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## Addressing environmental justice in clean energy policy: Comparative case studies from the United States and Nigeria

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### Abstract

This paper explores the intersection of environmental justice and clean energy policy through a comparative analysis of case studies from the United States and Nigeria. Environmental justice, defined as the fair treatment and meaningful involvement of all people in environmental decisions, is increasingly recognized as a critical aspect of transitioning to clean energy systems. By examining clean energy policies and initiatives in both countries, this study aims to identify successes, challenges, and lessons learned in addressing environmental justice considerations. In the United States, the analysis focuses on federal and state-level clean energy policies, assessing their impact on marginalized communities and efforts to promote equity in access to clean energy resources. Similarly, in Nigeria, attention is given to government-led clean energy initiatives and their implications for environmental justice, particularly in rural and underserved areas. Through a comparative lens, this paper highlights common themes and divergent approaches to addressing environmental justice in clean energy policy between the two countries. It identifies opportunities for cross-country collaboration and knowledge sharing to advance equitable and sustainable energy transitions globally. The findings underscore the importance of integrating environmental justice principles into clean energy policy development and implementation, with recommendations provided for policymakers and stakeholders to promote inclusivity, fairness, and community engagement in shaping the future of clean energy.

**Keywords:** Environmental Justice; Clean Energy; Policy; Comparative Case Studies; United States; Nigeria.

### 1. Introduction

In recent years, the pursuit of clean energy has become a global imperative to mitigate climate change and reduce dependence on fossil fuels ((Akinsanya, Ekechi & Okeke, 2024, Haines et al., 2007, Oguanobi & Joel, 2024). However, as nations transition to cleaner forms of energy, it is crucial to ensure that this transition is equitable and inclusive, with particular attention to addressing the needs and concerns of marginalized communities (Ajayi & Udeh, 2024, Familoni, Abaku & Odimarha, 2024). This is where the concept of environmental justice intersects with clean energy policy (Oriekhoe et al., 2024). Environmental justice encompasses the fair treatment and meaningful involvement of all people, regardless of race, ethnicity, income, or social status, in environmental decision-making and the distribution of environmental benefits and burdens (Beretta, 2012, Ekechi, et. al., 2024, Ikegwu, et. al., 2017, Onwuka & Adu, 2024). In the context of clean energy policy, environmental justice requires that the benefits of transitioning to clean energy are equitably distributed, and the burdens, such as pollution and environmental degradation, are not disproportionately borne by already marginalized communities (Familoni & Babatunde, 2024, Odimarha, Ayodeji & Abaku, 2024). Clean energy policies encompass a wide range of initiatives aimed at promoting renewable energy sources, energy efficiency, and sustainable practices to reduce greenhouse gas emissions and environmental impacts (Esan, Ajayi & Olawale, 2024,

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Igbinenikaro & Adewusi, 2024, Okatta, Ajayi & Olawale, 2024). While these policies offer significant potential for mitigating climate change and improving air and water quality, they can also exacerbate existing inequalities if not implemented with a focus on environmental justice (Familoni & Shoetan, 2024, Jambol, et. al., 2024, Oriekhoe et al., 2023, Popoola, et. al., 2024). Comparative case studies between the United States and Nigeria offer valuable insights into the intersection of clean energy policy and environmental justice from diverse socio-economic and geographical contexts (Idoko et al., 2024). Both countries are grappling with similar challenges related to energy access, environmental degradation, and socio-economic disparities, albeit with different historical, political, and institutional frameworks (Akintuyi, 2024, Joel & Oguanobi, 2024, Ogundipe, Odejide & Edunjobi, 2024).

