**Corrosive disadvantage: the impact of fracking on young people’s capabilities**

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Hydraulic fracturing (‘fracking’) is a policy problem that is both a spatial and temporal issue, touching on economic, environmental, health, safety, political and social concerns of interest to youth. This empirical study focuses on the impact of fracking on youth in communities in England. The Capabilities Approach is used as a lens for understanding the experiences of young people in their late teens. The article draws on focus groups with young people which took place within a 20 mile radius of exploratory fracking sites. The study contributes to understanding of youth experience of controversial energy interventions. Findings suggest that fracking prevents young people from living the lives they have reason to value, and has, and will continue to have, a negative impact on wellbeing in the present and in the future. Fracking creates conditions of corrosive disadvantage for affected youth. Greater inclusion of youth perspectives in environmental decision-making is needed.

Keywords: fracking, youth, capabilities

# Introduction

Hydraulic fracturing (‘fracking’) originally referred to the process of fracturing rock with high pressure liquid, but the use of the term has now expanded to include processes and impacts associated with the exploration and extraction of shale gas and oil (Evensen et al., 2014). Fracking is a policy problem that has both spatial and temporal dimensions, touching on economic, environmental, health and safety, political and social concerns of interest to youth both in the present and in the future. The decision about whether or not to frack involves evaluating alternatives with incommensurable outcomes in relation to the economy, the environment, society and industry. Fracking was promoted by the UK government for its potential to provide greater energy security, economic growth and jobs, and for its potential to support a transition to net zero emissions by 2050 (Department for Business, Energy & Industrial Strategy, 2019). However, research to date suggests that these claims are problematic, with concerns that shale gas extracted by fracking will supplement rather than replace coal, as has been seen in US patterns in coal usage (POST, 2011), and that investment in fracking will disincentivise investment in renewables (Johnstone, Stirling and Sovacool, 2017). Furthermore, research to date suggests that the mooted benefits do not play out in favour of local communities (Carpenter, Anderson and Dudensing, 2019; McHenry-Sorber, E., & Provinzano, K. 2017; Short and Szolucha, 2019).

Fracking began in England in 2011 and was operational at an exploratory stage at a number of sites until November 2019 when the government announced a moratorium. Fracking has long-term, intergenerational consequences for people and the environment (Kovats et al., 2014). To date, there has been little focus on the impact of fracking on young people’s wellbeing. Our focus is on the impact of fracking on the capabilities of young people aged 16-19 near sites of exploratory fracking in the north west of England. Whilst fracking is a specific context, the approach taken is likely to applicable to understanding youth experiences of other environmental interventions such as proposed geoengineering interventions, for example the Oxford Geoengineering Project (Oxford Geoengineering Project, 2018) which have long-term consequences for people and the planet.

# The long-term impacts of fracking

The turn to shale gas extraction using fracking is a controversial development, with a range of differential benefits and costs acting on people and communities. Potential benefits of fracking (done well) have been identified to include the provision of a source of energy, affordability, lower greenhouse gas emissions than other fossil fuels, and economic gains for suppliers and exporters (Sovacool, 2014). However, research has also identified a range of short and long term negative impacts of fracking. In a review of environmental impacts from shale gas extraction, Costa et al (2017) identified negative impacts associated with water resources and atmospheric emissions, occupational and public health and safety, land use and induced seismicity.

The impacts of fracking extend beyond the environment. Sangamoorthy et al (2016) found that the disruption of the physical environment and landscape as a result of fracking in the USA affected residents' sense of place and identity which created social stress. The persistent negative impact on communities as a result of psychosocial conflict has been described as ‘collective trauma’ (Hirsch et al., 2017), and it has been found that this can impact communities at the planning and exploratory stage i.e. before commercial fracking has started (Short and Szolucha, 2019). Hirsch et al (2017) found that although people living in fracking communities might experience initial benefits through lease of land and development infrastructure, these are minimal, and they might also experience a range of negative mental health impacts including, amongst others, anxiety and depression about lifestyle, health, safety, and financial security. These studies indicate evidence in support of the ‘resource curse’ in fracking communities. The ‘resource curse’ is the idea that resource dependence negatively affects growth (Badeeb et al., 2017), i.e. that paradoxically, areas where there is an abundance of natural resources have relatively poor performance on a range of measures including wellbeing, educational attainment and economic outcomes (Carpenter et al., 2019). Whilst these arguments have mainly been made at a national level, the studies discussed here suggest that there is evidence that the resource curse can be seen at a community level. Although arguments in favour of fracking often rely on the promise of economic development (Hassett and Marthur, 2013; Scanlan, 2017), research to date seems to suggest that this does not always play out in the favour of local communities where the extraction occurs (Cotton, 2017).

In the specific region of this study (Lancashire, England), ethnographic and participatory research by Short and Szolucha (2019) found a range of objections to fracking (including opposition to traffic, industrialisation, water and air pollution, noise and seismicity) and at the level of the community, collective trauma as a consequence of the planning process during which the local planning decision to reject the application to drill for shale gas at Preston New Road was overturned by the Secretary of State following an appeal from the company pursuing fracking at the site (Cuadrilla). An analysis of justice associated with the policy context of fracking (Cotton, 2017) found rescaling of decisions from local to national level being used to justify violation of political equality in decision-making. In-depth interviews with adult protesters at the fracking site found evidence of excessive policing and disparaging public messages about campaigners by the police, and an overall move to criminalise protest (Jackson et al., 2019).

# Fracking and youth

Few studies of fracking have focused specifically on youth, however fracking is an issue that has an impact on even the very young. In the USA, Currie, Greenstone and Meckel (2017) found evidence of negative health effects including low birth weights for infants born within 3km of fracking sites and in Australia, Coram Moss and Blashki (2014) argue that the young are more vulnerable to the hazards associated with fracking. This is due to immature and developing body systems, and higher respiratory and metabolic rates of infants and children which allow exposure to greater quantities of environmental pollutants (Lauver, 2012). A range of attitudes have been found to be held by young people, with ambivalent and negative attitudes dominating, and young people describing their anger, frustration and helplessness at being unable to influence decisions about their environment (Authors, 2020). A small number of studies have focused on the impact of fracking on education in communities affected, finding an increase in dropout rates associated with immigrant students in fracking communities (Carpenter et al., 2019) and challenges associated with increased demands on services, including support for children with special educational and English language needs and needs associated with transiency and homelessness e.g. spaces for young people to complete homework and funding to ensure children are fed (McHenry-Sorber and Provinzano, 2017).

