FIRE

PYROPOLITICS FOR A PLANET OF FIRE

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The World Wide Fund for Nature tagged it 'The Year the World Caught Fire'. In 1997–8 the coupled ocean-atmosphere system, the El Niño Southern Oscillation, went through an especially intense version of one its periodic changes in direction. Drought came to characteristically humid regions—desiccating tropical rainforests, while heavy rain fell on normally arid zones. Both of which, environmental historian Stephen Pyne (2001) explains, plumped up fuel loads in their respective ecosystems. Where there is fuel there will be fire, whether the spark comes from natural sources like lightning or from human ignition. Soon tens of thousands of blazes were raging across Australia and Amazonia, and from Siberia to Sumatra.

As Pyne (2001: 172) wryly observes the 'fires were telegenic, they were timely'. Television, itself a pulsing and flickering of light, has an affinity with fire. Tracking the blazes around the Pacific Rim and across the Americas, global media knew it was onto a winning topic. This was a time of ascending anxiety about human induced global warming, but neither figures of rising atmospheric carbon concentration nor global circulation models offered much in the way of visceral sensory charge. What the mass-mediated spectacle of the world's forests ablaze provided was the graphic interface that global warming had been lacking: here was an infernal iconography fitting for an era of runaway planetary heating (Pyne 2001).

If the 1980s and 1990s were decades when capital seemed to be roving the globe with unprecedented license, so too they were a moment when environmentalists were increasingly developing transborder tactics and alliances, as were climatologists and environmental scientists (Tsing 2005). While 1997–8 was neither the first nor the last year of widespread

wildfire, the tropical rainforests that burnt in those seasons were a focus for the political problematisation of transboundary environmental threats. But fire, in this sense, may be more than just one more ascendant object of political concern. It is the propensity of fire to sear its way across the Earth's surface and to transform the air in which we see, move and breathe, that makes it the kind of event that troubles the relationship between politics and the stuff of the world. Pyne (1997a: 5) points to an emergent understanding that localised fire is inseparable from the Earth's atmosphere, adding up to what he describes as a 'new mythological metamorphosis' in which air 'joins fire anywhere with fire everywhere'. Analogously, for philosopher Michael Marder (2015: 4), a planetary convergence of combustive processes and their atmospheric impacts is recomposing politics at the most elemental level. 'Our situation today', he declares, 'is that of *neither land nor sea*; updated for the twenty-first century, the central political elements are the dyad of air and fire'.

This chapter explores the idea of fire as a shifting and changeable elemental process that poses challenges to all who set out to manage parcels of the Earth's surface. At the same time, skilled operators can use fire to enrich and help secure a land or place of dwelling. If there is no inhabited region of the Earth where fire is not to some degree integral to the carving out and sustaining of territories, fire is also increasingly experienced as a transboundary force that can unsettle received understandings of territory as stable and enduring. As we will see, it is this combination of being at once local and global, grounded and circulatory, site-specific yet planetary in its connections and consequences, that makes fire such a provocation for rethinking territorial imaginaries.

I take my bearings from "The Year the World Caught Fire", which soon opens out into a succession of fiery years, and I focus on the islands of Indonesia —described as one of planet's preeminent frontiers of fire (Pyne 2001). Along with the Amazon, Indonesia—particularly Kalimantan, the Indonesian bulk of the island of Borneo—has been the site of extensive forest burning to make way for plantation agroecosystems. Harmful enough in themselves, many such fires have escaped control. Encompassing severe impacts on forest habitats and on traditional ways of life, Indonesian fire is a major source of the air pollution that plagues much of South East Asia. As well as addressing the causes of Indonesia's fire problem, I consider the collaborative efforts of the Association of South East Asian Nations (ASEAN) to deal with fire-induced `haze'.

This account, however, will be far from a simple one about a new transboundary problem

engendering novel transnational responses. Despite the efforts of ASEAN members—and nongovernmental actors—this story is yet without a happy ending. What is more, the question of what a transboundary political issue is or might yet be can draw us beyond even the most concerted efforts of contemporary transnational environmental governance. If we imagine that the only boundaries that really matter are those inscribed by human actors around the parcels of the Earth's surface we call nation states, then we may already be setting our sights too low—or perhaps not low enough. For in a world in which the operating state of the Earth system is a matter pressing concern, the thresholds that matter politically are no longer simply those that define nation-states, but those that distinguish one state of the Earth system or one geological epoch from another.

Given the well-established role of fossil fuel combustion as a driver of change, fire and its entanglement with Earth's atmosphere is a central concern when it comes to trying to protect crucial boundaries in the Earth system. Here too, Indonesia is a key player, for the archipelagic nation is a major exporter of coal. In this chapter, then, I ask how these two different kinds of combustion—fire that burns phytomass on the Earth's surface and fire that consumes fossilised biomass from the subsurface—are converging. I consider how they are fusing and being confused. For the very idea that all fire is bad fire, that the flaming forests are necessarily in collusion with combusting fossil fuels in destabilising the Earth system is something we need to question. What makes riveting television in an environmental age may not be the best foundation for a fire-centred rethinking of territory through and beyond terra.

As both Pyne and Marder suggest, fire may well have been a formidable and constitutive force in politics for much longer than most of us imagine. Moreover, when we start to think in a searching way about the great subterranean beds of fossilised hydrocarbons now causing so much climatic and earth system strife, their existence raises questions about how stable and immutable the ground beneath our feet has been. For just as the fire that drifts across the boundary between one nation state and another can perturb our sense of what constitutes a given political territory, so too can the fires that blaze across the boundary between one geological epoch and another unsettle our sense of the givenness of the Earth itself.

Territorialising Fire

During the extreme El Niño episodes of 1982–3 and 1997–8 even evergreens in the normally

lush tropical forest of Sumatra and Kalimantan shed their leaves, providing the dry biomass conducive to wildfire outbreak (Pyne 2001). But "normal" needs qualifying. As fire scientist Johann Goldammer (2007: 14) points out: 'Fire has been present in the Southeast Asian biota since the Pleistocene. Long-term climate variability (glacial vs. nonglacial climate) and short-term climate oscillations caused by the El Niño–Southern Oscillation event have repeatedly created conditions that make even rainforest susceptible to wildfires'.

