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Does the Public Approve of Massive Water Transfers and Construction Projects? Aqueducts, Fracking, and Pipelines in the High Plains

Brock Ternes * and Sebastian Boute

Department of Sociology and Criminology, University of North Carolina Wilmington, Wilmington, NC 28403, USA; snb4200@uncw.edu (S.B.)

* Corresponding author. E-mail: ternesb@uncw.edu (B.T.)

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ABSTRACT: Groundwater availability has been a growing problem in the state of Kansas, where the High Plains aquifer (HPA) has been declining. Simultaneously, the Sunflower State is moving toward wind energy, investing in red meat production, and eyeing a proposal for the Kansas Aqueduct (a tremendous water transfer from eastern to semiarid western Kansas, a region with a distinct vulnerability to drought that overlies the HPA). What do Kansans think about these changes in their environment and infrastructure? Using a survey of the state's residents (n = 864), we find that owning a private water well is a significant predictor of opposition to the colossal aqueduct, while living above the HPA predicts support for the water transfer. Well owners and women oppose the construction of coal-fired power plants, oil pipelines, hydraulic fracturing, and large corporate feedlots, while politically conservative ideologies predict support. Furthermore, well owners and women are nearly twice as likely to disapprove of fracking; conservatives have lower odds of fracking opposition. The Just Transition in Kansas is not only a question of how water, agribusiness, and wind and nuclear energy are developed, but also residents' perceptions of these projects.

Keywords: Public opinion; Water supply infrastructure; Renewable energy; Fossil fuels; Just transition; Kansas

1. Introduction

For decades, groundwater levels have been declining across the High Plains aquifer (HPA), the largest aquifer in the United States and a source of freshwater for many rural communities in the center of the nation. The aquifer is now 30 percent depleted, and if current extraction rates continue, it will be 69 percent depleted by 2060 [1]. This reduction is primarily driven by irrigation-intensive systems. Water sources are becoming increasingly volatile with prolonged droughts rippling across the Great Plains and into Kansas, a region already suffering from water scarcity and diminished water supplies [2,3].

Simultaneously, Kansas faces another critical shift. Once dependent on coal-fired power generation, the state has emerged as the second-largest wind energy producer in the United States, now sourcing 52 percent of its electricity from wind [4,5]. These trajectories of groundwater depletion and renewable energy

require careful consideration of the equity of climate change mitigation projects and their impact on communities, which are core concerns animating Just Transition (JT) frameworks.

The phrase 'Just Transition' emerged originally from labor unions and environmental justice movements based on the fundamental insight that while the transition away from fossil fuels is inevitable, equity is not [6,7]. This framework holds that phasing out polluting industries should not sacrifice the workers and communities who depend on them. Rather, it calls for energy transitions to protect workers' livelihoods, ensure frontline communities are not abandoned, and grant those most affected by both pollution and economic restructuring real power in deciding what comes next [8]. As ref. [9] describes, Just Transition means "greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind" (p. 2).

1.1. Coal, Wind, and the Uneven Geography of Decarbonization

Renewables generate widespread public support around the nation, as 79 percent of US adults think the country should prioritize developing alternative energy sources [10]. Kansas's renewable energy transition, mirroring patterns across the United States, reproduces an unequal geography of benefits and harms, as rural communities, agricultural producers, and energy workers experience the material costs and gains of decarbonization incongruently. While some counties enjoy millions of dollars in new wind energy tax revenues and agricultural landowners receive steady lease payments, others remain excluded. The state's sixteen coal-fired power plants employ nearly 1000 people [11]. As these plants close, workers risk facing displacement without any comprehensive retraining or income support. This economic gap hints at an uncomfortable truth about how energy transitions actually unfold.

Even as the environmental urgency to decarbonize energy production persists, Kansas's coal fleet still comprises approximately 5200 megawatts of generating capacity [5,11]. Coal still supplies about 22 percent of Kansas's net electricity, down from 58 percent a decade earlier, yet retains substantial economic and employment value [12]. Evergy, the state's largest utility, delayed the retirement of both the Lawrence Energy Center (to 2032) and the Jeffrey Energy Center (to 2033), keeping hundreds of megawatts of coal generation online with no transitory programs for affected workers or communities [5]. Of the sixteen major coal plants in the state, eight store millions of tons of coal ash, which is often associated with groundwater contamination by arsenic, mercury, boron, and other hazardous substances [13]. The politics surrounding coal retirement now concern not only how jobs and revenue are to be replaced, but also about who pays the costs of remediation and how equity is considered and integrated in post-coal transitions.

Wind energy employment, while growing, generates fewer permanent, well-compensated positions than union coal jobs; Kansas's wind and coal sectors each employed nearly 2000 workers in 2021, but wind positions are predominantly temporary construction roles rather than stable operational jobs [14–16]. Though the state draws over half its energy from wind, as the wind industry expands, rural areas face rapid landscape changes, rising property value costs, and other quality of life variations [17,18].