Whilst the research on young people’s responses to fracking is sparse, there exists a substantial body of literature in relation to the views of wider publics in the UK and other international contexts. These publics include lay groups such as ex-miners, allotment holders mothers, members of local history and wildlife societies (Williams et al., 2017), protesters (Drake, 2018), and residents of regions with a history of resource extraction (Budgen, Evensen and Stedman, 2017). There has been found scepticism about the economic benefits claimed for fracking, an emphasis on what is not known in contrast to what is known (Williams et al., 2017), erosion of trust in politicians (Drake, 2018), and concern for future generations associated with environmental risks, contributions to climate change and preferential support for fracking over renewables (Partridge et al., 2017). In regions in the USA with experience of resource extraction, a positive correlation has been found between positive prior experiences and support for fracking and between negative views of mining activities and likelihood of participating in political action (Budgen et al., 2017). In the USA, a large-scale survey (Boudet et al., 2013) found opposition towards fracking more common amongst women, people with egalitarian perspectives on the world and people with greater familiarity with fracking. They found support for fracking more common amongst older, politically conservative people and who associate fracking with positive outcomes associated with the economy and energy supply. A large-scale survey of adults in the UK (Howell, 2018) found that whilst more adults supported than opposed fracking in Britain, there was much less support for local fracking. In Howell’s survey, more knowledgeable participants were more likely to agree with negative statements about fracking, and more people disagreed than agreed that it is possible to compensate communities affected by fracking through financial payments.

Environmental risks are often placed in ‘the path of least resistance’, in or near communities with least social, economic and political capital (Davies, 2019). This appears to be the case in relation to fracking. Hirsch et al (2017) note that communities affected by fracking are often poor, rural or vulnerable, and may experience the damaging effects for generations. This could be argued to be the case for fracking in the north of England, where extraction has been targeted near some of the most deprived communities. The deliberate location of sources of toxic pollution near the poor has been described by Nixon (2011) as an act of slow violence, “a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all” (Nixon, 2011, p.2). Contrasting the slow, apparently invisible, impacts of pollution with an invasion involving weapons of mass destruction, Nixon notes that climate catastrophe and mass extinction of species are no less cataclysmic than such an invasion, but they are slow moving and long in the making, apparently “starring no-one,” i.e. the voices of those affected are absent from public discourse. Davies (2019) has challenged the idea that slow violence happens out of sight, and instead asked ‘out of sight *to whom*?’ Davies describes slow violence as intentional brutality that takes place over the long term, which is often built upon existing structural and social inequalities, often invisible to people other than those living in the affected communities (Davies, 2019). To study these gradual and incremental hazards requires researchers to engage with those who are experiencing the impacts in order to bring their experiences into sight. Here, we examine the impact of fracking on young people’s capabilities, or the opportunities they have to live the lives they value, with specific attention to young people in fracking communities.

# Theoretical framework: the capabilities approach

In contrast to resource-based theories of justice, capabilities approach is sensitive to how social norms and environmental conditions interact with individual differences. Schlosberg (2012) notes that resource-based and rights-based approaches to justice fail to take account of the fact that political mis-recognition is a key condition which produces poor distributions of goods and risks, and argues that attention to capabilities –the basic needs that people need to function – is required for justice. The capabilities approach is a way of understanding justice which links wellbeing not just to what a person ends up doing (their functioning), but also the freedoms that they have to achieve the functioning they desire (Sen, 2009), and here we use it to understand the impact of fracking on young people near fracking sites, and to better understand the needs and vulnerabilities of youth. Sen uses the example of hunger as a functioning of a person, where a person can be hungry due to lack of food, or by choice if they are fasting. The difference is in opportunity: the person who lacks food has no freedom to choose this functioning. The capabilities approach was developed from a critique of the idea that the quality of life of a nation was improving when, and only when, Gross Domestic Product (GDP) per capita was increasing. The capabilities approach in contrast takes each person as an end rather than the total or average wellbeing.

In the capabilities approach, justice is seen as the freedom each person has to achieve the basic requirements for a flourishing life (Griffiths, 2019), i.e. being able to live in accordance with one's values. Much research on fracking has focused on recognition and distributional and procedural aspects of environmental justice (Cotton, 2017; Clough, 2018), and Griffiths (2019) has applied the capabilities to the theoretical analysis of fracking in the UK but to date there has been little emphasis on empirical studies of the impact of fracking on the capabilities of people living in communities where fracking is operational. Evensen and Stedman (2012) analyse interview data from residents in rural USA and Canada where fracking is either under development or has the potential for development in the near future. Whilst they do not refer specifically to capabilities, they use the idea of human flourishing to interpret data, funding that those who believe their community is currently lacking or diminished supporting unconventional shale gas extraction, and those who believe that their community is thriving opposing fracking.

While conditions for a capability to exist, functioning is not always guaranteed. The freedoms that people have are dependent upon many other factors including economic arrangements and political and civil rights (Sen, 1999). For example, the effectiveness of elections and referenda depends on the accompanying conditions such as access to information, freedom of expression and freedom of dissent (Sen, 2009, p.327). Limits to functioning include access to resources and social and political conditions. The capabilities approach involves assessing the freedoms people have to choose between different ways of living. The focus on freedom values the opportunity individuals have to pursue their objectives, and ensures they are not being forced into a situation because of constraints imposed by others (Sen, 2009).

