

Architects of a Just Transition: From Instrumental Engagement to Open Empowerment

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June 8, 2025

Introduction

The global energy transition presents an ethical paradox: a project for planetary sustainability that often relies on unjust methods, deepening local inequities. The dominant, top-down model of energy development is characterized by an "instrumental" approach to community engagement, which prioritizes project acceptance over genuine partnership. The global energy transition is undermined by this ethical paradox: its dominant, top-down model of development relies on an "instrumental" approach to community engagement that perpetuates energy injustice. A genuinely sustainable and just transition requires a systemic shift to an open science paradigm, which directly remedies these ethical failings by dismantling information asymmetries and empowering communities through tools like Open Source Appropriate Technology to become architects of their own energy future.

The Hollow Promise of "Engagement": Analyzing the Instrumental Paradigm

The current model of community engagement in many energy projects is designed to manage dissent, not foster partnership. This represents a profound ethical failure. This instrumentalism manifests as a "tick-box" mentality, where legally mandated procedural hurdles are cleared, but community feedback is not meaningfully incorporated, breeding cynicism and distrust [Ryder and et al., 2023]. This approach is further exemplified by the transactional nature of many Community Benefit Agreements (CBAs), which are often used to "buy" social license rather than to build lasting, relational partnerships or mitigate harm [Eisensohn and Webb, 2023].

This model fails the key tests of energy justice. As defined by scholars like Sovacool and Dworkin [2015] and Miller [2014], energy justice demands more than just a fair distribution of outcomes (distributive justice). It also requires fair and inclusive decision-making processes (procedural justice) and respect for different cultures and values (recognition justice). The instrumental model fails on the latter two counts. This procedural failure is reinforced by a culture of opaque, closed-data research, where information asymmetry disempowers communities and erodes public trust [Alonso Pedrero and Van de Sande Araujo, 2025].

The Open Science Solution: A Framework for Genuine Partnership

Open science offers a direct, practical, and systemic remedy to the failures of the instrumental paradigm. By championing transparency and collaboration, it provides the necessary framework for a more just and effective energy transition.

First, it directly counters the culture of research opacity. By promoting open data, open-source code, and transparent methodologies, open science enables reproducibility and builds the public trust essential for collective action against climate change. Second, and more fundamentally, it addresses the core issue of power imbalance. Access to information is a prerequisite for meaningful procedural justice. When communities can access and utilize the same data and tools as developers, they are empowered to move from the margins of decision-making to the center.

The most tangible embodiment of this principle is Open Source Appropriate Technology (OSAT). OSAT is not about imposing a single, proprietary solution, but about providing a flexible, adaptable framework. The case of open-source solar racking, which can be modified for local material costs, perfectly illustrates this; it enhances distributive justice by lowering costs and procedural justice by giving local users agency in the design [Rana and et al., 2023]. Similarly, the development of accessible, open-source scientific hardware, such as a solar-powered ball mill, democratizes the very tools of innovation [Mottaghi and et al., 2023]. As the foundational work by Pearce [2019] argues, it is this transfer of knowledge and capacity that is pivotal. OSAT, enabled by open science, transforms communities from passive recipients into active participants and owners.

Conclusion

The problem of energy injustice is not an incidental flaw in the transition to sustainability; it is a direct consequence of a closed, top-down development model. Therefore, the solution must be a systemic shift to an open one. Open science is not merely about improving research methodologies; it is about fundamentally reconfiguring power. By providing the ethical framework and the practical tools to dismantle information asymmetries, it empowers communities to move beyond being passive stakeholders and become the active architects of a more just, equitable, and truly sustainable energy future.

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