



Climate Justice for Inclusive STEM Research and Communication



ENVIRONMENTAL
SOLUTIONS
INITIATIVE

What's in this module?

Activities

13 readings
6 case-studies
1 video
1 optional
project

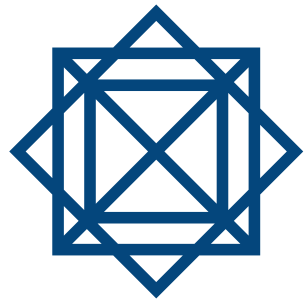
Contents

This module discusses the relevancy of climate justice across STEM fields and science communication. It aims to create more inclusive scientists, researchers, and communicators through a broad collection of STEM & Climate Justice case studies.

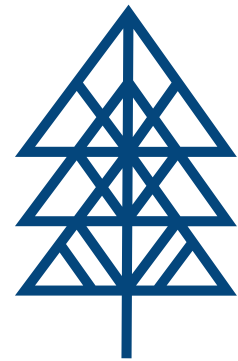
Key Resource

- [Situating the Scientist: Creating Inclusive Science Communication Through Equity Framing and Environmental Justice](#)

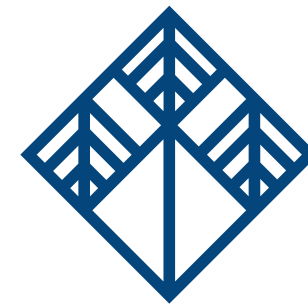
Agenda and Learning Objectives



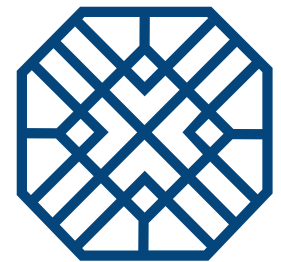
Understand the significance of the relationship between CJ and STEM



