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Place and avoiding the race to the bottom of the fractured well.

Abstract

Purpose

This paper considers the potential implications of the layering of regulation in relation to hydraulic fracturing (fracking) at the borders between the nations of the United Kingdom.

Design/methodology/approach

The paper utilizes a qualitative research method grounded in particular in legal geography to examine the existing approaches to regulating hydraulic fracturing to identify the places and their features that are constructed as a result of their intersection at the borders of the nations comprising the United Kingdom.

Findings

The current regulatory framework concerning hydraulic fracturing risks restricting the places in which the practice can occur in such a manner as to potentially cause greater environmental harm should the process be utilised. The regulations governing the process are not aligned in relation to the surface and subsurface aspects of the process to enable their management, once operational, as a singular constructed place of extraction. Strong regulation at the surface can have the effect of influencing placement of the site only in relation to the place at which the resource sought reaches the surface, whilst having little to no impact on the environmental harms which will result at the subsurface or relative to other potential surface site positions, and potentially even increasing them.

Originality

Whilst the potential for cross internal border extraction of gas within the United Kingdom via hydraulic fracturing and the regulatory consequences of this has been highlighted in academic literature, this paper examines the implications of regulation for the least environmentally harmful placement of the process.

Research limitations/implications

The paper is limited by uncertainty as to the future use of hydraulic fracturing to extract oil and gas within the United Kingdom. The issues raised within it would also be applicable to other extractive industries where a surface site might be placed within a radius of the subsurface point of extraction, rather than having to be located at a fixed point relative to that in the subsurface. The paper therefore raises concerns which might be explored more generally in relation to the regulation of place of resource extraction, particularly at legal borders between jurisdictions and the impact of regulation which does not account for the misalignment of regulation of spaces above and below the surface which form a single place at which extraction occurs.

Social implications

The paper considers the potential impacts of misaligned positions held by nations of the United Kingdom in relation to environmentally harmful practices undertaken by extractive industries which are highlighted by analysis of the extant regulatory framework for hydraulic fracturing.

Keywords

hydraulic fracturing, fracking, place, regulation, law, environment, devolution,

Introduction:

The use of hydraulic fracturing or 'fracking' to extract natural gas has had variable prospects in the United Kingdom. Until November 2019 it appeared that, in England, hydraulic fracturing was potentially destined to become a new source of natural gas. However, on reviewing evidence and outcomes presented in an Oil and Gas Authority (now the North Sea Transition Authority, and a UK government regulatory organisation operating independently of the Ministry of Business and Energy) report (Oil and Gas Authority, 2020) into seismicity at the Preston New Road site on the Fylde coast in Lancashire, the government announced a moratorium on the process until compelling new evidence was presented to alter this position. Despite the moratorium on the basis of risk, the recent cost of living crisis and changes in leadership of the governing Conservative party led to the re-emergence of the debate over whether this process should be utilised to access natural gas, which retains a key role in the short term in providing energy security and progression towards espoused climate change policy goals (Department for Business, Energy and Industry Strategy, 2022 and Committee on Climate Change, 2016).

The potential for hydraulic fracturing to be used in England has been tethered to support for the process at a local level, in the areas where hydraulic fracturing would occur, as well as to safety concerns (Department for Business, Energy and Industry Strategy, 2019). This caveat to the approval of sites using this process to extract natural gas considerably raises the significance of the physical spaces chosen through such approvals processes to become places in which hydraulic fracturing is permitted to occur. Such significance is however in itself not unusual within the context of planning law generally. Consideration of suitability and acceptability of spaces in which any development is situated are, by design of planning rules, a key aspect of such processes, from the consideration of scientifically measurable physical impacts on a surrounding area to the more subjective considerations of aesthetics by planning authorities. One of the basic tenets of the field of legal geography is that place (in this case that at which hydraulic fracturing occurs) is inextricably connected to, and constructed by, approvals for projects which have environmental, social and legal consequences (Braverman, A. Blomley, N. Delaney, D and Kedar, A, 2013). In the context of hydraulic fracturing (and other subsurface extractive industries) however, the nature of the process is such that the space focused upon by the majority of the regulatory framework, the surface extraction site, is not the only point of environmental impact. The subsurface point of impact is potentially not even within the same legal jurisdiction for the purposes of planning approval of the place (permitted connected surface and subsurface aspects of the process) in which extraction occurs. Whilst the subsurface impacts of hydraulic fracturing are regulated by other aspects of the regulatory process, these are measured relative to impacts upon the surface and non-place specific environmental standards. The contribution of this piece is the presentation of hydraulic fracturing for natural gas as an example of the potential dangers of regulation of extractive industries across jurisdictional borders. More specifically it argues that it is possible for regulation of the joined surface and subsurface spaces across jurisdictional borders to construct places of extraction without effective consideration of the optimum environmental outcome of an extraction process occurring. To clarify this potential, a brief explanation of the process of hydraulic fracturing to extract natural gas is necessary.

The extraction of natural gas through the process of hydraulic fracturing involves the drilling of wells from the surface extraction site, vertically initially and then turning towards the horizontal to allow the pipes inserted into the well to reach pockets or reservoirs of oil or gas under the surface of the earth. Whereas oil or gas extraction is often perceived as being where these pipes meet large single pockets of oil or gas which is then pumped out until the reservoir is exhausted, hydraulic fracturing offers the opportunity to extract less accessible resources. This is as oil and gas can become trapped in more dense material, such as shale, in many far smaller pockets within an area. To access these multiple smaller pockets of oil or gas through a single well, and to avoid the drilling of individual wells for each small deposit, hydraulic fracturing is used to release these smaller reservoirs and allow them to flow to the central well and be extracted via a single pipe at the well head on the surface. The release of these small

pockets is achieved by injecting mixtures of water, sand and other chemicals into geological formations such as shale, other rocks, and even coal, causing fractures within their seams and to allow oil and gas which would otherwise be trapped to flow into the central pipe for extraction at the surface extraction point.

