Factbook for H2Hubs Stakeholders

Community Insights on Research and Engagement

August 2024

EFI FOUNDATION

Project Team

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Preface

"[Researchers should] give an in-depth, detailed explanation of exactly what a hydrogen hub is, the benefits and background of how it came to be, in terms I can understand, but also don't make me feel stupid. I would like to be able to ask questions during all of this interaction." (Anonymous survey respondent)

In recent years, there has been a growing recognition of the importance of community-led research in building trust and fostering collaboration with local communities.[1,2,3] Community-led research, where community members actively participate in and guide the research process, ensures that the unique needs, values, and perspectives of the community are at the forefront. This approach not only enhances the relevance and impact of research but also strengthens the bonds of trust and mutual respect between researchers and the communities they serve.

The introduction of the Regional Clean Hydrogen Hubs (H2Hubs) demonstration program by the U.S. Department of Energy (DOE), with an $8 billion allocation to create a national clean hydrogen market, underscores the significance of community engagement. Historically, hydrogen's primary uses have been in refining and ammonia production,[4,5] mainly concentrated in the Gulf Coast region. Now, with the H2Hubs program bringing hydrogen into the national spotlight, communities near the planned projects are eager for more information on safety, economics, and potential environmental and climate impacts.[6] Identifying and prioritizing the research areas that matter most to these communities is important to build trust and effectively direct research efforts.

The EFI Foundation's commitment to community-led research aims to ensure that our research initiatives are responsive to community needs and that the benefits of our work are shared equitably. In addition, this approach provides valuable insights for DOE and H2Hubs partners, fostering more efficient project implementation and stronger public support. Building on our previous research on community engagement, this *Factbook for H2Hub Stakeholders* presents community preferences for the hydrogen research agenda, which is guiding the next phase of the EFI Foundation's research on the topic.

The role of community-led research is particularly vital in contexts where there has been historical mistrust or marginalization. By prioritizing transparency, accountability, and inclusivity, community-led research can help to address past injustices and build a foundation for long-term, positive relationships. It acknowledges the expertise and lived experiences of community members, ensuring that research is not only scientifically rigorous but also socially relevant and equitable.

As we embark on this journey, we invite you to join us in reimagining research as a collaborative endeavor, one that is guided by the principles of respect, equity, and mutual learning. Together we can create a future where research not only advances knowledge but also uplifts and empowers communities, paving the way for a more just and inclusive society.

Dr. Madeline Schomburg
Director of Research, EFI Foundation

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Executive Summary

This EFI Foundation (EFIF) factbook addresses communities' information needs and explores effective channels for communication. This research draws from two efforts: a survey of approximately 2,600 individuals in states selected for Regional Clean Hydrogen Hubs (H2Hubs) and an analysis of DOE's recent H2Hubs listening sessions with communities. The role of this factbook is to uplift community-driven research and insights in support of ongoing conversations among DOE, communities, and hub developers and partners. **The following are takeaways from the data collected so far:**

1. **Trust, safety, and respect are crucial factors in engagement, particularly for environmental justice (EJ) groups.**[a] EFIF's survey asked respondents what intangible factors are most important to them when engaging with H2Hubs developers and DOE. Among the most frequent answers, 78% of respondents cite trust as a top engagement need, while 77% request a safe environment, and 76% value respect.

2. **Building trust and fostering a sense of safety among community members begins with providing comprehensive, clear information.** Of those prioritizing trust, 58% say open communication and transparency from H2Hubs partners builds trust. For those who emphasize safety, one-third of respondents indicate that increased information sharing makes them feel safer, underscoring the need for H2Hubs partners to maintain open communication throughout the project life cycle.

3. **Research on air quality impacts and research on community benefits agreements (CBAs) are the top priorities, especially for EJ groups.** More than three-quarters of respondents overall, and more than 83% of EJ group respondents in particular, are interested in more information on CBAs and hydrogen's potential impacts on air quality. CBA negotiations can offer a structured forum to address concerns and develop strategies for managing hydrogen's potential risks and safety impacts.

4. **At DOE's listening sessions, community representatives from H2Hubs regions echoed EFIF survey respondents' concerns about transparency from DOE and developers, particularly regarding health and safety and the role of the community in H2Hubs processes.** 55% of community speakers asked for additional transparency from developers and DOE, and 35% of those speakers called for increased community involvement and a range of meeting options. Speakers also asked that H2Hubs partners consistently fulfill their commitments in order to gain the communities' trust.

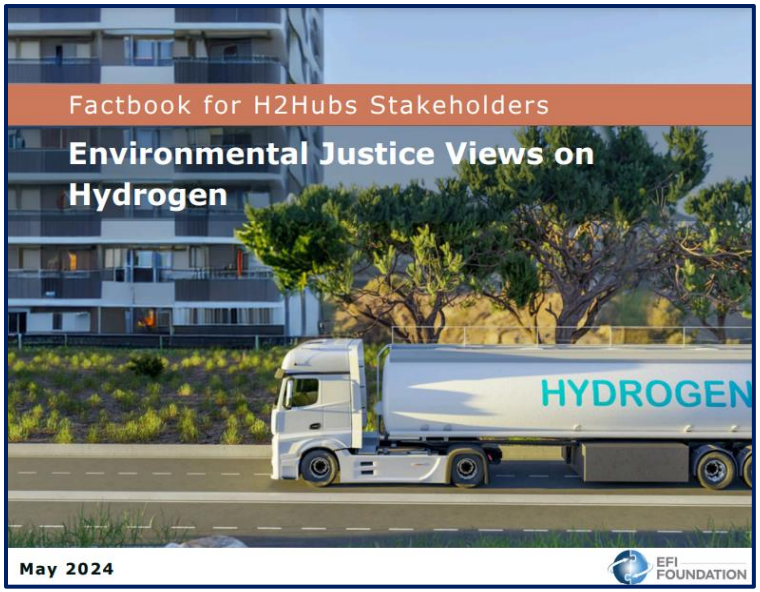
5. **Respondents generally prefer to be reached by H2Hubs developers at community centers and at home and want to be contacted weekly.** 58% of respondents favor community centers, followed closely behind by the 57% of respondents who prefer to be reached at home. Regarding frequency, 32% of all respondents express a preference for weekly outreach, while those from underserved communities show a higher preference for outreach whenever things are happening in the community.

[a] Environmental justice means the "just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment." U.S. Environmental Protection Agency, "Learn About Environmental Justice," https://www.epa.gov/environmentaljustice/learn-about-environmental-justice.

Community-Led Research for H2Hubs

This work builds on the EFI Foundation's previous research.

- This factbook is a continued effort to build research on effective community engagement for H2Hubs.
- EFIF's February 2024 factbook, *Building Stronger Community Engagement in Hydrogen Hubs*, highlighted survey responses from approximately 5,000 respondents, revealing insights on engagement preferences and attitudes about hydrogen.
- However, this initial report also uncovered discrepancies between the survey findings and public rhetoric. While the survey showed high levels of support for hydrogen in EJ communities, public letters signed by EJ organizations revealed much more negativity about hydrogen.
- To better understand this nuance, EFIF surveyed EJ organizations that had signed on to hydrogen-related public letters to ask them about their views on hydrogen. In May 2024, the results of this work were published in *Environmental Justice Views on Hydrogen.*
- Building on those studies, this new factbook highlights community perspectives on key areas for research and engagement on hydrogen. Drawing on EFIF's recent survey and analysis of DOE's H2Hubs listening sessions, EFIF finds that trust, safety, and respect are crucial for H2Hubs engagement. To build trust, survey respondents and listening session attendees want more information and more community-specific outreach methods. This factbook provides actionable steps to identify these information gaps and address engagement needs.



