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Community engagement in the development of bioenergy projects from cellulosic urban waste feedstock in Hawaii for sustainable aviation fuel

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The purpose of the research project was to reveal the perceptions of residents and communities of the City and County of Honolulu concerning bioenergy projects, feedstock, and sustainable aviation fuel. The perception study was conducted via community-scale surveys, interviews, and town meetings to gather feedback on the preliminary design of a proposed bioenergy project, including feedstock choice and the need for sustainable aviation fuel in Hawaii. Residents on the west side of Oahu were targeted due to their proximity to the proposed plant site location. Findings from this study aim to identify resident perceptions, understanding, and desire for bioenergy projects and new infrastructure to, improve the energy efficiency and sustainability of Hawaiian islands. While Hawaii has created policies and mandates to move toward 100% renewable energy sources by 2045, the focus has been predominately on renewable electricity, largely overlooking other sustainable energy options such as sustainable aviation fuel. There is a lack of research on the community engagement and perceptions of Hawaiian residents on bioenergy projects and sustainable aviation fuel, contributing to the low adoption of bioenergy projects on the islands. Insights from this study aim to add literature on the need for community engagement in the design process, the importance of accepting new sustainable infrastructure, and the production and use of sustainable aviation fuels.

KEYWORDS

community engagement, bioenergy, sustainable aviation fuel, feedstock, Hawaii

Introduction

In 2008 the Hawaii Clean Energy Initiative (HCEI) was launched after the State of Hawaii and the U.S. Department of Energy signed a memorandum of understanding focusing on the collaboration on the overall reduction of Hawaii's overwhelming dependence on imported fossil fuels. During this signing, the state estimated that 60–70 percent of the state's future energy needs could be delivered domestically through clean, local, and renewable energy sources (Hawaii State Energy Office, 2024). HCEI depends on collaboration from committed leaders, individuals, and public and private partnerships to identify new infrastructure required for clean energy. New infrastructure depends upon the support and establishment of clean energy technology and innovations, which could create economic opportunities and diversification of Hawaii's economy and an open-source model for other island communities pursuing similar clean energy goals (Hawaii State Energy Office, 2024). Ultimately, the goal is to make Hawaii energy independent. Hawaii mandates that 100% of its electricity be generated solely by renewable energy sources by 2045 (U.S. Energy Information Administration, 2024). The excessive cost of electricity is due to the state being dependent on petroleum for about four-fifths of total energy consumption (EIA, 2024; U.S. Energy Information Administration, 2024). While Hawaii has predominantly focused on the generation of renewable electricity, additional renewable energy may provide the required policy to support the growing biofuel industry needed for aviation and other transportation for the state (Korkut and Fowler, 2021).

In 2015, 17 Sustainable Development Goals (SDGs) were agreed upon by 193 member States of the United Nations. These ambitious SDGs cover a range of goals intended to address people, planet, prosperity, peace, and partnership for the planet (Tegizbekova, 2019; United Nations, 2024). Aviation as we know it today contributes to the UN's three pillars of sustainability, known as the 3Ps: planet, prosperity, and partnership. While the U.S. federal government adopted the SDGs, most of the U.S. has yet to significantly engage with the SDGs agenda (Tegizbekova, 2019). Without the structure of a comprehensive federal program requiring the use of sustainable aviation fuel (SAF), the U.S. has been promoting the use of SAF through state-level incentives (Korkut and Fowler, 2021).

While Washington, California, and Oregon have adopted Clean Fuels Programs allowing SAF producers to earn credits, Hawaii has focused predominately on tax incentives (Tegizbekova, 2019). Hawaii currently consumes nearly 700 million gallons of jet fuel annually for commercial aviation, all of which is derived from petroleum (Tegizbekova, 2019; Turn et al., 2023). On Oahu, construction and demolition (C&D) debris accounts for roughly 236,000 metric tons per year, disposed of at the PVT Integrated Solid Waste Management Facility in Nanakuli, Hawaii, the only location designated by the City & County of Honolulu for C&D (PVT Land Company, 2024; Turn et al., 2023). The utilization of urban waste as a feedstock for SAF production has numerous advantages, the primary is the reduction of waste materials entering the state's limited landfill space, and the second is the potential reduction of dependence on imported energy, namely fossil fuels (Turn et al., 2023).

Community input and engagement are critical to the success of bioenergy project initiatives due to the project's societal and environmental impacts on the surrounding community groups (Department of Primary Industries, 2022). Through the collaboration and community engagement of local stakeholders, societal, economic, and environmental impacts can be appropriately addressed and even mitigated (Dale and Newman, 2010; Department of Primary Industries, 2022). Despite the potential benefits of bioenergy and renewable energy projects, island communities are especially vulnerable to these initiatives' adverse effects on the island landscape, community, culture, and economy (Kallis, 2021). The community's perception of bioenergy and renewable energy projects strongly impacts the acceptance of renewable energy projects, illustrating the need for community and stakeholder engagement to build trust from the beginning through the implementation (Colmenares-Quintero et al., 2020).