1.2. Nuclear Energy

Kansas's nuclear power is produced solely from the Wolf Creek Generating Station near Burlington, which provided approximately 16 percent of the state's net electricity in 2024 [12]. This is by far the state's largest single source of energy and represents a crucial pillar for non-carbon power. Wolf Creek's reactor has operated since 1985 and has produced enough power for nearly 800,000 homes annually, shaping Kansas's energy [19,20]. From an environmental standpoint, nuclear offers stable, high-volume power that is independent of wind and solar generation, making it an attractive option for utility commissions and state policymakers. Yet concerns about worker safety, long-term nuclear waste siting, and cost distribution persist. The plant's construction ran over budget, resulting in complex rate structures that made residents

question how benefits and costs should be distributed [21]. Nationally, public support for nuclear energy has risen as climate concerns mount, reaching 61 percent in 2023 [22], but local tensions over placement and oversight decisions remain contested.

1.3. Hydraulic Fracturing, Oil Pipelines, and Resource Colonialism

Hydraulic fracking and horizontal drilling are central components of Kansas's oil and gas production. In 1947, the world's first commercial "frack job" took place in Grant County, Kansas [23]. Since then, over 57,000 wells have undergone hydraulic fracking, and in the coming decade, over 90 percent of new wells drilled will involve some form of fracture simulation.

Yet fracking's recent effects on local geography and the environment represent a different vision for the future. The rise in induced seismicity (human caused earthquakes) has emerged as the most visible and pressing environmental concern, intensified by Kansas's oil and gas operations. Since 2013, oil and gas-producing areas in south-central Kansas have experienced an increased frequency of earthquakes. This seismic uptick is due to high-volume wastewater injections into deep disposal wells following the Shale Development Boom, rather than hydraulic fracking itself [24]. Far-field wastewater disposal, where injection occurs more than fifty kilometers (roughly thirty miles) away from seismic activity, caused recent increases in seismicity within central and northern parts of Kansas [25]. Wastewater disposal operations, when altering subsurface pressure sequences and triggering stress changes along predisposed areas, can in fact trigger seismicity that would otherwise remain dormant [24,26]. In response to documented seismic activity and other projections, the Kansas Corporation Commission (KCC) has issued various operational restrictions on wastewater wells, including capping saltwater injection and additional safeguards meant to reduce the likelihood of earthquakes [27].

Fracking's boom over the past two decades illustrates how energy transitions can reproduce patterns of extraction and regional inequality. Despite industry projections of rural economic revitalization, promised gains for host communities have largely failed to materialize—a pattern defined as "resource colonialism" [28,29]. Kansas risks a similar fate without explicit Just Transition commitments. Understanding public sentiment on fracking is an important element in analyzing community capacity and opposition to frack jobs. While [30] revealed how political partisanship plays a significant role, they propose that public health be at the forefront of fracking discussions rather than focusing on the convoluted economy versus environment debate. Fracking projects should not undermine Kansas residents but instead center them alongside economic matters, thereby acknowledging the socio-political effects of siting decisions.

A similar concern about environmental externalities casts a shadow over oil pipelines and natural gas infrastructure among Kansans, as recent incidents have heightened public awareness of pipeline safety risks and the potential for further catastrophic environmental damage. In December 2022, a Keystone Pipeline spill discharged approximately 14,000 barrels (nearly 600,000 gallons) of tar sands crude into Mill Creek in Washington County, the second-largest tar sands crude spill on US soil [31,32]. Continuing into 2023, cleanup and restoration activities have cost over $480 million [33].

1.4. Industrial Agriculture and Feedlot Expansion

The infrastructure questions that stimulate this analysis extend beyond coal, wind, and nuclear energy, and beyond fossil fuel exploration, and additionally encompass a full portfolio of large-scale environmental and energy construction currently proposed, under development, or already integrated into the state's regulatory purview. A national powerhouse in beef production, Kansas ranks third in both total cattle and cattle on feed, and second in fed cattle marketed [34]. Kansas feedlots house over five million cattle, nearly twice the state's population. Therefore, red meat production represents an economic influence that encompasses multiple prominent markets such as banks, equipment sellers, and rural tax bases.

Western and south-central Kansas have been major sites for cattle feedlots. In August 2025, Kansas approved a mega feedlot expansion in Pawnee County, designed to house over 88,000 cattle, positioning it among the state's largest feedlots [35,36]. This facility exemplifies the scale of industrial agriculture in Kansas, with this particular operation producing an estimated 588,000 pounds of manure daily [35]. Importantly, these feedlots require immediate impact assessments of nearby neighborhoods, particularly regarding groundwater contamination. Pawnee County, situated over the Great Bend Prairie Aquifer, has nitrate levels in its groundwater reaching as much as six times the Environmental Protection Agency's safe drinking water standard in some areas, a crisis that these existing feedlot expansions threaten to compound [35,36]. Economic output conflicts with the significant externalities produced by manure. Regulators often present this as a manageable side effect of an indispensable industry, but from an environmental justice perspective, the rural communities most affected are substantially undermined by risks and burdens.

