

‘Telling Tales’: Communicating UK energy research through fairy tale characters

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Highlights

- Novel ways of communicating social science energy research are required to speed up the transformational adaptation required in the face of climate emergencies.
- Making use of fairy tale characters as metaphors offers one way in which we can do this.
- We translate already-existing research around renewables, cars, and plastics into the characters of mermaids, vampires, and witches.
- We extend an invitation to others to join us in re-telling tales of energy research in the social sciences by extending our cast of characters.

Abstract

Storytelling is gaining traction in the field of energy and social science research. It supports collective agenda setting, embraces complexity, and represents one way to tackle the ‘wicked problems’ of climate change. It is particularly important given the commonly opaque nature of social science outputs, and the urgency in which responses to climate change are now required. Responding to these challenges and recognising the value of storytelling, we present three ‘telling tales’ in this paper. Each takes inspiration from a well-known fairy tale character (i.e., mermaids, vampires, and witches) to translate energy and social science research in the empirical contexts of electricity generation, sustainable travel, and plastic pollution in the UK. We draw on these fairy tale characters as a part of arguing how UK policy reflects a fixation with renewables, over cautionary responses to car ownership and use, and too narrow understandings of, and reactions to, plastics. In response, we consider some alternative approaches, each aimed at delivering transformational adaptation as premised on demand reduction. We aim, more broadly, to inspire others to tell their own convincing tales to communicate research findings beyond academic circles and to help bring about change.

1. Climate Change: the importance of ‘telling tales’

Climate change represents a range of wicked problems [1]. Such problems defy easy bounding and require coordinated responses from multiple actors (e.g., communities, institutions, governments, researchers). Despite the coordinative efforts required, there is arguably a disconnect between social science energy research and policy, with the valuable fruits of much research failing to have a clear impact. One well-acknowledged reason for this is the favour given to the traditional and ‘hard’ sciences by research funders [2], [3]. However, the typically specialist and thus obscure nature of much social science-based sustainability research does little to help [4]. Indeed, work from the humanities on energy and sustainability (including our own (Author 3 et al., 2022)) can be hard-to-digest. The ‘publish or perish’ paradigm of academia only compounds the problem, with algometric models rewarding the untempered usage of buzzwords and concepts to attract further citations from one’s own community [4]. This is particularly troublesome given that wider audiences (including policymakers), with the power to enact change, are not a part of these communities. Even more worryingly, still, the wicked problems of climate change require urgent action [5]. With all of this in mind: how might scholarly knowledge be developed in a way that can be widely disseminated?

In this paper, we take inspiration from others, believing that well-crafted and convincing stories, rooted in the work of energy and climate research, are needed to communicate the challenges faced and the responses required [6], [7]. As part of building on this idea, we turn to fairy tales and their characters as sources of inspiration.

Fairy tales have – as long-lasting culturally sensitive and widely shared stories permeated with meanings and morals [8] – been used to communicate other types of research [9], [10]. To the best of our knowledge, however, fairy tale characters have not been used as metaphorical cases, nor have they formed an explicit mode of conveying key research insights and recommendations, within the energy research community.

This article takes the following structure. In the coming section, we briefly review some of the ways in which stories have been used by energy scholars to date. We also discuss the value of fairy tales and the opportunity they provide for the community to engage with the fruitful act of storytelling. In section 3, we describe the process through which we crafted the three ‘telling tales’ presented in this paper. Our use of ‘telling tales’ refers both to the practice of crafting broadly comprehensible stories and to the important messages they convey. We frame, in section 4, the selection of the empirical cases before switching attention to the details of each, and the pernicious tendencies in UK climate change policy they convey. These tendencies include: (1) a dangerous fixation on renewables (akin to those under the effect of mermaids’ mesmerising songs), (2) an all too cautionary set of measures against cars (akin to garlic-based attempts to deter vampires), and (3) a narrow understanding of plastics (akin to short-sighted witch-hunts). As part of telling each tale, we rearticulate core concerns and solutions from energy and social science research as aligned with the common qualities of the fairy tale characters discussed. In section 5, we return to the wicked problems of climate change, bringing the tales told together as part of articulating a broader call for systemic demand reduction. We conclude, in section 6, with a hopeful invitation to other researchers to extend and develop a cast of characters and stories aimed at disseminating energy research and bringing about positive and transformative adaptation.

2. Storytelling in Energy Research

Story making and telling are of critical importance to everyday life. As orienting rubrics, with ontological and epistemological qualities, stories inform how people make sense of their own and others’ lives, allowing them to make decisions about how to proceed. As MacIntyre [11, p. 250] writes – “I can only answer the question ‘What am I to do?’ if I can answer the prior question ‘Of what story or stories do I find myself a part?’”.

An acceptance of the importance of stories and storytelling has crept into energy research, with the latter increasingly used as a generative method of engagement and communication [2], [7], [12]–[14]. Storytelling was, for example, at the centre of a relatively recent special issue in this journal titled *Narratives and Storytelling in Energy and Climate Change Research* [15]. It has also been at the core of numerous international energy research projects over the past decade (e.g., IEA’s 2013-15 Demand Side Management Task 24; UK’s 2014-2017 Stories of Change; the EU’s 2017-2019 SHAPE ENERGY). These trends are synonymous with an understanding that narrative creation and storytelling offer great potential for those researching energy policy and seeking to develop and strengthen engagement and communication practices [6], [7].

Mourik et al., [7, p. 1] strongly communicate this sentiment, suggesting that stories have unique strengths “[...] in terms of enabling significant (un)learning regarding stakeholder relationships, [as a consequence of] allowing participants to step into others’ perspectives, [whilst] keeping hold of diversity, and the use of ‘we’ in stories leading to concrete future initiatives”. Building on this argument, they used set ‘story spines’ – “a set of beginnings of sentences, which participants [– energy professionals and local government officials –] could complete in their own words to build a story” [7, p. 2].

Examples like this, and others that have seen explicit engagement with storytelling, attest to a nascent interest in energy scholarship to mobilise the power and utility of stories. Such examples further evidence a shared appreciation emerging around the value of narrative construction for exploring and

communicating complexity, whilst enabling inclusivity, fostering empathy and supporting collective agenda-setting [2], [7], [12]–[14].

Storytelling,¹ however, is a vast field that encompasses many different forms. There remains scope, in this regard, for energy researchers to move beyond the use of narrative creation as a participatory method and opportunities to create their own engaging stories and convincing recommendations.

Fairy tales offer particularly ripe grounds for development.² Having been around since humans first formed societies as a means of maintaining pro-group behaviours and establishing moral norms [16], fairy tales form a literary memory of an oral tale tradition [17, p. vii]. Despite their modern conception, it is widely recognised that they were never written solely for the young but by “educated writers [who] purposely appropriated the oral folktale and converted it into a type of literary discourse about mores, values, and manners so that children and adults would become civilized according to the social code of that time” [19, p. 3]. Fairy tales are thus as much about control and establishing moral norms as they are wrapped up with dreams of a better life, social justice, and hope [8].

Anthropologists, folklorists, ethnologists, children’s literature specialists, and scholars of film, literature, and culture have mobilised fairy tales because of these powerful characteristics [8], [18], [19]. For example, fairy tales were revitalised in the 1970s through a critical feminist reevaluation to rewrite and challenge conventional and codified wisdoms [18]. This critical turn is synonymous with broader attempts to “[...] revalidate the history, values and narrative traditions of people whose cultures are threatened by the spread of Western, Anglo-European cultures” [18, p. xxxvii]. Fairy tales have long offered counter-narratives to environmental degradation. As Dean [10] explains, the collection and publishing of fairy tales in the 19th century forms a strand of ‘romanticism’ that emerged to challenge industrialisation’s aspiration to master ‘mother’ nature.