Nussbaum’s (2011) advancement of capabilities approach is as a theory of fundamental human entitlements. Nussbaum has identified ten central capabilities to be considered essential for human dignity. These are: life, bodily health, bodily integrity, senses, imagination and thought, emotions, practical reason, affiliation, other species, play, and control over one’s environment. It is important that people can not only achieve these functionings, but can sustain them (Wolff and De-Shalit, 2013). The central capabilities identified by Nussbaum are ‘irreducibly diverse’ and it is not possible to make up for shortcomings in one capability by having a surplus in another. Health, economy and quality of environment might be interconnected, but they cannot be reduced to a single quantitative measure of wellbeing. As all of these capabilities are intrinsically valuable and important, any situation where two or more collide is described as a ‘tragic choice’. In the fracking literature, there is often reference to ‘trade-offs’ (Davis and Fisk, 2014). This suggests a situation in which one thing is exchanged for another, and the connotation is that this is done willingly; a tragic choice on the other hand draws attention to the fact that a choice is imposed upon a community which demands that a choice must be made between capabilities which are irreducible, and therefore *cannot* be ‘traded-off’. Capabilities can interact in other ways. Wolff and De-Shalit (2013) describe ‘fertile functionings’, where achievement in one domain is likely to have (positive) effects in other domains and ‘corrosive disadvantage’, where a disadvantage in one domain is likely to have (negative) effects to other domains. For example, low income is a corrosive disadvantage as economic disadvantage impacts on capabilities such as health, adequate shelter and access to mobility. Just as corrosion refers to the gradual destruction of metals, corrosive disadvantage refers to the situation where damage to one capability causes damage to others. Corrosion is a slow process, not always immediately visible but capable of causing harm to seemingly strong, stable structures over the long term, ultimately able to cause the rapid failure of structures. Wolff and De-Shalit (2008) argue that identification of corrosive disadvantages is an important policy priority because the identification of causal relationships provides evidence of systemic, rather than accidental or coincidental, disadvantage.

In the context of fracking, a number of Nussbaum’s central capabilities are thrown into the spotlight: control over one’s environment in both political (being able to participate in decision-making) and material (having property and employment rights on an equal basis as others) senses, bodily health and integrity, affiliation, play and living with nature. However the environment is under-theorised in Nussbaum’s account. In the following section, we outline how the capabilities approach has taken the environment into consideration.

# Capabilities approach and fracking

In this study we are concerned not with the intrinsic value of the environment, but in the value it has to people. According to Sen (2009), the environment is not just what there is, but also the opportunities it offers to people. People’s capabilities depend directly upon the environment (Schlosberg, 2012), and they have the possibility to preserve, degrade or improve the environment. The relationship people have with the environment also shapes and is shaped by a maldistribution of wealth and power (Holland, 2008). A number of scholars including Schlosberg (2012) and Holland (2008) have argued for the expansion of the capabilities approach to include the environmental factors that enable human functioning and flourishing. Holland argues that the consideration of the environment’s instrumental value to human capabilities is needed to reason about the conditions of social justice because all central capabilities are dependent upon the natural environment.

Holland sees certain ecological conditions as a ‘meta-capability’ because of the impact they have on all of Nussbaum’s (2011) central capabilities. For example, bodily health requires ecosystems which can produce food and absorb pollution. Holland defines this ‘sustainable ecological capacity’ as being “able to live one’s life in the context of ecological conditions that can provide environmental resources and services that enable the current generation’s range of capabilities; to have these conditions now and in the future” (Holland, 2008, p.234). Holland argues that ecological systems operate at a level above economic, political and other social systems because these too are reliant on functioning ecosystems, and as such a sustainable environment must be considered as part of an individual’s opportunity set as a fundamental condition of justice. Similarly, political, economic and other social systems have the potential to degrade the ecological meta-capability. For this reason, capabilities approach is appropriate for understanding the impact of fracking on young people. Previous work by Evensen and Steadman (2017) used the idea of human flourishing to analyse fracking in communities in the Canada and the USA, and found that support or opposition for fracking was motivated by pursuit of human flourishing in relation to maintaining local population and preserving a rural way of life, beauty, peace and quiet. Wolff and De-Shalit (2013) point to the need to focus attention on functionings, rather than capabilities, given that they are observable. In this study, we are interested in functionings, but also in freedoms or unfreedoms that exist in relation to young people’s achievement of desired functioning. We examine how the ecological meta-capability interacts with the individual capabilities of youth in relation to exploratory fracking by analysing interviews with young people about their experiences of fracking with attention to how it has affected their central capabilities as defined by Nussbaum.

# Methodology

This study focuses on young people’s capabilities in relation to fracking, where it has been active at an exploratory stage. The guiding research question is: what is the impact of fracking on young people’s capabilities?

Our research design was informed by our interest in listening to the experiences of a specific group of young people. Young people were defined not only by age but have plural identities based on their membership of community, their gender, nationality and religion. An in-depth qualitative approach was used, and the data collection method selected was the focus group.

## Recruitment

Ethical approval to carry out the research was obtained from the departmental ethics committee. Heads of sciences and heads of sixth form were contacted in all institutions within a 20 mile radius of proposed or exploratory fracking sites in Lancashire and Yorkshire. Four institutions in Lancashire agreed to participate. Teachers and tutors provided the space and time for the focus groups to take place, and invited participants to participate at a time convenient to them. Participating young people were asked to give their voluntary informed consent to take part, and were reminded that they could withdraw from the study during data collection. No incentives or rewards were provided for participation. The most common subjects studied by participants were mathematics (40% of participants were studying this subject), chemistry and geography (26%), biology (25%), physics (23%) and economics (21%).

Young people were assured that it would not be possible to identify them or their educational institution from the data. In presenting findings we refer only to the number of focus group, and sex of participant where available: no identifying details are included, and place names are redacted.