Crucial to this discussion is the fact that the surface site and the point at which the fractures are created below the surface of the earth to enable the flow of gas upwards through the central pipe can be a considerable physical distance apart. By way of example, a well drilled at the Preston New Road site in Lancashire mentioned above extended over 800m horizontally and this distance was not at the furthest extent at which the process remains viable. The nature of hydraulic fracturing is such that 'significant areas of land might form part of a single project,' (Pearson and Brant, 2020) although not visible on the surface, and span more than one legal jurisdiction for the purposes of approval of the process. The implications of this for the consideration of the co-constructed places in which hydraulic fracturing might occur is significant. These two spaces, the surface extraction site and the subsurface process locations, can be considered either as a single constructed place, or, alternatively as two distinct places upon which a single surface extraction site is regarded as having impact for the purpose of planning. The latter is the manner more reflective of the extant regulatory framework. This conception of the place in which hydraulic fracturing occurs also has the effect of locating the legal focus of regulation largely upon the extraction site at the surface. It ignores the cross-border potential of the subsurface process space, which may be geographically distant and with connections to another legal jurisdiction with interest in regulating the impacts of the behaviour. The reality is that, to describe the current regulation of hydraulic fracturing as permitting, or not, the process within a single place, is to overly simplify the complex layering of regulation which exists.

The impact of this complexity is seemingly significantly reduced by the existence of legislation which has the effect of neutering the legal significance of place for the subsurface pipeline once it achieves a set depth. Section 43 of the Infrastructure Act 2015 grants the right to use of 'deep level land' (beginning at 300m below surface level) for the exploiting of petroleum (oil or gas) and geothermal energy sources. This provision effectively removes any rights of surface landowners above to oppose hydraulic fracturing under their land by providing a blanket right to use land at this depth for these purposes. The impact of this provision also reduces the role of planning authorities. Whilst said authorities ostensibly consider the projects proposed as a whole, this legislative provision granting a sweeping right of use at this depth below the surface limits refusals of permission to being based upon issues arising in relation to spaces involved within the process outside of this demarcated space. Once a pipeline reaches the prescribed depth, its position, and thus the fracturing aspect of the process which occurs there, becomes less connected to the surface site. This is central to the perspective of approvals for extractors and thus to the construction of places in which hydraulic fracturing occurs. They become, for the purposes of the Act, conceptually two separated places upon which law and the permissions it affords have an impact.

The surface extraction site can in theory be anywhere from which the subsurface area can be accessed, irrespective of the landowning rights over the surface area that the petroleum for subsurface extraction lies directly beneath. It might be argued therefore, that the space for this aspect of the process is irrelevant beyond 300m depth from surface level in relation to the construction of a place in which hydraulic fracturing occurs from the perspective of legal geography. It creates an essentially neutered space in which this process can be undertaken without reproach or legal objection. Alternatively, it could be said that the place co-constructed by law and other norms shifts entirely below this depth, relative to the specific extractive actions being undertaken, but which for other actions would not be afforded this broad blanket neutrality. Whilst from a purely procedural perspective either is potentially arguable, this paper contends that the reality is that the significance of the space at which hydraulic fracturing below

the surface occurs has considerable implications for the efficacy of the law which governs the process as a whole, in essence the constructed place at which hydraulic fracturing occurs. The seemingly broad approval of activity at this deep subsurface level has not addressed the fact that it potentially also has significant implications at the surface-level, in part because of the devolved authority over resource extraction within the UK to the individual nations (Pearson and Brant, 2020). The potential for this misalignment to influence the overall environmental impact of hydraulic fracturing operations is the focus of this argument.

The regulatory positions of the devolved nations in relation to hydraulic fracturing.

The basic position of England, Wales and Scotland (Northern Ireland also has devolved oil and gas licensing powers, but is excluded from this discussion owing to the lack of a land border with other devolved nations), is that extraction of oil and gas through newly approved hydraulic fracturing projects is not possible. Note should be made that the practice is not itself regarded as illegal, but permission for undertaking it will not be forthcoming. It is on this extant regulatory framework that the piece comments, and it is worthy of note because of the considerable volume of literature which contends that the process itself or its impacts should be banned or far more strictly regulated for a range of reasons (Lampkin and Wyatt, 2020 and Short, Elliot, Norder, Lloyd-Davies and Morley, 2015) or that the regulatory framework in place is failing to account fully for the public opposition to the practice (Szolucha, 2021). The aim, however, is not to take a particular position in this regard since this has been extensively discussed, but instead examine further the current regulatory position and their potential impacts thereof. However, how the de facto prohibition of fracking is achieved differs slightly in legal form for each jurisdiction. This element of devolved power introduces a further complexity in determining places in which hydraulic fracturing can occur for the purposes of legal regulation, in that the form of regulation can differ between the space in which the surface extraction site is situated, and the subsurface fracking activity.

The position of the United Kingdom in this regard is not unique in having the potential for extraction which crosses internal jurisdictional boundaries, though highly unusual. The particular lack of response to this however is without comparators. The United States of America has perhaps the most developed use of hydraulic fracturing to extract oil and gas, where activities of this type are often referred to as the shale gas industry. Whilst federal and state-level authorities can have oil and gas resource rights in relation to lands over which they have control, the vast majority of resource ownership is private, as rights to oil and gas are attributed to the surface landowner, not to the state via legislation as is the case in the United Kingdom and common in other jurisdictions. This is particularly true of the largest shale gas deposits in the United States in Pennsylvania and Texas which are almost exclusively beneath privately owned land. Both these states have also prevented bans on hydraulic fracturing from being implemented by local municipalities within their jurisdiction and have adopted broadly permissive approaches to the issuing of permits for both the process and its negative externalities. This means that accessing the resource once permission of the owner of the land above the resource is obtained is unconstrained compared to the United Kingdom. As such, the issue outlined in the piece which relates to cross border projects at the surface level, beneath which there is a singular approach to the subsurface resources, would be unlikely to arise in that jurisdiction. This is as a ban on extraction within the surface jurisdiction would prevent a surface landowner affording permission to an extractor with a surface extraction site outside that jurisdiction where the process was permitted. In short, the particular construction of place possible in the regulatory framework in the United Kingdom which gives rise to the problem highlighted by the piece would not arise under equivalent extant frameworks where extraction occurs in the United States of America. Comparison is therefore largely limited to highlighting the peculiar construction of a place of extraction (combining surface and subsurface points) that can occur and which the piece contends presents an opportunity for environmental harm which might be avoided.