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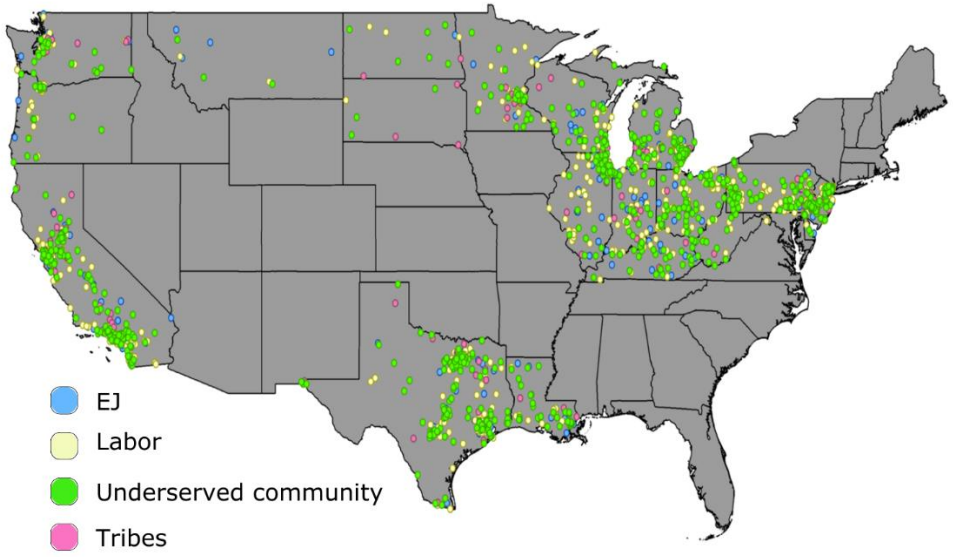
Community-Led Research for H2Hubs

This factbook consists of diverse stakeholder input.

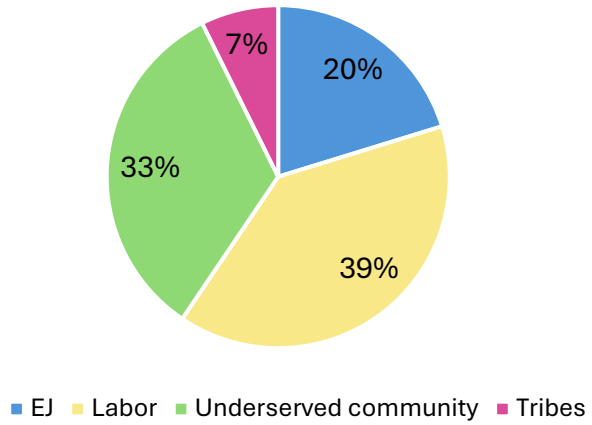
As the H2Hubs process unfolds, communities are voicing questions and concerns and sharing their priorities for the future of a U.S. hydrogen network. As EFIF identified in previous factbooks, community members continue to request more information and more research on important areas of interest. This factbook aims to highlight these community perspectives.

Figure 1. Survey responses by location and community type



Source: EFI Foundation.

Figure 2. Percentage of responses by community type



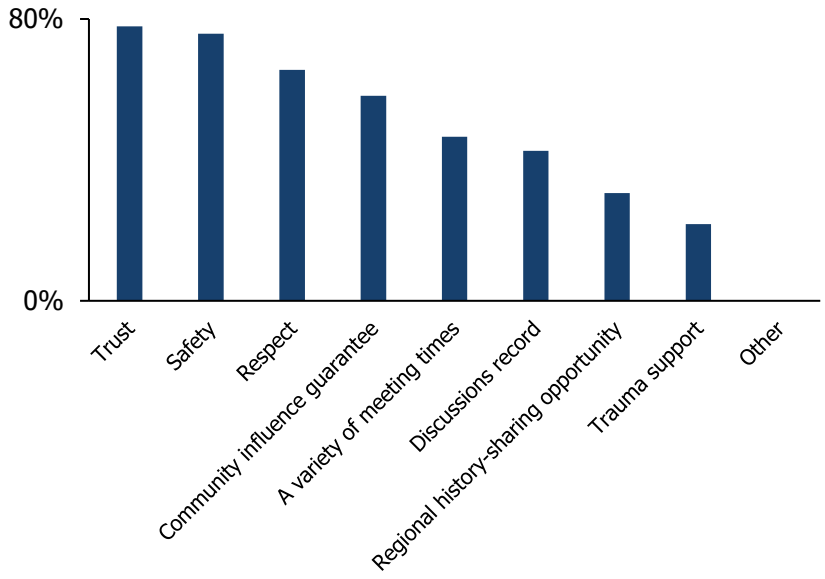
Source: EFI Foundation.

- EFIF conducted a survey to elicit community preferences for research and engagement pertaining to hydrogen hub development. The survey targeted individuals in states that DOE selected for H2Hubs award negotiations, as identified by DOE's H2Hubs selection announcement and each hub's marketing materials (Figure 1).[7,8,9,10,11,12,13,14] Approximately 2,600 survey responses were collected from individuals who identified as members of one of the communities highlighted in DOE's community benefits plan guidance: Tribal nations ("Tribes"), underserved communities, labor unions ("Labor"), and environmental justice ("EJ") groups (Figures 1 and 2).
- This report also incorporates insights from DOE's H2Hubs listening sessions. DOE's Office of Clean Energy Demonstrations (OCED) held these sessions for each H2Hub selectee region, allowing potential host communities to share their views on hydrogen hub development. The EFIF team attended each engagement and analyzed the events' transcripts to identify recurring themes within participants' comments.
- Note: All of the survey findings highlighted in the factbook are statistically significant.

Research Priorities for H2Hubs

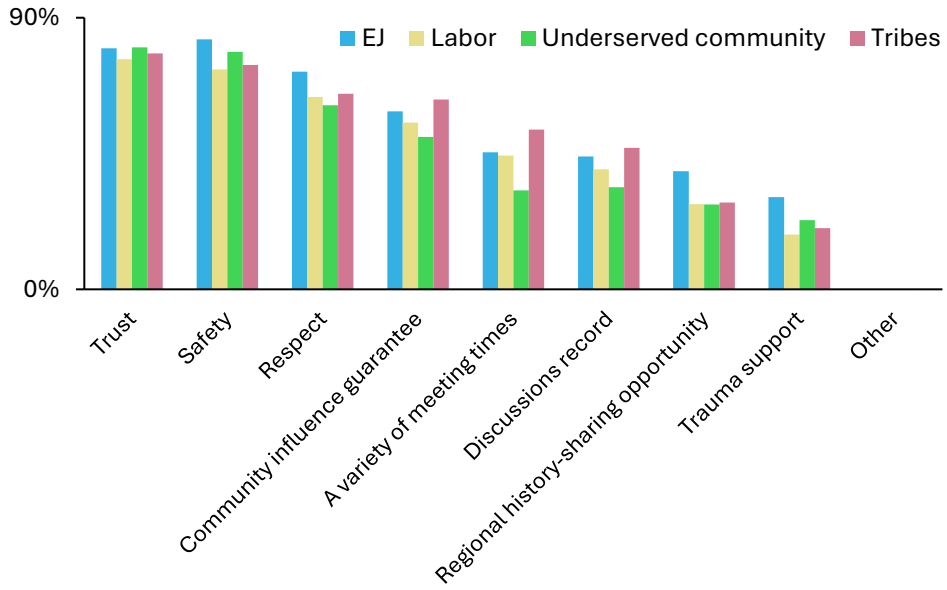
Trust, safety, and respect are crucial factors in engagement, particularly for EJ groups.

Figure 3. Intangible engagement requirements



Source: EFI Foundation.

Figure 4. Intangible engagement requirements by community type



Source: EFI Foundation

- EFIF's survey asked respondents about the intangible factors for engagement that were most important to them—including feeling safe during the engagement process (i.e., free from judgment). By identifying these priorities, H2Hubs partners can focus on often-overlooked yet crucial factors for building lasting partnerships. Research indicates that while material resources are easier to address, factors like trust and cultural sensitivity are equally vital for positive outcomes, despite being harder to quantify.[15,16]
- Trust, safety, and respect emerge as key engagement criteria for respondents, selected by 78%, 76%, and 66% of respondents, respectively (Figure 3). These preferences remain consistent among community types and hub regions, though there are some slight variations in emphasis. For instance, EJ groups are more concerned with having a safe engagement environment than Labor groups (Figure 4). Respondents in the Mid-Atlantic Clean Hydrogen Hub (MACH2) are especially concerned with safety in engagement.

