

DISCIPLINE-SPECIFIC MODULE

# Engineering Climate Justice



CLIMATE JUSTICE  
INSTRUCTIONAL  
— TOOLKIT —

# What's in this module?

## 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.

## Activities

3 parts  
1 video  
5 readings  
5 activities  
3 optional projects

## Key Resources

- [Engineering climate justice: how can we contribute to equitable global decarbonization?](#)
- [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.](#)



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# Learning Objectives

01

**Understand** engineering as a proactive approach to climate justice

02

**Identify** the intersection between environmental justice and engineering

03

**Discuss** personal responsibilities as engineers

04

**Explore** case studies from MIT

# Introduction

## PART 1



"Will Tarp, Civil and Environmental Engineering  
"Pee-cycling: Creating Sustainable Fertilizer from  
Urine"" Photo courtesy of [umseas](#) on Flickr. License:  
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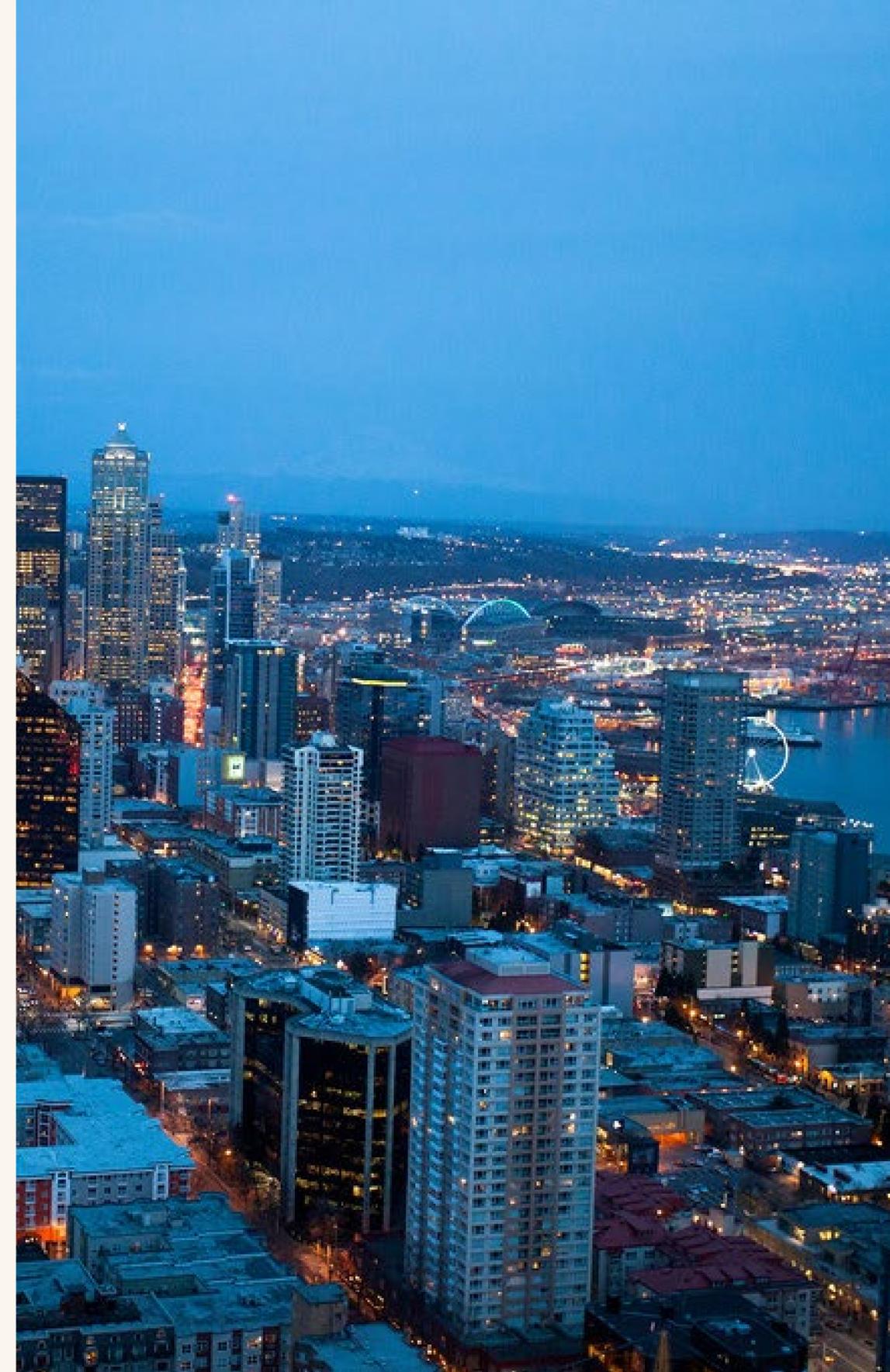
# Introduction

## What is climate justice?

“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)

## Connection between engineering and CJ

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.