The United States, as a global leader in clean energy innovation and policy development, has implemented various federal and state-level initiatives to promote renewable energy deployment, energy efficiency, and carbon reduction (Popp, 2020). However, disparities in energy access and environmental quality persist, disproportionately affecting communities of color, indigenous peoples, and low-income populations. On the other hand, Nigeria, as Africa's most populous country and a major oil producer, faces complex energy and environmental challenges (Adama, et. al., 2024, Igbinenikaro & Adewusi, 2024, Okeke, et. al., 2023). Despite its abundant natural resources, millions of Nigerians lack access to reliable electricity, leading to energy poverty and reliance on polluting fuels such as diesel and kerosene (Emodi and Boo, 2015). Moreover, the oil and gas industry has contributed to environmental degradation and social conflicts in the Niger Delta region, highlighting the urgent need for sustainable energy solutions that prioritize environmental justice (Eleogu, et. al., 2024, Nwankwo, et. al., 2024, Okatta, Ajayi & Olawale, 2024). By comparing clean energy policies and initiatives in these two countries, this study aims to identify common patterns, unique challenges, and best practices in addressing environmental justice considerations (Familoni & Onyebuchi, 2024, Nzeako, et. al., 2024, Olawale, et. al., 2024). Through cross-country learning and collaboration, policymakers, researchers, and practitioners can develop more effective strategies to promote equitable and sustainable energy transitions that benefit all communities, both locally and globally (Hampl, 2022).

## 1.1. Background

Environmental justice refers to the fair treatment and meaningful involvement of all people, regardless of race, ethnicity, income, or social status, in environmental decision-making and the distribution of environmental benefits and burdens (Ajayi & Udeh, 2024, Beretta, 2012, Ogundipe & Abaku, 2024, Popo-Olaniyan, et. al., 2022). The concept emerged in response to the recognition that certain communities, particularly those marginalized or disadvantaged, bear a disproportionate burden of environmental pollution, degradation, and health risks (Akinsanya, Ekechi & Okeke, 2024, Igbinenikaro & Adewusi, 2024, Shoetan & Familoni, 2024). Environmental justice seeks to address systemic inequalities by advocating for policies and practices that ensure equitable access to clean air, water, and land, as well as opportunities for participation in environmental governance and decision-making processes (Daley and Reames, 2015).

### 1.1.1. Clean Energy Policies in the United States

The United States has a complex landscape of clean energy policies and initiatives at both the federal and state levels, aimed at reducing greenhouse gas emissions, promoting renewable energy deployment, and increasing energy efficiency (Byrne et al., 2007). At the federal level, introduced by the Obama administration in 2015, the Clean Power Plan aimed to reduce carbon emissions from power plants, particularly those fueled by coal (Esho, et. al., 2024, Joel & Oguanobi, 2024, Ogundipe, Odejide & Edunjobi, 2024). Although the plan faced legal challenges and was eventually replaced by the Affordable Clean Energy rule under the Trump administration, it catalyzed investments in renewable energy and energy efficiency. The federal government offers tax incentives for renewable energy projects, including the Investment Tax Credit (ITC) for solar energy and the Production Tax Credit (PTC) for wind energy (Bolinger, 2014). These incentives have played a crucial role in driving the growth of renewable energy capacity across the country (Ajayi & Udeh, 2024, Igbinenikaro & Adewusi, 2024, Okeke, et. al., 2023). Various federal programs and initiatives set energy efficiency standards for appliances, buildings, and vehicles to reduce energy consumption and greenhouse gas emissions (Nadel and Ungar, 2019).

At the state level, many states have implemented their own clean energy policies, such as Renewable Portfolio Standards (RPS), which require utilities to generate a certain percentage of their electricity from renewable sources, and net metering programs, which allow customers with rooftop solar panels to sell excess electricity back to the grid (Esan, Ajayi & Olawale, 2024, Ochulor, et. al., 2024, Shoetan & Familoni, 2024)

### 1.1.2. Clean Energy Policies in Nigeria

Nigeria faces significant energy challenges, including widespread energy poverty, unreliable electricity supply, and environmental degradation from the oil and gas industry (Emodi and Boo, 2015). Despite being Africa's largest oil

producer, Nigeria has limited access to clean and sustainable energy sources for its population. The Nigerian government has initiated various programs and projects to expand access to electricity in rural and underserved areas through off-grid and renewable energy solutions, such as solar mini-grids and decentralized energy systems (Bhattacharyya and Palit, 2021). Nigeria has set targets for increasing the share of renewable energy in its energy mix, with a particular emphasis on solar, wind, and hydroelectric power. The government has introduced incentives and policies to attract investment in renewable energy projects and promote local manufacturing and deployment of renewable energy technologies (Okorie et al., 2024). In response to the environmental challenges posed by the oil and gas industry, Nigeria has enacted environmental laws and regulations to mitigate pollution, protect ecosystems, and promote sustainable development. However, enforcement and implementation remain significant challenges due to governance issues, corruption, and institutional weaknesses (Rose-Ackerman, 2005).