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Building trust and fostering a sense of safety among community members begins with providing comprehensive, clear information.

Figure 5. Survey respondents' first steps to building trust and a sense of safety

Statements about honesty

"Being open. Don't come in and try to tell me there will be no risk or no drawbacks. Everything comes with risk, just be honest about it."

"The first step is to be black and white. What are ALL of the pros and cons of having a hub near me?"

"When someone shows that I'm being listened to. A good way to do this is to repeat a concern and don't just answer with a pre-prepared dismissal. Instead, talk about the reality of the concern and its real-life impacts. Don't downplay them. Discuss the pros and cons of all issues and not just a salesy push for your way."

Statements about information sharing

"[H2Hubs could] have several independent 3rd party contractors provide evidence that it will be safe."

"Show examples of existing projects that are safe and describe the pros and cons and all of the features."

"[H2Hubs could] provide easy to read and understand real-time, up-to-date scientific research showing the safety of the project. Also providing clear/cut directions on what to do if an emergency occurs."

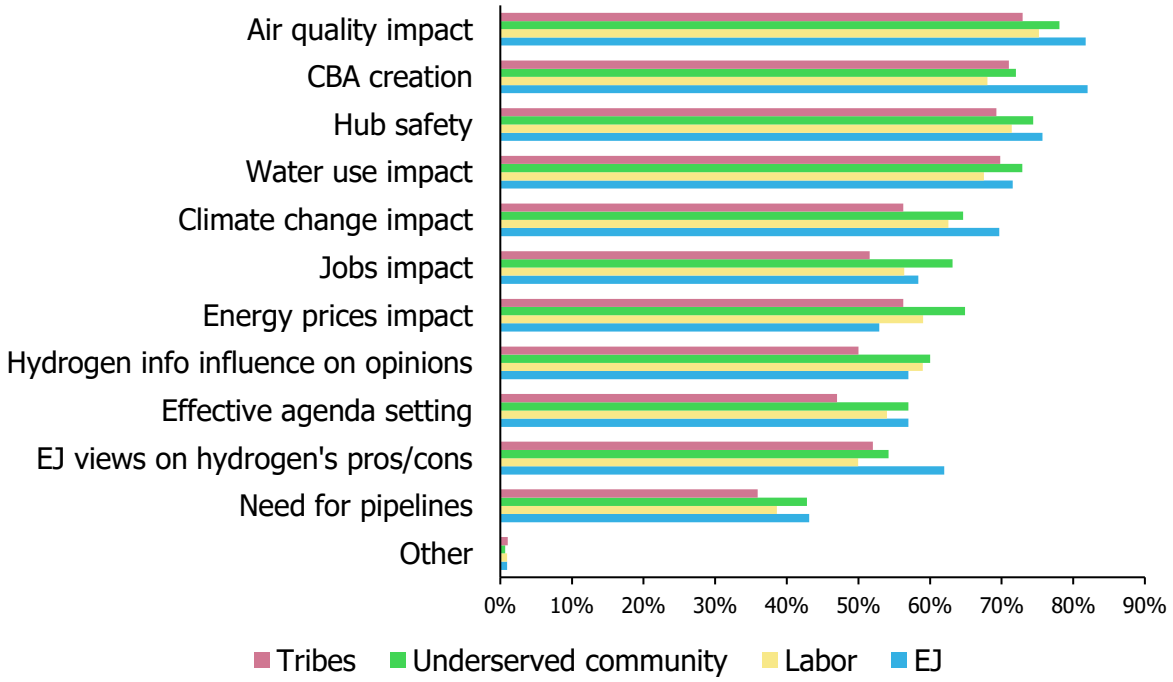
Source: EFI Foundation.

- Among the 2,043 respondents who identify trust as a critical engagement need, 58% say open communication and transparency from H2Hubs partners builds trust, and 18% say following through on commitments helps strengthen trust (Figure 5).
- Of the 1,988 respondents who point to safety as key to engagement, 34% say increased information sharing makes them feel safer, 28% want stronger safety protocols for hydrogen, and 25% ask that DOE and H2Hubs keep their promises in order to increase a sense of security (Figure 5).
- These findings emphasize that H2Hubs partners must prioritize open communication, consistently fulfill commitments, and ensure inclusive decision-making throughout all stages of project development and implementation.

Research Priorities for H2Hubs

Research on air quality impacts and research on community benefits agreements (CBAs) are the top priorities, especially for EJ groups.

Figure 6. Research preferences by community type



Source: EFI Foundation.

Figure 7. Research priorities from open-ended survey responses

Statements asking for information about hydrogen, H2Hubs projects, and other research priorities

"[I want to know] cost-effectiveness, technology used, environmental impact, safety, infrastructure, practical applications, government support and regulations, research and development."

"Providing basic information is a good start since I'm not familiar with any of this."

"[I want to know] the existing policy landscape at various government levels to identify regulatory challenges, compliance requirements, and opportunities for policy support that could facilitate the development of hydrogen hubs."

Source: EFI Foundation.

- The survey asked what information would be helpful to support engagement with DOE and H2Hubs developers. Top interests are air quality impacts, CBA creation, and hydrogen hub safety, as identified by 77%, 73%, and 73% of respondents, respectively. EJ groups prioritize CBA data, while underserved communities focus more on water use and energy price impacts (Figure 6).
- In an open-ended solicitation of research needs, 33% of respondents want more information generally about hydrogen technology or the hub (Figure 7).
- EFIF's next research phase examines case studies of successful developer-community agreements. Binding agreement negotiations can provide space to address these questions, including obtaining more information about hub projects and creating a path forward to account for the risks and safety aspects of hydrogen hubs.

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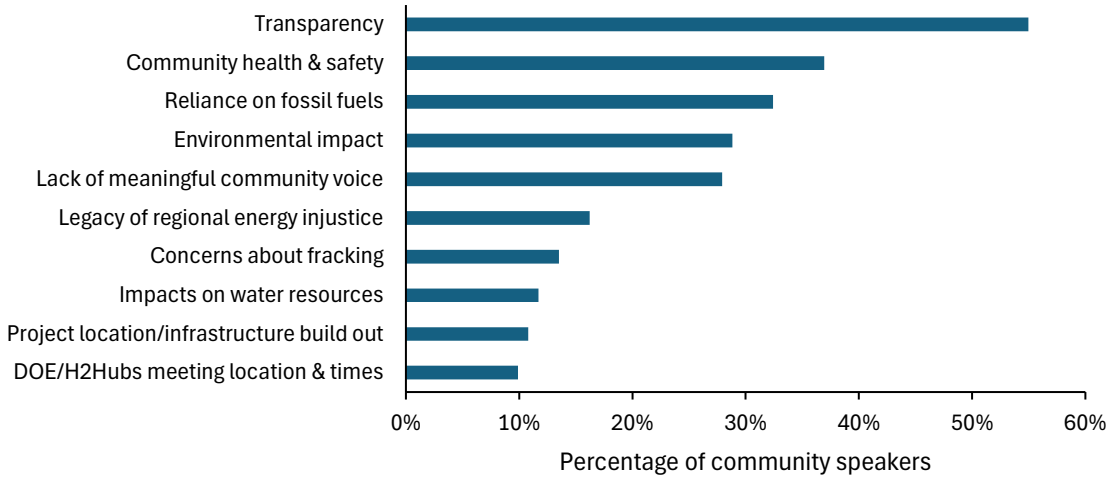
DOE's H2Hubs Listening Sessions

At DOE's listening sessions, community representatives from H2Hubs regions echoed EFIF survey respondents' concerns about transparency from DOE and developers, particularly around health and safety impacts.

Figure 8. Top concerns raised by listening session participants



Source: EFI Foundation.

Figure 9. Listening session takeaways

Statements about transparency with health and safety information

"We don't know details or potential impacts of the proposed projects. So how can we meaningfully evaluate the project? More studies, more details and more understanding of the environmental and especially health impacts of hydrogen will be necessary to evaluate any proposals in our region."