While I will not be exonerating the political or economic actors behind the latest outbreaks of intentional fire, it is vital to look at the broader socio-material context in which Indonesia burns. Alongside the syncopated inter-annual rhythms of El Niño, it is the alternating annual wet-dry cycles of the Asian monsoon that make fire as crucial an element of the biogeography of the Indonesian archipelago as rainfall or moisture (Pyne 1997b). And for perhaps 800,000 years, fire-wielding hominids have been part of this ecology. The East Indies, in Pyne's (1997b: 418) words, is 'one of the great hearths of anthropogenic fire'. For thousands of years shifting cultivators have followed fire-fallow regimes—what is often described as 'swidden' or, in more discerning indigenous vocabulary, *jhum*, *kaingin* or *lading*. The distribution of teak and other hardwoods, spices and many tropical fruits is believed to be in large measure an expression of this fire-catalysed gardening (Pyne 1997b).

It is important to recognise that Indonesian fire is not the same as European fire. This matters because in the context of colonisation, emissaries from Europe took it upon themselves to manage land across much of the rest of the Earth's surface, including the East Indies. What Europeans so often failed to understand was that in many parts of the world – especially the tropics – fire is a necessary preparatory phase of agriculture (Pyne 2001, 88). As Pyne (1997b: 420) writes of the European colonial encounter with Indonesia: 'Europe didn't trust roving villages, didn't believe shifting cultivation was sustainable, didn't ascribe value to "minor forest products" that foraging natives did, and didn't like fire'.

The roots of this European distrust of fire and of fire-fallow people's farming are deep and complex. North-west and central Europe, Pyne explains, is unusual for its perennial dampness—for the absence of wet and dry rhythms that lend the Indonesian archipelago and much of the rest of the world a distinctive fire season. European soils, churned and revitalised by geologically recent glaciation, are exceptionally tolerant of the ongoing ecological disturbance that is agriculture (Pyne 2001; 1997b). This enabled Europe to become an anomalous patch of the Earth so intensely cultivated that fire can be almost totally

domesticated—extinguished in the wild and reduced to little more than a farming implement (Clark and Yusoff 2014; Pyne 2001).

Even so, the periodic firing of forest and the regular burning of fallow remained the cornerstone of European agroecosystems for millennia, as it was in Indonesia and most other places where agriculture was practiced. But then in early modernity, fire suppression in Europe took a further turn, without parallel anywhere else in the world. "Enlightened" agronomists, newly converted to the idea of endless spirals of economic accumulation, became convinced that surplus organic matter needed to be cycled back into soil or forest rather than "squandered" in flame (Pyne 1997b). At the same time, metropolitan authorities, anxious about the incendiary inclinations of the urban masses, were ever more disposed to see open fire as an expression of social breakdown and disorder. As Michel Foucault (1991) so influentially depicted, modernising states during this period were increasingly concerned with the *qualities* of their territory—taking upon themselves the responsibility to optimize the wealth and vitality of the spaces and populations under their jurisdiction.

As Europe's burgeoning urban masses were being induced to channel and augment their bodily energies, so too were its peasant farmers being compelled to quench their fires and desist from torching fallow—in the interests of tightening the energetic circuits of agricultural production. It's no coincidence that the institution of curfew to constrain the spatio-temporal movements of urban bodies is derived from *couvre feu*—the covering or quelling of fire (Clark, 2011; Pyne 2001). Such insights suggest that the definitive modalities, tactics and practices of governing territory that crystallised in a modernising Europe had at their heart a certain orientation to fire. But it was a disposition so utterly intent on fire's exorcism that European thinkers have rarely dwelled on the fiery underbelly of political modernity. Or as I put it elsewhere:

> it is perhaps only in Europe that we could imagine a "biopolitics" that was not first and foremost a 'pyropolitics'—centred on the regulation, manipulation and enhancement of fire. Or is what we have come to call biopolitics, already, covertly, a set of practices concerning the governance of what can be burned, how, where and by whom? (Clark 2011,164–5).

If in the course of their drive for global expansion Europeans were willing to displace their repressed desire to burn onto distant lands, as the imperative to govern in "productive" and "optimising" ways was extended to colonial territories such as the East Indies so, too, were

sanctions against open fire. What began as a provincial mutation, a geographically and culturally specific renunciation of fire, was gradually assembled into a global norm: a set of prohibitions that cultivators, pastoralists and forest dwellers the world over were expected to abide by. As Pyne (1997b: 495) admonishes: 'the principles of fire conservancy became a dogma of British—indeed, of European—environmental policy. In what is surely one of the most paradoxical outcomes of European expansion, some of the most pyrophobic peoples on the planet assumed control over some of the Earth's most pyrophilic biotas'.

The East Indies caught the full force of this attempt to excise fire from constitutively fire-prone ecosystems. Europeans were certainly not immune to learning from novel environments or from harsh experience. Indeed, as environmental historian Richard Grove (1995) notes, much of the early imperative towards early forms of conversation came from observations that deforesting tropical lands—especially islands—could lead to desiccation, erosion, and even total biotic collapse. For authorities tasked with enhancing the "natural" productivity of the larger islands of the East Indies, it seemed as though fire reduction was the key to keeping landscapes well-watered and fertile.

While the earlier Dutch colonists of the late eighteenth century grasped that intentional use of fire was deeply entrenched and of customary significance, later colonial administrators—justifiably concerned over the impacts of commercial logging operations—turned to fire control as the pathway to watershed protection (Pyne 1997b). But undiscerning fire proscription quickly came up against the fire-inducing wet-dry pulsing of both the Asian monsoon and El Niño; more than this, injunctions against burning met with vigorous resistance by indigenous peoples. 'The more the Dutch objected to fire', observes Pyne (1997b: 423), 'the more often the natives were inclined to use it'. In the process, colonial foresters intent on harvesting teak missed the point that the deciduous, semi tropical hardwood tree flourished where it was exposed to regular fire.

