

Vital materialism from social theory to sociological lines of flight

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This paper reflects on the contributions of Jane Bennett and William Connolly at the seminar in Cardiff from the perspective of a new materialist social scientist. I first consider the distinction between philosophy and social inquiry, focusing on translating complex philosophical concepts into practical research methods. The paper then explores how – using Deleuze’s ethological framework – new materialist, posthuman and vital materialist ideas offer fresh perspectives on sociological data. I then make links between vital materialism and the monism and post-anthropocentrism of new materialism, indigenous ontologies and feminist posthumanism, applying these insights to the topics of environmental sustainability, sustainable development and environmental justice. I suggest that this interdisciplinary approach can provide innovative frameworks for addressing real-world challenges for society and the environment.

Keywords: *ethology, line of flight, new materialism, posthumanism, sexuality, social theory, sustainability, vital materialism*

The vital materialist affirms a figure of matter as an active principle, and a universe of this lively materiality that is always in various states of congealment and diffusion, materialities that are active and creative without needing to be experienced or conceived as partaking in divinity or purposiveness.¹

INTRODUCTION

It was a privilege to participate in the Cardiff University seminar with Jane Bennett and William Connolly in December 2019. Looking back now – from the other side of the SARS-CoV-2 pandemic – their analyses of vital materialism at that event gain ever greater significance. Who could have known then what we know now about how much contemporary daily lives are affected by the more-than-human?

Though I have offered my own small contributions to new materialist social theory over the years, I attended that seminar primarily as a ‘jobbing’ sociologist. I have spent most of my academic life devoted to the exploration of the social world through empirical studies of topics pertinent to our contemporary neoliberalizing, accelerating and increasingly unequal social world – gathering data, sifting it, analysing it, trying to do justice to it in the books and papers I write. However, this work has always been done against a backcloth of the skein of philosophy and social theory literatures that have variously been termed new materialist, posthuman, post-anthropocentric, feminist

1. J Bennett, *Vibrant Matter: A Political Ecology of Things* (Duke University Press, Durham 2010) 93.

materialist and vital materialist. As I've researched topics from health and illness to sexualities to climate change to political economy, I have gleaned from this body of work insights into social ontology that have both challenged and enlightened my practice of empirical sociology.

Consequently, my objective in this chapter is to refract the talks and conversations during that seminar through the lens of my own sociological applications of more-than-human ontologies. In different ways, both Bennett's more-than-human cautions concerning over-zealous human agency and Connolly's commentary on the flux of human and non-human affects within the Anthropocene address environmental degradation. To inflect those commentaries from the perspective of we jobbing sociologists, whose hands are dirtied with data, who use theory to make sense of the complexities of 'the social', much of what I write here will also be about environment and climate change.

However, I begin these meanderings with some thoughts on the difference between philosophy and social inquiry, and what that difference has meant when I have sought to translate the sometimes (to me) obscure language of philosophy into practical methodologies for social inquiry. I then discuss how I have operationalized the relationality, post-anthropocentrism and monism of new materialist, posthuman and vital materialist framings via Deleuze's 'ethological' toolkit of concepts, in order to deliver novel insights on empirical sociological data. Following that, I bring vital materialism into conversation with the monism of new materialist and some Indigenous ontologies, and with feminist posthumanism, to inform issues of environmental sustainability, sustainable development and environmental justice.

ON THE DIFFERENCE BETWEEN PHILOSOPHY AND SOCIAL SCIENCE

Philosophy and social theory have been core to the emergence and application of these perspectives among sociologists and cognate social scientists. Before proceeding any further, it is timely to acknowledge the way in which the incisiveness of Bennett's and Connolly's analyses of the liveliness of all matter have made the hazardous transition from philosophy to social science that much more accessible. Reading their work does not require a degree in philosophy, yet it does not skimp on founding its insights variously within a breadth of philosophical, political economic and social theories. Though perhaps inevitably – while appreciating the erudition and detailed grounding of vital materialism in Bennett's *Vibrant Matter*,² it is when Bennett and Connolly have addressed specific social issues that I have been the most inspired by vital materialism. Events such as power outages,³ the social and political ecology of the 'slow food' movement,⁴ and Connolly's analysis of capitalism and the Anthropocene⁵ are pellucid demonstrations of how matter matters sociologically.

So it is important not to underestimate the theoretical groundings underpinning the studies undertaken by the growing body of sociologists who apply new materialist

2. *ibid.*

3. J Bennett, 'The Agency of Assemblages and the North American Blackout' (2005) 17(3) *Public Culture* 445–65.

4. J Bennett, 'Edible Matter' (2007) 45 *New Left Review* 133–45.

5. WE Connolly, 'The Anthropocene as Abstract Machine' (2025) *Journal of Human Rights and the Environment* (this special issue).

and posthuman approaches. But while it's heartening to see the growth in the past two decades in these sociological applications, few of us engaged with this work will not also have experienced the resistance that these novel theories have engendered within sociology. Antipathy to ontologies that challenge some of the underlying anthropocentric and dualist premises of the discipline – from dismayed doctoral supervisors to antagonistic or obdurate paper reviewers and editors – has had a dampening effect, often placing obstacles in the path of those sociologists wishing to pursue this approach. Of course, resistance can also strengthen resolve, and the burgeoning literature continues to apply relational, post-anthropocentric and monist ontologies to an ever-widening breadth of sociological topics.

However, the emergence of new materialist sociology has sometimes been constrained by the divergence between the aims of philosophy and social science. To unpack this divergence between the objectives of philosophy and social science, where better to turn than to two of the avatars of vital materialism. For Deleuze and Guattari,⁶ philosophy's objective is to generate the concepts necessary to think productively and potentially transgressively about the world around us. However, they also suggest that such philosophical concepts should not be tied to a specific setting or event, but instead enable understanding of a breadth of events.⁷

From the perspective of a research-oriented social scientist, the practice of social science inquiry diverges fundamentally from the second of these statements, and is less ambitious in one way, more so in another. Whatever the methods used, empirical social research seeks most definitely to explore specific events demarcated in time and space, from refugees' migration using small boats to cross dangerous waterways to the social production of health inequalities. However, it also aims to generalize beyond the specifics of such events, to supply insights that may be used both to make sense of the social world, and (where necessary) suggest how that world might be changed and improved. The theories articulated to achieve this may be generated directly from the empirical data, as in Mertonian 'middle-range theory'⁸ and 'grounded theories'.⁹ Alternatively, it may accrete around concepts drawn from social theory or indeed from philosophy. Contemporary sociology is replete with examples of conceptual framings from social philosophers, including Comte (positivism); Marx (alienation, class conflict); Kuhn (paradigm shift, community of scientists); Foucault (governmentality, the gaze), Butler (gender performativity); Haraway (situated knowledge, companion species); Barad (diffraction); and Deleuze and Guattari (agencement/assemblage, line of flight).