Despite these efforts, Nigeria continues to face barriers to achieving sustainable energy access and environmental justice, including inadequate infrastructure, financing constraints, and socio-economic disparities (Akintuyi, 2024, Joel & Oguanobi, 2024, Ogundipe, 2024). Addressing these challenges requires holistic approaches that prioritize community engagement, equity, and environmental sustainability in clean energy policy and implementation (Nsafon et al., 2023).

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## 2. Case study: united states

The United States has been at the forefront of clean energy initiatives, with a diverse array of policies and programs aimed at reducing carbon emissions, promoting renewable energy deployment, and increasing energy efficiency (Lu et al., 2020). Some key clean energy initiatives in the United States include: Renewable Portfolio Standards (RPS), many states have implemented RPS policies, which require utilities to generate a certain percentage of their electricity from renewable sources such as wind, solar, and hydroelectric power (Berry and Jaccard, 2001). These standards have played a significant role in driving investment in renewable energy projects across the country. The federal government offers tax incentives for renewable energy projects, including the Investment Tax Credit (ITC) for solar energy and the Production Tax Credit (PTC) for wind energy (Bolinger, 2014). These incentives have helped spur growth in the renewable energy sector by making projects more financially attractive to investors. Energy Efficiency Programs: Federal and state governments have implemented various energy efficiency programs to reduce energy consumption in buildings, appliances, and industrial processes (Oriekhoe et al., 2024). These programs aim to lower energy bills for consumers, reduce greenhouse gas emissions, and enhance energy security. Clean Power Plan (CPP): Although the Clean Power Plan was ultimately repealed by the Trump administration, its introduction in 2015 marked a significant milestone in efforts to address climate change by setting carbon emission reduction targets for power plants and encouraging the transition to cleaner energy sources (Berardo and Holm, 2018).

### 2.1. Analysis of Environmental Justice Considerations in Policy Implementation

Despite the proliferation of clean energy initiatives, environmental justice considerations have not always been adequately addressed in policy implementation (Carley and Konisky, 2020). Historically, marginalized communities, including low-income neighborhoods and communities of color, have borne a disproportionate burden of environmental pollution and health risks associated with fossil fuel extraction, transportation, and power generation (Esho, et. al., 2024, Igbinenikaro & Adewusi, 2024, Thompson, et. al., 2022). In many cases, clean energy projects and policies have inadvertently perpetuated or exacerbated existing environmental injustices by siting polluting facilities in or near disadvantaged communities or failing to prioritize equitable access to clean energy resources. This phenomenon, known as "energy injustice," highlights the need for a more inclusive and participatory approach to clean energy policymaking that prioritizes the needs and concerns of frontline communities (Elmallah et al., 2022)

### 2.2. Successes and Challenges in Addressing Environmental Justice

Increasing recognition of the importance of community engagement and participation in decision-making processes has led to greater involvement of frontline communities in shaping clean energy policies and projects (Abaku & Odimarha, 2024, Nzeako, et. al., 2024, Olawale, et. al., 2024). Advances in environmental justice mapping and analysis tools have enabled policymakers and advocates to identify areas with high environmental burdens and prioritize investments in clean energy and environmental justice initiatives (Lee, 2020). Some states and localities have implemented policy reforms aimed at promoting environmental justice in clean energy development, such as requiring environmental justice impact assessments for proposed projects and establishing community benefit agreements to ensure that local communities share in the benefits of clean energy projects (Akinsanya, Ekechi & Okeke, 2024, Ochulor, et. al., 2024, Udeh, et. al., 2023).

However, significant challenges remain, including: Limited resources, capacity, and expertise within government agencies and regulatory bodies can hinder efforts to effectively address environmental justice considerations in clean energy policy implementation (Jenkins et al., 2016). Inadequate data on the distribution of environmental burdens and clean energy resources can hamper efforts to target investments and interventions in communities most in need (Adama, et. al., 2024, Joel & Oguanobi, 2024, Ogundipe, Babatunde & Abaku, 2024). Economic disparities and structural inequalities can exacerbate environmental injustices by limiting access to clean energy technologies and exacerbating energy poverty in disadvantaged communities (Biswas et al., 2022). While progress has been made in recognizing and addressing environmental justice considerations in clean energy policy, ongoing efforts are needed to ensure that clean energy transitions are equitable, inclusive, and beneficial for all communities (Akintuyi, 2024, Igbinenikaro, Adekoya & Etukudoh, 2024, Popoola, et. al., 2024).

