

Factbook for H2Hubs Stakeholders

# Environmental Justice Views on Hydrogen



May 2024

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***“Hydrogen could play a key role in some industrial processes, but the risks remain high. We are cautious, especially since hydrogen has been pitched for years as some kind of magic bullet.” (Anonymous survey respondent)***

In recent years, the federal government has signaled a strong interest in exploring clean hydrogen as part of the clean energy transition. As evidence of this growing national focus on hydrogen, the U.S. Department of Energy (DOE) launched the Regional Clean Hydrogen Hubs (H2Hubs) demonstration program, allocating \$8 billion to create a national clean hydrogen market.<sup>1</sup>

However, hydrogen has become a controversial clean energy pathway in environmental justice communities.<sup>a</sup> More than 140 environmental justice organizations have signed public letters emphasizing hydrogen’s potential to perpetuate the fossil fuel industry, cause safety issues, and contribute to local air pollution.<sup>2,3,4,5,6,7,8,9</sup>

When the H2Hubs program was launched, applicants were required to submit a community benefits plan (CBP) outlining how they would ensure their projects provide benefits for underserved, Tribal, labor, and environmental justice communities. Now that the program is underway, environmental justice groups have expressed frustration with the CBP process. Primarily, they argue that it has not produced the meaningful engagement envisioned in the CBP process.

Community engagement is an essential, multifaceted process that requires building relationships and trust among impacted communities, project developers and partners, and government officials. Achieving positive outcomes for communities and developers requires constructive and meaningful engagement to ensure that community input is helping to shape hydrogen hub development.

**Building on the EFI Foundation’s previous research on community engagement, this *Factbook for H2Hub Stakeholders* explores the positions of environmental justice groups on hydrogen and the CBP process. It is designed to add greater focus on and nuance to the conversation about community benefits and highlight the manifold nature of community perspectives.**

Environmental justice groups, and their members, are not monolithic. Reorienting and redefining community collaboration in clean energy development for the unfolding H2Hubs program means that hub developers will have to continue to develop relationships with environmental justice organizations as well as unaffiliated community members. Success in this regard will require that hub developers be both flexible and responsive to stakeholder feedback.

This factbook endeavors to bring clarity, depth, and a diversity of perspectives to the forefront of the conversation. The path ahead is not without difficulties. It demands persistence, open-mindedness, and a willingness to learn from and with the communities at the heart of the clean energy transition. Yet it is precisely through tackling these challenges—by fostering inclusive dialogue, respecting diverse viewpoints, and committing to collaborative problem-solving—that we can build a future powered by clean energy that benefits everyone. Let us forge ahead, making every effort to listen, learn, and lead with compassion and conviction.

*Dr. Madeline Schomburg*

**Dr. Madeline Schomburg**, Director of Research, EFI Foundation

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<sup>a</sup> “The term “environmental justice community” means a community with significant representation of communities of color, low-income communities, or Tribal and indigenous communities, that experiences, or is at risk of experiencing higher or more adverse human health or environmental effects.” *Empowering and Enforcing Environmental Justice Act of 2022*, U.S. Congress, H.R.9124, <https://www.congress.gov/bill/117th-congress/house-bill/9124/text>

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# Executive Summary

This EFI Foundation (EFIF) factbook highlights the perspectives of environmental justice (EJ) organizations. It reflects feedback gathered through two surveys—one targeting members of EJ communities, among others, (EJ members) and a follow-up survey focusing solely on EJ organizations (EJ groups)—as well as public letters of EJ organizations’ perspectives on hydrogen.<sup>b</sup>

The factbook data show that while environmental justice groups generally support green hydrogen<sup>c</sup> in specific applications, such as in hard-to-abate sectors, concerns remain regarding hydrogen’s potential to prolong our dependence on fossil fuels, cause explosions, and create local air pollution problems. These groups also lack faith in the community benefits plan (CBP) process as a means to address major concerns. EFIF offers this factbook to support ongoing conversations among the Department of Energy (DOE), hub developers and partners, and communities. Its role in this conversation is that of an information provider. EFIF is continuing to collect data to provide a comprehensive perspective for driving open and honest engagement among all stakeholders, and its learning in this space is evolving. **The following are key takeaways from the data collected so far:**

- 1. Many EJ groups have written public statements that express concerns about hydrogen.** In public discourse, EJ groups tend to focus on the potential risks of hydrogen, not its potential benefits.
- 2. Many EJ groups surveyed, however, expressed support for green hydrogen.** Follow-up conversations, plus the findings of the second survey, point toward important nuance in the perspectives of EJ groups. In addition to supporting green hydrogen, a few EJ groups expressed support for hydrogen produced via other pathways.
- 3. EJ groups that support green hydrogen see more potential benefits than EJ groups that do not support any form of hydrogen production, even though all groups share the same concerns.** Most EJ groups highlight concerns about hydrogen’s potential to prolong our dependence on fossil fuels, safety issues, and its contribution to local air pollution problems. However, those who support green hydrogen also see potential benefits in creating jobs and addressing climate change.
- 4. EJ members are generally more positive toward hydrogen than EJ groups, and EJ groups attribute the difference in perspectives to varying degrees of familiarity with hydrogen and the prevalence of misinformation.** EJ groups largely hypothesized that EJ members showed support for hydrogen in EFIF’s first survey because they did not know enough about it.
- 5. Citizen panels and public hearings were identified as two of the top three community engagement methods for both EJ members and EJ groups.** EJ groups selected working groups as their preferred engagement method, while that option was sixth on EJ members’ list.
- 6. EJ groups that have engaged with Regional Clean Hydrogen Hubs (H2Hubs) selectees are pessimistic about the benefits of the CBP process.** EJ groups did think the CBP process would increase community participation in H2Hubs conversations but did not think it would increase community decision-making authority, create a fairer process, or lead to real benefits for their communities.

<sup>b</sup> While there is a possibility of overlap among individuals responding to the “EJ members” survey and those representing “EJ groups,” the smaller sample size for the “EJ groups” survey makes it less likely that this occurred and thus would not significantly impact overall findings.

<sup>c</sup> Green hydrogen is hydrogen produced through electrolysis of water using renewable energy. National Grid, “The Hydrogen Colour Spectrum,” n.d., <https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum#:~:text=Green%20hydrogen%20is%20made%20by,as%20it%20becomes%20more%20common>.

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

From May to October 2023, the EFI Foundation (EFIF) conducted a survey to gather insights and points of view from members of disadvantaged, Tribal, labor, and environmental justice communities (EJ members) on hydrogen and the community benefits plan (CBP) process within the Regional Clean Hydrogen Hubs (H2Hubs) program.

Survey responses were predominantly favorable toward hydrogen, with EJ members agreeing that hydrogen could help solve climate change, create new jobs, and mitigate local air pollution problems. These findings revealed a surprising contrast with the concerns expressed by environmental justice organizations (EJ groups) in their public rhetoric, positions, and announcements about hydrogen.