Given these differing objectives, it is inevitable that when such translations occur, concepts developed originally for philosophical ends need to be repurposed to fit the needs of a social scientist who seeks to address a concrete and specific social issue. It is consequently pointless for philosophers to throw up their hands in horror as concepts are sullied with the grimy business of sociological inquiry. A case in point surrounds the Deleuzo-Guattarian concept of assemblage (*agencement* in the original French), which has been widely adopted in social science research and theory, sometimes in ways that have

6. G Deleuze and F Guattari, *What is Philosophy?* (Columbia University Press 1994) 7.

7. *ibid* 33–4.

8. RK Merton, 'On Sociological Theories of the Middle Range', in RK Merton (ed), *Social Theory and Social Structure* (Simon & Schuster 1949).

9. BG Glaser and AL Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (Routledge 2017).

distressed philosophical purists such as Buchanan.¹⁰ Buchanan quotes approvingly the distinction Deleuze and Guattari make between philosophers who use concepts to think differently, and mere ‘functionaries’ who enjoy a ‘ready-made thought’ and are ‘unaware even of the efforts of those who they claim to take as their models’.¹¹

While agreeing that those of us who use philosophical concepts in our work should always attempt to understand the provenance and the contexts in which these concepts were developed, I have no urge to become a philosopher, and remain very content as a sociological ‘functionary’. And is there not an implicit elitism in requiring all social scientists (and perhaps our readers) to immerse themselves in philosophical theory before attempting to apply a concept to sociological purposes?¹² Are those who do not have the time or the money to do this immersion-therapy to be condemned as ‘not Deleuzian enough’?¹³ Strom argues that Deleuzian concepts such as assemblage or rhizomatics are in themselves potential ‘lines of flight’,¹⁴ in other words, affects that radically shift a body towards new capacities. As sociologists and social theorists use and apply such concepts in novel settings, it is indeed they who will generate such flights, away from the humanist, anthropocentric and structuralist perspectives that have proven inadequate to research and re-shape the fluxes of a more-than-human, relational social world.¹⁵

To generate such sociological lines of flight, there is one immediate practical consequence of the difference between these objectives of philosophy and social science that all jobbing sociologists must address. This is the need to translate theoretical concepts such as ‘vital materialism’ and ‘posthumanism’ into a methodology of inquiry (in the jargon of research, to ‘operationalize’ these concepts as measuring tools). In the next section I explore my own route to achieving this translation and operationalization, by exploring my work with Professor Pam Alldred around the ‘sexuality-assemblage’. Subsequent sections describe how this methodological approach has been developed in our work on environment sustainability and environmental justice, and the sociological lines of flight thereby established.

ON DELEUZIAN ETHOLOGY AND SOCIAL INQUIRY

Like both Bennett and Connolly, my work has been informed by the work of the philosopher Gilles Deleuze. My own shift from essentialist, anthropocentric and structuralist sociology towards the new materialist ontological principles of relationality, the vitality of all matter and a flat ontology came in the early 1990s as I read Deleuze’s thin volume on Spinoza,¹⁶ and his collaborations with Guattari in *Anti-Oedipus* (1984)¹⁷ and *A Thousand Plateaus* (1988).¹⁸ There I found a toolkit of ‘ethological’

10. See I Buchanan, *Assemblage Theory and Method* (Bloomsbury 2021) 18–21. Bennett, Connolly and Manuel DeLanda are all targeted by Buchanan in *Assemblage Theory and Method* as social theorists who have diverged from strict Deleuzian conceptions of assemblage.

11. *ibid* 22. Buchanan refers on this point to Deleuze and Guattari (n 6) 194.

12. EA St Pierre, ‘Post Qualitative Inquiry, the Refusal of Method, and the Risk of the New’ (2021) 27(1) *Qualitative Inquiry* 6–7.

13. KJ Strom, “‘That’s Not Very Deleuzian’: Thoughts on Interrupting the Exclusionary Nature of “High Theory”” (2018) 50(1) *Educational Philosophy and Theory* 110.

14. *ibid* 112.

15. R Braidotti, *Posthuman Knowledge* (Polity 2019) 11.

16. G Deleuze, *Spinoza: Practical Philosophy* (City Lights 1988).

17. G Deleuze and F Guattari, *Anti-Oedipus: Capitalism and Schizophrenia* (Athlone 1984).

18. G Deleuze and F Guattari, *A Thousand Plateaus* (Athlone 1988).

concepts that could operationalize their ontology of matter for my sociological purposes,¹⁹ namely: affect, assemblage and micropolitics.

Foremost among these is ‘affect’, whose meaning Deleuze takes directly from Spinoza: it is ‘a capacity to affect or be affected’.²⁰ Significantly, affects are features of *all* matter;²¹ affects thereby establish the vibrancy, vitality, creativity of all matter, transforming at a stroke sociology’s conceit that agency is an exclusively human capacity. Affects, however, are not inherent attributes of matter; rather they emerge relationally and contextually.

Assemblage – a clumsy translation of *agencement* – is an arrangement of matter²² brought into being when two or more materialities (‘human’ or ‘non-human’) affect and/or are affected during what sociologists call interactions. In Deleuzian ethology, assemblages rather than single bodies become the unit of analysis, as it is only when a body or a thing assembles with another body or thing that its capacities for action or reaction emerge.²³ Any event or interaction may be considered as an assemblage of affective materialities.

Micropolitics, not to be confused with the constrained purview of micro-sociology, are the flows of power and resistance within assemblages. In the absence in the new materialisms of an ontology of social structures or underpinning mechanisms, these micropolitical flows establish the limits upon what bodies and other stuff can do within a specific assemblage/event/context, but in the process thereby produce the entirety of the social world and human history.²⁴ These affective flows, says Deleuze, are becomings: sometimes they weaken our capacities to act, sometimes they strengthen them.²⁵ They may specify (territorialize) what a body can do, or generalize (de-territorialize) its capacities to instigate the aforementioned ‘lines of flight’.²⁶ They may aggregate dissimilar bodies together, or fragment existing aggregations.²⁷

This ethological toolkit can be operationalized for sociological research purposes without difficulty. Methods (interviews, ethnography, survey and so forth) may be devised that can identify the human and non-human materialities that comprise an event; the affects that assemble these materialities; the capacities produced in bodies and other stuff by these assemblages; and finally, whether a specific assemblage constrains or enables what bodies can do; whether it aggregates similar or dissimilar bodies together, or fragments existing aggregations.²⁸

For example, these four aspects of vital materialist ontology could form the basis of an interview schedule, with questions intended to elicit data from human informants on the topics or events studied. Or they might guide an ethnographer to explore and analyse a setting.

This ethological approach to new materialist methodology underpinned the research on sexualities that I have undertaken with Pam Alldred and with Clare

19. See Deleuze (1988) (n 16) 125–6; Deleuze and Guattari (1988) (n 18) 256–8.

20. Deleuze (1988) (n 16) 124.

21. *ibid* 125.