That having been said, common issues with regulation of this complex form of extraction process have arisen and been highlighted in legal geography literature relating to both the United States of America and Australia. Worthy of particular note, is the work of Andrews and McCarthy who highlight that the nature of hydraulic fracturing as a process means that, 'the scale of development or hazards or commodification may not correspond with the existing scales of governance' (Andrews and McCarthy, 2014). Whilst the issues this misalignment of regulation with the nature of the process is a common issue, the vast differences in core principles of resource regulation between the United Kingdom and United States of America do still limit comparisons to such overarching observations on the common issues the process itself presents for legal frameworks and political mechanisms. Australia by contrast bears far more significant regulatory similarities to the United Kingdom. As Turton notes, in Australia also there is, 'a strong case for using the professional diversity of planners and their exposure to a wide range of stakeholders to draw out the diversity of opinions' as 'planners can potentially serve as a conduit for accessing industry and government perspectives on key [unconventional gas] issues, such as community protests against the [unconventional gas] sector and industry perceptions of the sector's environmental risks.' (Turton, 2019). Turton offers a solution to the issue of lacking consideration of, amongst others, environmental impacts of hydraulic fracturing, but this assumes a regulatory system akin to that found in the Australian structure. Here again, the impact of the Infrastructure Act 2014 cannot be understated. By removing the ability to contest extraction which occurs below 300m below surface level, an opportunity is created for opposed planning authorities to be avoided by extractors, giving rise to the issue raised by this piece. As such whilst both the American and Australian realities offer some comparative value, this remains severely limited by this idiosyncrasy of the approach to regulation of hydraulic fracturing in the United Kingdom.

Within Wales, the Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction 2015 states that "Where a local planning authority do not propose to refuse an application for unconventional oil and gas development, the authority must notify the Welsh Ministers". (The Town and Country Planning (Notification) (Unconventional Oil and Gas) (Wales) Direction 2015) Successive Welsh Ministers have then confirmed the position laid out by the late Carl Sargeant, then Minister for Natural Resources, in a letter to the Chief Planning Officers of Local Planning Authorities in Wales, which stated that if "local planning authorities are minded to approve them" any proposed projects seeking planning permission which concerned hydraulic fracturing should be referred to Welsh Ministers (Welsh Government, Minister for Natural Resources, 2015). This position has persisted in spite of licensing powers for new oil and gas projects being devolved to Welsh Ministers as of October 2018, and no new licences have been issued in the Welsh landward area since 2008. As such a de facto moratorium, and arguably ban, given the stated approach of the Welsh Government to all onshore oil and gas development, has emerged in Wales (Welsh Government, 2018).

In Scotland, a similar position has been reached, though this followed a comprehensive consultation process called, 'Talking Fracking,' (Scottish Government, 2017) which illustrated public opposition to use of the practice in Scotland. Licensing powers were devolved to Scotland under the Scotland Act 2016, which allows a unilateral policy position to be adopted in opposition to that in England. As a result of the consultation outcome, which also included expert opinion from relevant fields of research and expertise, (Scottish Government, 2017) the then Scottish Energy Minister, Paul Wheelhouse, stated that the Scottish Government position was that it did, 'not support the development of unconventional oil and gas in Scotland' (They Work For You (2017)) and that in particular, 'Scotland should say no to fracking.' (They Work For You (2017)). This policy position was then enforced through a letter to planning authorities within Scotland giving clear directions to this end and, 'effectively ban the development of unconventional oil and gas extraction in Scotland [meaning] that fracking cannot and will not take place' there (They Work For You (2017)). The resource extraction company Ineos attempted to challenge this position, seeking a judicial review of the Scottish Government position, arguing that it was not within the powers of the Scottish government to impose an

effective ban on the practice in Scotland. In rejecting the application, Lord Pentland concluded clearly in the Court of Session that this was in fact a preferred policy position and thus not subject to judicial review (*INEOS Upstream Ltd v Lord Advocate* [2018] CSOH 66). Some campaign groups (Friends of the Earth Scotland, 2020) have questioned this position (*INEOS Upstream Ltd v Lord Advocate* [2018] CSOH 66), given that the importing of gas from unconventional sources accessed using hydraulic fracturing is permitted, but this debate is beyond the scope of this examination.

The position in England is complicated by the devolution of powers to the other nations making up the United Kingdom, which means that the North Sea Transition Authority (formerly Oil and Gas Authority) can only in reality issue onshore oil and gas licenses for England, though it issues advice for use by all UK devolved governments. In spite of this, the outcome achieved in England is in effect the same as in the devolved nations. In November 2019, the then Business and Energy Secretary, Andrea Leadsom, and the Minister for Business, Energy and Clean Growth, Kwasi Kwarteng, announced the end of government support for hydraulic fracturing (Department for Business, Energy and Industry Strategy, 2019). This was achieved through imposition of a presumption that applications for the final stage in the regulatory approval process for hydraulic fracturing consents would be refused. This approach, whilst not eliminating the possibility that all other preliminary steps in the regulatory process may be passed by a private extraction company, appears to make such applications futile and economically unviable. As the governmental press release on this position states:

‘While future applications for Hydraulic Fracturing Consent will be considered on their own merits by the Secretary of State, in accordance with the law, the shale gas industry should take the government’s position into account when considering new developments.’ (Department for Business, Energy and Industry Strategy, 2019)