To explore this discrepancy, EFIF carried out a follow-up survey in January 2024 solely with EJ groups that had publicly expressed their positions through signed letters (see Appendix A for detailed methods). This survey was designed to identify the differences between the content of these letters and the initial survey responses and to investigate the reasons behind the inconsistencies. Understanding this mismatch is crucial as the CBP guidance issued by the Department of Energy (DOE) advises hub developers to primarily engage with EJ groups rather than individuals. If organizations and individuals hold divergent views on hydrogen, developers might receive only a limited range of feedback. These limitations have the potential to perpetuate community members' concerns about being overlooked.

This factbook presents the findings of the EJ group survey and highlights the complex landscape surrounding the H2Hubs program, balancing the federal commitment to a clean energy transition with the critical concerns raised by environmental justice communities. The EJ group survey was sent to organizations that signed publicly available letters regarding hydrogen energy. Among the EJ group survey respondents, 52% reported having one to 10 employees and volunteers, while 30% stated having 11 to 30. This suggests that a substantial portion of the signatory organizations are smaller, community-based EJ groups.

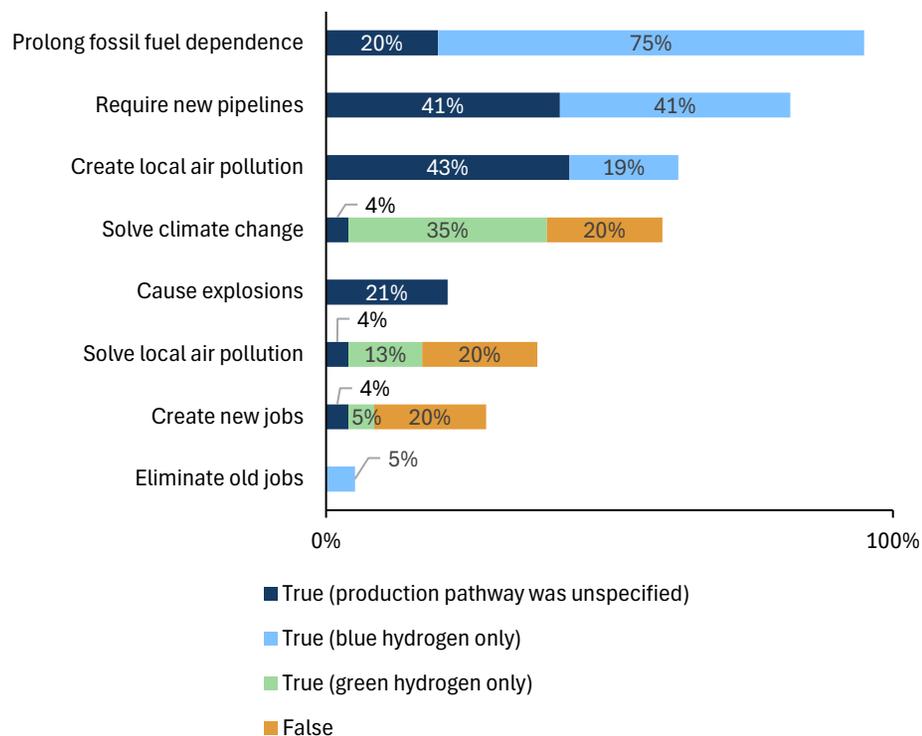


"Building Stronger Community Engagement in Hydrogen Hubs" is a factbook released in February 2024, presenting the results of a survey conducted from May to October 2023. The survey gathered insights from nearly 5,000 respondents from disadvantaged, labor, EJ, and Tribal communities regarding their attitudes toward hydrogen hubs and community engagement. *Source: EFI Foundation.*

# EJ Perceptions of Hydrogen

## Many EJ groups have written public statements that express concerns about hydrogen.

**Figure 1. Percentage of public letters that mention hydrogen’s potential to...**



Source: EFI Foundation.

The vast majority of EJ group letters highlight the potential for hydrogen—particularly blue hydrogen<sup>d</sup>—to prolong our dependence on fossil fuels, require new pipelines, and create local air pollution problems (Figure 1), as evidenced in the following excerpts:

- “Addressing the climate emergency must not include funding a hydrogen economy because the vast majority of hydrogen is created directly from natural gas and coal.”<sup>2</sup>
- “No hydrogen is clean ... hydrogen itself is an indirect greenhouse gas that extends the life of methane in the atmosphere.”<sup>3</sup>
- “Hydrogen hubs will require a massive buildout of pipelines to transport hydrogen from hub to end use. Hydrogen burns hotter than gas and is more combustible and corrosive. This means the slightest rupture can cause explosions.”<sup>4</sup>
- “If administered well, the program could help establish a hydrogen market that is aligned with U.S. climate goals, while protecting public health and delivering economic benefits to communities. However, the lack of transparency to date risks undermining this potential and the long-term success of the H2Hubs program.”<sup>5</sup>

<sup>d</sup> Blue hydrogen is hydrogen produced using natural gas in a process that captures and stores carbon. National Grid, “The Hydrogen Colour Spectrum,” n.d., <https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum#:~:text=So%2C%20the%20definition%20of%20blue,the%20creation%20of%20greenhouse%20gases.>

# EJ Perceptions of Hydrogen

Many EJ groups surveyed expressed support for *green* hydrogen.

Figure 2. EJ members' attitudes toward hydrogen

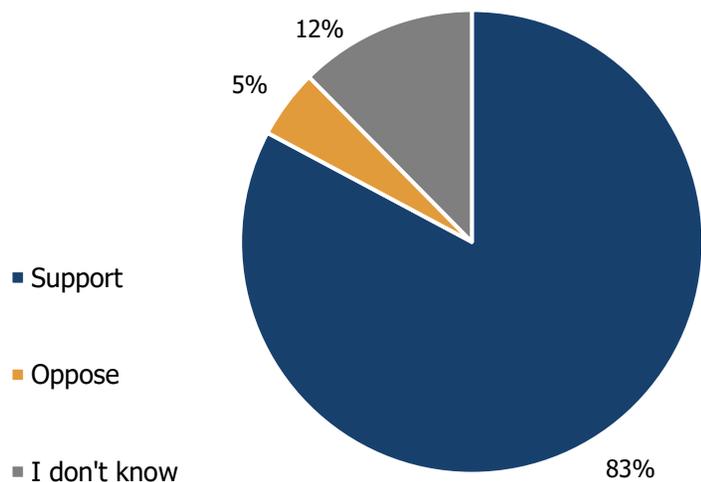
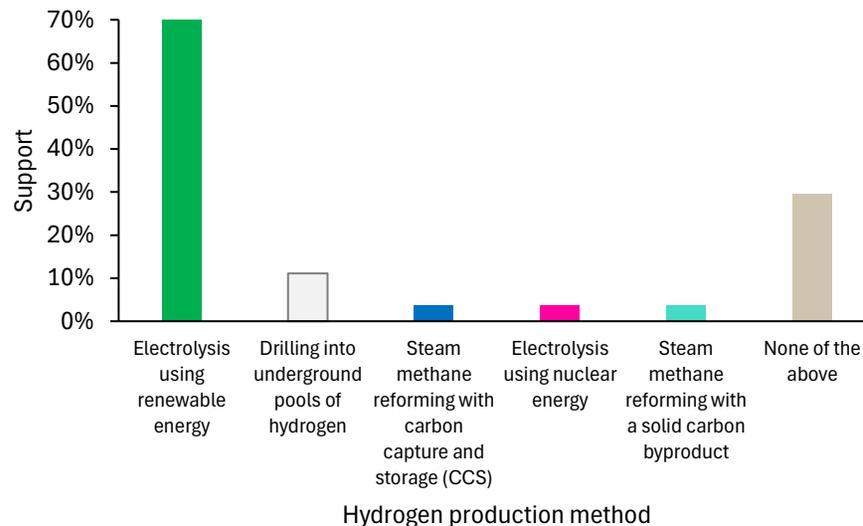


