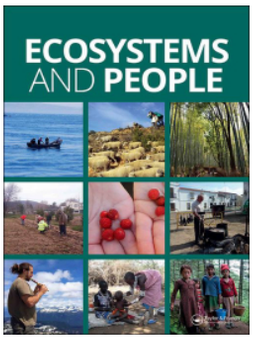

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PERSPECTIVE: HUMAN-NATURE CONNECTEDNESS AS LEVERAGE POINT

Applying the pathways to nature connectedness at a societal scale: a leverage points perspective

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ABSTRACT

The climate emergency and crisis of biodiversity loss show that the human–nature relationship is failing. This paper introduces the psychological construct of nature connectedness as a measurable target for improving the human–nature relationship, and therefore helping tackle the warming climate and loss of wildlife. The 'pathways to nature connectedness' (sensory contact, emotion, meaning, beauty and compassion) provide an important and flexible framework to help improve the human–nature relationship. Research evidence and practical examples are given from organisations using the pathways (e.g. National Trust, Wildlife Trusts, Durrell Wildlife Conservation Trust). This illustrates how the pathways provide a new methodological approach for improving human–nature relationships. A systems perspective is taken to consider wider application of the pathways framework. The societal relevance of the pathways approach is proposed, and the application of nature connectedness is considered across a range of leverage points relevant across multiple societal scales (from individuals to societies). Recommendations are given for specific pathways informed interventions to improve the human–nature relationship. These interventions focus on cultural programmes and urban design to increase sensory, meaningful and emotional engagement with nature. The interventions based on the pathways framework engage with leverage points around system goals, design, feedback and parameters across policy areas such as education, health, housing, arts, health and transport. This shows that the pathways to nature connectedness have a large scale of societal relevance and the potential to provide solutions across a range of leverage points to foster closer human–nature relationships across society.

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1. Introduction

The climate emergency and crisis of biodiversity loss (Ceballos et al. 2017; IPBES 2019) show that the relationship between humans and (the rest of) nature is failing. The human exemptionist paradigm (Catton and Dunlap 1978) of our superiority over nature may be at the heart of the environmental issues currently facing humanity (Flikke 2014) and drives human disconnection from nature in the human psyche (Fisher 2013). The scale of the inter-related issues of climate change and biodiversity loss and radical changes required for a sustainable future require a new relationship with nature. Bringing about a new relationship with nature needs interventions and approaches that affect large changes at scale across complex systems. The approach to creating a new relationship with nature is based on improving the psychological construct of nature connectedness through a framework called the 'pathways to nature connectedness' (Lumber et al. 2017). This framework can be used to help design interventions to enhance human–nature connections bringing about benefits to pro-nature behaviours and human wellbeing. The aim of the current paper is to show that a framework for the required interventions and approaches is available and can be applied at a societal scale at deep leverage points.

In the first half of the paper, both nature connectedness and the pathways are introduced. Then, to illustrate the need for the pathways approach, previous unsuccessful approaches to improve nature connectedness are considered. Then practical examples from organisations that have used the pathways to nature connectedness are summarised to demonstrate their utility. The second half of the paper discusses the wider systemic and potentially transformative implications of applying the pathways to nature connectedness within a leverage points perspective (Meadows 1999). The discussion covers the scale of societal relevance of each of the pathways. Then recommendations for nature connectedness and pathways applications are discussed through considering the four broad types of system characteristics that can be targeted

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through a leverage points approach: system intentions, system design, system feedback and system parameters (Abson et al. 2017). Finally, we summarize our arguments on the importance of the pathways to nature connectedness framework and how it can be applied across a range of leverage points for a stronger human–nature relationship.

