/ar6/syr/resources/spm-headline-statements/.

IPCC is one of the most trusted sources for climate science[90], and as climate change is one of the major causes of water scarcity, the organization has been a player in long-term solutions to the problem.

In general, most of the WMO's actions to fight water scarcity have been non-invasive, focusing more on analyzing data and giving recommendations rather than direct response. It is possible the WMO would be more effective if it expanded its efforts to direct response, but this would be difficult as the organization cannot force governments to do anything. However, the WMO could make partnerships with governments or other UN organizations, much like it has in the past, in order to get more involved on the ground. In the end, the actions of the WMO in the past can provide a framework for how to act in the future, though the organization must adapt to changing circumstances and determine how to ensure that its non-invasive recommendations are being implemented.

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[90] *Scientific American*. 2024. "The IPCC Assessment Process," February 20, 2024. https://www.scientificamerican.com/article/the-ipcc-assessment-process/.

Possible Solutions

As water scarcity has many different causes and comes in many different forms, possible solutions to the problem are very diverse. However, the solutions can generally be categorized as either mitigating the problems or addressing their root causes, and as either short-term or long-term. As the WMO discusses potential solutions, it should be noted that WMO resolutions are non-binding and are thus unenforceable. However, these resolutions still carry substantial weight in the international community and are critical in providing global guidelines to solve the problem at hand.

Case Study: Flint Water Crisis, 2014 - 2019

A water treatment plant tower in Flint, MI.[91]

The most obvious short-term cause of water scarcity is drought, and an expansion of the IDMP may be an option to deal with this issue. However, there are other problems, such as sudden contamination, that can lead

[91] US Environmental Protection Agency. 2016. "File:Flint-Water-Treatment-Plant-Tower.jpg - Wikimedia Commons." Wikimedia.org. April 11, 2016. https://commons.wikimedia.org/wiki/File:Flint-water-treatment-plant-tower.jpg.

to short-term shortages of water. One of the most infamous cases of water scarcity due to contamination in recent years was the Flint water crisis of 2014-2019. This began in 2014 when the city of Flint, Michigan decided to switch its water supply to the Flint River from the Detroit Water and Sewage Department (DWSD) to save money[92]. Almost immediately, an increase in Legionnaires disease was reported in the city, and boil advisories were issued. However, this was only the beginning of Flint's water problems. Due to the higher acidity of the Flint River[93] and the water supply's use of lead piping, lead ions began entering the water supply. Soon, the water in Flint had levels of lead high enough for the United States Environmental Protection Agency to consider it hazardous waste, and tens of thousands of people were exposed to lead. The DWSD offered Flint the opportunity to switch back to their water, but the city refused.

On January 16th, 2016, US president Barack Obama issued an emergency declaration and mobilized FEMA (Federal Emergency Management Agency) to respond to the crisis, leading to over nine million liters of water being distributed to the city.[94] This provided a temporary fix, but if Flint was to be self-sufficient in the future, the water contamination needed to be dealt with. The first step was to switch the city back to the DWSD's water, which, along with the use of a special filter to leach the remaining lead ions from the water, made the water safe to drink again. Then, there began a massive replacement of the lead pipes in Flint with copper ones, a process that took many years and a huge amount of money.[95] Today, almost all of the pipes have been replaced, and the

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[92]Ray, Michael. 2024. "Flint Water Crisis | Summary, Facts, Governor, & Criminal Charges." Encyclopedia Britannica. June 27, 2024. https://www.britannica.com/event/Flint-water-crisis.

[93]Panko, Ben. 2017. "Scientists Now Know Exactly How Lead Got Into Flint'S Water." *Smithsonian Magazine*, February 3, 2017. https://www.smithsonianmag.com/science-nature/chemical-study-ground-zero-house-flint-water-crisis-180962030/.

