

POLICY BRIEF

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Forging Sustainable Green Hydrogen Regional Alliances: Uruguay's and Germany's Path to Equitable Energy Security

Ricarda Leske, Tamara Avellan and Nidhi Nagabhatla

Highlights

- Green hydrogen is a key solution for climate change mitigation, aiming to reduce carbon emissions by 2050. It is produced using renewable energy and water and is vital for decarbonizing sectors like transport, industry, and steel production.
- Germany and Uruguay have emerged as important players in the green hydrogen landscape, each with distinct strategies. Germany, with limited domestic production potential, focuses on importing green hydrogen and establishing international partnerships.
- Uruguay aims to become a green hydrogen exporter, leveraging its renewable energy capacity. Its strategy focuses on developing a green hydrogen economy, with plans to produce 10 GW of green hydrogen annually by 2040.
- In the context of green hydrogen, interregional collaboration can play a crucial role, as exchange on green hydrogen projects can foster effective partnerships, technological exchange, shared investment, and policy alignment.

Introduction

Green hydrogen is widely regarded as a key solution in the climate change debate and is positioned as vital to significantly reducing carbon dioxide emissions by 2050. Produced using renewable energy and water, green hydrogen acts as a zero-emission energy carrier and plays a crucial role in decarbonizing challenging sectors such as transport, industry, steel production, and fertilizers. Green hydrogen represents a critical component of the global transition to sustainable energy, with distinct strategies emerging across different regions.

On the one hand, Germany needs to import green hydrogen to meet its growing energy demand, as domestic production potential is limited. This creates a significant gap that must be filled through bilateral energy partnerships. Germany introduced its first official federal hydrogen strategy in 2020, positioning itself as a global leader in the green hydrogen economy. This strategy focuses on expanding hydrogen infrastructure, developing legislative mechanisms, and promoting green hydrogen production and usage to secure future energy supplies. On the other hand, Uruguay aims to position itself as a green hydrogen exporter and integrate green hydrogen into its domestic energy mix. Uruguay's Green Hydrogen Roadmap, initiated in 2018, outlines a plan to leverage the country's renewable energy capacity to develop

a green hydrogen economy. The roadmap aims to produce 10 GW of green hydrogen annually by 2040 and emphasizes stakeholder engagement by incorporating input from the public and private sectors, as well as academia.

Examination of the strategy documents and expert interviews reveals that both the German and Uruguayan strategies exhibit strengths and limitations when assessed through an energy justice framework. While the documents indicate an awareness of social and environmental considerations, they lack specific mechanisms or binding commitments to ensure these factors are meaningfully integrated into project implementation and in building sustainable inter-regional pathways towards a green hydrogen economy. German experts view the strategy as largely positive and beneficial while acknowledging potential water and land conflicts arising from green hydrogen projects. Uruguayan experts are polarized, with government-aligned experts seeing the collaboration with Germany (EU region) as beneficial, while academic experts express scepticism about the government's claims and participatory efforts.

Uruguay is developing its green hydrogen sector to diversify its economy, aiming to establish a new industry akin to its current livestock and cellulose sectors. In contrast, Germany's hydrogen strategy is part of its broader climate goals, emphasizing green hydrogen's role in achieving carbon neutrality and positioning itself as a global leader in this field

The analysis of the strategies shows an opportunity to advance interregional cooperation. Uruguay's focus on industry development and Germany's emphasis on global leadership in the sector can complement each other, creating a synergistic relationship that enhances technological exchange, investment opportunities, and collaborative research at the regional scale. This alignment can strengthen both regions' global green hydrogen market positions and support their broader climate objectives.





Background

Green hydrogen is often depicted as a key energy solution in the current climate change debate to reduce global greenhouse gas (GHG) emissions. Produced using renewable energy and water, green hydrogen is a versatile energy carrier (Figure 1). It is particularly important in energy-intensive sectors, such as transport and heavy industry, where decarbonization is challenging. As a cornerstone for a sustainable energy future, green hydrogen enhances energy security, fosters economic growth, and opens new opportunities in green technologies.