1.1. Nature connectedness: what it is and why it matters

The relatively recent psychological construct of nature connectedness describes an individual's relationship with nature (Mayer and Frantz 2004). The construct covers how we think about nature, our affective relationship with nature and the extent to which we see ourselves as part of nature. Nature Connectedness is measurable using psychometric scales containing carefully constructed sets of items (for available measures see Tam 2013) and several studies suggest it can be increased through carefully designed interventions to prompt engagement with nature (e.g. Richardson and Sheffield 2017; Passmore et al., 2017; McEwan et al. 2019). With regard to demographics, population surveys have shown that nature connectedness is significantly higher in women than men, but relatively consistent across all socio-economic groups such as people working in managerial, skilled and manual occupations (Richardson et al. 2019). Nature connectedness varies across the lifespan, with a distinct dip from 10 to 15 years of age, with recovery to the population mean taking over 20 years (Hughes et al. 2018; Richardson et al. 2019).

Nature connectedness matters because it brings benefits for both humans and nature; it is a factor in improved mental wellbeing and increased pro-environmental behaviours. A recent systematic review shows a relationship between nature connectedness and both hedonic and eudemonic wellbeing (Pritchard et al. 2019), with empirical work suggesting a causal link to mental wellbeing (McEwan et al. 2019). The relationship to a worthwhile life has been found to be four times more important than an existing benchmark of socio-economic status (Martin et al. 2020). The evidence of the benefits to wellbeing is such that it is argued that nature connectedness is a basic psychological need (Baxter and Pelletier 2019; Hurly and Walker 2019). The importance of the construct is further illustrated by proposals for its inclusion in the Gallup World Poll (GWP) which has an international reputation as a tool for global decision-makers (Lambert et al. 2020).

Moving from human wellbeing to nature's wellbeing, a recent systematic review has shown a further causal relationship between nature connectedness and pro-environmental behaviours, that is positive inactions generally associated with lower energy and resource use (Mackay and Schmitt 2019). More recently, nature connectedness has been found to be an important factor in explaining the pro-nature conservation behaviours required to support wildlife, particularly when working together with other factors (Richardson et al. 2020). However, a population survey has shown that nature connectedness in the UK is well below levels required for pro-environmental attitudes and behaviours (Richardson et al. 2019).

Ives et al. (2018) note that calls for 'reconnection with nature' have been vague, with fragmentation around what nature connection is and with little concrete guidance towards achieving societies that are more connected to nature. Ives notes that the psychological construct of nature connectedness helps with the current diversity of approaches to understanding people's connection with nature. It provides a measurable focus within this fragmentation, with an evidence base of benefits to the wellbeing of both people and nature. To meaningfully progress a reconnection between people and the rest of nature, Ives et al. (2018) conclude that tangible actions directed towards specific changes are needed. The pathways introduced below help meet this need through specifying the types of relationships to enhance and the types of activity to promote.

2. Introducing the pathways to nature connectedness

The pathways to nature connectedness (Lumber et al. 2017) serve as a typology of activities that provide a new methodological approach for improving human–nature relationships through targeting and increasing nature connectedness. The pathways introduced below and outlined in Table 1, can also be used as a lens to review existing attempts to improve human–nature relationships. They can be applied at various points, from individual activities in nature, to nature engagement programmes, to the design of infrastructure and school curricula and beyond to improve relationships between humans and nature on a larger scale. Interventions informed by the pathways encourage specific forms of active engagement, moving away from traditional relationships of utility, control, knowledge and fear that, while providing food and resources essential to survival and progress, have dominated the human relationship with the natural world and thus contributed to a failing relationship with nature (Catton and Dunlap 1978; Baskin 2015; IPBES 2019; Ison and Straw 2020).

Lumber et al. (2017) used Kellert's (1993) nine values of biophilia, the innate human need for nature, as a framework to identify the types of relationship that best predict nature connectedness as measured by psychometric scales. Through ascertaining

Table 1. The pathways to nature connectedness and examples of potential interventions (adapted from Lumber et al. 2017).