Research led by Simonpietri Enterprises LLC (SE LLC) and research partners was conducted as part of a U.S. Department of Energy grant focusing on community-informed bioenergy projects from cellulosic urban wastes and assessing local organics with a Hawaiian approach for feedstock for sustainable aviation fuel. The overall objective of this research was to gather community input and feedback regarding the scale, site/location, feedstock, and products for the bioenergy project. Findings from the case study will contribute to the existing literature with community-informed design feedback from a native Hawaiian perspective on renewable energy products, project tradeoffs, and concerns regarding bioenergy projects including sustainable aviation fuel. The State of Hawaii supports the 2030 Agenda for Sustainable Development; however, without the support of the public as well as private partnerships, the state will fall behind on its goals (State of Hawaii Office of Planning and Sustainable Development, 2024). Community input and perceptions of bioenergy projects and sustainable fuels are foundational to bringing new sustainable infrastructure and renewable energy sources to the Hawaiian islands and hopefully may pave a path for the necessary policy support that is needed to support SAF and the growth of the biofuels industry in Hawaii.

Literature review

Sustainable community development

Sustainable community development (SCD) is a long-term viewpoint that centers on managing human, natural, and financial needs and capital to ensure sufficient resources are accessible to future generations. SCD also addresses meeting present needs without sacrificing or compromising future generations' access to meet their basic human needs (Hamstead and Quinn, 2005; Institute for Sustainable Communities, 2024). Sustainability at the community level presents challenges, especially in urban areas where human settlements are ecologically, economically, politically, and culturally bound (Spiliotopoulou and Roseland, 2020). SCD represents a holistic attitude encompassing environmental, ecological, and social considerations in the vibrant behaviors of communities (Roseland, 2012; Spiliotopoulou and Roseland, 2020).

Traditional community planning describes the process where only the stakeholders and government planners participate in the problem and identification process. Conversely, SCD is best addressed in a community setting and includes numerous attributes that broaden the stakeholder group in the issue-planning process. The most prominent attributes include civic engagement, accessibility, education, public safety, community identity, neighborliness, use of local resources, and quality of life (Flint, 2013). What makes SCD so significant is that it is seen as a holistic way to make positive changes in communities by creating employment, restoring natural health, stabilizing the local economy, and increasing control at the community level (Flint, 2013). SCD represents a new way of thinking about development over the long run, requiring changes to the status quo in favor of community well-being, meaningful improvements, and protection of the natural environment (Spiliotopoulou and Roseland, 2020).

Stakeholder theory

The stakeholder theory is an organizational management and ethics theory that addresses morals and values as a cardinal attribute. Stakeholders are individuals and organizations that have direct or indirect impacts on the project. Internal stakeholders include contractors, consultants, and clients, whereas external stakeholders will include local and state government authorities, social groups, political organizations, the public, and trade industries among the most prevalent (Agyekum et al., 2022). There are many critiques of the stakeholder theory as it can be distorted and misinterpreted by opportunistic managers acting in their self-interest such as the agency problem (Phillips et al., 2005). Stakeholders are prime contributors to a project's completion and success due to their willingness to support or not support, therefore it suggests that true stakeholders are the only individuals or organizations with an authentic interest in a project (Zarewa, 2019). Due to the public interest and concerns regarding sustainability, projects that deal with science, especially new arenas such as bioenergy projects have gravitated to involving stakeholders in the decision-making process (Horschig et al., 2020). Key players are stakeholders who represent groups with both high interest and high influence. Context setter stakeholders, while having high influence have low interest, whereas subject stakeholders hold high interest but have low influence on the project. Finally, crowd stakeholders demonstrate both low interest and influence, making this group the least desirable of the four types (Reed et al., 2009). Strategies on how best to communicate, educate, and engage going forward can be determined based on whether stakeholders are deemed supporters, neutral, or opposed.

IAP2 Spectrum of Public Participation

The Spectrum of Public Participation originated in the 1960s through the leadership of the International Association for Public Participation (IAP2) and was developed to define power sharing in the decision-making process while making a commitment to the public for its role. As a guiding tool, organizations can clarify roles in the decision-making process, set appropriate expectations that are clear to both the public and policymakers, and provide transparency by identifying the level of engagement while building trust (IAP2, 2024). The lowest level of impact starts with 'inform,' which focuses on providing necessary information for understanding without inviting feedback. Next is 'consult' which solicits feedback on identified issues whereas 'involve' moves the feedback further into addressing concerns. 'Collaboration' includes a level of partnership and sharing of the decision-making process while 'empower' allows the final decisions to be made by the public (Burdett, 2024). The IAP2 Spectrum of Public Participation is increasingly being recognized as a best practice when public participation is needed. The IAP2 provides a mechanism in which to engage the public, identify their role in the bioenergy project, build trust, provide access to accurate and complete information, and encourage respect for the communities most affected by the project. Community acceptance of bioenergy projects is critical due to the project initiative's social impacts on health and well-being, access to infrastructure and services, and opportunities for economic development (Department of Primary Industries, 2022).