Figure 3. EJ groups' attitudes toward hydrogen



Source: EFI Foundation.

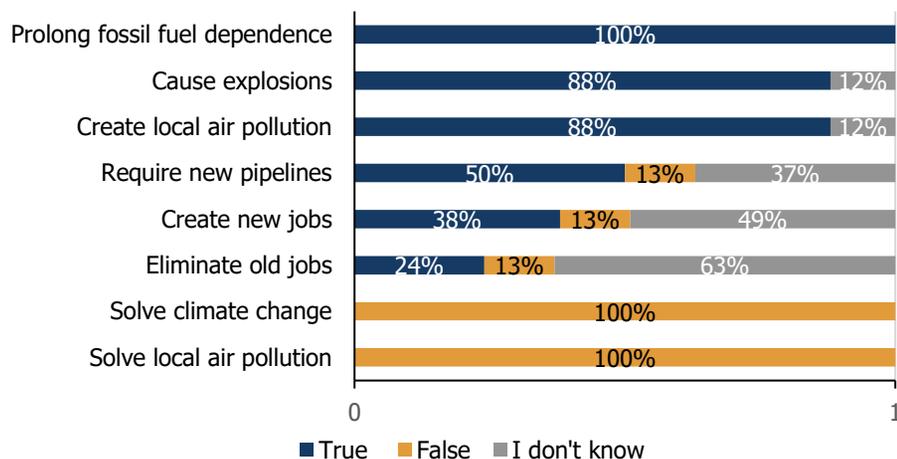
Source: EFI Foundation.

- Understanding EJ communities' sentiments toward hydrogen requires a more nuanced approach. EFIF's original survey of EJ members showed 83% supported hydrogen (Figure 2). Conversely, public letters from EJ groups revealed almost equivalent amounts of opposition (78%). To better understand this discrepancy, the EJ group survey focused on specific hydrogen production methods.
- Of EJ group survey respondents, 70% expressed support for green hydrogen, which is hydrogen produced with electrolysis using renewable energy, while 30% reported opposition to all methods of hydrogen production (Figure 3). A small percentage of respondents supported other production methods, but all of those respondents also supported green hydrogen.
- The survey results suggest that EJ community support for hydrogen depends on the production methods used, which was not discernible in the original survey and not readily apparent in the public letters. This finding indicates there may be more room for productive dialogue between hub developers and EJ communities than it often seems.

# EJ Perceptions of Hydrogen

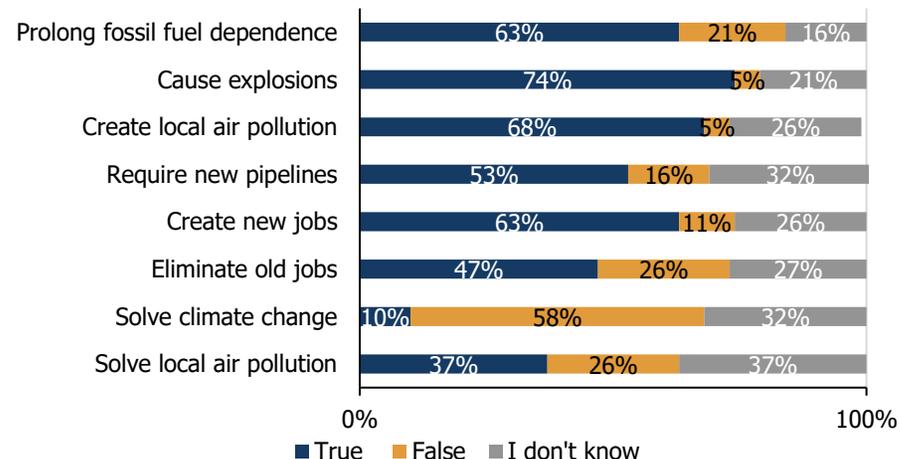
**EJ groups that support green hydrogen see more potential benefits than EJ groups that do not support any form of hydrogen production, even though all groups share the same concerns.**

**Figure 4. Percentage of EJ groups who oppose all hydrogen and believe it has the potential to...**



Source: EFI Foundation.

**Figure 5. Percentage of EJ groups who support green hydrogen and believe it has the potential to...**



Source: EFI Foundation.

- The EJ group survey asked two separate groups of respondents about their belief in the above narratives (i.e., prolong fossil fuel dependence, cause explosions, etc.). One group consisted of those who opposed all hydrogen production methods (Figure 4), while the other group was made up of respondents who supported green hydrogen (Figure 5).
- Respondents were closely aligned on their beliefs about hydrogen’s potential to require new pipelines (50% and 53%, respectively) and cause explosions (88% and 74%) but diverged on their views about hydrogen’s potential to create new jobs (38% and 63%) and solve local air pollution problems (0% and 37%).
- The survey findings indicate that EJ groups’ attitudes toward green hydrogen are more strongly influenced by their belief in the potential benefits than by their concerns about its potential risks. In other words, even if EJ groups are worried about the risks associated with hydrogen, they may still support green hydrogen if they are also confident in the benefits it can provide to their communities.

# EJ Perceptions of Hydrogen

**EJ members are generally more positive than EJ groups toward hydrogen, and EJ groups attribute the difference in perspectives to varying degrees of familiarity with hydrogen and the prevalence of misinformation.**

**Figure 6. EJ groups' insights into the differences between EJ groups' public opinions and EJ members' opinions on hydrogen**

## Statements about a need for more hydrogen education

"It appears that the authors of the signatory letters are more educated about hydrogen as compared with survey respondents."

"The EJ Group Letter signatories are likely EJ members who are more scientifically educated about hydrogen, who likely belong to an NGO or other EJ organization, while the [respondents to the first survey] are likely more general population who obviously do not know much about hydrogen."

"Letters written by folks with deeper expertise, survey folks may not be as aware of the issues. I agree with letter writers."