1.5. The Kansas Aqueduct and Water Transfer Politics

Rooted in the historical coupling between irrigation technology and industrial agriculture, rural Kansans are facing extreme droughts and heat waves, and the vulnerability to drought and groundwater decline has been a major concern of Kansas policymakers. In 2013, former Governor Sam Brownback called on water specialists to develop a plan to secure the state's water supply for the next 50 years, known as the "Long-Term Vision for the Future of Water Supply in Kansas". One of the most ambitious themes within Brownback's 50-year Vision, "additional sources of supply", includes construction projects that will augment the state's surface water supplies and help reduce declines in the High Plains aquifer [37].

In response to irrigation's demand for tremendous amounts of water, the Kansas Water Office and US Army Corps of Engineers studied the feasibility of diverting water from the Missouri River to western Kansas. This project would involve the construction of an aqueduct 360 miles long that would require 15 pumping stations. Known as the Kansas Aqueduct, this proposal was first drafted in 1982 and revisited in January 2015, when it was established that the aqueduct would take 20 years to construct and cost $18 billion [38]. The annual operation, energy, and maintenance costs of the aqueduct would total $1 billion. Approximately 3.4 million acre-feet of water would be pumped up 1700 feet in elevation each year, which would weigh approximately 4.5 billion tons, eight times the collective weight of every person on earth. Moving that volume of water uphill would require a gargantuan 8.8 million megawatt hours to operate the system. This amount of water exceeds Kansas's total extractions from the High Plains aquifer in 2013, which was 3.1 million acre-feet [39]. Since Kansas uses about 4 million acre-feet of water annually [37], this project could single-handedly supply enough water to meet most of the state's water needs. If constructed, the Kansas Aqueduct would compete for the title of the largest hydraulic project on earth and would likely be the biggest in the United States.

Southwest Kansas is the region that could potentially benefit the most from the aqueduct. The area uses half of the state's water, 2 million acre-feet, each year [40]. Proponents of the aqueduct insist that the state must construct it, even if it costs nearly six years' worth of irrigated corn (at 2025 prices). According to irrigators in western Kansas, who have suffered groundwater losses firsthand, the benefits of such a massive undertaking would far outweigh the exorbitant costs:

> The consequences of not [building] it are dire… We could take water from the Missouri and send it past Kansas. If it reaches Denver and the Front Range of Colorado, the excess floodwater from Missouri will flow to California and Phoenix. There will be work on [this proposal] from the Colorado basin states, so Kansas had better be on board [40].

Water supply infrastructures in Kansas reflect its reliance on groundwater, making private water wells essential for understanding freshwater access in the state. Scholars have used systems of provision to frame the infrastructural and social arrangements in which water consuming practices are embedded [41], but

"infrastructure" has been largely taken for granted as "municipal supplies". Water infrastructure in rural communities, primarily private wells, has not been fully incorporated into the scholarship on sustainable practices, and few demographic studies of well owners have been conducted [42,43]. Private wells constitute a distinct system of water provision with deep sociological and historical importance [44,45]. Our research highlights the role of infrastructure and environment—specifically wells and aquifers—in shaping public dispositions toward drought, agriculture, and energy in a semiarid context.

1.6. Research Focus

This analysis seeks to address two interrelated questions: What attitudes do Kansans hold toward large-scale environmental infrastructure projects currently underway (or proposed) across the state? How would an aqueduct designed to transfer water to semi-arid western Kansas be received? These questions are significant because statewide perceptions fundamentally shape the political feasibility of energy and environmental policy. Understanding where public sentiment aligns with or diverges from utility and state-level priorities provides essential insight into the material conditions required to implement energy transitions. The dataset enables an examination of which specific projects have support, which encounter resistance, and what spatial, demographic, or ideological patterns structure these attitudes. By centering Kansans' perceptions of energy transitions, this research contributes to understanding the social dimensions of environmental infrastructure development and the conditions necessary for equitable policy implementation.

2. Material and Methods

To study the associations that well ownership, geography, demographics, and political views have on attitudes about water transfers, industrial agriculture, and energy projects, we mailed 7021 notification postcards inviting Kansas well owners to participate in an online survey that measured their household water supply, beliefs about drought and climate change, and various water-consuming behaviors. Well owners' home addresses were obtained from the Kansas Geological Survey's database of well completion records. We also collected a sample of 420 Kansans from Qualtrics, mostly non-well owners. Qualtrics recruits panel participants from multi-sourcing samples to generate representative random samples, enabling us to generalize to Kansas and compare well owners and non-well owners. Table 1 provides detailed sample overviews.

Table 1. Sample Overview

		Non-Well Owners	**Well Owners**	**Total**
Well Ownership		452 (52.3%)	412 (47.7%)	864
		Eastern Kansas	**Western Kansas**	**Total**
HPA Residence		484 (58.4%)	345 (41.6%)	829
		White	**Nonwhite**	**Total**
Race		745 (90.6%)	77 (9.4%)	822
	Under $40,000	**$40,000–$99,999**	**$100,000 or More**	**Total**
Income	237 (30.1%)	345 (43.8%)	205 (26.0%)	787
		Male	**Female**	**Total**
Gender		395 (47.8%)	431 (52.2%)	826
	High School or Under	**Some College and Associate's Degree**	**Bachelor's/Graduate Degree**	**Total**
Education	166 (20.0%)	299 (36.0%)	366 (44.0%)	831
	Liberal or Very Liberal	**Moderate**	**Conservative or Very Conservative**	**Total**
Political views	136 (16.5%)	312 (38.0%)	374 (45.5%)	822

