

Engineering Climate Justice



ENVIRONMENTAL
SOLUTIONS
INITIATIVE



"Female engineer by windpower turbines" by U.S. Agency for International Development is marked with CC0 1.0.

What's in this module?

Activities

1 video
5 readings
5 activities
3 optional projects

Contents

This module combines engineering with concepts of climate justice, discusses how engineering decisions impact people's lives, and encourages students to discuss how justice is at the heart of engineering.

Key Resources

- [Engineering climate justice: how can we contribute to equitable global decarbonisation? \(Newby, 2022\)](#)
- [Engineering for the People: Putting Peace, Social Justice, and Environmental Protection at the Heart of All Engineering](#)
- [The climate is changing. Engineering education needs to change as well](#)

Agenda and Learning Objectives



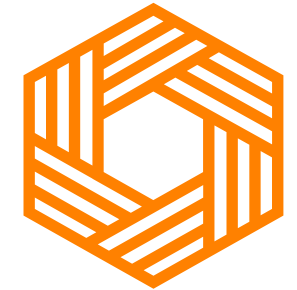
Understand engineering as a proactive approach to climate justice



Identify the intersection between environmental justice and engineering



Discuss personal responsibilities as engineers



Explore case studies from MIT

Introduction

As engineering continues to move society forward in innovative, exciting ways, it also interacts with the ongoing climate crisis. **Climate justice** recognizes the disproportionate impacts of climate change on low-income and BIPOC communities around the world, the people and places least responsible for the climate crisis (Center for Climate Justice).

Climate justice is a movement that emerged in recent decades, and is something that has begun turning into a priority for engineering and design. This module explores some of the ways in which engineering and climate justice interact, looking at the ways in which **engineering and design can help mitigate climate injustices.**

1

Brainstorm: What Does it Mean to Engineer Climate Justice?



"Will Tarpeh, Civil and Environmental Engineering "Pee-cycling: Creating Sustainable Fertilizer from Urine"" by umseas is licensed under CC BY 2.0.

Overview of Article 'Engineering Climate Justice'

It is imperative that high income countries focus on decarbonising *faster*; Tom Newby (2022) explains that engineers have a role to play in pushing for infrastructure changes that work towards these goals.

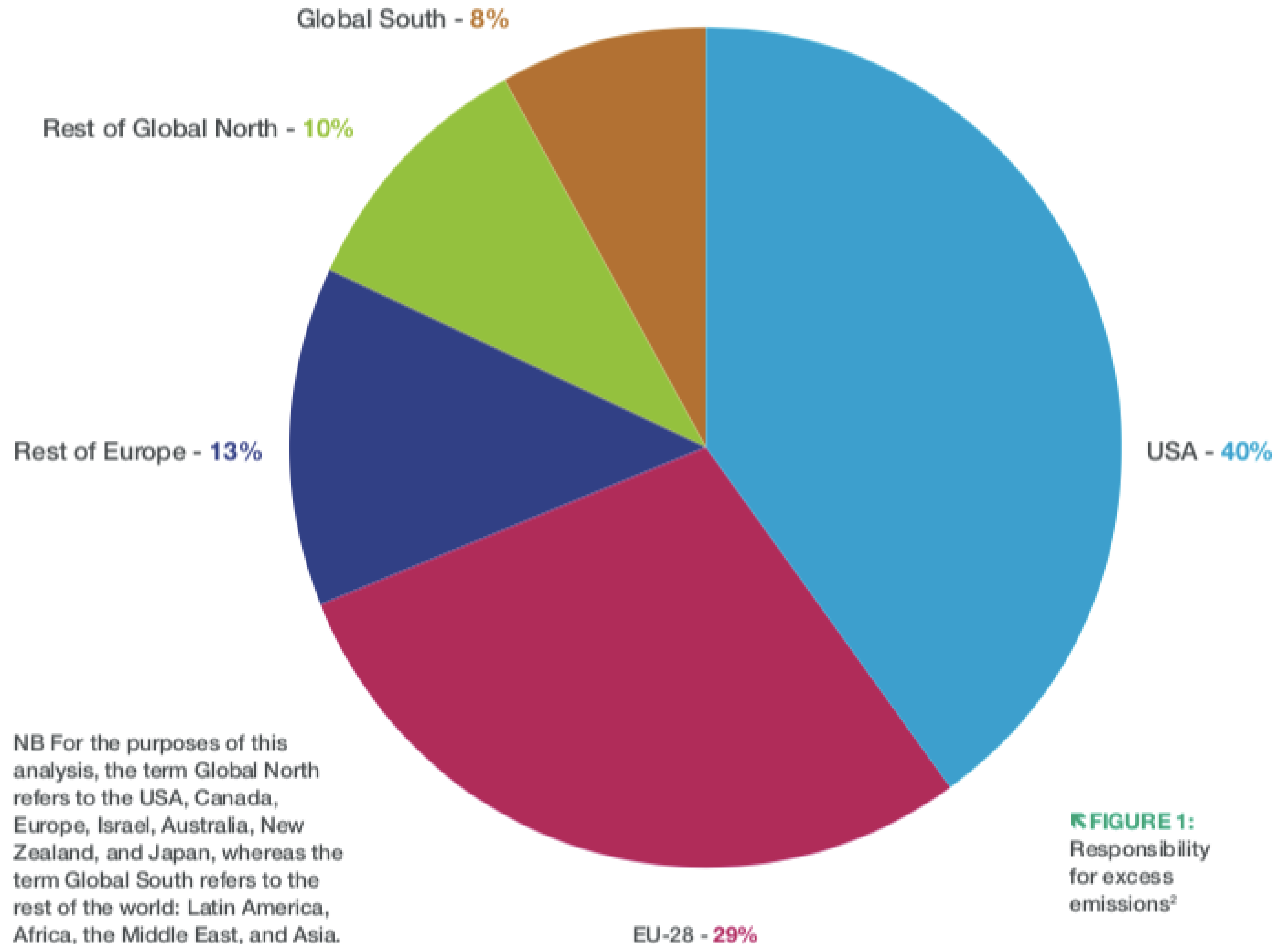
People in lower-income countries face a **triple injustice**:

- 1) a disproportionately large impact from climate change
 - 2) structural disadvantage
 - 3) a block on development
- (Newby, 2022, Engineering Climate Justice)



"USS Coronado's Chief Engineer explains his watch as the Tactical Action Officer to Under Secretary of the Navy during Rim of the Pacific 2016." by Official U.S. Navy Imagery

Figure 1: Global Responsibility for Excess Emissions - adapted from (Newby, 2022)



Activity 1: Reading & Discussion

Read the article 'Engineering Climate Justice', and then answer the following questions in groups.

- Discuss the **triple injustice**; can you think of examples of each kind?
- How are engineers' **moral** obligations also **pragmatic** ones?
- What are the implications of climate justice for engineers?
- What critiques do you have of this article?

5. Influence the brief

Engineering climate justice: how can we contribute to equitable global decarbonisation?

In this personal perspective, **Tom Newby** argues that high-income countries have a moral responsibility to decarbonise faster, and urges structural engineers to advocate for changes in the way infrastructure is designed and built in order to work towards this goal.



Activity 2: Further Reading: Engineering and Environmental Justice (Cohen 2020)

- The previous article (Engineering Climate Justice) briefly reviewed climate justice and civil engineering at a global level.
- Engineering and Environmental Justice (Cohen, 2020), reviews the movement and field of study, and connects it with engineering with a focus on community engagement.



"Construction and engineering students visit the Folsom spillway job site" by USACE HQ is marked with Public Domain Mark 1.0.

Go to the next slide for discussion questions:

Discussion Questions: Engineering and Environmental Justice (Cohen 2020)

- How is community and community engagement centered in this article? How does community participation and impact bring together engineering and environmental justice?
- What notions of justice are covered in this article? What notions of justice are important when considering how engineering processes impact communities?

Brainstorm: How should engineering education change to better address issues of environmental & climate justice?

“Empowering engineers with the skills to address the challenges created by climate change requires adapting both the technological and philosophical frameworks used in engineering education”

- The Research Journal for Engineering Education



"Very Short Introductions to logic, mathematics, information, education, engineering and networks" by dullhunk is licensed under CC BY 2.0.

Read: The climate is changing. Engineering education needs to change as well (Martin et al., 2022)

Discussion questions:

- According to the article, how should engineering education change in the face of climate change and climate justice?
- What are the engineering skill sets in relation to climate justice , and why is are they necessary? Which skill set stands out most to you and why?
- In your opinion and experience, have the engineering classes you have taken sufficiently included issues of climate and climate justice? Why or why not?
- How does this article connect with the previous two reviewed in this module?

*If you are interested in ideas like this, and our personal/ career responsibilities, check out:

From Personal Privilege to Professional Hegemony Kaufman, Cynthia (2003) Thinking About Liberation (selections).

In Ideas for Action: Relevant theory for radical change (pp. 18-34) Cambridge: South End Press. Takacs, David (2002)

2

Climate Justice: The Design Challenge



Photo from MIT D-Lab's work with the adaptive design center in Mexico:
<https://d-lab.mit.edu/news-blog/news/mit-d-lab-students-collaborate-adaptive-design-center-mexico>

Brainstorm:
Why should climate
justice be a critical
component of design?



"Gold-coated Engineering Design Unit (EDU) Primary Mirror Segment" by James Webb Space Telescope is licensed under CC BY 2.0.