Whilst the powers of influence of fairy tales have been noted, they are yet to play a telling role in energy research. Their accepted power suggests that they offer another means of storytelling for energy researchers wishing to (re)communicate insights and recommendations in response to the ever-pressing climate emergency. In the next section, we explain the steps we took as part of developing this idea.

3. Crafting Telling Tales

To craft telling tales of climate change, we began with three areas where our research overlapped (renewables, cars, and plastics). This is based on our wider expertise, with roots in sustainability and climate change social science-based research (see e.g., Redacted, Author 2 et al., 2022; Author 2 et al.,

¹ In this perspective piece, we use ‘story,’ ‘narrative’ and (fairy)’tale’ interchangeably. This is in recognition that that humans are stories and stories make up our social realities. As Storr in *The Science of Storytelling* states “there’s simply no way to understand the human world without stories [...] Stories are everywhere. Stories are us. It’s story that makes us human. Recent research suggests language evolved principally to swap ‘social information’ back when we were living in Stone Age tribes [...] We’d tell tales about the moral rights and wrongs of other people, punish the bad behaviour, reward the good, and thereby keep everyone cooperating and the tribe in check” [16, p. 2]. While others may distinguish ‘narrative’ as a reference to ‘non-fiction’ or ‘storytelling’ an indication of ‘performance’ (see [2] for definitions in the context of energy research) we utilise all three terms to refer to this broad idea presented by Storr that tales swap social information.

² Fairy tales are “built from folktales and folk customs and forms a literary memory of an oral tale tradition” [17, p. vii]. For conciseness and clarity, we therefore refer to fairy tales broadly to encompass folk tales and folk customs. While we acknowledge an importance in the oral-literary divide [18], [19], and do not aim to dismiss the power-dynamics implicit in literary prioritisation (e.g. how fairy tales have been used to colonise or extend patriarchal systems of oppression) [8], the focus here is on the content and style of these tales, their role in social monitoring and utopian connotations.

2022; Author 2 et al., 2016; Author 3, 2021; Author 3 et al., 2021). Though we had little idea of how we would translate these areas through fairy tale characteristics at the start of the project, as McNiff [20, p. 32] suggests “[...] nothing happens in creative expression unless we show up and start working on a project, even with little sense of where we might ultimately go with it”. To do this, we read about different fairy tales characters (e.g., witches, vampires, zombies, fairies) and academic literature in tandem, distilling key arguments, as well as characters and their characteristics, to move towards the development of a set of workable metaphors.

This proved an iterative process with diversions emerging along the way. For instance, we tried out some combinations of characters and challenges, like fairies and renewables, before deciding the comparisons were too weak and unconvincing. To explain this further, whilst we initially believed that fairies were universally mischievous, beautiful, and magical creatures, we learnt that this was a product of their ‘Disneyfication’ (à la Tinkerbell) [21]. Fairies are, instead, a far more motley cast of creatures, including mermaids, witches, brownies, and banshees, all with their own set of characteristics and qualities [22]. In wanting to use characters as tangible metaphors, the wide variety and diverse origins of the fairy were not appropriate for the task at hand, with other characters proving more suitable. Some cases, like renewables, were easier to tell than others, like plastics. This reflects both the complexity of the category of ‘plastic’, and the complexity of ideas in the academic literature on the topic.

It is worth providing a brief aside here on the tangibility of the metaphors used in what follows. The policy approaches we have critiqued, as well as the fairy tale characters we have used to do so, are very much UK-centric. Policy approaches to climate change differ globally, as do cultural representations of fairy tale characters. For instance, vampires, or Jiangshi, are understood in Chinese folklore to be repelled not by garlic, but by sticky rice [23]. Fairy tales are culturally and geographically specific [19] meaning the interpretations that follow would not be intelligible to other audiences. Similarly, Chinese policy approaches to plastic differ than those outlined in this piece [24]. Whilst climate change is a global problem that requires a global response, we use this perspective piece to tackle the puzzle of how we might better communicate energy research in the social sciences with local policymakers. Whilst the approach we have taken could not be used to communicate research findings outside of the UK, we recognise the importance of tackling local approaches to climate change as one step towards the transformational adaptation required at a global scale.

Once we had crafted a sense of the metaphors through which we wanted to communicate the empirical cases, we reached out to an illustrator to help translate the illustrative points from each case. This move was inspired by ‘co-creative’ approaches, which “[...] engender collaborative and creative forms of action and reflection” [25, p. 2] with stakeholders of a context. Similarly, by working with others, we have sought to “stimulate alternative understandings of how and why things are, and how they could be” [25, p. 2]. Though not a stakeholder of the ‘context’, the illustrator we have worked with has challenged and refined our thinking through their own practice and expertise, pushing us to reach points of clarity that likely would not have been possible without her work. The telling tales and images that have resulted from working together creatively are presented below.

4. Three Telling Tales

The wicked problems of climate change have, arguably, emerged from an ongoing and troublesome history in which a growing convenience is increasingly dominating the ordering of daily life [26] across many countries globally – though not always evenly [27]. The following three telling tales are presented here as vignettes of this overarching story, and the UK policy responses that have materialised in its wake. We emphasise again, here, that what follows is UK-specific in both its representation of fairy tale characters, and policy approaches.

First, we demonstrate the UK’s growing dependence on electricity and how an increasing awareness of climate change has led to a siren-like fixation and investment in renewables. We then address the all-too-cautionary (i.e., garlic-based) responses to vampiric-like cars and the centrality they have been given in the design of urban spaces and in everyday life more broadly. Finally, we tackle the narrow witch-hunt against plastics, which sees fears of harm overshadowing opportunities for healing. Whilst these

three cases do not speak to the totality of the wicked problems of climate change, they pull at important strands that require further thought and action if such problems are to be addressed.

4.1. The Call of the Siren: fixating on renewables

Like mermaids, renewable energy has a dangerously distracting allure. Her song, “a weird refrain that steeps in deadly enchantment the list’ner’s ravished brain” [28] is luring the UK towards the sharp rocks of climate change, seeing “but the maid alone” [28]. Indeed, a fixation [29]–[31] with the promises of renewable energy means that more multi-pronged solutions around demand reduction strategies (including demand side management (DSM), efficiency, and sufficiency) are overlooked. Despite the appeal of renewable energy generation, society must stuff its ears to her distracting allure, and mobilise her as a figurehead that accompanies it on other paths and routes towards net zero.

The dangerous fixation with renewables is not new. As home to the world’s largest offshore wind farm (off the coast of Yorkshire) [32], the UK has long been fixated upon wind power. Wind power generation increased by 715% between 2009 and 2020 [32]. 24% of total UK electricity in 2020 was generated from wind – between offshore (13%) and onshore (11%) sources – making it the “greenest year on record” [33]. That same year, the five-year ban on onshore wind farms was lifted, with governmental subsidies made available from September 2021 [34] suggesting that capacities are only set to increase further.

Renewable energy generation depends on technologies like wind turbines and solar panels to harness natural resources for energy production. It is an attractive solution: it is cheap, reduces some forms of pollution, whilst decreasing reliance on the energy supplies of other nations. Yet the song of renewables implies that it is not the organisation of society nor its associated consumption that is the problem – it is simply the technologies used to harness and generate energy supplies. Little change is, therefore, presumed to be required from consumers or industry in the form of demand reduction. This, combined with the intermittency of renewables, means that sharp rocks lie ahead.