## Participants

The characteristics of participants within each institution are found in Table 1 and 2. Young women were under-represented in the sample, as were young people of voting age and above.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Focus group (FG)** | **Number stated female** | **Number stated male** | **Not stated** | **Total** |
| 1-6 | 8 | 14 | 1 | 23 |
| 7-11 | 10 | 20 | 0 | 30 |
| 12 | 2 | 7 | 0 | 9 |
| 13-16  | 10 | 8 | 4 | 22 |
| **Total** | **30** | **49** | **5** | **84** |

Table 1: Sex of participating young people (grouped by school/college)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Focus group (FG)**  | **16** | **17** | **18** | **19** | **Not stated** | **Total** |
| 1-6 | 5 | 10 | 3 | 3 | 2 | 23 |
| 7-11 | 17 | 12 | 1 | 0 | 0 | 30 |
| 12 | 5 | 3 | 1 | 0 | 0 | 9 |
| 13-16 | 5 | 12 | 1 | 0 | 4 | 22 |
| **Total** | **32** | **37** | **6** | **3** | **6** | **84** |

Table 2: Age of participating young people (grouped by school/college)

## Methods

In a focus group, participants tend to come together for a one-off meeting to discuss a particular topic (Bedford and Burgess, 2001). They can provide the opportunity for marginalized groups to talk about issues relevant to their lives in order to produce a collective testimony. Focus groups enable participants to generate and share background information to ensure that language and concepts are grounded in the language and experiences of the participants (Bagnoli and Clark, 2010), here young people in fracking communities. Some of the participants in this study knew each other, but many did not. Fracking is highly controversial in these communities, so there was a need to be sensitive to participants who might have relatives working in the industry as well as those who have anti-fracking activists in their family, or are activists themselves. We highlighted our interest in their personal experiences, their questions. We also started the group by stating that we were particularly interested in where there was disagreement, and the reasons for this. We held off asking young people about their attitudes and feelings towards fracking until the end of the focus group to avoid creating situations where participants felt the need to defend a position, which has the potential to be polarising. The entire focus group was facilitated, with some opportunities for participants to discuss amongst themselves, with these conversations recorded.

An in-depth focus group guide (see supplementary information) was used in 16 focus groups in four schools and colleges to elicit young people’s experiences of fracking and associated decision-making processes, and to understand their capabilities and the impact of fracking on these. The focus group started by asking whether young people were familiar with the term, what they knew and understood about fracking processes and impacts. This allowed us to interpret their responses in relation to what they believed about fracking. We also asked young people to compare shale gas extracted by fracking with other sources of energy, and asked them to respond to a scenario. Rather than ask what functionings young people valued, which would be difficult to answer in the abstract, we looked for evidence of what young people valued in their responses. The majority of focus groups lasted approximately 60 minutes and consisted of 4-8 participants, but some were larger because the demand to participate was greater than the number of facilitators available. The focus groups were conducted in a vacant classroom space and were audio-recorded and transcribed.

## Methods of analysis

Focus group transcripts were analysed to identify the functionings (doings and beings) valued by young people, and the ways in which fracking interacted with them being able to achieve desired functionings. Nussbaum’s central capabilities along with Holland’s meta-capability (sustainable ecological capacity) were used as an overarching framework for the analysis, and were applied as themes to the dataset. A collaborative approach to data analysis was taken, whereby the mapping of data onto the themes derived from Nussbaum’s central capabilities was discussed within the research team (comprising researchers from science, education and policy backgrounds) and the agreed interpretation is presented here.

Whilst Nussbaum sees scope for rearranging and adding capabilities, most of the data from young people mapped on to these capabilities, albeit sometimes with a different emphasis. Capabilities belong to individuals rather than groups so in our analysis and reporting we are inclusive: not all young people discussed the same capabilities. We looked for evidence of where capabilities were enhanced, and where they were degraded. The dataset was rich and covered a wide range of issues associated with fracking including knowledge and understanding of the science, knowledge of political processes and perceptions of protest. Here we focus only on the data associated with young people’s capabilities.

# Findings: what is the impact of fracking on young people’s capabilities?

In this section, we first identify desired functionings that young people valued. We follow by identifying the freedoms and unfreedoms they faced. In accordance with Holland’s argument that sustainable ecological capacity is a meta-capability, we start with this before examining the impact on young people’s capabilities. The order in which the central capabilities are presented do not reflect importance: all capabilities are needed for the achievement of wellbeing. Quotes are attributed to the focus group (FG) in which they were expressed.

## Sustainable ecological capacity

Young people valued enjoyment of the land, countryside, plants and animals, corresponding to Nussbaum’s ‘other species’ capability. Young people valued the environment in its own right, as well as for its use to them, for example being able to enjoy recreational and economic activities associated with the environment, and providing them with a sense of place. They also value the environment for the support it could provide to future generations. This was threatened by fracking. Young people described ‘scars’ on the landscape, industrialisation, machinery and noise.

It just ruins everything and you just think now it’s going to take over the countryside as well. Female, FG1

Day to day life like obviously you’ve got air pollution, you’ve got traffic pollution, noise pollution. Protesters. But then also earthquakes and tremors. Female, FG15

Young people desired to prevent harm to animals including livestock (particularly where fracking takes place near or on farmland) and wild species.

If you’re looking at the community, that’s not just the people, that’s the wildlife as well, so it encompasses the environment as well. Female, FG15

Young people saw a range of environmental impacts of fracking activity, for example by the volume of water used and the diversion of this water from agriculture and domestic use:

The amount of water that’s actually used because they have to use it to do the whole process. So they're having less clean water to use so they’ll have to drink bottled water and it may increase costs which may lead to more of income being spent on basic necessities such as water. Male, FG7

As well as the volume of water, the chemicals added to water to frack were considered a threat to the environment, and ultimately to human health. Young people were unsure of the chemicals used in fracking fluid, and were concerned that chemicals used elsewhere were carcinogenic.

It can be toxic if it leaks into a water reservoir and then you know it can poison all the environment around it. Male, FG1

In addition to the local environmental impacts, young people were concerned about climate change, and saw the need to take local action to prevent negative impacts on distant people and places.

I don’t understand how we are still doing it. We’re complaining about the icebergs melting and all of that but then we’re going to carry on fracking and creating emissions which affect all of that. It’s just confusion and anger I feel...what are we doing?! Female, FG1

The young people valued the rural landscape and way and quality of life, and freedom from pollution. They were concerned that even after fracking ceased, they would be left with a degraded environment.