### 3. Case Study: Nigeria

Nigeria, despite being a major oil-producing nation, faces significant energy challenges, including widespread energy poverty, unreliable electricity supply, and environmental degradation (Iwayemi, 2008). In response, the Nigerian government has initiated various clean energy initiatives aimed at expanding access to electricity, reducing dependence on fossil fuels, and promoting sustainable development. Some key clean energy initiatives in Nigeria include (Esho, et. al., 2024, Odimarha, Ayodeji & Abaku, 2024, Onwuka, et. al., 2023).

The Nigerian Rural Electrification Agency (REA) has spearheaded efforts to electrify rural and underserved areas through off-grid and renewable energy solutions, such as solar mini-grids, standalone solar systems, and small-scale hydroelectric projects (Babayomi et al., 2023). Nigeria has abundant renewable energy resources, including solar, wind, hydro, and biomass. The government has set targets for increasing the share of renewable energy in the country's energy mix and has introduced incentives and policies to attract investment in renewable energy projects, such as feed-in tariffs and tax breaks for renewable energy developers (Ekechi, et. al., 2024, Igbinenikaro, Adekoya & Etukudoh, 2024). The Nigerian government, in collaboration with international partners and organizations, has implemented various programs to improve energy access for households, businesses, and communities, including the Energizing Economies Initiative, the Solar Home Systems program, and the Nigeria Electrification Project (Egieya et al., 2023). Nigeria has enacted environmental laws and regulations to mitigate pollution, protect ecosystems, and promote sustainable development, including the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act and the Environmental Impact Assessment (EIA) Act (Ezeabasili, 2009). These regulatory frameworks aim to ensure that clean energy projects are implemented in an environmentally sustainable manner.

#### 3.1. Analysis of Environmental Justice Considerations in Policy Implementation

In Nigeria, environmental justice considerations in clean energy policy implementation are critical due to the country's socio-economic disparities, environmental degradation, and dependence on fossil fuels (Ajayi & Udeh, 2024, Joel & Oguanobi, 2024, Onwuka & Adu, 2024). However, there are several challenges and limitations in addressing environmental justice in practice:

Millions of Nigerians lack access to reliable electricity, particularly in rural and remote areas (Shaaban and Petinrin, 2014). The burden of energy poverty falls disproportionately on low-income communities, exacerbating inequalities and hindering socio-economic development. The oil and gas industry, which has been the backbone of Nigeria's economy, has contributed to environmental pollution, land degradation, and social conflicts in the Niger Delta region (Esho, et. al., 2024, Igbinenikaro, Adekoya & Etukudoh, 2024). Communities living in oil-producing areas have borne the brunt of environmental injustices, including oil spills, gas flaring, and loss of livelihoods (Ejiba et al., 2016). Despite efforts to promote renewable energy development, access to clean energy resources remains unevenly distributed across Nigeria. Urban areas and industrial centers often have better access to electricity and clean energy technologies, while rural and marginalized communities continue to rely on polluting fuels such as diesel and kerosene for cooking and lighting (Pachauri et al., 2012).

#### 3.2. Successes and Challenges in Addressing Environmental Justice

While Nigeria has adopted various clean energy policies and programs, the effective implementation and enforcement of these policies remain a challenge due to governance issues, corruption, and institutional weaknesses (Oriekhoe et al., 2024). Meaningful engagement of affected communities in decision-making processes related to clean energy projects is often lacking, leading to conflicts, mistrust, and resistance to development initiatives (Shaw et al., 2015). Building local capacity and expertise in clean energy technologies, project management, and environmental management is essential for ensuring the sustainable and equitable implementation of clean energy initiatives in Nigeria (Adama & Okeke, 2024, Odimarha, Ayodeji & Abaku, 2024). Addressing environmental justice in clean energy policy

implementation requires holistic approaches that prioritize community participation, equity, and sustainability. Collaboration between government, civil society, the private sector, and international partners is essential to overcome the challenges and achieve meaningful progress towards a cleaner, more equitable energy future for Nigeria (Oyedepo, 2014).