Discuss STEM case studies centered around climate justice



Examine the different ways CJ is related to specific STEM fields

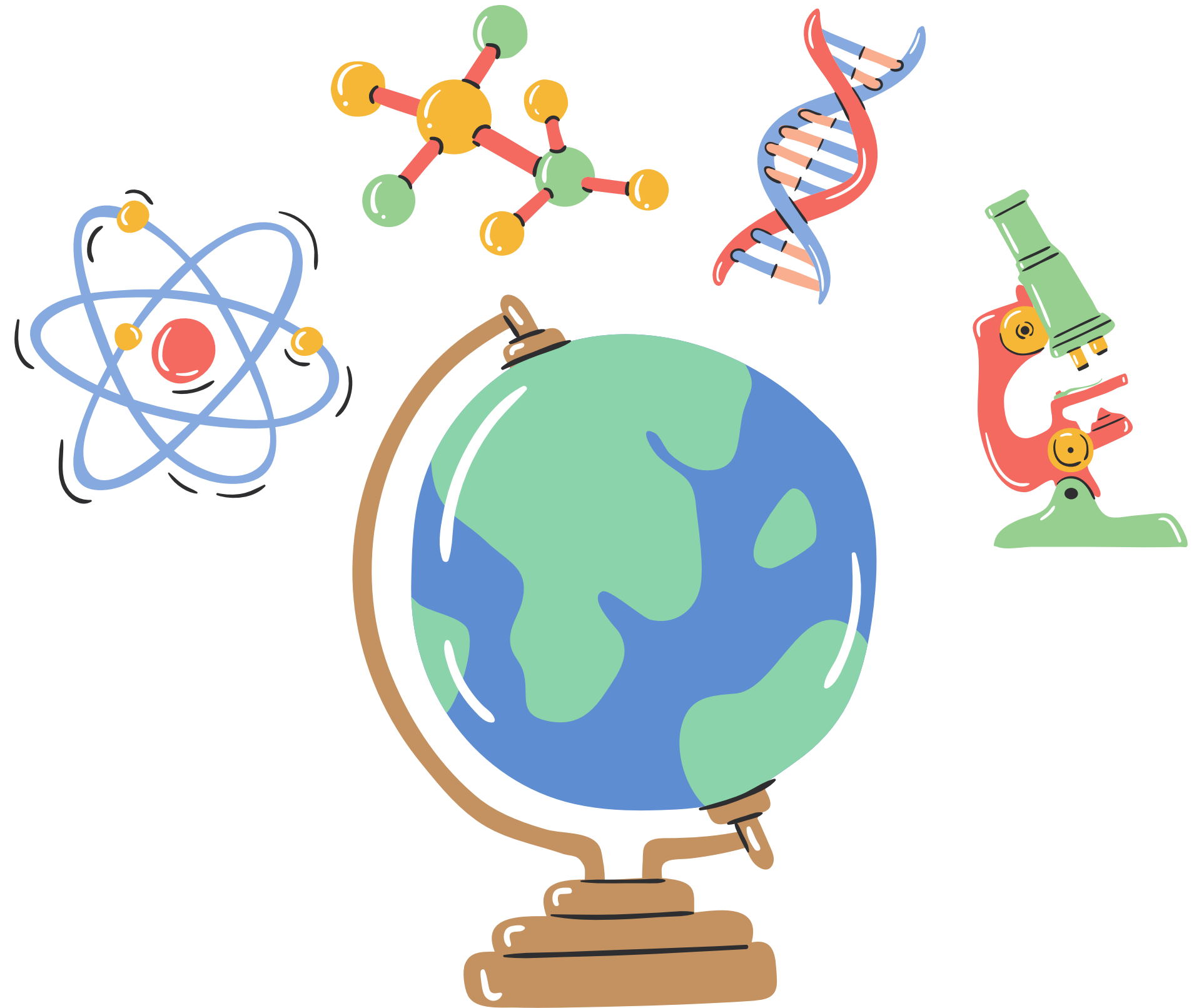


Explore current efforts bridging the gap between CJ and STEM

Warm up:

Why is STEM important to climate justice, and why is climate justice important to STEM?

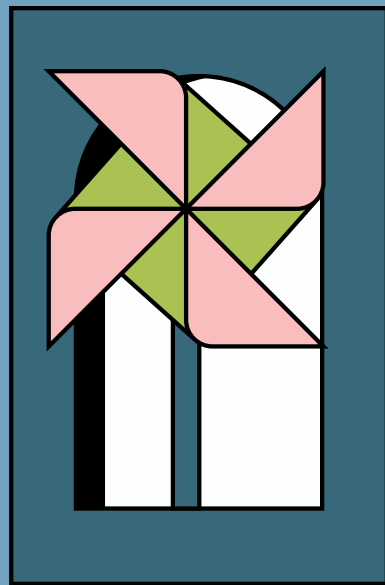
Turn to a partner or small group and discuss your ideas...