Pathways	This pathway is about the individual …	We need to create a society where people …	Potential Interventions (see recommendations section for details)
Contact through the Senses	Tuning in to nature through the senses.	Notice and actively engage with nature, spending time fully experiencing nature with all their senses.	Landscape design and art installations to prompt sensory engagement with nature.
Emotion	Feeling alive through the emotions nature brings.	Engage emotionally with nature and find happiness and wonder in nature. Note the good things in nature, the joy and calm that they can bring. Embrace nature at times of sorrow.	The creation of spaces to enjoy the good things in nature.
Beauty	Noticing nature's beauty.	Find beauty throughout the natural world. Every day, take time to appreciate beauty in nature and engage with it through art or in words.	Transport policy should celebrate the beauty of the natural world visible from trains and roads.
Meaning	Nature bringing meaning to our lives.	Explore and express how nature brings meaning to their lives. Notice how nature appears in songs and stories, poems and art, how special places are natural spaces. Celebrate the mystery, signs and cycles of nature.	Direct arts funding to celebrate our connections with the natural world through festivals and performance.
Compassion	Caring and taking action for nature.	Think about what they can do for nature. Take actions that are good for nature. Recognise shared life stories and be part of the community of nature.	Resident management of public wildlife-friendly gardens.

people's engagement with and perceived importance of each of the nine values of biophilia, the research identified five types of activity associated with nature connectedness. These were contact through the senses, emotion, beauty, meaning and compassion. These are defined and described in Table 1.

Rather than a detailed model, the pathways present five overarching types of relationship involved in improving nature connectedness. They are intuitive and broad, a framework providing simple direction and a focus on finding creative ways to engage with the five types of relationships that are positive for nature connectedness (Lumber et al. 2017). Given the benefits of nature connectedness outlined above, the pathways approach, through increasing nature connectedness, can also benefit wellbeing (Pritchard et al. 2019), pro-environmental (Mackay and Schmitt 2019) and pro-nature conservation behaviours (Richardson et al. 2020).

It is worth noting that Kellert's (1993) nine values of biophilia, which provided the foundation for the work of Lumber et al. (2017), provide one approach to considering the human–nature relationship. A second is provided by the five dimensions of nature connection referred to by Ives et al. (2018). These are material, experiential, cognitive, emotional, and philosophical connections which operate along a spectrum from internal connections (e.g., emotions or worldviews) to external connections (e.g., physical appropriation or interaction). Ives' five dimensions do not explicitly refer to the values of human–nature relationships identified by Kellert, for example utility and dominion, so direct comparison to Lumber's pathways is not straightforward and beyond the scope of this paper. However, Ives' dimensions can include more than one of Kellert's values in each and the dimensions can include types of relationship that are both positive and negative for psychological nature connectedness. For example, experiential connections could include dominion over nature and sensory contact. Therefore, Ives' dimensions are acknowledged, but there is no straightforward mapping onto Lumber's pathways. The pathways to nature connectedness (see Table 1) provide a typology of relationship types that provide specific routes to the desired outcome of improved psychological nature connectedness.

2.1. The need for the pathways to nature connectedness approach

The pathways can inform the design of interventions, both to help fix the disconnection with nature and provide the associated benefits of human wellbeing and pro-nature behaviours (both pro-environmental and pro-nature conservation behaviours). The pathways to nature connectedness provide concrete insights as evidenced by their adoption by practitioners and the successful interventions introduced below. Further, given the basis in Kellert's (1993) established framework, the pathways highlight broad types of relationship associated with improved nature connectedness, and therefore can be applied at a societal scale. In sum, the pathways provide clear direction of the types of relationship for society to foster.

The research of Lumber et al. (2017) also found that four of Kellert's (1993) values of biophilia were unrelated to nature connectedness. These were fear of nature, dominion over nature, utilitarian use of nature and a purely scientific relationship. These types of relationship are common, often emphasised within capitalistic societies and can be seen as essential pathways for human survival and progress that, unchecked, have led to nature's decline (Baskin 2015; Catton & Dunlap, 1978; IPBES, 2019; Ison & Straw 2020). For transformative change there is clearly an urgent need for a new relationship with nature, yet these negative types of relationship with nature still dominate (Ison & Straw, 2020). Nature is

often seen as a resource (utility), or a source of challenges to conquer (dominion), or nature is presented in terms of facts and figures (science), or as a threat (fear of nature). The necessary, but dominant relationships that unchecked can lead to environmental issues are summarised in Figure 1 and indicated by the red arrow. Kellert's (1993) five types of relationship which form the pathways to nature connectedness are included in the green arrow which points towards improved nature connectedness and its benefits: pro-environmental behaviour, pro-nature conservation behaviour and mental wellbeing. Greater focus on the types of relationship with nature that lead to nature connectedness would lead to a new, more sustainable, relationship with the natural world.