### 3.3. Comparative analysis

United States has a diverse array of federal and state-level clean energy policies, including Renewable Portfolio Standards, tax incentives for renewable energy, and energy efficiency programs (Zhou and Solomon, 2020). These policies aim to promote renewable energy deployment and reduce carbon emissions. In Nigeria, clean energy policies focus on expanding access to electricity, reducing energy poverty, and promoting renewable energy development. Initiatives include rural electrification projects, renewable energy incentives, and environmental regulations (Akinsanya, Ekechi & Okeke, 2024, Olawale, et. al., 2024, Popoola, et. al., 2024).

In the United States, despite progress in clean energy deployment, environmental justice considerations have not always been adequately addressed in policy implementation (Carley and Konisky, 2020). Marginalized communities often bear a disproportionate burden of pollution and lack access to clean energy resources, perpetuating environmental injustices. In Nigeria, the legacy of environmental degradation from the oil and gas industry exacerbates environmental injustices, particularly in oil-producing regions (Akintuyi, 2024, Joel & Oguanobi, 2024, Onwuka & Adu, 2024). While clean energy initiatives aim to improve energy access and reduce pollution, challenges remain in ensuring equitable distribution of clean energy resources and addressing socio-economic disparities (Haines et al., 2007).

United States, recognizing and addressing environmental justice considerations in clean energy policy implementation is essential for ensuring equitable and sustainable outcomes (Esho, et. al., 2024, Igbinenikaro, Adekoya & Etukudoh, 2024). Community Engagement: Involving affected communities in decision-making processes and project development can help identify and address environmental justice concerns (Sampson et al., 2014). Utilizing environmental justice mapping and analysis tools can inform policy decisions and prioritize investments in communities most in need.

Nigeria, environmental justice considerations are critical in the context of energy transitions, particularly in regions with a history of environmental degradation and socio-economic disparities (Orieno et al., 2024). Building local capacity and expertise in clean energy technologies and environmental management is essential for sustainable and equitable development (Hampl, 2022). Integrating environmental justice principles into clean energy policies and regulatory frameworks can help address systemic inequalities and promote inclusive development.

Opportunities for Cross-Country Collaboration and Knowledge Sharing, The United States and Nigeria can benefit from sharing experiences, lessons learned, and best practices in addressing environmental justice in clean energy policy (Abaku, Edunjobi & Odimarha, 2024, Ogundipe & Abaku, 2024, Popoola, et. al., 2024). Capacity-building initiatives and technical assistance programs can support Nigeria in developing and implementing effective clean energy policies and projects (Udeh et al., 2024). Collaborative research projects and partnerships between institutions in the United States and Nigeria can contribute to advancing knowledge and understanding of environmental justice issues in the context of clean energy transitions (Lacey-Barnacle et al., 2020). Civil society organizations, academic institutions, and international organizations can facilitate dialogue, advocacy, and networking opportunities to promote environmental justice and equitable clean energy development globally (Ajayi & Udeh, 2024, Joel & Oguanobi, 2024, Onwuka & Adu, 2024).

Cross-country collaboration and knowledge sharing are essential for addressing environmental justice challenges and promoting equitable and sustainable energy transitions in both the United States and Nigeria. By learning from each other's experiences and working together, both countries can contribute to building a more just and resilient energy future for all (Tompkins and Adger, 2004).

### *Recommendations*

Integrate environmental justice considerations into clean energy policy development, implementation, and evaluation processes to ensure that the benefits and burdens of clean energy transitions are equitably distributed (Carley and Konisky, 2020). Prioritize meaningful engagement and participation of affected communities, particularly marginalized and frontline communities, in decision-making processes related to clean energy projects and policies (Adama & Okeke, 2024, Odimarha, Ayodeji & Abaku, 2024, Popo-Olaniyan, et. al., 2022). Require comprehensive environmental justice impact assessments for proposed clean energy projects to identify and address potential environmental and social impacts on vulnerable populations. Establish equity targets and performance metrics to track progress in addressing

environmental justice goals and ensure that clean energy policies benefit underserved communities (McNamara et al., 2022). Allocate sufficient funding and resources to support initiatives aimed at promoting environmental justice, including community-led clean energy projects, capacity-building programs, and technical assistance for marginalized communities.