We can view this as a collision between competing ways of territorialising fire. Europe became a site in which the suppression of fire's mobile, mutable aspects played a key part in the fixing and bounding of territory at scales ranging from the farm to the nation. Indeed, pyropolitics—collective decision-making over fire—may well have played a much greater role in the characteristic grounding or stabilisation of territory in the `Old World' than most political theorists have acknowledged. The rural people of the East Indies had their own pyropolitics: their own ways of setting fire to work to shape, manage and render productive

specific pockets of land. But like the element of fire itself, these territories tended to shift and transform in response to environmental variability.

Over the latter nineteenth and early twentieth centuries, official policy in the East Indies was a variant of the European territorialising of fire. Fire suppression combined with irrigation was at the core of colonial strategies to substitute new export commodities such as coffee and sugar for fire-catalysed shifting cultivation across the inner islands of Indonesia (Pyne 1997b). Fire, needless to say, persisted. With independence came a relaxation of fire prohibition, but this change was hardly in the interest of traditional fire-fallow farming or the ecosystems it promoted. By the 1980s, concern over expanding populations and the belief that accelerating economic growth was the answer to political instability led to state-supported expansion to the "outer islands", especially Sumatra and Kalimantan (Tsing 2005). This time around, logging and plantation agriculture were to reach deep into the inland tropical rainforests, into an interior that had proven resistant to even the most avid colonial improvers. And fire was the most economical and convenient means of clearing the land.

Fire as a Transboundary Problem

As Pyne (1997a; 2001) insists, ideas about fire are both cultural and geographically specific—although, like flames, they tend to migrate and insinuate themselves in new environments. Neither inherently good nor bad, wildland fire is a manifestation of the different elements—oxygen, fuel-loads, ignition source, topography, weather conditions—that it brings together in what is always a unique event (Pyne 2014). But some blazes are exceptional. Since the early 1980s, fires that have been searing through the Indonesian interior have turned periodic combustive events into conflagrations too wide-ranging and incessant to allow for recovery and regrowth—which is often the point.

Until the 1970s, the tropical rainforests of Kalimantan and Sumatra had escaped large-scale logging, their very biodiversity presenting too much heterogeneity to suit the industrial harvester. From then on, a state-sponsored "New Order'" offering concessions to overseas corporations opened the way to a regime of mechanised extraction, quickly elevating Indonesia to the world's leading exporter of tropical timber (Tsing 2005). Regeneration was not a priority. Once commercially valuable wood was removed, the remaining vegetation was frequently burnt off to clear the ground and fertilise the soil for plantation crops. Prising open

the canopy resulted in drier microclimates, increasing the susceptibility of surrounding forest to further fire (Herawati and Santoso 2011). By the early 1980s, fire-driven rainforest conversion was generating an annual pall of airborne aerosol pollution—euphemistically termed haze— blanketing Indonesia and neighbouring nations.

The El Niño-compounded fire season of 1997–8 burned over eight million hectares across Kalimantan and Sumatra, creating acrid haze that affected the health of some 75 million people in the region, and exacting serious socio-economic impacts across six South East Asian nations. The smoke reduced rainfall, exacerbating the El Niño effect and increasing forest flammability. As well as having serious impacts on regional agriculture and biological diversity, the atmospheric effects of the fires helped elevate Indonesia to one the world's highest carbon dioxide emitters (Mayer 2006).

In the early years of the transboundary haze problem, traditional fire-fallow cultivators and migrant farmers were frequently held to blame. By the early 2000s, satellite imaging cross-referenced with concession maps linked plantation companies to 80 per cent of the fires (Varkkey 2013), with land clearance for the burgeoning palm oil industry regarded as the leading incentive for burning (Jones 2004). While using fire to clear land is technically illegal under Indonesian law, liability is hard to establish. In the messy ground-level reality of rainforest "development", smaller fires accidently grow into larger fires or can be encouraged to become so. Fire can be deliberately used to degrade "pristine" rainforest so it can be legally reclassified as convertible to plantation farming. Palm oil and rubber companies and other big operators devolve "land preparation" to a host of unregulated and ephemerally operating sub-contractors, some of whom reputedly set fires on villagers' lands and allow it to spread to where it is required (Varkkey, 2013).

Indeed, it is fire's propensity to overflow lines and markers inscribed on the surface of the Earth that helps make it such a recalcitrant object of regulation, a challenge no less complicated in relation to the transboundary effects of smoke. When it came to engaging with the increasingly intolerable effects of air pollution, it was fortuitous that the affected populations/governments were already members of Association of Southeast Asian Nations (ASEAN), the political and economic organization founded in 1967 by Indonesian, Malaysian and Singaporean governments—and subsequently expanded to include Brunei, Thailand, the Philippines, Cambodia, Vietnam, Laos and Myanmar/Burma. ASEAN's response to the haze problem has been widely praised, with the United Nations Environment

Programme, amongst others, commending the Association's collaborative air pollution mitigation efforts as a potential global model for addressing transboundary issues (see Varkkey 2012).

Despite political regime changes, Indonesia's own leadership has remained steadfastly committed to export-led economic growth, and has tended to tolerate haze and carbon emission problems as regrettable side effects of the drive for prosperity. 'Environmental protection is weighed against economic concerns,' political scientist Christopher Atkinson (2014: 254) observes, and it has been rare for the former to tip to the balance. But Indonesia's lack of concern with the wider impacts of its "frontier of fire" has not necessarily been out of keeping with international law and policy. Even the 1992 United Nations Conference on the Human Environment affirms each state's 'sovereign right to utilize, manage and develop their forests'— with no explicit reference to international cooperation over forest fire prevention (cited Robinson 2001: 463). This oversight seems to stem from the assumption that all nations would properly attend to their own forest fires rather than implying any reconciliation with forest fire *per se*.

