Environmental justice for early-stage research

Considering environmental justice (EJ) can help avoid damage to communities, social acceptance barriers, and missed opportunities. But how do we think about EJ when we don't know where a new technology might be deployed?
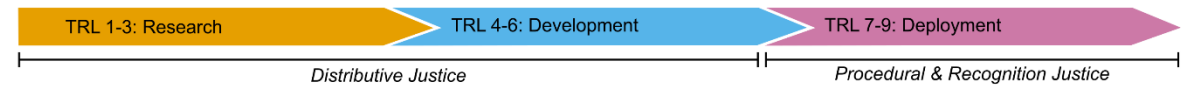
- We have developed a guiding framework for evaluating environmental justice during early technology readiness level (TRL) innovation.

- Try out the worksheet below and provide feedback to taylor.uekert@nrel.gov

EJ/SJ Worksheet

Step 1: Determine the Technology Readiness Level (TRL) of the solution to be evaluated.

TRL 1-3: Research	TRL 4-6: Development	TRL 7-9: Deployment
Distributive Justice		*Procedural & Recognition Justice*

Step 2: Answer the following justice questions.

Qualitative Assessment*
Environmental Impacts:
1. Are any toxic materials used?
2. Are any of the used materials known to cause social or environmental issues?
3. Are any hazardous waste streams produced?
Worker Impacts:
4. Are any of the used materials associated with forced or child labor?
Supply Chain Impacts:
5. Will existing infrastructure be unable to manage the solutions end-of-life?

Quantitative Assessment
Environmental Impacts:**
6. Using life cycle assessment, what are the impact scores for smog formation, respiratory effects, and human toxicity?
Worker Impacts:
7. What are the health and safety occupational hazards for workers?
Economic Impacts:**
8. What are the economic impacts of the solution?
9. Will consumers be able to afford this solution?
10. What are the number and types of jobs that will be created?

Qualitative Assessment
Worker Impacts:**
11. Will workers along the material supply chain receive an unfair salary?
12. Will workers along the material supply chain work an unfair number of hours?
13. Will collective bargaining rights of workers along the material supply chain be disrespected?
Community Impacts:**
14. Is there a history of problematic impacts or land use in the community where the technology will be deployed?
15. Is the community engagement plan lacking?
16. Are the land-use permits lacking?
17. Are the community preferences for the use of land being ignored?

Quantitative Assessment
Community Impacts:
18. What is the budget for community relations?
19. What are the community demographics?
20. How does the solution affect local access to resources such as water?**

Step 3: Reflect on the answers. How can the results be taken into consideration when designing the technology?
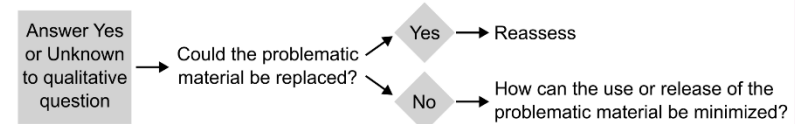
Step 4: Communicate results and repeat.

* Qualitative questions should be answered with "yes," "no," or "unknown."
** These questions may require additional expertise, such as a life cycle assessment expert, a techno-economic analyst, or a social scientist.

T. Uekert, J. Walzberg, H. M. Wikoff, M. M. Doyle, A. C. Carpenter, *in peer review*, **2024.**
N. S. Dutta, E. Gill, B. K. Arkhurst, M. Hallisey, K. Fu, K. Anderson, *Joule*, **2023**, *7*, 431-437.