Figure 1. Renewables as Mermaids. Credit: Véronique Heijnsbroek (<http://visitveronique.co.uk>)
[print in colour]

The weather conditions (i.e., wind, sun) required are variable, posing temporal challenges and a need for stop gaps. Though storage has been posited as a solution, it is still expensive and not always possible to store excess capacities for times when they are needed [35]. Low wind levels across the North Sea in 2021 made this challenge clear. Generation fell by 13% and 15% for onshore and offshore respectively, compared to the previous year [36]. Solar PV generation also fell 13% in this period due to lower levels of sunlight. In response, West Burton A, a coal plant previously on standby, had to be fired up [37].

Sailors, both literary and otherwise, have had strategies to avoid the distracting allure of mermaids, stuffing their ears and tying themselves to the masts of their ships [38]. Like journeys across the seas, there is no single specific course toward net zero. Accordingly, society must stuff its ears to the mermaid's singular attraction so it can spot other routes, as well as the dangers it might face in transit. Demand reduction is essential [39]. There is a myriad of ways in which it could happen, from internet data limits [40], to loosening office dress codes to reduce demand for air conditioning [41]. Admittedly, sufficiency measures have challenges of their own. For instance, they raise a critical assessment of 'need' in society [42], [43]. Demand reduction promises, nevertheless, to accelerate a transition to a low carbon energy supply by reducing needs for energy production. It would also reduce the costs, carbon, and challenges of expanding our energy system further by reducing the overall investment required to achieve net zero emissions, whilst decreasing the need to rely on risky carbon dioxide removal technologies [44]. If UK policy can break its fixation on renewable energy generation, it may just spot these other routes and the promise of other lands and solutions.

Renewables certainly have a role to play as society navigates the seas towards net zero, just as mermaids have been understood to help sailors avoid peril. Commonly carved as figureheads on nautical vessels between the 16th and 20th centuries, mermaids were also believed to appease the sea, ensure good weather, and help sailors back to land [45]. Similarly, renewable energies must accompany other climate change policy responses. Society's remaining supply of fossil fuels must stay in the ground [46] and this is, indeed, a part of the beauty of renewables in that they are crucial in supporting the ability to do this. The valuable potentiality of renewable energies means that they should not be ignored. Society must, however, not fall to the compulsion of their song, travelling towards them as a singular destination. Figureheads did not replace the hard work of the sailors, the need to keep watch, nor the value of a competent captain to navigate rough seas to ensure desired destinations are reached.

4.2. Vampire Cars: swapping garlic for stakes

The extreme difficulty of killing vampires inspires our next comparison. Vampires, though complicated and culturally nuanced characters [23], are generally known to be notorious blood drinkers, shapeshifters, and hard to kill. Bram Stoker's [47] infamous *Count Dracula* featured these qualities, whilst also being able to influence the minds and actions of those he had bitten in the past. Garlic could be used to ward him off, but his extermination was only possible through exposure to sunlight and a stake through the heart.

Cars, like vampires, are dangerous and deadly. Despite this, UK climate policies are merely garlic-like, seeking to manage where cars go (e.g., zebra crossings, speed bumps, or low emissions zones) or forcing them to shapeshift into arguably less 'dangerous' forms (e.g., electric). Such responses are cautionary, limited, and inadequate. Less car-dependent, alternative visions of the future need to be dreamt up and worked toward. It is time to put down the garlic, expose cars to the sunlight, and sharpen the stake to address the car's dangerous bloodsucking and mind controlling qualities.



Figure 2. Cars as Vampires. Credit: Véronique Heijnsbroek
(<http://visitveronique.co.uk>)
[print in colour]

The case for a dramatic shift in approach is strong. Like bloodsucking vampires, cars suck life out of communities. While driving has been positioned as a symbol of freedom and progress – with cars being a pioneer of mass production due to their symbolism in the Ford assembly line in modern industrial capitalist economies [48] – the rise of the car is tied to the decline of civic and public life [48], [49]. Whereas multi-modal and public transportation depend upon collective synchronisation, cars support individualistic timetabling and disrupt spaces that bring people together to form a public [50]. Societies centred around the car increasingly divide workplaces and retailing outlets from homes, resulting in lengthy commutes and journeys into and across cities. This disruption is recklessly inefficient and pernicious. Indeed, Great Britain's 32 million licensed cars [51] sit dormant for most of the day, like vampires resting in their coffins, nevertheless, the creation and maintenance of roads, parking lots, and garages have more persistent public (e.g., parks) and private (e.g., gardens) spatial and environmental (e.g., loss of habitats) costs.

Beyond the threats to healthy publics and environments, cars are well-known to be deadly to human life itself. Road traffic crashes rank as the 8th leading cause of death globally [52]. Thousands of premature deaths are also increasingly connected to air pollution from cars [53]. While drivers might feel safe, cocooned in metal, plastic, glass, and air filtration technologies from harmful toxins, these can actually be higher inside idling cars than outside of them [54]. When individuals have access to a car, too, they are less likely to engage in more active forms of travel (e.g., cycling, walking), which have clear benefits: reduced health care costs; lower risk of accidents; and less air and noise pollution and congestion [55]. Compounding the negative effects of mass car use, the benefits of active travel are also reduced when carried out in highly polluted cities [56].

The threats cars pose to society and health are well known. Yet mainstream UK government responses are all too frequently about supporting less harmful forms of driving [30]. This has seen attention paid

to facilitating a vampire-like shapeshifting, with the ambition of substituting combustion vehicles with their electric counterparts taking centre stage. But society must not be fooled – the UK government’s ban of fossil-fuel cars from 2040 is no stake. Electric cars do not tackle problems like road traffic congestion, health, safety, or degrading social connections. Indeed, while shapeshifting may reduce some risks like dementia, cognitive decline, and lung cancer from exhaust fumes [57], other forms of pollution (e.g., from braking and tyre wear), environmental harm (e.g., mineral extraction), and the carbon emissions associated with industrial production still occur, bringing with them dangerous and deadly implications (e.g., increasingly extreme weather events like storms, floods, and droughts impacting mortality). Electric cars still require fuel from electricity too – and this will not necessarily be from renewable sources anytime soon [58].

Garlic-like policy responses alone will not make society safe from the threats of the vampire car. Until the car has been exposed to the sunlight and a stake is driven through its heart, society will not be free of the dangers cars create. In this case, sunlight means a societal-wide reimagining of life without cars [59] and asking difficult questions about the ordering of everyday lives. What work and leisure activities are possible without the car? Where can housing, education, health and retail be located if it must be done by foot, bike, bus, scooter, tram, or train? With the answers to these questions brought into the light of the day, policymakers must then reach for the stake, reversing how land is used, and how finances and infrastructures for multi-modal transportation are structured [60]. Considering that roughly half of low-income households have no access to a vehicle and benefit from good public transport, the simultaneous application of sunlight and stake approaches can better contribute to decreasing the gap between the wealthy and deprived, as well as the urban and the rural [60], whilst representing a sustainable transition.

The changes called for will not be easy to achieve – having been bitten by the car, society is very much under its control. Because of this, the reimagining, dismantling, and remaking of its infrastructure requires active government coordination and work across local, regional, national, and international agencies. In this regard, shifting funding for new road-building programmes towards high-quality, zero-emission public transport and active travel is a prerequisite and crucial stake required to support the reimagining of alternative visions of the future.

