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# Along the energy justice continuum: An examination of energy disposal through the lens of feminist community based participatory action research

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## Abstract

Energy justice research tends to focus on inequalities that result from energy systems, including from fossil fuel extraction to production, distribution, and consumption. However, little research has investigated local effects of the disposal of waste products from fossil fuel extraction. To better understand these impacts, we employed a case study approach with qualitative interviews of residents of Kettleman City, a rural community in California's Central Valley (USA) that hosts a hazardous waste landfill which accepts predominantly waste from fossil fuel production. Informed by a novel feminist community-based participatory action research approach (CBPAR), interview data were collected from residents in the Summer of 2019 and analyzed using deductive and inductive coding strategies. Resident interviews highlighted the disproportionate distribution of pollution and environmental degradation shouldered by the community along with their experiences of adverse health and social impacts. Our analysis revealed the importance of incorporating an intersectional perspective to frame resident experiences of energy injustice. Our research highlights the untapped potential of feminist-informed CBPAR to catalyze change and challenge the production of energy injustice from energy waste disposal.

### Keywords

Energy justice; Community based participatory action research; Feminist methods; Energy waste

## 1. Introduction

Increasingly researchers are paying attention to issues and concerns of energy justice, investigating the ways in which energy production, consumption, and disposal create inequalities globally and locally [1,2]. Research into energy justice tends to focus on extraction, production, or consumption of energy resources, and the cost or lack of access



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to affordable, sustainable forms of energy [3,4]. Of the little research that has focused on the inequities associated with energy disposal – the discarding of waste byproducts from the production and refinement of energy resources [5] – research has suggested that such inequities are not just experienced externally but also embodied [2] and that energy waste disposal may have an intergenerational impact on local residents [6]. It is necessary to fill this gap in knowledge in order to better inform decision-makers and to account for resulting injustices that are frequently overlooked. Moreover, the injustices from energy disposal, particularly from landfills that typically have a 50-year lifespan in the U. S., are often experienced at a community level over generations which adds an often-overlooked temporal dimension to the experiences of injustice.

To better understand energy injustices that result from disposal of waste byproducts from the refinement of fossil fuels into hazardous waste landfills [7], this study employs a case study approach with in-depth interviews of residents of Kettleman City, a rural, farmworker community in California's Central Valley (USA) that hosts a hazardous waste landfill which accepts predominantly waste from fossil fuel production. To collect data, we developed and applied a novel feminist informed community based participatory action research (CBPAR) approach to study design and data collection. This approach allowed us to identify research questions of pressing concern to community members and local environmental justice advocacy organizations, who partnered with us for this study, and to hear first-hand how the landfill as a form of energy injustice impacts their lives.

## 2. Literature review

### 2.1. Energy justice

Environmental justice research and activism has a long tradition of investigating the uneven distribution of environmental inequalities such as poor air quality and the siting of hazardous facilities that disproportionately affect people of color and low-income communities across the U.S. and globally (e.g. [8–13]). Environmental justice research has sought both to identify the driving forces of environmental inequality, specifically racism, through discriminatory residential choice, and poverty, through a "race to the bottom", stemming from hazardous waste siting, and to unpack the harmful impacts of such inequalities including adverse health effects, such as high asthma rates and low birth rates, and marginalization of residents and communities [6,9,14–18]. Scholars have also investigated such impacts on rural communities (e.g., [8,19,20]) through specific studies into the disparate environmental and social impacts from hydraulic fracturing [21], coal impoundments [22], coal production [23], and hazardous waste facilities [19].

More recently, some environmental justice research has increasingly focused on disparate impacts related to climate change and the production, distribution, and consumption of energy resources [1,24,25]. Energy justice is a growing field that brings together energy research with insights from environmental justice, in which researchers investigate relationships among energy systems, access to energy resources, drivers of energy poverty, and the role of decision-makers in working towards more just outcomes [26–28]. The driving principle of energy justice is that in addition to safe, affordable, and accessible energy sources, people have the right to an environment free from harm [2,26–32]. Energy

research must also consider how to advance justice across the entire energy system, with eight principles suggested by Sovacool et al. [33] - availability, affordability, due process, transparency and accountability, sustainability, intragenerational equity, intergenerational equity, and responsibility - to guide such research.