This survey is one of the few quantitative datasets on well owners used for social science research. We collected survey responses in 2015; our overall response rate for the postcards sent to well owners was 6.3 percent, which produced 444 respondents. With the completed surveys from the Qualtrics panel, the dataset comprises 864 respondents. Our independent variables are well ownership, geography (living above the High Plains aquifer), race (white/nonwhite), income, gender, education, and political beliefs. This sample includes 452 non-well owners (52%) and 412 well owners (48%). Nearly half of our respondents (44 percent) live above the HPA in western Kansas. Roughly half of well owners have a bachelor's or graduate degree as opposed to 38 percent of non-well owners. Well owners' modal description of their political views is "conservative", whereas non-well owners most frequently describe their political views as "moderate". The modal income category for non-well owners is $20,000–$39,999, and well owners' modal household income range is $100,000–$149,999. Overall, 52.2 percent of respondents are women; 90.6 percent described their race as white.

Our four dependent variables include various measures of opposition to environmental projects related to Kansas. First, after providing a brief description of the Kansas Aqueduct in a survey item, we ask respondents if they would support or oppose this water transfer system (1 = strongly support, 2 = somewhat support, 3 = somewhat oppose, 4 = strongly oppose, and not sure are excluded from analysis). The public is almost in a three-way tie in terms of support, opposition, and uncertainty when it comes to views of the proposed aqueduct: 41.5 percent strongly or somewhat support, 27.2 percent strongly or somewhat oppose, and the remaining 31.3 percent are not sure. Respondents from western Kansas espouse the most favoritism for this project, while respondents who do not reside above the High Plains aquifer express the highest levels of opposition.

Next, we created a composite utilizing a checklist survey item that asked respondents to select any of the projects that would displease them if it were going to happen by their neighborhood: construction of a coal-fired electricity plant, construction of an oil pipeline, horizontal drilling and hydraulic fracturing or "fracking", or the construction of a large corporate feedlot for cattle or pigs. The composite has a minimum of 0, signifying no displeasure with any of those construction projects, and a maximum of 4, signifying opposition to all four of those projects. Then, we created a composite out of a checklist survey item measuring respondents' opposition to setting up wind turbines or building a "wind farm" or the construction of a nuclear power plant; the composite's minimum of 0 represents no opposition to those forms of renewable energy and its maximum of 2 represents displeasure with both nuclear energy facilities and windfarms being built nearby. Finally, our fourth dependent variable stems from a dichotomous survey item that asks respondents to select if fracking would displease them if it were happening near their neighborhood. This form of extraction is particularly relevant for rural populations in the High Plains. Please consult Appendix A for the survey items related to our dependent variables; more information about the survey may be available upon request.

We utilized multiple analytical procedures to answer our research questions. Roughly 19 percent of respondents (163 out of 864) left open-ended feedback, generating a rich qualitative dataset which we coded and themed. Our results section will present highlights from our qualitative discoveries. On the quantitative side, we deploy three OLS regressions to analyze predictors of opposition to the Kansas Aqueduct, opposition to fossil fuel- and feedlot-related construction, and opposition to renewable energy development; we use logistic regression to assess the independent variables' odds ratios with a dichotomous dependent variable measuring opposition to fracking. Due to the survey's planned missing data design [46–48], the number of respondents varies for the dependent variable tapping into respondents' views of the aqueduct and variables measuring their displeasure toward energy projects and feedlots.

3. Results

Comments from respondents reveal the polarizing nature of the construction and siting of aqueducts, energy projects, and feedlots in Kansas. Notably, our qualitative findings follow a clear gendered pattern, a precedent identified by other scholars studying perceptions of water supplies and drought [49]. Most comments about irrigation, Kansas water law, construction projects, and the aqueduct came from men; women's responses about water tended to focus on personal and domestic water conservation. A handful of participants referred to former Governor Brownback with negativity, and opposed his management of water in the state, noting, "There is absolutely no reason to follow [Brownback's] agenda on water issues" and, "I am aware of a plan by Gov. Brownback to run a water pipeline from the Missouri River to Western Kansas. I very much [oppose] this".

Many respondents freely commented on the Kansas Aqueduct and laid out major concerns and skepticism about its chances of becoming a reality. One man wrote, "Pumping water uphill 360 miles borders on insanity", and another added, "I can't imagine anyone is serious about building a 360-mile aqueduct".

On multiple occasions, commenters blended their opposition to water transfers with their frustrations with government spending and politics. This well-informed man (who knew the starting point and estimated cost of the aqueduct) voiced his opinion with, "I am against a water channel from St. Joe to out west, unless the persons benefitting are footing the bill on their own. No more taxes". Another man dismissed the aqueduct and government involvement, stating:

> Forget the aqueduct, it is only a diversion to keep politicians and their buddies in worthless jobs that have no real benefit to society… the aqueduct is BULL, yet it is portrayed as a way to get water to western Kansas. [emphasis original]

One male respondent argued that Kansas needs to completely change its economic model, leaving this critique of unsustainable irrigation:

> The aqueduct is a BAD BAD idea! Western Kansas has mined the Ogallala [Aquifer] for years... used it all up... now they want to use someone else's water all up! Then someone else's... then someone else's... BAD IDEA! [emphasis original]

Not all Kansans oppose the water transfer; in fact, the plurality of survey respondents somewhat or strongly support the Kansas Aqueduct. These two respondents pointed out the benefits a water transfer would give both Kansas (e.g., the augmented water supply) and other states (lower flooding risks):

> Western Kansas needs more water for agricultural reasons. A pipeline from the Missouri River basin would help western Kansas and also help control some of the frequent flooding on the Missouri.