SCD is a comprehensive approach illustrating the interconnectedness that addresses community concerns and challenges when introducing new sustainable policies, technologies, and infrastructure. Traditional community planning processes no longer serve the local communities. Instead, having a voice and buy-in is key to adopting and implementing bioenergy projects needed for future generations and sustainable practices. Stakeholders, both internal and external are primary contributors to the implementation and completion of a project. Conversely, stakeholders can also play a profound role in blocking the adoption or success of sustainable growth and new infrastructure when their questions and concerns are not addressed. Since stakeholder groups represent both high and low influence over new policies and infrastructure, stakeholder input must be captured. Further, stakeholders need to be educated on the need for change, which should include the benefits to them and the surrounding community. The IAP2 Spectrum of Public Participation is a widely recognized model that allows organizations to identify and clarify the roles of the public in the decision-making process as well as to set realistic and appropriate expectations as to the level of engagement needed from the community. Providing the public opportunities to engage with new project design and implementation builds transparency and trust, which are needed for the success of bioenergy projects and sustainable infrastructure.

Methodology

Community feedback was collected through online surveys, community group briefings, and structured stakeholder interviews utilized to refine and expand the scope of the bioenergy project. Additionally, community-based interactions were also used to provide education regarding technical aspects of the bioenergy project as well as the community benefits the region could expect because of this project. This study was approved by the University of Hawaii System Office of Research and Compliance Institutional Review Board (IRB) under protocol number [2024–00140]. The survey research focused on community perceptions and preferences regarding bioenergy for the local community, specifically residents of the City and County of Honolulu. An emphasis on partnerships with local stakeholders in underserved communities including residents of the proposed project site was considered. The geographic area of Kapolei, Nanakuli, and Waianae areas of West Honolulu on the island of O'ahu was targeted (Figure 1). Residents in these areas are predominately native Hawaiian in ethnicity and include lower-than-state average median income and life expectancy (US Census Bureau, 2020). Solid waste disposal streams disproportionately impact residents in these areas, especially regarding construction and demolition debris and municipal solid waste due to their proximity to the only C&D landfill in Nanakuli.

Participants and data collection

A perception study of community stakeholders and partners of bioenergy was conducted in two phases. Phase one took place in the Spring of 2022 and phase two in the Fall of 2022. Community stakeholders involved with the perception study included individual stakeholder surveys and interviews. Additional stakeholders included community group engagement pre-project briefings to elected community representatives in the two municipal neighborhood boards who most appropriately aligned with the area affected by the proposed bioenergy project, Kapolei and Nanakuli. Community education and outreach were performed to facilitate the development of the final phase of the bioenergy project planning. Attendance at four City and County of Honolulu local neighborhood boards was conducted and included the neighborhoods of Makakilo-Kapolei, Nanakuli-Mali, Ewa, and Waianae. At these neighborhood board