This is a more nuanced position than those found in Scotland and Wales, as it is not demonstrably prohibitive, but allows for projects to be considered on a case-by-case basis should the Minister of the day see fit to do so. It potentially creates a position where projects could be so-called ‘shovel-ready’ subject only to the final approval stage. Meanwhile, further analysis of the geological impacts of hydraulic fracturing and the potential to effectively monitor (and thus regulate) the effects of the process was carried out to allow for regulatory authorities to ‘evaluate with confidence whether hydraulic fracturing could resume...consistent with the government’s policy aims’ (Department for Business, Energy and Industry Strategy, 2019). This analysis concluded that, ‘[t]he estimation of maximum magnitudes before and during [hydraulic fracturing] operations remains challenging’ and ‘further work is needed to develop these models and incorporate them in risk assessments.’ (British Geological Survey, 2022). The, albeit extremely brief, government led by Prime Minister Liz Truss notoriously engaged in a political dalliance seeking to amend planning processes in England to permit individual local areas to provide consent to hydraulic fracturing projects. This was in breach of the Conservative 2019 election manifesto and to the consternation of her own Conservative MPs, particularly those in Lancashire and the South-West of England who withheld their votes on a proposed Bill to ban the practice (UK Parliament, 2022). The almost immediate change in leadership of the government to Prime Minister Rishi Sunak, has led to this policy being abandoned and the position outlined above remains the current status quo. As such, both scientific (British Geological Survey, 2022) and political thinking is currently aligned in pausing of any further use of hydraulic fracking to extract oil and gas in the onshore context in England.

Hydraulic fracturing is therefore under a de facto moratorium in each of the legal jurisdictions of England, Wales and Scotland, though it is not subject to a consistent legal ban (as is often represented). The position in Scotland and Wales arguably has equivalence to a ban given that neither offers any prospect of future hydraulic fracturing in the event of a shift in understanding of the process and its potential impacts, instead being based upon a wider

position of opposition to hydrocarbon resource exploitation. This reality is achieved by differing legal methods, but the outcome is identical. This status quo is a relatively stable one until further analysis of the geological and other risks of the practice is completed, but global economic pressures, and in particular rising domestic energy costs, have raised arguments for recommencing the practice based on notions of energy security and price stability. As a result, it remains possible that hydraulic fracturing may become a practical reality within a part or all of the UK once again. The most likely candidate for a shift in the policy of hydraulic fracturing is England. Both Scotland and Wales have attached climate change policy to their position on the practice, reducing the likelihood their policies will shift both because of immediate concerns around the safety of the practice for the locality in which it is conducted, but also due to wider action seeking to combat the continued use of fossil fuels for the production of energy. The Welsh position in particular is overt in this regard. Assuming that the positions of Scotland and Wales in this regard remain static, there is the potential for England to allow hydraulic fracturing whilst these two nations retain their opposition to it. It is in this eventuality that the following discussion is situated.

The bespoke nature of the regulatory framework surrounding the process has considerable implications. It demonstrates the complexities of determining the role of regulation in an environment where technological developments are increasingly capable of separating the physical space impacted by harm from the process of creation. This is often seen in the context of online behaviours, where harm is experienced in one place, having been actioned or experienced in another, but rarely is this seen in the context of extraction beyond consideration of the use or processing of materials extracted later in the life cycle of the resource. Hydraulic fracturing provides a key example of the complexities of regulating separated spaces and determining legal place in such a context.

The peculiarities of regulating place both above and below the surface

In a situation where England permitted extraction of oil and/or gas via hydraulic fracturing and Wales and Scotland did not, it will be suggested that there is potential for constraints upon place dictated by law to influence decision-making about positioning of hydraulic fracturing sites which could result in sub-optimal positioning of extraction sites. The regulatory process would not attribute requisite consideration to the outcome of these, what Bennett terms, normativities, put in place by the extant regulatory frameworks. Bennett's normativities are his encapsulation of, 'pre-established, collectively held patterns, framings, practices and goals' (Bennett, 2021) to which those constructing places conform and it is this conformity without wider consideration on which the piece focuses. The question that will then be posed is to what extent law should constrain the spaces in which surface extraction sites can be situated on any criteria other than where these normativities are in their optimum achievable positions for both extraction and environmental protection. This position is created by the divergence in the regulation of surface and subsurface spaces in a manner which does not fully reflect their fundamental interconnectedness in the context of the process of hydraulic fracturing, and the reality that they are a singular site of extraction and thus ought to be considered a singular constructed place in which hydraulic fracturing occurs.

The distinction between deep level subsurface land and other spaces, combined with the devolution of other regulatory powers to nations and smaller localities, has the potential to result in decision-making about the positioning of surface extraction sites which is affected by concerns other than the most efficient and safest singular place for resource extraction, which incorporates both surface and subsurface aspects of the process. This formation of a new legal space in the subsurface by the provisions of the Infrastructure Act, which is also unrestricted by consequence or limitations upon access, shifts the consideration of spatiality at the surface. The splices, to use Blomley's terminology for this interaction (Blomley, 1994) between space, time and law to give both spatial and legal outcomes, created as a result are

skewed in a manner which has the potential to, albeit inadvertently, increase environmental harms and allow avoidance of some of the regulatory positions of which it was originally composed (Pearson and Brant, 2020). This is as an optimum position, once it is established extraction will occur, for surface and subsurface extraction sites to access a resource might be rendered unachievable owing to misaligned regulatory regimes.