STEM to Climate Justice

01

Sustainable
Technologies



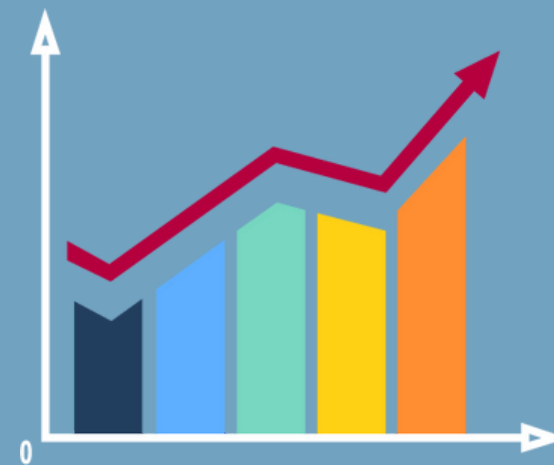
02

Environmental
Monitoring



03

Data Analysis/
Climate Science



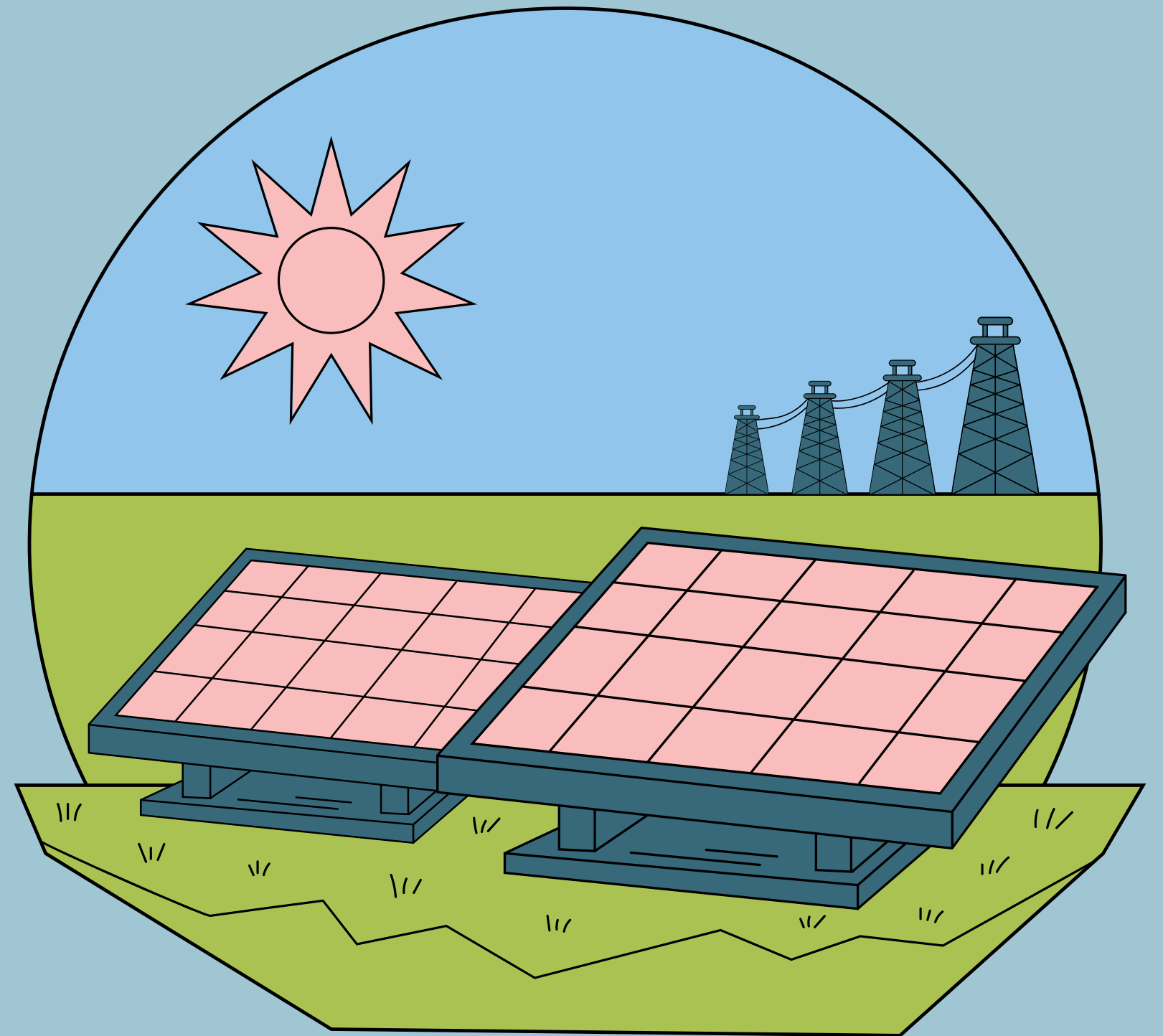
04

Interdisciplinary
Approaches



01: *Sustainable Technologies*

Engineers, scientists, and innovators in STEM fields contribute to the development of sustainable technologies. By promoting clean energy solutions, STEM professionals help support equitable access to clean energy, benefiting communities that have been disproportionately affected by fossil fuel energy.



02: *Environmental Monitoring*

STEM professionals play a role in monitoring environmental changes and assessing the resilience of ecosystems / communities. They provide insights into vulnerable areas, and contribute to building climate-resilient infrastructure and systems that can withstand the impacts of climate change for marginalized communities.