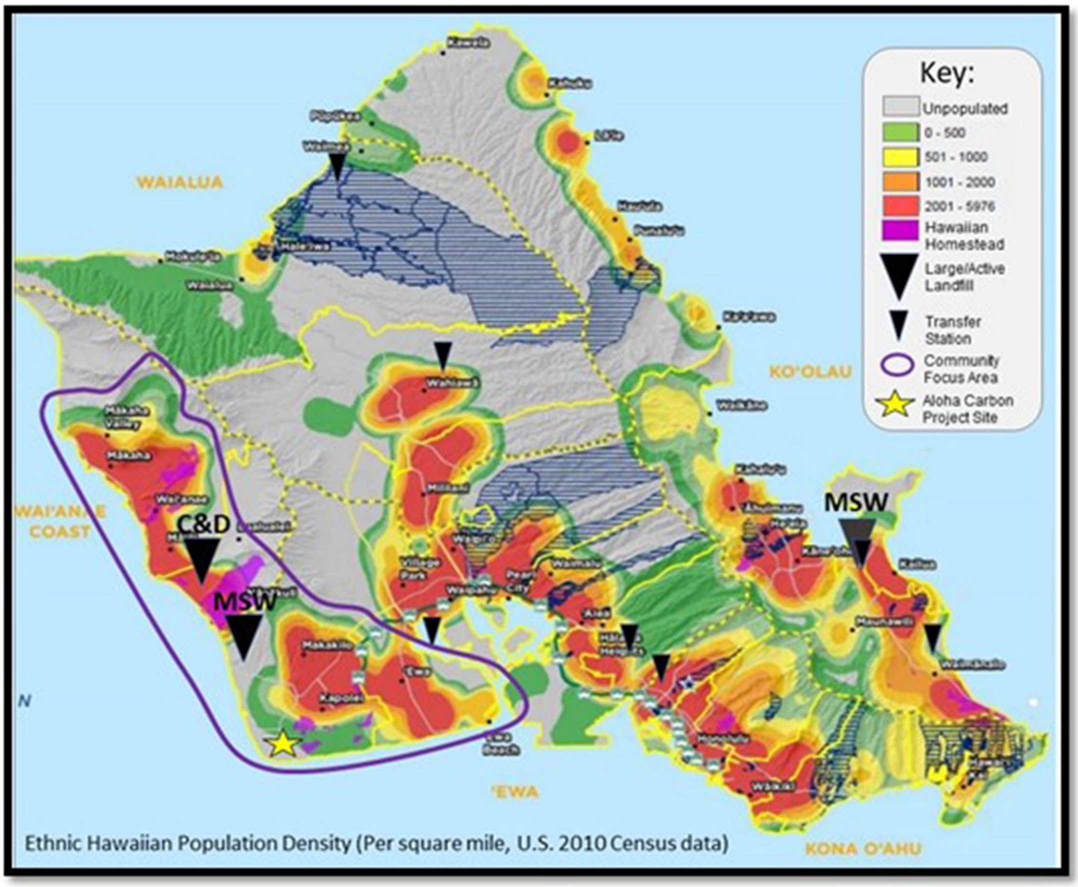

FIGURE 1
Geographic focus within the city and county of Honolulu on O'ahu. Source: Reproduced from Census Bureau (2010), with permission.

meetings, public dialog was monitored regarding relevant local projects to gather information regarding community perceptions of new projects and development. Community concerns, acceptance, and relevance to bioenergy and waste projects were recorded. The tone and formality of these meetings were especially helpful for gathering information on how best to communicate with these stakeholders going forward. A list of over 80 key stakeholders including community groups, leaders, neighborhoods, local elected and administrative officials, industry groups, local schools, organizations, and advocacy groups were included. Formal scripted interviews and surveys were conducted for comments on their perceptions of feedstock, end product, scale, and environmental impact tradeoffs.

To best understand the community's perception of bioenergy, bioenergy projects, and feedstock, an online survey was developed and circulated. Two surveys were conducted to the general public using SurveyMonkey in the Spring and Fall of 2022. The third was conducted during a real-time audience poll during the 2022 Bioeconomy Hawaii Forum webinar using the online service Mentimeter. Combined in total, 160 responses were collected over the three online polling events. Questions focused on bioenergy-related perceptions and demographics were recorded. The survey link was distributed via neighborhood board presentations, partners with the University of Hawaii, online forums, and advertisements.

Results

Demographics of respondents

Demographic data was collected from 141 survey respondents and identified 21.0% as Caucasian, 20.3% as Native Hawaiian/Pacific Islander, followed closely by Filipino (19.6%) and 2 or more races, respectively, (18.1%). Education data showed that 28.6% obtained a bachelor's degree, 25.7% held an associate's degree, 25.7% had some college but no degree and the rest had no college credits. Employment status indicated that 40.0% of respondents were employed in professional or skilled work and 29.3% were still currently in school (college or university). The age of respondents indicated that 36.7% were between 18 and 24 years old, 30.2% were 25–39, and 27.3% were 40–59. When asked how long the respondents lived in Hawaii 60.9% reported having lived in Hawaii for more than 20 years and 17.4% 11–20 years.

Figure 2 shows the combined responses ($n = 160$) for the question, "The materials listed below can be converted into fuel and recycled material products. Select your preference for each material." Construction and demolition debris (C&D) ranked the highest as most desirable, closely followed by municipal solid waste (MSW), and agricultural waste for conversion to energy and recycled-material products. The least desirable feedstock ranked was automobile and appliance shredder residue (AASR) and sewage sludge.

Figure 3 presents the combined results (n = 160) for the question, "The following energy products can all be made in Hawaii, but there is a limit to the resources to make them from. Choose the three most important in your view ("green," "renewable," and "sustainable" mean a lower lifecycle of greenhouse gas emission than fossil fuels). The six bioenergy options to choose from included electricity, renewable natural gas (RNG), green hydrogen (H_2), diesel, green gasoline, and SAF." Of the six, bioenergy end-products proposed in the community survey, respondents slightly preferred electricity over the other five options. RNG and green gasoline were chosen over the remainder of the options, but in aggregate, the preference of fuels over electricity by about three to one was observed.

