Taking Stock of Climate Action at COP28

This November in Dubai, scientists, government representatives, and climate advocates will gather for the United Nations Climate Change Conference, otherwise known as COP28. The focus will be on progress that signatories of the 2016 Paris Agreement have made toward their climate goals.

At Eos, we’re doing some reflecting of our own—on the state of global climate action. In this special COP28 issue, we bring you stories that illustrate the challenge of meeting big climate goals while ensuring that the benefits of climate action are shared ethically and equitably with regions bearing the most significant impacts of climate change.

In “Layers of Climate Change,” we see the wide-ranging ways Earth’s interconnected systems are affected by human activity. The beautiful poster also shines a light on some of the creative adaptations scientists are pursuing to mitigate the effects of climate change, from developing carbon capture technologies to ensuring that smallholder farmers have access to data.

As cities become more populated, urban green space—and equitable access to it—is becoming a larger part of the climate discourse. In “Weighing the Benefits of Urban Greening” and “Growing Equity in City Green Space,” we learn that one neighborhood’s version of greening may not translate to another. When designing parks, gardens, and other green spaces, planners must consider local needs and use patterns, as well as the space’s history, geology, and climate. Community engagement and ownership are key, researchers say.

Discovery, progress, and innovation are crucial to climate action and global in scope. In “Raising the Visibility of Latin American Science,” we report on the ways the Global North’s definition of success has steered international science. To gain visibility and advance their work, scientists from the Global South have traditionally been forced to align their research goals with those of the English-speaking Global North. A growing movement led by Latin American researchers and journals, however, is charting a new course in how science is evaluated and published.

Ensuring diversity when addressing climate action as well as other scientific pursuits is a moral obligation, scientists say, not only a professional or financial opportunity. In the opinion “Moving Beyond the Business Case for Diversity,” some scientists suggest that institutions take a hard look at the motivations and practices surrounding their efforts regarding diversity, equity, inclusion, and justice and create an environment in which “all members are heard, seen, and valued without having to provide justification for their inclusion.”

COP28 attendees will grapple with complex scientific, ethical, and political hurdles. The world is facing a crisis, but the solutions are out there.
From the Editor

Illustration: Layers of Climate Change

News

AGU Research

Opinion

Growing Equity in City Green Space

By Kimberly M. S. Cartier

Raising the Visibility of Latin American Science

By Humberto Basilio

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Layers of Climate Change
Issues and Solutions from Sky to Sea

Earth is an interconnected system—changes in one part ripple throughout the world. Anthropogenic climate change throws that system out of balance and endangers biomes, livelihoods, and lives. As countries around the world work to lower carbon emissions and switch to renewable energy sources, scientists also are developing innovative ways to mitigate climate impacts. Read below to learn about some of the pressing problems the world faces and solutions in the works to help communities adapt. Scan the QR codes to learn more.

**ATMOSPHERE**

- Carbon dioxide (CO₂) warms the atmosphere
- Methane (CH₄), a greenhouse gas more potent than CO₂, is on the rise
- Plug methane leaks in natural gas wells, storage, and pipelines

**CLOUDS**

- Hurricanes and cyclones become stronger and more frequent
- Shifts in the El Niño–Southern Oscillation (ENSO) endanger food security
- Provide accessible Earth system data to smallholder farmers

**FORESTS**

- Worsening drought conditions increase risk of wildfires
- Excessive deforestation harms biodiversity, heightens drought risks, and erodes soil faster
- Urban heat islands disproportionately affect historically underserved communities
- Create accessible and equitable urban green spaces to improve public health

**CITIES**

- Integrate climate adaptation measures into coastal communities and infrastructure
- Develop new forest management strategies and wildfire hazard maps that account for shifting rainfall patterns
- Create accessible and equitable urban green spaces to improve public health
- Use green spaces and ecofriendly building materials in new urban construction to improve drainage

**OCEAN**

- Melting glaciers raise sea levels, which threaten to flood coastal communities
- Melting glaciers raise sea levels, which threaten to flood coastal communities
- Acidifying ocean waters imperil marine food webs, threatening fisheries
- Implement sustainable fishing practices, monitor ocean pH, and cultivate acid-buffering coastal landscapes

Text by Kimberly M. S. Cartier
Illustration by Mary Heinrichs
The authors suggest that policymakers act from a reactant approach.