Held between 1992 and 1996, ASEAN's workshops on transboundary haze and the resultant Cooperation Plan on Transboundary Pollution certainly showed promise (Jones 2004; Robinson 2001); as did the more demanding Agreement on Transboundary Haze Pollution, signed by six member states in November 2002. The latter initiative—effectively an international treaty—stresses prevention and monitoring of transboundary haze, including inter-state cooperation in developing early warning systems, fire-fighting capability and preventive measures such as education, awareness-building and community participation (ASEAN 2016). But while the Agreement is legally binding on signatory states, critical commentators note that ASEAN's foundational principles of non-interference in each other's domestic affairs compromises the Agreement's effectiveness (Jones 2004). This limitation was compounded by Indonesia's delay in ratifying the agreement until 2014—making it the last of the signatories to fully commit.

A certain softening of the ASEAN hard line on respecting sovereign space is suggested by joint ventures such as Malaysia, Singapore and Indonesia's collaboration in cloud-seeding operations to extinguish fires in East Sumatra and West Kalimantan in 2005 – which was significant because it involved sharing national airspace and the possibility of redirecting rainfall across international borders (Mayer 2006). Critics note, however, that the root causes

of forest burning are inadequately addressed by the technical focus of such actions or by the Haze Agreement's central provisions more broadly (Mayer 2006). Much comes down to the Indonesian government's inability or unwillingness to enforce its environmental laws, a failure attributed to entrenched patronage relationships between the state and powerful corporate actors (Jones 2004; Varkkey 2012). Such complicity between political and economic elites characterises ASEAN member states more generally, as does the prioritisation of economic development over environmental protection (Robinson 2001).

It is important to recall that Indonesia is not the only ASEAN nation in which fire is used to clear forest (Jones 2004), and that Malaysian and Singaporean companies contribute significantly to Indonesian forest burning (Mayer 2006). In brief, plantation agriculture is big business across much of the region, and maximising growth and profitability in this sector is viewed as a keystone of economic and political stability in the region (Jones 2004). As Varkkey (2012: 83) pointedly concludes: 'ASEAN initiatives on haze have resulted in outcomes that protect national economic interests, preserve state sovereignty, and deflect responsibility on the haze issue, instead of actually reducing or eradicating haze'.

Increasing pressure from environmental NGOs in Indonesia and across the region, a concerted ASEAN response to the severe fire season of 2013, and Indonesia's belated ratification of the Transboundary Haze Agreement suggest that the governance of forest burning in South East Asia is an unfinished story. As the haze problem drives home, the quality of daily life in the streets of Kuala Lumpur or Singapore is intimately linked to what happens deep in the forests of Kalimantan and Sumatra. Just as fire sears its way across ground-level administrative borderlines and demarcations, so too do its airborne effects drift across national boundaries and enmesh themselves in the global atmosphere. In this way, the fearsome dyad of air and fire continues to test interstate capacities, provoking national, regional and international actors to forge new alliances and agreements.

At the same time, however, there is much in the regional haze problem that is resoundingly familiar: the recalcitrance of territorial sovereignty, nation-based preoccupations with economic performance, and the unfaltering ease with which capital crosses borders relative to those agencies that would constrain or limit its actions.

Combustion and the Politics of Strata

As environmental lawyer Nicholas Robinson (2001: 504) intones on the Indonesian predicament: 'Forest fires are a clear and present danger, not merely to territory within a nation, but globally and transnationally'. Reviewing the use of fire in Indonesia by powerful plantation and logging interests for forest conversion —and its biospheric and atmospheric repercussions—one could hardly disagree. But not all the implications and complications of combustion are quite so *clear and present.* And *territory*—usually taken to mean the exclusive parcelling out of the Earth's surface between more or less sovereign states—is not necessary the first or last word in political probity, even when these bounded spaces are over-flowed by unruly and transgressive forces.

Thus far, for all our attending to irruptions, driftings, circulations—we have still been focused on or over the Earth's surface—on events that play out on a globe whose curvature and contours are laid out before us. But the fires we have been tracking also draw us downward, into an underworld that is both part of the planet's deep past and implicated in its possible futures. For the combustion that is now taking place in Indonesia, I want to suggest, is enmeshed not only with the sociopolitical formations of polities such as Indonesia, Malaysia, or Singapore, but imbricated with the geological formations of the Eocene, the Miocene and the Pliocene—and whatever epochs are yet to come. And this traversing of the Earth's strata raises challenges to territorial imaginations every bit as profound as flows that move across the planet's surface.

ASEAN's Agreement on Transboundary Haze Pollution was followed by the Peatland Management Strategy (ASEAN 2006). Indonesia contains some 53 per cent of the world's tropical peatlands, and much of this area was burnt in the 1982–3 and 1997–8 fire seasons. Peat swamps contain considerable biodiversity and are vital components of the global carbon cycle. It is estimated that in 1997 these peat fires generated the equivalent of 40 per cent of the world's fossil fuel carbon emissions (Chokkalingum, Kurniawan and Ruchiat 2005). While the draining and firing of Indonesia's peat swamps is a well-publicised environmental threat, less attention has been given to the ignition of coal seams by forest fires. The areas of Sumatra and Kalimantan where forest burning has been most extensive are also the sites of 90 per cent of Indonesia's coal reserves. Here, forest fires frequently ignite exposed coal seams and whereas forest and peat fires burn out or are extinguished by rainfall coal fires can smoulder for decades. Researchers estimate there are up to 3000 coal fires burning in East Kalimantan, any one of which can ignite new forest fires (Whitehouse and Mulyana 2004).

Added to these accidental ignitions is the massive intentional exhuming and burning of fossil fuel deposits. Indonesia—the world's largest exporter of thermal coal—is a significant contributor (Belkin 2009: 261). Going against global trends for downsizing coal reserves, Indonesia is one of few nations for which known reserves have being growing, with deposits estimated at 57 trillion tons in the early 2000s (Fatah 2008). Concentrated in East and South Kalimantan and South Sumatra provinces, annual coal production has risen from 130 million tonnes in 2005 to a 2014 total of 458 million tonnes (BP 2015; Fatah 2008).