> Taking excess water flow on the Missouri BEFORE it floods downstream and sending it through an aqueduct connecting the major reservoirs already constructed to ensure a constant stream flow while following the contour of the land is both possible and could be done quickly. Such a diversion would benefit all the states on the High Plains while reducing the risk of flooding downstream for those who have too much water. [emphasis original]

A few supportive comments argued that allowing river water to reach the sea is a waste of freshwater, an important value of the previous century's water-development paradigm [50]. One man wrote:

> Bringing the water from the Missouri River is a great idea; there is no need for it to end up in the ocean. We have a lot of water going into the oceans, and we need that fresh water for irrigation, human, and livestock consumption.

Another man referenced that principle—while touching on a variety of examples and concerns—when expressing his support for water transfers:

> Think outside the box. Each spring, eastern states like Missouri, Iowa, Arkansas, Illinois, Indiana, and Ohio experience flooding. We (the government and insurance companies) continue to allow excess water to flow into the ocean. Why not build some drainage ditches and transport that water to Kansas? Don't tell me it can't be done. Southwestern Arizona had a huge irrigation project done in approximately 1906. It has provided irrigation water to that region, which now produces billions of dollars…

A male respondent covered a lot of related territory with this comment, including his opposition to unsustainable irrigation practices, fracking, and the aqueduct:

> Irrigation pumping & fracking will have the most detrimental effects on Kansas's long-term water problems. Money that would be wasted on an aqueduct would be better used to educate farmers & oil interests…

For a final qualitative representative, this respondent contextualized his opposition to both feedlots and windfarms—but not nuclear energy:

> I didn't care for your construction project question; they are all just about equally bad in my view. I chose the feedlot answer merely because of the stench it would generate. I don't care for wind farms dotting the landscape either; they are bad for birds of prey and ruin the view of a nice horizon. Nuclear power is the best option in my book.

Overall, the qualitative remarks reflect Kansans' strong beliefs (both for and against) various environmental projects.

Table 2 presents our first regression, with the dependent variable set to opposition to the Kansas Aqueduct. Well ownership is the only independent variable with a positive, significant slope with opposition ($b = 0.308$; $p < 0.05$). Geography is also statistically significant ($p < 0.01$) with a negative beta coefficient ($b = -0.316$). Race, income, gender, education levels, and political leanings are not statistically significant predictors of opposition to the aqueduct. Our next regression uses a composite of opposition to oil pipelines, fracking, coal-fired power plants, and large corporate feedlots as its dependent variable (see Table 3). Well ownership ($b = 0.310$; $p < 0.05$) and womanhood ($b = 0.330$; $p < 0.01$) are significant predictors of opposition to those projects, while political conservativism is negatively associated with disapproval of such construction ($b = -0.317$; $p < 0.001$). Living above the High Plains aquifer, race, income, and education do not have significant slopes in the second regression.

Table 2. Regression of Opposition to the Kansas Aqueduct on Well Ownership, Geography, Race, Income, Gender, Education, and Political Ideology ($n = 356$).

Opposition to Aqueduct	B	SE
Well Ownership	0.308 *	0.127
HPA Residence	−0.316 **	0.119
Race (nonwhite)	−0.266	0.173
Income	−0.039	0.033
Gender (female)	−0.079	0.117
Education	0.052	0.041
Political views (conservative)	−0.035	0.062

* $p < 0.05$; ** $p < 0.01$.

Table 3. Regression of Opposition to Fracking, Pipelines, Coal, and Feedlots on Well Ownership, Geography, Race, Income, Gender, Education, and Political Ideology (n = 476).

Opposition to Fossil Fuels and Feedlots	B	SE
Well Ownership	0.310 *	0.132
HPA Residence	−0.087	0.125
Race (nonwhite)	−0.368	0.215
Income	0.053	0.034
Gender (female)	0.330 **	0.125
Education	0.059	0.044
Political views (conservative)	−0.317 ***	0.067

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Only one independent variable is a significant predictor of opposition to renewable energy construction: gender (see Table 4). Being a woman is linked to increased displeasure with wind farm and nuclear power development (b = 0.115; $p < 0.05$). With a significance value of p = 0.060, residence in western Kansas has a nearly significant positive slope opposing clean energy; the null hypothesis is retained for race's, income's, education's, and political position's respective connections to the dependent variable.

Table 4. Regression of Opposition to Nuclear Power Plants and Windfarms on Well Ownership, Geography, Race, Income, Gender, Education, and Political Ideology (n = 476).

