



Environmental Justice & Technical Innovation

What's in this module?

Description

This module explores current paradigms, goals, and cultures of technological innovation, & the intersection with environmental justice practices, or lack thereof. It explores case studies where technological innovation in sectors like agriculture and digital technology has had unintended negative consequences, particularly for marginalized communities, and then reviews emerging solutions.

Activities

4 parts
2 readings
3 activities
2 optional projects

Key Resources

- When the implication is not to design (technology)(Baumer and Silverman, 2011)
- The Karlskrona Manifesto for Sustainability Design ([2014](#))



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Learning Objectives

01

Understand the core principles of environmental justice and how they intersect with technological innovation.

02

Examine the goals and cultures that drive dominant paradigms of technological innovation and their potential impacts.

03

Analyze case studies where technological advances have resulted in harm.

04

Apply environmental justice principles to tech design and development.

Environmental Justice & Tech Innovation

PART 1

Environmental Justice

What is Environmental Justice?

Environmental justice, as defined by Dr. Robert Bullard (2001), is the principle that “**all people and communities are entitled to equal protection of environmental and public health laws and regulations**” (Environmental Factor, NIH)

Additionally, Dr. Dorceta Taylor states that environmental **injustice** is experienced through heightened exposure to pollution and corresponding health risks, limited access to adequate environmental services, and loss of land and resource rights. (Toxic Communities)

