A more-than-urban political ecology of bushfire smoke in eastern Australia, 2019-2020

Abstract:

From September 2019 to February 2020 fires destroyed dwellings, towns and killed farm animals and wildlife in much of eastern Australia. While the threat and experiences of fire differed, smoke became a quotidian experience for millions of people not in direct danger from flames. The disjuncture between the Australian bushfire summer existing within much longer histories of air, respiration and smoke in cities and the experiences of smoke being new to many people highlights important issues relating to nomenclature, boundaries and urban imaginaries. Developing a more-than-urban political ecology of smoke, this paper concludes that understanding smoke as part of atmospheres within which humans live and breathe is necessary to support the integrated management of land, water, air and the living entities in and beyond a particular area or country. A more-than-urban political ecology of smoke will assist people to view themselves and their welfare as being connected with what happens on spaces that are physically distant.

Keywords: urban political ecology, smoke, wildfire, health, climate change

Introduction

On November 24th, 2019, before the official start of Summer, every state in Australia was ablaze after sixty fires broke out in the south-eastern state of Victoria (O'Mallon and Tiernan 2020). Landscape scale fire is not unusual in Australia (Pyne 1992; Pascoe, 2014; Neale 2016) and as

with other countries is exacerbated by climate change (Sherry, et al 2019; Morgan, et al, 2020), yet Australia's current Federal government "refuse to acknowledge anything more than a temporary emergency driven by 'natural' events, and for which they therefore take no personal or institutional responsibility" (Batterbury, 2020). Devastation from the bushfire crises of summer 2019-2020 in eastern Australia was widespread. New South Wales recorded 25 deaths, with five fatalities in Victoria, three in South Australia and one in the Australian Capital Territory (ACT) (Centre for Disaster Philanthropy 2020) in addition to injuries and widespread health impacts. More than 11 million hectares of bush, forest and parks across Australia were burned, greater than the combined area consumed by the infamous 2009 Black Saturday and 1983 Ash Wednesday bushfires (BBC 2020; CSIRO 2020). While fire is an annual occurrence in northern Australia, and fire and smoke closed the Nullarbor road crossing between South and Western Australia, the forest ecosystems were heavily impacted by historical standards, with about 5.8 million hectares of mainly temperate broadleaf forest burned in NSW and Victoria, or about 21% of this biome compared with expected rates of less than 5% per annum (Boer, et al 2020).

Smoke was a recurring experience for millions of Australians during the summer of 2019-2020, with estimates that 80 per cent of the population, or about twenty million people, were 'blanketed' by smoke and that Sydney, 'experienced 81 days of poor or hazardous air quality in 2019, more than the total of the previous 10 years combined' (Pickrell 2020). This 'collective asphyxiation' inspired Verlie (unpublished) to explore the disconnect between the science and politics of climate change at a distance, and embodied theories of climate justice. Smoke from the bushfires over 19 weeks was estimated to be responsible for 417 deaths (with a range of

153–680 deaths at the 95% confidence interval), with an estimated 219 deaths in NSW, followed by Victoria (120), Queensland (47) and the Australian Capital Territory with an estimated 31 deaths (Borchers Arriagada, et al 2020). This calculation is complex due to the influence of associated factors such as extreme heat (see Ashe, et al 2008, 2012; Johnston and Bowman 2013; McAneney et al 2014).

Smoke was unusual in 2019 in Australia, but not in earlier times nor in some parts of the contemporary world (Ve'ron, 2006; Neale, et al, 2019). During the late 19th and early 20th centuries the most severe air pollution problem was smoke. Uekoetter (2009, 1) observed that 'one did not simply live with the problem of smoke, but literally in it.' Again, this was not new; humans are 'fire creatures' (Pyne, 1997) and have been burning, and burned, for thousands of years (Neale, et al, 2019), with cultural burns in Australia and internationally being unique to each Indigenous group (Freeman, et al, 2021).