Hubbard considers a similar dilemma in relation to the challenges presented by the varied use of beaches, which also have complexly layered legal rules applicable to them. He utilises the term 'inter-legality' to describe this interaction of legal rules which results in inflexibility of means to resolve disputes over the land concerned (Hubbard, 2019). The piece will however remain focused upon Bennett's concept of normativities to present its arguments owing to a significant distinction to Hubbard's analysis of this legal pluralism at the beach (Hubbard, 2019). Hubbard is focused on a singular space, the beach, and the layering of law in relation to that specific location. By contrast the piece at hand is concerned with situations of more than one space (surface and subsurface) which are connected to construct a place of extraction in the context of hydraulic fracturing by layered legal rules which do not concern the both spaces. The Infrastructure Act provision in relation to the extraction of resources found below 300m from surface level, has no direct bearing on regulation of the surface site at which the resource extracted will leave that subsurface space. Indeed, this potential misalignment of layering of legal rules is at the heart of the issue upon which the piece focuses.

This expands somewhat upon normativities as framed by Bennett by including geological features as generating normativities in the context of extractive industries. To explain this in the context of hydraulic fracturing, the position of the subsurface resource sought dictates an area within which an extraction site might be placed from a purely practical perspective which is a material reality. However, this limits a space in which extraction of the resource is possible. Within that space there is a decision to be made as to the optimum position of an extraction site. Responses to the presence of gas beneath the surface therefore are predicated upon both a fixed radius dictated by material constraints, but also a decision made based upon experience, legal frameworks, availability of land via lease, purchase or other arrangement upon which an extraction site might be built, all of which can be influenced by decision makers and by which they are influenced. Such decision-makers would certainly fit within Bennett's conception of a place-manager, since they are evidently, 'sophisticated normative engineers and that their place-making is influenced by awareness of legal requirements, but also shaped by other normative pressures' (Bennett, 2021). Extractors, and specifically those who make decisions in relation to the placement of extraction sites (particularly at the surface) are therefore examples of pragmatic, conscious, goal oriented actors. They are constrained by practical limits, but within these parameters make decisions relative to legal frameworks and other factors utilising their experiences to seek out an optimum site. This is clearly therefore a, 'co-constitutive relationship of people, place and law' (Bennett and Layard, 2015). As such, the existence of gas subsurface would not in itself be a normativity within Bennett's conception were extraction only possible via a vertical well, and thus the location of a surface extraction site fixed by the presence of gas directly below it. However, as extraction can be a considerable distance from the space vertically above the gas reservoir beneath the surface, an element of selection of site is introduced. As a result, the positioning of a surface extraction site can be made in response to the physical presence of the resource, but also 'pre-established, collectively held patterns, framings, practices and goals' (Bennett, 2021) found within the gas extraction industry and extant regulatory frameworks which govern it.

The normativities which dictate the positioning of both surface and subsurface hydraulic fracturing spaces for efficient and safe extraction are many. The most obvious is of course the aforementioned proximate presence of the resource sought, oil or gas, and, for hydraulic fracturing to be considered as a process used for its extraction, and the relevant geological conditions suitable for this form of extraction. These are fixed normativities in relation to place and hydraulic fracturing. They cannot in themselves be influenced by law but decision-makers

are able to vary their response to them within a fixed parameter, in this case a practically viable radius for extraction from the space in the subsurface at which the resource is present. Such a suggestion of these as fixed in nature arguably does not fit into Bennett's bifurcation of drivers for conscious actors constructing places into normativities which are unstable and individual pragmatic objectives, (Bennett, 2021) but their categorisation is less relevant owing to their fixed nature, i.e. hydraulic fracturing for oil and gas cannot occur without the geographical and physical features being in existence. Their role in forming places in which it might occur is undeniable. As a result, their absolute consideration in the decision-making process of extractors can be presumed, in that no application for hydraulic fracturing would be made for a place where it could not functionally occur.

Within these fixed normativities, the influence of the law upon the places in which hydraulic fracturing occurs are in essence legally created variable normativities. Put more simply, hydraulic fracturing for oil and gas can only occur within a geologically defined area owing to fixed normativities. Once within that area however, where it occurs in terms of the positioning of the surface site, is not prescribed by fundamentally unavoidable normativities and the law can itself have influence over the space in which it is located. This connection of the spatial and legal results in a co-constructed place in which hydraulic fracturing to extract oil or gas can occur, as law is able to adapt to permit the optimal surface space for extraction to occur once connected to a subsurface space where it is practicable. In the context of hydraulic fracturing in England for example, the activity itself is potentially granted permission to occur by regulation rather than prohibited altogether, but can only occur within certain geological constraints and in the presence of the resource sought. This complex layering of normativities, both legal and spatial, creates the potential for the splices to which they give rise creating circumstances in which the outcomes do not actually meet the aims set by legal regulators, particularly in relation to protection of the environment.

Where there exists the political and regulatory support for hydraulic fracturing to occur, the role of law in dictating the place in which hydraulic fracturing might occur actually take place is not unconstrained. The normativities law creates can only induce splices (places in which practically operational extraction sites at both surface and subsurface which are permitted by law) to be created within the bounds of fixed practical realities of the process. In this instance, whilst the law will co-construct these legally and spatially distinguishable extraction sites, the physical confines of geology designate larger spaces in which they will inevitably be constructed. In practical terms, the law cannot move the earth, and as such extraction sites must come into being, and thus be regulated within spaces where certain conditions exist. Nature thus defines a space, defined by these fixed normativities, in which this co-constructed space of legal and spatial significance might arise. Law and society must then decide whether such splices should exist at all, i.e. in this context should hydraulic fracturing ever be permitted, and then consider how it creates them within these extant fixed normativities. Once it has been decided that such places might be constructed, it must be accepted that the influence of these extant geological fixed normativities will influence decision-making as to the placement of surface extraction sites. Failure to do so will, as will be discussed, potentially create perverse outcomes which the regulators inducing these skewed splices must accept. To establish how law influences place within these fixed normativities, it must also be considered what the aims of the law are in relation to the regulation of hydraulic fracturing.