However, green hydrogen is also a subject of considerable debate. It requires substantial renewable energy and water — approximately nine kilograms of fresh water per kilogram of hydrogen (Beswick et al., 2021). While seawater and wastewater are potential alternatives, they remain underdeveloped and costly. The key challenges include technological advancements for safety, storage, and transportation, as well as high production costs compared to the current widespread use of grey hydrogen. Despite these hurdles, green hydrogen is projected to significantly contribute to global energy needs, potentially meeting 12–24% of demand by 2050 (IRENA, 2022). Further, critics argue that green hydrogen could exacerbate global inequalities. Examining the trade routes for green hydrogen reveals a clear pattern: the Global North, seeking fossil-free energy for decarbonization, relies on the Global South,

which provides for the necessary resources to produce and export affordable renewable energy (see Figure 1). There is concern that the North might exploit these resources for market advantage, potentially leading to a new form of “green colonialism” (Van de Graaf et al., 2020).

In the Latin American region, as explained in the case of Uruguay, there are fears about the impact of green hydrogen projects on freshwater resources, particularly the Guaraní aquifer. The 2023 water shortage in Montevideo has raised doubts about the government's water management and tendency to favor large companies over local communities (Barriero, 2023; Martinez, 2023).

Color	GREY HYDROGEN	BLUE HYDROGEN	TURQUOISE HYDROGEN*	GREEN HYDROGEN
Process	SMR or gasification	SMR or gasification with carbon capture (85-95%)	Pyrolysis	Electrolysis
Source	Methane or coal 	Methane or coal 	Methane 	Renewable electricity 

Note: SMR = steam methane reforming.
* Turquoise hydrogen is an emerging decarbonisation option.

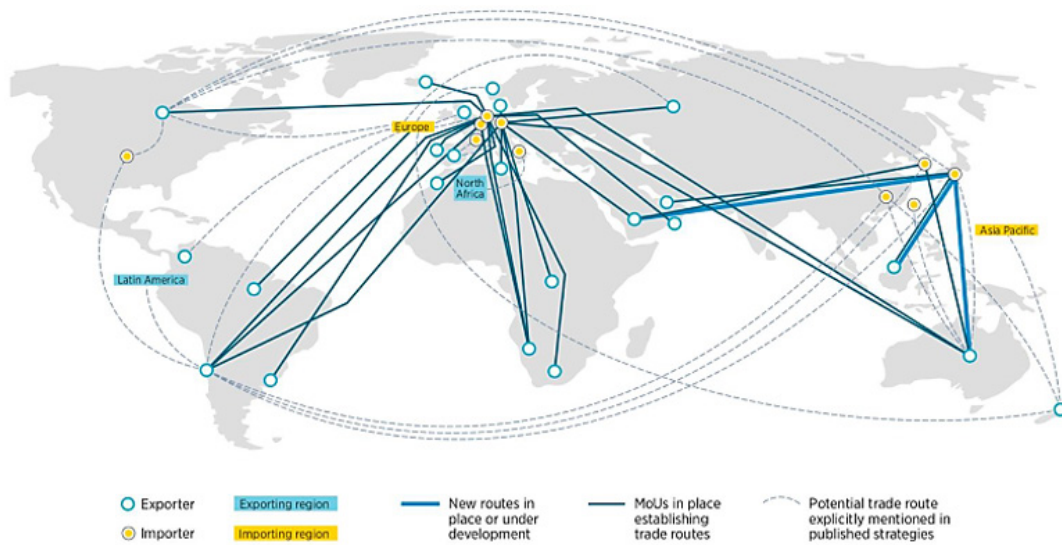


Figure 1:

Top: Selected shades of hydrogen (Source: IRENA, 2020)
Bottom: Hydrogen trade routes, plans and agreements (Source: IRENA 2022).

Approach

The brief outlines key elements of both countries’ strategies through an energy justice lens (see Box 1 on the hydrogen justice framework used), exploring their significance and evaluating their potential to support a more equitable and sustainable energy future. The findings stem from an analysis of the countries’ green strategies and expert interviews

conducted as part of the thesis research (Leske, 2024). The interviews included stakeholders from government, business, civil society, and academia, providing a comprehensive overview of the diverse attitudes and perspectives on green hydrogen strategies. It incorporates insights from non-European actors and non-state entities, aligning with concepts of cooperation within and across regions. This approach provides a broader understanding of these actors’ roles in

regional integration and cooperation (Litsegård & Mattheis, 2023), highlighting dynamics often overlooked in traditional state-centric analyses via the following three elements:

1. **Country-Level Strategies:** This section provides an overview of Germany’s and Uruguay’s plans, objectives, and the anticipated role of green hydrogen in their energy mix. The focus is on how these strategies comply with a just hydrogen transition.
2. **Perceptions:** This section examines the differing perceptions of green hydrogen strategies within each country, including the views of government officials,

academic experts, civil society, and the private sector. This section captures the diversity of opinions and concerns, highlighting the sociopolitical landscape that influences policy development.