03:

Data Analysis

STEM professionals, climate scientists, meteorologists, and environmental researchers provide critical data analysis on climate change trends, causes, and impacts. Understanding the scientific basis of climate change is essential to formulating evidence-based policies that consider the needs of vulnerable communities and promote climate justice.



04: *Interdisciplinary Approaches*

Addressing climate justice requires interdisciplinary collaboration. STEM professionals can work alongside social scientists, policy experts, economists, and community members to develop comprehensive strategies that tackle both the scientific and social aspects of climate change.



Climate Justice to STEM

01

Access to
Resources



02

Policy and
Governance



03

Collaborative
Problem Solving



04

Inclusivity



01: *Access to Resources*

Climate justice acknowledges that not all communities have equal access to resources, technology, and education. By integrating climate justice principles into STEM initiatives, we can work towards bridging these gaps and ensure that communities facing environmental challenges have the necessary tools and support to address them effectively.



02: *Policy and Governance*

STEM professionals often play a vital role in shaping climate policies and governance structures. By incorporating climate justice principles into their work, they can advocate for policies that prioritize the needs of marginalized communities and promote environmentally just practices.



03: *Collaborative Problem Solving*

Climate change is a global issue that requires collaborative efforts from scientists, engineers, policymakers, and communities. Climate justice emphasizes the importance of working together with affected communities to develop solutions that address their unique needs and concerns. By involving these communities in the process, STEM professionals can gain valuable insights and create more impactful interventions.



04: *Inclusivity*

The STEM fields need diverse perspectives and solutions to tackle complex challenges like climate change. Climate justice recognizes the importance of including voices from different backgrounds, cultures, and regions in research and decision-making processes. By promoting inclusivity, STEM can benefit from a wider range of ideas, experiences, and knowledge, leading to more comprehensive and equitable solutions.



Reading: *Situating the Scientist: Creating Inclusive Science Communication Through Equity Framing and Environmental Justice*

Reflect: How could an environmental justice frame help scientists become more inclusive communicators?

Situating the Scientist: Creating Inclusive Science Communication Through Equity Framing and Environmental Justice

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This article draws on environmental justice (EJ) scholarship to develop a novel concept of equity framing that can be used to achieve more inclusive science communication. We argue that centering equity in our communications framing can provide an essential point of access for marginalized communities to engage with scientific communication, and also an important opportunity for scientific researchers and writers to become more accountable to disadvantaged communities. Viewing science communication through an equity lens asks communicators to not only frame science in ways that are salient to particular audiences, but it also asks communicators to attend to particular discriminatory historical practices that have targeted marginalized communities, and continue to do so through current scientific discourse. EJ strategies for equity framing include asking science communicators to (1) become aware of their own positionality and partial perspectives, (2) name sources of inequity that arise from uneven power relations, and (3) find intersections with initiatives that are rooted in the experiences of disadvantaged communities. To ground our approach to equity framing, we also present our experiences teaching Stanford University's first comprehensive class on environmental justice as a case study. Key outcomes included: adding missing perspectives to scientific knowledge production by inviting representatives from diverse and marginalized communities to teach us; increasing the social relevance of scientific findings by asking our students to center the concerns and insights of marginalized communities in their communication; and encouraging collective action to address equity concerns and achieve a healthier society for all.

Introduction

In this article, we map out a process for more inclusive science communication grounded in the practices of environmental justice (EJ), with a specific focus on communication of the environmental sciences. We ground our analysis in the history of the EJ movement as it emerged as a transformative paradigm that has centered the fight for equity in environmentalism through a variety of discursive strategies (Bullard, 1993, 1996, 2000; Taylor, 1997, 2000; Pellow, 2016). We argue that science communication, as a field of inquiry and practice, must undergo a similar paradigm shift—namely through an increased attentiveness to equity framing as an essential tool ensuring that equity issues can be understood as a critical part of, and not separate from, science communication. To facilitate this shift, we develop a novel concept of equity framing, based on EJ practices.

Situating the Scientist: Creating Inclusive Science Communication Through Equity Framing and Environmental Justice (Polk & Diver, 2020)

3 tips for using CJ as a frame for inclusive science



"Army scientists energize battery research" by U.S. Army Combat Capabilities Development Command is licensed under CC BY-SA 2.0.