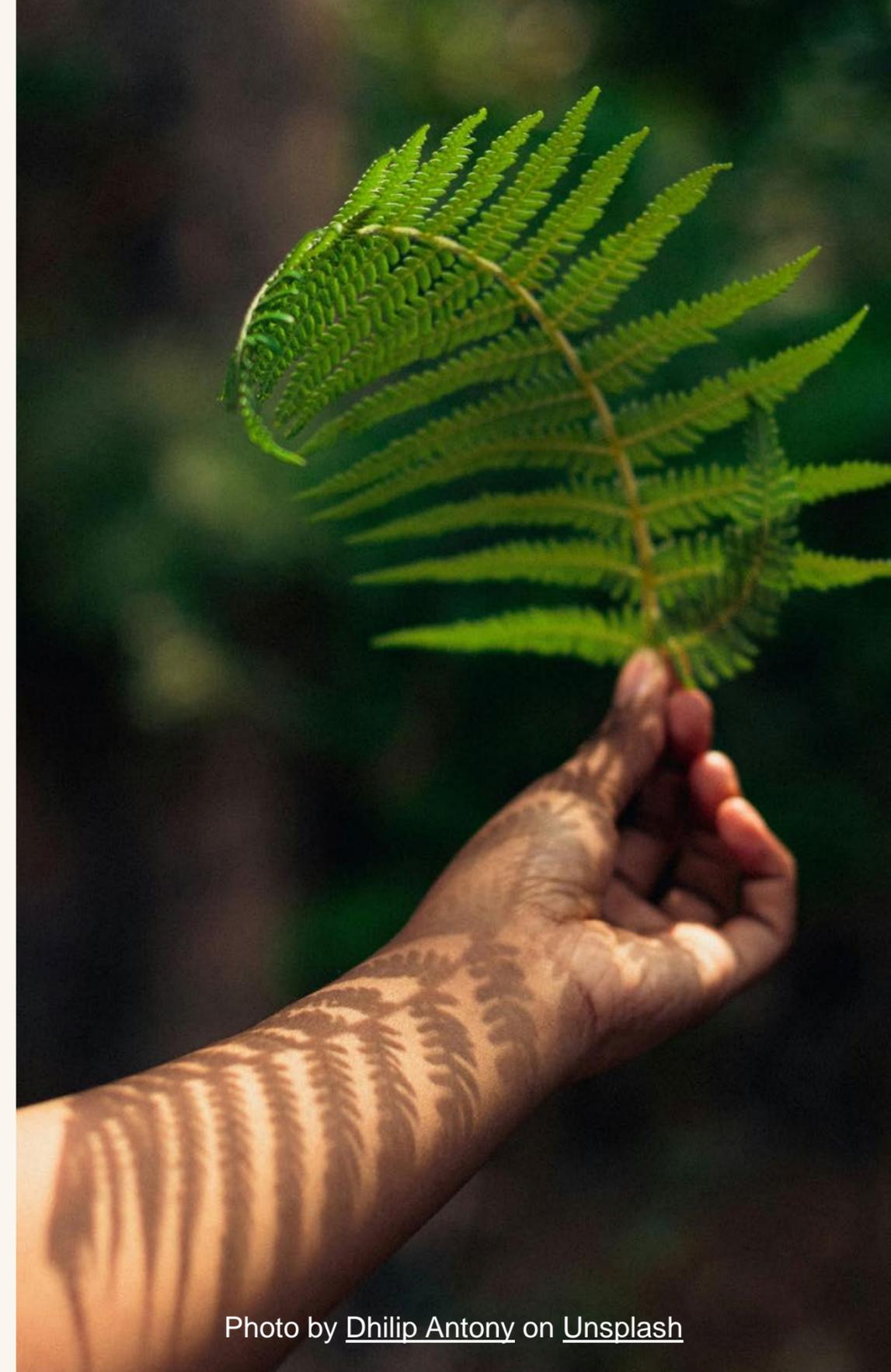


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Environmental Justice and Tech Innovation

The Urgent Need for Environmental Equity in Tech Innovation

Mainstream approaches to technological development may perpetuate social inequities by prioritizing rapid advancement over environmental and community well-being. Dominant tech paradigms may prioritize profit and novelty at the expense of the needs of marginalized communities most affected by environmental harm.

Without incorporating environmental justice (EJ) principles, technological solutions can exacerbate existing disparities, as seen in locations like “Cancer Alley”, a stretch of land in southern Louisiana where industrial decisions were made at the expense of local health and safety (Paul & Minns, 2024).

READING AND REFLECTION

Read

1. *Upgrading Environmental Innovation for the 21st Century*
2. *Sacrifice Zones: A Genealogy and Analysis of an Environmental Justice Concept*

Post-reading discussion questions

- How do concepts like “sacrifice zones” reflect the broader relationship between technological development and environmental justice - the notion of equal protection from environmental hazards and harms?
- In what ways can integrating environmental justice principles reshape the innovation process to avoid reinforcing social inequities?
- Why might “tech for good” initiatives be insufficient to address systemic inequities? Alternatively, if these initiatives might be sufficient, why is that the case?
- What role do marginalized communities play in pioneering sustainable solutions, and how can these contributions be better recognized within environmental and tech sectors?
- How do cultural and ethical considerations influence what different societies value as “progress” or “innovation”?

Perspectives on Technological Innovation

PART 2

Environmental Justice in the Innovation Paradigm

Drawing from Bruno Latour's actor-network theory and the field of science and technology studies (STS), technological innovation processes are deeply embedded in complex socio-technical networks that may prioritize certain interests over others. ([ScienceDirect](#))

Dominant technological paradigms are **primarily centered around market-based forces and economic gains** and tend to **prioritize novelty and urgency** — an approach that allowed humanity to reach the moon and develop vaccines but also emit billions of tons of pollution and develop deadly weapons that enable large-scale warfare.