3. **Inter-Regional Efforts/ Multi-scalar Global Dynamics:** The section categorizes the partnership between the two countries by analyzing the global dynamics of the green hydrogen market with its significant economic potential. It highlights the varying levels of participation from key regions and the efforts to establish uniform standards.

Box 1: Hydrogen Justice Framework Overview

Müller et al. (2022) developed a theoretical framework for hydrogen justice, offering an analytical tool for evaluating green hydrogen partnerships, strategies, policies, and projects. Hydrogen justice arises from the intersection of water, energy, and climate justice, integrating aspects of political ecology and postcolonial theory. This framework is divided into six dimensions, each covering distinct justice aspects:

Dimension	Key Question
Procedural Justice	What configurations of multi-stakeholder hydrogen governance are emerging? How inclusive are these global decision-making frameworks?
Relational Justice	How does the resource-intensive process of hydrogen production affect the relationship between humans and water or humans and land?
Recognitional Justice	Which stakeholders’ interests, needs and vulnerabilities are taken into account when formulating hydrogen strategies, management and projects? How are existing vulnerabilities exacerbated and what new vulnerabilities can be connected to hydrogen production?
Distributive Justice	In what manner are costs and benefits allocated throughout the hydrogen value chain? How will access to energy and water resources be reshaped by the hydrogen economy?
Restorative Justice	To what degree might hydrogen economies exacerbate historical injustices and dependencies associated with colonialism, such as land disputes, displacement due to projects, exploitative labor practices, or exclusion from resource utilization?
Epistemic Justice	In what ways are knowledge transfers facilitated within the hydrogen economy? Whose expertise regarding land use or energy production is taken into account?

Key Findings

A thorough examination of the strategy documents reveals that both the German and Uruguayan green hydrogen strategies exhibit notable strengths and limitations when assessed through an energy justice framework. Figure 3 illustrates the distribution of hydrogen justice dimensions across the examined strategies, showing a consistent pattern. Both countries strongly emphasize distributive and epistemic justice, highlighting the economic potential of green hydrogen and its benefits for market development, investment, and international cooperation. Both nations aim to position themselves as leaders in the green hydrogen transition, underlining research and knowledge transfer investments through collaborative efforts.

1. Country-level strategies

Germany additionally emphasizes restorative justice, particularly in the 2023 update, focusing on building partnerships and diversifying energy sources in light of geopolitical challenges such as the Ukraine war. On the other hand, the Uruguayan strategy emphasizes procedural justice, advocating for inclusive decision-making and a holistic approach. These differing emphases are advantageous, as they cover more justice aspects when the countries collaborate. Despite this, there is significant overlap and strong resemblance in the dominant and non-dominant dimensions of both strategies. Both strategies exhibit a significant gap in addressing relational and recognitional justice aspects, indicating potential oversights in managing resource conflicts and addressing the needs of marginalized populations.

GERMANY'S GREEN HYDROGEN STRATEGY



STRATEGY OVERVIEW

- **Initial Strategy:** Launched in 2020 to position Germany as a global leader in green hydrogen (BMW, 2020).
- **2023 Update:** Introduced specific goals and adaptations to the evolving energy landscape (BMW, 2023).
- **Diversification Need:** The Ukraine war highlighted the importance of diversifying energy sources.
- **Green Hydrogen Importance:** Essential for meeting Paris Agreement targets and decarbonizing industries like steel and chemicals.

NATIONAL HYDROGEN COUNCIL

- **Composition:** Includes members from science, civil society, and industry.
- **Role:** Advises the government on strategy development and implementation, supports market setup, and establishes sustainability standards.

HYDROGEN DEMAND AND PRODUCTION

- **Forecasted Demand:** 95-150 TWh needed by 2050.
- **Domestic Production:** Only 10 GW of domestic green hydrogen production capacity can be achieved by 2030.
- **Import Necessity:** Significant gap to be filled with imported green hydrogen.

GLOBAL NETWORK OF PARTNERSHIPS

- **Bilateral Energy Partnerships:** Promote green hydrogen production in countries with favorable conditions.
- **Diversified Imports:** Aims to diversify Germany's energy imports and improve energy security.

TECHNOLOGICAL LEADERSHIP AND ECONOMIC BENEFITS

- **Leadership in Technology:** Germany aims to maintain a leading role in hydrogen infrastructure technology.
- **Support for Businesses:** Investments in key technologies and international marketing for German companies.
- **Economic Impact:** Fosters mutually beneficial relationships with partner countries, benefiting Germany and the EU.