Participants were then asked to weigh the benefits or tradeoffs between different proposed types of projects. The primary objective of this question was to determine what the participants would choose when presented with no perfect solutions between two hard choices. The question asked, "If you had to choose between these options, which would you choose (option A or B)?" Figure 4 highlights the

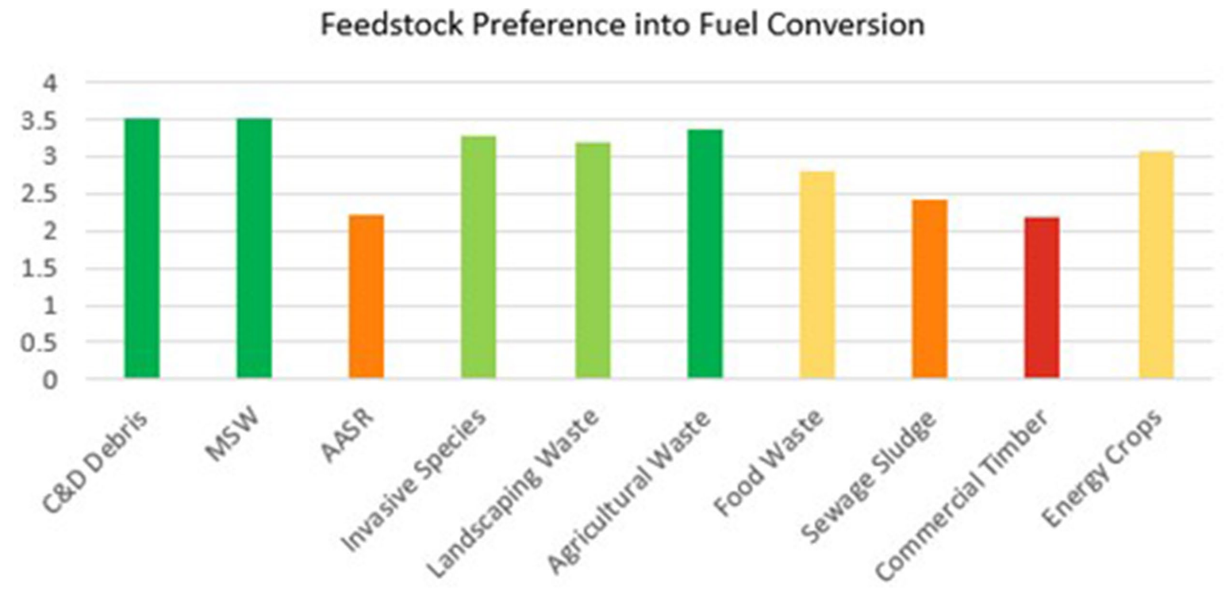

FIGURE 2
Preference selection for feedstock conversion into fuel.

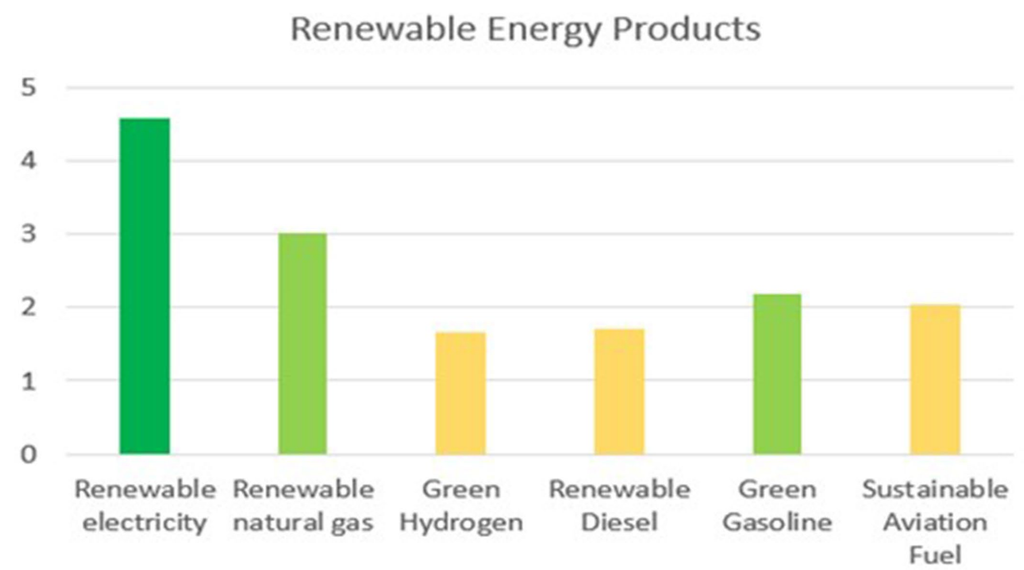

FIGURE 3
Renewable energy products in Hawaii.