If you take a chunk of something out of the ground it is not going to magically appear back overnight...eventually you are going to end up with issues with your land, you might end up with landslides, you might end up with sinkholes, basically making the land unusable for farming... then you can't use that land for many years. It does have a lasting effect, even if in the short term you get something good out of it. Respondent, FG3

We should be focusing on things that are going to last a lifetime and leave the planet in a good state for future generations to come. Male, FG9

Fracking was found to have a negative impact on young people’s perceptions of sustainable ecological capacity, with impacts extending in both space and time. The degradation of this capability was seen to have an impact on other capabilities, i.e. to be a corrosive disadvantage, with fracking having an impact on the sustainable ecological capacity which leads to negative impacts on health, ways of life and emotional wellbeing.

## Bodily Health

Nussbaum describes the capability of bodily health as being able to have good health and adequate shelter. Young people valued their health, and saw fracking as a threat. Environmental impacts were perceived to be a cause of poor health, particularly in terms of the impact of polluted water from the fracking process. Young people saw health as competing with employment and income. They saw economic benefits from fracking going outside of the community where the environmental and health effects would be felt:

I mean it’s mainly people who are higher up in power [who benefit from fracking]...and except for people who have got jobs from it. But I don’t think that’s as important as human health. Female, FG11

Health and being able to hold employment are both valued requirements for a life worthy of human dignity. However, the situation with respect to fracking in the community forces a choice to be made between these incommensurable functionings. This is an example of tragic choice.

Young people saw fracking as a contributor to global climate change, which they associated with deaths in countries far away. They noted in a somewhat sarcastic tone how the benefits were being positioned:

It could be global impact is one million people die but the local impact: they get nice shops. Respondent, FG10

The threats to functioning bodily health were perceived to come chiefly from polluted wastewater from fracking. Young people were sceptical about how arguments about fracking were framed by government and media, observing and emphasis on earthquakes rather than water pollution.

I think people are less aware that that is a problem...they don’t know how it can poison water supplies. Female, FG12

Another connection between health and control over the environment was made in relation to regulation. Young people saw the need for legislation to protect their freedom to achieve functioning health and safety, and for this to be monitored independently.

If you looked at the local impacts you could say, “This is having a clear direct impact on our health. If you truly represent us, you should then not allow that to happen”. Male, FG3

Although they did not report being well informed about regulation and monitoring, young people considered UK regulation to be comparatively robust on seismicity. However, they felt that they could not trust authorities to protect health through existing water regulation and monitoring regimes.

Well, in 2017, Cuadrilla were allowed to carry out their own health and safety assessments with one of their…I think it was “internal experts.” But that’s, like, asking someone to grade their own project, of course you’re going to come out with an A\*. Male, FG4

Bodily health was valued as a capability by young people, and they saw polluted water from fracking as a threat. They saw other capabilities such as control over the environment as being able to influence health both negatively and positively (where robust regulation was enacted and enforced). At present the impact of fracking on bodily health was considered negatively through their response to how industry was being regulated and how water quality was regulated and monitored.

## Shelter and mobility

Nussbaum includes the ability to have adequate shelter under the capability of human health. These young people valued the integrity of their property, and of the land in their community. Many young people and their friends and families reported experiencing tremors. They were largely unfazed with those they had experienced, but were concerned about the extent to which seismic events might become more intense, damaging or frequent. Shelter (housing) was connected with mobility, specifically the (in)ability to move out of fracking communities.

For Nussbaum, bodily integrity is taken to be the ability to move freely from place to place. Young people spoke of disruption, and for this reason we discuss mobility as the capability of value to youth. Short-term movement was restricted by increased traffic associated with the fracking site as well as by protesters, with young people at times unable to travel to school, college or work as FG9 and others revealed.

Female 1: It’s been a massive problem on that road, hasn’t it, and it’s quite a major road and there’s a lot of people protesting.

Female 2: Yeah, you could be backed up for like hours.

Mobility was also linked to health, with some concerned about the protesters associated with fracking blocking major transport routes:

I know they stopped an ambulance getting through a couple of months ago. They wanted them out of the way because they blocked the motorway entrance for it. Male, FG8

Longer term movement in and out of the community was identified as problematic by the young people: existing residents were unable to move out due to the devaluation of house prices, and people did not want to move in because of the fracking operations.

There’s like social impacts because people generally don’t want to live around the area if there’s drilling going on nearby. Male, FG11

Integrity of land and property was generally valued in terms of its economic value, without which people were unable to move. Falling house prices prevented people from being able to move *away* from the fracking site.

I know a few people who’ve been trying to sell up…they’re finding it quite difficult to sell because nobody wants to buy near a fracking site. Anybody that doesn’t risks losing money and possibly at some point even their property or the integrity of it. Male, FG4

The data demonstrate that functioning bodily health and mobility was valued by young people, but that the freedom to achieve the capability was undermined by life near a fracking site through both environmental (the impact of seismic events on structural integrity of property) and social (the response of people and communities to fracking) impacts. Fracking caused there to be protesters, which caused there to be disruption to mobility, which causes a threat to health. The data suggests that fracking presents a corrosive disadvantage, with young people reporting a disadvantage in one domain (here, bodily integrity or mobility) having negative effects on other domains such as health and education.

## Affiliation - living in community

Nussbaum recognises two aspects of affiliation: the ability to live with and towards others, and having the social basis of respect as a dignified being of equal worth to others. Young people valued harmony in the community, and saw fracking and associated protests as driving conflict and divisions.