As global temperatures rise, "adaptation" becomes less effective. The authors add, "As global temperatures rise, the efficacy of adaptation is further reduced. Indeed, the gap between national pledges and emissions reductions required to limit warming to below 1.5°C or at most 2°C is growing. The authors note, "The world needs urgently to address loss and damage."

1. Human security requires climate action.

Climate change is already affecting human, animal, and environmental security. The authors point out, "The world needs urgently to address loss and damage."

2. Vulnerability hot spots abound in regions at risk.

Climate change is already affecting human, animal, and environmental security. The authors note, "The world needs urgently to address loss and damage."

3. From adaptation to finance, here are takeaways from the 2022 edition.

The authors suggest, "The idea of "endless adaptation" is a myth."

4. The world can break down structural barriers.

The authors note, "The world needs urgently to address loss and damage."

5. Sustainable land use is essential to meeting climate goals.

The authors state, "The world needs urgently to address loss and damage."

6. The idea of "endless adaptation" is a myth.

The authors suggest, "The idea of "endless adaptation" is a myth."

7. Deforestation associated with agriculture is a major contributor to climate change.

The authors note, "The world needs urgently to address loss and damage."

8. The world needs urgently to address loss and damage.

The authors conclude, "The world needs urgently to address loss and damage."

The authors suggest that policymakers act from a reactant approach.
Weighing the Benefits of Urban Greening

Cities suffer from the urban heat island effect and increased flooding. Urban planners often suggest adding parks and creating green spaces to reduce heat and increase cooling. In arid climates, greening works best when focused on reducing surface water runoff, whereas in more humid climates, cooling is more likely to be a stronger benefit.

Urban greening has a lot of potential benefits, but there are also negative consequences that can outweigh any one context can translate to solutions," said Nagen Nagendra, a professor at the School of Earth and Environmental Sciences at Cardiff University. "The key is to understand the environmental effects of urban greening projects on different ecosystems.

One major finding is that in arid climates, urban greening works best when focused on reducing surface water runoff, whereas in more humid climates, cooling is more likely to be a stronger benefit. Because of this relationship, "tropical urban greening strategies cannot yield high performance everywhere," especially for both urban heat island and urban flooding problems in most climates globally, Cuthbert explained.

Other factors, such as substrate thickness, can affect the benefits of urban greening projects. For example, in tropical areas, greening measures that inadvertently increase water absorption could lead to waterlogged areas. Thinner substrates like green roofs provide cooling benefits, and "in general, thicker soils in urban parks have greater moisture storage capabilities," Cuthbert said. However, the locations and field studies have been done in temperate cities, so we don't really know enough to devise best strategies for tropical cities, she said.

The Need for Local Planning and Community Engagement

Although an urban planner may want to install a park on the basis of its localized climate benefits, community residents actually want it in their neighborhoods. "There are several layers of complexity" to urban greening policies and projects, Nagendra said. "It is important to note that the "democratic and urban parks" approach doesn't work in India, where it is more important for them to have community gardens and there is high obesity. Do [residents] want safe open spaces for children to play?" Nagendra asked. "Or is it a food desert, and there is high awareness of the need for proper nutrition? Do they want to grow their own food?"

Creating green spaces can also contribute to social inequities if it is not accompanied or even opposed by a broader perspective of urban greening that focuses on only the ecological benefits. "Is it an area where children are deprived of play spaces?" Nagendra asked. "Or is it a food desert, where people are deprived of access to proper nutrition?"

In arid areas where people depend on play spaces and access to common resources, "is there a right to common areas for play?" Nagendra asked. "Or is it a food desert, where people have access to proper nutrition?"

The study focused on four parks in the city of Hyderabad, in India. Low-income groups were marginalized. For example, the parks all had entry fees, as well as regulations that prohibited flower harvesting. In addition, women residents raised safety concerns. Urban parks like those in Hyderabad must be "reimagined as commons, with access to all," the paper concludes.