[94]"FACT SHEET: Federal Support for the Flint Water Crisis Response And." 2016. Whitehouse.Gov. May 4, 2016. https://obamawhitehouse.archives.gov/the-press-office/2016/05/03/fact-sheet-federal-support-flint-water-crisis-response-and-recovery.

[95]"Flint Enters Final Phase of Lead Service Line Replacement." 2022. September 30, 2022. https://www.michigan.gov/egle/newsroom/press-releases/2022/09/30/flint-enters-final-phase-of-lead-service-line-replacement.

water is considered safe to drink. However, many residents are still distrustful of the water, and lead poisoning lead to permanent health problems in many residents, especially children, that still persist to this day.[96]

The Flint water crisis, both in its causes and responses, provides a framework for both what to do and what not to do that can be applied to future short-term water crises. The crisis, first of all, would never have happened if the city officials had properly assessed the effects of switching to the Flint River for their water, and for this reason, the WMO may want to provide resources for local governments to assess water risks, which it already does to a certain extent with the IDMP. Second of all, there was a major delay in response to the Flint water crisis, with the US government declaring a state of emergency almost a year after the lead contamination began. Thus, an additional avenue for the WMO to consider is to strengthen communication systems to ensure water scarcity is responded to quickly and effectively. Despite its shortcomings, the response to the Flint water crisis also included many elements that could be used by the WMO. For example, the response both tackled the immediate situation, in its provision of clean water and water filters, as well as the root cause, in its replacement of lead pipes with copper pipes. This was handled by the US government, which was able to handle the crisis due to the country being relatively rich. However, some countries may not have the resources to handle water crises they are facing, and therefore the WMO may want to create a system to provide financial or resource aid to countries in this situation.

Transitioning To Renewable Energy Sources

Long-term causes of water scarcity, such as climate change and high demand, also have a great number of potential solutions, varying in their effectiveness and feasibility. In the case of climate change, the most obvious solution is transition to renewable and clean energy sources. The most successful sources of renewable energy in

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[96]Planet Detroit. 2024. "Ten Years After the Flint Water Crisis, Distrust and Anger Linger." May 8, 2024. https://planetdetroit.org/2024/05/ten-years-flint-water-crisis-distrust-anger/.

recent years have been solar and wind power, accounting for 95% of renewable energy expansion.[97] Renewables are also expected to overtake coal as the largest source of energy worldwide by 2025. Clean energy sources that are not renewable, such as nuclear power, are also expected to grow in coming years.[98] Another possible source of power that could be a possibility in the near future is fusion power, which could produce huge amounts of energy with very little fuel. While it is not quite ready yet, fusion power has shown promising results in recent months, with London researchers generating 69 megajoules of energy, enough to power 12,000 households, for five seconds with only 200 micrograms of fuel[99]. Still, transition to renewable and clean energy may be difficult for countries still industrializing, and carbon emissions still continue to increase despite the expansion of renewable energy. Other solutions to climate change may include carbon capture, which is done by apparati attached to direct CO_2 sources, as well as recapture, which can be done simply by planting trees.[100]

Addressing Increased Demand for Water

There are also many solutions available to higher demand for water. As the largest consumer of water is agriculture, one possibility to save on the liquid's consumption is to use crops that can survive in harsher and more water-deprived conditions, either naturally or due to genetic modification. One major example of this is cereal rye, which can be used to make bread and can naturally survive in drier conditions than other types of grain. Another possibility to deal with the demand for water is desalination.[101] Due to the fact that 97% of the world's

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[97] "Massive Expansion of Renewable Power Opens Door to Achieving Global Tripling Goal Set at COP28 - News - IEA." 2024. IEA. January 11, 2024. https://www.iea.org/news/massive-expansion-of-renewable-power-opens-door-to-achieving-global-tripling-goal-set-at-cop28.

[98] "IAEA Increases Projections for Nuclear Power Use in 2050." n.d. IAEA. https://www.iaea.org/newscenter/pressreleases/iaea-increases-projections-for-nuclear-power-use-in-2050.