"It is vitally necessary for communities to understand now, what training safety measures and protective equipment will be available to workers involved in every step of the process?"

Source: EFI Foundation.

- From March to May 2024, DOE's Office of Clean Energy Demonstrations (OCED) conducted virtual listening sessions in each H2Hubs region. These sessions were organized in response to public feedback and aimed to gather community concerns and priorities for each hub. OCED held nine sessions: one for each of the seven H2Hubs and one additional session each for MACH2 and the Appalachian Regional Clean Hydrogen Hub (ARCH2) due to high community interest. In total, 111 speakers participated across all sessions.
- EFIF attended the sessions and analyzed the events' transcripts to identify themes that cut across each of the discussions (Figure 8). This analysis identified research needs and engagement barriers expressed by community members. For more information on the qualitative analysis, see Appendix B.
- Consistent with the survey findings, community speakers asked for transparency in the H2Hubs process (55% of speakers) and expressed concerns about safety (37% of speakers) and environmental impacts (29% of speakers), particularly regarding air quality. Of those who commented about transparency, 41% also asked for more information about potential health and safety impacts (Figures 8 and 9).

DOE's H2Hubs Listening Sessions

Community representatives called for a stronger role in the H2Hubs process, encouraging DOE and developers to implement communication and participation methods that align with the communities' preferences.

- The listening sessions revealed community priorities for meaningful engagement in the H2Hubs process. In addition to inquiries around the potential health and safety impacts of H2Hubs, community representatives speaking at the sessions advocated for increased transparency and a seat at the table with H2Hubs partners.
- Of transparency-related comments, 35% called for increased community involvement in the H2Hubs process (Figure 10).
- Some speakers requested more diverse meeting options (11%), noting that online forums were not always the most effective way to engage all community members and suggesting varied locations and times for future meetings (Figure 10). These insights from the listening sessions revealed significant barriers to engagement, particularly in online settings.
- To address these concerns and better understand community needs, EFIF's survey also asked about community outreach preferences and barriers to participation. Respondents shared the tools they need to overcome obstacles to engagement and their preferred communication methods, locations for engagement, and frequency of contact. This information will allow DOE, hub developers, and philanthropists to more effectively target resources to facilitate engagement.

Figure 10. Listening session takeaways

Statements about having a meaningful community voice in the process

"This must be done carefully with a full knowledgeable participation of all the local communities. So hopefully we can get this done right."

"As we move forward, understand, the only way you right the wrongs here are to acknowledge your historical failures explicitly, and to create the opportunity for a two-way channel with the communities, especially those most affected. Sharing one way comments like this & limiting chat functionality is not true for community engagement."

"I believe that we must pursue our clean energy future with a different methodology than that [which] created climate change and environmental injustice to begin with. We're demanding more transparency, more public education, community input and government oversight."

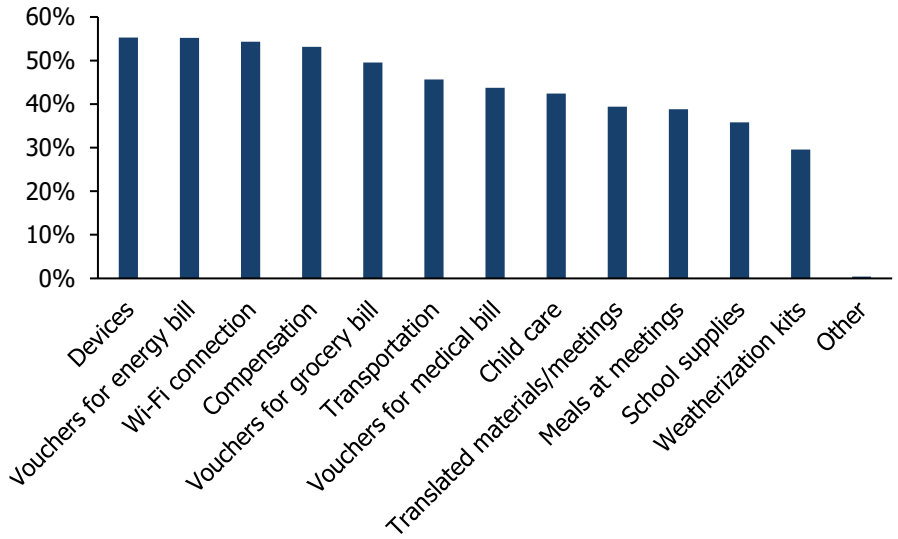
"The comments from community members at the last listening session have fallen on deaf ears when it was repeated that these sessions be done in person. …We are siloed again into a virtual world without the ability to converse among each other."

Source: EFI Foundation.

Engagement Needs for H2Hubs

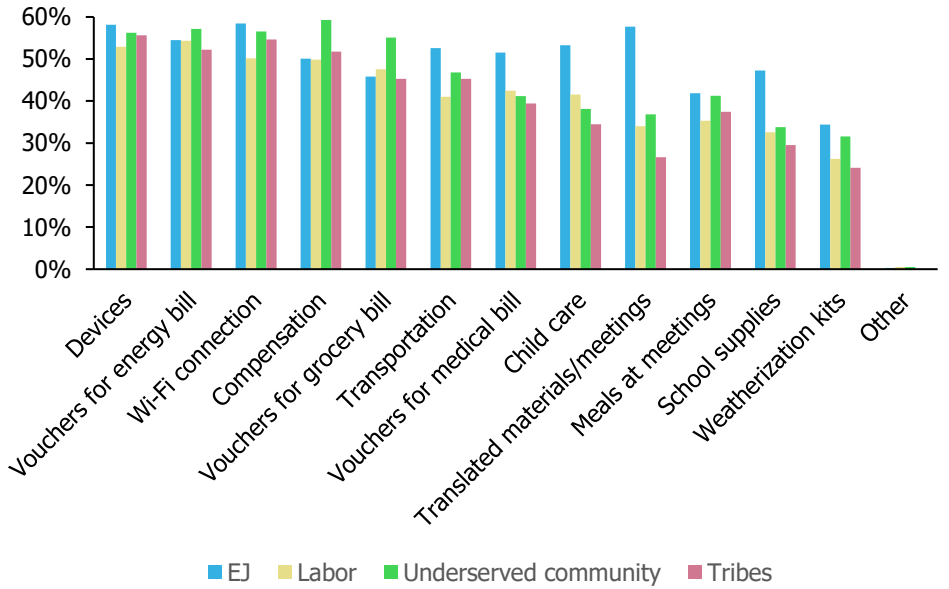
Free devices (e.g., laptops, cellphones) are the most requested resource to support engagement with DOE and H2Hubs developers, but EJ groups reveal preferences for other engagement resources.

Figure 11. Preferred engagement support resources



Source: EFI Foundation.

Figure 12. Preferred engagement support resources by community type



Source: EFI Foundation.

- When asked if there is something concrete a funder can do to help improve engagement, respondents cite free devices (chosen by 55% of respondents), including phones and laptops, as the top need. Vouchers for energy bills and free Wi-Fi connections follow closely behind, selected by 55% and 54% of respondents, respectively (Figure 11). EJ groups are more likely to select translated materials and meetings, child care, and school supplies (58%, 53%, and 47% of respondents, respectively) (Figure 12).
- Underserved communities are more likely to select compensation for their time (59%) and grocery vouchers (55%) (Figure 12). Regarding compensation, respondents prefer $15 per hour. Notably, parts of the Midwest are particularly interested in compensation relative to the rest of the nation.