# Review: *Engineering Climate Justice*

## Key point

High income countries need to focus on decarbonizing faster, and 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

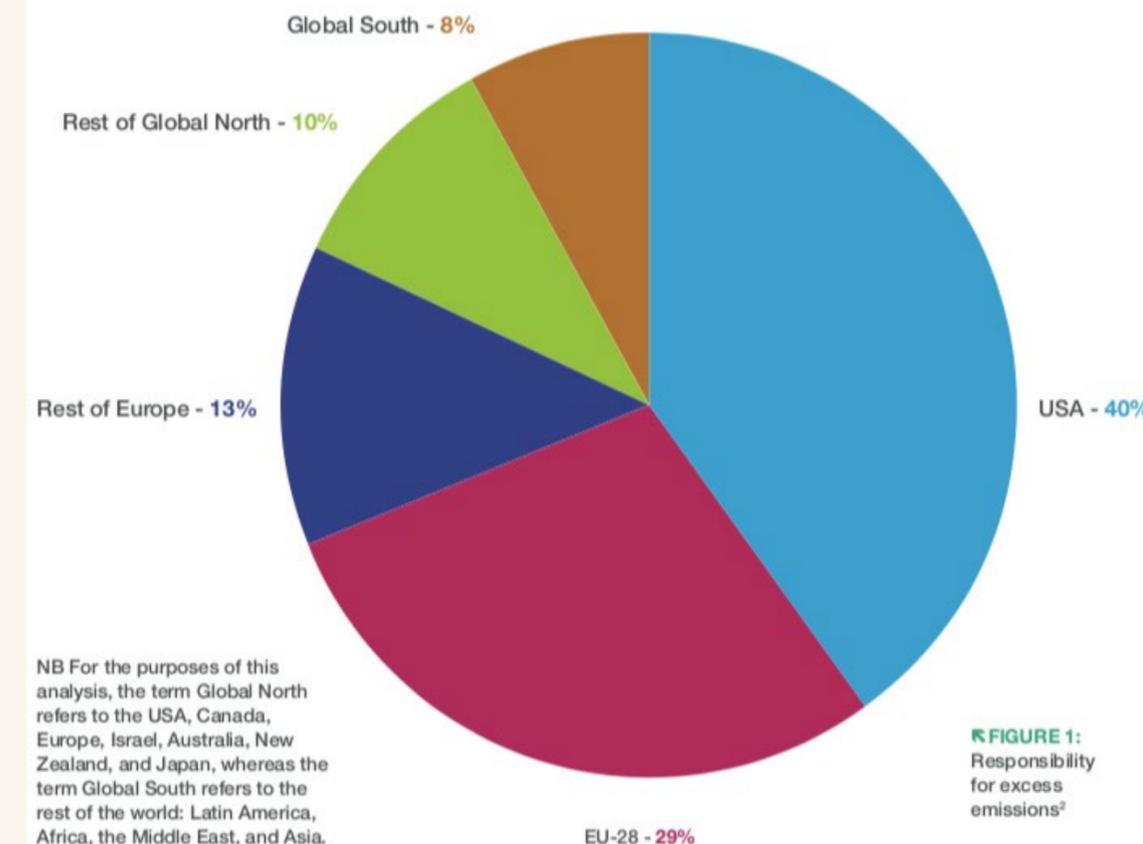


Figure 1: Global Responsibility for Excess Emissions - adapted from (Newby, 2022)

ACTIVITY #1

# AN INTRODUCTION TO ENGINEERING CLIMATE JUSTICE

## 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.

It is generally well understood that the climate emergency is a global problem, which needs global solutions. Hence the need for the Conference of Parties (COP) process to reach global agreements to mitigate and adapt to climate change.

The COP process includes ongoing discussion of who is responsible for the cost of adaptation and compensating for loss and damage in lower income countries, based both on ability to pay and responsibility for causing the crisis we face. However, the combination of who has heavily contributed issues of equity and climate justice and how these should – and will – affect our ability to decarbonise the built environment globally.

