DISCIPLINE-SPECIFIC MODULE

Climate Justice for Inclusive STEM Research

CJIT

CLIMATE JUSTICE INSTRUCTIONAL TOOLKIT

What’s in this module?

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.

Activities

4 parts
13 readings
6 case studies
1 video
1 project option

Key Resources

- *Situating the Scientist: Creating Inclusive Science Communication Through Equity Framing and Environmental Justice* (Mohai et al., 2009)

Learning Objectives

01

Understand the significance of the relationship between CJ and STEM

02

Discuss STEM case studies centered around climate justice

03

Examine the different ways CJ is related to specific STEM fields

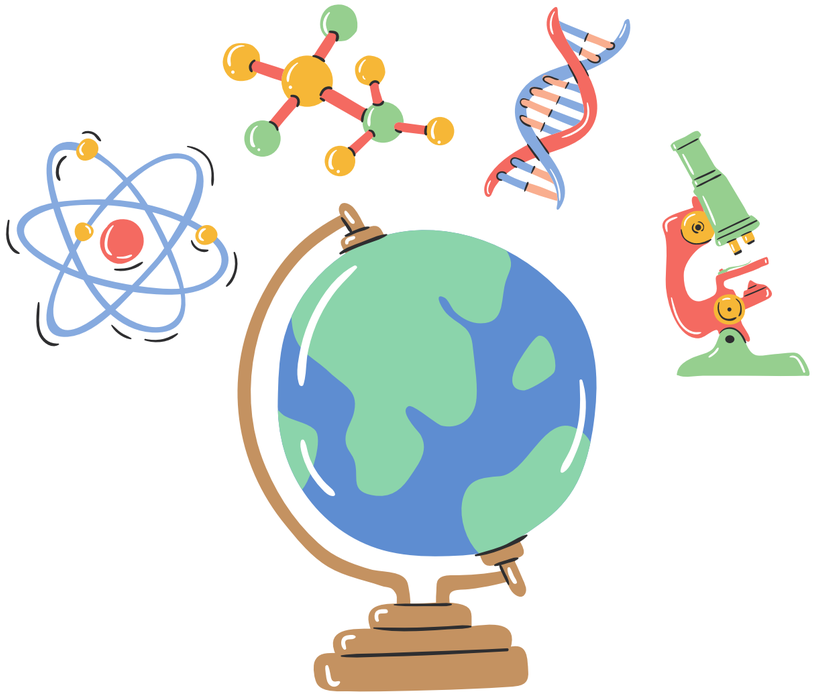
04

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 brainstorm your ideas.



Connection Between STEM & Climate Justice

PART 1

Why STEM is Important to CJ

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.

Why CJ is Important to STEM

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.

Inclusive Science

PART 2

Review: *Situating the Scientist*

Key points

- The field of EJ and the EJ movement began after protests in Warren County, North Carolina
- Minority communities face unequal exposure, impact, enforcement, and remediation
- Climate change disproportionately impacts communities of color, indigenous people, low-income communities, and developing countries

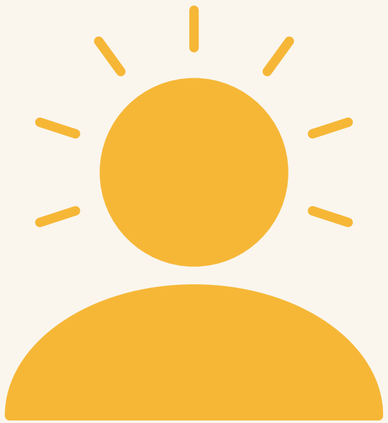
How could an environmental justice frame help scientists become more inclusive communicators?