Opposition to Renewable Energy	B	SE
Well Ownership	−0.028	0.058
HPA Residence	0.106	0.056
Race (nonwhite)	−0.036	0.087
Income	0.023	0.015
Gender (female)	0.115 *	0.056
Education	−0.023	0.020
Political views (conservative)	0.023	0.027

* $p < 0.05$.

Finally, given the distinct controversies related to hydraulic fracturing in Kansas, we run a logistic regression with a dummy variable measuring displeasure with fracking (see Table 5). Well owners have nearly double the odds of opposing fracking than non-well owners (Exp(B) = 1.969; $p < 0.01$). Yet a group with even stronger opposition to fracking relative to their counterparts than well owners is women; their odds are more than twice that of men (Exp(B) = 2.074; $p < 0.001$). Kansans with politically conservative views have 58 percent lower odds of disagreeing with fracking (Exp(B) = 0.632; $p < 0.001$). Considered together, our qualitative and quantitative results show that Kansans are far from monolithic in their attitudes about massive water transfers, renewable energy, fossil fuels, and large feedlots.

Table 5. Logistic Regression of Opposition to Fracking on Well Ownership, Geography, Race, Income, Gender, Education, and Political Ideology (n = 476).

Opposition to Fracking	Exp(B) (Odds Ratio)	SE
Well Ownership	1.969 **	0.227
HPA Residence	1.066	0.221
Race (nonwhite)	1.181	0.332
Income	0.936	0.056
Gender (female)	2.074 ***	0.211
Education	1.001	0.072
Political views (conservative)	0.623 ***	0.107

−2 Log Likelihood 616.932. ** $p < 0.01$; *** $p < 0.001$.

4. Discussion

Many scholars have explored how environmental risks are distributed inequitably along the lines of race and class for a review, see [51]. Some communities are more vulnerable (or protected) from environmental risks than others. Negative externalities stemming from large projects like pipelines [52], industrial farms [53], and resource extraction [54] are unevenly distributed along the lines of race and class. NIMBYism (Not In My Backyard) is one way to explain how affluent communities shape the placement of extractive projects by mobilizing political power to deflect unwanted development elsewhere [55]. Explaining the placement of environmental infrastructure as a result of NIMBYism reveals, in part, why marginalized communities are systematically targeted for burden while privileged communities employ exclusionary tactics to preserve their environments. This dynamic reinforces spatial patterns of inequality that consistently privilege certain landscapes while burdening others [56].

Our results can be interpreted through the JT framework to promote renewable transition policies that reckon with long histories of exclusion and political marginalization, especially in rural places where utility projects are sited in frontline communities with the least leverage. Exploring the attitudes of Kansans, we attempt to answer [57]'s call to examine how "burdens, hazards, costs, and externalities of the energy systems are disseminated through society". The renewable energy transition will require extensive investment in wind and nuclear sources, yet opposition to energy development is not simply a matter of proximity or NIMBYism; patterns of public discourse and "geographies of perception" play important roles in opposition to facility siting [58–60].

Yet NIMBYism's explanatory power can only get us so far in the Sunflower State. More protean social mechanics are likely involved. We find evidence that the *type* of construction project (renewable energy, fossil-fuel power, large feedlots, and aqueducts) plays an important role in levels of public support or opposition. For instance, it would be too simplistic to state that politically conservative Kansans are less NIMBYistic than their liberal counterparts. Although we find that conservatism correlates with a significant reduction in opposition to pipelines, fracking, coal-fired power plants, and feedlots (see Table 3), our methods reveal no significant association between political views and opposition to wind or nuclear energy projects (see Table 4). This suggests liberal Kansans could be more opposed to the development of fossil fuels and industrial agriculture than conservatives, but not when renewables are under consideration.

In fact, gender is the only significant predictor of opposition to clean energy projects in our study, with women having significantly higher disapproval than men. Women are also significantly more opposed than men to fossil fuel construction (see Table 3) and fracking (see Table 5), pointing to a feminine resistance to renewable *and* nonrenewable energy development. Women are regularly held up as environmental stewards [61–63], yet many environmental problems are not under women's control and result from the economic activities and environmental decisions of men [64]. A common explanation for the "feminization of environmental responsibility" [65,66] centers on women's socialization as caregivers [67–70]. Socialization theory posits that women are socialized from childhood to hold greater environmental and safety concerns, to perceive greater risk, and to show greater care for others (and the environment) than men. Additionally, a growing body of literature expands beyond this rationalization to include structural [71] and contextual factors [65]. Gender inequalities are causes—and consequences of—environmental care [71,72]. Ref. [73] find that women are significantly more likely to save water within the home during droughts. Understanding gendered reactions to droughts can reveal tactics for adjusting to long-term aridity, as "gender is a critical factor in exploring different adaptation strategies and understanding vulnerability to climate change" ([74], p. 237).

As an independent variable, well ownership performs in similar ways to womanhood. Both well owners and women have nearly identical likelihoods of opposing fracking (see Table 5); well-owning and female Kansans register significant resistance to oil pipelines, coal power, fracking, and feedlots (see Table 3).