With fire came smoke. The earliest cities in Mesopotamia were said to fill 'with smoke on calm days' (Hughes 1995). Inhabitants of Athens and Rome experienced air pollution daily such that 'the residents of ancient Rome referred to their city's smoke cloud as gravioris caeli ('heavy heaven') and infamis aer ('infamous air')' (Mosley 2014, 145). In the Middle Ages, the burning of 'soft coal' or 'sea coal' imported from the north-east of England was responsible for air pollution, such that King Edward I issued a royal proclamation in 1307 banning its use in London (Mosley 2014). John Evelyn (1620-1706) in 1661 wrote '… this is certain, of all the common and familiar materials that emit it, the immoderate use of, and indulgence to sea-coale alone in the City of London, exposes it to one of the fowlest Inconveniences and reproaches than possibly beffall so nobel and otherwise Incomparable City' (Evelyn 1999, 188). Evelyn (1999, 188)

blamed large industrial practices such as the 'Brewers, Diers, Lime-burners, Salt, and Sope-boylers', noting that smoke from household culinary fires'… is with such ease dispelled and scattered above, as it is hardly at all discernible'.

The idea of unclean air can be positioned within a longer history of air and breathing. Helen Mallinson traces the evolution of thought about air, noting that 'the word pneuma, the Greek term meaning breath, wind, mind and spirit' and the 'Latin word spiro, to breathe, generated inspiration, respiration, aspiration, perspiration, transpiration, as well the the (sic) term "spirit"', in essence saying that air was not external to the body prior to the Cartesian dualism (Mallinson 2014, 240). As such 'the 'air conditions' implicit in city air represent the shared passions of a common entity understood in holistic and vitalist terms' which differs from 'the idea of free and unfettered space as a neutral container of air, whether wholesome or life threatening.' (Mallinson 2014, 236) Similarly, Paul Emmons (2014) argues that air was not empty space and that the 17th Century tract of John Evelyn was not anti-smoke but was advocating fragrant air.

These understandings of air have largely been superseded by a mechanistic view of air as air quality, something to be maintained, or air pollution, something to be fixed. For example, the 2015 Sustainable Development Goals (SDGs) included Goal 11 Air Pollution, with the World Health Organisation (WHO) later noting that '92% of the world's population lives in places where air quality exceeds WHO limits. About 6.5 million deaths – 1 in 9 deaths worldwide – is due to air pollution-related diseases' (WHO 2017). This regulation of air, its chemical decomposition via various metrics into numerical values often measured as parts per million, and the subsequent invocation of safety standards based on exceedances of these values

averaged over time represents a mechanistic view of air as being something to control. This mechanistic view is exacerbated by what Neale et al (2019) term 'bureaucratic governance', such that fires are managed by one agency and the health impacts of smoke by another.

In Australia, smoke in cities was often associated with industry, where, for example, 'for much of its history, Newcastle's inhabitants accepted smoke-filled skies as signifiers of the city's importance within Australia and its associations with larger and more important cities overseas' (Cushing, 2009, 19). This was partly the result of political power in Sydney and the reluctance of industries to institute smoke minimisation measures. The generation of smoke within cities, even when the fuel source was imported, has until recently been expected.

Bushfire smoke is, however, perceived as intrusive because it transgresses boundaries such as an urban/rural divide that, if not in academic debates at least in the popular imaginary, are powerful rhetorical devices. The legend of 'the bush' in Australia was largely written around 1900 (Watson, 2014), as Australia urbanised, but it is important to situate this legend within the violence of settler colonial society relations with Indigenous people. 'The bush is where some Australians live and others will never go,' wrote Watson (2014, 70). While there have been large vegetation fires in Australian cities, the terminology of 'bushfire' evokes notions of elsewhere. Despite evidence of a land use continuum, and the ruralisation of urban spaces and urbanism without urbanisation in areas formerly imagined as rural, these boundaries not only remain but as observed by Rickards, et al (2016) and Tzaninis, et al (2021) are reinforced by policy discourses that emphasise the city.