4.3. The Dangers of ‘Plastic’ Witch-Hunts

The paradoxical portrayal of witches, as both harmers (e.g., *Hansel and Gretel*) and healers (e.g., *Rapunzel*) inspires our next case, plastics. Witches were blamed and scapegoated for various societal ills from the 14th to the 17th centuries in Europe [61]. At the same time, witches have long been heralded for their ability to provide magical solutions to everyday problems (e.g., infertility cures, love potions). Likewise, there has been a witch-hunt in the UK against plastics in recent years, while, simultaneously, this family of materials is acknowledged for its utility, malleability, and durability [62]–[64]. Like witches, plastics are thus complicated characters. However, this complexity is overlooked in mainstream approaches, with short-sighted and narrow policy interventions (e.g., price controls, recycling labels, and information campaigns) too often relied on (c.f., [65] critique of [66] in *ERSS*). These approaches, moreover, typically encourage a dangerous witch-hunt against plastics (e.g., straws and coffee stirrers) premised on naïve forms of material substitution.

The arguably reactionary and far too narrow witch-hunt against plastics is not entirely unfounded. Plastic production is inextricably linked to oil production [66], [67]. Plastic wastes also pollute ecosystems and poison species, with increasing credence given to the links between microplastics, phthalates, threats to health, and rising rates of human infertility [68]–[71]. Like the accused witches of the Renaissance, plastics are thus understood to pose many wicked and existential threats to life.

Nevertheless, historically plastics have also played, and continue to play, valuable and restorative roles. The origins of plastics lie, in part, in late 19th century endeavours to imitate valuable hard-to-source natural materials (e.g., rubber, ivory, and shellac) [72], the sourcing of which was premised on the

degradation of species and wider environments. Today, plastics extend the shelf life of many foods, support the manufacture of lighter products and vehicles (and therefore limit energy use and carbon emissions), and provide safer, more durable, and efficient casings and equipment, including those employed in medical practices [62], [63].

Due to the pervasiveness of plastics, it is useful to think through their use and treatment in reference to a particular context. Here we zoom in on hospitals and responses to the COVID-19 pandemic which provides a pertinent example of how plastics are all too commonly mistreated.



Figure 3. *Plastics as Witches*. Credit: Véronique Heijnsbroek
(<http://vistveronique.co.uk>)
[print in colour]

At the time of writing, over 6.5 million people have died from COVID-19 [73]. While the pandemic increased demand for single-use plastics, with some estimates associating more than eight million tons of plastic waste globally in the first year [74], it was common to see headlines in 2020 that lamented the lack of Personal Protective Equipment (PPE, e.g., masks, gloves, shields) for medical professionals. Clearly, plastic saved lives and played a crucial, valuable role in response to the crisis. From 2021, there were

outcries against the plastic waste produced to stop the spread of the virus and create safe(r) working conditions. Pictures of masks washed up on beaches circulated across media platforms, feeding into the demonisation of plastic products.

Possibilities for reuse remained a relatively mute consideration. Rather than simply substituting one single-use plastic item for another material or blaming individuals for littering (which accounts for a small fraction of PPE, the vast majority being used in hospitals [74]), society could have worked to implement systems for reuse. In terms of PPE, especially in a hospital setting, research shows that it is possible to collect, clean and reuse these items – if designed appropriately – forty times [75], [76].

According to Ellsworth-Krebs and colleagues' [77] study of the digital circular economy, the creation of systems of mass reuse could be founded on traceability, which in this context ensures product safety (e.g., evidence of cleaning to prevent further contamination). Being able to uniquely identify a product also provides essential data for designers, to see what parts or materials fail, since single-use design does not require consideration of how to enable hundreds of uses out of one product or package. Enacting such changes will require the development of specific solutions to challenges rooted in everyday systems of production, consumption, and disposal. Engagement with the politics of plastics throughout various life cycles is thus crucial [65], [78].

Alas, reuse is not at the centre of current policy responses to plastics. And, not unrelatedly, the witch-hunt against plastics continues apace. Examples including single-use polyethylene bags (i.e., through price controls) and more recently plastic straws (i.e., through messaging), are pertinent. Both have contributed to the unfair broader demonisation of plastic, whilst also failing to make much of a dent in the growing and troubling global production and consumption of plastics [78]. In short, information campaigns have 'burnt at the stake' specific and easy-to-target plastic witches. It is high time to call off the witch-hunt and focus on reorganising systems of provision, consumption and disposal in ways that maximise the restorative roles plastics can play, while also limiting harmful impacts.

Appropriately balancing the burden of funding is crucial here. Producers of plastics and, therefore, fossil fuel companies, should carry a larger portion of the responsibility than the individuals who are targeted through messaging and information campaigns. In the UK, for example, businesses currently pay 10% of the disposal cost of plastic packaging, with the remainder being subsidised by council tax [79]. It is hardly surprising that this is insufficient to deal with the volumes of plastic waste now normalised in everyday life, nor that only 9% of plastic ever produced has been recycled [80]. The introduction of Extended Producer Responsibility (EPR) by 2024 in the UK could mark an important shift [81]. Crucially, this shift needs to see funding poured into the plumbing of improved recycling and reuse systems as opposed to producers simply paying a tax on the continued use of 'throwaway' single-use consumables, with incineration remaining an all too attractive option (see [82] on the political economies of waste in the UK).

In this regard, the broader systems around how we manufacture, use, and dispose of plastics remain neglected concerns [83]. Responses outside of price controls and messaging exist (e.g., Scotland's recent ban on single-use plastics [84]) but it remains to be seen whether these represent the types of systemic and systematic changes needed. As van Veelen and Hasselbach [65, p. 100145] describe: "[t]he structural conditions that have created the global plastic pollution problem are multiple: plastic is too cheap, designed to be disposable, and waste management systems are inadequate and reliant on exports from rich to poor countries". Simplistic witch-hunts against particular plastic items, and the individualisation of responsibility implied by these, mean opportunities to accelerate systemic and systematic sustainability transitions are negated. Society must fund and create systems that account for, and maximise, the full lifecycle costs and value of this magical family of materials.

5. Climate Fairy Tales and Transformational Adaptation

Climate change requires evidence-based, coordinated, and shared interventions, the scale and scope of which defy anything seen before [1]. There is, in this regard, an increasingly accepted understanding that the fundamental attributes of socio-economic systems need to change in response to, and in anticipation of, further climate change. A call for 'transformational adaptation' is now at the core of the

IPCC's work. As explained in the recently published Sixth Assessment Report *Impacts, Adaptation and Vulnerability* – transformational adaptations are “[...] transformations in existing social and social-technological and environmental systems that include shifts in most aspects of society” [5, p. 99].

Although the scale and scope of change required in the face of climate change is broadly acknowledged, policy responses remain inadequate at the local and global level. Working to critique local responses, we focused on the UK specifically in this piece. As we have demonstrated, UK policy has fixated on the allure of 'cleaner' energy sources, embraced cautionary approaches to car use, and is too narrowly framing and, therefore, demonising plastics. However, the inadequacy of these responses is not just evident in these cases. For instance, in the recent foreword to the UK's *Net Zero Strategy* [30] the following is stated:

This strategy shows how we can build back greener, without so much as a hair shirt in sight. In 2050, we will still be driving cars, flying planes and heating our homes, but our cars will be electric gliding silently around our cities, our planes will be zero emission allowing us to fly guilt-free, and our homes will be heated by cheap reliable power drawn from the winds of the North Sea [30, p. 9].