There is a small body of research that tests approaches to improving nature connectedness that fall outside the five pathways. As this work has not led to sustained increases in nature connectedness it adds further support for the pathways approach. For example, an emphasis solely on knowledge (not a pathway) as a means to reconnect with nature has been tested (Ernst and Theimer 2011; Mace et al. 2012). These purely education-focused programmes when evaluated struggle to show sustained increases in nature connectedness (Ernst and Theimer 2011). Bruni et al. (2015) compared a knowledge-based quiz trail to incorporating meaningful nature-based sources into a variety of artistic projects and found the latter increased nature connectedness. The pathways approach suggests that knowledge-based endeavours should be broadened to also emphasise senses, beauty, emotions, meaning and compassion. When pathways approaches have been included alongside knowledge in outdoor education programs (Braun and Dierkes 2017) increases in nature connectedness have been found.

It is not just knowledge-based activities that can struggle to bring about sustained increases in nature connectedness. Although time in nature is linked to short-term increases (e.g. Mayer et al. 2009), simple contact with greenspaces such as parkland (Arbuthnott et al. 2014), or a vegetated courtyard (Schultz and Tabanico 2007) do not always lead to short-term improvements in nature connectedness. From a pathways perspective this result could well be due to passive contact rather than active engagement suggested by the pathways. Further, there is evidence that shows the active engagement with nature should be of a certain form to increase nature connectedness. Traditional outdoors adventure programs have not led to increases in nature connectedness (Williams et al. 2018). This is likely to be due to the focus on challenge and adventure in nature rather than pathways activities. Less prescriptive outdoor adventure activities that involve exploring the physical environment in an individual way have been found to be important for a connected relationship with nature (Martin 2004). In sum, although simple exposure can bring about short-term increases in nature connectedness, as detailed below, larger and sustained increases tend to come from active engagement with nature through the pathways.