Owning a private well is also a significant predictor of opposition to the Kansas Aqueduct. As previously mentioned, Kansas well owners are a key social group whose environmental stewardship is pivotal to understanding the state's water supplies. Ref. [45,75] propose that, compared to non-well owners, well owners (1) have higher levels of water awareness, (2) deliberately conserve water more often, (3) rank water security as a higher political challenge, and (4) express more environmental motivations to conserve water. They also engage in routines that connect them to their water supply, including checking their well depth and testing for water contamination [76]. The Safe Drinking Water Act does not protect private wells. This suggests that well owners can be understood through their exercising of "groundwater citizenship", an ethic of conserving and being mindful toward aquifers [45,75]. Having heightened awareness of groundwater's limits, taking actions to extend groundwater supplies, and living sustainably within a region reliant on groundwater (not transferred surface water) could all be factors that foster opposition to the giant proposed aqueduct.

Perhaps unsurprisingly, living above the High Plains aquifer in western Kansas—the area of the state on the receiving end of the proposed water transfer—corresponds with significantly lowered opposition to the controversial project. Our discovery of political conservativism negatively associating with opposition to fracking, oil pipelines, coal, and feedlots (see Table 3) and lowering the odds of opposition to fracking (see Table 5) also may not astonish. The fossil fuel industry has allied with republican administrations at the state and federal levels in the US to slow renewable industries' growth, making the "fossil fuel agenda part-and-parcel to the [right-wing] agenda" ([77], p. 9). Lastly, even though race, income, and education are commonly studied independent variables in environmental sociology and relevant factors in JT research, in our project, they are not statistically significant predictors of any of the dependent variables measuring opposition to construction.

5. Limitations

We acknowledge several limitations. The survey was conducted in 2015, combining a postcard-recruited sample of Kansas well owners and a Qualtrics panel of non-well owners. The overall response rate for the well owner sample was 6.3 percent, which, while consistent with comparable mail-recruited web surveys [78], introduces the possibility that respondents who participated may hold stronger views on water and environmental infrastructure than those who declined. The Qualtrics panel component, while allowing comparisons between well owners and non-well owners, relied on opt-in respondents who may be susceptible to satisficing behaviors and may differ from traditional probability-based samples [79]. Therefore, researchers seeking to replicate similar findings may want to consider probability-based survey designs.

Another limitation concerns the temporal distance between data collection and publication. As the survey was conducted approximately a decade before this paper's issuance, it is reasonable to ask whether attitudes measured in 2015 remain reflective of Kansans' current views. However, we argue that the intervening decade has validated, rather than undermined, the central concerns animating this study. For example, Kansas Geological Survey data show that Kansas' southwestern Groundwater Management District (GMD 3) recorded a 1.52-foot decline in the aquifer in 2024, slightly exceeding the prior year's drop [80]. These figures position the aquifer on a trajectory aligned with projections available at the time of data collection [1]. Farmers in western Kansas currently face pressure to use less. For the first time, GMD 3 is proposing 5 percent irrigating cuts each year for the next two decades to stabilize the aquifer in a farmer-driven, legally binding plan called a Local Enhanced Management Area [81].

In addition, a sustained drought cycle from 2020 to 2024 resulted in estimated agricultural losses of $23 billion across Kansas, Oklahoma, and Texas [82]. Current Kansas Governor Laura Kelly issued a drought emergency as recently as December 2025 [83]. Meanwhile, the 2025 Kansas Speaks Survey found that 52 percent of Kansans remain very or moderately concerned that the state is running out of water [84], consistent with the levels of concern expressed by our 2015 respondents.

This study's survey was run during the Brownback administration (2011–2018), when large-scale water infrastructure and energy development were active areas of state policy. Brownback's 2013 "Long-Term Vision for the Future of Water Supply in Kansas" formally revived the Kansas Aqueduct proposal and commissioned the joint KWO/Army Corps feasibility study, making the aqueduct a genuine, if contested, item on the state's policy agenda at the precise moment Kansans were surveyed [37,38]. That same year, Brownback signed legislation repealing Kansas's 20 percent Renewable Portfolio Standard, replacing it with a voluntary goal even as the state's wind capacity continued to grow [85].

The political landscape then shifted under Governor Kelly, a Democrat who has held office since January 2019. Rather than reviving the aqueduct, Kelly reoriented Kansas's water policy toward aquifer conservation and demand management. In her final state of the State address, she proposed $30 million in water preservation funding and warned that parts of western Kansas may not have enough groundwater to sustain farming for another twenty-five years—a concern reflected in a bipartisan groundwater conservation law that passed the Kansas Senate 34–6 in 2023 [86]. On energy, Kelly has championed wind expansion, with the state investing more than $250 million in wind-related projects since 2019, while coal retirement timelines and the absence of worker transition programs have grown more politically salient [5].

These shifts suggest the aqueduct now functions less as a concrete policy proposal than as what one recent analysis calls a "sociotechnical imaginary", a speculative framework that resurfaces whenever aquifer depletion reaches critical proportions [87]. Taken together, these developments suggest that our data serve as a valuable baseline assessment documenting Kansans' attitudes at a pivotal moment before Kansas water governance became substantially more interventionist. Our data reveal well ownership, geography, and gender are critical factors that continue to shape debates on water policy.