It can sometimes cause a bit of divided opinion...you have some people protesting and some people going to work for it. Female, FG4

Young people discussed the importance of a quiet life, free from noise and visual pollution, and for the continuation of activity including tourism as an industry and agriculture as an industry and way of life. This was threatened by divisions resulting from the actions of fracking companies:

There’s three farmers who own that area of land and they all got massive sums of money, more than if they would have sold that land to another farmer or something like that, so they gave up their land … it’s only just a small part, and they got paid loads for it. They’ve been getting a lot of hassle. Respondent, FG5

Others are going through hardship and like difficulties because of fracking. Obviously I’m going to support them because money isn’t as important as family. Male, FG12

Young people saw fracking as having an impact on community cohesion and described heightening tensions in the community:

People don’t want to drive down [that] road and see the protestors, so it’s not just the health, it might be the overall vibe of a community could be changing. Respondent, FG1

They also felt that their neighbourhood had been poorly represented as a result of fracking:

Our community’s been put in a negative light because it’s in our area and the bad aspects of it like being an eyesore, causing tremors, the possible pollution of the water. Male, FG12

The impacts of fracking were also thought to interfere with community life as usual as it involved diverting public resources to the fracking site, exacerbated by the view that many protesters tended to come from outside the community:

There is a massive police presence, and I think some people get annoyed about the protesters because of all the money being spent to send the police there...I think that just puts people off protesters. Male, FG3

Young people described ways in which the social basis of respect as a dignified being of equal worth to others was not achieved because of the way in which political decisions had been taken. They saw no recognition of youth interests:

But because we are only young there’s not necessarily much you can do because usually it’s like the adults that are in power so you don’t really get as much of a voice unless you have lots of people come together and you kind of work that way. Female, FG11

Young people felt that as members of a small rural community they were seen as of less worth than others. The democratic deficit felt when the secretary of state over-ruled the local decision against planning permission for fracking resulted in feelings of anger and impotence. Young people saw themselves as living in, as one participant put it, the ‘sacrifice zone’ where their health, environment and the livelihoods provided as a result of the environment (agriculture and tourism) were sacrificed for a supply of energy and the economic gain of others. Risks were perceived to be present both now and in the future. The data here demonstrate corrosive disadvantage, whereby affiliation is disadvantaged through lack of material and political control over one’s own environment.

## Control over one’s environment

Control over one’s environment, both political (being able to participate in decisions that govern one’s life) and material (being able to hold property and employment on an equal basis with others) was an important capability for the youth in this study.

### Material control

Youth valued access to sustainable industry, economy and employment and control over energy supplies, water, land, air and property, and employment. They also valued access to energy to meet current demands.

We’re doing it because the UK isn’t very energy secure. So it would stop reliance on overseas energy. Female, FG15

Connected to this, young people valued affordable energy, although their views were divided by the extent to which reduced energy costs would be passed on to consumers. Young people also desired energy to be reliable, efficient and clean (renewable), identifying these criteria to be important when comparing different ways of producing energy. They valued access to free clean and safe drinking water, and desired not to be put at risk by uncertain or risky energy interventions.

You’re paying the prices with the environmental and social impacts at the end of the day. Male, FG9

Some young people perceived energy supply (however it came) to be pitted against environmental impacts and health, asking “if not here, where?” and some were resigned to living in the ‘sacrifice zone’. They recognised the challenges of living in an area where ‘traditional’ industries were in decline, and the need to replace them with new industries to counter existing socio-economic deprivation. Young people wanted these new industries to be sustainable, but noted that for some, economic survival shaped their responses to fracking:

I think we’ve got to think about the economic impacts as well, like if you find out that there’s going to be fracking on the land but maybe your gas prices are going to fall then that probably invited a lot of people to sort of agree with it. Male, FG6

There were concerns however that fracking would have negative impacts over the longer term, damaging industries and ways of life.

It can cause problems for financial reasons or possibly just the quality of farming as well because if you’ve not got clean water to use because fracking companies are taking it all, you’ve then got to export it or import it into your farm or your company which then increases cost margins and making less profit, so it’s financial impact. Male, FG7

An important aspect of material control (connected to political control) valued by the young people was climate action:

[The government] has been promising all these big changes and reducing carbon emissions and all this stuff, but then they’re still going ahead with things that will be detrimental to the environment in the future if they continue...they’re contradicting themselves and that makes me feel annoyed about fracking. Female, FG15

Young people wanted the government to act with long term environmental interests in order that the environment became no more degraded than it is today, leaving the planet habitable for the next generation. They recognised that fracking in one place had implications on the global climate through greenhouse gas emissions.

### Political control

The challenges to the realisation of the capability of control over one’s own environment was also evident in how young people discussed political participation. Young people valued recognition and trusting government. They wanted to see their interests being represented within political processes and by industry. However, they were not seen to be.

If you looked at the local impacts you could say “this is having a clear direct impact on our health. If you truly represent us, you should not allow that to happen.” Male, FG3

Young people recognised that those in power had control not only over the local environment, but over the global environment and therefore the capabilities of people in other countries and contexts. As noted by the participant in FG15 who confuses renewable and non-renewable, young people valued robust regulation and international agreements such as the Paris Climate Accord to protect people, property and environment and which minimises risks, and saw the need for coordinated international action on fracking in relation to the climate crisis:

If we were to say no to fracking, all the countries in the world would have almost no choice but to attempt to try to find ways of using [non-]renewable sources, and if each country starts doing it one by one, it will have a massive, positive effect on global warming. And if you allow fracking... one day it’s going to catch people back up and then we’re going to be in trouble. Male, FG15

Those who felt informed about fracking, and also about the ways in which they could express their views politically, believed that functioning political control had been limited by the overturning of local democratic divisions. However, young people preferred formal political methods, and online campaigns as preferable for achieving this functioning:

With fracking, I think it’s a much better way just to talk to the authorities about it. Respondent, FG1

This was largely due to the corrosive impact of protest on their mobility and other capabilities. Referenda, lobbying, writing to local representatives, using YouPoll and other surveys to inform decision making were mooted as ways to involve local people in decision-making but they perceived these to be largely ineffective, and observed that people were ‘sick of voting’. Furthermore, whilst there was opposition to fracking, they saw a need to select representatives in the round, where for example, candidates’ positions on fracking had to be weighed against their position on investment in the community:

Fracking could ruin a community but in the same sense, like a bad politician can ruin a community with other things like not investing enough into social services will equally do as much so you have to figure out how bad each policy is. Male, FG6

Young people reported that their communities have a range of socio-economic needs, and in a situation of limited budgets (which were not challenged by the groups) decisions about fracking were perceived to pit sustainable ecological capacity against social care and other priorities.