22. Buchanan (n 10) 20.

23. Deleuze and Guattari (1988) (n 18) 88–9.

24. NJ Fox and P Alldred, *Sociology and the New Materialism* (Sage 2017) 235.

25. G Deleuze and C Parnet, *Dialogues II* (Columbia University Press 2007) 60.

26. Deleuze and Guattari (1988) (n 18) 88.

27. *ibid* 213.

28. NJ Fox and P Alldred, ‘Doing New Materialist Data Analysis: A Spinozo-Deleuzian Ethological Toolkit’ (2021) 25(5) *International Journal of Social Research Methodology* 625–38.

Bale, in which we developed and then applied the concept of a sexuality-assemblage that comprised not only human but also a range of other matter.²⁹

Sexualities may seem at first glance an unpromising topic for post-anthropocentric vital materialism, entangled as they are in contemporary culture with such humanist tropes as agency, free-will, personal choice and human rights.³⁰ The more-than-human ontology of sexualities that we proposed³¹ abandons a view promulgated in philosophy and ethics for 2500 years that sexuality is an attribute of an individual body and its sexual desires and responses³² and substitutes the view that sexualities must be explored as micropolitical flows within assemblages of bodies, things, ideas and social institutions. It is these more-than-human flows and intensities that establish what a body can do ‘sexually’.

This analysis of sexuality shifts attention away from concerns with internal bodily ‘drives’ and the cultural forces that constrain or enable sexualities. Instead, the analysis establishes an imperative for the sociological study of sexuality to re-focus upon *assemblages* of relationships and connectivities, which may incorporate bodies, inanimate objects, technology, social formations and ideas, all assembled by the affects between these materialities. Within sexuality-assemblages, neither biology nor the social is privileged over the other: body-parts, organs, desires and emotions interact with all manner of physical stuff ranging from condoms, alcohol and drugs, places and spaces, technologies, social institutions and collectivities (such as schools or workplaces), the cultural formations associated with sexual conduct and desire, as well as memories and expectations, and abstractions such as ‘love’, ‘monogamy’, marriage’. The possible range of combinations within assemblages are consequently limitless, as subsequent empirical studies of young men’s sexualities,³³ sexualities education and sexual citizenship,³⁴ and of sexualization and pornography among teens of all genders³⁵ have revealed.

Sexuality-assemblages are thus emergent features of the interactions between bodies and all these myriad other elements, though they are continually in flux, as bodies interact with non-human matter and the physical and cultural environment within specific encounters. Sexualities, often within anthropocentric sociology almost synonymous with sexual identities, are radically re-construed in this analysis as the micropolitical flows of *affect* within sexuality-assemblages.³⁶ The affects between the materialities in sexuality-assemblages may be physical (for instance, between two bodies or between a body and a space); physiological or sensory (bodies affected by alcohol or perfume); psychological and emotional impacts of sexual encounters or

29. See P Alldred and NJ Fox, ‘The Sexuality-Assemblages of Young Men: A New Materialist Analysis’ (2015) 18(8) *Sexualities* 905–20; P Alldred and NJ Fox, ‘Assembling Citizenship: Sexualities Education, Micropolitics and the Becoming-Citizen’ (2019) 53(4) *Sociology* 689–706; NJ Fox and P Alldred, ‘The Sexuality-Assemblage: Desire, Affect, Anti-Humanism’ (2013) 61(4) *Sociological Review* 769–89; NJ Fox and C Bale, ‘Bodies, Pornography and the Circumscription of Sexuality: A New Materialist Study of Young People’s Sexual Practices’ (2017) 21(3) *Sexualities* 393–409.

30. E Grosz and E Probyn, ‘Introduction’ in E Grosz and E Probyn (eds), *Sexy Bodies* (Routledge 1995) xiii.

31. Fox and Alldred (2013) (n 29).

32. E Grosz, *Volatile Bodies* (Indiana University Press 1994) 5.

33. Alldred and Fox (2015) (n 29).

34. Alldred and Fox (2019) (n 29).

35. Fox and Bale (n 29).

36. Fox and Alldred (2013) (n 29) 773.

sexual imagery; and social (cultural norms, values, peer-group pressures and so on). Together these affects shape sexual identities, behaviours, desires, codes, customs and conduct of human bodies within specific social and material assemblages.

The empirical studies we conducted using this ontology of sexualities both sought to unpack a seeming contradiction: that while today's world is progressively more and more 'sexualized', the range of sexual desires, behaviours and identities remains remarkably narrow and constrained.³⁷ The resolution to this was found in the *micro-politics* of sexuality-assemblages: the specifications or generalizations, the aggregations and dis-aggregations that affects produce in bodies. Both studies revealed that while sexualization during adolescence and adulthood could indeed enable psychological and emotional *lines of flight* from previous constraints on what bodies could do, physical, physiological, social and cultural affects variously *specified* (territorialized) the limits on sexual conduct and expectations. Analysis of the processes whereby teens become sexually active indicated that pornography and media representations of sexualities *aggregate* bodies into narrow and prescriptive formulations of gender and sexuality that 'reproduce and reinforce misogyny, sexual objectification and neo-liberal sexual consumerism' while constraining sexual diversity.³⁸

Together, these insights into the vital materiality of sexuality-assemblages *and* the limitations that shape most people's daily sexualities suggest the critical advances that an assemblage approach enables in the sociology of sexuality. They make sexualities both infinitely more complex than in some sociologies, and also intrinsically political: about engaging with the real struggles of people (women, men, children, old people), as they are territorialized – by biology *or* by culture – into particular sexualities. What is needed, Fox and Bale suggest, is not normative sex and relationship education for school students, but the 're-sexualisation of everyone'.³⁹ This would encourage 'sex-positive' celebrations of diverse desires and relationship structures, as well as material intensifications that extend beyond narrow distinctions between sexual and non-sexual, and recognize the endless permutations and possibilities for material sexual becoming. 'Making love', say Deleuze and Guattari 'is not just about becoming as one, or even two, but becoming as a hundred thousand'.⁴⁰

I have used this toolkit of ethological concepts to study a range of other sociological topics, including ageing and frailty, health technology, creativity and more recently climate change and the SARS-CoV-2 pandemic. In the next sections, I explore how – when combined with vital materialism and Rosi Braidotti's analysis of posthumanity⁴¹ – this ethological methodology operationalizes an ontology and methodology that can inform and transform the sociology of environment sustainability.

ON THE MONISM OF VITAL MATERIALISM

A few years back, Pam Alldred and I set out to develop an understanding of environmental sustainability informed by posthuman, post-anthropocentric, vital materialist

37. Alldred and Fox (2015) (n 29) and Fox and Bale (n 29).

38. Fox and Bale (n 29) 405.

39. *ibid* 406.