This body of research typically examines air, land and water pollution resulting from fossil fuel extraction, production and consumption with links to adverse health and wellbeing outcomes, such as increased rates of asthma and diabetes [26,31,34,35]. Moreover, increasingly scholarship suggests that energy life cycles create sacrifice zones that result in social, health, and environmental disparities for whole communities [36,37]. Recent research extends this concept of a sacrifice zone to embodying the environmental inequality associated with the energy life cycle [2]. Although research into the local effects of waste disposal from fossil fuel extraction is limited, there is a growing body of literature using secondary data that finds living near a hazardous waste site may increase the risk of asthma and type 2 diabetes through exposure to particulate matter (PM) which can come from emissions of the hazardous waste facilities, themselves [38,39]. Indeed, a study using secondary data, controlling for confounding factors, found associations between proximity to a hazardous waste site and asthma in adults by analyzing linkages between persistent organic pollutants (e.g., dioxins/furans, PCB) and heavy metals in hazardous waste sites and asthma [40]. Because of such potential risks, there is increasing awareness of the need to study injustices that result from the disposability of such energy resources [2,32]. To better understand such injustices, there are methodological advances to be made by incorporating CBPAR approaches, frequently used in environmental research, to identify pressing concerns of community members and gather data that are responsive to their concerns [41–45].

### 2.2. Community based participatory action research & feminist research approaches

CBPAR is a powerful tool for advancing research through its commitment to amplifying and centralizing the voices of historically and contemporarily marginalized communities [44,46–50]. CBPAR is a form of collaborative systematic inquiry between researchers and community members, with the aim of working together to advance research and increase community capacity for science and advocacy [48,51]. Through such kinds of collaboration, CBPAR has the ability to enhance the reach, rigor, and relevance of research [44]. Given the impact of such community-engaged approaches, recently, there has been an uptake of CBPAR within energy justice research (e.g., [51–54]). The use of these approaches has demonstrated an increase in the capacity of communities to conduct science and relate it to their own advocacy efforts [55–58]. While CBPAR approaches have not yet fully articulated how power operates within and across both academic research and community spaces, feminist scholarship has a long history of identifying power differentials across decision-making, communities, and research institutions (e.g. [59–65]).

Energy research has also more recently begun to engage feminist theory and methods more deeply. Such recent scholarship has investigated how energy concerns vary across gender and how critical feminist research approaches can advance our understanding of energy justice (see [66]). Scholars have also argued for a deeper engagement with intersectional

feminist approaches to energy issues to identify structural inequalities, access to resources, and power differentials [67,68]. An intersectional approach investigates the interlocking axes of social location that exacerbates social inequality [69,70] with recent scholarship applying this approach to issues of environmental and energy justice including the distribution of landfills [8,71–73]. Intersectionality approaches engage with experiences and meaning of belonging to multiple social groups, examines power and inequality, and illuminates how structural power operates to create wide ranging disparities [71,74].

## 3. Study site, data, and methods

### 3.1. Study site: Kettleman City

Kettleman City, California, USA is an unincorporated township located in the agriculturally productive San Joaquin Valley and hosts one of two operating class I hazardous waste landfills,[1] which accepts waste from oil refinement, in the state [51,76]. Nestled in King County, Kettleman City was originally populated by oilfield workers following the discovery of oil in the region in the late 1920s [76]. Today, the town is located at the junction of two major highways, I-5 and CA-41, and the surrounding land is used primarily for agriculture, including pistachio, almond, stone fruit, onion, and alfalfa production [77]. Fig. 1 shows a satellite image of the town. Kettleman City is a community of approximately 1200 residents, who mostly identify as Hispanic or Latinx (e.g., 97.1 % of residents identified as such according to the 2020 U.S. Census [78]) and the primary language spoken at home is Spanish [79]. In 2019, 52 % of the community identified as foreign-born, and 3 out of 4 foreign-born residents had yet to obtain US citizenship [79]. Of residents in the community, 28 % reported incomes that are less than 125 % of the U.S. poverty level [80].

Given its location in the heart of the state and at the nexus of two major roadways, the community is both currently and historically centered in a location used for both the production and transport of oil and gas. Kettleman City lies between the Kettleman Hills landfill and Kettleman North Dome oil fields, and multiple oil pipelines run adjacent to the community [76].

