

This is the version of the chapter accepted for publication in Peter, Kimberley, Steinberg, Philip and Stratford, Elaine, (eds.), *Territory Beyond Terra*. London: Rowman & Littlefield International, pp. 51-67

Includes: Figure 1. The extended safety zone of the Jubilee oil field

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<https://rowman.com/ISBN/9781786600127/Territory-Beyond-Terra>

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WATER

ORDER AND THE OFFSHORE: THE TERRITORIES OF DEEPWATER OIL PRODUCTION

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Introduction

How might territory in the deep oceans be practised differently from more familiar terrestrial environments? In this chapter I consider the reterritorialisation of space that enables offshore oil production and countervailing processes of deterritorialisation that have complicated the practice of territory. Oil companies are concerned with the discovery and extraction of materials that are territorially bound in geological deposits, whereas the ocean environments that they encounter are by their nature in flux, constantly moving independent of human efforts to calculate and to control territory. In contrast to deterritorialised industries and globalized flows of capital, the oil industry remains closely tied to place, yet operates in environments where place is continually reformed by the movement of water and all that moves with it and through it. This temporal-spatial disjuncture between the ocean and the subterranean world is associated with distinct practices of territorial control that have been both enabled and constrained by the material conditions under which the offshore oil industry operates.

In this chapter, I analyse the social life of the offshore territories of oil. The practice of territory in the offshore oil industry demonstrates the broad ways in which territory is socially and materially produced in environments not defined by the fixed and stable points on the surface of land. I describe processes of territorialisation in three distinct but related spaces united in one offshore oil field: the subterranean territories of oil exploration; the (sub)marine spaces of offshore oil production; and the atmospheric spaces of carbon commodification and trade. By focusing on one extractive site of the global oil industry in Ghana, I demonstrate how space is produced in three different domains with material characteristics very different to one another. The materiality of the subsurface, the oceans and the atmosphere, are critical in facilitating, undermining and re-working the practice of territory.

Geographical debates have been animated in recent years by different ways to account for materiality. Specifically, some analysts have utilised actor network theory or concepts of assemblage to draw attention to the agency of nonhuman actors in ways that are said to be poorly captured by historical materialist ontologies (Bennett 2010; Castree 2002; Deleuze & Guattari 1987; Whatmore 2006). “Nonhuman actors” in the oceans could refer to fish, an anchor, water, nutrients or ocean currents, for example. The term can also refer to less tangible entities and forces that under some readings can be considered as “actants” (Lambert *et al.* 2006, Latour 2005). Examples might include narratives such as the tragedy of the commons (Gordon 1954), or liberal management norms on how to manage oil production appropriately (EITI 2013). All might come together with human action somehow to co-produce ocean environments in ways that cannot be accounted for simply by the way that they are represented by human actors (Anderson 2012; Bear 2012).

Similar post-structural ideas have shaped recent debates over the conceptualisation of space. For Painter (2010), Latour’s (2004) actor network theory provides the conceptual framework with which to understand ‘territory-as-effect... necessarily porous, historical, mutable, uneven and perishable. It is a laborious work in progress, prone to failure and permeated by tension and contradiction’. As an *effect* of networked socio-technical practices territory is not an *a priori* foundation of state power (see also Mitchell 1991). Nor is it incommensurable with networked forms of spatial organisation. Rather, territory and networks are instead understood as interconnected. Meanwhile, topological forms of power offer something distinct to analysis of how power is expressed over space. Topology refers to networked forms of political ordering and relationships that are not directly related through their proximity to one another (Allen 2009). In contrast to networks of relations that are organised across a topographical landscape, topological space is folded and twisted, such that relations are made between human and nonhuman actors that would otherwise be separated by distance (Martin & Secor 2013).

In this chapter I seek an epistemological middle ground that employs complementary lenses from post-structural thought, while maintaining a dialectical understanding of the power relations and historical processes through which things—human and nonhuman entities and forces—‘come together’ (Bumpus 2012; Sneddon 2007). I adopt the same relational understanding of how space can be organised, in which territory is produced as the effect of socio-material relations between the human and nonhuman world, while the same space can simultaneously be folded in ways described by topological sensibilities (Allen 2009).

Through this lens, I examine the spatial and socio-material conditions under which the Ghanaian state and international oil companies have sought to organise *territory beyond terra* – in the subterranean, marine and atmospheric spaces of offshore oil.

The chapter proceeds as follows. First, I describe the creation of new subterranean territories of fossil fuel exploration through which resource discoveries are made and the value of oil is created and captured. Next, I discuss the re-territorialisation of the marine environment to protect the infrastructural assets of the oil industry from other users of ocean space. Last, I describe how air has been territorialised to produce carbon as commodity, enabling the global trade of carbon emissions generated by the consumption oil. The analysis draws on a selection of 60 interviews conducted in Ghana between February and October 2014 with policy makers, regulators, oil company officials, activists and industry analysts.