A singular definition of the aims of environmental regulation is far from simple to construct. The UK Environment Agency, a government agency, in 'EA2025: Creating A Better Place' action plan stated three long term goals: i) A nation resilient to climate change, ii) Healthy air, land and water and iii) Green growth and a sustainable future (Environment Agency, 2020). In a situation where hydraulic extraction is undertaken, some environmental harm is inevitable, and as such a risk-based approach to regulation would inevitably result (Rothstein, Borraz and Huber, 2012). The aim of regulation in this regard will be to allow for oil and gas extraction in

the least environmentally harmful manner practicable (North Sea Transition Authority, 2021). The potential environmental impacts of hydraulic fracturing are numerous (Werner, A. Vink, S. Watt, K. and Jagals, P., 2015), and many of these will be either exclusively or most acutely felt in proximity to the surface extraction site and include noise, air and water pollution as well as induced seismological and visual impacts. One of the focuses of regulatory discourse in the UK has been induced seismicity (de Pater and Baisch 2011; Green et al 2012), and it was concerns in this regard which resulted in the ending of support for the process in England by the government (Department for Business, Energy and Industry Strategy, 2019).

These potential impacts are by their nature variable, and the extent to which they will be permitted in a risk-based regulatory system would form the focus of much of any regulatory framework which defines the place which is constructed to enable the process to occur. Law therefore focuses upon those variable normativities which the process of hydraulic fracturing produces or causes to occur. It considers both proximity to the place, and the extent to which anticipated risks can or might be controlled. The limits upon these variables form the basis for the regulatory system surrounding the process, and thus to an extent delineate the places in which the process can occur. Positioning of surface extraction sites will be influenced by regulatory constraints on impacts beyond the process of extraction itself, such as increased heavy traffic, noise, and air pollution, as well as those directly resultant from it, such as induced seismicity and water consumption amongst others. For example, a site is far less likely to be approved if it is in close proximity to a residential area regardless of whether the site would be optimal from the perspective of efficiency of extraction. Similar variances in approvals are attributable to (actual and perceived) levels of risk and the duration of impact being classified as short and long term, including pre- or post-completion of operations at which point attribution of liability becomes complex. This in itself is not an unusual approach to regulation in the sphere of environmental impacts and consideration of such complex potential and actual impacts is a normal planning law consideration in determining the suitability of a site (Lee, 2022, p. 10). The issue on which the piece focuses is the impact of constraining the physical location of extraction sites (whether in terms of at the surface or beneath ground) within those fixed normativities on other bases than the net environmental impact of the resultant constructed place as a whole and the potential for law to thus dictate place with adverse effects, essentially blocking co-construction of place which might be less damaging to the environment as a result.

Arguably the most prominent of the proposed hydraulic fracturing sites in the UK, the Preston New Road site on the Fylde coast of Lancashire (broadly conceived here to also include the separate application for seismic monitoring stations) was initially rejected for planning permission by the local regulatory authority (the Mineral Planning Authority) against the advice of the Planning Officer, on the basis of local concerns surrounding various potential impacts, primarily induced seismicity (Lancashire County Council, 2014). In 2015, the decision was then brought in at the request of the extractor by the then Secretary of State for Housing, Communities and Local Government, Greg Clark, under his powers granted by the Town and Country Planning Act 1990. The resulting approval (Department for Communities and Local Government, 2016) was subsequently rendered irrelevant by the concerns around induced seismicity following instances of earth tremors which resulted in removal of governmental support for all hydraulic fracturing in the landward area of the UK in November 2019, meaning final consent to commence hydraulic fracturing was not granted (Department for Business, Energy and Industry Strategy, 2019). Note should be made that whilst the piece is not intended to be a case study of this particular site, it remains the project that has, by far, progressed furthest through the regulatory frameworks to which it was subject and thus that which has come closest to commercial extraction of gas solely through hydraulic fracturing (i.e. not simply as a finishing technique to a conventional well). As such it would be remiss not to base any discussion of hydraulic fracturing in the United Kingdom around the example of the progress of this project made through those frameworks. In spite of this the Preston New Road Site itself would not present the issue on which the piece focuses.

However, should final consent be granted, the places constructed in this eventuality would always be bounded initially by the extant practical fixed normativities, largely predicated upon practical limitations of the process. This is as hydraulic fracturing can only occur within a radius of oil or gas trapped within appropriate geological structures as there are practical limits as to how far from the resource a surface site can be as has been considered. Following this however the imposed normativities of regulatory authorities such as licensing areas and prohibitions on the process within local regulatory authorities would further constrain spaces in which hydraulic fracturing might be undertaken. Only once potential spaces had been outlined by these two sets of normativities, one practical and one legal, would the variable normativities within the regulatory framework governing the process of hydraulic fracturing then impact positioning of a surface extraction. These might include noise and traffic impacts or induced seismicity as well as public concerns regarding such harms and the ability to assuage them. Such impacts are variable owing to the risk-based approach to their regulation as they cannot always be eliminated entirely if extraction is to occur at all, simply mitigated to a sufficient degree. The impact of this on the co-construction of a place consisting of both surface and subsurface spaces involved in extraction would be to further constrain the placement of a surface site. Whilst imposed legal normativities might themselves be based upon the potential for environmental harm (as is the case in Wales and Scotland), the reduction in accessible surface spaces which are practicable further increases the risk that optimum placement for reduction in net environmental harm is not achievable.

Where the legal and practical positions are aligned regarding area of the surface, resulting in regulatory licence to proceed with hydraulic fracturing, that space is one in which co-constructed places of a hydraulic fracturing surface extraction site can arise once connected to a subsurface site. As a result, decisions upon where it is then situated will be made in accordance with variable normativities in pursuit of Bennett's 'individual pragmatic objectives' of actors (Bennett, 2021). In this instance these are likely to be to optimise environmental protection and extractive efficiency in a balance acceptable to all parties concerned with final approval. There are however potential places in which hydraulic fracturing might occur as the practical fixed normativities would allow, but where this does not align with the variable normativities of a regulatory position predicated upon opposition to the practice occurring at all.