As encapsulated by this quote, current and convenient ways of life, with their accompanying norms and expectations – apparently – need not change.

In line with this understanding, current and growing levels of demand are only questioned to a limited extent. Where attention has been paid to demand, technological efficiencies have been foregrounded. These are expected to deliver demand reduction targets of 78% below 1990 levels by 2035, and net zero by 2050 [85]. Yet, Barrett et al. [44] argue that current policy measures are far lower than what is required (e.g., only a 5% reduction by 2050). As they render clear – “[w]hile the carbon intensity of the global energy system is falling, at its current rate, it would take 150 years to fully decarbonize” [86, p. 726]. Moreover, instead of broadening the focus of demand initiatives beyond efficiency, there is now an archetypal individualisation of responsibility in policy [87], [88].

In contrast, the imaginative and – hopefully – evocative telling tales told in this paper acknowledge complexity, whilst pointing to the need to move beyond the individualisation of responsibility when it comes to facing down the wicked problems of climate change. In our portrayal of cars, for instance, we have not implied that someone is 'bad' for driving: it is – in fact – the car that has agency to bite and seduce its victims. Calling for sunlight and stake responses emphasises the need, instead, for systemic interventions. The aim here is not to diminish quality of life through climate and energy policy. Others have recognised this. Barrett et al., [44, p. 33], for instance, present scenarios to meet the UK's net-zero climate target by “reallocat[ing...] expenditures, street design, pricing and regulation [to facilitate the] transfer of car trips to public transport, walking and cycling”. Alas, the UK Government has committed £27.4 billion to road infrastructure by 2025, and only £2 billion for active travel modes for the same period [89] – an investment inconsistent with net zero targets. Suggestions resulting from Barrett et al.'s [44] modelling arguably offer more systemic alternatives that deserve greater attention. Much like our call for sunlight and stakes, over garlic-based responses, Barrett et al.'s [44] work calls for: doubling investment in public transport, walking and cycling; no more substantial road building; high taxation on more than one car per household; and parking charges that encourage vehicle sharing.

Similarly, instead of witch-hunts against single-use plastics (e.g., straws and bags), and focusing individual's attention to what they buy, we outlined how plastic products must be valued as assets so that they do not immediately become waste as soon as they leave the shop floor [77]. This requires Extended Producer Responsibility legislation so that the cost of disposal is factored into products, and necessary innovations in (reverse) supply chains is led by manufacturers, retailers and government working together rather than placing the onus on citizens and consumption habits [65].

The allure of renewables – over demand reduction – can also not be reduced to individual responses. It involves, instead, understanding the social orchestration of peaks and troughs of energy demand, and

how these relate to the routinised performance and wider ordering of social practices [90]. With demand understood as not simply met, but made, it is necessary to begin thinking about how it could be made differently as a part of a larger rejigging of social life [90].

To summarise, three cautionary warnings lie at the core of this discussion and its calls for overall demand reduction and transformational change. In reference to energy supply and consumption, we have acknowledged the alluring siren-like role of renewables in working towards a fossil-free future, but also cautioned against assumptions that other measures are not required. We have also warned against garlic-based policy responses to vampire cars, calling for more stringent actions that lead to less car-dependent and damaging ways of moving around and living. In contrast to the 'doom and gloom' public narrative that exists around plastics, we have also called for an end to a damaging witch-hunt to call forth, instead, a more systemic and systematic approach aimed at fostering a better understanding of plastics' roles, and their possibilities for reuse. This would minimise resource demand and make sure the values of plastics are maximised and no longer neglected. All these warnings and related responses are telling of the types of shifts needed in the UK as part of the transformational adaptation necessitated by climate change.

We have argued here that there are benefits to mobilising fairy tale characters as a mode of communicating the types of transformational shifts needed in policies and practices in the UK. This style of storytelling acknowledges complexity, whilst moving beyond the individualisation of responsibility in defining the wicked problems of climate change. In doing so, it goes beyond narratives of 'doom, cost, and sacrifice' common in critiques of policy responses, and identified by Stoknes [91] as one of the five main barriers to effective climate communication. In this perspective piece we have experimented with this style of storytelling, and though we are yet to test it, others have demonstrated the impact of different narrative styles on an audiences' perception. Whilst doom and gloom narratives have been successful in bringing climate change into the political agenda, other strategies like win-win (e.g., green growth narratives) [92] and 'learning stories' (i.e., in contrast to technological hero stories) [93] are now needed to move critique to pursuable and transformative action. We believe that making use of fairy tale characters as metaphors can add to this repertoire.

6. Storytelling and Climate Change: inspiring others

In this paper, we have responded to Moezzi's [2, p. 7] call to the energy social science community to "use stories more systematically" as well as Royston and Foulds [3, p. 1] prod that "greater attention [be paid] to the meaningful integration of [social science and humanities] into energy and sustainability research". While the communication of all research is a form of storytelling, rarely do the stories produced venture off traditional tracks of engagement and dissemination as a means of communicating with wider audiences in shared terms. When they have, it has typically been as a method of provoking others to work together, collaborate, network and co-create outputs [6], [7]. Given the deaf ears on which much work within energy research and the social sciences has so far fallen, the question remains as to whether traditional methods of dissemination are engaging and intelligible enough to evoke the transformational adaptation required to tackle the wicked problems of climate change.

Despite the well understood importance of engaging with diverse stakeholders, and particularly those who have the power to enact the change required by transformational adaptation (e.g., policymakers), social science research remains – in many cases – overly complicated and targeted at specialist audiences. Thus, engagement through terms and in forms that can cut across different audiences and disciplines remains paramount and a central challenge.

To meet this challenge, we have drawn on a well-known cast of fairy tale characters to argue for transformational adaptation as it relates to the impacts of electricity generation, sustainable travel, and plastic pollution. As part of doing so, we have argued that UK climate change policy approaches are too fixated upon renewables, too cautionary with regards to cars, and too narrowly focused concerning plastics. These suggestions are not that novel. Social science researchers have long conveyed similar messages and warnings (indeed we took our inspiration from many of them). They have just done so with

more specialised audiences in mind, whilst we have reframed them with the intention to bring well-trodden arguments to a broader audience. Moreover, in mobilising fairy tale characteristics, we have contributed to the strengthening of arts, humanities, and storytelling in general, in attempts to move energy and social science research beyond the obscure, and into more accessible and engaging formats (e.g., Clifi [94], [95], civil disobedience [96], Brandalism [97], children's books [98], [99], and gallery exhibits (e.g., photo essays (Author 1 et al., 2021))).