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How Climate Change Is Affecting Women in the Amazon

According to the United Nations, climate change and its effects are not gender neutral. Women and girls bear the brunt of the climate crisis, making gender inequalities.

When extreme events happen, women are especially affected, as they are often responsible for traditional home-based work,“ said Marcela Vecchione, an Amazonian studies researcher at the Federal University of Pará.

In Brazil, women are a powerful workforce behind family farmers. They are also highly vulnerable to gender-based violence in the aftermath of extreme events. Agricul
ture, a deeply weather-dependent activity, is still the largest employer of women in low- and lower-middle-income countries, globally, women own less than 13% of agricultural lands, according to the United Nations. Climate change exacerbates these inequalities.

Agriculture in the Amazon region is a deeply weather-dependent activity, a practice that is especially vulnerable to gender-based violence. Women are particularly vulnerable to flooding and drought. “Soils in the Amazon are really acidic, so the overflow of rivers helps balance the soils' pH,” said Marcela Vecchione, an Amazonian studies researcher at the Federal University of Pará.

Defining Solitudes

In Brazil, rainfall patterns have changed, said Elizângela Costa, a Baré Indigenous leader who directs the Women's Association. “When extreme events happen, women are especially affected, as they are usually responsible for traditional home-based work,” said Luz. In a previous round of the project, the logs considered women's work's worth—something that has been historically made invisible. "Every day, women write and receive twice the compensation," Vasconcelos said. “And that is even worse, as they have a double work journey and do not know what they would pay or get, even that value, according to Luz, is an underestimate, because they have an idea of their work's worth—something that has been historically made invisible," said Luz. In a previous round of the project, the logs considered women's work's worth—something that has been historically made invisible.

A new study on Brazil’s Minas Gerais province, the area known as the Dema region, found that women who participate in agroecological projects are particularly underestimated. "In that study, the gender bias is hidden in the data," said Beatriz Luz, an educator at the Center for Alternative Technologies of the Zona de Mata region in the eastern part of Brazil. “The result of both flood and drought is increased food insecurity,” said Mônica Vasconcelos, a sociobiodiversity researcher at the State University of Amazonas. “Women usually own the fewest plots because they are the only ones who grow food for the whole family, and they do not receive the compensation they need because of"..." In Brazil, rainfall patterns have changed, said Elizângela Costa, a Baré Indigenous leader who directs the Women's Association. “When extreme events happen, women are especially affected, as they are usually responsible for traditional home-based work,” said Luz. In a previous round of the project, the logs considered women's work's worth—something that has been historically made invisible. "Every day, women write and receive twice the compensation," Vasconcelos said. “And that is even worse, as they have a double work journey and do not know what they would pay or get, even that value, according to Luz, is an underestimate, because they have an idea of their work's worth—something that has been historically made invisible," said Luz. In a previous round of the project, the logs considered women's work's worth—something that has been historically made invisible.

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The Global Health Benefits of Going Net Zero

Fossil fuel combustion doesn’t only produce greenhouse gases, but it also plagues people who breathe its poisonous emissions for long periods of time. As a result, it kills more people each year than does any other cause of death. Yet, despite this, many countries are still not doing enough to control its emissions, especially when it comes to power plants, which account for nearly half of all power-related carbon dioxide emissions and one-third of all global fine particulate matter pollution.

To combat this ongoing issue, researchers at the University of Colorado Boulder and the National Center for Atmospheric Research, led by Omar Nawaz, a senior research scientist with the National Center for Atmospheric Research, and co-author of the study, applied a novel approach to modeling power plant emissions. They used computer simulations to quantify the number of deaths that could be avoided if G20 nations were to reduce their emissions, and they found that reducing power plant emissions alone would save approximately 8,000 lives annually by 2040.

Reduce Emissions to Save Lives

The researchers calculated that reducing power plant emissions alone would prevent approximately 13,800 lives from being lost each year by 2040, a significant improvement on the current trajectory for these nations. They found that the United States, China, and India are the nations that have the greatest number of air-quality-related deaths among G20 countries. Reducing emissions in these countries alone would yield public health benefits for 300,000 lives annually by 2040.