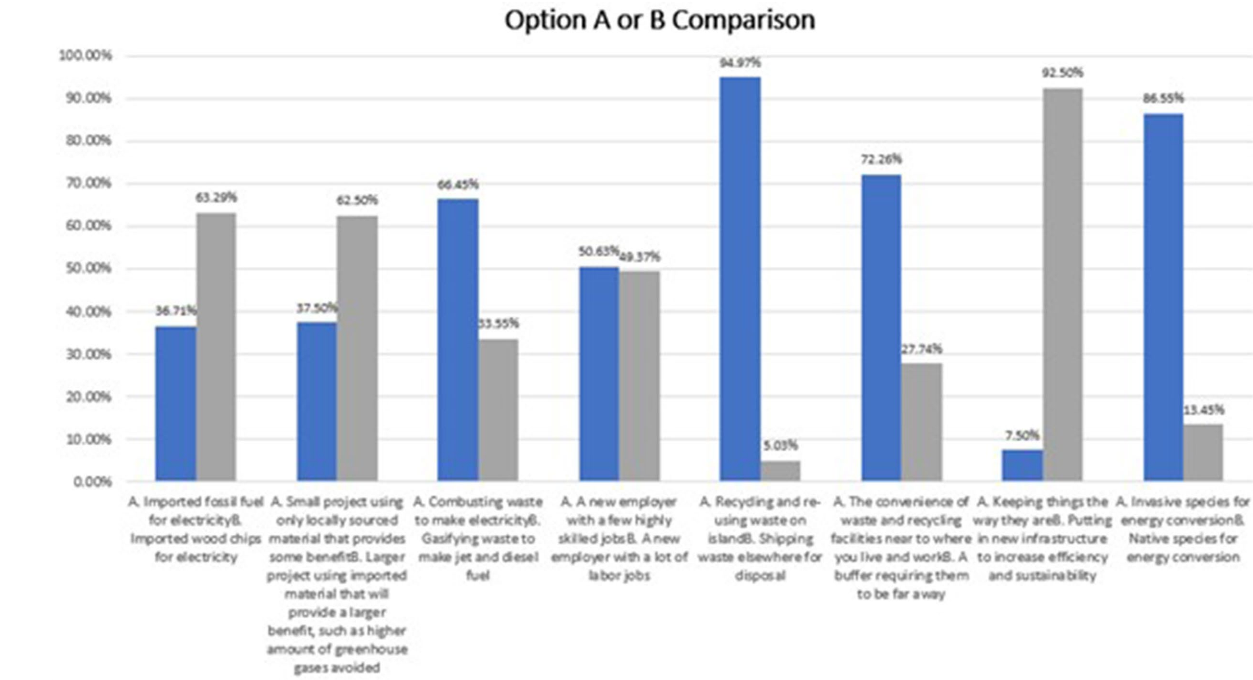

FIGURE 4
Option A or B comparison.

results from the respondents (n = 160). Notable results from this question highlight that when asked to choose between the convenience of waste and recycling facilities near where they live and work compared to a buffer requiring them to be far away, respondents chose the convenience of the facilities (94.9%) over a buffer (5.03%). When asked if the infrastructure should stay the way they are compared to putting in new infrastructure to increase efficiency and sustainability, 92.5% preferred new infrastructure compared to keeping the same facility (7.5%). Another clear response addressed the type of feedstock to use for energy conversion. Respondents indicated a preference for invasive species (86.6%) compared to native species (13.5%) respectively.

Discussion

The community-informed plant design process began with reviewing several case studies related to bioenergy projects proposed and executed within the past 15 years, five of which were located in Hawaii and five on the continental U.S. From the case study review, projects that were smaller in scale were more successful in permitting, construction, and operations. Site location preferences were industrial over residential and rural areas. Feedstock choices preferred solving local waste problems over planting monocrops for energy conversion, illustrating using local feedstock over imported. End-use products that focused on transportation fuel were preferred over electricity. Residents expressed their desire for the projects to be run by local companies with residents leading the project development over bringing in outside companies. Finally, a circular model for bioenergy projects with an emphasis on sustainability that addressed waste produced in the process, and recycled back into construction materials was favored. Findings from the case study review were used to develop the survey and interview questions posed to residents on the west side of Oahu to gain a community perspective on bioenergy projects in Hawaii.

Table 1 presents the summary of the community engagement findings. The first two questions used a 5-point Likert scale, and the weighted average (WA) was calculated. For this research, WAs greater than 4.5 were considered highly relevant, 3.5 to 4.5 as relevant, 2.5 to 3.4 as moderately relevant, 1.5 to 2.4 as undecided, and 1.4 and less as not relevant. When asked to select a preference for types of feedstocks, respondents indicated C&D waste (3.52) and MSW (3.50) ranked as relevant feedstock choices. Agricultural waste (3.36), invasive species (3.27), landscaping waste (3.19), energy crops (3.08), and food waste (2.81) followed as moderately relevant feedstock choices. Sewage and sludge (2.43), AASR (2.23), and commercial timber (2.18) were ranked undecided. These results confirmed the current plans to use C&D waste as the primary feedstock for the proposed commercial-scale plant. The results also confirmed the partiality toward MSW as a feedstock choice but is already converted to electrical energy via combustion at a plant operated for the City and County of Honolulu. Unexpected results were the use of invasive species to rank as a relevant option. The desire to use invasive species was brought up again in stakeholder interviews as a feedstock that needed to be addressed. This confirmed that residents were aware of the problem and were looking for solutions. AASR is the most challenging solid waste the City and County of Honolulu must deal with, and a majority of the waste materials go straight to the city's only landfill.