With a long history of intentionally crafted tales to communicate moral codes of conduct, fairy tales offer a clear avenue for energy researchers to translate their policy recommendations in the face of pressing climate emergencies to local audiences. Of course, challenges exist too. For instance, some cases – like plastics – were harder to translate through fairy tale characteristics. This, in part, reflects some of the challenges of understanding the complex category of plastic itself and the myriad of materials that this represents. In addition, the fairy tale characters that we have mobilised to critique UK policy responses to the three empirical cases selected, are culturally and geographically specific. In some cases, there will be little – if any – overlap. And even where commonalities in policy approaches may exist, the tales we have told do not capture the dynamics of different cultural contexts. For instance, China is – arguably – also under the allure of the mermaid that is renewable energy, however, it is also the world's largest greenhouse gas generator, and this is without emissions having yet peaked [100]. In addition to the cultural challenges of this work, it was beyond the scope of this piece to 'test' our characters and visualisations with specific groups (e.g., school children, policymakers, organisations) and 'measure' behaviour change. Despite these limitations, toying with the boundaries between fiction and nonfiction has allowed us to be playful in developing and telling the stories of research itself, mobilising the benefits of storytelling (e.g., exploring and communicating complexity; enabling and fostering empathy; supporting collective agenda setting [2], [7]) through tales, and in terms, that are more familiar to local audiences than those that are commonly used in the academic literature. We hope that others will take inspiration from our approach and join us in re-telling tales about the climate crisis (or other wicked problems) in new ways. There remains much scope in this regard. Though we mobilised fairy tale characters as metaphors, there are a range of other 'story' elements that we did not engage with (i.e., initial situations, complications, resolution, heroes, villains, and victims [101]) which could prove fruitful in re-telling tales of energy research. However, we also specifically call on other energy researchers within the social sciences to consider extending and adding to our cast of metaphorical fairy tale characters, broadening this both locally and globally, as part of shaping, and trying to speed up, the transformational adaptations required in the face of climate emergencies.

References

- [1] K. Levin, B. Cashore, S. Bernstein, and G. Auld, 'Overcoming the tragedy of super wicked problems: Constraining our future selves to ameliorate global climate change', *Policy Sci.*, vol. 45, no. 2, pp. 123–152, 2012.
- [2] M. Moezzi, K. Janda, and S. Rotmann, 'Using stories, narratives, and storytelling in energy and climate change research', *Energy Res. Soc. Sci.*, vol. 31, pp. 1–10, 2017.
- [3] S. Royston and C. Foulds, 'The making of energy evidence: How exclusions of Social Sciences and Humanities are reproduced (and what researchers can do about it)', *Energy Res. Soc. Sci.*, vol. 77, p. 102084, Jul. 2021, doi: 10.1016/j.erss.2021.102084.
- [4] J. Kirchherr, 'Bullshit in the Sustainability and Transitions Literature: A Provocation', *Circ. Econ. Sustain.*, 2022, doi: 10.1007/s43615-022-00175-9.
- [5] IPCC, 'Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change', Cambridge University Press, Cambridge, UK and New York, USA, 2022. [Online]. Available: https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_FrontMatter.pdf
- [6] S. Rotmann, "'Once upon a time...'" Eliciting energy and behaviour change stories using a fairy tale story spine', *Energy Res. Soc. Sci.*, vol. 31, pp. 303–310, Sep. 2017, doi: 10.1016/j.erss.2017.06.033.
- [7] R. Mourik, G. Sonetti, and R. Robinson, 'The same old story – or not? How storytelling can support inclusive local energy policy', *Energy Res. Soc. Sci.*, vol. 73, p. 101940, 2021.

- [8] J. Zipes, 'Speaking the Truth with Folk and Fairy Tales: The Power of the Powerless', *J. Am. Folk.*, vol. 132, no. 525, pp. 243–259, 2018, doi: 10.5406/jamerfolk.132.525.0243.
- [9] F. Cochoy, 'Hansel and Gretel at the grocery store: Progressive grocer and the little American consumers (1929–1959)', *J. Cult. Econ.*, vol. 1, no. 2, pp. 145–163, 2008.
- [10] C. Dean, 'Making Wonder Tales: An exploration of material writing practice for ecological storymaking', Doctoral Thesis, Lancaster University, 2018. Accessed: Nov. 10, 2022. [Online]. Available: <https://doi.org/10.17635/lancaster/thesis/544>
- [11] A. MacIntyre, *After Virtue: A study in moral theory*. London: Bloomsbury Academic, 2013.
- [12] L. Bevan, T. Colley, and M. Workman, 'Climate change strategic narratives in the United Kingdom: Emergency, extinction, effectiveness', *Energy Res. Soc. Sci.*, vol. 69, p. 101580, 2020.
- [13] P. G. Raven, 'Telling tomorrows: Science fiction as an energy futures research tool', *Energy Res. Soc. Sci.*, vol. 31, pp. 164–169, Sep. 2017, doi: 10.1016/j.erss.2017.05.034.
- [14] J. Smith et al., 'Gathering around stories: Interdisciplinary experiments in support of energy system transitions', *Energy Res. Soc. Sci.*, vol. 31, pp. 284–294, Sep. 2017, doi: 10.1016/j.erss.2017.06.026.
- [15] ERSS, Energy Research and Social Science, Spec. Issue Narrat. Storytell. *Energy Clim. Change Res. Energy Res. Soc. Sci.*, vol. 31, 2017.
- [16] W. Storr, *The science of storytelling*. London: William Collins, 2019.
- [17] J. Pazdziora and D. Cizakca, *New Fairy Tales: Essays and stories*. Unlocking Press.
- [18] D. Haase, 'Introduction', in *The Greenwood Encyclopaedia of Folktales and Fairy Tales*, D. Haase, Ed. United States of America: Greenwood Publishing Group, 2008.
- [19] J. Zipes, *Fairy tales and the art of subversion: the classical genre for children and the process of civilization*. Milton Park, Abingdon, Oxon; New York: Routledge, 2006.
- [20] S. McNiff, 'Art-Based Research', in *Handbook of the Arts in Qualitative Research: Perspectives, Methodologies, Examples and Issues*, United States of America: Sage Publications, 2008.
- [21] C. Bacchilega, *Fairy tales transformed? Twenty-first century adaptations and the politics of wonder*. Detroit: Wayne State University Press, 2013.
- [22] K. Briggs, *The Fairies in Tradition and Literature*. London: Routledge, 1967.
- [23] S. Lam, 'Hop on Pop: Jiangshi films in a transnational context', *CineAction*, vol. 78, p. 48, 2009.
- [24] J. Liu, Y. Yang, Q. Liu, and J. Ding, 'The Value of China's Legislation on Plastic Pollution Prevention in 2020', *Bull. Environ. Contam. Toxicol.*, vol. 108, pp. 601–608, 2022.
- [25] A. Franklin, 'Introduction: Sustainability Science as Co-Creative Research Praxis', in *Co-Creativity and Engaged Scholarship: Transformative Methods in Social Sustainability Research*, A. Franklin, Ed. Cham, Switzerland: Palgrave Macmillan, 2022.
- [26] E. Shove, *Comfort, cleanliness and convenience: the social organization of normality*, 1. publ. Oxford: Berg, 2003.
- [27] N. Höhne et al., 'Contributions of individual countries' emissions to climate change and their uncertainty', *Clim. Change*, vol. 106, 2010.
- [28] M. Twain, *A Tramp Abroad*. United States of America: American Publishing Company, 1880.
- [29] R. E. H. Sims, 'Renewable energy: a response to climate change', *Sol. Energy*, vol. 76, no. 1–3, pp. 9–17, Jan. 2004, doi: 10.1016/S0038-092X(03)00101-4.
- [30] Government, 'Net Zero Strategy: Build Back Greener, October 2021', 2021. Accessed: Nov. 10, 2022. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf
- [31] Government, 'The UK Renewable Energy Strategy', 2009. Accessed: Nov. 10, 2022. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf
- [32] ONS, Office for National Statistics, 'Wind energy in the UK', 2021. <https://www.ons.gov.uk/economy/environmentalaccounts/articles/windenergyintheuk/june2021> (accessed Nov. 24, 2021).
- [33] National Grid, '2020 greenest year on record for Britain', 2021. <https://www.nationalgrid.com/stories/journey-to-net-zero-stories/2020-greenest-year-record-britain> (accessed Oct. 19, 2022).
- [34] BEIS, Department for Business, Energy & Industrial Strategy, 'Biggest ever renewable energy support scheme backed by additional £265 million', 2020. Accessed: Nov. 24, 2022. [Online]. Available: <https://www.gov.uk/government/news/biggest-ever-renewable-energy-support->