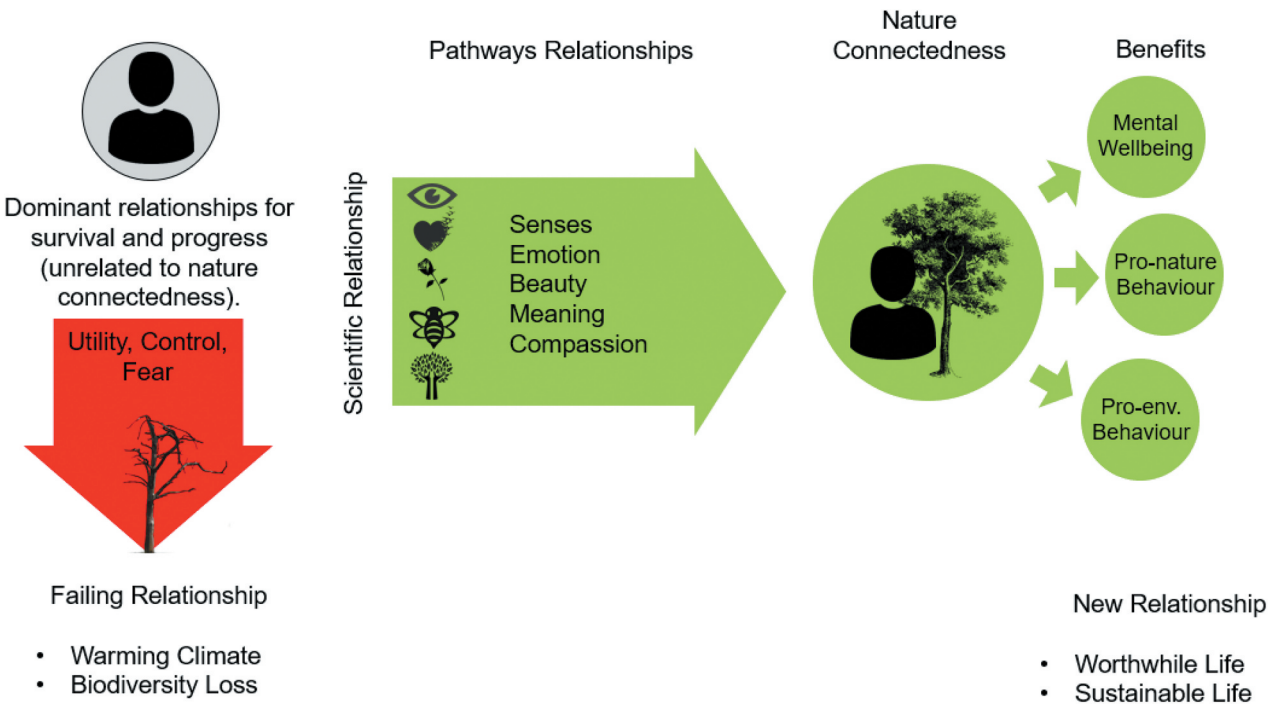

Figure 1. A graphical summary of the types of human–nature relationships, nature connectedness and their outcomes.
Key: Pro-env. = pro-environmental (carbon & resource use reduction); Pro-nature = pro-nature conservation (wildlife habitat creation).

2.2. Applying the pathways – research evidence

Beyond the evidence in the original research of Lumber et al. (2017), the pathways have been used as a framework to guide work that aims to increase nature connectedness. One of the first interventions found to bring about sustained increases in nature connectedness focussed on the sensory contact pathway, with instructions also giving guidance related to the emotion and beauty pathways. It asked participants to note three good things in nature each day for 5 days. A control group noted three factual things (e.g. what they had to eat). Two months later, the good things in nature group showed sustained and significant increases in nature connectedness (measured using the Connectedness to Nature Scale; Mayer and Frantz 2004) compared to the control group (Richardson and Sheffield 2017). This approach has also been used successfully in a smartphone version that prompted urban dwellers to note the good things in nature. This research found that increases in nature connectedness also helped explain clinically significant improvements in mental health (McEwan et al. 2019). A content analysis of the sentences written during the good things in nature task showed that the intervention activated several of the pathways to nature connectedness, namely sensory contact, emotions and beauty (Richardson et al. 2015).

2.3. Applying the pathways in practice – practical examples

The practical examples below show how four organisations have used the pathways approach. They are not academic or research interventions. The examples show the utility of the pathways approach, help illustrate the pathways and provide examples for policy makers.

2.3.1. National Trust (UK)

In 2018 the National Trust adopted the pathways as a framework they could apply to the design of visitor experience activities and programmes in order to improve nature connectedness of their 5.8 million members, 25 million annual visitors to historic houses, gardens and parkland, and many more visitors to National Trust coast and countryside.

Incorporating knowledge exchange and coproduction with academic colleagues, the Trust provided guidance and conducted workshops with their local teams. End user feedback from staff on the pathways as a design tool was overwhelmingly positive, highlighting how the pathways can help 'tweak' existing activities or inspire new ideas. Reducing a focus on species knowledge and identification – although challenging for some – has been widely embraced. Staff reported feeling liberated to be more creative in their programming, inspired to make small but high impact changes, and being given a 'licence to talk about emotions'.

Unpublished quantitative and qualitative evaluation by external agencies has also shown the approach has garnered a positive public response. By way of illustration a historic house and parkland estate designed new experiences for visitors inspired by the pathways. Recognising that their existing trials comprised 'fact'-driven leaflets the team worked with their Countryside Ranger to identify his favourite route around the estate and the places where he found peace or a 'place to think'. Working through the pathways, the team introduced quotes and poems on wooden plaques encouraging visitors to stop and connect through the senses. The team also looked to foster more emotional connection through stimulating personal responses. They deliberately chose the most beautiful viewpoints to place the quotations and then encouraged people to appreciate nature through the poetry and link it to their reaction to the view (see www.nationaltrust.org.uk/50-things-to-do). The team reported a remarkable response on social media, with dozens of posts of people reacting emotionally to the quotes and relaxing spots.