Coal—like petroleum—is effectively sunshine structured into biomass, compressed, transmuted and sequestered beneath the Earth's surface. Despite the evidence linking the burning of fossil fuels with global environmental change, mobilising nation states into effective action to mitigate these changes has proved to be a formidable political challenge. Although critical scientific witnesses insist that the outcome of the 2015 United Nations Climate Change Conference in Paris is nowhere near sufficient to prevent dangerous climate change (Anderson 2015), it is noteworthy that for the first time that delegates agreed in principle that a significant proportion of known fossil fuel reserves must remain in the ground.

ASEAN officials, convening on the side-lines of the Paris Conference, set the region the task of controlling its forest fires and becoming largely `haze free' by 2020. As Faizal Parish, director of the Malaysian-based Global Environment Centre puts it: 'Without stopping peatland fires and degradation, ASEAN will continue to be a major emitter of greenhouse gases' (cited in Wangkiat 2015: n.p.). Indonesia's ratification of the Transboundary Haze Pollution Agreement is obviously crucial. Currently the world's sixth largest emitter of greenhouse gases, Indonesia's ranking is raised by the exceptionally high proportion of its emissions arising from deforestation and land-use change; this also contributes to the excessive level of the carbon intensity of the Indonesian economy. At just under 1000 tonnes of greenhouse gas emitted per million dollars of Gross Domestic Product (the global average is 372 tonnes), Indonesia's emissions intensity is by far the highest in the world (Ge *et al*. 2014).

But what such a hefty deforestation component in the national carbon tally means in practice is that Indonesia and a number of its ASEAN fellow members can propose more-or-less acceptable targets for overall emission reduction *without* significantly cutting fossil fuel consumption (Witoelar, in Rappler.com 2015). As Malaysia's undersecretary of climate

change makes plain, immediate reductions in the region's reliance on coal are unlikely (Theseira, in Wangkiat 2015). That may be an understatement. The Indonesian government plans to construct 119 new coal-fired power plants, aiming to have 20 gigawatts of coal-fired capacity in place by 2020 (Energy and Climate Intelligence Unit 2016, 20-21). Much of this coal will be supplied from opencast mining and mountain top removal (Fatah 2008). However, there are signs that local resistance over air pollution concerns, especially on the populous island of Java, may be slowing progress (Energy and Climate Intelligence Unit 2016: 20–1).

These matters bring us to a `deeper' point. Some 60 to 70 million years ago, when the present Indonesian islands were part of the Sundaland sub-continent, rifting tectonic plates in the region produced shallow basins that were infilled by fluvial deposits. Here, peat swamps flourished. Peat development—which eventually produced Indonesia's relatively young coal beds—took place during warm, wet climatic phases strung out over the next 40 million years, including the early and mid-Eocene, the late Oligocene and the early Miocene, tailing off during a glacial episode in global climate, then resuming around five million years ago in the Early Pliocene (Belkin 2009; Davis, Noon and Harrington 2007). In short, the events that produced the fossilised hydrocarbons that Indonesia is now adding to the global carbon budget are the product of a tectonically active zone on what is an exceptionally tectonically active and climatically changeable planet. Indeed, as geologist Jan Zalasiewicz (2008: 14–5) reminds us, there is no astronomical body in the solar system whose tectonic plates are so mobile and whose geological strata are so rich and varied as those of the Earth.

From the surface layers of biological life, through the shallow stratum of recently deposited peat, and into the multiple strata of coal and its companion lithic layers, the issues of combustion in Indonesia draw us 'vertically' into the deep, geological time-space of the Earth (see Clark 2016; Elden 2013). This is immediately politically troublesome terrain. When it comes to Kalimantan's problem of forest fires that ignite coal seams, or coal seams that set forests alight, it is by no means clear which government departments ought to be responding:

> the Ministry of Energy and Mineral Resources …was certain coal fires were not their responsibility. MEMR's position was that while some coal fires occur within the areas of active mines where they have jurisdiction, they most often occur in forests, parklands and rural neighborhoods where they have no jurisdiction. (Whitehouse and Mulyana 2004: 93)

But the problem is bigger than this, for what the issue of extracting and combusting fossil fuels raises is the challenge of how to manage our transactions with the substrata of the Earth. To put it another way, where the haze problem is transboundary in the international sense, the question of whether or not to exhume and burn fossilised hydrocarbons concerns the possible transgressing of *geologic* boundaries. More than a matter of a collection of sovereign states trying to balance their interests, the challenge of "managing" global climate or attempting to "govern" Earth systems requires economic agents to renegotiate their relationships with geologic body of the Earth (see Rockström *et al*. 2009). Climate change and Earth system change raise the possibility of a dynamic Earth lurching into a new operating state—or even a novel geological epoch, as the Anthropocene thesis proposes. The triggers of these transformations are anthropogenic processes of exhuming and setting to work the productions of past geological periods, and also involve the inherent changeability of the Earth system. And this means that the collective responses called forth are at once a politics of *territory* and *flow* and a politics of *strata* (Clark, 2014; 2017).

It is worth recalling that the Earth's atmosphere is also stratified, though these layers flow and recompose themselves much faster than the rocky material of the Earth's crust. Smoke from Indonesia's burning biomass enters turbulent and circulating currents of the troposphere—the lowest, most mobile stratum of the atmosphere—through which it is transported over neighbouring regions. And it is here, in the troposphere, that the two different kinds of `transboundary' combustion we have been talking about—burning phytomass on the Earth's surface and burning fossilised hydrocarbons from the subsurface—come together. For especially above dense urban centres like Singapore or Bangkok, smoke from forest fires forms a toxic admixture with emissions that come from motor vehicles, industry and other forms of combusting fossil fuel (Aiken, 2004).