Reading and Discussion:

Climate Justice is the Design Challenge of our Lives

Leo a Daly



Climate justice is the design challenge of our lives

Climate change and toxic emissions disproportionately affect poor and minority communities. Here's how designers can help.

 [leoadaly.com /](https://leoadaly.com/)

Activity 3: Group Discussion

- In what ways is the climate crisis an issue of social justice?
- According to the article, how do engineers interact with underserved communities?
- As engineers, how do we benefit from solving problems of injustice?
- What would it mean to adopt climate justice as a foundational principle of design? What would a climate justice design protocol look like?



"G20-social-justice-and-state-security-demonstrations-20100626T144830.0214.JPG" by Tim & Selena Middleton is licensed under CC BY 2.0.

Activity 4: Case Studies & Jigsaw Activity

1. Break up into 3 groups.
2. Each group will pick one of the following articles about different MIT initiatives and spend approximately 10 minutes reading. Take notes about that relate to climate justice and design.
3. Participate in a 'Jigsaw' activity where each person will then talk to one person from each of the other groups about what they read.



Anthro-Engineering in Mongolia: MIT NEET/ Anthropology

Case Study 1

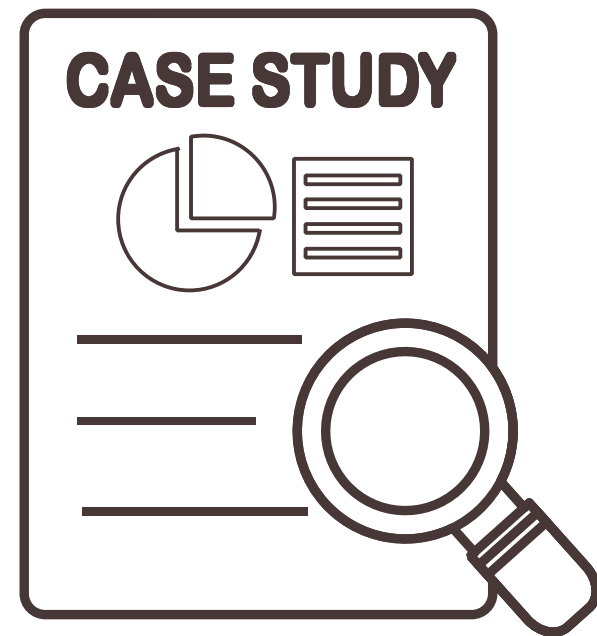


Photo retrieved from MIT News Article linked above: Photo credit:
Jiyoo Jye

Environmental Engineering and Climate Justice: An Interview with Juliana Mitkiewicz

MIT/D-Lab

Case Study 2

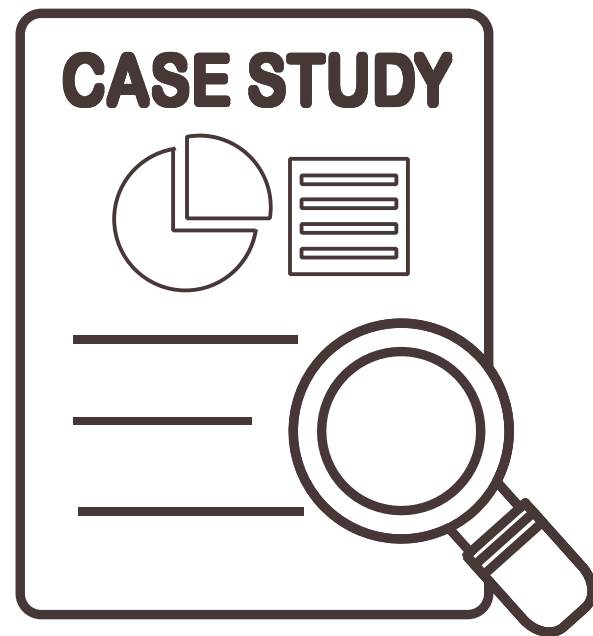
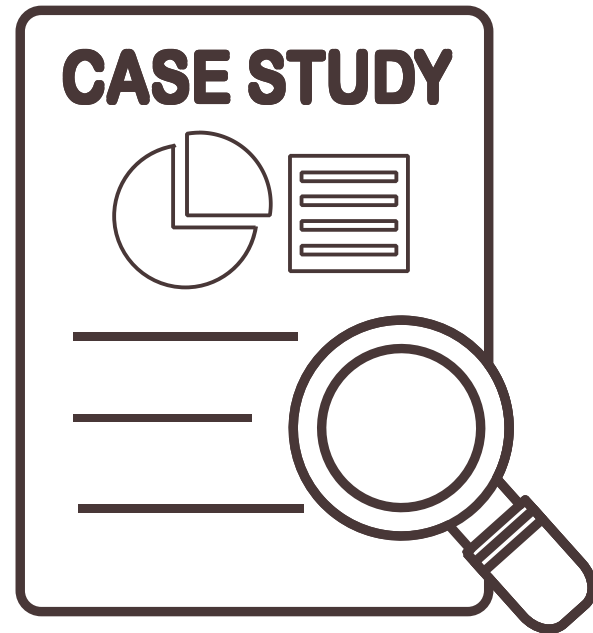


Photo retrieved from above article from the MIT Climate Portal.