(Greg Gibson/AP)

Tips for Using CJ as a Frame for Inclusive Science

01

Become aware of their own positionality and partial perspectives

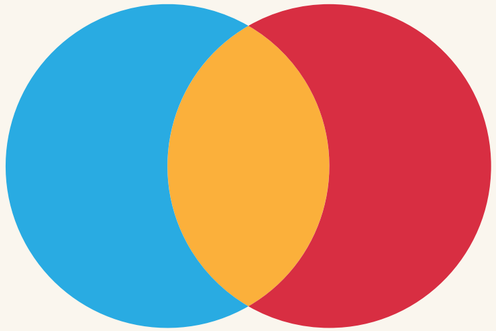


02

Name sources of inequity that arise from uneven power relations

03

Find intersections with initiatives that are rooted in the experiences of disadvantaged communities



(Polk & Diver, 2020)

Considering Inclusivity

Questions to ask yourself

- How do I write in a way that makes the problems disadvantaged communities face and their solutions more visible?
- How do I ground my scientific research in larger social and political contexts that make our knowledge more complete?
- How do I effectively communicate with my intended audience(s) about equity issues, as an important part of the story?
- How has my own positionality affected my research questions, research design, and communication choices?
- How do I do this in a way that does not render the knowledge and leadership of disadvantaged communities invisible?

Why are these questions important for scientists engaging in research and scientific communication? Which resonate with you? How can these questions be applied in your research/studies?

(Polk & Diver, 2020)

CJ-Informed STEM Research Case Studies

PART 3

Computer graveyard in Agbogbloshie, Ghana. Source: Agbogbloshie Makerspace Platform. CC BY SA 2.0

CASE STUDY #1

CLIMATE JUSTICE AND COMPUTER SCIENCE

Read

The Cloud Is Material: On the Environmental Impacts of Computation and Data Storage

A Data Center in Arizona.
By: Steven Gonzalez Monserrate.

Post-reading discussion questions

In small groups, discuss these questions:

- What could be the disproportionate impacts of the carbon footprint generated by the cloud on marginalized communities, and how can these impacts be mitigated?
- To what extent do you think corporate action surrounding cloud technology consider the principles of climate justice, and how can these policies be reimagined to better reflect such principles?
- 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?
- 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?

CASE STUDY #2

CLIMATE JUSTICE AND CHEMISTRY

Read

Metals in the Drinking Water of First Nations across Canada

Post-reading discussion questions

In small groups, discuss these questions:

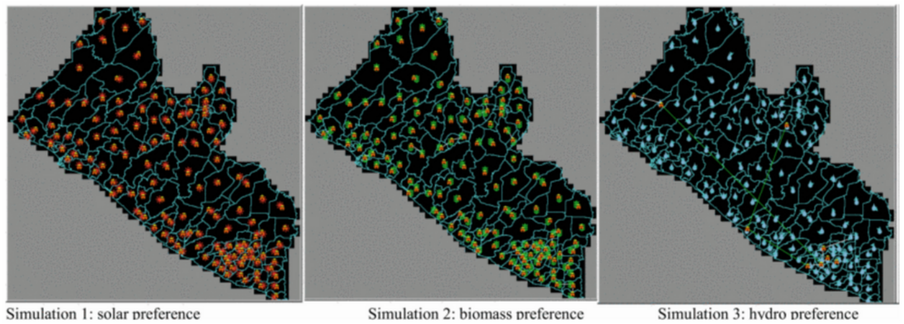
- What innovative and sustainable water treatment technologies can be developed or adapted to effectively remove toxic metals from water sources in remote indigenous regions, taking into consideration both technical feasibility and cultural appropriateness?
- How is climate change influencing the presence and distribution of toxic metals in water sources commonly used by indigenous peoples?
- What are the potential health risks associated with long-term exposure to toxic metals such as lead, aluminum, and manganese etc. in drinking water?
- 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?

CASE STUDY #3

CLIMATE JUSTICE AND PHYSICS

Read

An energy justice based approach for electrification planning – An agent-based model



Simulation 1: solar preference | Simulation 2: biomass preference | Simulation 3: hydro preference

(Tarekegne & Rouleau, 2019)

Post-reading discussion questions

In small groups, discuss these questions:

- From the article, what justice-based strategies can optimize renewable energy integration into existing grids to enhance energy resilience and reduce environmental impacts?
- 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?
- 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?
- 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?