Volumetric territories of offshore oil production

In recent years, the spatial form of extractive industries has come under renewed scrutiny. For many authors, this work has meant accounting for extractive “enclaves” as operating through a spatially distinctive political-economic logic (Ferguson 2005), in contrast to the universalising grid of the modernist state (Scott 1999). Territorialisation is critical to contemporary extractive industries, but in ways that do not necessarily align with the borders and boundaries of the nation state. These spaces are captured well in Ferguson’s (2005: 378–9) description of the offshore oil industry as an archetypal enclave industry, where investment does not flow through Africa, so much as ‘skips and hops’ across the continent ‘concentrated in secured enclaves, often with little or no economic benefit to the wider society’. Where foreign capital is primarily concerned with securing access to particular “holes” into the subsurface, a highly selective territorialisation is performed to enable extraction (Bridge 2009).

However, although extractive enclaves might be sited in remote locations or within physically bounded spaces, by no means are they politically isolated. In particular, the imaginary of the securitised, privatised enclave discounts the important role of the state and processes of territorialisation in securing enclave space for extractive capital. Even the most remote extractive sites are connected to the world around them in multiple ways, not least by

the territorialising practices of different state agents (Appel 2012; Hönke 2010; Mohan 2013). Spatial control can be extended by resource discoveries, shaped by the limits and demands that states and capital place upon one another (Chalfin 2015; Emel *et al.* 2011); the technological capacity of international oil companies is sought by state actors who, in turn, serve as gatekeepers to extractive territories. In a globalised world of flows, oil production nonetheless depends on particular extractive territories and processes of territorialisation.

Here, I consider these spaces of extraction anew by considering their expression in three-dimensional space. Often, the oceans have been analysed as flat, two-dimensional spaces to be traversed and divided into territories in a horizontal plane (see Steinberg & Peters 2015). Recently, verticality has gained greater attention in geographical analysis as an important axis through which power can be expressed over territory—below, through and above ground, water, air and various states in between (Braun 2000; Scott 2012). Influenced by the development of extractive industries, Africa is “re-spaced” (Engel & Nugent 2010) through dialectical processes of deterritorialisation and reterritorialisation—not only in the horizontal plane, but in three dimensions. Yet, as Elden (2013: 45) has argued, there is more to this exercise than merely adding a vertical axis to analysis of area: to comprehend volume requires attention to ‘instability, force, resistance, depth, and matter alongside the simply vertical’. In short, analysis of volume implies consideration of relationships between space and matter.

Volumetric territories of offshore oil in Ghana

The discovery of oil in Ghana’s territorial waters in 2007 has led to some familiar and some less familiar processes of territorialisation. For example, international borders are being contested and redrawn, both in the horizontal plane and in the vertical. Contesting the horizontal, the government of Côte d’Ivoire has made a challenge at the International Tribunal on the Law of the Sea (ITLOS) over the position of the maritime border with Ghana (ITLOS 2015). The two national governments dispute the position of the line that bisects their territories, drawn during the colonial period as originating from an administrative outpost and now given heightened importance with the discovery of the Tweneboa, Enyenra and Ntomme (TEN) oil fields beneath. The Tribunal is asked to mediate over a familiar dispute for which there is precedent: planar expressions of sovereignty over the ocean surface that confer control of the resources beneath, in which territorial control is divided between states.

Recent efforts to extend the scope of state territories in the ocean have involved new expressions of sovereignty over depth. In the vertical plane, the Ghanaian government has successfully applied to the UN Commission on the Limits of the Continental Shelf (CLCS) to extend the state's ownership of seabed resources out to the edge of the continental shelf (Government of Ghana 2009). Precise scientific calculations of Ghana's underwater topography (bathymetry) are required to delimit which parts of the seabed comprise the 'natural prolongation of its land territory', while the water above remains international waters (*UNCLOS* 1982 Article 76; Sammler 2015). To define the limits of the continental shelf is to recodify a relationship between sovereignty and vertical and volumetric spaces. These new frontiers of resource exploration involve processes of reterritorialisation that reconstitute the relationship between sovereignty and space in three dimensions.

Subterranean territories

Oil exploration and production in the deep oceans is associated with processes of reterritorialisation that are also not so closely tied to national borders. Before oil production comes oil exploration and, with it, the territorialisation of three-dimensional subterranean spaces. Maps of oil concessions divide the water's surface into large, angular, two-dimensional blocks of territory that remain the property of the state, but over which oil companies are granted temporary exclusive extraction rights over state property for their ability to identify resource-rich subterranean territories. During the costly process of exploration, oil companies maintain a shallow connection to place that enables the mobility of an industry in which resource exploration yields more failures than successes and where the ability to cease exploration in an unprofitable concession is integral to the business model. Yet in contrast to the abstraction of two-dimensional concession maps, oil exploration is dependent on rendering subterranean space legible using distinctly three-dimensional technologies. Two-dimensional seismic surveys can produce vertical planes of information on the geological composition of the subsurface, but the deployment of three-dimensional seismic surveys gives much greater certainty over the commercial viability of a site before expensive exploration wells are drilled. Modern oil exploration in itself is a process concerned with the calculation of volumetric space (Bridge 2013).