40. Deleuze and Guattari (1984) (n 17) 196.

41. See R Braidotti, *The Posthuman* (Polity 2013) and Braidotti (2019) (n 15).

and Indigenous ontologies.⁴² Specifically, we sought to cut across the nature/culture and human/non-human dualisms that had been a feature of much sociological analysis of environment and sustainability.⁴³

Culture/nature dualism supplied post-Enlightenment philosophers and scientists with a simplistic way to carve up the world, and in due course set limits on the respective concerns of the social and natural sciences.⁴⁴ As Haraway puts it, 'nature' is culture's 'Other', used historically as a justification for colonialism, racism, sexism and class domination.⁴⁵ This dualism also bled over into the foundational premises of the social sciences,⁴⁶ reinforced by the nineteenth-century differentiation between human social life and the forces of nature then being revealed by theories of genetics and natural selection. However, culture/nature dualism swiftly unravels when exploring sociological topics such as health and illness, sexualities, climate change and technology.⁴⁷ Furthermore, nature/culture dualism in philosophy and social theory sidelines many non-Western and Indigenous ontologies that accept humans as part of 'environment'⁴⁸ and acknowledge 'people, plants, animals, energies, technological objects' as together contributing to the production of the social world.⁴⁹

A new materialist perspective operationalizes two shifts implicit in these latter ontologies: from essentialism to relationality, and from (human) agency to vital material affectivity. On the former, Deleuze's Spinozist ontology of affects and assemblages, outlined in the previous section,⁵⁰ substitutes notions of pre-existent, fixed entities such as bodies, plants, bacteria, fossil fuels, atmospheric conditions, motor vehicles and governments with assemblages of matter whose capacities emerge as a consequence of their interactions.⁵¹ These assemblages – and hence the world (social

42. NJ Fox and P Alldred, 'Re-assembling Climate Change Policy: Materialism, Posthumanism, and the Policy Assemblage' (2020) 71(2) *British Journal of Sociology* 269–83.

43. There are some notable exceptions. See P Stevens, 'Towards an Ecosociology' (2012) 46(4) *Sociology* 579; Stevens argues for an 'ecosociology' that extends ideas of 'the social' beyond the human. See also B Latour, *Reassembling the Social* (Oxford University Press 2005); Latour goes further, arguing for a sociology that recognizes social, biological and physical forces as together producing the world around us. Also see R Lidskog and C Waterton, 'Anthropocene – A Cautious Welcome from Environmental Sociology' (2016) 2(4) *Environmental Sociology* 399; Lidskog and Waterton suggest that in the 'Anthropocene' both physical processes and human culture produce the 'conditions of possibility for life on earth'.

44. See NJ Fox and P Alldred, 'Sociology, Environment and Health: A Materialist Approach' (2016) 141 *Public Health* 289; K Barad, 'Meeting the Universe Halfway: Realism and Social Constructivism without Contradiction', in LH Nelson and J Nelson (eds), *Feminism, Science and the Philosophy of Science* (Kluwer 1996) 181; Braidotti (2013) (n 41) 3; and M Meloni, 'From Boundarywork to Boundary Object: How Biology Left and Re-Entered the Social Sciences' (2016) 64(1) *The Sociological Review* 61–78.

45. D Haraway, 'Otherworldly Conversations; Terrain Topics; Local Terms' (1992) 3(1) *Science and Culture* 65.

46. DN Shalin, 'The Impact of Transcendental Idealism on Early German and American Sociology' (1990) 10(1) *Current Perspectives in Social Theory* 8.

47. B Latour, *We Have Never Been Modern* (Harvard University Press 1993).

48. Z Todd, 'An Indigenous Feminist's Take on the Ontological Turn: "Ontology" is Just Another Word for Colonialism' (2016) 29(1) *Journal of Historical Sociology* 4–22.

49. J Sundberg, 'Decolonizing Posthumanist Geographies' (2014) 21(1) *Cultural Geographies* 33.

50. Deleuze (n 16) 122–8 and Deleuze and Parnet (n 25) 55.

51. Deleuze (1988) (n 16) 128 and see also M DeLanda, *A New Philosophy of Science* (Continuum 2006) 3.

and natural) – are inherently fluid and continually in flux, as relations (bodies, things, social institutions and constructs) join or leave.⁵²

When new materialists such as Jane Bennett and William Connolly proclaim the vitality of all matter,⁵³ this confirms a critical second shift for sociology, displacing human agency as the prime mover of social production. In Bennett's view, human agency is itself a variety of 'thing-power', though this is a consequence of a human body's component materialities (bone, muscle, blood and so forth) rather than motivation by an active soul or mind.⁵⁴ This perspective flattens out distinctions between human and all the other stuff conventionally treated as our 'environment': all the disparate materialities that may assemble together within an event have capacities to affect – or to be affected by – other assembled relations.⁵⁵ As Bennett argues, vital materialism thus offers an alternative to 'environmentalism' as a model of engaged and responsible human/environment interaction, in which humans are not stewards or protectors of environment, but themselves fully integrated.⁵⁶ The entirety of the natural and social world *is* the environment, with nothing beyond it, and nothing (for instance, humans and their culture) excluded from it.

Removing the privilege from humanity and human endeavours⁵⁷ has practical implications for a culture that has often benefitted from this privilege, and hence for its sociological study. As noted earlier, this post-anthropocentric viewpoint recognizes that the nature/culture division has been founded upon a supremacist politics of sexualization, racialization and naturalization of the West's Others.⁵⁸ As Braidotti concludes, the materialist act of refusing and overturning this politics of sexism, colonialism and anthropocentrism requires a new eco-philosophy and ethics that affirms the commonalities and connectedness of all matter.⁵⁹ We would suggest it also needs a new sociology. Matter is to be studied not in terms of what it is or is not, but in terms of what it does: what associations it makes as it affects and is affected; what consequences derive from these affective interactions;⁶⁰ and how assemblages of non-human matter may be creative,⁶¹ opening up new possibilities for what matter can do.

From such a post-anthropocentric perspective, 'the environment' is no longer simply the *context* for human agency, but is the productive arena for both 'natural' and 'social' worlds. Such a materialist sociology of environment needs to be focused firmly upon empirical exploration of specific events. Recalling the ethological research questions asked in the study of sexualities discussed in the previous section,

52. Deleuze (1988) (n 16) 128 and see also T Lemke, 'New Materialisms: Foucault and the "Government of Things"' (2015) 32(4) *Theory, Culture & Society* 3–25.

53. Bennett (2010) (n 1) 2 and WE Connolly, 'The "New Materialism" and the Fragility of Things' (2013) 41(3) *Millennium* 400.

54. Bennett (2010) (n 1) 10.

55. Deleuze (1988) (n 16) 101.

56. Bennett (2010) (n 1) 111.

57. Later I challenge the aggregating terms 'human' and 'humanity', favouring instead the notion of disparate and diverse 'posthumans'.

