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Perspective

Beyond environmental harm: Industry claims, lived experiences, and the impacts of gas extraction

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ABSTRACT

The peer-reviewed literature presents overwhelming evidence that fossil fuel based energy infrastructure projects are responsible for lower residential property values, environmental destruction and pollution that decrease residents' quality of life. These projects also challenge local people's sense of identity and even the threat of such a project can make residents question their sense of place. As evidence, we first present a bibliographic analysis of the environmental impact statements for the Mountain Valley Pipeline in West Virginia and the Jordan Cove Energy Project in Oregon. We find that their approval processes relies on non-peer-reviewed, industry-funded claims that pipelines will bring economic benefit and will have no effect on property values. Second, through original interview data gathered between 2019 and 2021 in West Virginia and in 2021 in Oregon, we engage with the concepts of sense of identity and sense of place to demonstrate that regardless of the local context, fossil fuel based energy infrastructure projects cause more than environmental damage; they trigger emotional reactions in residents that see or fear seeing their everyday lives upended. Taken together, this Perspective contributes to the emerging field of emotional energy geography to show how the plans and implementation of oil and gas pipelines become crucial turning points in residents' lives.

1. Introduction

The USA is currently the world's leading producer of gas. The technological advancement of hydraulic fracturing beginning in the 2000s has allowed the country to position itself as a net exporter of energy [1]. Exports increased after the Russian invasion of Ukraine when Europe shifted from purchasing Russian to USA gas [2]. A vast network of transmission pipelines now crisscrosses the USA, transporting and distributing gas to ports and international pipelines [3]. These pipelines and related infrastructure ensure the energy independence of the USA. Because pipelines are considered critical for national security, the government can and does exert eminent domain to require landowners to allow pipeline construction on their property [4].

It has been documented that gas pipelines and hydraulic fracturing are responsible for major environmental impacts in the forms of forest fragmentation, hazardous material spills, methane leaks, explosions, and air pollution [5]. These represent major threats to public health and

safety [6]. Yet, these risks are mediated by a range of advantages that energy extraction and development are expected to bring. According to the industry and some local governments, benefits include higher employment, higher tax returns to reinvest in schools and roads, higher property values, and general business growth [7]. However, when scrutinized by peer-reviewed studies, these returns do not materialize: employment increases are only temporary, tax returns are not redistributed to schools or roads, and property values do not increase [8]. Rather, studies on the social impacts of energy infrastructures show that communities experience increased vulnerability and that already marginalized groups are much more likely than the general population to be saddled with pipeline infrastructure [3].

This Perspective, focuses on a lesser known impacts: how fossil fuel based energy infrastructure projects challenge local people's sense of identity and how even the threat of such a project can make residents question their sense of place. "Place" is a site that is given meaning based on experiences, relationships, and emotions [9]. Sense of place refers to

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the ways in which people form a bond with place and the meanings associated with that place over time. These bonds are influenced by the depth of experience as well as the relationships linked with a setting [10]. In turn, sense of place influences place-based identity, meaning the formation of identity through a connection to place and the ways in which place provides meaning or purpose [11]. When sense of place is threatened or disrupted, individuals may feel a loss of identity, which can result in grief for the memories of a place, as well as an unstable sense of self [12]. Researchers in Appalachian contexts have demonstrated that extraction, including coal mining and fracking, disrupts sense of place, identity, and community [13,14].

Adding to this literature, our aim is to contribute to the emerging

field of emotional energy geographies to show how planning and implementing oil and gas pipelines are critical turning points in residents' lives [15,16]. We ground our analysis on a case study of the Mountain Valley Pipeline (MVP) under construction in West Virginia and the proposed and now canceled Jordan Cove Energy Project (JCEP) in Oregon. The data for this Perspective is drawn from bibliographic reviews of the environmental impact statements used to approve these two pipelines. We examined both documents with a specific focus on sections dealing with potential impacts on property values near oil and gas pipelines. We also carried out more than 60 interviews in 2019 and 2021 with residents of areas affected by the MVP and potentially impacted by the JCEP. We assessed their emotional responses and



Fig. 1. Mountain Valley Pipeline route (from mountainvalleypipeline.info).

challenges to developments, knowledge production during permitting, and perceived agency over the process. Interviewees were initially and purposefully sampled through local groups of concerned residents, followed by snowball sampling.