The legibility of subterranean space is hence a significant factor in the creation and distribution of value and the governance of resources. When the National Democratic Congress (NDC) came to power in Ghana in 2008 it contested the fiscal terms of the

petroleum agreement that had been signed with Texan oil firm Kosmos Energy by the previous government (Phillips *et al.* 2016). That the terms granted to Kosmos Energy were generous was not in dispute. Yet, whether they represented a fair deal reflecting the risk of investment, or a corrupt deal reflecting graft or privileged corporate access, is a judgement that rests, in large part, on how different parties judged the value-addition of three-dimensional seismic surveys that were shot by Kosmos prior to the discovery of the Jubilee field. Moreover, calculations and categorisations of volumetric space remain important throughout the lifespan of an oil field, and similar dynamics were at play two years later in 2010 when Kosmos Energy sought to sell its stake to ExxonMobil against the express wishes of the Ghanaian government. Determining the value of the equity stake depended on specifying a level of certainty over the proportion of reserves that could be categorised as either proved (1P), probable (2P) or possible (3P). Hence, the legibility of these inaccessible spaces remains a matter of determining probabilities of their material properties. During both exploration and production, the subterranean spaces of oil are visualised, calculated and rendered legible as volumetric spaces—a process that is both a technical challenge and a political act that shapes the distribution of risk, reward and resources.

Marine territories

Territorialisation

The creation of new territories in the ocean has also been practised over volumetric space, but through a medium with very different material properties to those of the underground, beneath the water. The Jubilee oil field is Ghana's first major oil field development, 75 kilometres offshore (Figure 1). The depiction of the exclusion zone is typical of cartographic representations of the ocean in that it displays a static and stable bounded area on the surface of an indefinite fluid environment. Here oil and gas are extracted and collected by a floating production storage and offloading (FPSO) vessel, which serves a purpose similar to that performed by an oil platform, but which is better suited to deep-water and ultra-deep-water environments. FPSO vessels float on the surface, moored by sets of chains that hold them in position against ocean currents and weather systems. Flexible risers transport oil through the water column to the vessels and are similarly designed to accommodate ocean currents. Contrary to the popular imaginary of a singular vertical pipe sunk into the sea bed like a drinking straw, offshore oil fields typically draw from seabed installations that are many kilometres apart, connected across a mountainous bathymetry. The great depths that these

installations occupy generate technical challenges to their safe operation, but it is at the surface that other human users of the ocean are encountered, generating requirements for more exclusionary territorial spaces. With necessarily high safety standards, all offshore oil installations are thus subject to exclusion zones.

The exclusion zone that surrounds the Jubilee field FPSO vessel is a globally standardised practice under international law, taking its size and spatial form from terrestrial installations and environmental conditions (*UNCLOS* 1982). Safety zones for oil installation were first codified in international law to isolate the risk of the spread of fire (*UN Convention on the Continental Shelf* 1958). Five hundred metres was considered an appropriate distance to isolate an installation from neighbouring infrastructure and populations. As technology advanced to enable production offshore, these onshore safety zones were reproduced in ocean environments. They were later reviewed and a case was made to increase the size of the zones to reflect the indeterminacies of ocean environments (*UNCLOS* 1982, Article 60). But they remained restricted to a 500 metre radius, this time reflecting the interests of several UN member states for which the protection of offshore installations conflicted with the principle of freedom of navigation for shipping. Oil installations are considered sufficiently hazardous that no other vessels should come within 500 metres of the FPSO vessel at any time, while in Ghana the state has successfully extended this specification to cover a radius of five nautical miles, centred on the subsea infrastructure of wells and pipes over 1000 metres below (Figure 1; *Ghana Shipping (Protection of Offshore Operations and Assets) Regulations* 2012).

<Take in Figure 1 around here>

The creation of safety zones is a process of *reterritorialisation*. The original enclosure was created by the 1982 UN Convention on the Law of the Sea (*UNCLOS*), which incrementally extended state control over oceanic resources to 200 nautical miles from shore. Hence, the Jubilee oil field and the ocean spaces above it were the property of the state long before the exclusion zone was gazetted, along with all resources ‘in, under or above’ Ghana’s land and waters (*Ghanaian Constitution Article 257(6)*, 1992). But the safety zone extends elements of state territorial control in important ways, establishing the FPSO vessel as a new artificial island that enables an extension of Ghanaian sovereignty over space in the Exclusive Economic Zone—a jurisdiction where only partial sovereignty would otherwise be held (*UNCLOS* 1982). Within the exclusion zone, a broader range of economic activities can be directed, regulated and governed by the state (Chalfin 2015; Ghana Maritime Authority

2011). Historically, the intersecting paths of ships played an important role in creating the uneven territories of imperialism in Africa, producing corridors of control that contrast to the imaginary of colonial territorial rule over entire nation states (Benton 2010). As a fixed (but temporary) installation on the ocean surface, the FPSO is subject to different modalities of territorial control to those of colonial ships, yet produces a similarly partial and layered picture of sovereignty.