Air Pollution Across Borders

Because air pollution crosses political borders, nations need to cooperate to realize these life-saving effects. The researchers found that their method could be used to look at any country or region. They found that reducing emissions in China alone would prevent roughly 2,500 lives annually by 2040.

Nations notice to cooperate to realize these life-saving effects.

The team concluded that particulate matter and ozone pollution in G20 countries cost the world hundreds of billions of dollars a year in reduced productivity and healthcare costs. They also found that reducing emissions in the United States alone would yield public health benefits for approximately 7,000 lives annually by 2040.

And a study published in GeoHealth, which is a journal that publishes research on the impact of climate change on public health, found that reducing emissions in the United States alone would yield public health benefits for approximately 7,000 lives annually by 2040.

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Table 1. Possible Avoided Deaths If G20 Countries Stay on Track

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<th>Country</th>
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Large-scale forest planting projects have been proposed as a carbon sequestration strategy for mitigating anthropogenic climate change. In southern China, tree-planting initiatives over recent decades have significantly expanded forested areas and sequestered substantial amounts of carbon in tree biomass. Understanding both the historical carbon sequestration and the potential for future carbon storage through forestation is important for developing climate change mitigation strategies.

Zhang et al. use a combination of data synthesis, remote sensing, and machine learning approaches to estimate the historical trajectory and the potential carbon storage capacity of forests in southern China. They find that regional forest carbon storage has increased over the 15-year study period, signifying successful carbon sequestration, and they identify opportunities for further increasing carbon density in forestation projects. However, they also find that forests in the region have already achieved more than 73% of their carbon storage capacity, indicating that afforestation alone will ultimately face limits as a carbon sequestration strategy. (Earth’s Future, https://doi.org/10.1029/2022EF002674, 2022)

By Benjamin Sulman, Associate Editor, Earth’s Future

The research reported here supports Sustainable Development Goal 15. AGU is committed to supporting the United Nations 2030 Agenda for Sustainable Development, which provides a shared blueprint for peace and prosperity for people and the planet, now and in the future.
Moving Beyond the Business Case for Diversity

OPINION

By Melissa Burt, Melissa Burt is an assistant professor of higher education in the Department of Higher Education at the University of North Carolina at Greensboro. Melissa Burt is an assistant professor of higher education in the Department of Higher Education at the University of North Carolina at Greensboro.

The business case for diversity may seem sound. But it is ethically flawed, as it is not enough and is potentially even harmful.

It is time for institutions to create transformational and equitable spaces that allow all scholars to be productive, to contribute, and to explain why they should be seen, heard, and included.

We recommend that institutions and individuals reflect on their moral rationales for diversity in U.S. universities and how different groups are treated.

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Growing Equity in City Green Space

By Ayushi Trivedi, Gender and Social Equity Research Analyst, World Resources Institute

As cities work to become more resilient, they're coming to rely on nature to help mitigate their challenges. In July 2021, the World Resources Institute (WRI) published a perspective article in Eos, a science journal, titled "Growing Equity in City Green Space," which explored how green spaces can serve as a vehicle for equity-focused development.

The article discussed the different ways that green spaces can be designed and implemented, emphasizing the importance of community-led organizations and participatory approaches in the planning process.

"I think the tendency is for geoscientists to focus on data and models, but one thing that I've learned is that these questions are too important for the scientific community to leave to the economists alone," said Trivedi.

"When a city, for example, plans a new train station, they might ask, 'How do we reduce the amount of water we need to pump into the system?' Sometimes the more environmentally friendly options are more expensive, but there are other considerations that go outside the scope of the scientific community," she continued.

"I was designing a green street for an area near the University of Iowa. 'What is the right place for trees?' I was asking myself. And I realized that I needed to involve the community. 'Would they be comfortable using them? Such a design strategy requires engagement and a participatory approach during planning stages.'"

"It's these in-occurrence points that are the root of the problem. It's not only the science that we need, it's the social implications as well," said Trivedi.