### 3.2. Study site: Kettleman Hills Landfill

Located 3.5 miles, as the crow flies, southwest of Kettleman City is the Kettleman Hills Facility, a landfill owned and operated by Chemical Waste Management, Inc. [81]. Fig. 2 shows a picture of the facility. In 1975, the Kettleman Hills Facility was built and permitted for oilfield waste disposal, and, in 1977, expanded to become a hazardous waste disposal facility [82]. While the public notice given at the time the landfill was built met legal requirements, the notice did not meaningfully inform Kettleman City residents of the site's intended use [10]. Instead, residents learned of the landfill five years later, when it received media attention for violating environmental laws and was required to pay millions of dollars in fines [10].

[1]Class 1 hazardous waste facilities are permitted to accept solid, semi-solid, and liquid hazardous waste – waste defined as being harmful to human health or the environment - for final disposal [75].

Currently, the Kettleman Hills Facility is operating under a Hazardous Waste Facility Permit [81]. Within the 1600-acre facility, 695.5 acres of land are permitted for hazardous waste, including byproducts from oil refinery processes [83]. The current permit, effective in 2003, expired in 2013, with application materials for a new permit under review. Thus the facility continues to operate under the 2003 permit until the application receives either approval or is rejected by the California Department of Toxic Substances Control [81].

Over the years, multiple incidents and violations to both the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA) have occurred at the Kettleman Hills facility [84]. For example, in March 1988, one of the landfill units in the facility experienced a slope failure, displacing waste within the unit and resulting in tearing of the site lining [85]. In 2005, the facility violated RCRA standards through shortcomings in their practices of sampling and testing hazardous waste [83]. In 2010, an inspection found that the facility had failed to meet standards for laboratory quality control, as well as failing to fully determine whether hazardous waste leachate met standards prior to land disposal [83]. In 2013, the facility was penalized after failing to report 72 spills of hazardous waste between 2008 and 2012, with the largest spill measuring between 5 and 8 gal of waste [83]. The facility has also been subject to TSCA violations, including in 2004, when it was revealed by the facility that lysimeters at one of the PCB units had not been monitored as required between 1996 and 2003 [83]. In 2004, an investigation by the U.S. EPA found that lab instruments used to analyze PCBs were not correctly calibrated, after which the facility remedied [83]. The facility was penalized in 2010 after an inspection discovered incomplete manifests, incomplete container labels, use of a building contaminated by PCBs, and improper PCB disposal as a result of leaks and spills [83]. In 2012, the facility disclosed that leachate from its PCB landfill had not been tested before being disposed of [83].

Residents of Kettleman City have also experienced a variety of health issues. A study conducted by the California Department of Public Health identified 11 babies with structural birth defects, born between 2007 and March of 2010, who were born to mothers who had either lived in Kettleman City during their pregnancy or at the time of birth [86]. Three of these infants passed away within a year of being born [84]. While the number of birth defects observed during this time was greater than expected based on previous years, the investigation was unable to identify a specific cause of these anomalies [86]. According to county-level health data outlined in the 2020 Environmental Justice Analysis, which cites information from the California Environmental Health Tracking Program, Kings County residents make increased emergency room visits related to asthma compared to the entire state of California [84].

Given the regulation breaches and adverse health outcomes experienced by Kettleman City residents, we conducted in-depth interviews with residents to better understand how they experience energy injustices from waste disposal from the production and refinement of fossil fuels.

### 3.3. Data collection & analysis

Building on the long tradition of feminist scholarship in the social sciences (e.g. [63–65,67,68,87,88]), we advance CBPAR within energy justice by developing and deploying

a feminist informed CBPAR (f-CBPAR) approach. This approach is grounded in four pillars - (1) acknowledging embedded context of systems of colonialism and oppression (acknowledging); (2) identifying power embedded and operationalized through history and place (circulating); (3) situating the researchers' standpoint, access to resources, and limitations (reflexivity); and (4) working to center residents and their experiences of environmental pollution and burdens (centering). This approach informed our research design, data collection, and analysis as elaborated in the sections that follow. We argue an explicit feminist approach to CBPAR advances the aims of CBPAR to create an inclusive, equitable, and effective partnership among researchers and community members by working to identify arrangements of power and opportunity in the researcher-community relationship and the research context and to situate the standpoint of researchers and community members alike to better center those impacted by energy injustices.