Enforcing the zone is not a trivial task. The water is too deep to mark the border of the zone on the surface with buoys, without which some fishers have contested any sanctions levelled against them for incursion, particularly since fishing boats and nets drift with the current. In the absence of physical markers on the ocean surface, radio signals are broadcast over the airwaves to inform mariners that they are in the vicinity of an exclusion zone (Figure 1).

These signals can be received by shipping companies or industrial and semi-industrial fishing vessels, but are not of use in communicating with canoe fishers who typically do not travel with radio receivers, nor navigate with the maps that specify the location of the zones.

Rather, zone is guarded from canoe fishermen by the navy—the classic spatial expression of sovereignty at sea. Navy forces periodically patrol the zone on board a boat funded by the oil companies for purposes of both deterrent and enforcement of a new territorial zone.

Deterritorialisation

The territorial zones created to bring order to extractive marine spaces are typical of cartographic representations in their delimitation of static and stable zones. Yet the material environments in which these zones exist are distinct from land and generate different forms of control and exclusion. Notably, the conceived space of the exclusion zone contrasts with the lived space of the fishers whom it excludes (cf. Lefebvre 1991). It also contrasts with the spatial and temporal movements of the fish that fishers seek and of multiple other nonhuman actors that occupy the space on a temporary basis. Critically, the movements of fish and fishers operate on a notably deterritorialised basis with respect to the exclusion zone. Fishers follow fish to different parts of the ocean at different times of year and fish populations in turn migrate in accordance with their lifecycle and seasonally in pursuit of nutrients driven by global ocean currents. The upwelling of nutrients on the coast of West Africa makes the fishery particularly productive, and has provided the basis of local livelihoods and export economies for decades (Alder & Sumaila 2004). The temporal-spatiality of fishing reflects how depth becomes surface and surface becomes depth over relatively short time frames.

Importantly, oil installations in the ocean are not neutral additions to these marine ecosystems. For example, the legs of oil platforms can create a solid substrate upon which corals can grow. Under some conditions this process can form the basis of an artificial reef that attracts small fish and, in turn, larger predators (Claisse *et al.* 2014). In the Gulf of Mexico, targeted “rig-to-reef” interventions have been designed to create these new socio-environments by sinking oil platforms to the seabed when they have reached the end of their serviceable life (Jørgensen 2009). Likewise, the FPSO vessel is not a neutral addition to the waterscape; attracted by light, fish are observed to assemble around the vessel at night when Ghanaian fishermen take to the water. The effect is similar to the use of lights as fish aggregating devices—a common (illegal) fishing method that reduces fishing effort. The important difference is that fish are aggregated in a territory around the FPSO from which fishers are explicitly excluded.

As such, the territorialisation of the FPSO exclusion zone became one of the most contentious issues in the early years of the Ghanaian oil industry. Fishers have asserted that they are experiencing the costs of oil production without the benefits of the huge wealth it generates. While there are lively public debates over the allocation of oil revenues, the efficacy of Corporate Social Responsibility (CSR) programmes or the rising cost of living in cities that serve the oil industry, objections to the exclusion zone are the complaints most closely associated with a claim of livelihood impacts. The fish aggregation effect ensures that the significance of such zones is greater than the relatively small area set aside. Managers of fishery certification schemes face similar inadequacies to drawing lines on a map in their efforts to delimit a sustainable fishery (Bear & Eden 2010). Whether the subject of management is the extraction of (mobile) fish or (non-mobile) fossil fuels, efforts to construct territory in the deep ocean that build upon terrestrial ontological assumptions have been confounded by the movement of water and the human and nonhuman actors that move with it and through it.

Reterritorialisation

Although the borders of the exclusion zones contrast with the rapid flows of the oceans, they are not as static as they may first appear. They have to be continually made and remade and they take on meanings that their inscription on maps does not capture. Exclusion zones have to be created and maintained through territorial practice, and the circulations of the oceans have generated calls from various actors for reterritorialisation, reaffirming the physical

borders of the exclusion zone. The way that the territorial exclusion zone operates in practice is an effect of socio-natural relations.

Information has been an important means through which to remake the territorial zones in light of the effects of FPSO vessels on fish aggregation. Critical to this assessment has been the question of whether oil installations can be demonstrated to increase fish productivity *in situ*, or simply attract fish populations from further afield. Artificial reefs have been shown to increase fish populations in some circumstances (Claisse et al 2014); FPSO vessels have not been shown to have the same effect. Either way, the accuracy of these assessments is of secondary importance to the argument here. More relevant is how the assessment of environmental impacts has been used to redraw territorial lines on the ocean and among the actors that use it. This process has been something that three sets of actors have all engaged with to different ends, but on similar territorial terms: state actors, oil companies and fishers.