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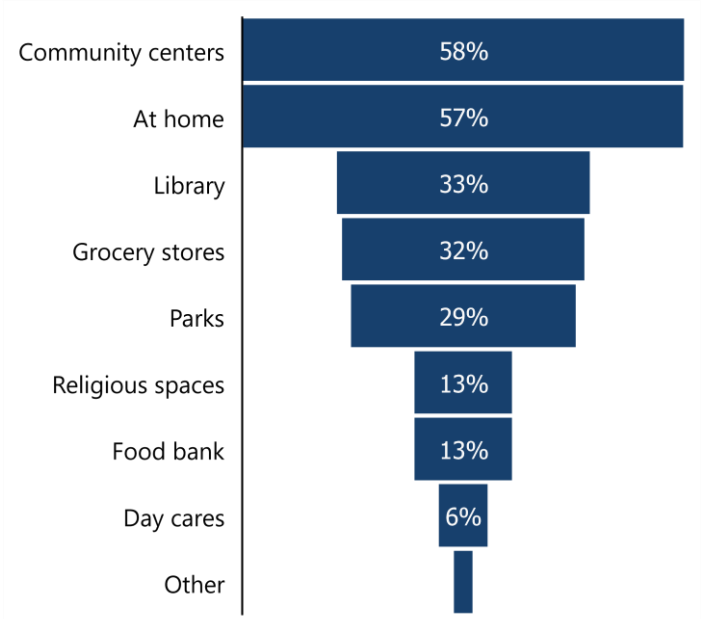
Engagement Needs for H2Hubs

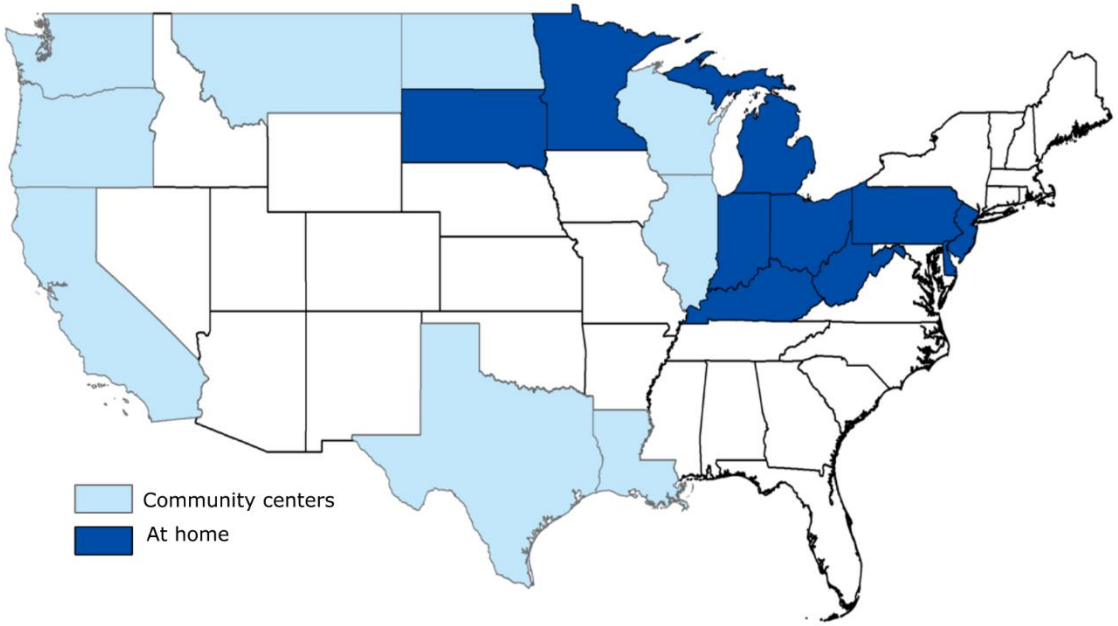
Respondents generally prefer to be reached by H2Hubs developers at community centers and homes.

Figure 13. Preferred outreach location



Source: EFI Foundation.

Figure 14. Preferred outreach location by state



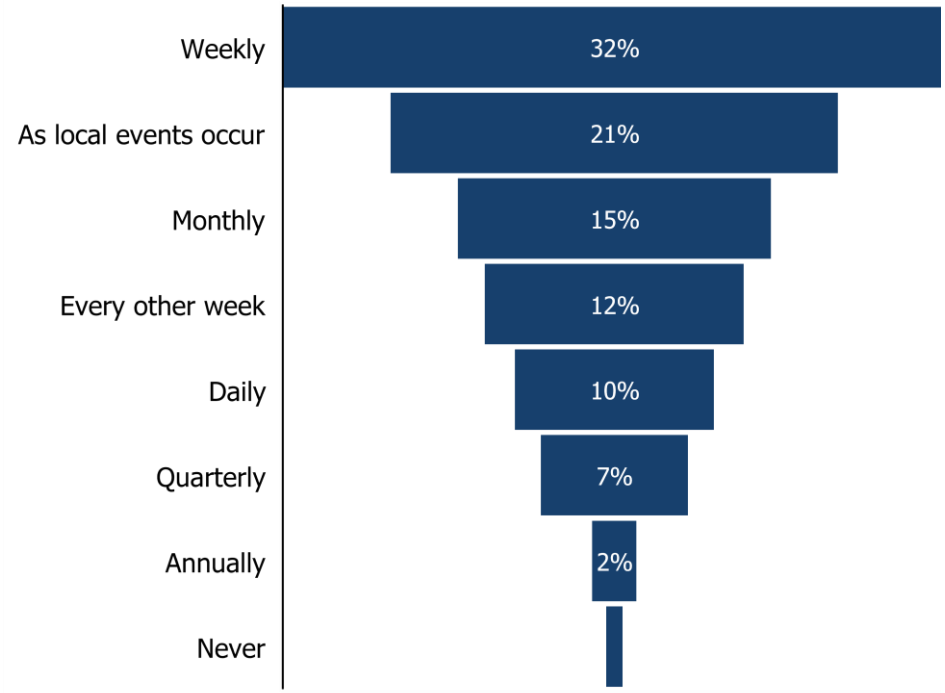
Source: EFI Foundation.

- Across community types and regions, respondents prefer to be reached at community centers (58%) and at home (57%) (Figure 13). EJ groups show a particularly strong preference for being reached at community centers (66%).
- Regional preferences for outreach locations vary among H2Hubs (Figure 14).
    - The Pacific Northwest Hydrogen Association (PNWH2) shows a stronger preference for community centers compared with other hub regions. Conversely, in the Eastern United States, ARCH2 is less likely to choose community centers than some hubs.
    - The Midwest Alliance for Clean Hydrogen (MachH2) and ARCH2 show greater preference for at-home outreach than other hub regions.
- At the state level, Montana shows the strongest preference for outreach at community centers, with 77% of respondents favoring this option. Delaware leads in preference for at-home contact, with 85% of respondents favoring this approach.

Engagement Needs for H2Hubs

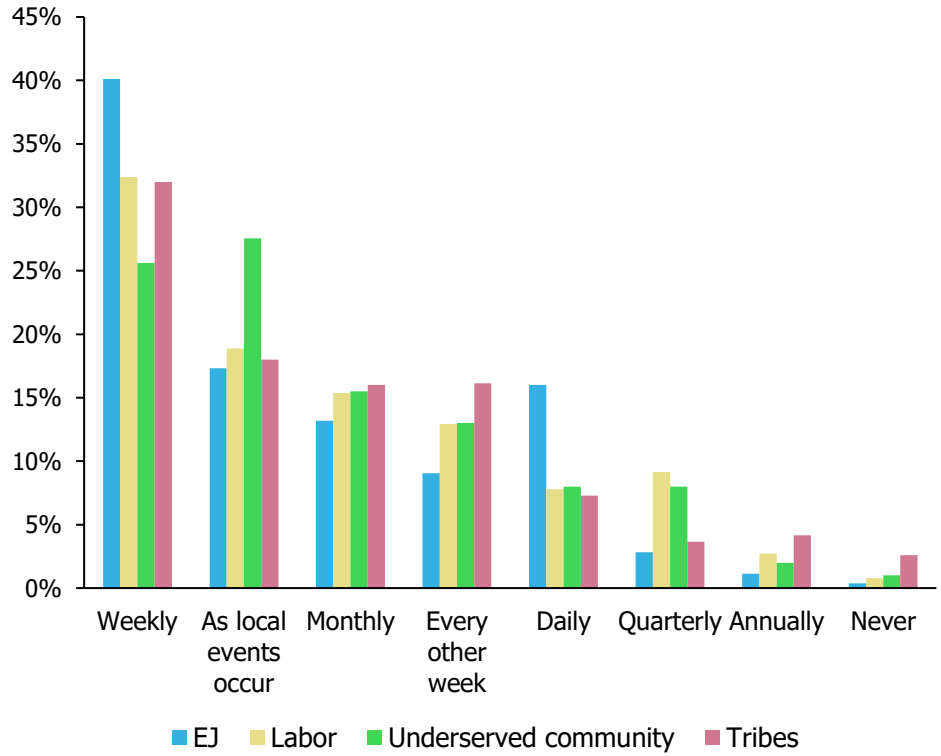
Respondents generally prefer to be contacted weekly, though those from underserved communities prefer to be updated only when things are happening in the community.