## Statements about hydrogen misinformation and skepticism

"There is much misinformation about hydrogen, especially green H2 ... this is a pipe dream that is being promoted as a climate solution that will not ever come to fruition and cause delays in implementing real solutions."

"We are very concerned about hydrogen misinformation targeting our communities that is funded by the government and stakeholder industries."

"I am intensely skeptical of the hubs process. The skepticism has been amplified by insight into the DOE's internal community oriented hub selection criteria. At this time, the failures of outreach and involvement of heavily polluted, historically disempowered communities has been concerning but not unsurprising."

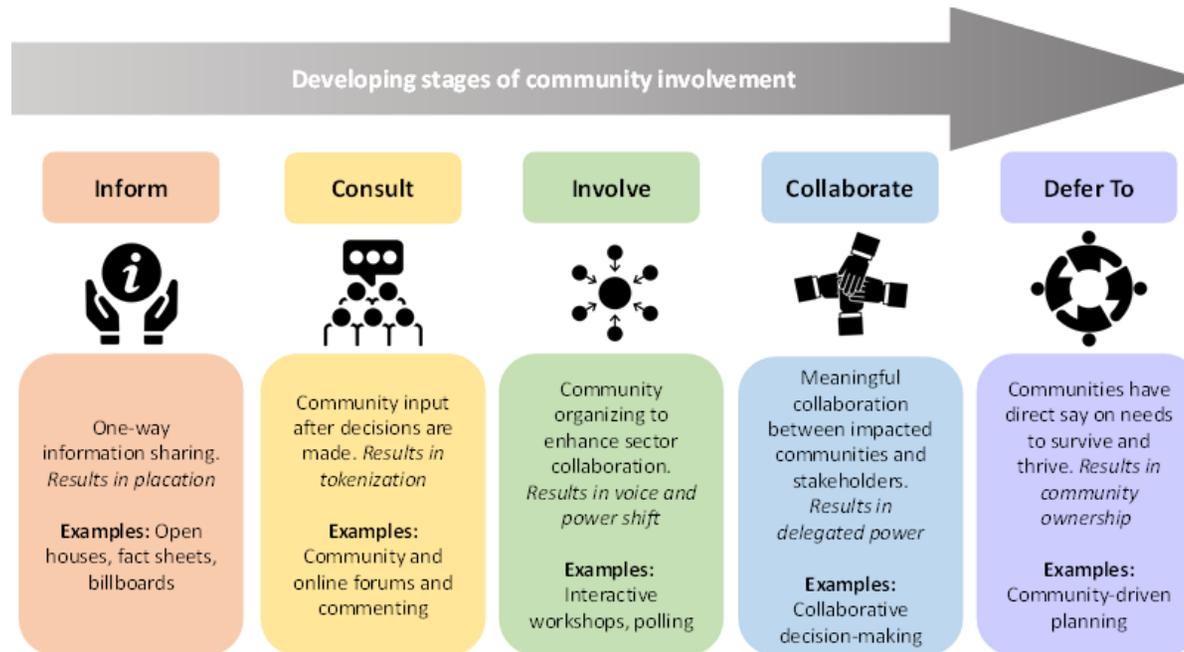
Source: EFI Foundation.

- The newest survey presented respondents with examples of the differences observed between EJ groups' public letters and EJ members' survey responses from the first survey (as described in the beginning of this factbook). The survey then asked respondents an open-ended question regarding why they believe these differences exist between the letters and the first survey's results. An analysis of their responses, based on the frequency of respondents mentioning specific issues, can offer insights on how to better understand and address hydrogen concerns for EJ communities (Figure 6). (See Appendix B for methods.)
- EJ group survey respondents (37%) suggested that public letter signatories were more familiar with hydrogen than EJ member respondents, potentially explaining the divergent attitudes between the two groups. However, EJ member respondents self-reported a high level of familiarity with hydrogen, with 41% knowing "a great deal" or "a lot" and 33% knowing "a moderate amount." This suggests the difference in attitudes may not be solely due to a knowledge gap.

# Engagement Strategies

Community engagement methods vary in their levels of involvement and collaboration, as illustrated by the spectrum adapted by EFIF (Figure 7).<sup>10</sup> Each stage in the continuum represents increasing degrees of community input and decision-making authority.

**Figure 7. Stages of community involvement**



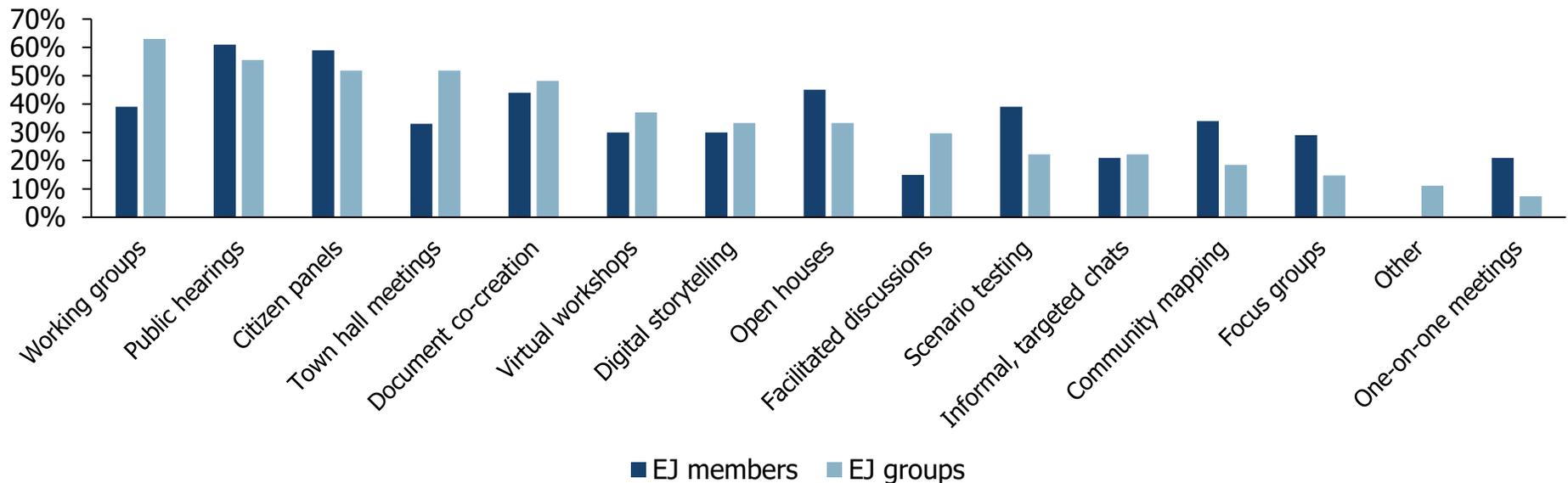
Adapted from: *Facilitating Power, The Spectrum of Community Engagement to Ownership, 2020, p. 1-14, <https://www.communitycommons.org/entities/3aec405c-6908-4bae-9230-f33bef9f40e1>.*

While informing and consulting are essential for relationship-building, effective engagement necessitates sustained involvement, collaboration, and deference to communities to find tailored solutions. The H2Hubs CBPs present an opportunity to facilitate meaningful engagement by prioritizing collaboration and involvement.