Respondents were next asked to rank their preferences from a list of six bioenergy products that could be made from bio-based feedstock in Hawaii. Renewable electricity (4.58) was the overwhelming choice indicating familiarity with the renewable

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TABLE 1 Community engagement findings.

Preference for materials to be converted into fuel and recycled material products	Responses (*N*)	Least preferred % (*N*)	Slightly preferred % (*N*)	Undecided % (*N*)	Preferred % (*N*)	Most preferred % (*N*)	Do not know % (*N*)	Weighted average
C&D Debris	147	5.4 (8)	6.1 (9)	20.4 (30)	29.3 (43)	32.7 (48)	6.1 (9)	3.52
MSW	146	6.2 (9)	10.3 (15)	16.4 (24)	30.8 (45)	32.2 (47)	4.1 (16)	3.50
AASR	112	7.1 (8)	8.9 (10)	21.4 (24)	32.1 (36)	16.1 (18)	14.3 (16)	2.23
Invasive species	141	7.1 (10)	9.2 (13)	25.5 (36)	24.1 (34)	29.8 (42)	4.3 (6)	3.27
Landscaping waste	127	3.1 (4)	11.8 (15)	12.6 (16)	29.9 (38)	38.6 (49)	3.9 (5)	3.19
Agricultural waste	130	6.2 (8)	6.9 (9)	10.0 (13)	31.5 (41)	42.3 (55)	3.1 (4)	3.36
Food waste	106	4.7 (5)	6.6 (7)	10.4 (11)	29.2 (31)	46.2 (49)	2.8 (3)	2.81
Sewage sludge	114	14.9 (17)	11.4 (13)	26.3 (30)	16.7 (19)	27.2 (31)	3.5 (4)	2.43
Commercial timber	106	12.3 (13)	12.3 (13)	17.0 (18)	24.5 (26)	24.5 (26)	9.4 (10)	2.18
Energy crops	137	10.2 (14)	10.9 (15)	19.0 (26)	21.9 (30)	32.1 (44)	5.8 (8)	3.08

Top 3 most important energy products that can be made in Hawaii	Responses (*N*)	Very unimportant % (*N*)	Unimportant % (*N*)	Somewhat unimportant % (*N*)	Somewhat important % (*N*)	Important % (*N*)	Very important % (*N*)	Weighted average
Renewable electricity	154	3.2 (5)	3.2 (5)	2.6 (4)	6.5 (10)	3.9 (6)	80.5 (124)	4.58
Renewable natural gas	118	3.4 (4)	6.8 (8)	8.5 (10)	12.7 (15)	20.3 (24)	48.3 (57)	3.03
Green hydrogen	89	6.7 (6)	25.8 (23)	18.0 (16)	10.1 (9)	9.0 (8)	30.3 (27)	1.66
Renewable diesel	89	9.0 (8)	14.6 (13)	22.5 (20)	15.7 (14)	11.2 (10)	27.0 (24)	1.70
Green gasoline	91	5.5 (5)	12.1 (11)	8.8 (8)	13.2 (12)	12.1 (11)	48.4 (44)	2.18
Sustainable aviation fuel	97	20.6 (20)	6.2 (6)	8.2 (8)	10.3 (10)	10.3 (10)	44.3 (43)	2.05

If you had to choose between these options, which do you prefer?	Responses (*N*)	Option A % (*N*)	Option B % (*N*)	Preference A or B	Comments
(A) Imported fossil fuel (B) Imported wood chips for electricity	158	36.7 (58)	63.3 (100)	B	Identified preference for wood chips over fossil fuels to generate electricity.
(A) Small project locally sources (B) Larger project with imported materials	160	37.5 (60)	62.5 (100)	B	Residents prefer larger projects with greater benefits for their community.
(A) Combusting waste to electricity (B) Gasifying waste for jet fuel	155	66.5 (103)	33.5 (52)	A	Residents prefer combustion to electricity to gasification for jet fuel.
(A) Few highly skilled jobs (B) Many labor jobs	158	50.6 (80)	49.4 (78)	A	Nearly a 50/50 split for skilled vs. labor jobs.
(A) Recycling & reusing on island (B) Shipping waste for disposal	159	95.0 (151)	5.0 (8)	A	Strong preference for recycling & reusing on island vs. shipping waste off island.
(A) Conveniently located facility (B) Buffer from waste facility	155	72.3 (112)	27.7 (43)	A	Strong preference for a conveniently located waste facility.
(A) Keep things the same (B) New infrastructure	160	7.5 (12)	92.5 (148)	B	Strong preference for new infrastructure to be more efficient & sustainable.
(A) Invasive species for energy (B) Native species for energy	119	86.8 (103)	13.4 (16)	A	Strong preference for the use of invasive species for energy production.

product and its current application on the island. Renewable natural gas (3.03) ranked as a moderately relevant option followed by green gasoline (2.18), SAF (2.05), renewable diesel (1.70), and green hydrogen (1.66) ranking undecided. Discussions with the public indicated that renewable electricity and natural gas were more widely known and understood in their application. Further outreach and education on green gasoline, green hydrogen, SAF, and renewable diesel would have proven useful for the community to understand the benefits of these renewable fuels. The unfamiliarity of the numerous options of renewable biofuels confirms that community engagement is important, and the education piece is critical to gaining feedback.