58. D Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature* (Routledge 1991) 150.

59. Braidotti (2013) (n 41).

60. Deleuze (1988) (n 16) 124.

61. Connolly (2013) (n 53) 408.

any event – which might be an observed activity, interaction or occurrence – can be researched empirically by asking these general questions:

- What material relations are assembled?
- What affective interactions assemble these relations in order to produce the event?
- What are the capacities produced by this affect economy – what can assembled human and non-human relations *do*?
- What are the micropolitics of the event assemblage – what does the analysis reveal about flows of power and resistance in the assemblage?

The final question has implications not only for research, but also for policy and activism,⁶² as it opens the door not only to describing an event, but also making sense of why it is the way it is, and conceivably, manipulating its affect economy⁶³ to change what it does. Dualist approaches to humans and the ‘environment’ are widespread in policy and practice.⁶⁴ So, for instance, public health specialists have advocated changes to urban environments to improve children’s well-being by discouraging private motor vehicles and encouraging use of public transport, walking and cycling.⁶⁵ Such initiatives are unashamedly humanistic, founded on a dualism that privileges the human over the non-human (the built environment, cars, oil, pollution and so forth).

The materialist perspective we have outlined here requires that this dualistic approach is re-thought, to overcome the foundational distinction between humans and ‘the rest’, instead adopting a posthuman sensibility that neither privileges nor denies human aspirations, values and desires.⁶⁶ Staying for a moment with the example of child health and traffic pollution, in this formulation, humans are no longer privileged actors. Other relations such as cars, roads and fuel must also be recognized as affective in this assemblage, while the outcomes depend as much on the capacities of the non-human or inanimate components (for example, the pollution products of carbon fuels or the effects of weather and climate) as upon humans. Human bodies, along with other ‘human’ stuff such as thoughts, ideas, memories, aspirations and so forth are drawn into a single assemblage alongside both ‘social’ stuff such as organizations and social formations, and all the ‘natural’ stuff that comprises the physical environment.

Understood in this way, ‘human’ bodies and other ‘human’ relations in the assemblage are inseparable from ‘environment’, and events can no longer be evaluated against humanistic values or by ascribing privilege to human agency.⁶⁷ Rather, a ‘posthuman politics’⁶⁸ needs to be founded upon the mutual dependency of human

62. See Fox and Alldred (2017) (n 24) 176–90.

63. PT Clough, ‘Future Matters: Technoscience, Global Politics, and Cultural Criticism’ (2004) 22(3) *Social Text* 1–23.

64. E Cudworth and S Hobden, ‘Liberation for Straw Dogs? Old Materialism, New Materialism, and the Challenge of an Emancipatory Posthumanism’ (2015) 12(1) *Globalizations* 140–41.

65. CM Hoehner et al., ‘Opportunities for Integrating Public Health and Urban Planning Approaches to Promote Active Community Environments’ (2003) 18(1) *American Journal of Health Promotion* 14–20.

66. S Hobden, ‘Posthumanism’ in C Death (ed), *Critical Environmental Politics* (Routledge 2014) 177.

67. See Bennett (2010) (n 1) 120 and Braidotti (2013) (n 41) 56.

68. Hobden (n 66) 182.

and non-human, valorizing an event (that is, a specific assemblage of human and non-human materialities) in terms of the breadth of possibilities it produces in its constituent materialities.⁶⁹ Applied to issues of environment, this posthuman politics amounts to a focus on 'ecological potential'.⁷⁰

This shift in understanding has led us variously⁷¹ to re-examine the politics surrounding sustainable development and policies to roll-back climate change, as well as analyses of capitalism and environmental degradation and waste congruent with Connolly's assessment of the more-than-human forces in the Anthropocene.⁷² The next section assesses how a focus upon ecological potential transforms perspectives on environmental sustainability, posing challenges for policies that aim to achieve it.

ON SUSTAINABILITY

Sustainability has been a contested concept,⁷³ which draws into assemblage a range of natural science, ecological, economic, political, social justice and other perspectives on the interactions and conflicts between nature and culture. Indeed the 2014 report to the Intergovernmental Panel on Climate Change concluded that there was no 'satisfactory empirical indicator' of 'sustainability'.⁷⁴ Despite this limitation, sustainable development has been elevated to the status of a policy goal in fields including energy production and consumption, employment, housing and so forth, but has typically been assessed in terms of human needs and desires, for both current and future human generations.

Paramount among such policy statements on sustainable development have been the series of reports by the United Nations and associated bodies on global environmental challenges, including climate change. In 1987, the Report of the World Commission on Environment and Development (commonly known as the Brundtland Report) defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.⁷⁵ The United Nations Millennium Ecosystem Assessment was established to assess the effects of ecosystem change upon human well-being, and the

69. Braidotti (2013) (n 41) 60.

70. NJ Fox and P Alldred, 'Sustainability, Feminist Posthumanism and the Unusual Capacities of (Post)Humans' (2020) 6(2) *Environmental Sociology* 121–31.

71. See Fox and Alldred (2020) (n 42) and (n 70), and NJ Fox and P Alldred, 'Economics, the Climate Change Policy Assemblage and the New Materialisms: Towards a Comprehensive Policy' (2021) 18(7) *Globalizations* 1248–58.

72. Connolly (n 5).

73. See R Braidotti et al., *Women, the Environment and Sustainable Development: Towards a Theoretical Synthesis* (Zed Books 1994); S Lockie, 'Sustainability and the Future of Environmental Sociology' (2016) 2(1) *Environmental Sociology* 1–4; and BD Ratner, 'Sustainability as a Dialogue of Values: Challenges to the Sociology of Development' (2004) 74(1) *Sociological Inquiry* 50–69.

74. M Fleurbaey, S Kartha and S Bolwig, 'Sustainable Development and Equity' in O Edenhofer, R Pichs-Madruga and Y Sokona (eds), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press 2014) 293.