URUGUAY'S GREEN HYDROGEN STRATEGY



STRATEGY OVERVIEW

- Strategy: Official roadmap for green hydrogen published in 2022 to harness renewable energy capacity and drive the transition to green hydrogen (MIEM, 2022).
- Export and Domestic Use: Position Uruguay as a green hydrogen exporter while integrating green hydrogen into the domestic energy mix to decarbonize maritime and air transport sectors.

HYDROGEN PRODUCTION

- Target: Production capacity of 10 GW of green hydrogen annually by 2040.
- Renewable Energy Requirement: Approx. 20 GW renewable energy capacity.
- Cost competitiveness: Projected decline in the levelized costs of renewable energy to \$11/MWh for photovoltaic, \$15/MWh for onshore wind, and \$21/MWh for offshore wind by 2040.

LOCATION ADVANTAGE

- Current Renewable Energy Mix: Over 90% of the energy mix is based on renewable sources.
- Political and Economic Stability: Uruguay's stability and low corruption levels make it attractive for foreign investment.
- Freshwater Resources: Uruguay has abundant freshwater resources for the production of green hydrogen.

STAKEHOLDER ENGAGEMENT AND ECONOMIC BENEFITS

- Roundtable Discussions: Input from public and private sectors for the strategy building.
- Economic Goals: Green hydrogen projected to contribute 2% to Uruguay's GDP by 2040.
- Public acceptance and participation: Aiming to raise national awareness of societal and economic benefits.

PRODUCTION SITES AND COOPERATION

- Key projects: Tambor Green Hydrogen Hub, H24U pilot project, HIF Global project, and Kahiros project.
- International Cooperation: Uruguay and Germany signed a climate and energy partnership in March 2023 to advance green hydrogen development and cooperation.

Figure 2:

Top: German green hydrogen strategy (own illustration, based on BMWi (2020), BMWK (2023))

Bottom: Uruguay's green hydrogen strategy (own illustration, based on MIEM (2022))



Figure 3:

Distribution of the hydrogen justice dimensions in the strategy documents based on the number of codes found for each dimension in the documents (Source: Leske, 2024)

Top: Summary of the German hydrogen strategy (2020) with updates (2023)

Bottom: Uruguayan green hydrogen roadmap (2022)

These strategy documents demonstrate a general awareness of social and environmental issues related to green hydrogen. However, they do not provide concrete mechanisms or binding commitments for integrating these considerations into project execution. The impact on vulnerable populations and the equitable distribution of costs and benefits are addressed only broadly. As a result, these documents serve as preliminary frameworks reflecting regional perceptions and can be a starting point for developing a more comprehensive and actionable plan for a just transition.

Complementarities

The strategy documents provide a broad overview, outlining overarching goals for the hydrogen sector rather than detailed action plans to ensure a just transition. They highlight each country's strengths and their potential to become global leaders in the hydrogen economy, with Uruguay positioned as a potential exporter and Germany as an importer.

Uruguay aims to attract investment by emphasizing its favorable conditions for green hydrogen production. Germany, on the other hand, seeks to promote the global hydrogen economy and support partner countries in developing their green hydrogen production to secure imports. For example, Germany's strategy specifies that partner countries should meet certain standards (BMWK, 2023), while Uruguay's strategy details its compliance with these international standards, fulfilling Germany's investment requirements (MIEM, 2022). Thus, the strategies complement each other by aligning mutual needs and delineating each country's strengths and positions within the global hydrogen market.

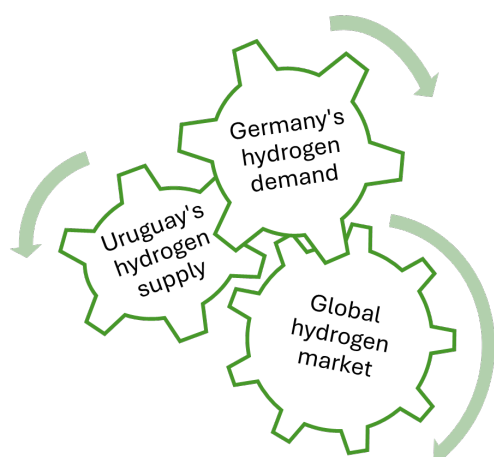


Figure 4:

Complementarity of the green hydrogen strategies
(Source: Leske, 2024)

2. Perceptions

Interviews across various sectors—including government, business, civil society, and research—were used to map perceptions of the green hydrogen strategies, offering an overview of attitudes toward green hydrogen in both countries. Figure 5 summarizes experts' views on the alignment of hydrogen strategies with the dimensions of hydrogen justice. Consistent with the document analysis, experts in both countries largely disagree on relational and recognitional justice, highlighting that the strategies lack mechanisms to prevent resource conflicts and protect vulnerable populations. Conversely, there is broad agreement on the procedural justice dimension, with experts noting that relevant stakeholders are engaged, and decision-making processes are transparent and inclusive.