Partnering with two local environmental justice organizations, El Pueblo para el Aqua y Aire Limpio de Kettleman City and Greenaction for Health and Environmental Justice, the research team worked to identify residents' experiences of the landfill. The research team began meeting with the organizations and residents to relationship build and establish trust. Throughout these interactions, we worked to acknowledge the embedded context of oppression the residents experience through our discussions of their broader experiences of racism and discrimination (acknowledging). Together, we identified the ways in which power has been operationalized both in ways that disadvantage residents as well as the ways in which they have used their own agency to advocate for better conditions for their community. We similarly discussed the academic research system of which the researchers are a part as a site of power - political, academic - that can be leveraged to work with residents from under-resourced and marginalized communities (circulating). Doing the work of laying out the ways that power operates in and across the contemporary and historical place of Kettleman City, we were able to then situate the different access to resources that both community partners and researchers had (reflexivity). For instance, community partners were lifelong residents and had family and friends in the community that supported them in their environmental justice advocacy. Laying this foundation through frequent dialogue and face to face meetings at the start of the study allowed the entire research team (including community partners) to center the residents in the research study from study inception and developing research questions through data collection, analysis, and sharing findings (centering).

In-depth interviews were conducted in English and Spanish, which-ever the participant preferred, by one of the authors using an in-depth semi-structured interview protocol (see Appendix A). X University Institutional Review Board approved this study (reference number: 1207313–1). Consent was gained through an informed consent process using a consent form in English and Spanish. Inclusion criteria were 18 years or older, a resident of Kettleman City, and a participant in the larger study. Interviews lasted from 20 to 90 min and were conducted in Kettleman City in the Summer of 2019 at a time convenient for the participants ($n = 4$). Of the sample, two participants identified as men and two as women, with three of the participants identifying as Hispanic and one identified as Mexican. Ages ranged from 22 to 73 years old. All the participants shared they felt they had enough money

to make ends meet. The interviews were deidentified, audio recorded, and transcribed into English by one of the authors and checked by another author.

Interview data were inductively coded by two authors independent of one another [89,90]. Transcripts were coded into chunks with primary codes. Three authors met to discuss the primary codes and develop themes that emerged inductively from the codes, which were then grouped based on theme, structure, and intent [91]. This strategy resulted in creating central analytic categories that emerged from the data around issues and concerns related to energy justice [92]. Three authors then discussed the codes and themes that emerged from the data. Coupled with the case study discussed above, interview data were supported by extensive participant observation by two authors with note taking occurring immediately after quarterly visits to the field site over two years (2017–2019) (e.g. [93]). Field journals were kept by each research team member describing observations and conversations from each field visit. Field visits were conducted to meet with community partners and residents to discuss their environmental justice concerns, including experiences of exclusion and environmental threats to their health, and to design the research project together. Additionally field visits included different research activities that were part of the larger study such as sampling air and water for pollutants that have been previously linked to adverse health outcomes and delivering a survey by going door to door to each residence in the community. During and after each field visit, research team members took notes on their observations and interactions to better understand the specific experiences and context of community members related to their experiences of environmental injustice. In this article, culturally appropriate pseudonyms are provided for participants in keeping with best practices to protect their privacy and to keep confidentiality [94–96].

## 4. Discussion of results

Four major themes - cumulative exposure, structural arrangements that perpetuate marginalization, experiences of discrimination that lead to institutional distrust, and community response of resilience and uplift – emerged inductively from coding the interviews with Kettleman City residents. These themes were the central analytic categories that emerged from the data around issues and concerns of energy injustice. This section is organized by themes that identify three drivers of injustice – cumulative exposure, structural arrangements that perpetuate marginalization, and experiences of discrimination that leads to institutional distrust – followed by how the community responds to injustice. These themes provide key examples of several energy justice principles adapted from Sovacool et al.'s [33] energy justice theoretical framework - due process, transparency and accountability, intragenerational and intergenerational equity, and responsibility - in a local context of energy disposal. Table 1 presents these adapted principles that emerged in the Kettleman City context.