The viewpoint aims to help those working in the built environment to understand the reality and context of how we, as a profession, respond to the climate emergency in a matter that is equitable and fair to all of humanity.

**What is climate justice?**  
The world is a deeply unequal place, and the climate crisis greatly exacerbates the inequality. People in lower income countries, who make up the majority of the world's population, face a triple injustice:  
1. A disproportionately large impact from climate change.

#### Disproportionate impact

With less resilient infrastructure, less money and less capability to respond to and mitigate the climate crisis, and generally with a geography and climate more prone to high temperatures and natural hazards, the effects of climate change are mounting fast, and returning fast, in the countries least able to respond to them. The whole people in these countries face – both physically and culturally – made effectively no contribution to the climate emergency.

#### Structural disadvantage

Lower income countries are structurally disadvantaged as a result of a history of colonisation and exploitation over which much

of the wealth of the other countries of the world is built.

#### Stuck on development

In fighting the climate crisis, it is better that high income countries stop emitting greenhouse gases, and that lower income countries do not substantially increase their greenhouse gas emissions. But stopping greenhouse gas emissions will not potentially severely limit the development and welfare of lower income countries, trapping them in a permanent state of poverty and poverty.

#### What does this mean?

The topic is about what is meant by climate



## Read

*Engineering Climate Justice: how can we contribute to equitable global decarbonisation?*

## Post-reading discussion questions

- 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?

## ACTIVITY #2

# DIVING DEEPER INTO ENGINEERING CLIMATE JUSTICE

## Read

*Engineering and Environmental  
Justice*

## Post-reading discussion questions

- 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?

U.S. Army Corps of Engineers photo by Michael J. Nevins. This image is in the public domain.



# Climate Justice in Engineering Education

PART 2



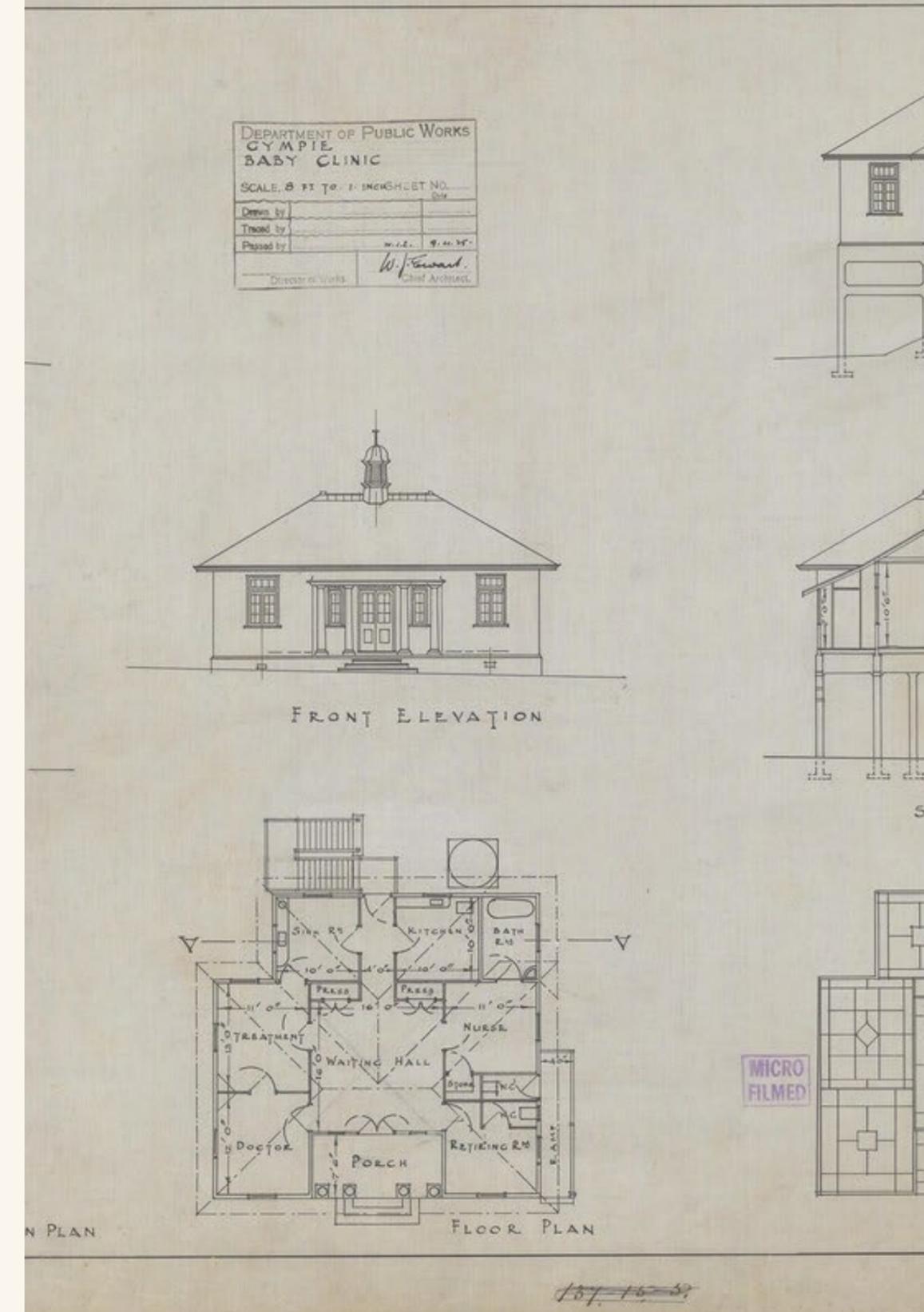
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# Review: *The climate is changing. Engineering education needs to change as well.*