In this paper I argue that there is a disjuncture between the Australian bushfire summer existing within much longer histories of air, respiration and smoke in cities and the experiences of smoke being new to many people in urban areas. In 2019-20 corporeal experiences of the visibility of smoke, its smell, taste and the breathing difficulties it caused, often did not align with the systems of knowledge mobilised to communicate safety and danger, reinforcing the disjuncture and potentially heightening the danger. While improved construction standards, fire-fighting procedures and evacuation processes are crucial, this paper develops the argument that a reimagination of space is needed to enable people to live safely in smoke in potential future bushfire/wildfire events.

The structure of the paper is as follows. It commences by introducing Urban Political Ecology (UPE) and discussing theoretical conceptions of space that respond to a perceived city focus within UPE, urban metabolism, a political ecology of urban air (Graham, 2015) and a more-than-urban political ecology (Tzaninis, et al 2021). The next section of the paper develops the idea of living in smoke, highlighting the materiality of smoke and the associated health impacts, noting in particular how this unfolded with regard to particular occupations and vulnerabilities in 2019-2020. The following section identifies the disjuncture between these corporeal experiences of smoke and the systems of knowledge employed to construct and communicate smoke to people. This mediated knowledge should enhance health and safety, but this was not necessarily the case. The paper concludes by calling for a reimagining of our relationships with air and the development of UPE theory to better account for the agency of nature other than simply through metabolic relations.

Urban political ecologies of air

Urban Political Ecology **(**UPE) emerged from a political ecology of soil erosion associated with Blaikie (1985) and Brookfield and Blaikie (1987). It emphasises power relations contributing to the production of nature and the uneven distribution of resources and costs, focusing on developing countries (Bryant, 1998). The emergence of an urban political ecology (UPE), especially within Anglo-American geography (Zimmer 2010), saw early literature in UPE characterised by an 'intensely critical predisposition' that linked 'specific analysis of urban environmental problems to larger socioecological solutions', particularly those inspired by Henri Lefebvre and David Harvey (Keil 2003, 724).

Erik Swyngedouw (1996) introduced the concept of socio-natural metabolism that has inspired UPE and impacted wider thinking about urbanisation and cities. The city was the focus of this approach because the 'accelerating metabolic transformation of nature becomes most visible, both in its physical form and its socioecological consequences' in urban areas (Swyngedouw and Heynen 2003, 907). This transformation is facilitated by infrastructure that enables resources to be transported from outside city boundaries and be made available for distribution in the city, with an emphasis on the justice of this appropriation, notably in early studies of water and sanitation (Kaika 2005), food (Heynen 2006) and oil (Peluso and Watts 2001). This focus on justice extended to air pollution and the politics of creating of clean landscapes in Delhi (Ve´ron 2006) and was developed by Mee, et al (2014, 365) to combine UPE insights with 'an appreciation of dynamics of normal standards of comfort, cleanliness, and convenience in the home' to 'reveal the complexities of attempts to engage more sustainably with water in rental property'. Similarly, justice and metabolism inform UPE research into the

removal of unwanted material from the city, as shown with electronic waste (Amuzu 2018). Loftus and March (2016, 59) argue that urban political ecology has 'never been constrained by the urban form but has, rather, developed an approach that always moves beyond the local to understand the broader ensemble of socio-ecological relations out of which specific urban forms are produced'.

Despite the recognition of flows across boundaries, there is concern within UPE, and urban studies more broadly, about overemphasising cities to the detriment of understanding other environments. As Rickards et al (2016, 1524) observe, 'at the same moment as the wider world is feting the city and championing the urban as a category of practice, there has emerged a troubling set of concerns regarding the coherence of the city as a category of process and the integrity of urban studies as an intellectual tradition'. This recognition has, in part, been galvanised by the planetary urbanisation thesis of Brenner and Schmidt (2014), with critiques of an urban-centric perspective. Angelo and Wachsmuth (2015, 20) criticised the 'analytical privileging, isolation and perhaps naturalization of the city in studies of urban processes where the non-city may also be significant', a process they call 'methodological cityism'.