In Germany, the green hydrogen strategy is viewed positively, mainly due to establishing the Hydrogen Council, which includes industry and civil actors advising the government. However, stakeholders urge more institutionalized and transparent processes over informal consultations to enhance involvement. Concerns about potential water and land conflicts from green hydrogen projects exist, such as possible adverse outcomes of the hydrogen infrastructure. These impacts are primarily focused on the partner countries, with less emphasis placed on potential effects in Germany. They recommend participatory processes and stakeholder engagement to mitigate negative impacts. However, there has yet to be a consensus on Germany's responsibility for the effects on partner countries' local populations. The outcomes heavily depend on the partner country, with Uruguay's democratic structures being a key factor in managing conflicts. These differing factors and the variety of partner countries are also reflected in the experts' responses to the justice dimensions, with more uncertainty or neutral answers from German experts compared to their Uruguayan counterparts (Figure 5).

Consulted experts agree that Germany covers most economic costs and risks, while partner countries mainly face ecological and social risks. They generally see no significant conflict between expanding German technologies and benefiting partner countries as long as capacity-building and local value-creation are prioritized. However, there needs to be more debate over how much value chain relocation abroad is acceptable.

„Wir wollen nicht schon wieder einen extraktiven Markt sozusagen etablieren, einen neuen Wasserstoffmarkt, sondern wir meinen es ernst mit einem Wandel in Handelsbeziehungen.“ (We do not want to establish