As the guarantors of enclosure, Ghanaian government agencies have had to answer to fishers with respect to the latter's exclusion from ocean space. The Environmental Protection Agency maintains that the safety zone is necessary for the safe operation of the oil field, but a second set of ideas emerges as a supporting justification for exclusion, and is summarised by a manager in the Environmental Protection Agency: 'Incidentally, this area is serving as a refuge for fish ... in the long term we can project that it will rather help to improve the already degraded fisheries'. The suggestion is that the zones act as *de facto* marine reserves, sheltering vulnerable juvenile fish populations from over-harvesting; this is a familiar terrestrial narrative of fortress conservation translated to the marine environment. Yet, it is at odds with the relevant environmental impact assessment, which suggests that the size of the zones is too small—and the time that fish spend within them too short—to have any conservation effect. The narrative expresses the same territorial logic as that which created the zone, and is used to support the exclusion of fishermen on the grounds of sustainability.

For staff of the operator of the Jubilee Field, Tullow Oil, becoming embroiled in fisheries governance conflicts with a business model of strategic disengagement with national territories beyond the extractive site itself. The company's response to the complaints of fishers has been to emphasise the conclusions of environmental impact assessments that fish stocks will be unaffected, because fish will not *remain* within the zones; they will 'spill-over'. According to staff working on Tullow Oil's corporate social responsibility

programmes, the company's interventions reflect their assessment that the company owes no compensation or *alternative* livelihood to fishers:

For the fishermen we are saying it's livelihood support, unlike alternative livelihoods, which was the norm in the past. We can't take them off the sea and provide them with something else. Some of them have been fishermen since aged twelve or eleven, up to forty years. It is difficult to give them new skills to take them off the sea and weave baskets and sell them. So let them continue with their fishing activities ...

Interview with Communications staff, Tullow Oil Plc, August 2014

Hence, support is provided for *existing* fishing livelihoods, with fishers given ice boxes or assistance to improve fish smoking ovens. Livelihood support is presented as neutral with respect to responsibility, but nevertheless is helpful to the company as it seeks to secure from local residents an informal 'social license to operate'. In contrast, when people are defined as members of the 'affected communities' of oil production (and therefore the subjects of CSR programmes), boundaries around them are drawn partly on the basis of modelling of coastal areas that would suffer from a potential oil spill—something for which oil companies would in principle accept responsibility.

Given these provisions, it is noteworthy that fishers themselves typically do not claim that safety zones have *caused* a decline in fish stock, since their experience of the fisheries crisis pre-dates the advent of oil production in 2010. Rather, fishers have objected to their exclusion from territories where fish aggregate by using territorial logics of their own. Frustrations are articulated by professional representatives of Ghanaian fishermen in statements directed at state agencies for redress: 'They should know that national security will be at stake if [fishers] are not employed. Just look at Nigeria'. This reference is to one of the longest standing complaints of artisanal fishers—the failure of state authorities to exclude foreign industrial fishing vessels from the inshore waters reserved for Ghanaian canoes. The dispossessed fishers of the Niger Delta are mobilised by Ghanaians to suggest a threat may be posed to the state by surplus labour, and to spur supportive state intervention motivated by enlightened self-interest (cf. Duffield 2007).

The positions of all three sets of actors illustrates the social life of these borders in ocean space and highlights the discursive and material power of those that create, experience and

maintain them. One distinction from terrestrial environments underpinning all three is the link between resource, territory and depth. The relative location of fish in oceans is different from that of bauxite in land, or cocoa on land and representations of the spatiality and temporality of fish movements have been used by all three sets of actors to argue for particular rules of resource management. Two notable proposals for alternatives to the exclusion zone have been raised by fishers during consultation exercises. The first proposal is to “desaturate” the zone, allowing occasional temporary access to fishers. But a second proposal mobilises a different logic: to exclude fish from the zone by sinking an impenetrable perimeter fence to the ocean floor. This solution may be practically unfeasible in deep water, but shows that access to the territory is a means to catch fish. Likewise, some Ghanaian NGOs have called for coordinated processes of marine spatial planning that would seek to balance the interests of different users of marine space more equitably than do the exclusion zones; this would be guided by participatory principles, mimicking the territorial logics of Marine Protected Areas observable elsewhere in the world (Bear & Eden 2012; Pieraccini 2015). Processes of territorialisation pervade modern fisheries, and so it is perhaps unsurprising that the flows of the oceans have generated from a range of actors these calls to reassert boundaries in various forms. The spatiality and temporality of fish movements are up for definition and contestation for particular ends.

Atmospheric territories

The marine territories described above represent relatively new locations for old territorial logics, in which ocean space is reterritorialised to accommodate the material flows of the ocean under a new extractive imperative. However, the volumetric spaces of offshore oil are not only subterranean and submarine, they are also atmospheric. The atmosphere is globally mixed on relatively short time frames such that it can be considered deterritorialised—uncontained by national or regional borders—but the FPSO vessel is one of many new sites for the territorialisation of air. In addition to oil, the Jubilee field produces natural gas, which has to be either transported to land where it can be used productively or flared at sea. By investing in the infrastructure to pipe gas onshore, the developers of the project can claim to have reduced greenhouse gas emissions that would otherwise have been emitted by gas flaring. This allows them to earn carbon credits under a UN scheme to offset emissions in the North using low carbon development projects in the South (UNFCCC 2012). Sixty kilometres offshore, subterranean carbon is extracted as crude oil and on that same site atmospheric carbon is produced as a commodified waste product for global trade.