Target investments in clean energy infrastructure, such as solar mini-grids and decentralized energy systems, in rural and underserved areas to improve energy access and reduce energy poverty (Babatunde, et. al., 2024, Ogedengbe, 2022, Ogundipe, Odejide & Edunjobi, 2024). Develop innovative financing mechanisms, such as community-based financing models and microfinance schemes, to enable low-income households and communities to afford clean energy technologies and services (Ajayi & Udeh, 2024, Ikegwu, et. al., 2022, Popoola, et. al., 2024). Invest in local capacity building and workforce development programs to empower communities to participate in the clean energy transition, including training in renewable energy technologies, project management, and entrepreneurship (Gui and MacGill, 2018). Foster coordination and integration between clean energy policies, environmental regulations, and social welfare programs to ensure a holistic approach to addressing energy disparities and promoting environmental justice (Familoni, 2024, Igbinenikaro, Adekoya & Etukudoh, 2024, Popoola, et. al., 2024). Design clean energy programs and initiatives with an equity-centered approach that prioritizes the needs and preferences of marginalized communities and incorporates culturally appropriate solutions (Adama, et. al., 2024, Joel & Oguanobi, 2024, Osimobi, et. al., 2023).

Invest in robust data collection efforts to better understand the distribution of environmental burdens and clean energy resources, as well as the socio-economic factors influencing access to clean energy technologies and services (Mukoro et al., 2022). Foster interdisciplinary research collaborations between academia, government agencies, civil society organizations, and communities to address complex environmental justice challenges and inform evidence-based policy decisions (Aturamu, Thompson & Akintuyi, 2021, Oguanobi & Joel, 2024). Develop long-term strategic plans and roadmaps for advancing environmental justice in clean energy policy, with clear goals, timelines, and accountability mechanisms to guide implementation and monitor progress (Finley-Brook and Holloman, 2016). Facilitate knowledge sharing and capacity-building initiatives to exchange best practices, lessons learned, and innovative solutions for promoting environmental justice and equitable clean energy transitions globally (Adaga et al., 2023). Encourage policy experimentation and innovation at the local, regional, and national levels to test new approaches for addressing environmental justice in clean energy policy and identify scalable solutions for broader implementation (Seyfang and Haxeltine, 2012).

By implementing these recommendations, policymakers, stakeholders, and practitioners can advance environmental justice goals, reduce energy disparities, and promote equitable access to clean energy resources for all communities (Edu, et. al., 2022, Jambol, et. al., 2024, Onwuka & Adu, 2024).

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#### 4. Conclusion

Both countries face significant energy challenges, including energy poverty, environmental degradation, and socio-economic disparities. Clean energy policies have the potential to mitigate these challenges by promoting renewable energy deployment, reducing carbon emissions, and improving energy access. However, environmental justice considerations are often overlooked in clean energy policy implementation, leading to disparities in access to clean energy resources and perpetuating environmental injustices. Successes in addressing environmental justice include community engagement, policy reforms, and advances in environmental justice mapping and analysis. Challenges remain, including institutional barriers, lack of data, economic disparities, and governance issues, which hinder efforts to achieve equitable and sustainable energy transitions.

Environmental justice is essential for ensuring that the benefits and burdens of clean energy transitions are equitably distributed across society. By prioritizing environmental justice in clean energy policy, policymakers can address systemic inequalities and historical injustices that disproportionately affect marginalized communities. Improve public health outcomes by reducing exposure to pollution and environmental hazards in vulnerable populations. Enhance social cohesion and community resilience by empowering communities to participate in decision-making processes and shaping their energy futures. Foster economic development and job creation through investments in clean energy infrastructure and workforce development programs.

To promote equitable and sustainable energy transitions, policymakers, stakeholders, and practitioners are called to integrate environmental justice principles into clean energy policy development, implementation, and evaluation processes. Prioritize community engagement and participation in decision-making processes related to clean energy projects and policies. Target investments in clean energy infrastructure and capacity-building programs in underserved communities. Foster interdisciplinary research collaborations and knowledge sharing initiatives to inform evidence-

based policy decisions. Advocate for policy reforms and institutional changes that promote equity, inclusion, and justice in the clean energy transition.

By taking concerted action to prioritize environmental justice in clean energy policy, we can build a more just, equitable, and sustainable energy future for all. Together, we can address the urgent challenges of climate change, energy poverty, and environmental degradation while advancing social equity, human rights, and environmental stewardship.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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