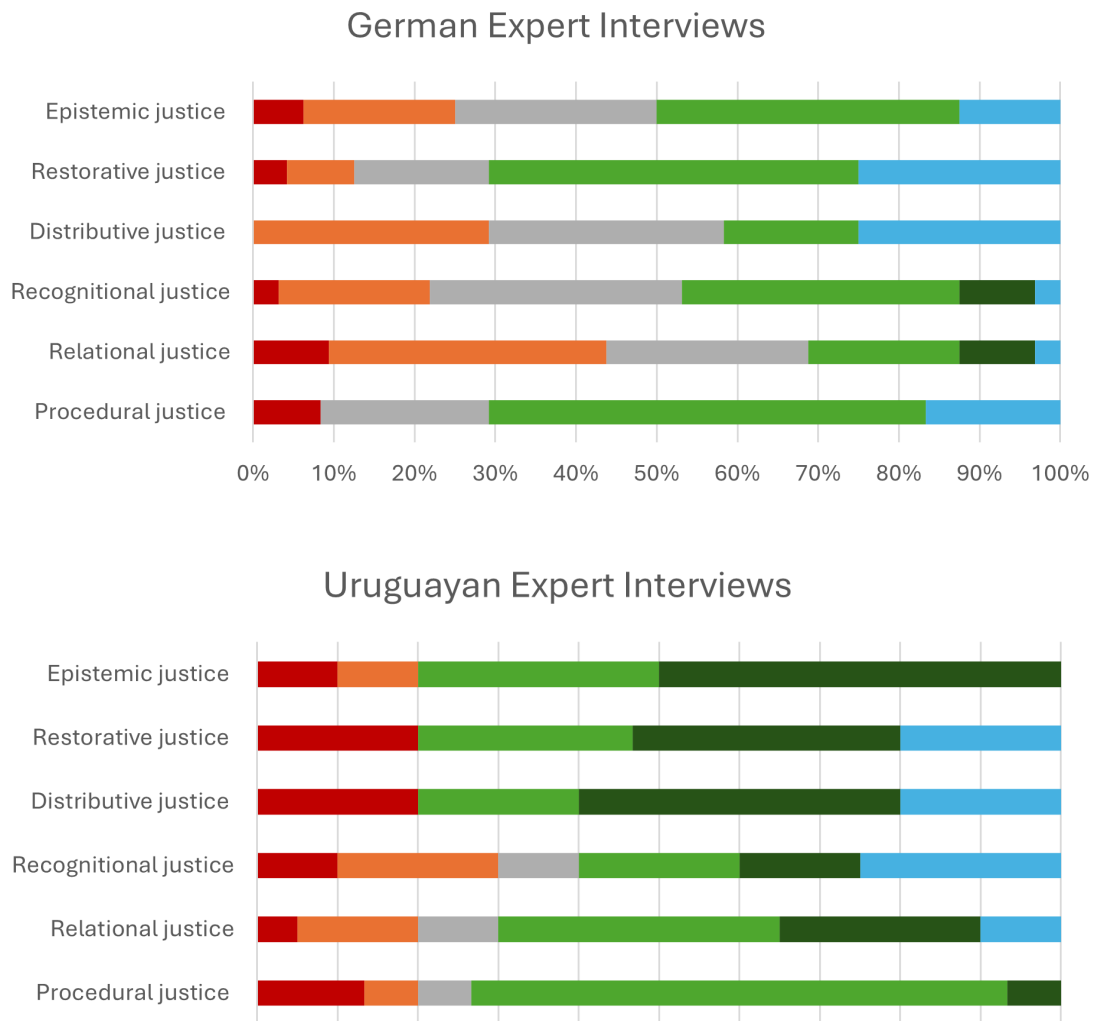


Figure 5:

Overview of experts' answers to the hydrogen justice dimensions based on questionnaires prior to the interviews (derived from Leske, 2024).

yet another extractive market, a new hydrogen market, but we are serious about a change in trade relations.)
(German expert research institute, Leske, 2024)

In Uruguay, expert opinions on the green hydrogen economy are polarized, as illustrated in Figure 5, with a significant divide between strongly agree and strongly disagree responses. Experts aligned with the government view the partnership with Germany positively, praising its participatory structures and local integration efforts. They believe these elements will yield beneficial socio-economic outcomes, as reflected in the large consensus on the epistemic justice dimension (see Infographic 5). They indicate that green hydrogen will be utilized domestically and emphasize that German companies running the projects bear the most economic costs and risks.

In contrast, academic experts are skeptical, arguing that these efforts may be superficial and amount to greenwashing. They critique the government for neglecting public interests and failing to address the long-term socio-environmental impacts of hydrogen projects. Thus, they not only challenge the government-aligned experts in Uruguay, but also contradict the German experts who argue that Germany bears most of the economic burden.

“Ha sido todo muy público. O sea que en realidad no veo que se esté dejando de lado, por ejemplo, a la ciudadanía.” (It’s all been very public. So, I don’t really see that, for example, the public is being left out)
(Uruguayan legal expert, Leske, 2024)

“En general, son acuerdos secretos a puertas cerradas para la población y sin ningún tipo de acceso a tomar decisiones.” (In general, these are secret agreements behind closed doors to the population and without any access to decision-making.) (Uruguayan expert in academia, Leske, 2024)

Government experts emphasize Uruguay’s adherence to high environmental standards and public consultations to prevent adverse effects on natural resources and local communities. However, civil sector experts contend that these measures are mainly ineffective, accusing the government of prioritizing economic benefits over genuine environmental and community protections. The divide highlights broader societal concerns about equity, sustainability, and local involvement. This polarization underscores the need for transparent communication, authentic stakeholder engagement, and trust-building to ensure that the transition to a hydrogen economy is perceived as fair and inclusive.

3. Multi-scalar (Global-Local) dynamics and interregional cooperation driving the green hydrogen market economy

Experts highlight that the hydrogen market operates globally, with key players including countries like Japan, South Korea, and China. Although partnerships are often bilateral, numerous other nations are involved in the global markets steering a hydrogen-based economy. These countries have varying sustainability standards, with Europe enforcing the most rigorous regulations. While the global enthusiasm for green hydrogen is immense, with infrastructure investment potential reaching \$11 trillion over the next three decades and annual revenues estimated at \$2.5 trillion (Woods et al., 2022), this enthusiasm may lead to rapid expansion without fully addressing potential risks. Therefore, the need for international cooperation to develop uniform standards is paramount.

One German governmental [German Development Agency (GIZ)] expert notes that countries with substantial production capabilities are attracted to green hydrogen’s financial and developmental opportunities (Leske 2024). While companies are working to meet sustainability standards, they face the challenge of competitive disadvantages in the global markets. In response, the German government has introduced the H2Global mechanism, which provides subsidies for green hydrogen to counteract the higher costs compared to conventional grey hydrogen and to support its market adoption. The green hydrogen market is driven by both global and local dynamics, reflecting a multi-scalar approach. International collaborations and regional strategies interplay, influencing technological advancements and market

expansion. This example reflecting the exchange between Germany and Uruguay also fits into the wide spectrum of interregional approaches that help trigger innovation and economic growth within the green hydrogen sector.