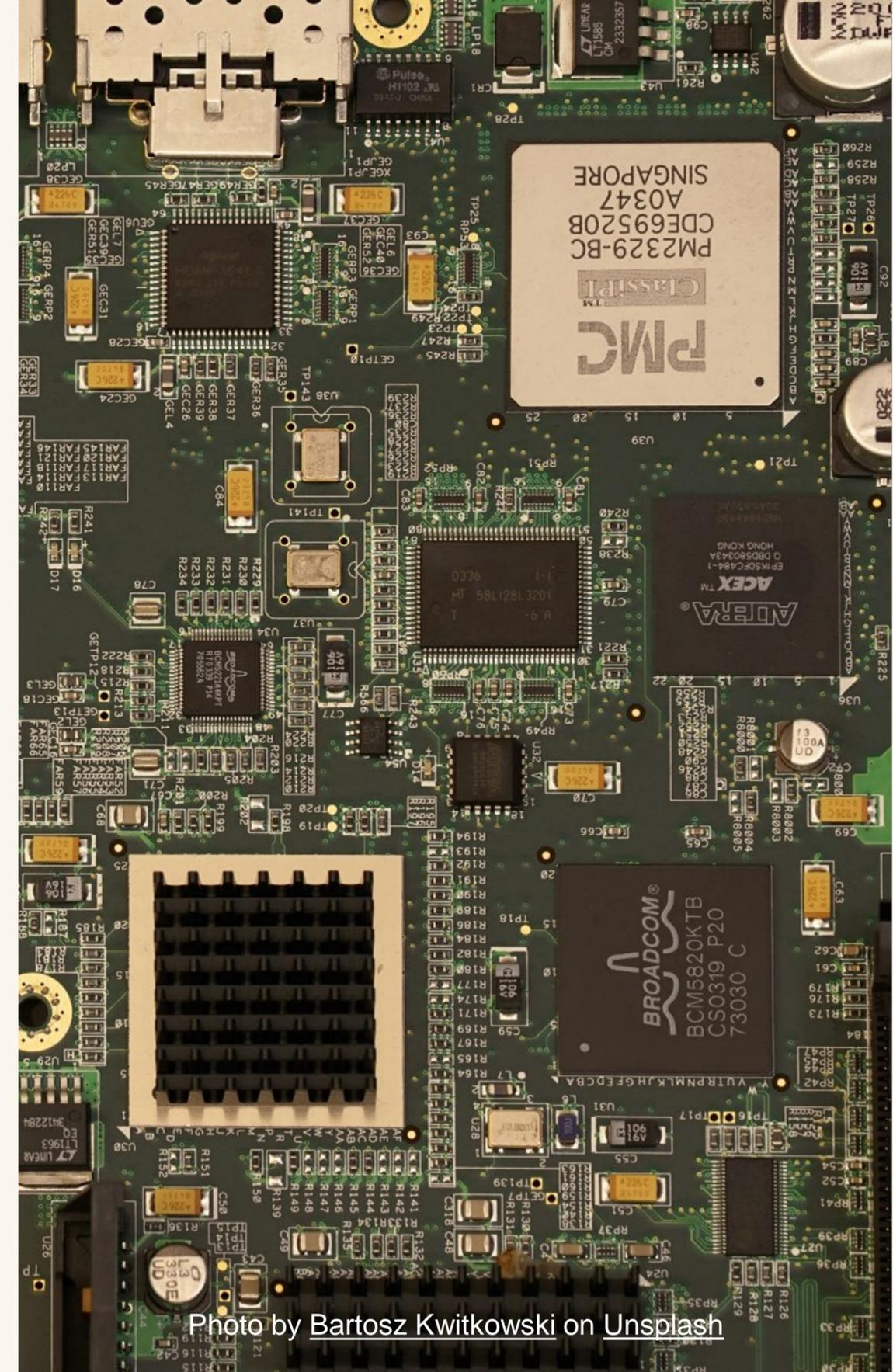


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Trends in Tech Innovation

The landscape of technological innovation in 2025 is full of rapid advancements and paradigm shifts, particularly in artificial intelligence (AI), automation, and digital transformation. Across sectors ranging from healthcare and agriculture to finance and manufacturing, the notion of “innovation” is primarily driven by goals of economic efficiency, scalability, and profitability. ([Aghion et al 2021](#), [Hernandez-Cortes and Meng 2020](#), [Sanchez-Henriquez and Pavez, 2021](#))



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Cultural Influences and Power Dynamics

The culture of technological innovation is generally shaped by a complex interplay of stakeholders, including corporations, governments, research institutions, and startups. The dominant narratives prevalent in tech spaces, ranging from startups to governments, often emphasizes technological optimism: the belief that innovation will solve major societal challenges, including environmental problems. However, this optimism can sometimes obscure the risks of unintended consequences or the concentration of power and benefits among a limited set of actors. (Vogel, Rainie and Anderson 2020, Alsaleh 2024)



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ACTIVITY #2

POWER MAPPING: ENVIRONMENTAL JUSTICE GAPS/ OPPORTUNITIES IN TECH

Set Up

- Materials: Whiteboard/paper, sticky notes (3 colors), markers.
- Divide board into 3 sections: High Power, Medium Power, Low Power.

Activity

- Identify Stakeholders (10 minutes)
 - Brainstorm key players in the ecosystem (tech companies, regulators, communities, etc.).
 - Write each stakeholder on a sticky note and place them in the High, Medium, or Low Power sections.
- Map Relationships (15 minutes)
 - Draw arrows between stakeholders to show influence or connections (e.g., funding, policy).
 - Think about who influences whom and where decisions flow.
- Highlight EJ Gaps (15 minutes)
 - Use a different color sticky note to mark missing EJ elements:
 - Where are community voices absent?
 - Where are power imbalances affecting outcomes?
 - Label specific gaps (e.g., lack of community input, transparency issues).
- Reflect and Discuss (10 minutes)
 - Share findings:
 - What EJ gaps did you find?
 - Where could power shift to support justice?