[99] *CNN*. 2024. "Scientists just set a nuclear fusion record in a step toward unleashing the limitless, clean energy source," February 8, 2024. https://www.cnn.com/2024/02/08/climate/nuclear-fusion-energy-milestone-climate/index.html.

[100] Weingart, Eden. 2023. "How Does Carbon Capture Work?" *The New York Times*, March 21, 2023. https://www.nytimes.com/interactive/2023/03/19/us/carbon-capture.html.

[101] "Cereal Rye." 2021. Sustainable Agriculture Research & Education Program. March 22, 2021. https://sarep.ucdavis.edu/covercrop/cerealrye.

water is in the ocean, the possibility of removing the salt and rendering such water drinkable could mean a manyfold increase to the world's water supply. Desalination in its current form already accounts for 1% of the world's drinking water supply[102]. However, recent advancements in desalination, such as a suitcase-sized device developed by MIT that can produce 4-6 liters of freshwater from saltwater each hour[103], could make this much more effective, especially coastal regions without good sources of clean water.

Reducing Pollution and Contamination

Finally, pollution, while it has gone down in recent years, remains a problem. In the case of pathogenic contaminants, boil advisories, such as those given in the early days of the Flint water crisis, may be useful. However, they do not respond to the root causes of water contamination. Fortunately, most of the technology needed to purify contaminated water already exists, and merely needs to be further rolled out. To do this, the WMO may want to make a partnership with a UN relief agency to provide regions without clean water with the resources they need for purification. Standardization of water quality and clear guidelines for analyzing and predicting the effects of developments, like what the WMO has already done for droughts in the IDMP, could be another possibility to ensure that water quality does not decline.

In the end, due to the huge scope of water scarcity, there are many different possible solutions to the problem. In developing solutions to this problem, it is critical that delegates consider how to address water scarcity in the short and long term, as well as developing solutions that tackle the root causes of water scarcity.

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[102] Voutchkov, Nikolay. n.d. "Desalination – Past, Present and Future." International Water Association. https://iwa-network.org/desalination-past-present-future/.

[103] "Desalination System Could Produce Freshwater That Is Cheaper Than Tap Water." 2023. MIT News | Massachusetts Institute of Technology. September 27, 2023. https://news.mit.edu/2023/desalination-system-could-produce-freshwater-cheaper-0927.

Bloc Positions

Region I: Africa

The Congo River is a lifeline for many in East Africa.[104]

Africa is a continent with a rich tapestry of climates, from sprawling deserts to dense rainforests, and it's home to over 1.4 billion people. Despite its abundant natural resources, the continent grapples with serious water management challenges. These challenges are driven by erratic climate patterns, rapid population growth, and underdeveloped infrastructure.[105] The World Meteorological Organization (WMO) is playing a key role in tackling these issues by creating early warning systems for droughts and floods and improving the sharing of

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[104] Wikimedia Commons: The Congo River is a Lifeline. Accessed August 27, 2024. https://commons.wikimedia.org/wiki/File:Oxfam_East_Africa_-_SomalilandDrought022.jpg.

[105] "State of Climate in Africa Highlights Water Stress and Hazards." 2023. World Meteorological Organization. February 27, 2023. https://wmo.int/news/media-centre/state-of-climate-africa-highlights-water-stress-and-hazards.

climate data across regions.[106] This support is crucial, as millions of Africans face water scarcity and poor quality, which impede economic development.

In response, African countries are undertaking various initiatives to improve water resource management. For example, the African Ministerial Council on Water (AMCOW) works to enhance water infrastructure and policy across the continent.[107] Countries like Ethiopia and Kenya are investing in water harvesting techniques and irrigation systems to better manage their water resources.

Region II: Asia

Asia, the largest and most populous continent, faces diverse water issues, including over-extraction of groundwater and significant river pollution. The WMO supports this region by providing advanced climate forecasts and assisting in the management of transboundary water resources[108]. This support is crucial due to the severe impacts of water challenges such as the depletion of the Indus and Ganges rivers and extensive flooding in Southeast Asia, which affect millions of people and regional economies[109].