## Discuss your thoughts

- 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 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?



# Climate Justice: The Design Challenge

## PART 3



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

# Brainstorm

**How should climate justice be incorporated as a critical component of engineering design?**



## ACTIVITY #3

# FURTHER EXAMINATION OF JUSTICE



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## Read

*Climate Justice is the design challenge of our lives*

## Post-reading discussion questions

- 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?

## ACTIVITY #4

# CASE STUDIES AND JIGSAW ACTIVITY

### Group and pick a case study

In 3 groups, pick one of these case studies to research:

- [Anthro-Engineering in Mongolia](#)
- [Environmental Engineering and Climate Justice: An Interview with Juliana Mitkiewicz](#)
- [Xylem Water Filters](#)

### Read and discuss

In your groups, spend about 5-10 minutes reading about your case study and taking note of how it relates to climate justice and design. Then, take another 5 minutes to briefly discuss within your groups what you took note of.

### Jigsaw discussion

Get into groups of 3, where each person read a different case study, give a brief outline of the case study that you read about and then discuss these questions:

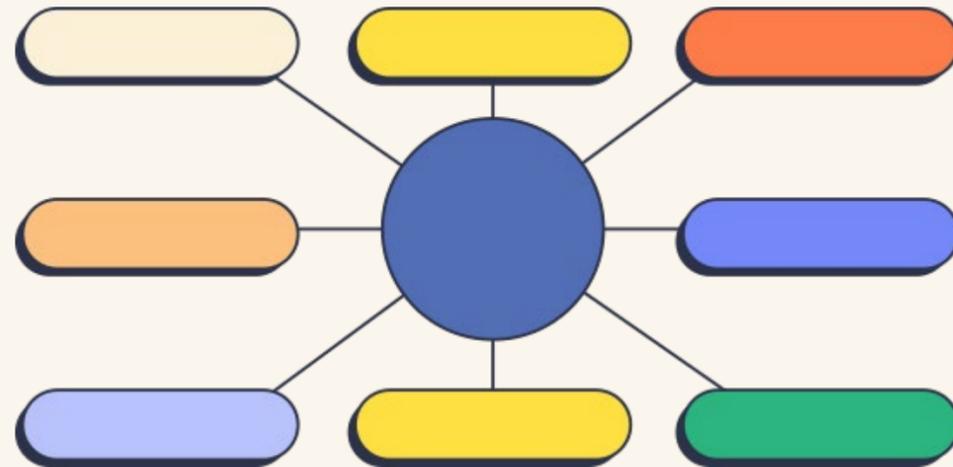
- What helped with the success in the project? What roles did the engineers of the project play? How were community members or organizations included in the design process?
- What are some ideas can you take with you to implement in future projects (either climate justice related or not)?
- What were some elements of climate justice or social justice that you noticed?

## ACTIVITY #5

# BUILDING A CONCEPT MAP

## Read

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



## Create a concept map

Make a concept map for how engineering can consider and address issues of climate injustice. Think about how different sectors of engineering might have different opportunities and capabilities, and brainstorm any possible incentives for engineers and engineering firms to consider and address climate justice.