In such a situation where only a surface site was concerned, or a single space being regulated to form a place co-constructed by law, this would present no immediate issues as the place would simply not be constructed. The nature of hydraulic fracturing and the extant national regulatory framework when layered on top of positions held within the devolved nations presents the opportunity for the regulation of spaces above and below the surface to become bifurcated. Such spaces have been considered by Pearson and Brant (2020) in relation to the implications for devolved powers in relation to environmental protection and natural resources. This argument is however is focused on an almost inverse issue, where regulation might incentivise sub-optimal positions for environmental protection yet within both those practical fixed normativities, and those which are variable but accounted for in differing manners by regulatory authorities, which govern spaces on the surface where surface extraction sites would be fundamentally practicable. These are situations where a subsurface space at which extraction is possible via hydraulic fracturing might be accessed from multiple surface spaces which are within different jurisdictions. In instances where these jurisdictions hold differing views on the process of hydraulic fracturing, the spaces at the surface which might comprise part of a place in which extraction via hydraulic fracturing would occur would be limited, and not necessarily with consideration of whether the resultant constructed place would be the optimum achievable place for environmental protection. In the context of the United Kingdom, a resource might be extracted in an optimal manner for policy goals such as environmental protection (assuming that extraction would occur regardless) by allowing the resource to be

extracted using a site placed at the surface within the Scottish or Welsh landward areas. However, the prohibition of this placement of the surface site would result in a worse net outcome in relation to that policy goal resulting from the place of extraction constructed (surface and subsurface extraction sites in combination) in response to the extant regulatory regimes.

The alignment of the regulation of spaces above and below the surface to consider the net impacts of the resultant constructed place ensures that variable normativities can be balanced freely when considered the situating of hydraulic fracturing projects. The imposition of a de facto ban on hydraulic fracturing within a geographical area at the surface whilst below the surface it remains possible to extract the resource being sought allows for a situation in which the construction of place is predicated first upon finding a surface extraction site which can provide access to the subsurface resource which is directly beneath an area of the surface on which that site could not be placed. This introduces to the construction of place in which this activity might occur a legally imposed normativity which will supersede variable normativities including the extent of environmental protection (assuming a risk-based approach to environmental regulation). As such environmental protection will be considered in relation to only sites which are not excluded by the de facto ban, but without consideration of whether a higher level of environmental protection might be achieved by accessing the same resource from a surface site which is within that excluded surface area.

The misalignment of regulation of the surface and subsurface space in the manner outlined presents the potential for extractors to situate surface extraction sites to access resources beneath areas where the surface site could not be placed. This is of course always the case as the subsurface resource will not involuntarily move, and as such the surface site is positioned to access it in a manner in accordance with the legal regime governing that surface space. Introducing imposed legal normativities excluding surface sites from certain areas reduces the available spaces in which they might be situated. This impacts significantly upon the balance of normativities (fixed and variable) which constructs the place in which hydraulic fracturing will occur, by constraining the potential connected surface and subsurface places within the parameters they set which could form them. In the context of the devolved positions of the United Kingdom at present (and assuming only that England permitted the process once more), might result in a surface hydraulic fracturing operation within England which extracted subsurface resources from beneath Scottish or Welsh surface area and complied with all legal requirements upon it. However the place co-constructed by this layering of normativities might be more harmful to the environment than one in which the surface extraction site was located within Scottish or Welsh land surface area.

The subsurface space at a deep level having been made neutral from a regulatory perspective, and infinitely accessible to those engaged in the extraction of oil and gas by the Infrastructure Act 2015, would not cease to potentially have tangible impacts at the surface. This position within the legislation does however increase the risk of the misalignment outlined, by reducing the likelihood of these surface and subsurface places being considered part of a constructed place in which hydraulic fracturing will occur with a differing potential profile of harm to one constructed with a different surface extraction space. This is as environmental impacts (or potential ones) will vary between spaces in which a surface extraction point might be situated despite being part of a constructed place in which hydraulic fracturing might occur within the bounds of regulation with the same subsurface space. Ignoring that the place in which hydraulic fracturing occurs consists of both surface and subsurface spaces, despite the subsurface space having been neutered from a legislative perspective, eliminates the effective consideration of the environmental impacts which might arise relative to that which might otherwise occur. A constructed place in which hydraulic fracturing might occur and cause lower overall environmental harm, but which consisted of a surface extraction site within Scotland or Wales would not therefore necessarily be considered. This opens the potential for

these potential places with lower environmental impact but achieving the same broader goals of that place to be disregarded entirely, and the extant system exploited to secure the construction of a more harmful place than that which might have been constructed comprising of an alternate surface space. The result therefore is a potential promotion of sub-optimal positions for environmental protection overall.

Lessons for the Management of Place and Subsurface Extraction of Resources:

As Delaney notes, ‘Law’ draws lines, constructs insides and outsides, assigns legal meanings to lines, and attaches legal consequences to crossing them.’ (Delaney, 2014) However, the where the impact of those lines being drawn creates consequences which although permitted are sub-optimal in terms of the aims of the regulatory framework(s) which imposed them, their application ought to be questioned. Legal geography requires that normative responses by place managers to the lines drawn by the law and extant physical realities of the resources sought through extraction be considered to allow for analysis of the places co-constructed by place managers as a result of them. The extraction of oil and gas is not only notably absent from such analysis, but also arguably where it ought to be undertaken with great care given the vexed and complex debates within which it exists.