The pathways were also applied in redesigning National Trust's '50 Things to do before you're 11 ¾' campaign (). Applying the pathways saw the dominionistic 'climb a tree' become 'get to know a tree' – which now comprises a wider range of immersive activities designed to develop a more meaningful relationship with nature. The changes have been very well received within the organisation and by the public – the associated web site receiving a 400% increase in traffic and engagement. More detailed unpublished quantitative and qualitative evaluation by external agencies has shown a positive impact on visitors' nature connection as well as enrichment of the visit experience overall. In particular the multi-sensory focus works well and parents say they appreciate the additional elements to each activity, moving them away from a single quick tick on a list, to a longer and immersive activity where there's more to do.

2.3.2. The Durrell Wildlife Conservation Trust (UK)

Durrell Wildlife Conservation Trust have made nature connectedness and the pathways central to their public engagement, both within their zoo in Jersey and through their field-based wildlife conservation programmes around the world. Durrell's goal is to improve connection between people and nature, for their own wellbeing and to promote care and respect for the natural world. Informed by the pathways, Durrell have created a brand-new exhibit to help achieve this – a butterfly house and garden called 'Butterfly Kaleidoscope'.

The pathways provided a framework both to inform the design of the exhibit, but also to provide a narrative for the experience. There was an opportunity to focus on two of the pathways, senses and beauty, but also relate to meaning and compassion. When walking through a flower garden, visitors are immersed in a warm and humid environment, surrounded by a multitude of butterflies without barriers, free to enjoy the sight and smell of exotic plants. The pathways provided the designers the prompt to focus on the qualities of the butterflies, their colourful, striking patterns and delicate flight, and their special role in many human cultures. A blackboard is provided for visitors to share their reflections on the experience. Outside the exhibit a path meanders through 'insect-friendly' planting for native butterflies, bees and other pollinating insects. Information is then provided on how people can give pollinating insects a helping hand through simple, practical actions. Feedback has been positive, with a preliminary evaluation showing that, when asked why they enjoyed their experience, visitors most frequently mentioned words relating to emotion and beauty. Specifically, 'calming' and 'beautiful' were the most commonly expressed-terms. Dwell times in this exhibit are notably longer than other similar-sized exhibits.

Following on from this early work, Durrell now has a cross-departmental 'Nature Connection Working Group' to ensure nature connection explicitly guides the design of a range of interventions. For example, the framing of the zoo visit experience, design of new animal exhibits, the design standards of zoo-based messaging and interpretation, nature-based activities for children in the zoo, and engagement with nature-dependent communities living in and around Durrell's field conservation sites.

2.3.3. Department of Conservation (NZ)

Since 2017, the New Zealand Department of Conservation has developed a suite of New Zealand curriculum-linked education resources aimed at supporting teachers to use local nature as a context for teaching and learning to encourage pro-environmental behaviours. Although many teachers are using the education resources, these teachers tend to be part of an already 'converted' audience that have a meaningful relationship with nature. In 2019, the pathways were identified as a way to engage a wider and 'unconverted' teacher audience with the department's education resources by providing opportunities that foster a connection with nature and build nature confidence. A suite of 'stepping-stone' activities informed by the five pathways were developed and introduced at teacher professional development workshops. Teacher feedback was extremely positive resulting in the formal design of six activities for all New Zealand teachers to use.

Thanks to support from the National Trust, the Department of Conservation used the 50th anniversary of their national conservation week to launch a New Zealand 50 things' campaign. Again, the pathways to nature connectedness were used as a framework. The campaign requires children under 13 to draw their favourite activity to do in nature. To increase understanding of the linkages between pathways and activity, the campaign provides five sentences based on each pathway and asks the entrant to tick any that apply. The entries will be used to develop a New Zealand version of '50 things to do'. The campaign is in both English and Te Reo Māori (New Zealand's indigenous language), providing an opportunity to analyse the pathways alongside Te Ao Māori (Māori world view).