Figure 15. Preferred outreach cadence from H2Hub developers



Source: EFI Foundation.

Figure 16. Preferred outreach cadence from H2Hub developers by community type



Source: EFI Foundation.

- On average, 32% of respondents prefer to be reached weekly (Figure 15).
- Respondents from EJ groups (41%) are especially likely to prefer weekly contact from H2Hubs developers (Figure 16).
- Those from underserved communities indicate they would rather be contacted when relevant things are happening in the community (28%) and are less likely to choose weekly communication than other community types (26%) (Figure 16).
- EJ group respondents are also more likely to prefer daily contact (16%) than other community types (Figure 16).

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Conclusion

The EFI Foundation's (EFIF) factbook on community-driven research and engagement for the Regional Clean Hydrogen Hubs (H2Hubs) program underscores the critical role that community insights play in shaping the future of hydrogen. This comprehensive survey and analysis reflect the collective voice of diverse stakeholders, including Tribal nations, environmental justice (EJ) groups, labor groups, and underserved communities, highlighting their priorities and concerns.

The central themes that emerged from the community feedback include their desire for trust, safety, and respect, which are indispensable for meaningful engagement. These elements are particularly emphasized by EJ groups, who have historically experienced marginalization and mistrust. The survey results reveal that 78% of respondents consider trust a top priority, with open communication and transparency from H2Hubs partners being vital to building this trust. Safety concerns are equally important, with 76% of respondents prioritizing a secure environment and clear, accessible information on hydrogen projects. Moreover, the factbook identifies research on air quality impacts and research on the establishment of community benefits agreements as top priorities. More than 83% of EJ group respondents seek more information on these topics, reflecting their heightened concern about the environmental and health implications of hydrogen hubs.

The factbook also delves into the preferred methods of engagement, with community centers and homes being the most favored locations for outreach. Weekly updates are generally preferred, though underserved communities lean toward preferring communication when relevant events occur. This data provides a clear directive for H2Hubs developers and the U.S. Department of Energy (DOE) to tailor their engagement strategies to meet community preferences effectively. Addressing barriers to engagement is crucial for fostering inclusive participation. The survey identifies free devices, vouchers for energy bills, and Wi-Fi connections as top choices to support engagement. EJ groups, in particular, highlight the need for translated materials and meetings, child care, and school supplies to facilitate their involvement.

DOE's listening sessions, analyzed within this factbook, echo the survey findings, with a significant call for increased transparency and a more substantial role for community voices in the H2Hubs process. Community representatives advocate for diverse meeting options and a more inclusive approach to decision-making, ensuring that their concerns and insights are integral to the development and implementation of hydrogen projects.

As the H2Hubs initiative progresses, the insights gathered in this factbook provide a road map for effective community engagement and research prioritization. This factbook is not just a reflection of current community sentiments but a call to action for all stakeholders involved in the H2Hubs program. By addressing the information needs and engagement preferences outlined in this factbook, DOE, H2Hubs developers, and other partners can foster a collaborative environment that supports both technological innovation and community well-being.

In conclusion, EFIF's factbook is a pivotal resource for understanding and addressing the complex dynamics of community engagement in hydrogen research. It highlights the importance of incorporating community voices in every stage of the research process, from planning to implementation, to ensure that the transition to a low-carbon economy is both inclusive and equitable.

Appendix A. Survey Methods

Methodology

The survey was developed using an online platform called Pollfish. Pollfish's algorithm provides access to a broad range of survey respondents through 120,000-plus partner applications. Pollfish sends the survey as advertising alternatives to individuals who have the partner applications installed. Respondents are recruited through in-app invitations in the form of banner ads or pop-ups. Then, respondents can confirm interest in the survey and create a profile. Respondents are able to take the survey as long as they fit the targeting criteria set by the survey maker. Pollfish's AI technology performs consistent verification throughout the creation of the profile and as the respondent takes the survey to verify that the respondent is not a bot (by detecting the speed at which the survey is taken and the legibility of open-ended responses). If a bot is detected, its responses are removed from the survey results.[17]

- At the time of its creation (March 2024), the survey was distributed only to people living in states selected by DOE for H2Hubs award negotiations.[7]

- When fielding the survey, 9,167 people were filtered out following the initial question: "Are you a member of one of the following groups?" Respondents were unable to complete the survey if they did not identify as a part of the following: a recognized Tribe; labor union, worker organization, or workforce development organization; underserved community based on the Climate & Economic Justice Screening Tool (CEJST) map; or environmental justice organization, or other organization representing overburdened, underrepresented, or disadvantaged communities. According to CEJST, 34% of the U.S. population is living in census tracts labeled as disadvantaged. Out of those who began the survey, 25% were cleared to complete it following the filter question. With approximately 2,600 survey completions, respondents who qualified to complete the survey were representative of the nation.

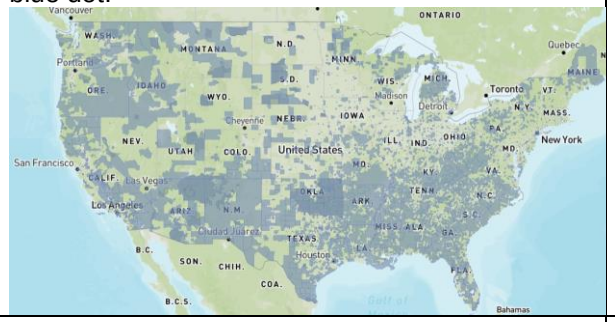
- Underserved communities are equivalent to disadvantaged communities as defined by CEJST. Communities are considered disadvantaged by CEJST if they are in census tracts that meet the thresholds for at least one of the tool's categories of burden, or if they are on land within the boundaries of a federally recognized Tribe. The categories of burden include being (1) at or above the threshold for one or more environmental, climate, or other burdens, and (2) at or above the threshold for an associated socioeconomic burden. In addition, a census tract that is completely surrounded by disadvantaged communities and is at or above the 50th percentile for low income is also considered disadvantaged.[18] The poverty level varies based on household size: The 2024 federal poverty level is yearly income ranging between $15,060 for individuals and $52,720 for a household of eight. The official poverty rate is currently 11.5%.[19] Of our survey respondents, 15% reported yearly income under $25,000, and 11% reported yearly income of $25,000 to $49,999. With poverty level included as a factor in determining disadvantaged communities, our survey respondents are representative of the nation. Other factors, including climate burdens, are unable to be determined based on limitations within the survey data.