The seemingly simple and singular place constructed by the regulatory framework in relation to hydraulic fracturing, an extraction operation, is instead as a result composed of more than one layered regulated space within the extant regulatory frameworks of the United Kingdom. This reality is one which, in itself, ought not to be overly complex and inhibitory of an effective regulatory framework over a place co-constructed by law and other norms. Indeed, the danger of singular or narrow approaches to place construction has long been understood by legal geographers and those concerned more broadly with the formation of places. Delaney, amongst many others notes the limitations of a purely functional view of territory as satisfying a need for resources. ‘This functional view of territory ... is not very helpful, insofar as it reduces an enormous range of phenomena and experiences to a very small number of posited functions’ (Delaney, 2005). Similarly, the wider impacts of extraction of many resources has been studied in great depth in relation to a range of processes within this broad category. The distinct difficulty with achieving and incorporating this in the context of hydraulic fracturing however comes from the nature of the process in which surface and subsurface spaces are not necessarily proximate, and do not have to be proximate to operate, added to which is the multifaceted nature of the potential harms caused by the activity. There are those harms which are relatively proximate to the surface site, such as the risk of induced seismicity and contamination of aquifers, and those which are national and international in nature, specifically the contribution of the practice to climate change. One can be avoided by locating the harm causing activity cautiously or refusing to allow it within a designated space where those harms are mitigated, the latter by contrast is a collective action problem and thus not avoidable by a single regulatory authority.

For this reason, the decision by any regulatory authorities to reject all applications to engage in hydraulic fracturing would be seen by many as overwhelmingly positive owing to its avoidance of the consequential environmental harms and alignment in particular with policies surrounding the mitigation and prevention of climate change. In isolation this is a laudable approach, but the reality is somewhat more nuanced. An immediate and complete end to the use of oil and gas globally is neither possible nor likely for a multitude of reasons (Global Agenda Council on the Future of Oil & Gas, 2016 p.3), but the need for a transition towards this position reflects practical, social and economic realities of the current embeddedness of oil and gas within society. Accepting this parameter necessitates the reality that some oil and gas extraction remains unavoidable in the short term if one compares current consumption rates and accessed reserves, with focus therefore often upon ‘just transitions’ and how these

can be effectively managed (Heffron, R and McCaukey, D., 2022). The debate then turns to how and where it is extracted in the least harmful manner possible.

The increasing awareness of the impacts of fossil fuel consumption upon the environment and actions to reduce and mitigate this has resulted in hydraulic fracturing being used to extract oil and gas onshore within the UK being seen as increasingly unpalatable. Indeed, even those involved in this once emergent industry are now questioning its viability generally rather than simply in environmental terms, stating that, 'the sociopolitical and economic barriers to [hydraulic fracturing] are high.' (Cornelius, C and Linder, M., 2022) Despite this, the implications of the current regulatory structure for the construction of places in which hydraulic fracturing might occur are demonstrative of a lacuna of thought which might emerge in relation to the regulation of extraction of other subsurface resources. This being the misalignment of regulation of surface and subsurface spaces in the extraction process which gives rise to adverse construction of the place where extraction occurs. Such misalignment which results in a place of extraction not being constructed is harmful only to the extent that it reduces resources extracted. However, where this misalignment permits places of extraction to be constructed which are sub-optimal in relation to the environment, the overall impact of layered regulatory regimes becomes potentially highly negative. The aims of the regulators imposing them thus risk inadvertently detracting from their own goals in relation to environmental protection. Noteworthy here is the work of Stretesky, Short and Stamford (2023) which notes that perceptions of risk and, 'trust in central and local governments and regulators appear to matter little. However...trust in the oil and gas industry is especially important for risks associated with hydraulic fracturing.' Whether this absence of connection of risk perception to local government and regulatory authorities by UK residents results in a lack of consideration of the resultant impacts of extant regulatory approaches, owing to a focus on preventing the process altogether, is worthy of further consideration.

The extant, though currently dormant, regulatory regimes concerning hydraulic fracturing are therefore illustrative of the dangers of layered regulation at borders between jurisdictions with misaligned approaches or goals in relation to the extraction of subsurface resources. Such issues have been noted in relation to the complexity of planning decisions relating to urban environments. Hubbard and Prior note the importance a 'flexible notion of locality' in this regard, to avoid conflict based on the excessive focus upon the needs of those in the immediate vicinity (Hubbard and Prior, 2018). There is clear connection here to the issue highlighted by the piece of overlapping jurisdictions resulting in the extraction of a resource resulting in increased net environmental harm. This is particularly true where both jurisdictions utilise the resource sought irrespective of their permissiveness in relation to its extraction. In such instances there is the potential for an absence of consideration of overall regulatory outcomes, or an 'inflexible notion of locality' to paraphrase Hubbard and Prior, to have negative environmental impacts. The consideration of the process of extraction, including both subsurface and surface activities, as a singular regulated place co-constructed by regulatory regimes concerning its various aspects is not entirely absent from regulatory approaches at present. Environmental licensing and permitting regimes have progressively moved towards such integrated approaches, as seen in successive iterations of the Environmental Permitting (England and Wales) Regulations (current iteration, 2016) and the work of the Better Regulation Executive (formerly Commission). The overarching consideration of the impacts of layered aspects of the regulatory framework upon decision making of actors with regard to place whilst within the remit of regulatory authorities in question is clearly susceptible to being neglected, particularly in circumstances of jurisdictional borders such as those outlined above.

This microcosm of place co-construction at jurisdictional borders which does not effectively account for the realities of the processes which will occur in those places is reflective of the challenging question with which policy makers must grapple; where to extract necessary

resources and the extent to which inevitable harms said extraction causes are acceptable. Both are the subject of considerable debate, and entrenched positions which are often seemingly insurmountable. However, the consideration of a situation in which fixed and variable normativities are layered so as to construct a place in which the optimum outcome from an environmental perspective, is unachievable, is an eventuality which all parties to those debates would, or should, want to avoid. The potential for this to occur speaks to an absence of consideration of extraction processes where surface and subsurface extraction spaces and their regulation are misaligned as a singular constructed place of extraction. Whilst this is masked in situations where those fixed and imposed normativities are not conducive to extraction occurring at all, or the points are within the same jurisdiction so as to also align with a singular policy approach permitting or preventing extraction, it is exposed where they are not. This reflects the fundamental failure of conceptualising extraction of some subsurface resources as though a singular place. A clearly singular constructed place of an active extraction site, is then regulated in a manner misaligned from this reality, potentially providing for sub-optimal environmental protection in risk-based approaches to the regulation of subsurface resource extraction.

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