As a political issue that involves both the stratification of the Earth's lithic crust and the atmosphere, governing fossil fuel combustion would seem to fit well within recent research that explores how the project of making and maintaining territory is now being extended vertically or volumetrically (Elden, 2013). However, little of this work has yet seriously considered the *dynamic* nature of the processes that generate the Earth's rocky or atmospheric strata. For as Earth scientists insist, strata-forming processes are incessantly active, and the uppermost layers of the Earth's crust are in constant interaction with the swirling mobility of air, water and life at the planet's surface (Zalasiewicz *et al*. 2017). As a reaction that integrates air, water, life and rock, fire is a vital part of this dynamic interchange. But if

inherited political architectures struggle to come to terms with socio-material processes that overflow bounded constructions of territory, arguably we are even more stymied by the challenge of elemental forces that well up from the geological depths of the Earth. In short, it is not only that modern territorial imaginaries have tended to focus overwhelmingly on land rather than the relatively mobile elements of sea, air, ice or life, it is that `terra' itself – viewed in the long term - is a much more shifting and mutable entity than most political thinkers or practitioners have assumed. In the concluding section, I tease out some of these themes in the context of the fraught politics of Indonesia's multiple layers of combustion. Here, too, I return to the idea that all politics is, sooner or later, pyropolitical, and consider the urgency and complexity of today's pyropolitics.

Pyropolitics for a Dynamic Planet

Europe, as recalled earlier, has a paucity of wildland fire and a peculiar cultural intolerance of open flame. But fire does have a "positive" role in the iconography of European politics and culture. An inextinguishable flame symbolises belonging to family, community, and nation. As Martin Heidegger muses, `the hearth, the homestead of the homely, is Being itself in whose light and radiance, glow and warmth, all beings already have gathered' (cited in Capobianco 2010: 62). This hearth around which the community gathers—the ontological ground of the polis—is emphatically an enclosed and domesticated fire. In the western tradition, going back to the Greeks, the hearth is literally fixed to the ground, and in this way it is 'identified with the earth, immobile and stable' (de Beistegui 1997: 139). Contained fire, in short, is the symbolic counterpart of territorial boundedness and anchoring in an enduring Earth. However, for all Heidegger's commitment to Earth-rooted community, even he recognised that there was something *unheimlich*—uncanny, unsettling—in the way that flame and smoke left the terrestrial abode and wafted up into the heavens (de Beistegui 1997: 139).

Leave perennially soggy Europe and venture into the wet-dry pulsing of the tropics and fire becomes 'unhomely' in ways Heidegger never dreamed of. But these are latitudes in which there are peoples at home with open fire, cultures for whom selectively burning vegetated land has long been the fulcrum of their sustenance and relations with a living world. Fire for them is a means of carving out and shaping territory—but territory that tends to be porously bounded and inclined to move in synch with environmental rhythms and flows. In the 'environmental era', however, European bias against burning biomass still commands authority. 'A world war fought on its own soil and the postwar loss of empire did little to

diminish Europe's influence on global fire,' laments Pyne (1997: 532). Shades of lingering European fire aversion might be discerned in the 2008 UN Initiative on Reducing Emissions from Deforestation and Forest Degradation (REDD), launched in 2008, which is currently rolling out financial incentives across the developing world to promote the shift from swiddening to more commercial agroecosystems. Indonesia, a prime recipient, hosts 44 projects.

As Alan Ziegler and his colleagues (2012: 3095) observe: 'Indonesia's REDD+ strategy proposes agricultural intensification (permanent cropland) and planting of oil palm and trees for pulp and timber (plantations) as alternatives to unsustainable forest harvest and slash-and-burn agriculture'. Contra REDD directives, their study of rural Indonesia demonstrates the superiority of long fallow swidden systems over monoculture and agroforestry for long-term carbon capture. Ziegler *et al*. (2102: 3096) encourage further research that delves beneath the cycling of carbon through living phytomass, calling for 'particular focus on below-ground carbon, which can sway decisions regarding optimal land use'. This conclusion resonates with earlier work by atmospheric chemist and Anthropocene theorist Paul Crutzen, who questioned the validity of studies derogating tropical swidden agriculture and suggested that some forms of burning biomass were 'possible net sinks for atmospheric CO_2' (Crutzen and Seiler 1980: 241). As Goldammer and Crutzen (1993: 11) later concluded in work that set out to integrate the fields of wildland fire science and atmospheric chemistry; 'the preservation and study of fire will assist humanity in its larger stewardship of the Earth'.

The connection, via Crutzen, to the Anthropocene thesis is significant, for it reminds us that fire is intimately linked to the different states through which the Earth system has passed and to processes of geological transition. As Pyne (2014: n.p.) puts it, `the fires of the Carboniferous period differ from those of the Permian. Miocene fires rippling over grasslands differed from Eocene fires that had no grasses to burn'. Just as fire flourishes at junctures in the planet's mobile crust—the volcano-strewn East African Rift Valley, the Pacific Ring of Fire—so too does it proliferate at transitional points in the Earth system. Fire, observes Pyne (1994: 890), 'appears more profusely during times of rapid and extreme climatic change'. And this is one reason why fire-wielding hominids need to be ready, need to know what they are doing with fire, need the full range of burning practices at their disposal.

For *Homo sapiens* across most of the world, fire has been the preeminent means of dealing with climatic irregularity. Skilled application of fire is a way to massage the Earth's

sustaining capacities, to care for land, to forestall larger, fiercer conflagrations. In other words, a way to forge and hold territory that befits a dynamic planet. This is why peoples who find their customary burning practices prohibited or have alien fires introduced into their world tend to respond with the ploy they know best. They set fire.