CASE STUDY #4

CLIMATE JUSICE AND ENGINEERING

Read

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

Post-reading discussion questions

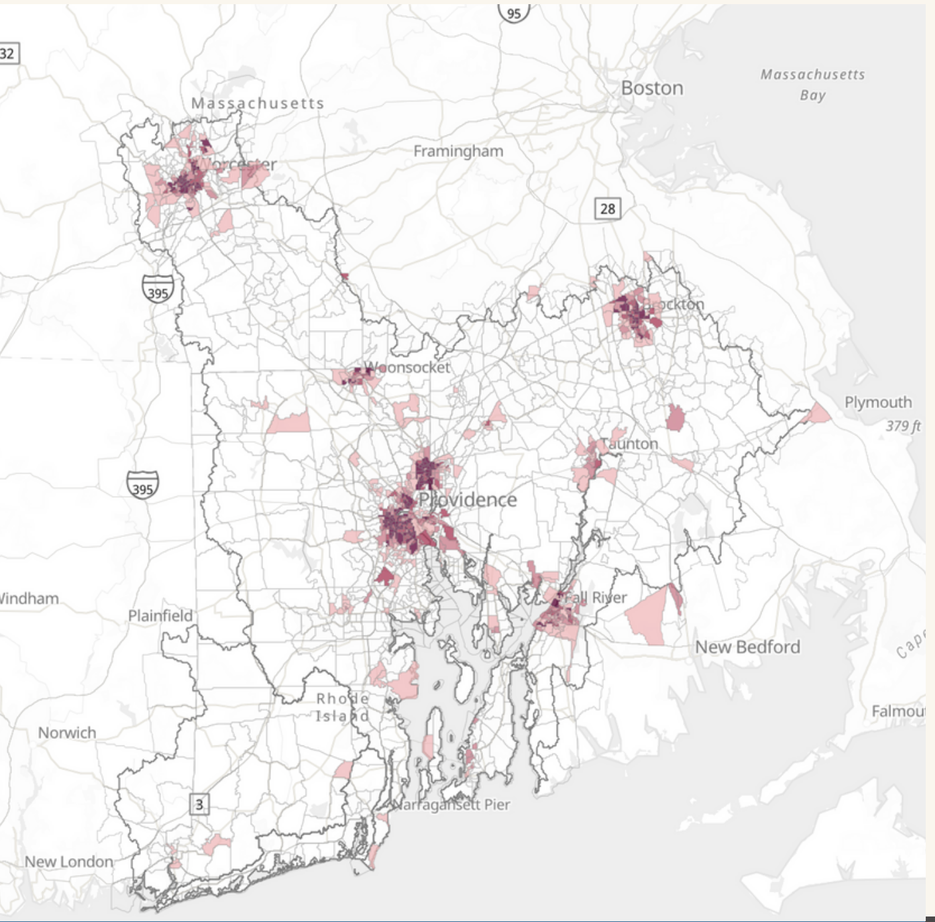
In small groups, discuss these questions:

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

Visit the Engineering Climate Justice module to learn more

CASE STUDY #5

DATA FOR CLIMATE JUSTICE



Read

Why we need data science in the fight for climate justice

Post-reading discussion questions

In small groups, discuss these questions:

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

See more data sets and tools for climate justice

CASE STUDY #5

AEROSPACE ENGINEERING FOR SOCIAL JUSTICE

Watch

Spacial Justice

Post-reading discussion questions

In small groups, discuss these questions:

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

Visit the Mapping Environmental Justice module to learn more

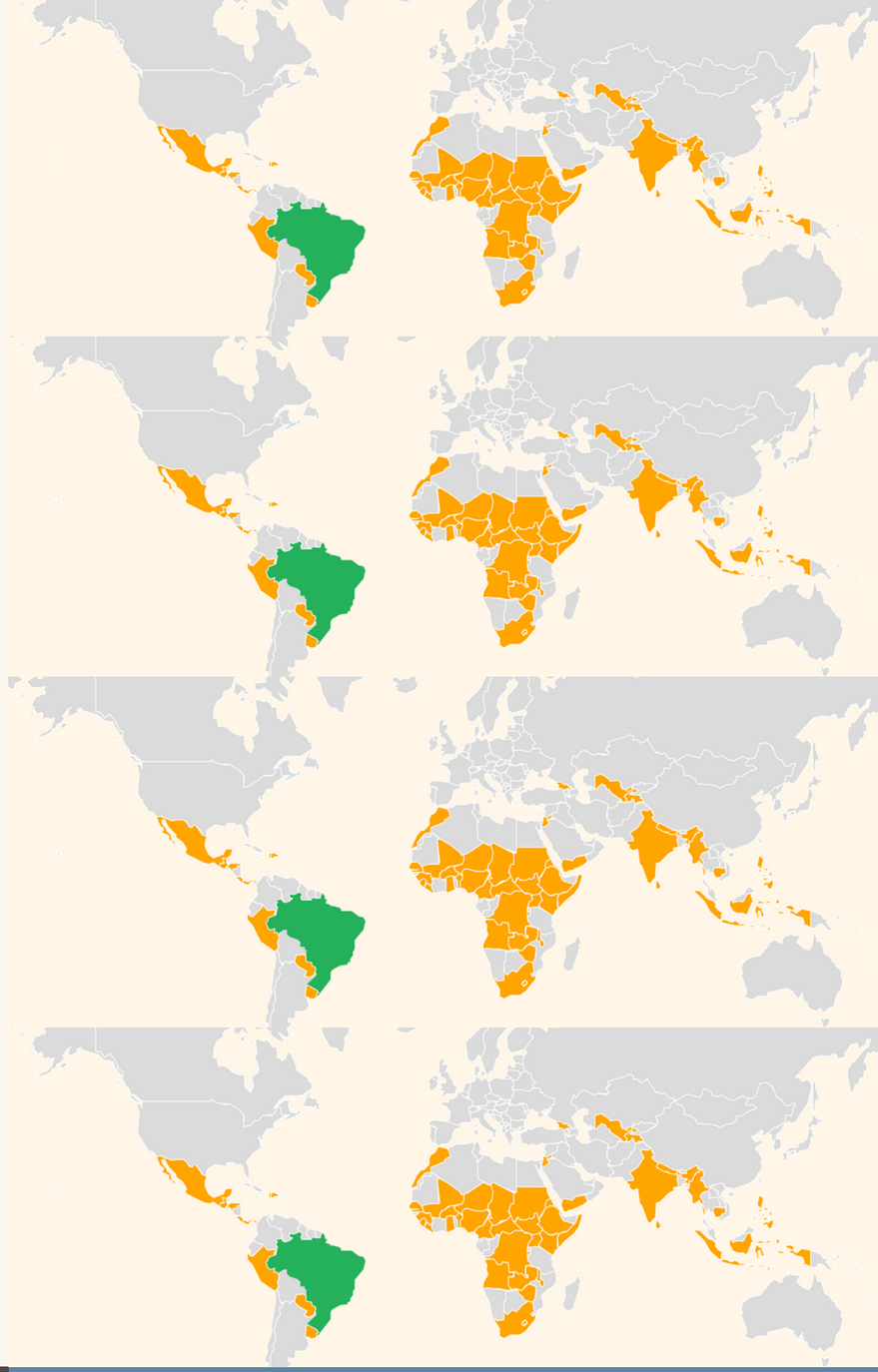
Reflect

After learning about environmental and climate justice in STEM, reflect on these questions:

1. How will EJ impact your research?
2. How can you be a more inclusive science communicator?
3. How can CJ impact your coursework?

Beyond the Module

PART 4



PROJECT OPTION #1

Poster with Personal Climate Justice Goals

Prompt suggestion

Design a poster about how you can use climate justice in your life, research, and career, and give a 5 minute presentation of your poster.

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?

Additional Resources

Further Reading/Watching

- *Engineering for the People: Putting Peace, Social Justice, and Environmental Protection at the Heart of All Engineering* (Karway, 2019)
- Gender Data Must Be the Bedrock of Climate Justice (GEDA)
- Interview of Juliana Mitkiewicz
- Current efforts to mitigate the presence of harmful chemicals in the water of the First Nations in Canada

Relevant Organizations

- National Renewable Energy Laboratory
- The Environmental Justice and Climate Resiliency Initiative

Tools + Data

- Climate Change AI
- Gender Climate Tracker
- NASA Worldview App

For more resources on climate and environmental justice: **Please explore other modules in the Climate Justice Instructional Toolkit.**

Module References

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