### 4.1. Cumulative exposure to multiple sources of pollution

Kettleman City residents must face the cumulative exposure from multiple sources of pollution on a near daily basis. These sources include point sources of pollution, such as the Kettleman Hills hazardous waste landfill, and mobile sources of pollution, such as

exposure to diesel trucks traveling to and from the landfill as well as general traffic on the nearby major highways [97,98]. Research suggests that environmental polluting sources tend to be co-located in the same areas, which means the landfill could operate as a magnet for attracting other polluting sources (e.g. [15,99]). Moreover, Kettleman City's location in the San Joaquin Valley means that residents are exposed to multiple kinds of0020pollution that result in both poor air and water quality [100–102].

It is clear to the residents we spoke with that their lived experiences are linked to the environment they live in. As a result of the intersecting forms of environmental pollution experienced in Kettleman City, residents understand that such sources increase their likelihood of environmental exposures and worry that such exposures may contribute to health problems in their community. The multiple sources of exposure and their cumulative effects becomes clear as one resident with pseudonym Diego, shared, "then of course the waste dump is over there and then when we look over here on this side, across that building and across the town, there is a human sewage sludge plant, like half a mile down the road and what they do there, is we accept medical waste from Los Angeles and San Francisco." Residents worry about both the individual and cumulative impacts from so many sources of environmental pollution. One respondent, Isabella, makes this point clear when talking about previous state-led investigations into the potential impacts from the local landfill. She told us, "But it's like, well we've told them so many times, okay you're saying this causes problems, this causes problems, this causes problems, yet we have each one here and you're not taking it as a whole. You're only saying yeah this causes problems as individuals, you know, but what we don't like it's like if they don't thinking about it like what happens as a whole."

Moreover, prior research has found links between these kinds of pollutants, including diesel pollution, pesticide drift, and contamination from landfills, and adverse health outcomes including asthma, diabetes, and some forms of cancer [103–105]. As one resident, Clara, tells it "There's a lot of this diabetes, there's a lot of uh hypertension um there's been a lot of residents with cancer. High cholesterol, obesity is really bad here." Another resident shares how frequently asthma occurs in children in the community. Diego tells us "But these kids are like born, born with asthma, like when have you ever seen stuff like that, like never, and especially like in other areas where, you know, they have more money, or they have better infrastructures and better ordinances in their town." Though asthma occurs in many wealthy communities, research suggests that exposure to high air pollution, such as in Kettleman City, exacerbates asthma rates. These experiences taken together point towards the lack of responsibility on behalf of the government and industry to protect the environment and reduce energy-related threats.

The compounding political and environmental forces contributing to the social inequality faced by Kettleman City residents suggests the community may be treated as a sacrificial zone - lands marked as exploitable and treated as outside the realm of sociopolitical consciousness [2,106] - inhabited by "sacrificial people," or people whose lives and well-being are considered secondary to economic growth [36,106,107]. Like sacrificial people, the on-the-ground reality for Kettleman City residents – health disparities, social marginalization, and systematic economic disinvestment – is characteristic of such sacrificial

zones. As a site of cumulative environmental exposures, Kettleman City residents experience embodied energy injustices with potential threats to their health and that of their family coming from multiple sources [2]. This research offers additional support for Healy et al.'s [2] theory of embodied energy injustice - that explicitly renders visible hidden injustices throughout the stream of energy production, consumption, and disposal. Such examples show the lack of responsibility and intergenerational equity present in Kettleman City as well as the urgent need for these principles to be employed to address energy injustice.

### 4.2. Structural arrangements that perpetuate marginalization

Such co-constituted injustices are maintained by structural arrangements across different levels of government which can result in community marginalization (e.g., [108]). Kettleman City as an unincorporated township has diverse relationships, at times oppositional and at times cooperative, with regional and state governments. Unincorporated areas are communities that lie outside the defined bounds of incorporated cities with limited access to services. Diego put it thusly, "we're not technically a town we're just a property of Kings County so they kind of just dump whatever projects they want on this side which is, you know, terrible." Residents shared how they feel their life circumstances, including factors such as Kettleman City's lack of cityhood and a family's socioeconomic status, impact their health and quality of life experienced by themselves and those around them. Given this lack of political jurisdiction, residents have frequently viewed government and select agencies as both a resource and, at times, at odds in their environmental justice work [10]. This is evident, in part, because of the ways communities that would offer the least resistance to waste-to-energy projects were identified [109]. Cole and Foster [10] describe in their landmark book on U.S. environmental justice movements that after learning about the proposed incinerator at Kettleman Hills, residents felt this is exactly what happened to them [109].