Xylem Water Filters

Case Study 3



Women holding prototype of xylem water filter, India, 2018.

Photo retrieved from above D-Lab Webpage/article

Sharing Out

Talk to at least one person from each of the other groups, switching after 3 minutes. Some prompts that can aid in your discussion:

1. Give a brief outline of the case study you read about.
2. What helped with the success in the project? What roles did the engineers of the project play? How were community members or organizations included in the design process?
3. What are some ideas can you take with you to implement in future projects (either climate justice related or not)?
4. What were some elements of climate justice or social justice that you noticed?

Activity 5 Reading and Debate: Engineering for the People: Putting Peace, Social Justice, and Environmental Protection at the Heart of All Engineering (Karwat, 2019).



Darshan Karwat

Engineering for the People: Putting Peace, Social Justice, and Environmental Protection at the Heart of All Engineering

DARSHAN MUKESH ARVINDA KARWAT.

▸ [Author Information and Affiliations](#)

Inequality and injustice are hardwired into current models of technological design and technical work, even in the United States, one of the most technologically advanced and resource-rich nations on Earth. However, the onus for change is not only on those who officially *make* policy—politicians, lawyers, and businesspeople—but also on those who *build* policy and *create* possibilities—engineers. For example, if engineers did not design and build bombs, there would be fewer of them for people to use; engineers can *not* create the possibilities of mass destruction.

On the other hand, engineers *can* create possibilities for deep good by aligning their work with the needs of those who are traditionally marginalized and exploited in and by technical work. In fact, there is a rich history of activism in engineering and science that practicing engineers today can build on to put peace, social justice, and environmental protection at the heart of engineering. I describe different ways in which engineers across the United States are incorporating these ideals, and pose questions for engineers to consider in building a movement of engineering for the people.

Spend 15 minutes reading Karwat's (2019) Article.

Learn more about Darshan Karwat's work [here](#).

Activity 5: Explorative Debate

Q1: How can we bring CJ closer to the heart of engineering's goals?

Q2: Which subfields of engineering need to grow to meet the new demands of a changing climate and ensure greater social parity? Which fields within engineering need to diminish, or be transformed?

How do these questions relate to the technological inequalities that Karwat discusses?



"Forest near Vřesina" by Jiri Brozovsky is licensed under CC BY 2.0.

*Next slide for more activity instructions

Activity 5: Reading and Debate

- In your groups, brainstorm ways to answer each of the questions. Think about real life examples, or, for Q1, how *you* plan to go about navigating the future.
- Make two quick concept maps focused on this question on a shareable board. Once you are done, spend some time looking at what other groups came up with.



"Wind Program Engineer Kurt Myers" by Idaho National Laboratory is licensed under CC BY 2.0.

Optional Further Exploration: Watching a Video Lecture: Me. We. Moving from Ethics to Justice in Engineering



Dr. Khalid Kadir is a Continuing Lecturer at UC Berkeley, teaching courses in the Global Poverty & Practice program, Political Economy, and Civil and Environmental Engineering. After completing his Ph.D. in Environmental Engineering at Berkeley, Khalid focused his research on the role that **engineering expertise plays in the politics of international development and poverty alleviation, and his current work focuses on the intersection of poverty, expertise, and politics.**

Project Options 1:

How could you apply what you learned in this module about climate justice to your current course?

Work with a group to develop a Climate Justice Design Protocol.

Guiding Questions:

- How would it inform engineers or designers that are not familiar with climate justice?
- What key climate or environmental justice concepts from this module could be included as critical parts of this protocol?
- How would the protocol include voices and experiences from community members or organizations that face climate related problems and threats?

Project Options 2:

How could you apply what you learned in this module about climate justice to your current course?

Create a presentation on a current or past project you are working on and explain how Tom Newby's discussion of climate justice could be included in the design process.

What principles from his article (facts, theories, arguments) are critical to include in civil and environmental engineering?

Project Option 3:

How could you apply what you learned in this module about climate justice to this course?

Imagine you were designing a needed engineering or design project of your choice in Massachusetts or in a community you know well.

How could you implement climate justice concepts into a design, both considering how engineering has a relationship with 1) the Earth, and 2) social injustices?

Module References

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"My Public Lands Roadtrip: Wildlife in Wyoming" by mypubliclands is licensed under CC BY 2.0.

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