6. Conclusions

Planning renewable energy projects and water transfers will need to encourage participation from women and, in particular, well owners. The farmland above the High Plains aquifer has some of the nation's lowest proportions of women operated farms in comparison to men [88], and men make up 74 percent of the principal farm operators in Kansas [89]. Ref. [90] notes that irrigators are a distinctly masculine group who wield tremendous authority because only landowners can vote on groundwater policy, which excludes many women, minorities, and working-class Kansans. Based on their traditional roles in farming, men often dominate the water dialogue in Kansas and make most decisions about the aquifer because of the institutional and economic opportunities available to them, while women are largely excluded from agricultural programs [49]. Moving forward, this information can be used to create even-handed gendered futures while also adequately preserving natural resources. Amplifying women's voices in farming and water policy will be important for future water conservation in Kansas. "Women's potential talents as key agents of change and their resourcefulness in adapting to climate change should be enhanced" ([74], p. 249). If women are given equal opportunities with men, they could improve farm management—particularly irrigation decisions.

As drought conditions worsen across the Western US, water availability challenges will spread and intensify, yet rural well owners are often excluded from affordable, clean, and reliable municipal water. Access to public water has been regarded as an "emblem of citizenship" ([91], p. 20). If many well users do not receive water supplied by local municipalities, individuals dependent on wells can be seen as marginalized citizens. Rural citizens who draw from unregulated wells are exposed at higher rates than the general population to water that does not meet the Clean Water Act's quality standards [92]. Droughts create important environmental and socioeconomic challenges that disproportionately harm marginalized groups, such as the elderly, rural residents, and the poor [93,94]. When wells are threatened by groundwater depletion or contamination, rural well users need to be recognized as a distinct sociological group that lacks access to dependable water supplies.

While the reduction of coal generation in Kansas has opened new avenues for power, and an enormous water transfer project could augment regional water availability, effective planning requires a detailed understanding of public sentiment to energy and water supply infrastructure development. Kansas possesses the technical infrastructure, renewable resource base, and growing renewable energy sector necessary to facilitate a leading role in the nation's energy transition. These governance decisions will determine how transition benefits are distributed, whether existing inequalities are reinforced, and whether novel forms of extraction and exploitation are produced in these rural areas. Realizing a Just Transition requires multiple structural conditions, including sustained political commitment, sufficient capital investment, institutional capacity within rural governance structures, and organized advocacy from labor unions, environmental justice organizations, and affected communities themselves. Conversely, a market-driven energy transition absent from explicit justice commitments risks reproducing historical patterns of unequal development and forestalling the possibility of constructing an equitable and sustainable energy system.

Applying Just Transition frameworks, this study understands how changing environmental landscapes are not simply technical or economic; they are also about power, which groups bear the costs, and which reap the benefits. Frontline populations, predominantly energy workers, agricultural communities, and low-income residents, cannot be made passive recipients of policy decisions made by utilities, developers, and state planners. They must be at the forefront of these initiatives, shaping what energy transitions look like on their own home turf. This leadership demands concrete mechanisms that provide worker retraining and income support, community benefit agreements with real enforcement, educational investment so rural counties can negotiate from a position of strength, and genuine decision-making power—not just input—in energy planning. The politics of water, agriculture, wind, and nuclear energy, and a Just Transition in the rural United States, is not only a question of the terms of development, but how residents support or oppose these projects.

Appendix A

Dependent Variable Survey Items

Earlier this year, the Kansas Water Office and US Army Corps of Engineers studied a plan that involved diverting water from the Missouri River to western Kansas. This project would involve the construction of an aqueduct 360 miles long and 15 pumping stations to transfer the water. It is estimated that the aqueduct would take 20 years to construct and cost $18 billion. If this water transfer system was scheduled to be built, would you support or oppose this project?

1. Strongly support
2. Somewhat support
3. Somewhat oppose
4. Strongly oppose
5. Not sure

Imagine that some construction is scheduled to take place near your neighborhood. Which of the following would DISPLEASE you the most if it were going to happen by your neighborhood? (You may select more than one)

1. Setting up wind turbines or building a "wind farm"
2. Construction of a nuclear power plant
3. Construction of a coal-fired electricity plant
4. Construction of a large corporate feedlot for cattle or pigs
5. Construction of an oil pipeline
6. Horizontal drilling and hydraulic fracturing or "fracking"

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Author Contributions

Conceptualization, B.T.; Methodology, B.T.; Software, B.T.; Validation, B.T. and S.B.; Formal Analysis, B.T.; Investigation, B.T. and S.B.; Resources, B.T. and S.B.; Data Curation, B.T.; Writing—Original Draft Preparation, B.T. and S.B.; Writing—Review and Editing, B.T. and S.B.; Visualization, B.T.; Supervision, B.T.; Project Administration, B.T. and S.B.; Funding Acquisition, B.T.

Ethics Statement

The study was conducted according to the guidelines of the Human Subjects Committee Lawrence Campus, and approved by the Institutional Review Board of the University of Kansas (protocol code #00001050; date of approval 28 October 2014).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data may be made available upon request. Please email the lead author.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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