## Discussion questions

In groups of 3-5 people, discuss these questions and think about real life examples:

1. How can we bring CJ closer to the heart of engineering's goals?
2. 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?

# Beyond the Module

PART 3

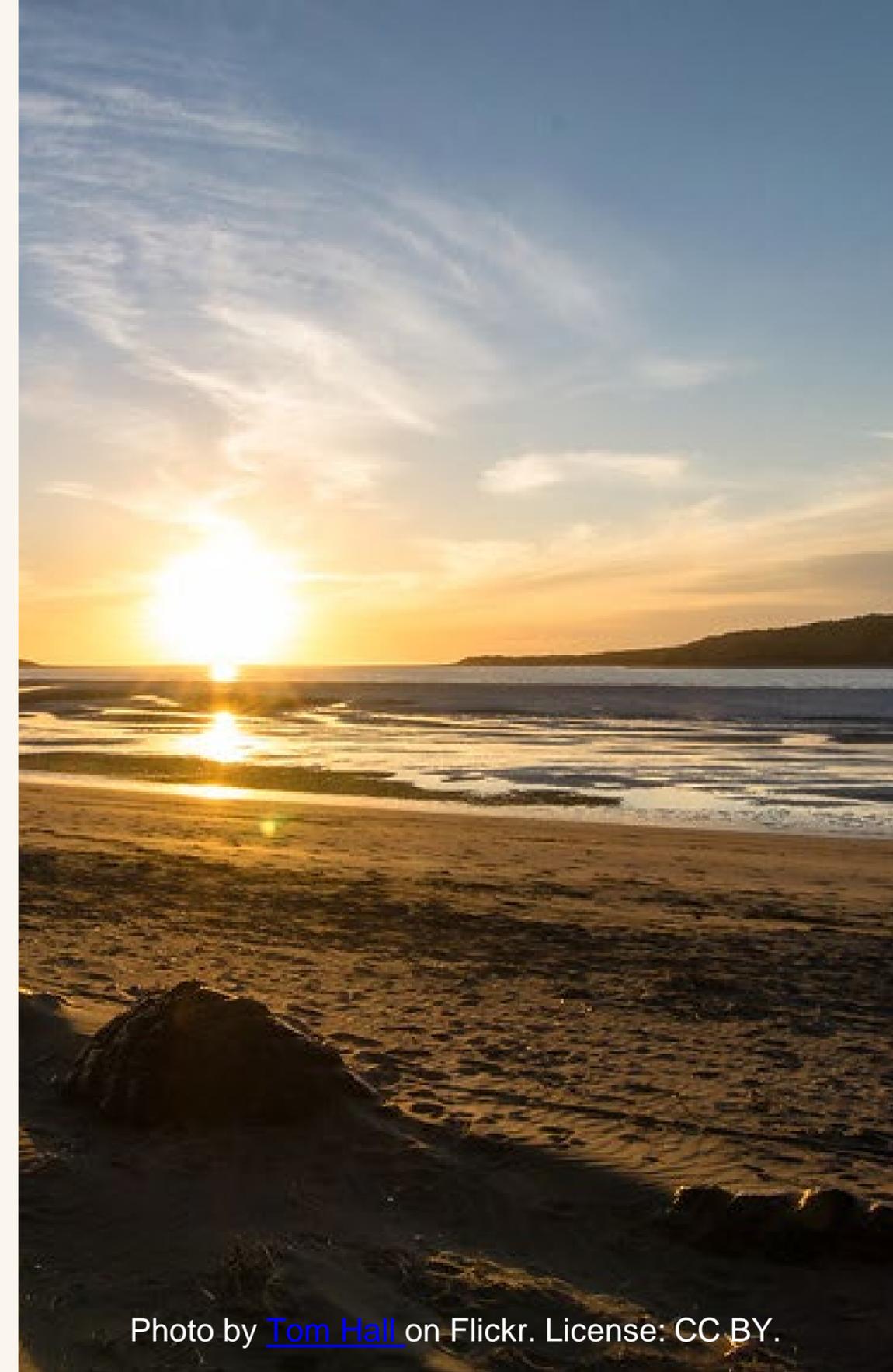


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# Develop a Climate Justice Design Protocol

## Prompt suggestion

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?

# Presentation Connecting What You've Learned to a Previous Project

## Prompt suggestion

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?