There have been various attempts to move beyond a city-centric focus within UPE. Gustafson et al (2014, 666) introduced the notion of a megapolitan region in order to capture 'the connections between multiple cities of varying sizes and their rural hinterlands' using a political ecology approach that emphasises 'the connections between social power and ecological change spanning scales'. McKinnon, et al (2019, 353) identify within a broad concept of UPE 'two somewhat separate literatures', namely UPE based on cities and metabolism crossing boundaries into other environments for the acquisition of resources and disposal of

wastes, and what they call Ex-urban Political Ecology (Ex-PE) which is 'a political of ecology of exurbia'. These authors favour ExPE which has 'focused on the environmental changes, political conflicts, and management challenges that emerge from flows of people, materials, and representations between cities and other spaces' (McKinnon, et al 2019, 354). This emphasises 'the ways that (formerly) rural places are transformed by the interrelated dynamics of capital flows and ideological interpretations of material nature that accompany the movement of people to these spaces', particularly the environmental imaginaries (McKinnon 2019, 370).

Tzaninis et al (2021, 233) extend the notion of ex-urbia and position it within four emerging UPE discourses to 'enrich rather than split the field'. The first discourse, highlighted by Angelo and Wachsmuth (2015) and Connolly (2018), critiques the perceived methodological 'city-ism' in UPE. The second, calls for a 'situated' UPE attempt to open the possibility for a broader range of urban experiences (from women, people in developing countries) to inform UPE theory. The third emerging discourse addresses the gaps between academic debate that questions the concept of the city and various policy discourses that increasingly emphasise cities as the object of inquiry and site of intervention for experiments about smart cities and climate change. The fourth emerging UPE discourse involves researching human and more-than-human actors to consider how dynamics in cities have strong implications for the urbanisation of non-human natures (see also Zimmer, 2010; Connolly, 2018).

Tzaninis, et al (2021, 232) recognise that 'socio-environmental disasters' like wildfires 'demonstrate the relation between ecological problems and urbanization processes'. This means that:

> UPE's call to overcome the distinction between inside and outside, to understand the dialectic between the local and the global that produces uneven development, to understand the core and the periphery as part of the same socio-environmental continuum is today more relevant than ever.
>
> Tzaninis, et al, 2021, 235

Tzaninis et al (2021, 232) call for a 'more-than-urban political ecology' where the 'politics of ecology become especially discerning when related to something as fundamental as air and oxygen' (Tzaninis et al, 2021, 239). These authors note the contribution of Stephen Graham (2015) as part of a volumetric approach (see also McNeill, 2020). Based on the observation that 'the politics and geographies of bad or lethal air in cities remain remarkably peripheral to the huge growth of political –ecological work on the social and technological productions of nature in urban environments', Graham (2015, 193) outlined ten themes a political ecology of urban air needs to address, including 'the links between global warming, urban heat-island effects and killer urban heatwaves; urban pollution crises; the paradoxes of urban pollution; horizontal movements of polluted air… .' (Graham 2015, p.192) While acknowledging that 'atmospheric pollution can be a great leveller in terms of wealth and class', Graham demonstrates that 'generally, wealthy and elite groups are able to insulate themselves from its effects more effectively than are poor or marginalised ones' (Graham 2015, 202). This latter phenomenon is present in the slow violence of air pollution, but not immediately obvious with bushfires in that if 'urban landscapes are sculpted by the reciprocal relations between environmental and social' (Christophers, 2018, 145), how does something as ephemeral as

smoke, but with both immediate and longer-term health consequences, shape imaginaries and contribute to the sculpting of landscapes?

To summarise, within UPE the focus on infrastructure enables recognition of the transgression of boundaries, but it is usually intentional in the service of humans, with power-relations central to any explanation of these infrastructures of acquisition and disposal. These studies do not readily explain the crossing of perceived urban/rural boundaries by entities not intentionally created directly by production processes, including bushfire smoke. A more-than-urban political ecology of smoke is needed which eschews urban/rural boundaries in favour of notions such as megapolitan areas, Ex-urban Political Ecology (Ex-PE) and landscape scale processes while recognising the agency of entities such as smoke to act outside of human intentionality and control.