The creation and trade of a unit of carbon is productive of both territorial and topological space. In contrast to the production of marine territories in geometric space, the spaces of global carbon trade are produced through the relationship between the distant sites of fossil fuel production and consumption, rather than their proximity. Yet it also depends on accounting for atmospheric space within national boundaries. The UN system of carbon emission reductions is based on a deterritorialised, globally mixed atmosphere such that a reduction in carbon emissions in country A is considered equivalent to the same reduction in country B. But the system also reframes climate change in territorial terms in order to make a North-South trade in units of carbon (a “carbon offset”) possible: carbon can be traded globally once measured, reported and constrained within the statist frame (Löwbrand & Stripple 2006). The process thus brings distant sites of carbon consumption such as a German steel plant into relation with the Ghanaian oil field. The carbon trade creates new, national atmospheric territories in the global atmosphere, while simultaneously bringing distant sites of carbon consumption and reduction into relation through the twisting and folding of space.

Again, information is central to this process. The creation of carbon as commodity and its virtual trade depends on a number of spatially expansive “technological zones”: spaces where ‘the differences between technical practices, procedures or forms have been reduced, or common standards have been established’ (Barry 2006: 239). These zones allow a common spatially, socially and historically abstracted unit of carbon to be created in sites as diverse as a Thai forest or a Ghanaian oil field. Standardisation is required such that a definable, measurable, verifiable unit of carbon can be made legible, tradable and ultimately governable (MacKenzie 2009). The borders of these zones are not those associated with the nation state, but are those that ‘constrain the movement of certain categories of persons, objects and information’ (Barry 2006: 239). Simultaneous processes of territorialisation and deterritorialisation enable a trade that generates a flow of climate finance from the North to the temporary locations of the transnational oil industry in the South. To create new territories in the atmosphere, the geometric space over which oil tankers transport petroleum from Ghana to markets in Europe or North America is folded and twisted to enable a new virtual trade in carbon credits over topological space.

Moreover, these norms of carbon accounting that enable this trade present only one instance of how technological zones have shaped the physical spaces described in this chapter. Zones of qualification might also describe: UN conventions that create the safety zone around the FPSO and delimit the continental shelf (*Convention on the Continental Shelf* 1958, *UNCLOS*

1982); the voluntary codes of oil company corporate responsibility programmes (Tullow Oil 2013); the *Voluntary Principles on Security and Human Rights* that are used to train Ghanaian naval officers to police the FPSO exclusion zone; the environmental impact statements for the Jubilee field (ERM 2009; ERM 2014); or the political and commercial risk assessments of the petroleum industry. All embody or employ highly standardized sets of transnational practices developed outside of the confines of the territorial nation state; yet each has been instrumental in shaping the contested processes of territorialisation. The spaces described are neither territorially bound spaces demarcated by state borders, nor globally abstracted, deterritorialised spaces of global capitalism (Amin 2000; Ong & Collier 2005).

Discussion and conclusions

In this chapter I have examined how volumetric offshore spaces have been territorialised, deterritorialised and reterritorialised to enable offshore oil production. Territoriality remains a governmental technology of great importance to the oil and gas industry (Bebbington & Bury 2013; Bridge 2011). The bounded physical spaces of extraction are of course intimately linked with the globalised flows of capital associated with West African oil production. Yet although globalisation evokes images of power expressed beyond territory, and although the term ‘offshore’ is often used to imply deregulated spaces in a globalised world (Urry 2014), states and capital continue to depend on territorialisation to reproduce the spaces of petro-capitalism.

Petroleum resources are “landed” with respect to their fixed locations and embeddedness in the territorial structures of the nation state, ensuring that authority over physical space will continue to be critical to the politics of oil and gas (Bridge 2008). Yet, the multiplication of territories such as zones, hubs and corridors of investment has created a more complex picture of the practice of territory (Easterling 2014). The spaces of offshore oil are connected to the world around them by transnational governance systems, community engagement programmes, and transnational circulations of capital, standards, norms of governance, knowledge and information that are connected both across networked topographical space and in topological space. A detailed study of Ghana’s Jubilee oil field demonstrates how topographical and topological spaces co-exist and can be produced as an effect of the mutual dependence, cooperation and tension between state and capital. This relational account of sovereignty (Emel et al. 2013) and territory (Painter 2010) highlights again the inadequacies of understanding territory-making as a state-led project alone. More importantly, it moves

debate beyond a simple binary of state and capital that presupposes that state power and corporate power are in necessary opposition in the production of territory at different scales.