Countries in Asia are addressing these challenges through both regional cooperation and technological advancements. China and India are investing in major water management projects, while the Mekong River Commission is facilitating cooperative management of water resources in Southeast Asia.[110] Efforts are also underway to improve agricultural water efficiency and reduce pollution. Enhancing regional partnerships and advancing water management technologies are critical for sustainable water use in the continent.

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[106] "Region I: Africa." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/africa.
[107] "Programmes – African Ministers' Council on Water (AMCOW)." n.d. https://amcow-online.org/programmes/.
[108] "Region II: Asia." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/asia.
[109] "It's Time for South Asia To Talk Climate." n.d. United States Institute of Peace. https://www.usip.org/publications/2022/10/its-time-south-asia-talk-climate.
[110] "Mekong River Commission MRC." n.d. https://www.mrcmekong.org/.

International collaborations have furthered these initiatives. For instance, the World Bank's South Asia Water Initiative aims to improve water management and infrastructure in South Asia, including countries like India, Bangladesh, and Nepal.[111] This initiative focuses on enhancing water supply, reducing pollution, and promoting sustainable practices across the region. Such efforts are essential for tackling the complex water issues in Asia and ensuring effective management of its water resources.

Region III: South America

South America is endowed with substantial water resources, notably including the Amazon Basin, yet it faces significant challenges such as deforestation, pollution, and infrastructure deficits. The WMO contributes by providing essential climate data and forecasts, which are crucial for managing water resources and addressing the impacts of environmental changes[112]. This support helps mitigate issues like pollution and deforestation that threaten water quality and availability.

Countries such as Brazil and Argentina are taking steps to safeguard their water resources. Brazil is working on combating deforestation in the Amazon and enhancing water quality monitoring. In turn, Argentina and Chile are focusing on advancing water management technologies and improving infrastructure. Regional organizations, including the Amazon Cooperation Treaty Organization (ACTO), facilitate cooperation between nations to address deforestation and manage resources effectively[113].

International collaborations are also playing a key role. Partnerships with organizations such as the World Bank and various environmental NGOs are supporting projects aimed at improving water management and

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[111] "South Asia Water Initiative (SAWI)." n.d. World Bank. https://www.worldbank.org/en/programs/sawi.
[112] "Region III: South America." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/south-america.
[113] "ABOUT US - OTCA." 2021. OTCA. April 13, 2021. https://otca.org/en/about-us/#:~:text=Facilitate%20and%20foster%20actions%20to,with%20nature%20and%20the%20environment.

conservation. These cooperative efforts are important for addressing the complex water management challenges in South America and ensuring sustainable use of its water resources.

Region IV: North America, Central America, & the Caribbean

This diverse region faces a range of water challenges, including pollution, water rights disputes, and the impacts of climate change. The WMO supports North America, Central America, and the Caribbean by providing climate monitoring and early warning systems to manage water resources and address extreme weather events[114]. This support is crucial for regions experiencing water stress due to industrial activities and climate variability.

Countries in the region are implementing various strategies to address water issues. The United States and Canada collaborate on agreements like the Great Lakes Water Quality Agreement to manage shared resources. In Central America, nations are advancing integrated water resource management plans, while Caribbean countries focus on enhancing climate resilience and water access.[115]

Region V: Southwest Pacific

The Southwest Pacific, with its numerous small island states, faces distinct water management challenges. These include irregular rainfall patterns, limited infrastructure, and issues with water contamination. The World Meteorological Organization (WMO) supports these nations by providing critical climate data and early warning systems[116]. This support helps manage water resources and prepare for extreme weather events, which is especially

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[114] "Region IV: North America, Central America, the Caribbean." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/north-america-central-america-caribbean.