Michael Marder's (2015) searching ruminations on the `pyropolitical' capture the insurrectionary connotations of fire. But as with most Eurocentric accounts of fire these reflections lean toward the metaphorical rather than the pragmatic—although he is surely right to insist 'that pyropolitics is co-extensive with the concept *and* the event of the political' (p.10). Whereas Marder's collective actors tend to play variations on the theme of fire's insurgent associations, other analysts of political fire emphasise the inseparability of flame as symbolic and material force. As an expression of agrarian discontent, rural incendiarism belongs 'to that shadowy realm between crime and protest where it is often no easy matter to tell the two apart' (Rude cited in Kuhlken 1999: 344–5). Christian Kull (2002: 949) adds that what may first appear to be acts of politically motivated arson may well turn out to be 'straightforward livelihood practice': that is, traditional land management techniques rendered clandestine and revitalized under cover of social unrest.

Indonesian fire is all this and more. Researchers on Java in the 1960s noted that fire was used for clearing land, 'for hunting, for pleasure, for pestering neighbors or neighboring villages' (van Steenis in Kuhlken 1999: 357). In Kalimantan and Sumatra, clashing land developers and small farmers each use fire to assert their rights: 'Companies used it to stake claims to locally held land, and rural dwellers, embittered by several decades of marginalization and widespread appropriation of their natural resources, used it to destroy estate crops and timber plantations' (Aiken 2004: 74). As complex in motivation as they are in physical-material composition, such fires tend to be extremely difficult to extinguish.

It is crucial to remember that fires which burn live or recently living phytomass are part of the Earth's constant solar income, whereas fires that consume fossilised biomass dig into a kind of geological solar capital. While they both release the energy locked in carbon bonds, these fires have very different implications for the Earth system. Pyne (1997a; 2001) insists that one of western modernity's greatest mistakes is to imagine that the contained fire of combusting fossil fuels can replace the open fire of burning vegetation. Across much of the Earth's surface—he is not writing about permanent conversion of forested land here—there is far too much fossil-fuelled flame but not nearly enough blazing phytomass. And both the

superfluity and the shortage are profoundly politically challenging.

Among ASEAN members, the ongoing tussle with the transboundary haze problem is a reminder of how contentious it is to deal with fire within the borders of another nation. At the same time, the unresolved issue of global climate change demonstrates the diabolical difficulty of trying to manage how nation-states and non-state actors interchange with the Earth's substrata. For there are two different but enmeshed transboundary problems here: the challenge of navigating the boundaries between socio-political formations and the challenge of negotiating the boundaries between geological formations. The pyropolitics of *territory* and the pyropolitics of *strata* are not yet "talking" to each other nearly as much as they need to be.

Mounting scientific evidence suggests that the relatively stable climate the Earth has enjoyed over the last 10,500 years may be ending, and that we should expect more instability in the Earth system. Fire is one of our species' time-honoured means of dealing with environmental variability, but a changing Earth system will inevitably bring new and strange fires. Fire can never simply be a political act, but is always also to some degree an experiment: a symbolic gesture as well as a medium of material intervention, learning, trial and error (Clark 2008; 2015). In the Indonesian archipelago, pyropolitics poses difficult questions about who gets to experiment, where and when. At the same time, it raises the question of how to deal with experiments that fall short or go awry. As they surely will, sooner or later. For on planet that is itself in constant transformation, working with fire comes with no assurance or guarantee.

References

Aiken, Robert. 2004. "Runaway Fires, Smoke-Haze Pollution, and Unnatural Disasters in Indonesia." *Geographical Review* 94 (1):55-79.

Anderson, Kevin. 2015. "Talks in the City of Light Generate More Heat." *Nature*. 528:437.

Association of South East Asian States. 2006. *ASEAN Peatland Management Strategy*.

Jakarta: ASEAN Secretariat

Association of South East Asian States. 2016. *ASEAN haze action-online.* Accessed 20 May. http://haze.asean.org/asean-agreement-on-transboundary-haze-pollution-2/

Atkinson, Christopher. 2014. "Deforestation and Transboundary Haze in Indonesia: Path Dependence and Elite Influences." *Environment and Urbanization Asia.* 5 (2)253-267.

BP (2015) *Statistical Review of World Energy*. Accessed 20 May. http://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html

Belkin, Harvey., Tewalt, Susan., Hower, James., Stucker, J and O'Keefe, J. 2009. "Geochemistry and Petrology of Selected Coal samples from Sumatra, Kalimantan, Sulawesi, and Papua, Indonesia." *International Journal of Coal Geology* 77:260–268.

de Beistegui, Miguel. 1997. *Heidegger and the Political: Dystopias*. Abingdon, Oxon: Routledge.

Capobianco, Richard. 2010. *Engaging Heidegger*. Toronto: University of Toronto Press.

Chokkalingam, U., Kurniawan, I. and Ruchiat,Y. 2005. "Fire, Livelihoods, and Environmental Change in the Middle Mahakam Peatlands, East Kalimantan." *Ecology and Society* 10(1): 26. Accessed 20 May. http://www.ecologyandsociety.org/vol10/iss1/art26/

Clark, Nigel. 2008. "Aboriginal Cosmopolitanism." *International Journal of Urban and Regional Studies* 32 (3): 737–744.

Clark, Nigel. 2011. *Inhuman Nature: Sociable Life on a Dynamic Planet*. London: Sage.

Clark, Nigel. 2014. "Geo-Politics and the Disaster of the Anthropocene." *The Sociological Review* 62:S1: 19–37.

Clark, Nigel. 2015. "Fiery Arts: Pyrotechnology and the Political Aesthetics of the Anthropocene." *GeoHumanities,* 1(2):266-284,

Clark, Nigel. 2017. "Politics of Strata." *Theory, Culture & Society*.

Clark, Nigel and Yusoff, Kathryn. 2014. "Combustion and Society: A Fire-Centred History of Energy Use." *Theory, Culture & Society* 31 (5): 203–26.

Davis, R., Noon, S. and Harrington, J. 2007. “The Petroleum Potential of Tertiary Coals from Western Indonesia: Relationship to Mire Type and Sequence Stratigraphic Setting.” *International Journal of Coal Geology* 70:35–52.

Elden, Stuart. 2013. “Secure the Volume: Vertical Geopolitics and the Depth of Power.” *Political Geography* 34:35–51.