These spaces of offshore extraction produce physical zones over which broader socio-material relations are contested. Where capital ‘skips and hops’ between securitised zones (Ferguson 2005: 378), enclaves of extraction are nonetheless produced through relations between multiple human and nonhuman actors. In this account I have highlighted the socially and materially constructed spaces of the subterranean, submarine and atmospheric domains, where territories are expressed as socio-material volumes. Offshore infrastructures encounter a historically contingent set of political relations that are shaped by the materiality of resources and the environments in which territory is produced: human activity, nonhuman life, and the biophysical characteristics of the oceans, subsoil and atmosphere all complicate the exercise of control over space. Efforts to construct territories in water that mimic the determinate boundaries and surfaces of land have been both confounded and partially enabled by the material environments that offshore oil production encounters. Territorial practices that are largely unproblematic when anchored to fixed points on stable land are partially re-worked and adapted in the fluid, deep oceans to enable successful oil exploration and profitable oil production. Nevertheless, infrastructure in the oceans continues to be organised as territory by different human actors for different ends. Oil companies, state agents and fishing associations have all proposed and implemented territorial solutions to the disruptive flows of the oceans. Meanwhile a vast array of geophysicists, engineers, accountants, auditors and managerial staff are required to visualise, calculate, and realise the subterranean spaces of oil and the commodity form of atmospheric carbon. In many ways, the agency of nonhuman actors has been built into these new territorial systems of governance as the effect of human-nonhuman relations. What is governed in these spaces is not water, hydrocarbons, fish, rock or air *per se*, but the relations between materials and actors.

In these inherently relational environments, time has been an equally important factor shaping the practice of territory over space. The offshore oil industry operates in both a geo-social, subterranean world and a hydro-social, marine world (Peters 2012; Whatmore 2006). More recently, the climate-forcing impacts of oil production and consumption have also opened sites of resource commodification in the atmosphere. New territories have been created in all three spaces through different modalities. In this respect, the sea floor and ocean surface provide liminal planes between spaces that conform to different spatial-temporal dynamics. Above the seabed, the oceans are mixed on short time scales such that place is

continually reproduced. Global ocean currents carry nutrients to the surface that create the biannual fishing seasons in Ghana's coastal waters, conflicting with the spatial form of oil's exclusive zones. Here, the spatial power of the zone is expressed as a temporal force, while the movements of the oceans and those that move with it produce opposing spatial-temporalities that remake territory. Below the seabed, oil production is similarly expressed as a temporal force, penetrating through layers of carboniferous deposits laid down over millennia to access the fuels that underpin modern life (Clark 2016). Oil production creates 'a transfer of geological space and time that has underpinned the compression of time and space in modernity' (Bridge 2009). Moreover, as the current and future climatic impacts of fossil fuel consumption have become apparent, novel schemes have arisen to commodify carbon as a waste product at "the other end" of the carbon commodity chain (Bridge 2011).

The spatial form of territory for the offshore oil industry reflects this disjuncture between the subterranean and the submarine worlds. For Clark (2012: 1), 'there are no territories without exposed strata, no exposed strata without multiple layers of subtending strata, no subtending strata without deep, temporal dynamics'. The Earth's geological strata that have produced subterranean oil deposits, and which, in the future, will bear signatures of the Anthropocene, can be captured by these geographies of verticality. Yet the process of visualising the underground in extractive industries relies on political technologies that visualise and calculate the earth's strata in three dimensions to enable accumulation. Moreover, the different spatial-temporal dynamics of the oceans provide the basis of a contrasting volumetric account of rapid flows of oceans and those human and nonhuman actors that move in, on and through them (Steinberg and Peters 2015). Meanwhile, the carbon trade is built on calculations of the future, in which projections of counterfactual scenarios are required to estimate the volume of carbon emissions that will have been hypothetically avoided by any low carbon investment in ten or twenty years' time. In short, territory in three dimensions is subject not only to multiple spatialities, but to multiple temporalities that can only be understood in relation to space in an analytically whole category (Massey 1992). These temporal-spatialities are constitutive of the governance of whom or what is able to control space, and whom or what is not. In this respect, analysis of the practice of territory at sea shares conceptual ground with long-standing principles of terrestrial resource studies: that understanding relationships between enclosure, commodification and struggle is central to understanding the transformation of landscapes (Bebbington & Bury 2013).

There is a long history to representations of the oceans as empty spaces, devoid of human activity and relations (Anderson & Peters 2014, Steinberg 2001). More recently, the language of ocean grabbing has gained prominence, mobilising territorial metaphors similar to the terrestrial equivalent of land grabbing. The UN Special Rapporteur on Food warned in 2012 that ‘shady access agreements that harm small-scale fishers, unreported catch, incursions into protected waters, and the diversion of resources away from local populations—can be as serious a threat as “land-grabbing”’ (De Schutter 2012: 1). Feelings about the justice and injustice of certain circumstances are different for different people in different contexts (Sikor 2013). What is important, in this light, is the question of how particular notions of justice gain traction in public discourse and in some cases become hegemonic. A socio-material reading of territorial practices illuminates important processes in which territory and space are made through relations between state and capital and between the human and nonhuman world. The links between the territories of the underground, the (sub)marine and the atmosphere and the various resources therein are complex and changing, such that the exclusionary and inclusionary effects of enclosure cannot be assumed. They can however be accounted for by attending to the historical production of *territory beyond terra* in and across three-dimensional spaces continually recreated through social practices.