Finally, participants were asked to weigh the benefits or tradeoffs between distinct types of waste-to-energy projects to determine preferences when there was no perfect choice (Table 1). A few of the choices, such as recycling waste on the island and investing in new infrastructure to increase sustainability, were clear winners confirming ideas about preference for these choices, especially within the native Hawaiian community. Preferences such as these results make the proposed feedstock bioenergy project more agreeable to the local community and at less risk of negative pushback. Surprisingly, the results display a greater preference to larger projects with greater benefits as compared to smaller local projects. This contrasted the information gathered from case studies that found communities tended to be more opposed to larger "mainland-style" projects and seemed to prefer smaller projects that kept activities at the local community scale. Additionally, many of the community residents who reside in the same area of the current landfill are opposed to its expansion and continued operations, most of the respondents still opted for the convenience of having a waste facility nearby. Also worth noting during the community surveys and stakeholder interviews, there was strong sensitivity to certain technical terms. For example, when asked to choose between "combustion" and "gasification" of waste, respondents preferred "combustion." In another version of the same question, the word "burning" instead of "combusting" was used and got the opposite response. Respondents preferred "gasification" to "burning" by a margin of 3 to 1. These results indicate that more education may be required to better inform the communities about the processes and how they compare to more familiar technologies.

Limitations

There are limitations to the case study design. The process can be time-consuming and require significant resources to access and engage with community members. To address potential biases in responses, effort was taken to involve the community in the research process to ensure their perspectives were represented. To address potential biases in data collection, multiple qualitative and quantitative data were collected to gain a more comprehensive understanding of the community. Data triangulation was used from different sources of information to verify findings and minimize bias. The online survey may have left out groups of people without access to a computer, therefore their responses may not have been recorded. Recommendations for further research include surveying the community at local events in person to capture a wider resident base.

Conclusion

Research findings indicated that preference for C&D waste and MSW were the most preferred wastes to be converted into fuel and recycled products. While MSW is already being addressed, C&D remains a strong choice for feedstock on the island. Renewable electricity is the top choice for energy products that can be made on the island, but again is already in production and does not completely address Hawaii's move toward 100% renewable energy sources by 2045. Since Hawaii uses 700 million gallons of jet fuel annually, finding solutions to create SAF with cellulosic urban waste feedstock provides a viable opportunity for the state. Research findings indicate that respondents on the west side of Oahu prefer larger projects that will provide greater benefits for the community. While excited by bringing in new infrastructure and jobs, there was no clear preference for either fewer technical jobs or more labor jobs. However, there is a strong preference for recycling and reusing on the island whenever possible and avoiding shipping waste off the island, consistent with working toward an energy-efficient and sustainable Hawaii infrastructure. Respondents also indicate that the waste facility should be conveniently located as transportation and traffic are a continuing problem for the state. Finally, helping to solve the island's waste problem extends to dealing with invasive species. Residents would like to see these materials used for energy production.

The purpose of the research project was to reveal the perceptions and preferences of residents of the City and County of Honolulu concerning bioenergy projects, feedstock, and sustainable aviation fuel. The study was conducted via community-scale surveys, interviews, and town meetings to gather feedback on the preliminary design of a proposed bioenergy project, including feedstock choice and the need for sustainable aviation fuel in Hawaii. Residents on the west side of Oahu were targeted due to their proximity to the proposed plant site location. A lack of research on community engagement and perceptions of Hawaiian residents on bioenergy projects and sustainable aviation fuel contributes to the low adoption of bioenergy projects on the islands. Insights from this study will contribute to the existing literature regarding the need for and importance of community engagement in the development of bioenergy projects from cellulosic urban waste feedstock in Hawaii for sustainable aviation fuel.

Data availability statement

The datasets presented in this article are not readily available because permission would need to be granted by Simonpietre Enterprises. Requests to access the datasets should be directed to Naomi Kukac, naomi@alohacarbon.com.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent was obtained from the [patients/ participants OR patients/participants legal guardian/next of kin] in this study in accordance with the national legislation and the institutional requirements.

Author contributions

LR: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing, Project administration, Software, Supervision, Resources, Validation, Visualization. JS: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Resources, Supervision, Writing – original draft. NK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Writing – review & editing.

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Conflict of interest

JS was employed by Simonpietri Enterprises LLC. NK was employed by Aloha Carbon.

The remaining author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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