- Survey respondents were mostly representative of the nation demographically, though Hispanic respondents were underrepresented. The U.S. Census Bureau's 2022 American Community Survey found U.S. racial demographics to be 58% white,

Appendix A. Survey Methods

19% Hispanic or Latino, 12% Black, 6% Asian, and 4% multiracial. Survey respondents' racial makeup was 69% white, 15% Black, 4% Asian, 2% multiracial, 4% Hispanic or Latino, and 6% who marked "other" or preferred not to say. The Census Bureau estimates 50% of the population to be female persons. The survey respondents were 45% female persons and 55% male persons.[20]

Survey questions and descriptive statistics for the survey results are shown below:

Question	Answer	Count	Answers (%)
Are you a member of one of the following groups?	Environmental justice organization, or other organization representing overburdened, underrepresented, underserved, or disadvantaged communities	531	20.3
Are you a member of one of the following groups?	Labor union, worker organization, workforce development organization	1,028	39.2
Are you a member of one of the following groups?	Underserved community, as indicated by the blue dot. 	871	33.2
Are you a member of one of the following groups?	Recognized Tribe	192	7.3
Are you a member of one of the following groups?	None of the above	0	0
Over the past few years, clean hydrogen has been talked about as another method for reducing pollution. The U.S. Department of Energy (DOE) is awarding $8 billion to a handful of groups throughout the country that are working to create "hydrogen hubs" where clean hydrogen energy will be made and used. You are located in a region with plans for a hydrogen hub. We are part of a research team aiming to improve community engagement during hydrogen hub development by gathering perspectives from people living near potential hydrogen hubs. This survey is being used to understand what communities need in order to engage with the Department of Energy (DOE) and hydrogen hub developers. We may be able to help connect you and your community to funders who can provide the support you need. You will have an opportunity at the end of the survey to leave your contact information if you would like to be put in touch with potential funders. NOTE: Your responses are completely anonymous. The results of this study will not be associated with any		2,622	

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individuals or organizations. Your participation is entirely voluntary. We appreciate your input.			
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Translated materials and meetings	938	35.8
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free devices (laptops, phones)	1,439	54.9
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free wifi connection	1,421	54.2
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free childcare	1,055	40.2
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free meals at meetings	1,007	38.4
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free transportation or transportation vouchers	1,160	44.2
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free weatherization kits	719	27.4
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free vouchers for energy bill	1,433	54.7
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free vouchers for grocery bill	1,276	48.7
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Free vouchers for medical bill	1,099	41.9

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We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	School supplies	909	34.7
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Compensation (for your time)	1,430	54.5
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	Other	3	0.0
We know that there are barriers to engaging with DOE/hydrogen hub developers. If you could request something real or concrete from a funder that would help you to engage, which of the following would you ask for, if any? Select all that apply.	None of the above	33	1.3
You indicated that you would like materials and meetings to be translated. Into what languages?		938	
You indicated that you would like compensation. How much ($) per hour?		1,430	
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Respect	1,719	65.6
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Documentation of discussions	1,116	42.6
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Trust	2,043	77.9
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Safety	1,988	75.8
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	An opportunity to share the history of your region	802	30.6
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	A commitment that community feedback will actually affect the project	1,526	58.2
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	A variety of meeting times (morning, midday and evenings; weekdays and weekends)	1,221	46.6
Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Trauma support	570	21.7

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Aside from the real or concrete things in the last question, what other things might you need in order to engage in hydrogen hub conversations? Select all that apply.	Other	1	0.0
What is the first step to building trust with you?		2,043	
What can DOE/hub developers do to make you feel safe?		1,988	
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Text	1,597	60.9
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Phone call	1,260	48.1
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Mail	849	32.4
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Virtual message board (ex: Nextdoor.com)	230	8.8
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Email	1,893	72.2
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Door knocking	153	5.8
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Community events	449	17.1
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Flyers	295	11.3
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Tables with materials/information	230	8.8
If a hydrogen hub developer were to contact you, how would you prefer to be reached? Select your top 3 choices.	Other	8	0.0
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Grocery stores	844	32.2
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Religious spaces	340	13.0
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Community centers	1,537	58.6
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Parks	782	29.8
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Daycares	170	6.5
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Food bank	340	13.0
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Library	880	33.6
If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	At home	1,529	58.3

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If a hydrogen hub developer were to contact you, where would you prefer to be reached? Select your top 3 choices.	Other	66	0.24
How often would you want to be contacted?	Daily	250	9.5
How often would you want to be contacted?	Weekly	831	31.7
How often would you want to be contacted?	Every other week	325	12.4
How often would you want to be contacted?	Monthly	393	15.0
How often would you want to be contacted?	Quarterly (4 times/year)	185	7.1
How often would you want to be contacted?	Annually (once/year)	56	1.87
How often would you want to be contacted?	Whenever there are things happening in the community (e.g., hearings, meetings, decisions, brainstorming)	561	21.4
How often would you want to be contacted?	Never	21	00
A team of researchers is considering doing research on the following topics about community engagement in hydrogen hubs but want to know if the results would be helpful to you. Would any of the following information help support your engagement with DOE and the hydrogen hub developers? Select all that apply.	Knowing more about how to make a community benefits agreement (a promise that the developer will provide certain things to the community in exchange for support for the project) with a developer	1,907	72.7
A team of researchers is considering doing research on the following topics about community engagement in hydrogen hubs but want to know if the results would be helpful to you. Would any of the following information help support your engagement with DOE and the hydrogen hub developers? Select all that apply.	Knowing more about how different information about hydrogen changes people's opinions about hydrogen (supporting or opposing hydrogen)	1,521	58.0
A team of researchers is considering doing research on the following topics about community engagement in hydrogen hubs but want to know if the results would be helpful to you. Would any of the following information help support your engagement with DOE and the hydrogen hub developers? Select all that apply.	Knowing more about how environmental justice leaders feel about the potential benefits and risks of hydrogen	1,407	53.7
A team of researchers is considering doing research on the following topics about community engagement in hydrogen hubs but want to know if the results would be helpful to you. Would any of the following information help support your engagement with DOE and the hydrogen hub developers? Select all that apply.	Knowing more about setting effective agendas for collaboration and how discussions can be facilitated (e.g., strive for info sharing, consensus building, or deliberative votes)	1,440	54.9
A team of researchers is considering doing research on the following topics about community engagement in hydrogen hubs but want to know if the results would be helpful to you. Would any of the following information help support your engagement with DOE and the hydrogen hub developers? Select all that apply.	None of the above	47	1.8
If you could ask a team of researchers to study anything about hydrogen hubs, what information would be the most helpful for you in supporting your efforts to create meaningful engagement between you and DOE/hydrogen hub developers, if any?		2,622	

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If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Potential impacts on air quality	2,027	77.3
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Potential impacts on water use	1,843	70.3
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Potential impacts on climate change	1,684	64.2
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Need for pipelines or other infrastructure	1,068	40.7
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Safety of hydrogen hubs	1,917	73.1
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Potential impacts on energy prices	1,561	59.5
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Potential impacts on jobs	1,539	58.7
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	Other	16	0.0
If you could ask a team of researchers to study anything about hydrogen hubs more generally, what information would you want to have, if any? Select all that apply.	None of the above	23	0.0
If there is an organization you think would benefit from being connected to a funder in order to engage with the hydrogen hubs, please enter the organization's name here. If not, please put NA.		2,622	

Appendix B. Qualitative Coding Methods

Methodology

Two team members were responsible for developing, assigning, and synthesizing codes for 6,384 open-ended survey responses and nine listening sessions. The codes were defined through an inductive coding process. The team conducted an interreliability test on a random subset of 10% of survey responses to assess the consistency and agreement between both coders, ensuring the validity of our coding process. For the survey responses, percent agreement between coders was 77%, and the Cohen's kappa was 0.74. For the listening sessions, percent agreement was 78%, and the Cohen's kappa was 0.75, a substantial level of agreement for all analyses.[21]

The survey responses were derived from the following open-ended questions:

> What is the first step to building trust with you?
>
> What can DOE/hub developers do to make you feel safe?
>
> If you could ask a team of researchers to study anything about hydrogen hubs, what information would be the most helpful for you in supporting your efforts to create meaningful engagement between you and DOE/hydrogen hub developers, if any?

The coders developed and followed the following general principles for the listening sessions. Any typos within the definitions are preserved to maintain the integrity of respondents' comments.

1. **Coding Level:**
    - Prioritize subcodes. When a subcode doesn't fit, go to the larger, generalized code.
    - Code at the paragraph level.
        - This allowed for adequate context to be included.
2. **Overlapping Codes:**
    - If a sentence aligns with multiple codes, include all relevant codes.
    - If a sentence can be interpreted multiple ways and you are unsure of the appropriate code, refer to the codebook for definitions. If it still unclear, use each code and add a note.
3. **Notes for Thought and Questions:**
    - Include notes for segments that are complex, unclear, or open to interpretation.
    - Include notes if you think an excerpt is particularly important or interesting.