2. Mountain Valley Pipeline and Jordan Cove Pipeline Project

The MVP is a gas pipeline majority owned by Equitrans Midstream (under construction at the time of writing) running from northwestern West Virginia (WV) to southern Virginia (VA). Shale gas is taken from the Marcellus and Utica reserves in WV traveling 488 km across the Appalachian Trail close to the Peters Mountain Wilderness in VA. Once finished, the pipeline, is expected to have a capacity of 2 billion cubic feet/day and will cost an estimated \$6.6 billion USD [17]. The pipeline has been met with opposition mostly in VA. Environmentalists and the Appalachian Trail Conservancy argue that it will impact the scenic landscape along the trail and cause negative environmental consequences, such as erosion, landslides, and leaks [18].

The MVP crosses the whole of WV, where we gathered our data. This state epitomizes Appalachia history of internal colony of the USA being exploited for its natural resources and not developing thanks to them, but rather becoming dependent on extraction which companies along the East Coast profited from [19]. This region, historically characterized by an economy solely geared toward extraction of timber, coal, oil, and gas [20], is now experiencing population decline, and increasing rates of unemployment and opioid addiction due to the waning of coal extraction [21]. Because of its history of dependence on extractive industries, WV has not experienced the same level of opposition to the MVP as in VA. Residents and the local authorities in WV have been hopeful that MVP will bring jobs and commerce to remote rural areas that have suffered economically after the decline of coal and have therefore not been as opposed to the MVP as in VA. Yet, these hopes have not materialized [8]. The supposed construction jobs have been delayed due to incidents and litigations [22]. However, the MVP was recently part of a provision of the Fiscal Responsibility Act, effectively quelling all ongoing lawsuits and expediting the completion of the pipeline [17]. A map of the proposed route is provided (Fig. 1).

The JCEP was proposed as a liquefied natural gas (LNG) pipeline that would connect existing lines in southeastern Oregon to the Pacific coast where gas could be exported to Asia. Construction of the 234-mile, 36-inch diameter pipeline was estimated to have a capacity of 1.2 billion cubic feet/day [23] and cost \$9.8 billion USD [24]. Discussions about the pipeline began as early as 2003, and the project changed hands through three Canadian companies, from the Fort Chicago LP to Veresen, Inc. to Pembina, who ultimately canceled the project in 2021. If completed, the project would have been at risk from significant earthquake and tsunami events [25], and it would have been the state's largest greenhouse gas emitter. The pipeline would have crossed 218 bodies of water and one estuary, including 34 bodies of water listed as impaired under the Clean Water Act [26].

The JCEP would have crossed counties in Oregon characterized by lower median household incomes than the national average, higher percentages of poverty, and white population proportions greater than the national average [27a,27b,27c]. The project would have adversely affected nine threatened and endangered species [26], and it would have threatened fishing, crabbing, tourism, and other local livelihoods. Over 600 private landowners would have needed compensation for land seized by eminent domain [28,29]. Many locals balked at the idea of losing their land to an export project owned by a foreign company. Nicknamed "the next Standing Rock" due to its potential to harm waters of significance to Indigenous peoples [30], the JCEP would have crossed the territories of five sovereign Tribal Nations while endangering the drinking water of three others. The Federal Energy Regulatory Commission (FERC) ultimately denied authorization on the grounds that it is "inconsistent with the public interest," citing environmental impact statements, public comments and protests, and declining global LNG and

oil prices [24]. In this study, we focus on the terminal county (Coos) and its impacts on the coastal area. A map is provided to show the length of the proposed route (Fig. 2).

3. Under which premises were these projects approved?

The MVP and JCEP both required various federal and state authorizations related to legal requirements under the National Environmental Policy Act, the Natural Gas Act, the Clean Water Act, the Endangered Species Act, and other statutes. For both projects, FERC was responsible for preparing environmental impact statements to document the potential environmental effects of pipeline construction and operation, as well as a suite of potential effects related to economic, cultural, and other factors. Environmental impact statements nominally inform decisions by federal and state agencies on whether to grant permits or authorizations for pipelines and related infrastructure. Yet, decision-making documents by FERC and other agencies cite these statements extensively to justify their decisions about these projects [31].

FERC finalized and published environmental impact statements for the two pipelines in 2017 (MVP) and 2019 (JCEP). In each environmental impact statement, FERC reached the conclusion that the project would have little or no detrimental impact on property values. However, when we looked closely [8], we found that only 19 % of the evidence cited in the MVP environmental impact statement were peer-reviewed. The remaining items were non-peer-reviewed (i.e., gray literature) documents, nearly half of which were consulting reports or trade magazine articles funded by the oil and gas industry themselves. In justifying their decision to authorize the MVP, regulators tended to cite these industry-affiliated reports and magazine articles while dismissing the conclusions of peer-reviewed studies [31,32]. Notably, all the peer-reviewed studies reached the same conclusion: that pipelines would negatively impact nearby property values [8]. The environmental impact statements for two other Appalachian shale gas pipelines yielded similar results in terms of bias toward non-peer-reviewed, industry-affiliated documents, suggesting that the MVP is not an isolated case [8].