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Step 2: Identify stakeholders

- Brainstorm key stakeholders (i.e. tech companies, regulators, communities)
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Step 3: Map relationships

- Draw arrows between stakeholders to show influence or connections (e.g., funding, policy)
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Step 4: Highlight EJ gaps

- Use a different color sticky note to mark missing EJ elements:
 - Where are community voices absent?
 - Where are power imbalances affecting outcomes?
- Label specific gaps (e.g., lack of community input, transparency issues)

Step 5: Reflect and discuss

Share out your findings using these guiding questions:

- What EJ gaps did you find?
- Where could power shift to support justice?

Case Studies

PART 3

Agriculture: Automation & Digital Tools

Benefits and Risks of Agricultural Automation

- **Increased Productivity and Resilience:** Automation, including tractors, robotics, and AI, may boost farm outputs, improve resource efficiency, and help adapt to climate change. (Mana et al 2024)
- **Potential for Inclusive Gains:** When adopted responsibly, it is possible that automation can benefit smallholders, improve working conditions, and create new skilled jobs, especially in regions with labor scarcity.
- **Environmental Impact:** Automation can lead to more precise use of inputs, reducing overuse of water, fertilizers, and pesticides, and thus supporting environmental sustainability (Aijaz et al 2025)

Unintended Consequences and Equity Concerns

- **Job Displacement and Unemployment:** In regions where much employment relies on agricultural work, automation can displace workers, leading to unemployment and reduced remittances for migrant families (FAO)
- **Deepening Inequality:** Access to automation technologies is uneven, often favoring large producers over smallholders, youth, and women. This can exacerbate existing inequalities (Hackfort 2021, Rotz 2019)
- **Land Consolidation and Environmental Degradation:** Uneven adoption can drive land consolidation, marginalizing small farmers and leading to environmental issues such as land degradation (Union of Concerned Scientists)

Digital Technologies: AI, Big Data, & Social Media

Amplified Inequalities and Bias

- **Algorithmic Bias:** AI and big data systems in hiring, lending, and policing have been shown to replicate and amplify societal biases ([OECD 2023](#))
- **Digital Exclusion:** The digital divide persists, with rural, elderly, and low-income populations often lacking access to digital tools and the internet. ([Yang et al 2024](#))

Surveillance and Social Impact

- **Increased Surveillance:** Digital surveillance technologies, such as facial recognition and predictive policing, are deployed more frequently in marginalized communities, raising privacy and civil rights concerns. ([Lee and Chin-Rotman, 2022](#))
- **Social Media and Polarization:** Big data and social media algorithms can amplify misinformation, polarization, and hate speech, further marginalizing vulnerable groups. ([Awasthi 2025](#))

Beyond the Module

PART 4

Develop an Environmental Justice Impact Assessment Tool

Prompt Suggestion

Create an Environmental Justice Impact Assessment Tool designed to evaluate new technologies through an equity-focused lens. This tool should include clear instructions and guidelines to help users assess potential environmental, social, and economic impacts on marginalized communities. Define the target audience, specifying whether this tool is for policymakers, tech developers, or environmental advocates, to ensure it effectively supports informed, justice-centered decision-making in technology development.