See Appendix A for definitions of engagement methods that were offered to survey respondents. The survey included and expanded on the engagement methods listed in DOE's CBP guidance.

**Citizen panels and public hearings were identified as two of the top three community engagement methods for both EJ members and EJ groups.**

**Figure 8. Preferred engagement methods among respondents**



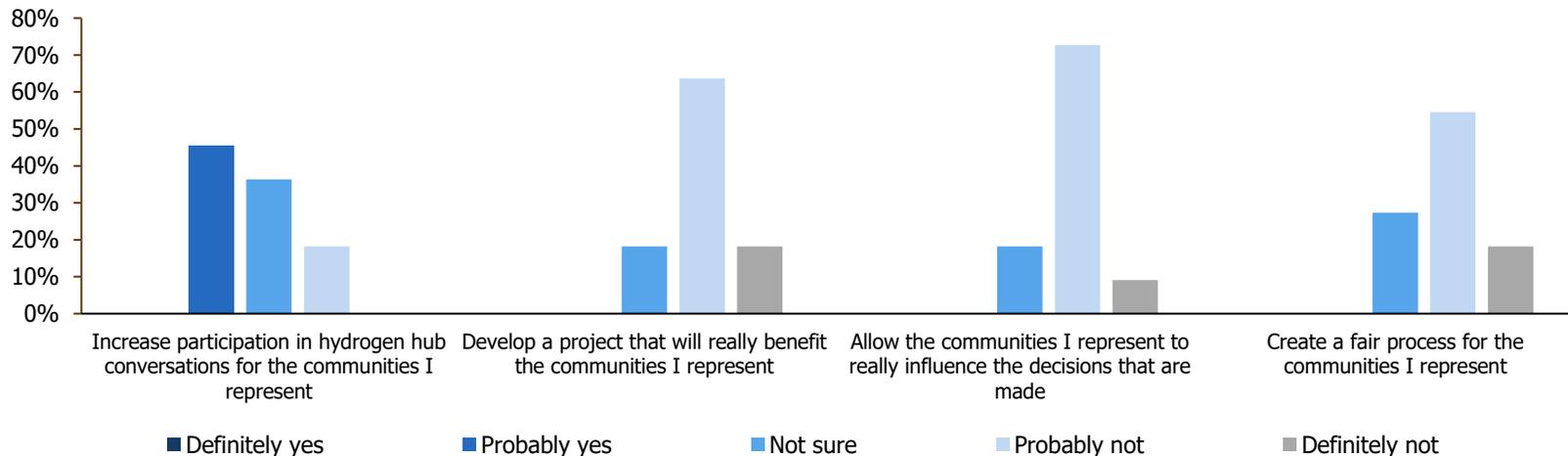
Source: EFI Foundation.

- Both the EJ member survey and EJ group survey revealed a need for more engagement-heavy methods to build on those offered in the CBP guidance.
- Public hearings and citizen panels are particularly valuable; they were the only two methods preferred by more than 50% of respondents in both surveys. Additionally, EJ group survey respondents said their top method was working groups, which use a small, trusted group of community representatives much like citizen panels do.
- Taken together, the surveys' results suggest that expanding DOE's recommended engagement methods can improve community-level support. In addition, engagement methods that maximize community input from select representatives can minimize the time and effort required of the broader community.

# Engagement Strategies

## EJ groups that have engaged with H2Hubs selectees are pessimistic about the benefits of the CBP process.

Figure 9. Based on engagement with H2Hubs so far, the H2Hubs CBP process is likely to...



Source: EFI Foundation.

- Among EJ group survey respondents, 45% believed that H2Hubs engagement so far would lead them to increase their community's participation in conversations. However, most respondents felt the CBP process would probably not benefit their community, allow their community to influence decision-making, or create a fair process, based on their experience engaging with H2Hubs.
- Of EJ groups surveyed, 41% indicated they had engaged in hydrogen hub conversations with H2Hub selectees. Of the 59% who had not participated in H2Hub conversations, 50% said the reason they were not involved in those conversations was because they were not invited to participate and 25% said their organization was not actively involved in hydrogen issues. This is noteworthy because hub developers seeking to identify EJ representatives to engage with may not be able to easily find appropriate groups merely from public declarations about hydrogen.
- As H2Hubs are currently negotiating contracts with DOE, their ability to engage with communities may be limited by, for instance, concerns over preemptively sharing proprietary information before a contract is signed. However, based on the survey findings, EJ groups may need to be invited into the conversation in order to participate. Identifying those groups requires due diligence to ensure H2Hub selectees are actively working with their community.

# Conclusion

The transition to a net-zero emissions future requires accelerating clean energy deployments while actively engaging communities in the project development process. This factbook offers valuable insights into the priorities and concerns of EJ organizations and EJ members regarding hydrogen development.

The findings reveal nuanced perspectives among EJ groups concerning hydrogen. While many EJ groups have expressed general opposition to hydrogen in public statements, a significant portion of these groups support green hydrogen specifically. EJ groups that support green hydrogen recognize its potential benefits, such as job creation and climate change mitigation, while acknowledging the concerns shared by most EJ groups, including the potential for prolonging dependence on fossil fuels, explosions, and local air pollution.

Interestingly, the survey results also show a difference in perspectives between EJ members and EJ groups, with EJ members expressing higher levels of support for hydrogen overall. EJ groups attribute this difference to varying degrees of familiarity with hydrogen and the prevalence of misinformation. EFIF's survey results highlight the importance of implementing preferred engagement strategies, such as public hearings and citizen panels, which are prioritized by both EJ groups and EJ members. Notably, EJ groups' top engagement method is working groups, presenting an opportunity for them to continue their leading role as existing community liaisons.

However, the pessimism expressed by EJ groups that have engaged with H2Hubs regarding the benefits of the CBP process emphasizes the need for continued efforts to build trust and meaningful collaborations. Though H2Hubs remain in the early stages, sustaining active engagement with EJ groups as the projects progress is central. This will help to ensure that the H2Hubs program addresses the unique needs of both groups and individuals within these communities.

Through future surveys and interviews, the EFIF team aims to deepen its understanding of the diverse priorities of the H2Hubs communities, developers, and DOE, with the acknowledgment that many people who could be impacted by the hydrogen hubs have not been represented in EFIF surveys so far. Additionally, EFIF is conducting analyses to explore how legally binding agreements between developers and communities can strengthen the collaborative process and ensure that the benefits of H2Hubs and clean energy projects, more broadly, are shared.

Moving forward, the H2Hubs process presents an opportunity to learn from EJ groups and facilitate open dialogues that lead to a more inclusive approach to clean energy development. By working collaboratively, H2Hubs can accelerate the transition to a net-zero emissions future while ensuring that the benefits of this transition are shared among all communities. The EFI Foundation is committed to supporting stakeholders in fostering these collaborations and building trust, ultimately advancing H2Hubs in an equitable, rapid, and successful manner.