Inclusive Science Communicators can:

- 1** Become aware of their own positionality and partial perspectives
- 2** Name sources of inequity that arise from uneven power relations, and
- 3** Find intersections with initiatives that are rooted in the experiences of disadvantaged communities.

Questions of Inclusivity :

How do I write in a way that makes the problems disadvantaged communities face and their solutions more visible?

And how do I effectively communicate with my intended audience(s) about equity issues, as an important part of the story?

How do I do this in a way that does not render the knowledge and leadership of disadvantaged communities invisible?

How do I ground my scientific research in larger social and political contexts that make our knowledge more complete?

How has my own positionality affected my research questions, research design, and communication choices?

How can this framework be integrated in your coursework?

Discussion

Turn to a partner or a small group:

Why are these questions important for scientists engaging in research and scientific communication?

Which resonate with you as an undergraduate in science?

How can these questions be applied in your research?

As we move into the following case studies, keep the environmental justice framework for inclusive communication in mind.

Activity

1

Read and Review

Climate and Computer Science:

The Cloud Is Material: On the

Environmental Impacts of

Computation and Data Storage

Beyond the Text


Guiding Questions

1. What could be the disproportionate impacts of the carbon footprint generated by the cloud on marginalized communities, and how can these impacts be mitigated?
2. To what extent do you think corporate action surrounding cloud technology consider the principles of climate justice, and how can these policies be reimaged to better reflect such principles?
3. How can the concept of climate justice inform the design and implementation of more energy-efficient computation systems, considering factors like sustainable practices and culture?
4. What are the conflicts between the rapid pace of technological innovation and the aspirations of climate justice as mentioned in the case? How can these conflicts be reconciled to ensure responsible and sustainable development of the cloud?

Discuss your ideas in a small group...

Further Reading

Climate Change AI is a hub that gathers useful resources on machine learning efforts in relation to climate change. From academic papers, events, to interactive summaries, it is a great way to keep up with the current developments in the field!



Climate Change AI is a global non-profit that catalyzes impactful work at the intersection of climate change and machine learning.

Activity

2

Read and Review

Climate and Chemistry:

Metals in the Drinking Water of
First Nations across Canada

Beyond the Text

Guiding Questions

1. What innovative and sustainable water treatment technologies can be developed or adapted to effectively remove toxic metals from water sources in remote indigenous regions, taking into consideration both technical feasibility and cultural appropriateness?
2. How is climate change influencing the presence and distribution of toxic metals in water sources commonly used by indigenous peoples?
3. What are the potential health risks associated with long-term exposure to toxic metals such as lead, aluminum, and manganese etc. in drinking water?
4. How can the discourse around toxic metal contamination in indigenous drinking water be expanded to encompass broader discussions on decolonization, environmental justice, and sustainable development in the context of changing global climates?

Discuss your ideas in a small group...

Further Reading

Here is the [link](#) to the Canadian government's current efforts to mitigate the presence of harmful chemicals in the water of the First Nations. Explore their policies as you evaluate their success.



Activity

3

Read and Review

Climate and Physics:

**An energy_justice based approach
for electrification planning - An
agent-based model**

Beyond the Text

Guiding Questions

1. From the article, what justice-based strategies can optimize renewable energy integration into existing grids to enhance energy resilience and reduce environmental impacts?
2. How do disparities in energy access across communities contribute to broader social and economic inequalities, and how can physics-informed electrification planning address these disparities?
3. What factors should be considered when selecting appropriate renewable energy technologies for microgrids in diverse Sub-Saharan African contexts, taking into account local challenges, energy demand, and available resources?
4. How can the deployment of renewable energy-supported microgrids in Sub-Saharan Africa be optimized to ensure that rural communities, particularly marginalized groups, have equitable access to clean and reliable energy services?

Discuss your ideas in a small group...

Further Reading

Here is the [link](#) to the National Renewable Energy Laboratory, a government run organization that gathers research on creative methods to clean energy development. There are various articles and other resources with an emphasis on climate justice.