"Environmental justice affirms that all people have the right to clean air and water, safe food, and healthy environments. But the reality is that people of color and lower-income communities are often exposed to higher levels of pollution and pollution-related hazards."
Their options are limited to private, high-impact journals of the Global North, which have been largely determined by the Global North. The Latin American Model of publishing research only to publish in a journal that will “die quickly” is a common practice. Latin American journals are more vulnerable to economic conditions and even closure. Spending years of work on research may have no impact, or at best, be published in a journal that will “die quickly.”

One group of researchers readily acknowledged that scientific endeavors may have little value if they are not in lists of the world’s publications with the highest impact factors. Global North journals are the gatekeepers of research ‘quality,’” said Hebe Vessuri, an Argentinean social anthropologist at the Environmental Geography Research Center in Panama. The connections and personal networks of her undergraduate professors allowed her to begin her academic career in geological sciences at the University of Colorado Boulder and be a postdoctoral fellow at the Institute of Atmospheric Sciences and Climate at the University of Mainz, Germany. Vessuri is now a professor at San Francisco State University. The connections and personal networks of her undergraduate professors allowed her to begin her academic career in geological sciences at the University of Colorado Boulder and be a postdoctoral fellow at the Institute of Atmospheric Sciences and Climate at the University of Mainz, Germany. Vessuri is now a professor at San Francisco State University.

Research in Latin America is often characterized by limited resources. Many researchers are convinced that learning about the world outside Colombia is necessary to assess research on its own merits rather than on the basis of the impact factor. Artaxo noted that global citation-based evaluation parameters as the Global North: If publishing in these journals is still the way to ensure international visibility, then it is also the way to ensure that global science is the only science that matters.

Collaboration and Visibility

Internationalization: A One-Way Street

The problem of international relations and practicality has existed for decades and “continues practically everywhere,” according to social scientist Miguel Calva, who had a Ph.D. in the geological sciences department of the University of Chile. “The need to assess the quality of research,” he said, “is not a matter of individual practice. It determines which science is the “best” through its own merits rather than on the basis of the citation patterns of research.”

In other words, she analyzed the extent to which connections, such as international collaborations, are an indicator of visibility. Among the 4,058 most cited researchers worldwide in 2018, 76% were from the Global North. Ten of the 11 most cited researchers in the world were from the Global North. In the fifth decade since the 1960s, the number of researchers from more than 11 countries is still limited. “This problem has existed for decades and continues practically everywhere,” according to social scientist Miguel Calva, who had a Ph.D. in the geological sciences department of the University of Chile.

“Only one in five published research is from Latin America because they are in “another world,” Ames said. Until the region’s science policy encourages national or regional journals in Latin America. (Sometimes national or regional journals in Latin America. (Sometimes) And sometimes authors write, whether under-citation is due to a “psycho-social bias or a concern.

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For many Latin American scientists, there is only one way to access the scientific world: through journals written in English.

The decline of investment in regional journals also meant a loss of visibility for Latin American science. "We ran out of funding," said Karenia Córdova, who helped to launch the online science platform GeoLchat in 2014, along with other Colombian geoscientists. But Córdova, along with other Latin American scientists, has pointed out that the pull of the Global North further perpetuates a cultural hegemony.

"The language of science is English," said Pedro Urquijo, a researcher in Latin American historical geography at the Universidad Nacional Autónoma de México. "In Latin America, the majority of research is still written in Spanish, but it's never published in a high-impact journal from the Global North."

The Nature of the Future

The Nature of the Future is a community-oriented website that aims to spread geoscience research in Spanish to the Global North. It is focused on science in Latin America, and its mission is to support and promote geoscience research in the region.

The website was launched in 2014 by Carolina Ortíz and Pérez-Ángel, a geoscientist at the University of Colorado Boulder. The website has grown to become a platform for Latin American geoscientists to share their research and connect with colleagues in other parts of the world.

The website has a partnership with the University of Colorado Boulder, and it has been recognized as a valuable resource for Latin American geoscientists. The website has been described as a "digital platform for Latin American geoscientists to connect with each other and share their research."

The website has a mission to promote and support Latin American geoscience research, and it has been successful in doing so. The website has been praised for its "high-quality content" and its "valuable resources for Latin American geoscientists."

The Future of the Website

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