# Appendix A. Survey Methods

The survey was developed using an online platform called Pollfish. For the purposes of this survey, the EFIF team created a database of all signatories of the hydrogen-related public letters.<sup>e</sup> Once the team finalized the comprehensive list, the team removed all signatories from the database that were not self-classified as EJ organizations, leaving 140 EJ organizations in the final outreach list. EFIF then gathered contact information for each of these organizations and distributed the survey via an anonymous Pollfish link to the final outreach list. The response rate was approximately 20%.

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

In May 2023 the EFI Foundation conducted a national survey of community members who identified as part of a Tribal community, labor organization, disadvantaged community (DAC) or environmental justice (EJ) organization. The survey asked them about their perceptions of hydrogen as a decarbonization tool, and DOE's hydrogen hubs (H2Hubs) program, particularly the community engagement processes and community benefits plans (CBPs). The EFI Foundation received 500 responses from people representing EJ organizations. At the same time, the EFI Foundation collected 11 letters signed by 179 EJ organizations, including yours, to learn more about EJ organizations' perceptions of hydrogen energy, especially its potential risks and benefits. The goal was to help create better community engagement between DOE, hub developers, and community partners. To do that, we believed it was important to know more about EJ organizations' stances on hydrogen energy.

We expected the survey results to match what we had gleaned from the letters, but surprisingly, there were a few major points of disagreement between what was expressed in the letters and in the survey. We're not quite sure how to interpret these differences and are hoping you can help us understand why they might be. This follow-up survey asks for your feedback on a few of the key findings from our research. Your responses are completely anonymous. The results of this study will not be associated with any individuals or organizations. Participation in this survey is entirely voluntary. If you would prefer to speak to us directly, or if you have any questions or comments, please reach out to Beth Dowdy at [bdowdy@efifoundation.org](mailto:bdowdy@efifoundation.org).

Hydrogen can be produced through the following methods:

- Blue – produced by steam methane reforming with carbon capture and storage
- Green – produced by electrolysis using renewable energy
- Pink – produced by electrolysis using nuclear energy
- Turquoise – produced by steam methane reforming with a solid carbon byproduct
- White – produced by drilling into underground pools of hydrogen

Which of these hydrogen production methods does your organization support as a decarbonization tool, if any?

<sup>e</sup> These survey methods are representative of Survey 2. For more information on the survey methods of Survey 1, visit Appendix A in the following publication: <https://efifoundation.org/foundation-reports/building-stronger-community-engagement-in-hydrogen-hubs/>.

# Appendix A. Survey Methods

Answers	Respondents(%)	Answers(%)	Count
Blue	3.70%	3.03%	1
Green	70.37%	57.58%	19
Pink	3.70%	3.03%	1
Turquoise	3.70%	3.03%	1
White	11.11%	9.09%	3
None of the above	29.63%	24.24%	8

Assuming lifecycle emissions were the same as the decarbonization methods you chose—Q3 Hydrogen can be produced through the following methods:

Blue – produced by steam methane reforming with carbon capture and storage

Green – produced by electrolysis using renewable energy

Pink – produced by electrolysis using nuclear energy

Turquoise – produced by steam methane reforming with a solid carbon byproduct

White – produced by drilling into underground pools of hydrogen

Which of these hydrogen production methods does your organization support as a decarbonization tool, if any?—would your organization support hydrogen produced through these other methods?

Answers	Respondents(%)	Answers(%)	Count
Blue	5.26%	5.26%	1
Green	0.00%	0.00%	0
Pink	0.00%	0.00%	0
Turquoise	5.26%	5.26%	1
White	5.26%	5.26%	1
None of the above	84.21%	84.21%	16

# Appendix A. Survey Methods

If hydrogen is produced using the methods you selected—Q3 Hydrogen can be produced through the following methods: Blue – produced by steam methane reforming with carbon capture and storage Green – produced by electrolysis using renewable energy Pink – produced by electrolysis using nuclear energy Turquoise – produced by steam methane reforming with a solid carbon byproduct White – produced by drilling into underground pools of hydrogen Which of these hydrogen production methods does your organization support as a decarbonization tool, if any?—would you agree or disagree with the following statements? Hydrogen has the potential to:

	Count			Answers (%)		
	True	False	I don't know	True	False	I don't know
Solve climate change	2	11	6	10.53%	57.89%	31.58%
Prolong our dependence on the fossil fuel industry	12	4	3	63.16%	21.05%	15.79%
Cause explosions	14	1	4	73.68%	5.26%	21.05%
Create local air pollution problems	13	1	5	68.42%	5.26%	26.32%
Solve local air pollution problems	7	5	7	36.84%	26.32%	36.84%
Require new pipelines to be built in my neighborhood	10	3	6	52.63%	15.79%	31.58%
Create new jobs	12	2	5	63.16%	10.53%	26.32%
Eliminate old jobs	9	5	5	47.37%	26.32%	26.32%

Would you agree or disagree with the following statements? Hydrogen has the potential to:

	Count			Answers (%)		
	True	False	I don't know	True	False	I don't know
Solve climate change	0	8	0	0.00%	100.00%	0.00%
Prolong our dependence on the fossil fuel industry	8	0	0	100.00%	0.00%	0.00%
Cause explosions	7	0	1	87.50%	0.00%	12.50%
Create local air pollution problems	7	0	1	87.50%	0.00%	12.50%
Solve local air pollution problems	0	8	0	0.00%	100.00%	0.00%
Require new pipelines to be built in my neighborhood	4	1	3	50.00%	12.50%	37.50%
Create new jobs	3	1	4	37.50%	12.50%	50.00%

# Appendix A. Survey Methods

Eliminate old jobs	2	1	5	25.00%	12.50%	62.50%
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Have you participated in any hydrogen hub conversations, specifically with H2Hub selectees?		
Answers	Answers(%)	Count
Yes	40.74%	11
No	59.26%	16

If not, why not?			
Answers	Answers(%)	Count	
My organization was not invited to participate	50.00%	8	
My organization tried to participate but was not included	0.00%	0	
My organization lacks the capacity to participate (time, money, staff, etc.)	6.25%	1	
My organization is not actively engaged in hydrogen issues	25.00%	4	
Other	18.75%	3	
The Hydrogen Hub proposed by our state was not selected.			
I don't know if we are invited.			
I'm not sure, perhaps one of our volunteer leaders participated			

If yes, based on your participation so far, would you agree or disagree with the following statements? The community engagement efforts of the H2Hubs applicants will:										
	Count					Answers (%)				
	Definitely yes	Probably yes	Not sure	Probably not	Definitely not	Definitely yes	Probably yes	Not sure	Probably not	Definitely not
Increase participation in hydrogen hub conversations for the communities I represent	0	5	4	2	0	0.00%	45.45%	36.36%	18.18%	0.00%
Develop a project that will really benefit the communities I represent	0	0	2	7	2	0.00%	0.00%	18.18%	63.64%	18.18%

# Appendix A. Survey Methods

Allow the communities I represent to really influence the decisions that are made	0	0	2	8	1	0.00%	0.00%	18.18%	72.73%	9.09%
Create a fair process for the communities I represent	0	0	3	6	2	0.00%	0.00%	27.27%	54.55%	18.18%

There are many methods for community engagement to ensure that benefits actually flow to the communities you represent. Please select your 5 of the most important engagement methods. “Important” here means methods that are most likely to include lots of voices in decision-making and lead to real benefits for you and your community.