Activity

4

Read and Review

Engineering and climate justice:

The climate is changing. Engineering education needs to change as well

For more information, visit the

Engineering Climate Justice module

Beyond the Text

Guiding Questions

1. What skills are needed for engineers to tackle climate change-related issues now and in the future?
2. What changes to traditional engineering education are needed to create engineers equipped with these skills?
3. How do you think about environmental justice in the context of engineering?
4. Think of the courses you are taking/have already taking, what climate change education have you received? What about environmental justice? Climate justice?
5. How can engineering be more inclusive?

Discuss your ideas in a small group...

Further Reading

Read or listen to [this](#) interview of Juliana Mitkiewicz on the MIT Climate Portal.

Read [Engineering for the People: Putting Peace, Social Justice, and Environmental Protection at the Heart of All Engineering](#) (Karwat 2018).

Explore [The Environmental Justice and Climate Resiliency Initiative](#).



Activity

5

Read and Review

Data for climate justice:

**Why we need data science in the
fight for climate justice**

To access more data sets and tools for
climate justice, click [here](#)

Beyond the Text

Guiding Questions

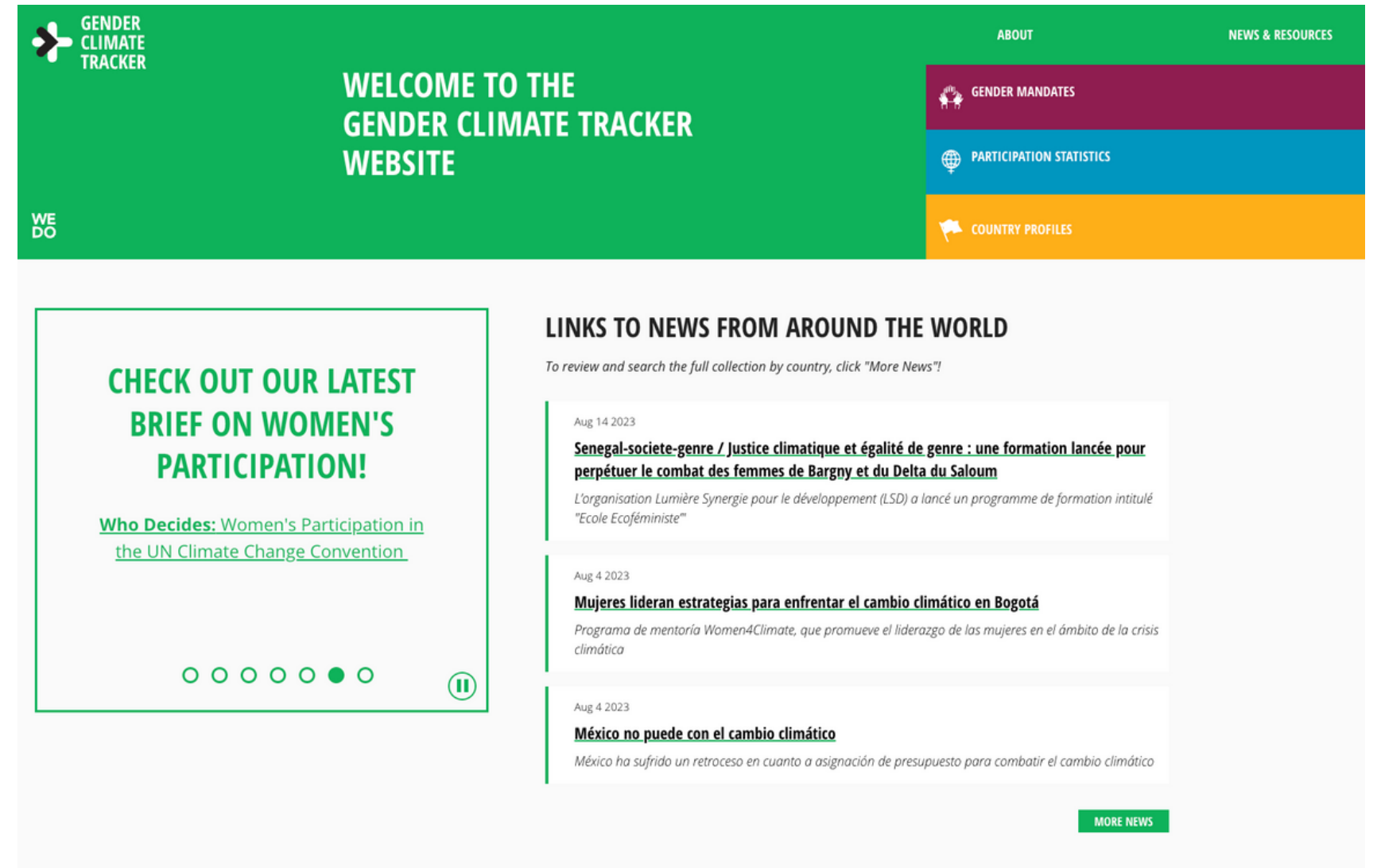
1. Why is data important for the fight against climate change and for climate justice?
2. How can statistics be used more responsibly?
3. What is equitable data gathering and management? Can you identify it in your classes or research?