For this Perspective, we conducted a similar examination of the JCEP environmental impact statement [23]. Here, we found that most (six of eight) cited documents were industry-affiliated, including reports and trade magazine articles. As observed in other cases, these documents concluded that pipelines did not have detrimental impacts on property values. Here, too, regulators accepted the conclusions of these industry-affiliated documents while dismissing the conclusions of the two peer-reviewed studies cited in the environmental impact statement. Specifically, FERC noted in its assessment of the JCEP, "Based on the research cited above, we conclude that having a natural gas pipeline on or near a property does not necessarily negatively impact the value of that property" [23].

In both examples, the MVP and the JCEP, regulators tended to downplay or dismiss peer-reviewed research when drawing conclusions about the potential property value impacts of natural gas transmission pipelines. These examples illustrate one of the ways in which oil and gas industry actors actively shape regulatory narratives about the impacts of pipelines on relationships between people and place. Specifically, when regulators accept, uncritically, the results of industry-affiliated reports or magazine articles, they amplify the opinions and perspectives of industry actors at the expense of both peer-reviewed science and the experiences of people who actually live near oil and gas transmission infrastructure.

4. Challenges to sense of place and place-based identity

The majority of interviewees both in WV and OR chose their place of residence because of deep enchantment with the surrounding natural beauty and reported a loss of safety.

Part of this shift in feelings of security were changes to interviewee relationships with nature and the landscape. Several reported that they

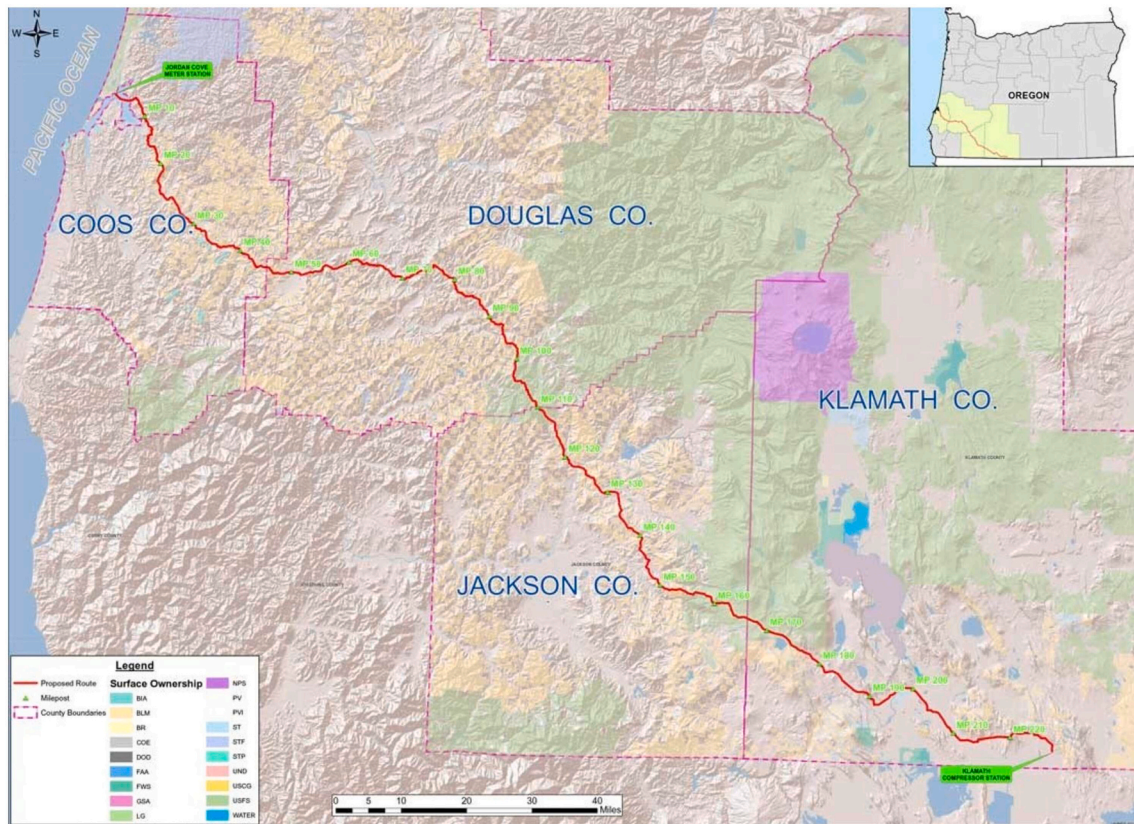


Fig. 2. Proposed route of the Jordan Cove Energy Project route (from Oregon Department of Energy).

moved to West Virginia for peace and nature but were disturbed by the “rape” of the land and the loss of “the idyllic setting” as exemplified in this testimony.