Shaping just interregionalism

While Germany and Uruguay have developed complementary strategies for green hydrogen, significant challenges remain in ensuring a just transition that benefits all stakeholders involved:

- **Resource Conflicts:** The strategies lack mechanisms to manage resource conflicts and address the needs of marginalized communities.
- **Market Pressures:** The competitive nature of the global green hydrogen market may perpetuate inequalities, with the Global North relying on the Global South for resources
- **Implementation Gaps:** While both strategies show awareness of social and environmental issues, they lack concrete commitments for integrating these considerations into project execution.

From the viewpoint of interregional cooperation, the partnership between Uruguay and Germany is marked by transparent and equitable engagement. Uruguayan politicians, who are democratically elected, participate in discussions on equal terms with their German counterparts. This democratic legitimacy means that questioning their authority or dismissing their viewpoints based solely on domestic opposition would be considered presumptuous from a German perspective. However, a more nuanced approach is necessary when dealing with interregional partnerships involving countries with varying political systems, particularly non-democratic ones. This complexity requires careful consideration to ensure effective and respectful collaboration across diverse political landscapes. Table 2 outlines key considerations for the future strategies and in particular their implementation that we draw from our findings.

Despite the inherent risks and challenges, green hydrogen is crucial in reducing carbon emissions and combating climate change within our current system. However, it is important not to view green hydrogen as a panacea. Enhancing energy demand management and improving energy efficiency are equally essential. Green hydrogen production demands significant resources, particularly high levels of renewable energy and reliance on rare earth elements. Therefore, a holistic approach that addresses both the benefits and limitations of green hydrogen is imperative for navigating the transition toward a more sustainable energy future.

Aspect	Advantages	Challenges
Shared Responsibility for a Just Energy Transition	<p>Ensures sustainable implementation of projects.</p> <p>Respects partner countries' sovereignty and avoids neo-colonial practices.</p> <p>Encourages transparent and equal partnerships.</p>	<p>Need for careful balance between donor influence and local autonomy.</p> <p>Potential for excessive intervention if not managed carefully.</p> <p>Complexities in dealing with non-democratic partners.</p>
Intersection of Green Hydrogen and Development Policy	<p>Supports global transition to clean energy.</p> <p>Encourages significant investments and technology transfer.</p> <p>Provides opportunities for developing nations to benefit from advanced technologies.</p>	<p>Risk of dependency on foreign technologies.</p> <p>Potential exacerbation of existing inequalities.</p> <p>Power imbalances might lead to unfair market conditions or exploitation.</p>
Managing Conflicting Goals and Trade-offs	<p>Aims to balance sustainability standards with market requirements.</p> <p>Promotes stakeholder involvement.</p> <p>Encourages thorough and responsible project implementation.</p>	<p>Conflicting goals can slow down progress.</p> <p>Increased costs and complexity in project execution.</p> <p>Challenges in balancing responsibilities and protecting vulnerable groups.</p> <p>Tensions between sustainability, feasibility, and market pressures.</p>
Effectively Managing Uncertainties	<p>Highlights the need for early action and comprehensive sustainability efforts.</p> <p>Encourages investment in research and development as well as knowledge-sharing.</p> <p>Supports international cooperation for a global green hydrogen market.</p>	<p>High levels of uncertainty and risk in green hydrogen projects.</p> <p>Requires significant investment and resource commitment.</p> <p>Must balance the role of green hydrogen with other energy solutions and manage resource demands.</p>

Table 2:

Key considerations for future strategies and their implementation

Key Recommendations

The policy brief emphasizes the need for strict sustainability standards, participatory processes involving local communities, regional partnerships for knowledge-sharing, addressing market dynamics to create a balanced framework, and implementing monitoring and evaluation mechanisms to assess socio-ecological impacts. In terms of future action towards promoting a just transition in developing green hydrogen projects, five key points are noted.