Energy and Climate Intelligence Unit. 2016. “Asia’s Tigers: Reconciling Coal, Climate and Energy Demand.” Accessed May 19. http://eciu.net/assets/Reports/ECIU_Asia¹s-Tigers_FINAL.pdf

Foucault, Michel. 1991, (1st 1975*) Discipline and Punish: The Birth of the Prison*. London: Penguin.

Fatah, Luthfi. 2008. “The Impacts of Coal Mining on the Economy and Environment of South Kalimantan Province, Indonesia.” *ASEAN Economic Bulletin* 25 (1):85–98.

Ge, Mengpin., Johannes, Friedrich and Damassa, Thomas. 2014. “6 Graphs Explain the World’s Top 10 Emitters.” *World Resources Institute*. Accessed 19 May. http://www.wri.org/blog/2014/11/6-graphs-explain-world’s-top-10-emitters

Goldammer, Johann. 2007 “History of Equatorial Vegetation Fires and Fire research in Southeast Asia before the 1997–98 Episode: A Reconstruction of Creeping Environmental Changes.” *Mitigation and Adaptation Strategies for Global Change* 12:13–32.

Goldammer J.G. and Crutzen P.J. 1993. “Fire in the Environment: Scientific Rationale and Summary of results of Dahlem Workshop.” In *Fire in the Environment: The Ecological. Atmospheric, and Climatic Importance of Vegetation Fires*, edited by J. G Goldammer and P. J. Crutzen P.J. Chichester: Wiley.

Grove, Richard. 1995. *Green Imperialism*. Cambridge: Cambridge University Press.

Herawati, Hety and Santoso, Heru. 2011. “Tropical Forest Susceptibility to and Risk of Fire under Changing Climate: A Review of Fire Nature, Policy and Institutions in Indonesia.” *Forest Policy and Economics* 13:227-233.

Jones, David S. 2004. “ASEAN Initiatives to Combat Haze pollution: An Assessment of Regional Cooperation in Public Policy-making.” *Asian Journal of Political Science* 12 (2)59-77.

Kuhlken, Robert. 1999. “Settin’ the Woods on Fire: Rural Incendiarism as Protest.” *The Geographical Review* 89 (3):343-363.

Kull, Christian. 2002. “Madagascar Aflame: Landscape Burning as Peasant Protest, Resistance, or a Resource Management Tool?” *Political Geography* 21:927–953.

Marder, Michael. 2015. *Pyropolitics: When the World is Blaze*. London: Rowman & Littlefield.

Mayer, Judith. 2006. “Transboundary Perspectives on Managing Indonesia’s Fires.” *Journal of Environment & Development* 15 (2): 202-223

Pyne, Stephen. 1994. “Maintaining Focus: An Introduction to Anthropogenic Fire. *Chemosphere* 29 (5):889–911.

Pyne, Stephen. 1997a. *World Fire: The Culture of Fire on Earth*. Seattle: University of Washington Press.

Pyne, Stephen. 1997b. *Vestal Fire*. Seattle: University of Washington Press.

Pyne, Stephen. 2001. *Fire: A Brief History*. Seattle: University of Washington Press.

Pyne, Stephen. 2014. “Moved by Fire: History’s Promethean Moment.” *The Appendix.* 2: 4 . Accessed 20 May. http://theappendix.net/issues/2014/10/moved-by-fire-historys-promethean-moment

Rappler.com. 2015. “Indonesia Steps up Commitment to Fight Climate Change at #COP21.” Accessed 19 May. http://www.rappler.com/world/regions/asia-pacific/indonesia/bahasa/englishedition/115805-cop21-climate-change-deal-indonesia

Robinson, Nicholas A. 2001. “Forest Fires as a Common International Concern: Precedents for the Progressive Development of International Environmental Law.” *Pace Environmental Law Review* 18:459-504.

Rockström, J., Steffen, W., Noone, K., Chapin, F., Lambin, E., Lenton, T., Scheffer, M., Folke, C., Schellnhuber, H., Nykvist, B., De Wit, C., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R., Fabry, V., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. and Foley, J.,

2009. “Planetary Boundaries: Exploring the Safe Operating Space for Humanity.” *Ecology and Society* 14 (2):32. Accessed 23 May. http://www.ecologyandsociety.org/vol14/iss2/art32/

Tsing, Anna Lowenhaupt. 2005. *Friction: An Ethnography of Global Connection*. Princeton University Press: Princeton and Oxford.

Varkkey, Helena. 2012: “The Asean Way and Haze Mitigation Efforts.” *Journal of International Studies* 8:77-97.

Varkkey, Helena. 2013. “Patronage Politics, Plantation Fires and Transboundary Haze.” *Environmental Hazards* 12 (3-4):200-21.

Wangkiat, Paritta. 2015. “Asean Nations Vow to be Haze-Free by 2020.” *Bangkok Post*. Accessed 20 May. http://www.bangkokpost.com/print/784505/

Whitehouse, Alfred and Mulyana, Asep. 2004. “Coal Fires in Indonesia.” *International Journal of Coal Geology* 59: 91– 97.

Zalasiewicz, Jan. 2008. *The Earth after Us*. Oxford: Oxford University Press.

Zalasiewicz, Jan., Steffen, Will., Leinfelder, Reinhold., Williams, Mark and Waters, Colin. 2017. “Petrifying Earth Process: The Stratigraphic Imprint of Key Earth System Parameters in the Anthropocene.” *Theory, Culture & Society*.

Ziegler, Alan., Phelps, Jacob., Yuen, Jia Qi., Webb, Edward., Lawrence, Deborah., Fox, Jeff., Bruun, Thilde,. Leisz, Stephen., Ryan, Casey., Dressler, Wolfram., Mertz, Ole., Pascual, Unai., Padochkk, Christine and Koh, Lian Pin. 2012. “Carbon Outcomes of Major Land-Cover Transitions in SE Asia: Great Uncertainties and REDD+ Policy Implications.” *Global Change Biolo*