Living in Smoke

The increased academic interest in air and atmosphere contrasts with the experience of many Australians for whom the existence of both outdoor and indoor smoke is unusual, despite its presence on the continent prior to human settlement, its importance in Aboriginal land management, communications and cleansing ceremonies and a history of both bushfires and industrial pollution since European occupation (Pyne 1992). Backyard burning was made illegal in Sydney in 1988, while many workplace environments, and houses, were filled with tobacco smoke until the late 1990s and the first decade of the 21st Century (Allianz Australia 2020). In 2017-2018, 21.7% of adults in the most disadvantage quintile were current daily smokers,

compared with 6.8% in the least disadvantaged quintile (Australia Bureau of Statistics 2019). With the exception of barbecues and wood-fired indoor heating, contemporary Australian cities are relatively devoid of smoke except in some industrial areas, or where socio-economic disadvantage is concentrated.

This changed on 4 September 2019 with fifty bushfires in Queensland (O'Mallon and Tiernan 2020) before fires emerged in northern NSW. In late October bushfires began at Gospers Mountain northwest of Sydney and Green Wattle Creek south-west of the city, both burning large areas of forest and joining with other fires to form a 'mega-blaze' or a 'complex'. The Blue Mountains west of Sydney also came under threat and was defended vigorously by firefighters. There was the occasional fire within cities, in November at South Turramurra fifteen kilometres north of the Sydney city centre and in suburbs of Melbourne in December (White 2019). More common from late December onwards when fires raged in northern NSW, the Snowy Mountains, the south coast of NSW and in the Gippsland Region of eastern Victoria was the associated smoke and dust. Hot, north-westerly winds pushed the smoke into Sydney and Canberra, which was enveloped for many weeks.

Smoke is gas generated by the incomplete burning of materials, especially carbon in the form of wood or coal, and these small particles amassed together enable visibility. Richard Stone (1995, 1771) described wood smoke as a '… a witch's brew of carcinogens, including aldehydes and polycyclic aromatic hydrocarbons, carbon monoxide, and organic particles less than 10 microns in diameter, called PM10'. While PM10 is deadly, it has been known for approximately fifty years that smaller particles (e.g. PM2.5) in vehicular emissions are even more lethal (Whitby, et al 1972; Cao, et al 2013). Bushfires generally burn organic materials,

releasing carbon monoxide, water and other gases from wood and leaves, but can destroy houses, vehicles and other structures and release cyanide gas and other toxics from the burning of plastics, vehicle fuel, paint and foam.

In addition to climate change temporality, smoke is temporal and visceral in that its presence is discerned by its visibility, odour and taste if it enters the mouth. Its absence, however, cannot be understood as a permanent disappearance. In 2019-2020 smoke that had not dissipated from inland Australia and off the coast, circulated depending on the wind directions and speed at any given time because smoke can travel long distances and persist for up to eight months in the stratosphere (Yu, et al 2019). Smoke from wildfires in western Canada in August 2017 circulated in the lower stratosphere at high northern latitudes and partly reached the tropics (Kloss, et al 2017) whilesmoke from the 2019-2020 Australian bushfires reached New Zealand on 7 December and South America in early January 2020 (O'Mallon and Tiernan 2020).

Often the health impacts of bushfire smoke were concealed because people with vulnerabilities were trapped inside their dwelling, focusing on maintaining internal air quality and not over-exerting their bodies. The health impacts of bushfire smoke in urban areas were, however, highlighted by industrial action at Port Botany when the Maritime Union of Australia (a division of the Construction, Forestry, Maritime, Mining, and Energy Union) said 'all outside work should stop if the smoke pollution posed a danger' as the Air Quality Index (AQI) readings at an adjacent monitoring station in Randwick on the 5, 6, and 7 December, 2019 reached 523, 402, and 674 respectively (Reynolds 2019). Readings above 200 are considered hazardous by the WHO. This action highlighted the different character of work environments, and how some

workers were expected to work in poor quality air while other workers in air-conditioned buildings were significantly less impacted. The notion of worker can be extended from a stereotypical industrial worker at a port to professional sporting players. Media reported that state-level cricketers playing a Sheffield Shield match at the Sydney Cricket Ground (SCG) at the same time as the nearby industrial action at the port endured 'shocking conditions at a smoke-blanketed SCG [that] affected the vision and breathing of cricketers' (AAP 2019) and in Melbourne in mid-January 'bushfire smoke forced one player to retire with breathing problems and another match to be abandoned, with air quality in Melbourne dropping to the worst in the world overnight' (Murray 2020) during lead-up events and qualifying rounds of the Australian Open tennis tournament (Zaczek 2020).