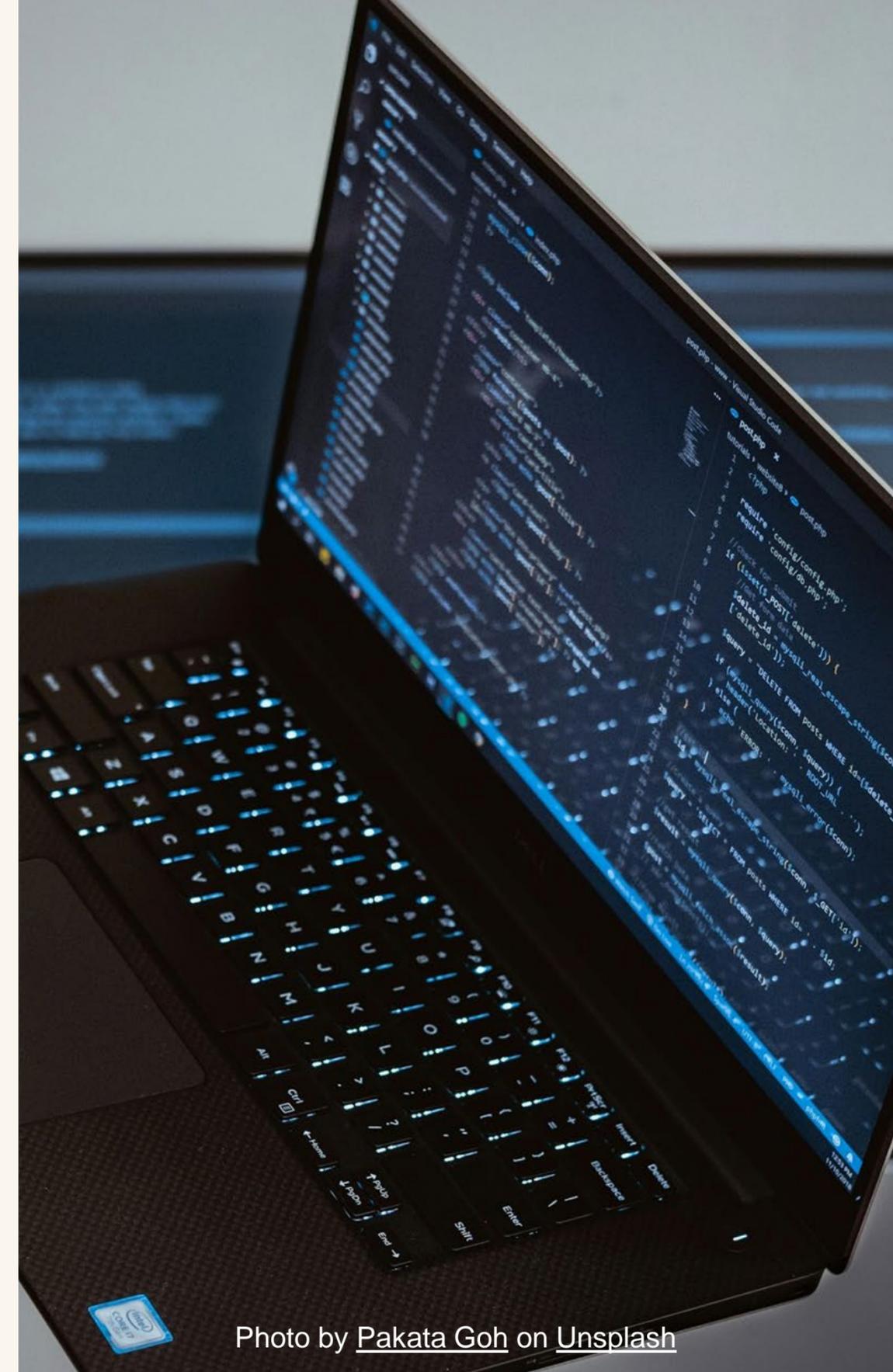


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Create a Sample Campaign to Advocate for EJ Principle Adoption

Prompt Suggestion

Design an advocacy campaign to encourage a tech company or industry association to adopt environmental justice principles in their operations and products. Define the campaign type—whether political, social media-driven, or business-focused—and develop key personas representing stakeholders, such as community advocates, ethical investors, or environmentally-conscious consumers. This campaign will use targeted messaging and strategies to build awareness, drive stakeholder engagement, and push for actionable commitments to equity and justice in tech development.



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Additional Resources

- Computing for Sustainability : Computer Science professor Samuel Mann's website exploring sustainable practice in computing
- Indigenous Innovation Initiative: Empowering First Nation, Inuit and Métis innovators and communities
- Critically Conscious Computing: A digital, living book exploring the technical and pedagogical foundations of CS education
- Data and Society Research Institute's program on Climate, Technology and Justice: A program exploring environmental justice intersections with technology
- Graceful Degradation: A paper discussing the concept of graceful degradation in design
- Jugaad: An introduction to the regional innovation concept of Jugaad

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



Module References

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RES.11-003 Climate Justice Instructional Toolkit Spring 2025

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