But when I moved here in the early 90s, I just thought it was so idyllic, and this land is so — and she still does have so much to offer. Everything, every medicine you possibly could need grows here. And you know, it's not too harsh in the winter. I mean, there's just, it's a beautiful pocket. It's a beautiful place to live.

(Interview 7, 2021 West Virginia)

Responses were similar in Oregon, “I like it and I don't want it to be destroyed” (Interview 3, 2021 Oregon). The majority of Oregon participants also expressed feeling a special relationship with the land— from a deep sense of appreciation for the nature around them to appreciation for the refuge and calm the land provides them. One resident elaborated on how their family observed the native plant fairy slipper orchids to predict local ecosystem patterns and how their parents taught them to care for them. Another Oregon resident connected their life and love for Oregon with the future of the environment and their livelihoods:

I think the memory now is wrapped up in the pipeline... I mean, we bought the property because of the timber prospects and the proximity to the other things we enjoy. It has tainted it. I don't think I would be honest if I didn't say it has tainted how we feel about things in general.

(Interview 4, 2021 Oregon)

This was in direct contrast to how corporations saw the land, as the optimal geological route, detached from social or ecological context. In Oregon, if the proposed pipeline evolved from a line on a map to reality, the pipeline would sever at least one resident's access to their well. This could represent a serious water security risk since, in parts of southwest Oregon, aquifer levels are stressed by over pumping, snowpack decline, drought, and wildfire: “It is not a foregone conclusion that when you drill,

you're gonna get water.” (Interview 2, 2021 Oregon)

All in all, interviewees conveyed a deep sense of connection with their natural, pristine surroundings which constituted the basis for their identity as a West Virginian or an Oregonian. They resided in these areas because they had purposely chosen to be in the midst of nature, away from cities and industries. They shared that living in a rural area was a crucial component of their identity, and seeing those rural areas torn by an energy infrastructure project made them realize that the place they loved so much was being threatened. With that, they told us, their identity was under threat:

It gets really hard to just function when somebody is threatening something you care so deeply about.

(Interview 4, 2021 Oregon)

Insecure about what the land can do to you now, which we felt safe on our land, now we don't know what can happen, it's just a bomb laying there waiting to explode. It's ruined a lifetime of my husband's work that he put into it, that him and I did over 51 years. And it'll never be the same again.

(Interview 6, 2020 West Virginia)

Having poured their lives and souls into making the area around their home into *their* land, residents perceived the incoming pipeline not just as a physical threat, but also an emotionally destabilizing one. Interviews in Oregon echoed sentiments about the connection between nature and labor. One resident elaborated on how the threat of environmental change soured their relationships with others and impacted their mental well-being and emotional state.

I love my home and my land and feel an overwhelming sense of gratitude that I have the means and privilege to call it my home. Our land is our refuge and sanctuary. Because of our spiritual connection with nature and the improvements we've made...[but] this experience has affected our health, our marriage and made us bitter toward the community and its

leaders and governmental systems and the seeming lack of concern for landowners and the impacts of eminent domain on families and individuals.

(Interview 1, 2021 Oregon)

When asked if their relationship with their land had changed since the JCEP process started, one Oregon resident immediately referred to a loss of control:

Oh yeah. There's no question. You have to recognize the fact that you don't have the control that you think you have. You learn that just because you own something doesn't mean you own it. Someone can come along and take it away, and that is a lesson we all got.

(Interview 4, 2021 Oregon)

In both sites, residents connected their experiences to their hopes and dreams for the future.

When we formed the land trust years ago, we had this whole idea that there would be young people here and people would be farming here and that we were preserving this place for posterity.

(Interview 2, 2020 West Virginia)

In western Oregon, you can look around and see that there's not a lot of land that's just kinda being left... alone. And right now, that's kind of what we're doing. Especially with the pastureland, we're being particular about what we're gonna do... for the next generation.

(Interview 4, 2021 Oregon)

By showing how the vision of the future for residents changed due to the impending threat of the pipeline project, these statements manifest how residents are aware that their identity, through the loss of their land and, in turn, their legacy is at stake. This realization has created a sense of loss and despair, as we highlight above, but has also generated responses of everyday resistance in residents. For instance, Oregon participants commented upon how they have appreciated and engaged with places in new ways since entering the fight to stop the JCEP, demonstrating that the threat of pipelines creates pathways for residents to develop a new sense of place and a place-based identity.