75. G Brundtland, M Khalid and S Agnelli, *Our Common Future (The Brundtland Report)* (Oxford University Press 1987).

actions needed to enhance the conservation and sustainable use of ecosystems so that they can ‘continue to supply the services that underpin all aspects of human life’.⁷⁶ The 5th Assessment report of the Intergovernmental Panel on Climate Change confirms a need for economic, social and environmental sustainability to go hand in hand, with human well-being depending on all three spheres while other living things depend only on the latter.⁷⁷ This emphasis is also reflected in the United Nations’ 2016 Agenda for Sustainable Development – a set of objectives adopted by world leaders in New York the previous September.⁷⁸ This agenda comprised 17 sustainable development goals, yet – remarkably – 13 of these focused upon the quality of human life (for example, ending poverty, achieving gender equality, access to clean water and affordable energy) and only three on the rest of the environment.⁷⁹ All these pronouncements on sustainable development have been foundationally inflected by an anthropocentrism that sets humans apart from ‘the environment’; while the underlying conception of ‘sustainability’ as continuity or stability (for example, not eroding the ‘living standards’ of future generations of humans) must also be questioned. The vital materialist ontology espoused *inter alia* by Deleuzians such as Bennett, Connolly and myself is founded on the view that most assemblages are not sustainable, and have within them contradictory forces that will lead them to fall apart or to transmogrify into something else within a day, a week or perhaps a millennium.⁸⁰ After all, the universe itself, we are told, is not sustainable, at some point in the future it will either expand to infinity and slowly chill to near absolute zero, or collapse into a singularity; one day the Earth will fall into the sun and be utterly transformed materially.⁸¹

An alternative view of sustainability more in line with a materialist ontology of assemblages and affects needs to focus upon potentials and capacities,⁸² and be underpinned by a posthuman ethics that moves beyond the usual narrow focus on human potential, to instead acknowledge the capacity of all matter to ‘become other’.⁸³ Sustainable development would seek ways to enhance the capacities and ‘becomings’ of all elements of the assemblage – from the interactions between earth, air and water, nitrogen and water cycles of the physical environment, to the productive life-courses of the multiplicity of plants and wild animals, to the opportunities for humans to work, play and interact productively – and to do all this in ways that do not oppose humans to other materialities. Sustainability would accordingly counter those forces that constrain the environment’s potentialities – be that by exhausting natural resources, filling the atmosphere with greenhouse gases, or limiting human possibilities through poverty, inequity or threats to health.

What counterposes such a recognition to an anthropocentric focus is that within a sustainability grounded in ecological potential, human possibilities for becoming are

76. World Health Organization (WHO), *Ecosystems and Human Well-Being* (A Report of the Millennium Ecosystem Assessment) (Geneva: WHO 2005).

77. Fleurbay, Kartha and Bolwig (n 74) 322.

78. United Nations, *Sustainable Development Goals* (Geneva: United Nations 2016) <<https://www.un.org/sustainabledevelopment/>> accessed 2 July 2024.

79. *ibid.*

80. Deleuze and Guattari (1984) (n 17) 5.

81. European Space Agency, ‘Gaia Reveals the Past and Future of the Sun’, 11 August 2022 <https://www.esa.int/Science_Exploration/Space_Science/Gaia/Gaia_reveals_the_past_and_future_of_the_Sun> accessed 2 July 2024.

82. See R Braidotti, *Nomadic Theory* (Columbia University Press 2011) 312–13 and A Parr, *Hijacking Sustainability* (MIT Press 2009) 161.

83. F Guattari, *The Three Ecologies* (Athlone 2000) 20.

located within the broader concern with ecological possibility: what sustains ‘the environment’ can also be ‘emancipatory’.⁸⁴ The following case study illustrates how a more-than-human, ethological approach may be brought to bear within social policy, to address this perspective on environmental becoming.

ON ECOLOGICAL POTENTIAL AND SOCIAL POLICY

Over the past half century, many developed countries have experienced de-industrialization, as heavy industries such as mining, engineering and car manufacture have struggled financially in a globalized marketplace. Towns and cities in industrialized areas in many developed nations have experienced radical social and economic change as a consequence.⁸⁵

The village of Trowell, in the heart of the English Midlands, is one such community. This part of the world was once dominated by deep coal mines, and communities grew up around the pits during the nineteenth and twentieth centuries; often the mines were the only employers in these villages. When – in the 1980s – shifts in energy policy from coal to natural gas and nuclear power, and political antagonism towards then powerful mining trade unions led to coal pit closures across the UK, miners lost their jobs, and rural mining communities were devastated socially and economically. Industrial landscapes of pit-heads and slag heaps gave way to green fields, wildlife and open country as the deep mines closed one by one.

Against this trend, in 2013 a private coal mining company applied to excavate a vast swathe of the countryside close to the village for open-cast coal mining. Feelings in the community towards the proposal were divided. For some former miners and their families, memories of earlier days inspired positive responses to the proposal. They saw it as a way to bring a return to good wages and traditional employment (that is, *male* employment) back to the community, and to reinstate what they saw as a proud history of coal mining that had been destroyed when the deep mines were closed. Others disagreed. Over 1200 locals signed a petition objecting, fearing negative consequences including the mine’s visual impact, noise, air pollution and road traffic increases as the coal was carted away (as well as concerns over carbon release from further fossil fuel use). Though local planners accepted these concerns and rejected the proposal for the new mine, a government minister subsequently overruled local councillors and gave the go-ahead for the development in June 2015.⁸⁶

Sociologists have tended to focus upon the affects in this mix that involve humans, socially, psychologically, emotionally, economically or politically. De-industrialization had devastating consequences on Trowell and other mining communities.⁸⁷ These effects were economic: as families lost their main source of income, with knock-on effects on

84. Cudworth and Hobden (n 64) 144.

85. See T Strangleman, J Rhodes and S Linkon, ‘Introduction to Crumbling Cultures: Deindustrialization, Class and Memory’ (2013) 84(Fall) *International Labor and Working-Class History* 7–22 and CJ Walley, *Exit Zero. Family and Class in Postindustrial Chicago* (University of Chicago Press 2013).

86. A Britton, ‘Controversial Mine Near Trowell is Approved’, *Nottingham Post*, 11 June 2015 <<https://www.staplefordcommunitygroup.org.uk/2015/06/11/controversial-mine-near-trowell-is-approved/>>.

87. T Strangleman, ‘Networks, Places and Identities in Post-Industrial Mining Communities’ (2001) 25(2) *International Journal of Urban and Regional Research* 256.

the community's disposable income and infrastructure; social: affecting boys' job expectations and aspirations⁸⁸ and impacting gender relations once men were no longer the main family earners; and cultural: destroying a working-class way of life built upon co-operation, solidarity and shared values.⁸⁹

A vital materialist approach suggests a different emphasis, predicated upon the understanding of sustainability as ecological becoming established earlier. Formal analysis might begin by documenting the wide range of natural and social relations that contribute to this event-assemblage. These include:

- Physical stuff like the coal under the ground, the land and the landscape it is in, the machinery needed to dig it out and transport it, the power stations that will burn it and the electricity and pollution it will produce.
- The humans who will work at the mine and those in the community who will both benefit and suffer from the development.
- Biological entities that constitute the ecology of the proposed mining location, such as vegetation and trees, birds and wild animals, micro-organisms and organic molecules that make the soil fertile.
- Economics, and the flows of money and resources that will flow through the mining enterprise and into the pockets of shareholders, workers and the local community.
- The social processes associated with both industry and its management and governance.
- The politics of planning, industrial development and protest.
- Regulations governing coal extraction, safety, employment and so on.
- The past experiences and memories of locals.
- Hopes, fears and other emotions.