- scheme-backed-by-additional-265-million
- [35] K. Rippy, 'These 3 energy storage technologies can help solve the challenge of moving to 100% renewable electricity', *The Conversation*, 2021. <https://theconversation.com/these-3-energy-storage-technologies-can-help-solve-the-challenge-of-moving-to-100-renewable-electricity-161564> (accessed Oct. 19, 2022).
- [36] BEIS, Department for Business, Energy & Industrial Strategy, 'Energy Trends UK, April to June 2021', 2021. Accessed: Nov. 24, 2022. [Online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1021952/Energy_Trends_September_2021.pdf
- [37] BBC, 'UK fires up coal power plant as gas prices soar', BBC Online, 2021. Accessed: Nov. 24, 2022. [Online]. Available: <https://www.bbc.co.uk/news/business-58469238>
- [38] C. Bacchilega and M. Brown, 'Introduction', in *The Penguin Book of Mermaids*, C. Bacchilega and M. Brown, Eds. United States of America: Penguin Books, 2019.
- [39] IPCC, 'Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change', Cambridge University Press, Cambridge, UK and New York, USA, 2022. [Online]. Available: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf
- [40] J. Morley, K. Widdicks, and M. Hazas, 'Digitalisation, energy and data demand: The impact of Internet traffic on overall and peak electricity consumption', *Energy Res. Soc. Sci.*, vol. 73, pp. 128–137.
- [41] S. Royston, J. Selby, and E. Shove, 'Invisible energy policies: A new agenda for energy demand reduction', *Energy Policy*, vol. 123, pp. 127–135, Dec. 2018, doi: 10.1016/j.enpol.2018.08.052.
- [42] N. Cass et al., 'Curbing excess: High energy consumption and the fair energy transition', Centre for Research into Energy Demand Solutions (CREDS), Oxford, UK, 2022. Accessed: Nov. 14, 2022. [Online]. Available: <https://www.creds.ac.uk/wp-content/uploads/CREDS-curbing-excess-Feb2022.pdf>
- [43] T. Fawcett and S. Darby, 'Energy sufficiency in policy and practice: The question of needs and wants', in *Proceedings of ECEEE Summer Study*, 2019.
- [44] J. Barrett et al., 'The role of energy demand reduction in achieving net-zero in the UK', Centre for Research into Energy Demand Solutions (CREDS), 2021. Accessed: Oct. 19, 2022. [Online]. Available: <https://low-energy.creds.ac.uk/wp-content/uploads/CREDS-Role-of-energy-demand-report-2021.pdf>
- [45] D. Cordingly, *Women Sailors and Sailors' Women: An Untold Maritime History*. London: Random House Trade, 2001.
- [46] H. van Asselt, 'Governing fossil fuel production in the age of climate disruption: Towards an international law of "leaving it in the ground"', *Earth Syst. Gov.*, vol. 9, p. 100118, Sep. 2021, doi: 10.1016/j.esg.2021.100118.
- [47] B. Stoker, *The Annotated Dracula*. New York: Clarkson N. Potter, 1897.
- [48] A. Best, *Fast Cars, Cool Rides*. New York: New York University Press, 2006.
- [49] M. Sheller and J. Urry, 'The City and the Car', *Int. J. Urban Reg. Res.*, vol. 24, no. 4, pp. 737–757, Dec. 2000, doi: 10.1111/1468-2427.00276.
- [50] J. Habermas, *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*. Cambridge, MA: MIT Press, 1992.
- [51] RAC, 'Motoring FAQs', 2021. <https://www.racfoundation.org/motoring-faqs/mobility#a1> (accessed Oct. 19, 2022).
- [52] WHO, World Health Organisation, 'Global status report on road safety', 2018. Accessed: Nov. 14, 2022. [Online]. Available: <https://www.who.int/publications/i/item/9789241565684>
- [53] I. S. Mudway et al., 'Impact of London's low emission zone on air quality and children's respiratory health: a sequential annual cross-sectional study', *Lancet Public Health*, vol. 4, no. 1, pp. e28–e40, Jan. 2019, doi: 10.1016/S2468-2667(18)30202-0.
- [54] B. Bos et al., 'Taxi drivers' exposure to black carbon and nitrogen dioxide in electric and diesel vehicles: A case study in London', *Environ. Res.*, vol. 195, p. 110076, 2021.
- [55] F. Rajé and A. Saffrey, 'The Value of Cycling', *Cycling Embassy*, 2016. Accessed: Nov. 14, 2022. [Online]. Available: <https://americantrails.s3.us-west-2.amazonaws.com/files/pdf/value-of-cycling.pdf>
- [56] M. Tainio et al., 'Can air pollution negate the health benefits of cycling and walking?', *Prev. Med.*, vol. 87, pp. 233–236, Jun. 2016, doi: 10.1016/j.ypmed.2016.02.002.