Answers	Respondents(%)	Answers(%)	Count
Document co-creation: a process for hub groups and community members to make binding agreements about the benefits the hub groups will provide to the communities	48.15%	9.63%	13
Citizen panels: a group of people who represent all the different kinds of people in your community are chosen to discuss an issue and make recommendations on how to proceed	51.85%	10.37%	14
Community mapping: community members help hub groups create a map of the resources and assets that exist in your area	18.52%	3.70%	5
Working groups: a group of community leaders and relevant stakeholders who get together regularly to discuss the project	62.96%	12.59%	17
Digital storytelling: community members bring their stories to life by creating movies, photographs, and other media	33.33%	6.67%	9
Scenario testing: a group of community members comes up with a few different hypothetical ways the project could go, including the types of benefits they could get out of it	22.22%	4.44%	6
Public hearings: a formal, in-person meeting to record questions from members of the public or give people a set time to speak to voice their opinions.	55.56%	11.11%	15
Town hall meetings: more of an open discussion than a formal public hearing.	51.85%	10.37%	14
Open houses: often include information or education about a project, where the public can go around and ask questions like at a science fair.	33.33%	6.67%	9
Informal, targeted chats: short presentations to targeted audiences (e.g., environmental NGOs), followed by open discussion.	22.22%	4.44%	6
Focus groups: a small group of people brought together to talk about an issue.	14.81%	2.96%	4
One-on-one meetings: a project representative sits down with you or someone from your community for a personal meeting.	7.41%	1.48%	2
Facilitated discussions: conversations that are guided by a third party (neutral person).	29.63%	5.93%	8
Virtual workshops: can combine aspects of the above methods (open houses, informal chats, town hall meetings) but it all takes place online.	37.04%	7.41%	10

# Appendix A. Survey Methods

Other	11.11%	2.22%	3
Community self-determination by providing community members direct decision-making power in project direction.			
You don't really need all this community engagement. Minimize usage of green hydrogen to hard-to-electrify uses, that's it!			
This topic is a big waste of time compared to investment in education about energy conservation & BE.			

As described at the beginning, some of the key points of difference between the EJ group survey respondents and the EJ groups' letters can be seen here. Why do you think these differences exist?

What is the approximate number of full-time employees and volunteers (combined) at your organization?		
Answers	Answers(%)	Count
1 to 10	51.85%	14
11 to 30	29.63%	8
30 to 50	7.41%	2
50 to 100	3.70%	1
100 +	7.41%	2

What is your organization's approximate annual budget?	
Answers	Count
N/A	1
2,000	1
\$1 million	1
\$1.8m	1
\$0	1
350,000	1
300,000	1

# Appendix A. Survey Methods

\$1,500,000
I don't know.
3000
n/a
I'm a newer employee and do not know this information.
800K
About \$500k
200,000
\$5 million
\$90,000
\$500K
\$60,000
\$3-4 Million
\$250,000
130,000
\$450,000
\$2 million
n/a
I don't know
\$0

Please provide any additional comments on your organization's views on hydrogen, the DOE H2Hubs program, or why our original survey results differed from the information we found in public letters. If you have no further comments, please put 'N/A.' Thank you very much for your input!

## EFI Foundation Survey Open-Ended Responses

Two team members were responsible for developing, assigning, and synthesizing codes for 54 open-ended survey responses. 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 among both coders, ensuring the validity of our coding process. Percent agreement between coders was 85%, and the Cohen's kappa was 0.84, a substantial level of agreement.<sup>11</sup>

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

As described at the beginning, some of the key points of difference between the EJ group survey respondents and the EJ groups' letters can be seen here.

Why do you think these differences exist?

Please provide any additional comments on your organization's views on hydrogen, the DOE H2Hubs program, or why our original survey results differed from the information we found in public letters. If you have no further comments, please put 'N/A.' Thank you very much for your input!

The coders developed and followed the following general principles. 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 survey response level.
  - Example: "Only once it is perfected, green hydrogen is the only viable solution. we are years away from this. \$\$\$ should be put into perfecting green hydrogen rather than the other false solutions. also, to expect community groups/orgs, citizens who are already at capacity to do the input work for the hubs is a stretch. scientists actually working on this issue should be consulted, and not the ones who are in industry's pocket."
  - This survey response is multiple sentences, but being that the survey responses are generally short, each code will encompass a whole survey response.

### 2. Overlapping Codes:

- If a sentence aligns with multiple codes, include all relevant codes.

# Appendix B. Qualitative Coding Methods

- 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 codes and their definitions are replicated below.

#### 1. Knowledge gaps

- General lack of understanding, or limited education about hydrogen production and uses.
- Example: "we're not experts. we are still learning, and are constantly taking on new points of information."
  1. Hydrogen Colors/Production Methods: Lack of understanding about different hydrogen types (green, blue, grey) and lack of clarity around hydrogen terminology. Limited knowledge about hydrogen impacts depending on "color." Example: "Use of the term "hydrogen" is undefined as to which type." "Types of hydrogen (green, blue) not defined by law, assumptions fuzzy."
  2. Hydrogen Feasibility: Limited understanding of feasibility, costs and efficiency of hydrogen production. Example: "Green hydrogen using renewable power is a pipe dream that won't come to fruition."
  3. Public Awareness: Not enough widespread public awareness and education about hydrogen energy. Example: "Rest of EJ group not up-to-speed like the few researching it."
  4. Local Context: Need for context-specific knowledge based on local resources and conditions. Example: "It's about knowing your region, resources & science - most surveyed don't know."

#### 2. Environmental concerns

- Issues related to air pollution, water scarcity, greenhouse gas emissions, and impacts on the renewable energy transition.
- Example: "today the us produces nearly no green hydrogen, and if it ever does come into more widespread use there are many negative factors, including increased emissions of smog-forming nitrogen oxides, wasting 50-80% of the clean energy used to create the hydrogen..."

#### 3. Community impacts

- Potential effects on jobs, local air quality, and how impacts may vary across different regions or communities.
- Example: "we are located on an indian reservation and we have provided hydrogen information sessions as well as developers, and a majority of our local chapter communities along the proposed h2 pipeline route have passed hydrogen opposition resolutions..."

#### 4. Fossil fuel dependence

- Concerns about hydrogen prolonging the use of fossil fuels, acting as a "bridge fuel," or requiring fossil fuel infrastructure.