Whilst many young people not report participating in protest, they valued the ability for others to protest, and saw protesters as pushing fracking onto the political agenda:

I would think it’s a good thing that people are standing up. Respondent, FG5

Young people saw their local political control being degraded by national government, with their community’s preferences being sacrificed for material control of energy and economic interests at a national level, with the government protecting industry over people. They felt unheard, with no control despite protests:

It’s like all the protest against it is just ignored by the government because they want stuff like tax revenue and the energy that the big company would bring in. Male, FG6

Young people were sceptical about the extent to which information and evidence was used in decision-making.

It’s just frustrating because...you feel like you’ve got all the answers and no-one’s listening...the people that are making the decisions about it aren’t going to be directly affected...you feel quite helpless. Female, FG1

Other non-governmental ways in which young people thought they could achieve the functioning of political control was through donations to pressure groups, participating in Fridays for Future, signing petitions and participating in protest. Young people also considered direct engagement with the company, in recognition that protest needs to be targeted at decision makers. Protesting was positioned as extreme:

...you have got to do something big to get the attention of the people at the top, otherwise you are just making the fracking employees, they are going to be more aware, but that doesn’t really help your cause, unless the CEO or whoever knows about it. Male, FG3

Young people had knowledge about fracking to a greater or lesser degree, and about how to participate, but not the agency to put this knowledge to work in gaining control over their environment. This presents evidence of corrosive disadvantage, whereby the degradation of the sustainable ecological capacity brought about by lack of political control over the environment inspires protest, which leads to reduced mobility having an impact on education and health.

## Knowledge (being informed)

Nussbaum describes the capability of being able to imagine, think and reason in a way informed by education. Young people valued knowledge about fracking. They collectively had a great deal of knowledge about fracking, but many felt insufficiently informed. Functioning knowledge was hindered in two ways: limited research to answer young people’s questions, and limited access to this research. Whilst fracking did not stop them from obtaining knowledge, they felt that it was a subject about which they now needed knowledge, and some of that knowledge was perceived not to exist. This was unsettling for some, for example in relation to the contents of fracking fluid:

It’s quite unnerving to not know what is affecting what’s around you... Female FG1

Young people valued access to evidence which they could put to work in forming opinions and making decisions. Where limited evidence exists, they desired new energy interventions to be researched on their introduction.

I know that it concerns a lot of people in the area...we know some of the effects but they’re only short term at the minute, we don’t know what the long-term effects could be. Male, FG12

I just think at the moment there’s not enough research and trials been done to actually extract it safely, and it’s that safety element – the fact that it could be polluted water...it could go right but then it could go wrong, and it’s that ‘could go wrong’ bit that I have a bit of an issue with, especially living so close to a site. Respondent, FG2

As well as valuing the evidence itself, young people valued access, and the ability to interpret and evaluate information and to separate myths from reality.

It can be hard to separate the actual fact of what it does from these sort of sensationalist rumours that just sort of swirl around....so the impartial take on the actual facts might just be a little bit obscured so I never know quite what to believe. Male, FG6

This capability was limited by the ways in which it was treated, or for some, not treated in school.

I don’t feel like the high school sources were very informative. They were kind of just like, ‘Whatever you need for GCSE, here’s the basics’...we talked about it for like….basically five minutes. I don’t think they're there to actually teach you the impact, maybe just it’s like case studies or whatever the exam board has set as is important to know...they never told us really about the negative aspects in detail because they tried because there’s not as many, they can’t think of as many positive ones to outweigh it so they just kind of state what it is and that’s about it*.* Female, FG15

Young people had knowledge about a range of ways in which they could express their views but felt that they were not listened to because they had insufficient political or material control over their environment.

In conclusion, young people valued a range of functionings: health, movement, energy access, access to safe and clean drinking water, access to safe housing, recognition in decision-making processes, action for the climate, access to sustainable employment, industry and economies, being informed, community cohesion and enjoyment of the land and countryside. It is important to note that the absence of some capabilities from the data does not mean that young people did not value these, but more likely that these were not felt to be threatened or enhanced by fracking.

# Discussion and conclusions

Capabilities approach is a novel way of looking at the impacts of fracking on youth. The approach has allowed us to contribute to knowledge about the impact of an energy intervention on the wellbeing of young people living in the locations of resource extraction, and on their ability to lead a life of value to them.

The research question guiding the study was ‘what is the impact of fracking on young people’s capabilities?’ Whilst correlational studies of representative adult populations have found that support for fracking varies with gender, age, geographical location, political leaning and familiarity with the issue with female, younger and liberal respondents generally more opposed (Clark et al., 2012), we found widespread opposition amongst respondents, the majority of whom were male. We found that whilst natural gas was valued as an energy source, renewable or nuclear options were preferred, and young people identified a range of negative impacts of fracking on wellbeing, mainly through the destruction of ecological capacity. This was connected to a lack of material and political control that young people had over their environment, and resulted in threats to health, mobility, and affiliation. In common with Sangamoorthy et al (2016) and Hirsch et al (2017) we found that the disruption of the physical environment and landscape as a result of fracking disrupted young people’s sense of place and (rural) identity and caused them to experience a range of negative impacts. Whilst some adults might experience initial benefits through land leasing, young people were sceptical about the extent they would experience benefits, and the young people in this study were concerned not only about risks present now but also those that would remain in the future. These long-term impacts leave youth disproportionately affected by the impacts of fracking – and unable to participate in associated decision making.