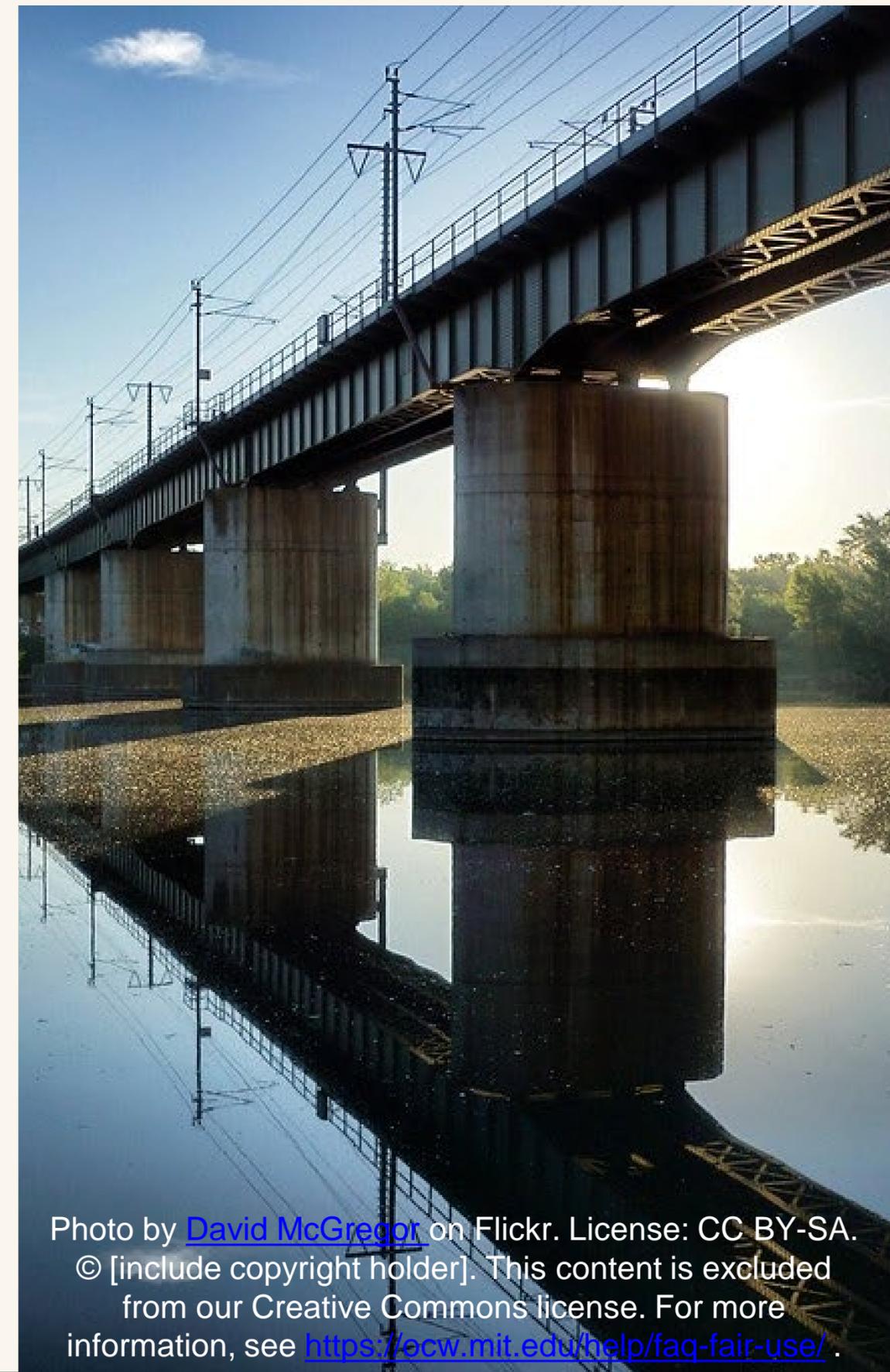


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# Essay on Implementing CJ Concepts into an Important Project

## Prompt suggestion

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—considering how engineering has a relationship with both the earth and social injustices?

# Additional Resource

- Video lecture from Khalid Kadir: [Me. We. - Moving from Ethics to Justice in Engineering](#)



Online Ethics Center  
FOR ENGINEERING AND SCIENCE



## Me. We. - Moving from Ethics to Justice in Engineering

Guest Lecturer: Dr. Khalid Kadir  
Continuing Lecturer at UC Berkeley

Discussant: Valerie Michel  
Ph.D. student  
University of Virginia

*Part of the Bringing Ethics into the Conversation Series hosted by the Online Ethics Center*

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



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