In addition to the sense that residents were unfairly put into harm's way, residents expressed that they believe the county monetarily benefits from the landfill and that these funds are not equitably distributed to the township. Isabella put it this way, "Waste Management gives a lot of money to the county, why? Because we're not, we're unincorporated so that doesn't come in here you know all the money from the restaurants, from all that, you know goes to the county, it doesn't, none of it hits here." In addition to the landfill as a resting place for energy production-related waste, residents expressed concern over the nearby land, its ownership and potential uses as opening another site of energy injustice through experiences of marginalization. Diego shares "We don't have what's called buffer zones for pesticide usage and if you look around okay so right here, all of this property in the back is owned by Chevron and they just opened up 300 new wells to frack."

As an example of "divisibility" or the separation of risks and benefits associated with a hazard [110], residents shared their experiences of intragenerational energy injustice [33]. In this way, residents expressed feelings of frustration that their experiences led to no benefit for the community.

### 4.3. Experiences of discrimination lead to institutional distrust

Differing or varying perceptions of due process leads to gaps in perception of energy injustices between community residents and decision-makers, which can impact perceptions of transparency and accountability. The impact of the hazardous waste landfill is further compounded and reinforced by social disparities and contributes to the sense that their lives and communities are sacrificial zones [106,107]. For instance, Diego told us, “And they’re all in the same communities, people, where there’s only like a thousand, two thousand people and they’re all brown and they’re all uneducated and so it’s just like these bastards really think that its right, that we deserve the trash and that they deserve uh Beverly Hills and Hollywood, which is not good.” This sense of being treated as though they deserve the refuse is further understood to be a function of how the community feels they are treated intersectionally based on their ethnicity, low-income status, and rurality. Clara tells us, “I feel like we do get judged too sometimes and people want to do negative things, want to bring negative things, um, I feel like it’s it’s because it’s a Hispanic town.” These dynamics create an us vs. them mindset rooted in institutional distrust, in which the community feels an emphasis on the distinction between rich and poor, a historically-rooted distrust of authority and of outsiders, and lack of belief in the ability of government and outside actors to initiate equitable community-informed social change [111–113].

Ethnicity intersects with low income in Kettleman City and other communities impacted by energy injustice (e.g. [32,34]), stacking the deck against the community as Clara elaborates, “They see a town poor and yeah there is a, there is a lot of poorness here, not to the point where they’re living out on the streets.” The residents we spoke with identified a lack of transparency and accountability on behalf of the authorities and understood the justification for such a lack to be because of intersections of ethnicity, low income, and rurality, which aligns with much environmental justice research (e.g., [15,18]). This point is reflected in an experience shared by one of our respondents, Marco, who traveled 2 h by bus to attend a community meeting and was told, “Those that don’t speak English to go to the back.” The lived experiences of the residents and their justified perception of discrimination and racism at the hands of the community outsiders inadvertently works to build a sense of shared community responsibility and trust. Because Kettleman City residents have experienced disproportionate cumulative exposure to multiple sources of pollution, a lack of power through structural arrangements of governance, including their unincorporated town status, and experience of a lack of transparency and accountability that produces institutional distrust, residents have responded by fostering their own community networks of change and resilience.

### 4.4. Community response of resilience and uplift

The support networks of overlapping family, community, and activism groups are essential to not only daily life in Kettleman City but also the success of their environmental justice work [10]. In response to their lived experiences in Kettleman City, residents have spent multiple generations campaigning for equal environmental conditions in the hopes that their children will be able to live healthier lives. Just as we found that impacts stemming from the production of energy resulted in intragenerational injustices, we find that efforts resisting these injustices are intergenerationally fought. For example, as the community has worked

to strengthen itself and fight for their right to an environment free from harm, they have focused on uplifting their families through education and advocacy. Isabella shared with us, “They created a group known as El Pueblo and they raised hell…protest against The Dump and the manager at the time personally went to my grandma’s house and told her you guys won, like we’re not going to build that and we never will…like it’s not every day you hear like, a small town of a thousand people beat a, you know, uh super waste dump that has billions of dollars at their disposal.”