1. **Development of Sustainability Standards:** we emphasize the need for strict sustainability standards for producing green hydrogen. These standards should address environmental and social impacts, ensuring that projects do not exploit local resources or communities. Establishing clear guidelines can help mitigate adverse effects and promote responsible practices.
2. **Participatory Processes:** Engaging all stakeholders, particularly local communities, in decision-making is crucial. This participatory approach can enhance the acceptance of green hydrogen projects and ensure that the concerns and needs of affected populations are taken into account.
3. **Partnerships and Knowledge Sharing:** Strengthening partnerships between engaging states (bilateral engagement explained between Germany and Uruguay) in this case also reflects on the interregionalism strategy to facilitate knowledge transfer and capacity building. These collaborations can help Uruguay leverage its renewable energy potential while benefiting from Germany's technological expertise and experience in green hydrogen production.
4. **Addressing Market Dynamics:** The need to navigate the complexities of the global hydrogen market, including the pressures of competitiveness and the potential for unequal power dynamics between importing and exporting countries is pertinent. Strategies should aim to create a balanced framework that respects the sovereignty of partner countries while ensuring fair trade practices.
5. **Monitoring and Evaluation Mechanisms:** Implementing robust monitoring and evaluation mechanisms is essential to assess the socio-ecological impacts of green hydrogen projects. Such mechanisms can help ensure accountability and facilitate adjustments to strategies as needed to promote a just transition.

In closing, we reiterate that cooperation between Germany and Uruguay reflects on emerging relationships between Europe and Latin America and that regional actors are open to external engagement towards a common goal. In the context of green hydrogen, interregional collaboration can play a crucial role, for instance, as exchange on green hydrogen projects can foster effective partnerships, technological exchange, shared investment, and policy alignment. Examples of successful collaborations can help states in both regions to advance their energy goals and support global climate targets. Also, by focusing on specific agendas like energy security, regions can address broader environmental and economic objectives together, making their interregional cooperation more tangible and impactful.

References

Barriero, R. (2023). Green hydrogen plant in Uruguay faces challenge over water use. Retrieved from: <https://dialogochino.net/en/climate-energy/374197-green-hydrogen-plant-in-uruguay-faceschallenge-over-water-use/>.

Beswick, R. R., Oliveira, A. M., & Yan, Y. (2021). Does the Green Hydrogen Economy Have a Water Problem? *ACS Energy Letters*, 6(9), 3167-3169. doi:10.1021/acseenergylett.1c01375.

BMWi. (2020). *The National Hydrogen Strategy*. Berlin: Federal Ministry for Economic Affairs and Energy.

BMWK. (2023). *National Hydrogen Strategy Update*. Berlin: Federal Ministry for Economic Affairs and Climate Action.

IRENA. (2020). *Green Hydrogen: A guide to policy making*. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Nov/IRENA_Green_hydrogen_policy_2020.pdf.

IRENA (2022). *Geopolitics of the Energy Transformation: The Hydrogen Factor*, International Renewable Energy Agency, Abu Dhabi.

Leske, R. (2024). Green hydrogen as a catalyst for just energy transitions? A comparative study of strategies in Germany and Uruguay. *Examensarbete vid Institutionen för geovetenskaper*, ISSN 1650-6553 ; 11.

Litsegård, A., & Mattheis, F. (2023). Broadening the concept of interregionalism: beyond state-centrism and Eurocentrism. *Third World Quarterly*, 45(7), 1273-1290. <https://doi.org/10.1080/01436597.2023.2274829>

Martinez, B. (2023). *Running Dry: The Battle for Water Security in Uruguay and Why It Foreshadows a Greater Issue*. Retrieved from <https://hir.harvard.edu/running-dry-the-battlefor-water-security-in-uruguay-and-why-it-foreshadows-a-greater-issue/>

MIEM. (2022). *Green Hydrogen Roadmap in Uruguay*. Retrieved from: <https://www.gub.uy/ministerio-industria-energia-mineria/sites/ministerio-industria-energiamineria/>

Müller, F., Tunn, J., & Kalt, T. (2022). Hydrogen justice. *Environmental Research Letters*, 17(11). doi:10.1088/1748-9326/ac991a.

Van de Graaf, T., Overland, I., Scholten, D., & Westphal, K. (2020). The new oil? The geopolitics and international governance of hydrogen. *Energy Res Soc Sci*, 70, 101667. doi:10.1016/j.erss.2020.101667.

Woods, P., Bustamante, H., & Aguey-Zinsou, K.-F. (2022). The hydrogen economy - Where is the water? *Energy Nexus*, 7. doi:10.1016/j.nexus.2022.100123.

EDITORIAL INFORMATION

About the Authors:

Ricarda Leske¹, Tamara Avellan^{2,3}, Nidhi Nagabhatla^{3,4}

¹ Uppsala University, Uppsala, Sweden, ricarda.leske.2580@student.uu.se

² University of Oulu, Oulu, Finland

³ UNU-CRIS, Bruges, Belgium

⁴ University of Ghent, Ghent, Belgium

Corresponding author: ricarda.leske.2580@student.uu.se

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