- [57] W. J. Requia, M. Mohamed, C. D. Higgins, A. Arain, and M. Ferguson, 'How clean are electric vehicles? Evidence-based review of the effects of electric mobility on air pollutants, greenhouse gas emissions and human health', *Atmos. Environ.*, vol. 185, pp. 64–77, Jul. 2018, doi: 10.1016/j.atmosenv.2018.04.040.
- [58] GSR, Global Status Report, 'Renewables: Global Status Report', 2021. Accessed: Nov. 10, 2022. [Online]. Available: https://www.ren21.net/wp-content/uploads/2019/05/GSR2021_Full_Report.pdf
- [59] R. Warren, *Rail and the city: shrinking our carbon footprint while reimagining urban space*. Cambridge, Massachusetts: The MIT Press, 2014.
- [60] H. Bennett and C. Brandmayr, 'Not going the extra mile: Driving less to tackle climate change', Green Alliance, 2021. Accessed: Oct. 19, 2022. [Online]. Available: <https://green-alliance.org.uk/publication/not-going-the-extra-mile/>
- [61] E. Jong, *Witches*. New York: Open Road, 1981.
- [62] A. Andrady and M. Neal, 'Applications and societal benefits of plastics', *Philos. Trans. R. Soc. B*, vol. 364, pp. 1977–1984, 2009.
- [63] T. D. Nielsen, J. Hasselbalch, K. Holmberg, and J. Stripple, 'Politics and the plastic crisis: A review throughout the plastic life cycle', *WIREs Energy Environ.*, vol. 9, no. 1, Jan. 2020, doi: 10.1002/wene.360.
- [64] M. Burgess, H. Holmes, M. Sharmina, and M. Shaver, 'The future of UK plastics recycling: One Bin to Rule Them All', *Resour. Conserv. Recycl.*, vol. 164, p. 105191.
- [65] B. van Veelen and J. Hasselbalch, 'Power and politics in plastics research: A critique of "Whither Plastics"', *Energy Res. Soc. Sci.*, vol. 61, p. 101445, Mar. 2020, doi: 10.1016/j.erss.2020.101445.
- [66] M. Jefferson, "'Whither Plastics?' – Petrochemicals, plastics, and sustainability in a garbage-riddled world', *Energy Res. Soc. Sci.*, vol. 56, p. 101229, 2019.
- [67] D. M. Sicotte, 'From cheap ethane to a plastic planet: Regulating an industrial global production network', *Energy Res. Soc. Sci.*, vol. 66, p. 101479, Aug. 2020, doi: 10.1016/j.erss.2020.101479.
- [68] M. Liboiran, 'Redefining pollution and action: The matter of plastics', *J. Mater. Cult.*, vol. 21, pp. 87–110, 2016.
- [69] CIEL, Center for International Environmental Law, 'Plastic & Climate: Hidden costs of a plastic planet', 2019. Accessed: Nov. 14, 2022. [Online]. Available: <https://www.ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf>
- [70] S. D'Angelo and R. Meccariello, 'Microplastics: A Threat for Male Fertility', *Int. J. Environ. Res. Public Health*, vol. 18, p. 2392, 2021.
- [71] R. Geyer, 'A Brief History of Plastics', in *Mare Plasticum – The Plastic Sea*, M. Streit-Bianchi, M. Cimadevila, and W. Trettbak, Eds. Cham, Switzerland: Springer, 2020.
- [72] W. Bijker, *Of Bicycles, Bakelites, and Bulbs: Toward a theory of sociotechnical change*. United States of America: MIT Press, 1997.
- [73] WHO, World Health Organisation, 'WHO Coronavirus (COVID-19) Dashboard', 2022. Accessed: Oct. 19, 2022. [Online]. Available: <https://covid19.who.int/>
- [74] Y. Peng, P. Wu, A. T. Schartup, and Y. Zhang, 'Plastic waste release caused by COVID-19 and its fate in the global ocean', *Proc. Natl. Acad. Sci.*, vol. 118, no. 47, p. e2111530118, Nov. 2021, doi: 10.1073/pnas.2111530118.
- [75] HSE, The Health and Safety Executive, 'Re-use of Personal Protective Equipment (PPE) during the SARS-CoV-2 (COVID-19) Pandemic: Evidence summary to August 2020', 2020. Accessed: Oct. 19, 2022. [Online]. Available: <https://www.hse.gov.uk/research/assets/docs/re-use-of-ppe.pdf>
- [76] Revolution Zero, 'The Zero Waste Zero Carbon PPE', 2021. <https://www.revolution-zero.co.uk/> (accessed Oct. 24, 2022).
- [77] K. Ellsworth-Krebs, C. Rampen, E. Rogers, L. Dudley, and L. Wishart, 'Circular Economy Infrastructure: Why we need track and trace for reusable packaging', *Sustain. Prod. Consum.*, 2022.
- [78] A. Mah, *Plastic Unlimited: How Corporations Are Fuelling the Ecological Crisis and What We Can Do About It*. Cambridge: Polity, 2022.
- [79] S. Laville, 'Packaging producers to pay full recycling costs under waste scheme', *The Guardian*, 2018. Accessed: Oct. 19, 2022. [Online]. Available: <https://www.theguardian.com/environment/2018/dec/18/packaging-producers-to-pay-full-recycling-costs-under-waste-scheme>

- [80] OECD, Organisation for Economic, Co-operation and Development, 'The current plastics lifecycle is far from circular', 2022. <https://www.oecd.org/environment/plastics/plastics-lifecycle-is-far-from-circular.htm> (accessed Oct. 19, 2022).
- [81] RECOUP, 'UK Household Plastics Collection Survey', 2021. Accessed: Nov. 10, 2022. [Online]. Available: <https://www.recoup.org/download/960/uk-household-plastics-collection-survey-2021>
- [82] N. Gregson and P. Forman, 'England's municipal waste regime: Challenges and prospects', *Geogr. J.*, vol. 187, no. 3, pp. 214–226, 2021.
- [83] R. C. Thompson and S. Pahl, 'Plastics, the Environment and Society: Current Consensus and Future Directions', in *Plastics and the Environment*, R. M. Harrison and R. E. Hester, Eds. The Royal Society of Chemistry, 2018, pp. 177–187. doi: 10.1039/9781788013314-00177.
- [84] Scottish Government, 'Single use plastic ban', 2022. <https://www.gov.scot/news/single-use-plastics-ban/> (accessed Oct. 20, 2022).
- [85] Committee on Climate Change, 'The Sixth Carbon Budget: The UK's path to Net Zero', 2020. Accessed: Oct. 19, 2022. [Online]. Available: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>
- [86] J. Barrett et al., 'Energy demand reduction options for meeting national zero-emission targets in the United Kingdom', *Nat. Energy*, vol. 7, pp. 726–735, 2022.
- [87] E. Shove, 'Beyond the ABC: Climate Change Policy and Theories of Social Change', *Environ. Plan. Econ. Space*, vol. 42, no. 6, pp. 1273–1285, Jun. 2010, doi: 10.1068/a42282.
- [88] M. Maniates, 'Individualization: Plant a tree, buy a bike, save the world?', *Glob. Environ. Polit.*, vol. 1, no. 3, pp. 31–52, 2001.
- [89] S. Betts-Davies, 'Energy demand reduction is not "nanny state" governance. It's sensible, strategic and consistent climate policy', 2022. <https://www.creds.ac.uk/energy-demand-reduction-is-not-nanny-state-governance-its-sensible-strategic-and-consistent-climate-policy/> (accessed Nov. 14, 2022).
- [90] J. Rinkinen, E. Shove, and G. Marsden, *Conceptualising demand: a distinctive approach to consumption and practice*. Abingdon, Oxon; New York, NY: Routledge, Taylor & Francis Group, 2021.
- [91] P. E. Stoknes, 'Rethinking climate communications and the "psychological climate paradox"', *Energy Res. Soc. Sci.*, vol. 1, pp. 161–170, Mar. 2014, doi: 10.1016/j.erss.2014.03.007.
- [92] J. Hinkel, D. Mangalagiu, A. Bisaro, and D. Tăbara, 'Transformative narratives for climate action', *Clim. Change*, vol. 160, pp. 495–506, 2020.
- [93] K. Janda and M. Tapouzi, 'Telling Tales: Using stories to remake energy policy', *Build. Res. Inf.*, vol. 43, no. 3, pp. 516–533, 2015.
- [94] O. El Akkad, *American War*. London: Picador, 2018.
- [95] T. Onyebuchi, *War Girls*. United States of America: Razorbill, 2019.
- [96] S. Capstick, A. Thierry, E. Cox, O. Berglund, S. Westlake, and J. Steinbeger, 'Civil disobedience by scientists helps press for urgent climate action', *Nat. Clim. Change*, vol. 12, pp. 773–774, 2022.
- [97] Brandalism, 'Barclays #FossilBanks', 2021. <http://brandalism.ch/projects/barclays-fossil-banks/> (accessed Oct. 20, 2022).
- [98] L. Bergen, *The Polar Bears' Home: A story about global warming*. New York: Little Simon, 2008.
- [99] K. Maclear, *The Fog*. China: Tundra Books, 2017.
- [100] K. Abbasi, M. Shahbaz, J. Zhang, M. Irfan, and R. Alvarado, 'Analyze the environmental sustainability factors of China: The role of fossil fuel energy and renewable energy', *Renew. Energy*, vol. 187, pp. 390–402, 2022.
- [101] K. Fløttum and Ø. Gjerstad, 'Narratives in climate change discourse', *Wiley Interdiscip. Rev. Clim. Change*, vol. 8, no. 1, p. e429, 2016.