Corporeal experiences and systems of knowledge

The air quality levels were hazardous. This problem emerged first in the north of NSW, with the air quality reading in Port Macquarie exceeding the World Health Organisation's (WHO) standard of hazardous by 19 times. In Sydney on 10 December 2019 the exceedance was 13 times the WHO standard. On New Year's Day in the inland city of Canberra the air quality reading was 26 times levels considered hazardous to human health and was the worst on the planet (The Guardian 2020).

While New Year's Day brought extremely hazardous air quality to Canberra, arguably the biggest controversy and faultline was the spectacular New Year's Eve fireworks in Sydney, an event that attracts thousands of international tourists and is shown around the world. While

people in Sydney experienced the smoke, they usually did not experience the danger of the bushfires, and the tragedy of loss. The disjuncture was captured by Danielle Celermajer (2019) who opposed the fireworks, writing that 'the photos are awful and people losing their homes is tragic, but like every other story in the newsfeed, it is displaced by the next one.'

The Sydney Harbour fireworks at midnight went ahead, but the fireworks in Canberra and many smaller New Year's Eve firework events in NSW were cancelled. Smoke impacted the daily lives of Australians. Local sporting events were cancelled, ranging from suburban cricket matches to rowing regattas and school sport carnivals. These largely went unnoticed, except by people directly experiencing these changes and some local media reporting. The daily outdoor play time at school, or childcare centres, was curtailed. This is daily life for people in some non-western cities , but it was new to Australians who had largely taken these activities for granted.

Smoke became known not just through its physical properties and their corporeal impacts, through media images and text, but also through systems of measurement supported by technologies that enabled smoke to be measured, information transmitted, mapped and communicated within minutes and hours. Smoke was doubly mediated, as the systems of measurement were then used by media organisations to construct material about the fires and their impacts.

Australians became familiar with concepts such as particulate matter (PM) and the various sizes measured. Many people, however, appeared unaware of the problems with recording and communicating air quality and pollution. The air quality measurement was influenced by the location of the monitoring station. If a station was on a peninsula or a higher area where

there was greater wind influence, then the extent of smoke hovering in the valleys, or trapped between buildings, was likely understated. A recording for PM2.5 averaged over a 24-hour period underestimates spikes in air quality deterioration. Concerns were raised about the disjuncture between people's experience of air quality people at a particular time, and the readings as averaged over a 24-hour period, with Asthma Australia noting;

> Bushfire smoke fluctuates rapidly. Information and advice based on average concentrations of PM2.5 over a 24-hour period is not helpful. Side effects can be experienced as soon as pollution levels begin to increase – they do not wait 24 hours.
>
> Asthma Australia undated

Post bushfires, the NSW Department of Planning, Industry and Environment introduced new interim hourly standards for air quality, which concerned r Doctors for the Environment because of a lack of scientific evidence for the new standards and generated criticism by long-time activists about how the measurement of poor air quality was altered through this process (McCarthy 2020). One activist perceived the revised standards were introduced 'because of the bushfires and the smoke in Sydney but if you live near coal mines you're dealing with poor to hazardous air quality on a regular basis' (McCarthy 2020).

Conclusion

The smoke enveloping Australian cities departed soon after the bushfires were extinguished. The bushfires ended when it rained. And rained. Despite efforts to fight the bushfires, in most cases the focus was on protecting human lives and property and containing the spread of the fires when possible rather than quelling the fire.