# Appendix B. Qualitative Coding Methods

- Example: "those who are educated...understand that it is primarily an effort by oil and gas companies to prolong the use of fossil fuels and detract from the political will and the financial resources available to the technologies that already work - solar, wind and battery storage."
5. Misinformation:
- Presence of misinformation or misleading information about hydrogen. Misinformation refers to explicitly wrong information being shared, whereas misleading may refer to "false solutions" or greenwashing techniques.
  - Example: "There is much misinformation about hydrogen, especially green H2." "Major utilities like Duke Energy are using the promise of green H2 in order to build more gas infrastructure now and burn even more fossil fuels."
6. Government skepticism
- Skepticism and concerns about lack of transparency from government entities when promoting hydrogen, especially related to ties with fossil fuel industries.
  - Example: "We are very concerned about hydrogen misinformation targeting our communities that is funded by the government and stakeholder industries. i.e. informing our communities of the benefits of hydrogen without explaining its ties to fossil fuel infrastructure and that better home energy alternatives exist."

# Appendix C. Examples of Community Engagement

## Examples<sup>12,13,13</sup>

### Inform

- General information channels
- Websites
- Public meetings
- Social media
- Videos
- Site visits, open houses, and tours
- Infographics and fact sheets
- Presentations
- Displays, billboards, and exhibits

### Consult

- Focus groups
- Polls
- Surveys
- Voting
- Comment boxes
- Interviews
- Social media listening
- Door-to-door
- Community and online forums
- Open houses
- Town halls
- Workshops
- Kitchen table talks
- Public comment and online commenting

### Involve

- Visioning
- Mind mapping
- Digital storytelling
- Crowdsourcing ideas
- Community mapping
- Hackathons
- Design charrette
- Participatory budgeting
- Scenario testing
- Community organizing and advocacy
- Interactive workshops
- Polling
- Community forums
- Open planning forums with citizen polling

### Collaborate

- Memorandums of understanding (MOUs) with community-based organizations
- Citizen advisory committees (panels)
- Collaborative data analysis
- Co-design and co-implementation of solutions
- Collaborative decision-making

# Appendix C. Examples of Community Engagement Methods

- Large group meetings
- Working groups
- Open space forums
- Online communities
- Document co-creation (e.g., CBA)

## Defer to

- Community-driven planning
- Consensus building
- Participatory action research
- Participatory budgeting
- Cooperative models

# References

- <sup>1</sup> U.S. Department of Energy (DOE) Office of Clean Energy Demonstrations (OCED), “Regional Clean Hydrogen Hubs,” <https://www.energy.gov/oced/regional-clean-hydrogen-hubs-0>.
- <sup>2</sup> “Hydrogen: Don’t Believe the Hype,” 2021, <https://www.foodandwaterwatch.org/wp-content/uploads/2021/09/Dont-Believe-the-Hydrogen-Hype.pdf>.
- <sup>3</sup> “Reject Western Interstate Hydrogen Hub application for Department of Energy Regional Clean Hydrogen Hubs (H2Hubs) funding (DE- FOA-0002779) and all H2Hub proposals nationwide,” 2023, [https://www.biologicaldiversity.org/programs/public\\_lands/pdfs/23-06-12-NFS-Hydrogen-Letter.pdf?\\_gl=1\\*xl5npX\\*\\_gcl\\_au\\*MTczOTg4OTczMC4xNzEzMzY4MTY0](https://www.biologicaldiversity.org/programs/public_lands/pdfs/23-06-12-NFS-Hydrogen-Letter.pdf?_gl=1*xl5npX*_gcl_au*MTczOTg4OTczMC4xNzEzMzY4MTY0).
- <sup>4</sup> “Don’t believe the ‘Hydrogen Hype’ - Reject all applications for Department of Energy Regional Clean Hydrogen Hubs (H2Hubs) funding (DE- FOA-0002779),” 2023, [https://www.biologicaldiversity.org/programs/climate\\_law\\_institute/pdfs/National-Hydrogen-Letter-8\\_22\\_23.pdf](https://www.biologicaldiversity.org/programs/climate_law_institute/pdfs/National-Hydrogen-Letter-8_22_23.pdf).
- <sup>5</sup> “Need for transparency in the implementation of the Infrastructure Investment and Jobs Act (IIJA) hydrogen hubs program,” 2023, <https://www.nrdc.org/sites/default/files/2023-06/iija-hydrogen-hubs-transparency-letter-20230504.pdf>.
- <sup>6</sup> “A Better Path Forward to Achieving a Just and Renewable Energy Future,” 2023, <https://www.biologicaldiversity.org/programs/energy-justice/pdfs/Letter-from-290-Frontline-Communities-Organizations-on-Permitting-Reform.pdf>.
- <sup>7</sup> “73 Organizations Call for A Just and Ambitious 2022 Scoping Plan,” 2022, [https://earthjustice.org/wp-content/uploads/73\\_orgs\\_letter\\_-\\_a\\_just\\_and\\_ambitious\\_scoping\\_plan.pdf](https://earthjustice.org/wp-content/uploads/73_orgs_letter_-_a_just_and_ambitious_scoping_plan.pdf).
- <sup>8</sup> “False Solutions in Justice40,” 2022, <https://www.weact.org/wp-content/uploads/2022/09/EJLF-False-Solutions-in-Justice40-Letter-091922.pdf>.
- <sup>9</sup> “Statement by Environmental Justice Organizations on the National Symposium on Climate Justice and Carbon Management,” n.d., <https://www.weact.org/2023/06/statement-by-environmental-justice-organizations-on-the-national-symposium-on-climate-justice-carbon-management/>.
- <sup>10</sup> Facilitating Power, The Spectrum of Community Engagement to Ownership, 2020, p. 1-14, <https://www.communitycommons.org/entities/3aec405c-6908-4bae-9230-f33bef9f40e1>.
- <sup>11</sup> Cliodhna O’Connor and Helene Joffe, “Intercoder Reliability in Qualitative Research: Debates and Practical Guidelines,” *International Journal of Qualitative Methods* No. 19 (2020): <https://doi.org/10.1177/1609406919899220>.
- <sup>12</sup> The Center for Rural Pennsylvania, “Developing Effective Citizen Engagement: A How-To Guide for Community Leaders,” 2008, [https://www.rural.pa.gov/getfile.cfm?file=Resources/PDFs/research-report/archived-report/Effective\\_Citizen\\_Engagement.pdf&view=true](https://www.rural.pa.gov/getfile.cfm?file=Resources/PDFs/research-report/archived-report/Effective_Citizen_Engagement.pdf&view=true).
- <sup>13</sup> National Coalition for Dialogue and Deliberation, “Resource Guide on Public Engagement,” 2010, [https://www.ncdd.org/uploads/1/3/5/5/135559674/ncdd2010\\_resource\\_guide.pdf](https://www.ncdd.org/uploads/1/3/5/5/135559674/ncdd2010_resource_guide.pdf).