Throughout this research, we worked with two generations of environmental justice advocates of Kettleman City. Moreover, empowerment of residents occurred in many forms of community development, including through investing in public space, an increased emphasis on the importance of education, and most importantly, the utilization of collective action, seen in the formation of attending community board meetings and taking legal action to try to stop the re-permitting of the landfill. This point is reflected in what Clara told us about their own relationship with her mother and education, “um it’s called the ag-prep program so I have my daughter in that and I uh I try to educate her a lot and show her that it’s important to get that and um, cause like I said, my mom never really supported me when it came to school she never even seen my work, she never knew what work I was doing.”

Much of the desire and motivation for community investment through community action in Kettleman City may be driven, in part, by place identity and attachment. Place attachment is understood as a group of people who share a common relationship rooted in the cultural, political, and social significance of their mutually-inhabited geographic location and the experiences unique to those who have lived there [114,115]. Genealogical place attachment, in which individuals link a location with their family history [115], is of particular relevance to Kettleman City. Several respondents told us that multiple generations of their family lived in Kettleman City. As Isabella told us “I was born and raised here so for me it’s been a lot harder to leave and another reason why I don’t leave umm you know I’m going to be straight up and honest umm the house I live in I don’t pay rent or anything I was raised by my great grandma so when she passed away she left me the home so that is one of the things too keeping me here.”

Residence in Kettleman City served as a foundation for a community identity upon which activist relationships were rooted. It could be the case that residents experienced place attachment, which can influence place protective actions, particularly in cases where residents perceive their environment to be unsatisfying [116]. Place-attached communities have used their shared identity to partake in matters of local policy development and to create support networks [114]. Furthermore, research suggests sustained engagement in place-protective actions is more likely to occur in individuals who felt that their protests were successful in influencing policy decisions [117], while the success of such actions is influenced by the strength of interpersonal community ties, a concept interwoven throughout our interviews.

In sharing their experiences of community response and resolve, respondents communicated to us a worldview that is future oriented and rooted in future forward thinking. Central to such a worldview is an inherent commitment to the future and the desire to assume

responsibility for the impact of current actions on future realities. Future forward thinking is understood as both “a personality trait and a cultural characteristic that strongly influences behavioral decisions on personal and societal levels” [118], p.1304. As the people of Kettleman City continue to fight for their resilience in the face of energy injustice, one of their greatest strengths is their commitment to the future. Many members of the community harbor a personal fear or worry for the future, a driving force to fight for change, and many others also carry a hope for a better future, which simultaneously serves as a source for their strength to keep working for energy justice.

This commitment to a future that is more just than the present is another way of fighting against intra- and inter-generational energy injustice [118–120]. This intergenerational response of future forward thinking is reflected in our interviews. Diego tells us “It’s always going to be about, in my mom’s eyes, the people you know, the heart of the people, what are we gaining for our people. You know what, what benefits can we get.” The community members we spoke with continue to seek to improve the community and the lives of their children, which is sustained by hope for a better future. In this way, the resistance to energy injustice is also inter- and intra-generational. The commitment of Kettleman City residents to the future, to their families, and to their community has led to the success of their organizing and serves as testimony to the strength of multi-generational community-based networks of support and advocacy.

## 5. Conclusions

In this paper, we have explored experiences of injustices by local residents from energy disposal by developing and applying a novel feminist-informed approach to CBPAR grounded in four pillars - (1) acknowledging embedded context of systems of colonialism and oppression (acknowledging); (2) identifying power embedded and operationalized through history and place (circulating); (3) situating the researchers’ standpoint, access to resources, and limitations (reflexivity); and (4) working to center residents and their experiences of environmental pollution and burdens (centering). Using inductive coding of in-depth interview data, coupled with participant observation and a case study approach, we identified four themes - cumulative exposure from multiple sources of pollution, structural arrangements of power that drive marginalization, experiences of discrimination that lead to institutional distrust, and community responses of resilience and uplift. These themes offer important insights into the intersectionality of ethnicity, low-income status, and rurality for energy disposal. Not only is energy disposal an often overlooked and understudied area of research, but it is also a site of environmental injustice rural communities continue to face – a multigenerational inheritance just as is the fight to stop it. Hearing from those who experience energy disposal firsthand, and its likely attendant consequences including health risks, offers further evidence of embodied injustice - what Healey et al. [2:7] call “energy justice to explicitly consider hidden and distant injustices (upstream or downstream) arising from the extraction, processing, transportation and disposal of energy resources.” Using our feminist informed CBPAR method provides a framework to look across intersections not only of social locations (i.e., race, income) but also across space (i.e., rurality, embodied) and time (i.e., multiple generations of injustice and resistance to it).