We find evidence of the ‘resource curse,’ which suggests that areas abundant in natural resources perform poorly in measures of economic outcomes, educational attainment, and other measures of well-being (Carpenter et al., 2019). The young people in this study recognised that fracking was a threat to their community specifically because it is a rural community with a low population density, where traditional industries are in decline and there is a need for economic stimulation. This was used to impose fracking on them, and whilst young people recognised the economic argument, they were not convinced by this, and believed that their living conditions would worsen as a result of fracking. In contrast to Evensen and Stedman (2018), we did not find evidence of binary relationships between perceptions of flourishing in existing communities and support or opposition to fracking. Indeed, young people recognised the need for economic development to support flourishing in their communities (which had experienced industrial decline), but they rejected fracking as a response to this, preferring investment in renewables to investment in the fossil fuel industry.

We found that the impact of fracking on the ecological meta-capability led to perceived negative impacts on young people’s central capabilities. In particular, they were threatened by the impact of fracking on the sustainable ecological capacity which had consequences for bodily integrity, shelter, mobility, affiliation, and control over their environment. We saw evidence of corrosive disadvantage, where a disadvantage in one domain has (negative) effects on other domains, here local environmental disadvantage has negative effects on the local economy, health, and community relations. For example, a loss of control over their environment led to problems with affiliation between members of their community, with the ‘vibe’ of the community changed as a result of the actions of the fracking industry and government. Lack of political control over the environment had an impact on their wellbeing and on community life. Youth responded with anger, frustration and helplessness to fracking because the will of the community was not listened to by central government. This democratic deficit left them sympathetic to the aims of protestors at the same time as being frustrated by the impact that protest had on their lives in terms of restricting access to education, health and work. We also see evidence that young people believe their community is forced into what Nussbaum (2011) calls ‘tragic choice’ whereby two capabilities collide, and the choice over which is practically valued involves doing wrong to someone. This was observed in the data where young people saw choices to be made (and which they had no input into) between national energy needs and energy security and local environment and landscape; and between national economic prosperity and the wealth, health and mobility of local people and communities.

The young people in this study share the concerns by adults found by Partridge et al (2017) and Thomas et al (2017) including concern for the future associated with environmental risks, distrust of industry and government, and concerns about contributions to climate change. However, in contrast with the findings of the systematic review of public perceptions of hydraulic fracturing in the USA and Canada (Thomas et al., 2017) we did not find young people perceiving that the local economy would be boosted by fracking, indeed they were sceptical of this, believing that profit, if present, would not remain in their communities. Whilst young people in this study did not discuss prior experiences of resource extraction in their communities (the most common industries they discussed were agriculture, tourism and retail), they drew on reports of fracking in other locations, most notably the USA, noting environmental harms experienced elsewhere that they wanted to avoid, and comparing UK regulation favourably with that in the USA, albeit without reference to specific regulation other than the upper allowed limit on seismic events.

The impacts identified by the young people - and the scale of these in time and space - point to an act of slow violence on these communities. Whilst some impacts of fracking were visible - fracking infrastructure, traffic and protest - others were invisible, but no less real, not least the threats that young people recognised in relation to the chemicals used to extract oil, which were present in the minds of young people as a threat to their water supply and therefore to their health. Similarly the impact of fracking on the climate which would be felt into the future. Davies (2019) argues that “slow violence presents us with a political geography of deferred environmental threats, where violence is out- sourced – not only to the global south – but also to a global future.” (p.2). Whilst the study did not take place in the global south, the young people were aware of their communities as being economically disadvantaged and saw themselves as living in ‘the sacrifice zone’. They talked about long-term consequences on the environment and human health, and were pessimistic about how their land, health and planet would be left when fracking stopped. This corresponds to the findings of Partridge et al (2017) who found that people in the UK and USA were not only concerns about specific risks such as contamination of water, but also about the impact on climate change, the development of renewables and the short-termism of politicians’ visions which had negative consequences for future generations. The youth in our study were also concerned about the impact of fracking on people in regions more susceptible to the effects of climate change.

All young people were living or being educated within 20 miles of a fracking site. In fracking, distance is a critical factor in environmental risk assessments as there exists a higher risk of groundwater and drinking water contamination and a higher human health risk due to exposure to gas emissions (Meng and Ashby, 2014). Whilst it is unlikely that these findings are applicable to young people in locations where fracking is not operational - Howell (2018) found there was less support in the UK for fracking locally than there was for fracking generally - the study provides insights into the range of impacts an energy intervention can have on young people’s capabilities. When weighing up decisions about fracking, this study adds new knowledge about the impacts young people experience from these energy interventions and highlights the voices of youth, often absent in discussions about fracking. The capabilities approach is likely to be useful in other situations and with other populations where fracking is more advanced. Similarly, we have been able to identify that young people see fracking as a process which has impacts which have long-term, global consequences, and as such adds to our understanding of how youth experience slow violence. In common with Williams et al (2017) who worked with lay publics including parents, allotment holders, ex-miners amongst others, we found scepticism about mooted economic benefits. Where there was negativity towards fracking, this was based on known environmental risks and saw beyond the economy *versus* environment argument, discussing fracking in the context of alternative responses to energy demands.

A range of implications arise for policy, practice and future research. The way in which political decisions were taken removed what little control young people felt they had over their environment. In common with Drake (2018) who interviewed protesters in Yorkshire, England, we found eroded trust in politicians and views that government priorities were misplaced, with fracking favoured over renewable energy solutions. There is a need for the inclusion of young people’s experiences and perspectives in decision making, particularly where it is clear that the impacts will extend into their futures. This is likely to be most effective if it happens in places where young people are - in schools and colleges. Young people require more information about fracking, and there is a need to ensure that education meets the young people in their local lives, i.e. goes beyond the prescribed national curriculum. However, it is not possible to teach about every possible intervention and there is therefore a need to allow for flexibility based on local priorities. Critical pedagogies of place, whereby place-based approaches are combined with critical approaches which challenge taken-for-granted assumptions, practices and outcomes in education, provide potential here. This could include how air and water are regulated. There are also implications for research. Young people demand wider dissemination of research knowledge related to fracking. This might include making existing research open-access, providing research summaries accessible to wider audiences and involving youth as stakeholders in deciding the research questions that should be prioritised. The capabilities approach has allowed a consideration of the impacts of fracking on the wellbeing of *individuals* affected, not in relation to predetermined metrics more common in distributional theories of justice.

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