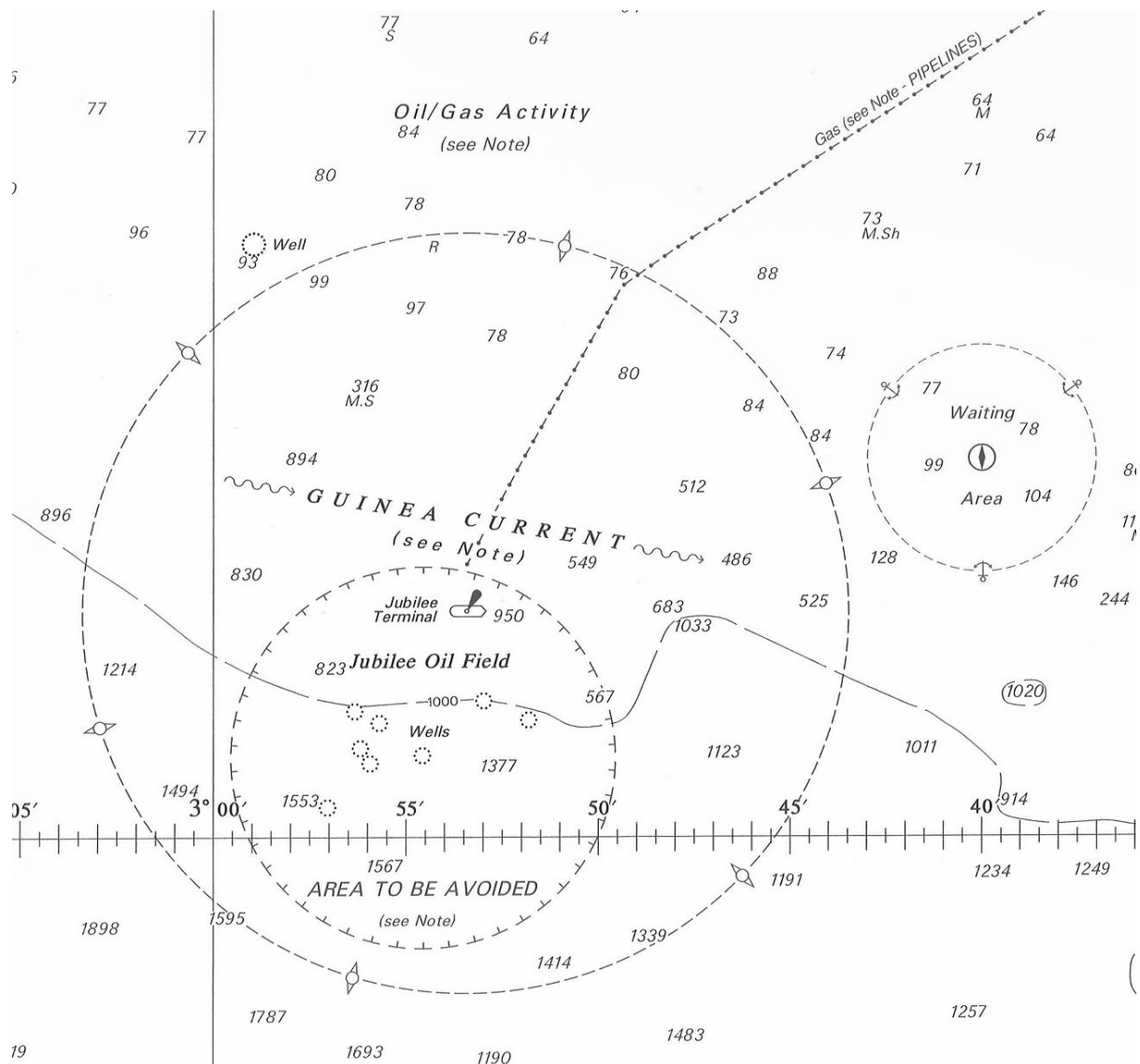


Figure 1. The extended safety zone of the Jubilee oil field ('Area to be Avoided'). The Floating Production, Storage and Offloading (FPSO) vessel *Kwame Nkrumah MV21* ('Jubilee Terminal') is moored 60km from the Ghanaian coast. The Area to be Avoided covers an area of radius 5 nautical miles centred on subsea oil wells. The larger concentric circle displayed is the area covered by radio transmissions that are broadcast from the FPSO to warn off intruders.

Source: Admiralty Standard Nautical Chart 1383: Lagune Abey to Tema. Reproduced with permission from United Kingdom Hydrographic Office (UKHO)

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