Building on Tzaninis et al (2020), this paper extends the notion of a more-than-urban political ecology to understand unbidden and unwanted socio-nature. A more-than urban political ecology can incorporate materiality and environmental imaginaries that are not city-centric (McKinnon et al, 2019), without dropping political concerns of justice and equity relating to resource acquisition, distribution, use and disposal. The early literature in UPE that linked 'specific analysis of urban environmental problems to larger socioecological solutions' (Keil 2003, 724) suggests that while improved construction standards, fire-fighting procedures and evacuation processes are crucial, a reimagination of space is also needed to enable people to live safely in smoke in potential future bushfire/wildfire events. This is because smoke is generated by fire burning materials, and ecologically sensitive reductions of fuel loads are sometimes required before a fire begins in order to starve it, especially in exurban areas. This approach has drawbacks, including smoke generated from controlled burns. Adopting traditional Aboriginal burning practices, recognising that they are unique to each Indigenous group (Freeman, et al, 2021), that reduce smoke levels is needed but is an insufficient response alone given the size of forest and bushland in Australia, increasing temperatures related to anthropogenic climate change and concerns about potential cultural appropriation and the maintenances of settler-colonial dominance through such practices. The cultural-ecological burns advocated by Freeman et al (2021, 119) can be undertaken for various reason, but with

'the primary purpose being cultural renewal'. While these practices reduce the late season bushfires in northern and central Australia (Freeman, et al, 2021), they have, until recently, not been undertaken to the same level in southern Australia and, as noted earlier, the 2019-2020 fires in eastern Australia started before summer commenced.

Expecting cultural-ecological burns to be a solution to raging fires both devalues Indigenous cultural practices and potentially ignores the significance of climate change. Understanding Australian bushfire within a global climate approach that links exacerbation and impacts is therefore required, along with an emphasis on landscape scale fire and smoke management that sees bush/rural/urban areas as part of a megapolitan region where interests are not polarised by location or sector, but recognised as connected. As Keenan (2020) observed in calling for a national approach to fire management, Australia is 'one of the most urbanised countries on Earth' and 'there are few votes to be gained in more spending on rural land management'.

Importantly, it is not 'rural land management'. The 2019-2020 bushfires consumed mostly forest rather than land cleared for agriculture. Neither is it simply 'land management', but the integrated management of land, water, air and the living entities in and beyond a particular area or country. This management should be funded appropriately and undertaken as a way of life to save lives and enhance wellbeing in areas where fire is likely and in areas prone to being enveloped by smoke. Widespread political support for such funding and action is likely to be more forthcoming if people see themselves and their welfare as connected with what happens on spaces that are physically distant from them. A more-than-urban political ecology is well positioned to develop such connections, although it has tended to focus on the built form of

sculpted landscapes, such as suburbanization, rather than engaging with the ephemeral agency of phenomena such as smoke.

From an UPE perspective, urban/regional divides are unhelpful in that they perpetuate myths of bushfire as part of the Australian bush far beyond urban areas. UPE traditionally has negotiated these boundary transgressions by analysing metabolic flows and focusing on the infrastructure (and more recently the finance) that has enabled flows across the boundaries that exist in other conceptions of space. The concern for justice, and recognition of vulnerabilities based on sometimes multiple and overlapping factors, enables a more-than-urban political ecology to engage with the agency of non-human phenomenon in ways other than as resource/waste. Following Tzaninis, et al (2021), recalibrating UPE not simply as a way to account for urban forms such as suburbanization, but to recognise the connectivity between urban and other environments through phenomena such as fire and smoke, is crucial. Smoke disrupts the categories of human and more-than-human in that we breathe in smoke, it becomes part of our body and it can be fatal. It can kill humans who are distant from the fire itself. As Tzaninis et al (2021, 239) observed, 'the movement of air has little concern for such categories as it crosses bodily and territorial boundaries with troubling nonchalance'.

Smoke from the 2019-2020 fires highlighted the need to re-imagine ourselves as part of global air and to develop theory that 'might find new openings and possibilities for engagement between human and more-than-human worlds' (Tzaninis, 2021, 244). Understanding the history and both the contemporary manifestations and impacts of smoke are small steps to

developing socio-environmental theory that is necessary for us to live with other humans and with non-human others today and into the future.

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