The affect-economy in this assemblage includes obvious affects such as the physical, biological and chemical processes that produced coal deposits in the first place and that enable coal to generate electricity when burnt for fuel. Affective interactions between coal, money, mining, machinery and miners turn a subterranean mineral millions of years old into a product to be sold commercially and burnt for fuel, and at the same time provide work and wages to local people. Planners and local councillors, planning laws and procedures, a petition and a government minister interacted in a complex affect-economy that produced decisions, appeals and finally approval for this open-cast mining enterprise. Memories of both the earlier mining history and of the following de-industrialization are also powerfully affective.

A post-anthropocentric approach to sustainable development consequently needs to address this complex mix of human and non-human, natural and cultural affectivities, drawn together in a monist perspective on environment that neither privileges nor sidelines human interests and capacities. If the anthropocentric concerns of economists and politicians for economic growth and increasing human prosperity cannot hold, neither can (equally anthropocentric) notions of sustainable development that treat the environment as a resource to be tapped by future as well as contemporary human beings. A commitment to ecological potential requires that a village such as Trowell must be seen as a geological, geographical, cultural, social and biological assemblage, in which minerals, wind, air, trees, wildlife, humans and their technologies are all constitutive,

88. See A Nayak, 'Displaced Masculinities: Chavs, Youth and Class in the Post-Industrial City' (2006) 40(5) *Sociology* 813–31.

89. Strangleman (n 87) 255.

and in which the possibilities for becoming (or ‘sustainability’) of all these disparate relations must be acknowledged.

This approach suggests a need for a sociologically-informed resolution to the development of human settlements, transcending both desires for a ‘natural’ post-industrial landscape in which trees and wildlife (and the Earth’s climate) are privileged over humans, *and* the ‘cultural’ concerns of industry and commerce (for profit and economic prosperity) and some locals (for work and traditional forms of working-class culture). The task of a materialist sociology of environment is consequently to find the means (in its research and in translation into social policy) to assure a sustainable development in which ecological and human becoming go hand in hand. This sociology supplies the foundation for a more-than-human social justice that while no longer privileging men and women over the rest of creation, instead aspires to the becoming of all matter, be that non-human or human. For those such as the villagers of Trowell, this means a focus neither on ‘economic sustainability’ at the expense of wildlife and geology, nor an ‘environment sustainability’ that discounts the aspirations of working people. It invites all the ingenuity of a sociological imagination to be deployed in a posthuman vision for what and how an integrated nature/culture might become.⁹⁰

This case study also raises questions about diversity and inequalities, which casual use of the aggregating terms ‘humans’ and ‘humanity’ masks. I conclude this commentary by addressing this.

ON THE DIVERSITY OF POSTHUMANS AND THEIR CAPACITIES

Throughout this contribution, I have used terms such as ‘human’, ‘non-human’ and ‘humanity’ without comment. Notions of humans and humanity aggregate bodies that are inevitably distinct in many ways from each other, thereby artificially smoothing out differences, while the blanket term ‘non-human’ also serves to privilege the one materiality this term excludes: ‘human’. Braidotti has pointed out that, in post-Enlightenment cultures, the models chosen to epitomize ‘humans’ and ‘humanity’ always seem to turn out to be white, male, able-bodied and from the global North.⁹¹ These humanist aggregations obscure the diversity and inequalities between genders, races, sexualities, incomes, abilities, nationalities and other stratifications.⁹²

Furthermore, these privileged models of humanity – which imply similarity and homogeneity – disguise the reality: a supremacist politics of sexualization, racialization and naturalization of the West’s Others.⁹³ This politics has led to the inequalities between rich and poor, white and Black, global North and South.⁹⁴ In relation to environmental sustainability, there are vast divergences between human bodies in

90. Postscript: the Trowell open-cast mining enterprise fell at the first hurdle, when it transpired that removal of vast quantities of heavy topsoil would be prohibitively expensive. The land was sold on, and is now being developed for dormitory housing for nearby cities: an initiative that many residents also resisted.

91. Braidotti (2011) (n 82) 82.

92. Braidotti (2019) (n 15) 159.

93. Haraway (n 58) 150.

94. H Baer, ‘Global Warming as a By-Product of the Capitalist Treadmill of Production and Consumption – The Need for an Alternative Global System’ (2008) 19(1) *The Australian Journal of Anthropology* 58–62.

terms of, first, the contributions they make to anthropogenic climate change; second, how climate change will impact their lives; and finally, their capacities to alter their behaviour to reduce their negative impact on the environment or positively to counter the effects of climate change.⁹⁵

Following Braidotti,⁹⁶ in my recent writing with Pam Alldred⁹⁷ I have replaced the aggregative term ‘human’ with ‘posthumans’, as a means to acknowledge the diversity of individual bodies in terms of capacities to act and interact. Rather than focusing upon humans as ‘individuals’ (literally: ‘indivisible’), a ‘posthuman’ is an assemblage of biological, sociocultural and environmental elements, whose capacities to affect and be affected are contingent upon setting and emerge in how it relates to other matter.⁹⁸ Fox and Alldred⁹⁹ argue that any policy to address environmental sustainability and sustainable development in the face of anthropogenic climate change and environmental degradation must recognize this diversity and the complex interactions of race, gender, material prosperity and geography that produce it.

This ontological shift from an aggregated ‘humanity’ to a diversity of posthumans has consequences for the sociological analysis of sustainability and policies for sustainable development. First, recognition that matter’s capacities are always context-dependent also requires acknowledgement of the unevenness of how posthumans’ capacities manifest. On one hand, diverse capacities mean that some posthumans play a much greater part in using energy and resources and generating pollution than others.¹⁰⁰ On the other, some posthumans (predominantly those who are white, male, comparatively rich and from the global North) have access to a range of resources not open to those from other contexts. This disparity has consequences when it comes to assessing the impacts of environmental degradations. Two-thirds of greenhouse emissions have been produced by rich white posthumans in the EU, US and Japan,¹⁰¹ while much of the impact (such as flooding, drought, loss of biodiversity, land quality degradation) has been experienced – and will increasingly be felt – by poor posthumans in the global South.¹⁰²

Second, with reference to the earlier discussion of an inclusive ‘environment’ that incorporates all matter, posthumans are an integral part of ‘the environment’, not separate from it, and with the same rights accorded to all matter. This overcomes anti-humanist inclinations in some environmentalism in which ‘humanity’ became the enemy of all other animate and inanimate matter.¹⁰³ By contrast, such posthuman environmental inclusivity entangles the need for social justice to challenge the

95. See D Schlosberg and LB Collins, ‘From Environmental to Climate Justice: Climate Change and the Discourse of Environmental Justice’ (2014) 5(3) *Wiley Interdisciplinary Reviews: Climate Change* 359–74.