Discuss your ideas in a small group...

Further Reading

Read [Gender Data Must Be the Bedrock of Climate Justice](#) and explore the [Gender Climate Tracker](#) from the Women's Environment & Development Organization

Analyze international gender-responsive climate action and policy.



The screenshot shows the homepage of the Gender Climate Tracker website. The header is green with the 'GENDER CLIMATE TRACKER' logo on the left and 'ABOUT' and 'NEWS & RESOURCES' on the right. Below the header is a navigation bar with three colored buttons: 'GENDER MANDATES' (purple), 'PARTICIPATION STATISTICS' (blue), and 'COUNTRY PROFILES' (orange). The main content area features a large green box on the left with the text 'CHECK OUT OUR LATEST BRIEF ON WOMEN'S PARTICIPATION!' and a link to 'Who Decides: Women's Participation in the UN Climate Change Convention'. On the right, there is a section titled 'LINKS TO NEWS FROM AROUND THE WORLD' with a sub-header 'To review and search the full collection by country, click "More News"!'. Below this are three news items, each with a date and a headline. The first item is dated Aug 14 2023 and has the headline 'Senegal-societe-genre / Justice climatique et égalité de genre : une formation lancée pour perpétuer le combat des femmes de Bargny et du Delta du Saloum'. The second item is dated Aug 4 2023 and has the headline 'Mujeres lideran estrategias para enfrentar el cambio climático en Bogotá'. The third item is dated Aug 4 2023 and has the headline 'México no puede con el cambio climático'. A 'MORE NEWS' button is located at the bottom right of the news section.

Activity

6

Read and Review

Aerospace engineering for social justice

Spacial Justice

For more information on this topic click [here](#)
for the mapping environmental justice module