The following are the codes used for the survey responses:

Code System	Definition

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	Information sharing		Comments on sharing information about hydrogen generally, the hydrogen project timelines, hydrogen project details, including expected outcomes; "show clearly how these projects would affect the community"
	Accountability		Comments on being consistent, dependable, accountable, honest, transparent; example: "Keep one's promise"
	Community engagement		Comments regarding engagement with the community in a two-way approach, with community members being able to provide input in the engagement; example: "They could have a question and answer discussion so that people could learn more information about it"; "Insured that my concerns are heard"
	Education		Comments regarding providing general information, education about the project, or energy in general; example: "explain everything thoroughly"
	Safety Protocols		Comments regarding safety, safe work environments, safety regulations, safety measures, safety in hub design; example: "discussing safeties and risks and how it's being prevented"
	Financial		Comments regarding the financial aspects of hydrogen technologies, hydrogen projects, or the hydrogen hub in particular; example: "the proven data from research previously done showing that it is beneficial, safe, and also profitable"
	Impacts		Comments about the impacts of hydrogen or the project itself, without specifying whether positive or negative impacts, or any particular aspect of the impact (safety, environment, health, etc.); example: "effects on the community"
		Environmental	Comments specifically regarding the environmental impacts that the community or individual might expect from a hydrogen hub; example: "How using hydrogen will make life better and how it can help in having less harm to the planet"
		Risks	Comments regarding risks that the community or individual might experience from a hydrogen hub; example: "risks and benefits related to energy"

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		Benefits	Comments regarding benefits that the community or individual might expect from a hydrogen hub; example: "what are the advantages of having it as well as the disadvantages."
	General information		General information about the technology, the hub, or the project; example: "I would ask them to explain exactly what it is"
		Safety	Comments regarding safety around the hydrogen hub project or hydrogen in general; example: "how dangerous are they?"
	Dependability		Comments about following through, being reliable, and meeting commitments made; example: "It's by fulfilling promises made"
	Communication		Comments regarding sharing of information; example: "talking about all the basic facts and improvements"
	Transparency		Comments regarding transparency in process and engagement; different from honesty in including comments about intentions, openness, ways to engage; example: "very open and transparent. making sure to provide plenty of opportunities for public meetings and forms"
	Respect		Comments on showing respect to the individual or to the community; example: "Actually treating me as a peer"
	Honesty		Comments regarding segments about honesty; example: "Being honest about intent"

The following are the codes used for the listening sessions:

Code System	Definition
Potential Benefits and Risks	• Focus: A need for understanding of the potential benefits and risks associated with the hydrogen hub project. • Captures: Both positive opportunities and community concerns regarding impact. Subcodes include positive and negative options. If positive, use positive subcode; if negative, use negative subcode; if neutral, use neutral subcode.. Ultimately, the neutral code shouldn't be used. Use Potential Benefits and Risks > Positive OR Neutral OR Negative if general sentiments of benefits and risks. Otherwise, use subcodes under Positive, Negative, Neutral.

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Neutral	
Economic Impact	• Focus: Economic changes at local and regional levels. • Includes: Potential boosts in business activities and economic growth, but also considerations of energy price impacts and financial drawbacks for the community.
Project Location/Infrastructure Development	• Focus: Needs for physical infrastructure like pipelines, storage facilities, and transportation systems. • Includes: Safety concerns related to infrastructure development, balanced with potential improvements in infrastructure quality. Also includes questions or comments about the project locations.
Environmental Impact	• Focus: Effects on the local environment. • Includes: Concerns about air and water quality, soil contamination, and biodiversity, alongside potential benefits to ecosystem health.
Water Resources	• Focus: Potential effects on local water resources. • Includes: Concerns about water usage in hydrogen production and impacts on water supply, as well as considerations of water quality.
Health and Safety	• Focus: Community concerns about health risks and safety hazards. • Includes: Discussions on air quality improvements (or worries about decline), as well as worries about potential accidents, long-term health effects, and emergency preparedness.

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Labor and Workforce	• Focus: Impact on local employment, workforce development, and labor conditions. • Includes: Opportunities such as job creation and skills training, alongside concerns about potential job losses, worker safety, and union involvement.
Positive	
Labor and Workforce	• Focus: Impact on local employment, workforce development, and labor conditions. • Includes: Opportunities such as job creation and skills training, alongside concerns about potential job losses, worker safety, and union involvement.
Health and Safety	• Focus: Community concerns about health risks and safety hazards. • Includes: Discussions on air quality improvements (or worries about decline), as well as worries about potential accidents, long-term health effects, and emergency preparedness.
Environmental Impact	• Focus: Effects on the local environment. • Includes: Concerns about air and water quality, soil contamination, and biodiversity, alongside potential benefits to ecosystem health.
Water Resources	• Focus: Potential effects on local water resources. • Includes: Concerns about water usage in hydrogen production and impacts on water supply, as well as considerations of water quality.
Project Location/Infrastructure Development	• Focus: Needs for physical infrastructure like pipelines, storage facilities, and transportation systems.

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	• Includes: Safety concerns related to infrastructure development, balanced with potential improvements in infrastructure quality. Also includes questions or comments about the project locations.
Economic Impact	• Focus: Economic changes at local and regional levels. • Includes: Potential boosts in business activities and economic growth, but also considerations of energy price impacts and financial drawbacks for the community.
Negative	
Labor and Workforce	• Focus: Impact on local employment, workforce development, and labor conditions. • Includes: Opportunities such as job creation and skills training, alongside concerns about potential job losses, worker safety, and union involvement.
Health and Safety	• Focus: Community concerns about health risks and safety hazards. • Includes: Discussions on air quality improvements (or worries about decline), as well as worries about potential accidents, long-term health effects, and emergency preparedness.
Environmental Impact	• Focus: Effects on the local environment. • Includes: Concerns about air and water quality, soil contamination, and biodiversity, alongside potential benefits to ecosystem health.
Water Resources	• Focus: Potential effects on local water resources. • Includes: Concerns about water usage in hydrogen production and impacts on water supply, as well as considerations of water quality.

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Project Location/Infrastructure Development	• Focus: Needs for physical infrastructure like pipelines, storage facilities, and transportation systems. • Includes: Safety concerns related to infrastructure development, balanced with potential improvements in infrastructure quality. Also includes questions or comments about the project locations.
Economic Impact	• Focus: Economic changes at local and regional levels. • Includes: Potential boosts in business activities and economic growth, but also considerations of energy price impacts and financial drawbacks for the community.
Announcement of Meetings or Engagement Opportunities	• Focus: Announcements of meetings or other engagement opportunities. • Includes: Comments on the way DOE/H2Hubs are notifying the public of their community engagement meetings.
Fossil Fuels	• Focus: Mention of concern around the use of fossil fuels or blue hydrogen.
Fracking	• Focus: Mentions of concerns around fracking.
Meeting Location & Times	• Focus: Scheduling meetings and events at convenient times and convenient locations for community members. • Includes: Considerations for accommodating diverse schedules to enhance participation. Comments about meeting locations.
Meaningful Community Voice	• Focus: Ensuring meaningful participation of community members in decision-making processes. • Captures: Expressions of empowerment of community voices and challenges in achieving genuine involvement. Could include both praise for DOE for this engagement effort or critique. Subcodes include positive, neutral, and negative options. If positive, use positive subcode. Negative, use subcode, neutral, use subcode.

Appendix B. Qualitative Coding Methods

Negative	
Neutral	
Positive	
Binding Agreements	• Focus: Desire for binding agreements (project labor agreements, CBAs). • Captures: Community requests for binding agreements between developer and community.
Research	• Focus: Desire for more information, research, data. • Captures: Community requests for more research surround hydrogen or hydrogen hubs. Will likely be coded often with impact codes (health, economics, etc.)
Transparency	• Focus: Openness and clarity in information sharing. • Captures: Community expectation for transparent processes to build trust and ensure informed decision-making.
Legacy of Injustice	• Focus: Historical impacts influencing current community perspectives. • Captures: Past experiences of marginalization or neglect informing community attitudes, trust levels, and engagement expectations.

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