96. Braidotti (2013) (n 41).

97. See Fox and Alldred (2020) (n 41) and (2021) (n 70).

98. See generally Fox and Alldred (2020) (n 42) and see DeLanda (n 51) 10–11.

99. Fox and Alldred (2020) (n 70).

100. J Agyeman and B Evans, ‘Just Sustainability: The Emerging Discourse of Environmental Justice in Britain?’ (2004) 170(2) *Geographical Journal* 155–64.

101. P Baer et al., ‘The Greenhouse Development Rights Framework: Drawing Attention to Inequality within Nations in the Global Climate Policy Debate’ (2009) 40(6) *Development and Change* 1127.

102. Schlosberg and Collins (n 95) 360 and United Nations, *The Sustainable Development Goals Report* (Geneva: United Nations 2019) <<https://unstats.un.org/sdgs/report/2019>> accessed 2 July 2024.

103. M Kowalik, ‘The Rise of Anti-Humanism’ (2018) 62(5) *Quadrant* 60–61.

inequities between posthumans with the drive towards environmental sustainability. Policies to address climate change must also address ‘climate justice’,¹⁰⁴ as policies to counter the effects of anthropogenic climate change (such as switches to renewable energy sources, controls on rain forest clearances for agriculture) might otherwise disproportionately affect the poorest posthumans and be far more onerous for them than for others, increasing inequalities between rich and poor.¹⁰⁵

These consequences of the shift from ‘humans’ to ‘posthumans’ weaves the previously-separate threads of justice and sustainability by acknowledging both the connectedness of all matter, *and* the diversity and multiplicity of posthumans. The ‘posthuman politics’¹⁰⁶ that derives from this amalgam concerns the mutual dependency of posthuman and non-human capacities, valorizing an event (that is, a specific assemblage of human and non-human materialities) in terms of the breadth of possibilities it produces in its constituent relations.¹⁰⁷ Environmental policy, in this posthuman register, will aim to enhance the capacities of both non-human and human, neither privileging the latter over the former (humanism) nor the former over the latter (anti-humanism) – with both perspectives represented in contemporary environmental politics, nor privileging the capacities of rich, white, global North posthumans over others.

There is however, one further – seemingly contradictory – consequence of acknowledging diverse posthumans as fully part of the environment. A posthuman ontology of environment cannot sustain the anti-humanist perspectives found among some environmentalists that reverse the previous privilege accorded to humans, treating them instead as pariahs irretrievably culpable for environmental degradation and climate change. A posthuman environmental ethos is no longer concerned merely to ensure that the Earth’s resources remain in place for a few more human generations or to replace human with non-human privilege. Instead, it can encourage processes of becoming that together produce an environment that is endlessly emerging, changing, fragmenting and fracturing, opening up both human and non-human possibilities rather than closing them down.

The import of this acknowledgement is that ‘sustainability’ in this posthuman sense entails reducing and removing the differential access to such opportunities between rich and poor, global North and South, and eradicating the sexism, racism and ableism between posthumans. However, in return, posthumans cannot walk away from the environmental damage that has been progressively inflicted on the planet by land clearance for agriculture, by extraction of material resources, and by industrial-scale use of fossil fuels to generate wealth and human well-being.¹⁰⁸ Similarly, Bennett cautions against assuming that the role humans should play within the environment is merely to ‘tread lightly on the earth’, as environmentalists have sometimes argued.¹⁰⁹ While an environmental ethics based on a principle of enabling the ecological becomings of all matter redresses the balance between different materialities, she suggests that sometimes environmental becoming may need ‘grander, more dramatic and violent expenditures of human energy’.

104. Schlosberg and Collins (n 95).

105. N Taconet, A Méjean and C Guivarch, ‘Influence of Climate Change Impacts and Mitigation Costs on Inequality Between Countries’ (2020) 160(1) *Climate Change* 17.

106. Hobden (n 66) 182.

107. Braidotti (2013) (n 41) 60.

108. Connolly (n 5).

109. Bennett (2010) (n 1) 121–2.

Posthumans possess some unusual and potentially highly valuable capacities that are infrequently observed elsewhere in the known universe. These include the capacity to attribute meaning to – or otherwise conceptualize – events; to act altruistically; to imagine and create technologies; and to use reason to theorize, predict or anticipate future or unseen events.¹¹⁰ To address the sustainability of planet Earth at a point in its history where capitalist exploitation of the environment threatens the continuity of the ecosystem and the sustainability of many plant and animal species – these unusual capacities will be essential to address the imminent crisis of global climate change.¹¹¹ Posthumans' unusual capacities must be added to the mix, along with the vital capacities of other matter.¹¹² To give an example touched upon earlier in the case study of the Trowell open-cast mining proposal: resolving the kinds of conflicts between economic and environmental interests concerning continued fossil fuel extraction in the US, Australia and Europe cannot now be left to the capacities of non-human matter to restore climatic balance: the amplifiers and positive feedback loops described by Connolly¹¹³ mean that the situation has gone too far for that.

This is not to re-privilege human reason and ingenuity by the back door (for instance, by assuming that the market and technology can together solve climate change, as argued by 'green capitalists'.¹¹⁴ Bennett's propositions for (post)human agency in the era of climate change favour 'acting amidst':¹¹⁵ a collaboration between posthumans and other materialities, in place of the top-down model of the sovereign human, whose real and metaphorical thunderbolts rain down upon a passive environment. The vital materialist route towards sustainability and sustainable development that I've set out in this commentary depends not only upon the unusual capacities of *all* posthumans but upon the capacities of *all* matter. Posthumanism does not mean stepping away from 'the environment' but integrating fully within it.

110. There is evidence that some animal behaviour (for instance protection of offspring or fellow living creatures) may appear objectively 'altruistic'. There is less evidence that such behaviours are rational or self-conscious, as opposed to emotional or 'instinctual': see G Schino and F Aureli, 'Reciprocal Altruism in Primates: Partner Choice, Cognition, and Emotions' (2009) 39 *Advances in the Study of Behavior* 45–69. Similarly, there are examples of tool use by birds and primates to solve immediate physical problems such as extracting food, but little evidence of conceptualizing or pre-designing tools for future application: see A Seed and R Byrne, 'Animal Tool-Use' (2010) 20(23) *Current Biology* R1032–R1039.

111. Fox and Alldred (2021) (n 70).

112. J Lorimer, *Wildlife in the Anthropocene: Conservation after Nature* (University of Minnesota Press 2015).

113. Connolly (n 5).

114. See S Prudham, 'Pimping Climate Change: Richard Branson, Global Warming, and the Performance of Green Capitalism' (2009) 41(7) *Environment and Planning A* 1596 and J Zysman and M Huberty, *Can Green Sustain Growth? From the Religion to the Reality of Sustainable Prosperity* (Stanford University Press 2014).

115. J Bennett, 'Acting Amidst: Some Concepts and Practices' (2025) *Journal of Human Rights and the Environment* (this special issue).