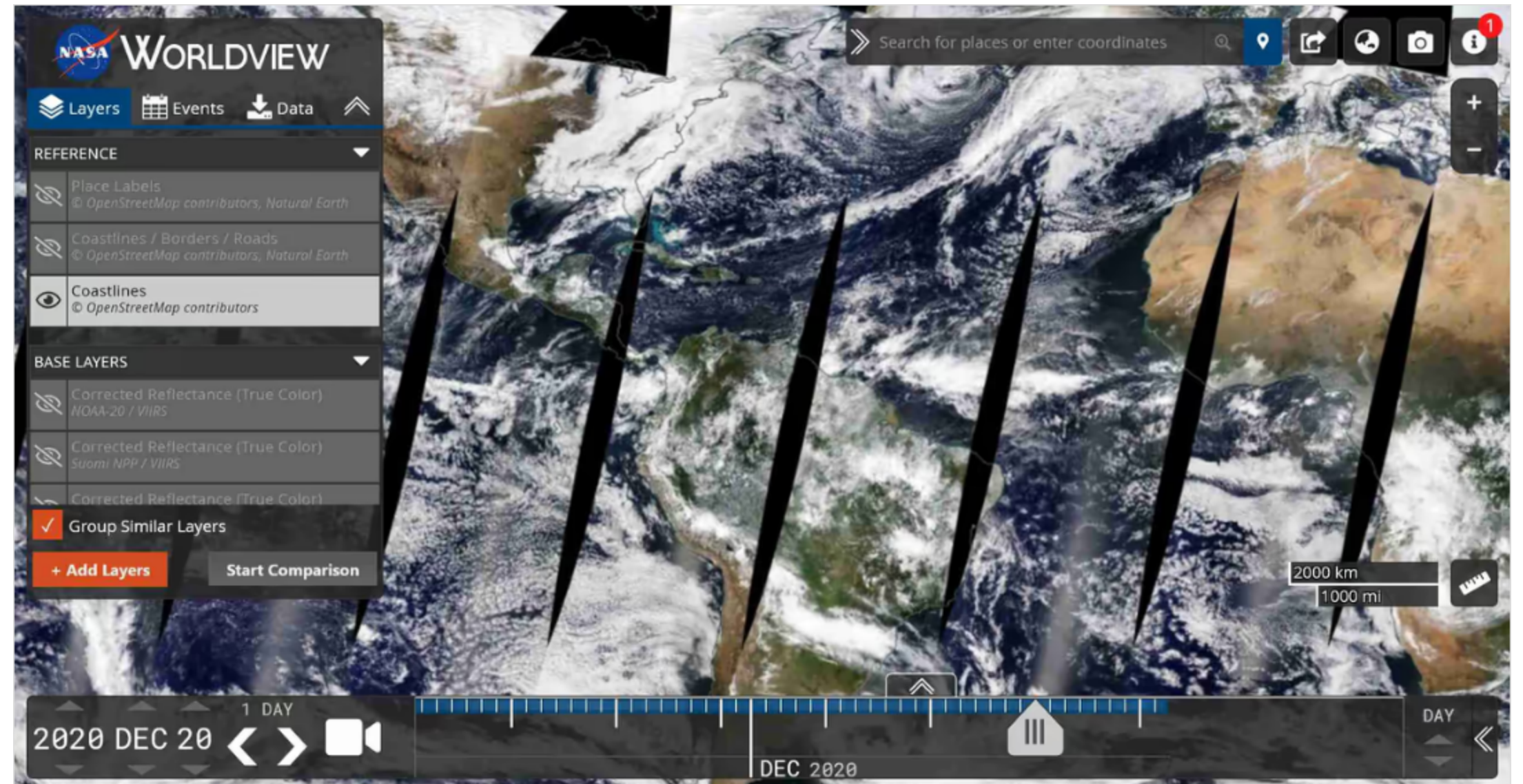
Beyond the Text

Guiding Questions

1. What makes prisons susceptible to environmental injustices? How are prison injustice spacial issues?
2. What STEM tools and approaches does Ufuoma use to identify environmental injustices within or around prisons?
3. What are some of the injustices she unearths using space enabled technology?
4. How does Ufuoma's social identity connect with her STEM Research? How does this relate to the EJ frame discussed earlier in this module?
5. Ufuoma mentions she did not want to work at Boeing or Ford - what is she referring to here?
6. What does it mean to "engineer while black" - what does Ufuoma say about this?
7. How is your identity either represented or not represented within STEM fields? In what ways do you connect with Ufuoma's story?

Further Reading

How NASA is using data and imaging to promote environmental justice and climate action



Explore Your Dynamic Planet

The NASA Worldview app provides a satellite's perspective of the planet as it looks today and as it has in the past through daily satellite images. Worldview is part of NASA's Earth Observing System Data and Information System.

 Worldview

Taking Action

After learning about environmental and climate justice in STEM, reflect...

How will EJ impact your research?

How can you be a more inclusive science communicator?

How can CJ impact your coursework?



"Bering Glacier Research Natural Area/Area of Critical Environmental Concern, Alaska" by mypubliclands is licensed under CC BY 2.0.

Optional Project

Design a poster about how you can use climate justice in your life, research, and career

Guiding questions:

How should climate justice be integrated as a critical part of careers in STEM?

In what ways could CJ impact your career?

How could technological or scientific developments be made more accessible to people experiencing climate injustices?

What is the impact of your scientific research beyond the classroom?

Module References

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