[115] "Advancing Integrated Water Resource Management in Central America Through Improved Monitoring and Policy Instruments | Department of Economic and Social Affairs." 2023. December 31, 2023. https

[116] "Region V: South-West Pacific." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/south-west-pacific.

important in a region where climate change and natural disasters, such as cyclones and floods, significantly impact water availability.

In response to these challenges, countries in the region are undertaking various initiatives. Fiji and Samoa are investing in rainwater harvesting systems and improving water infrastructure to address water scarcity. For instance, Fiji has implemented systems that capture and store rainwater for both drinking and irrigation purposes. Samoa is also enhancing its water infrastructure by upgrading pipelines and water treatment facilities to reduce leakage and contamination.

Regional organizations play a vital role in coordinating these efforts. The Pacific Islands Forum (PIF) works on regional policies and strategies to promote sustainable water management. The Secretariat of the Pacific Regional Environment Programme (SPREP) provides technical support and facilitates collaboration among island nations on climate adaptation and water resource management.[117] These organizations help unify efforts across the region, ensuring that strategies are aligned and resources are used effectively.

Region VI: Europe

Europe generally enjoys stable water access but faces significant challenges such as pollution, over-extraction, and regional disparities. The World Meteorological Organization (WMO) supports European countries by providing crucial climate and hydrological data, which aids in managing water resources and responding to extreme weather events[118]. This support is essential for addressing pollution issues and ensuring consistent water quality across the continent's diverse regions.

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[117] "Climate Change and Disasters | Pacific Islands Forum Secretariat." n.d. https://forumsec.org/climate-change-and-disasters.
[118] "Region VI: Europe." n.d. World Meteorological Organization. https://wmo.int/about-us/regions/europe.

European nations are actively engaged in improving water management through various initiatives. The European Union's Water Framework Directive (WFD) is a key regulatory framework aimed at achieving sustainable water use and maintaining high water quality[119]. This directive requires member states to implement river basin management plans and take actions to prevent pollution, restore ecosystems, and ensure that water bodies meet environmental standards.

[119] "Water Framework Directive." 2024. Environment. July 31, 2024. https://environment.ec.europa.eu/topics/water/water-framework-directive_en.

Glossary

Desalination: The process of removing salt and other impurities from seawater to make it suitable for drinking and irrigation.

Water Scarcity: The lack of sufficient available water resources to meet the demands of water usage within a region. It can result from both physical shortages and issues with water quality.

Wet Areas: Regions with high levels of precipitation, such as rainforests or marshlands, where the environment is typically moist or saturated

Aqueduct: An artificial channel or bridge designed to transport water from a distant source to a place where it is needed, such as in ancient Rome

Agricultural Revolution: A period of significant technological advancement in farming practices, beginning around 10,000 BCE, which led to the development of agriculture and the rise of permanent settlements.

Sanitation Revolution: A historical period in the mid-19th to early 20th centuries marked by significant improvements in public health through the development of modern sewage systems and treatment facilities.

Aral Sea: A large, formerly freshwater lake in Central Asia that has largely dried up due to excessive water diversion for irrigation, resulting in environmental and economic consequences.

Desertification: The process by which fertile land becomes desert as a result of drought, deforestation, or inappropriate agriculture, leading to a decrease in land productivity and increased water scarcity.

Fertilizer Runoff: The loss of excess fertilizers from agricultural fields into nearby water bodies, which can lead to nutrient pollution and harmful algal blooms.

Integrated Drought Management Programme (IDMP): A program run by the WMO and the Global Water Partnership that aims to improve drought management through monitoring, early warning, mitigation, preparedness, and impact assessment

Intergovernmental Panel on Climate Change (IPCC): An international body established by the WMO and the United Nations Environment Programme to assess scientific knowledge on climate change and its effects. It provides periodic assessment reports and recommendations.

Boil Advisory: A public health warning issued when water is contaminated with pathogens, advising residents to boil water before using it to kill harmful microorganisms.

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