There are several limitations to the current research. The themes emerged from a limited number of in-depth interviews coupled with two years of participant observations and a case study. The results drawn from this research are constrained by the particularities of its context, though findings may provide insights into experiences of marginalization and discrimination by those who experience energy disposal first-hand. Though a rigorous method was undertaken to analyze the data with three independent reviews there are limitations to the subjective analysis of qualitative data. Additional research is needed to further test the insights garnered here to verify them and to identify whether they occur in other contexts.

Finally, this research opens additional avenues of exploration particularly for investigating injustices that stem from energy disposal, further develop theories and examples of how energy injustices can and are embodied, along with using feminist-based theories to inform research approaches to energy justice concerns. This study begins to highlight the ways that feminist theory can be used to inform CBPAR approaches to energy disposal and how such approaches can better help us to understand both the intersectional consequences of marginalization and discrimination and how such experiences are embodied.

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## Data availability

The data that has been used is confidential.

## Appendix A.: Semi-structured interview guiding questions

## Demographics

- What sex/gender do you identify with?
- What race/ethnicity do you identify with?
- Do you find you have enough money to make ends meet?
- In which age range do you fall? 18–24, 25–34, 35–44, 45–60, 60+
- Do you have a full-time job? What do you do?
- How many people live in your household?
- What is the highest level of school you have completed?

## Neighborhood

- How long have you lived in Kettleman City?

- Are you aware of the landfill near Kettleman City? Do you have positive or negative perceptions of the nearby landfill? Are there positive or negative memories you have about the landfill? Can you tell me about them?
- What are the positive features of Kettleman City? What are some negative features of your neighborhood?

## Health

- Do you have any chronic or acute health problems you want to mention?
- What factors do you think contribute to these health problems?
- Do you notice similar kinds of health issues in your community? Inequality
- Do you feel government or society treats you negatively for any reason? What might be the reason(s)? By whom?

Do you feel living close to a landfill disadvantages you in any particular ways? Do you feel treated differently by the government or other people because of it?

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**Fig. 1.**
Satellite image of Kettleman City with environmental hazards. Creative Commons | Google Maps.

**Fig. 2.**
Kettleman Hills Landfill entrance from CA-41 in 2019. Photo credit | Author.

**Table 1**

Energy justice principles adapted from Sovacool et al. [33], p. 5 to the local Kettleman City context.

| Energy justice principle | Kettleman City context |
|---|---|
| Due process - Local governments should respect due process and human rights in the production, use and disposal of energy. | Kettleman City community members do not have an environment free from harm as indicated by multiple studies that show high burden of air and water pollution (see [51]). The lack of due process has led many residents to feel marginalized. |
| Transparency and accountability - Everyone needs to have access to high-quality information regarding energy and the environment and accountable forms of energy decision-making, including the disposal of energy. | Institutional distrust, or the lack of faith in societal institutions, such as governments or agencies, experienced by Kettleman City residents as a response to experiences of environmental and social disparities has contributed to the lack of transparency and accountability that characterizes the community's relationship with government entities. This is due to generations of historical distrust, experiences of discrimination, and lack of belief in the ability of local government to protect their environment. |
| Intragenerational equity - All people within a generation have the right to fairly access energy. | Kettleman City residents are subjected to multiple forms of energy and environmental injustice in the form of pollution of their air and water [see 83,84], which have contributed to intergenerational inequity in the form of adverse health outcomes such as a higher than expected rate of birth defects and asthma for community members [83]. |
| Intergenerational equity - Future generations have a right to an environment free from harm, including from our energy systems | The community's commitment to intergenerational environmental equity is evident in the rise of future forward thinking within Kettleman City residents as demonstrated in their environmental justice advocacy. Future forward thinking is conceptualized as both an individual and communal commitment to the future, the weighing of present-day decisions on future outcomes, and taking an active role in shaping the future. |
| Responsibility - All governments have a responsibility to protect the environment and reduce energy injustices. | Residents argued that local government must be held accountable for the perpetuation of the energy injustices in the form of the hazardous waste landfill faced by Kettleman City residents. |