We got rid of our propane tank... Honestly, you can't keep saying that you're not in favor of gas and you're burning gas. You just have got to stop. And then we bought an electric car because we felt like it's the same thing.

(Interview 6, 2021 Oregon)

5. Different locations, same phenomenon, similar reactions

As Pasternak et al. [33] poignantly stress, pipelines reify the future reality of societies still dependent on fossil fuel extraction through “displacement, environmental destruction and contamination, wealth disparity...and climate change”. Together with our prior work [8], this Perspective explains one of the mechanisms that produces this situation - a skewed power hierarchy in which regulators disregard peer-reviewed publications in favor of industry-funded reports that downplay the potential socioeconomic and environmental impacts of pipelines.

Because the JCEP process spanned almost two decades, changed owners three times, and experienced multiple route changes, the prevalent emotion was uncertainty. The heightened risk factored into personal cost-benefit analyses and prevented people from accomplishing other goals. As this piece illustrates, a synthesis of emotional and energy geography literature can be used to understand the consequences of the disruption to emotional and cultural attachments that people hold [16]. This Perspective emphasizes how energy development can affect sense of place and identity and does this in a novel way by engaging with case studies diverse in demographics, socioeconomic status, and project outcomes. And yet, we see similarities in the experience of living in a pipeline path - *whether they materialize*. By grounding our analysis on the

concepts of sense of identity and sense of place we show that regardless of the local context, fossil fuel-based energy infrastructure projects cause more than environmental damage; they trigger emotional reactions in residents that see or fear drastic disruption of their everyday lives. Our findings echo other studies in which residents affected by fracking express a loss of control, feelings of distress, and fractured identities [14,33]. Parallel situations exist in other energy contexts, such as uranium mining and nuclear siting [34,35]. Notwithstanding the intrinsic limitations of our sample and the sample size, the comparison of two very different energy projects suggests the potential for the generalizability and transferability of place identity and sense of place themes in relation to transnational critical infrastructural developments.

In 2023, Congress passed the Fiscal Responsibility Act, which expedited all permits needed to complete the MVP, notwithstanding evidence of environmental and health risks connected to the construction of the pipeline. This action is in line with the context of environmental injustice that we show in this Perspective. Both MVP and JCEP were approved through biased approval processes relying on false, non-peer-reviewed literature assuming that pipelines will bring economic benefit. By codifying the approval of MVP into law, the USA has further amplified its prior endorsement of industry-sponsored ideas about the impacts of pipeline infrastructure on relationships between people and place. The move by Congress further signals that decision-makers privilege such industry-sponsored ideas over the everyday lived experiences of residents. Ultimately, the situation results in residents relinquishing control, ownership, access to, and use of their land to private companies for the extraction and distribution of oil and gas. This context of environmental injustice is further aggravated by boosting the opinions expressed in industry-affiliated consulting reports and trade magazine articles, the USA solidifies the unscientific perspective of industry actors who claim that pipelines do not impact property values or other concepts of value that people assign to the places they call home (see also [8]). We argue that the perspectives of affected residents should be prioritized over such unscientific perspectives on extraction when decisions threaten to upend their lives. This is a matter of environmental justice, particularly for rural historically disenfranchised populations, such as the one of West Virginia, which have suffered at the hands of the extractive industry since the 1800s.

Scholars have shown that extractive developments not only impact landscapes themselves but also threaten emotional attachments to places that residents want to protect Author 1 et al., 2021 [11,31]. This Perspective contributes to the understanding of the emotional nuances of energy development, energy-society relationships, and everyday life [36,37]. We demonstrate that for residents affected by the MVP, environmental injustice is manifested also through a lost and degraded sense of place, leading to feelings of loss concerning what their land and homes used to be. Participants were not only affected by conflict over property rights and land use, but also by the emotional impacts on their sense of place. While bridging research between energy and emotional geographies is still nascent, we argue that this is a fruitful intersection which can generate data that can be readily understood by policymakers who will be able to relate to the meaning that place and home have for people and the painful emotions attached to the loss of those.

CRedit authorship contribution statement

Martina Angela Caretta: Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Melissa Haefner:** Writing – review & editing, Writing – original draft, Formal analysis. **Ryan Emanuel:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Conceptualization. **Racheal Hood:** Methodology, Investigation, Formal analysis, Data curation. **Julia Seydel:** Methodology, Formal analysis, Data curation.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Martina Angela Caretta reports financial support was provided by Heinz Foundation.

Data availability

Data will be made available on request.

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