2.3.4. The Wildlife Trusts (UK)

As detailed by Richardson et al. (2016), the pathways were applied to the design of the activities that form the key content of The Wildlife Trusts' *30 Days Wild* campaign. Firstly, to review the long list of suggested activities then to refine the precise wording to operationalise the pathways to nature connectedness. During this process knowledge based activities could be revised and activities could reframed around a pathway, by noticing the beauty of nature for example. Although health, wellbeing and pro-nature conservation activities were target outcomes, the *30 Days Wild* campaign was not framed as a public health or health promotion campaign. The primary objective was to encourage people to make more time for 'everyday nature' in their lives and thus value nature more highly. The evaluation focussed on nature connectedness; hedonic wellbeing; improved health; and an increase in nature conservation behaviours. The evaluation used a repeated measures time-series design with self-reported scores taken at three time-points: pre-participation, post-participation and follow-up at two months. The rationale, theoretical basis, clear delivery content and defined outcomes of the evaluation met checklist criteria for public health interventions (Des Jarlais et al. 2004), with the design approach providing convincing evidence of intervention success within a public health context (Rychetnik et al. 2002; Sanson-Fisher et al. 2007). Over 5 years over 1,000,000 people have taken part and over 1,000 participants have been tracked with the results showing that taking part in *30 Days Wild* has led to sustained and significant increases in nature connectedness, health, wellbeing and nature conservation behaviours, particularly for those with lower nature connectedness (Richardson et al. 2016, 2018b; Richardson and McEwan 2018).

3. The systems perspective: the societal relevance of the pathways approach

The pathways have informed successful large-scale campaigns and visitor experience programmes, but the serious consequences of the human–nature relationship breakdown require a paradigm shift and societal change (Hirvilammi and Helne 2014). The relevance of the pathways at a societal scale needs to be considered alongside taking a systems perspective of societal change. This perspective considers the parts of the system where maximum impact can be gained, through using concepts such as leverage points (Meadows 1999), where small changes within a complex system (e.g. a corporation, an economy, a city, an ecosystem) can produce large changes. Meadows (1999) describes 12 leverage points within complex systems, which range from shallow places, those where interventions are relatively easy to implement, but less impactful on system behaviours, to deep places where interventions are difficult but can deliver transformational change. Drawing on the ideas of Meadows, Abson et al. (2017) assert that people's connections to nature are one of three key realms for transformational sustainability interventions, alongside restructuring institutions and rethinking how knowledge is created and used.

The cumulative societal impact of people's connections to nature can be considered through 'extinction of experience' (e.g. Pyle 2003; Soga and Gaston 2016). The ongoing reduction in individual's experiences of nature permeates culture and society and becomes a social norm (Nyborg et al. 2016). The results of which can be observed in the increasing cultural disconnect with nature (Kesebir and Kesebir 2017). This powerful effect also provides an opportunity to drive positive societal change through creating individual experiences that increase nature connectedness, such as noticing the good things in nature (McEwan et al. 2019). The effective individual experiences of nature, categorised by the pathways, can inform the design of environments and cultural events to create societal improvements in human–nature relationships. It is proposed that nature connectedness and the five pathways have societal relevance, but this will vary according to the characteristics of each of the pathways.

In order to facilitate the discussion on the relevance of the pathways for individual and societal connectedness to nature, and their potential for application at leverage points, an illustration (Figure 2) informed by the figure design adopted by Ives et al. (2018) is used. Figure 2 considers the location of connection/leverage points (*X*-axis) and scale of relevance (*Y*-axis) for the five types of relationship with nature found to be positive pathways to nature connectedness. The order of the pathways on the leverage points scale represents the proposed potential for deep leverage based upon the location of connection, internal to external. For each pathway, the impact on

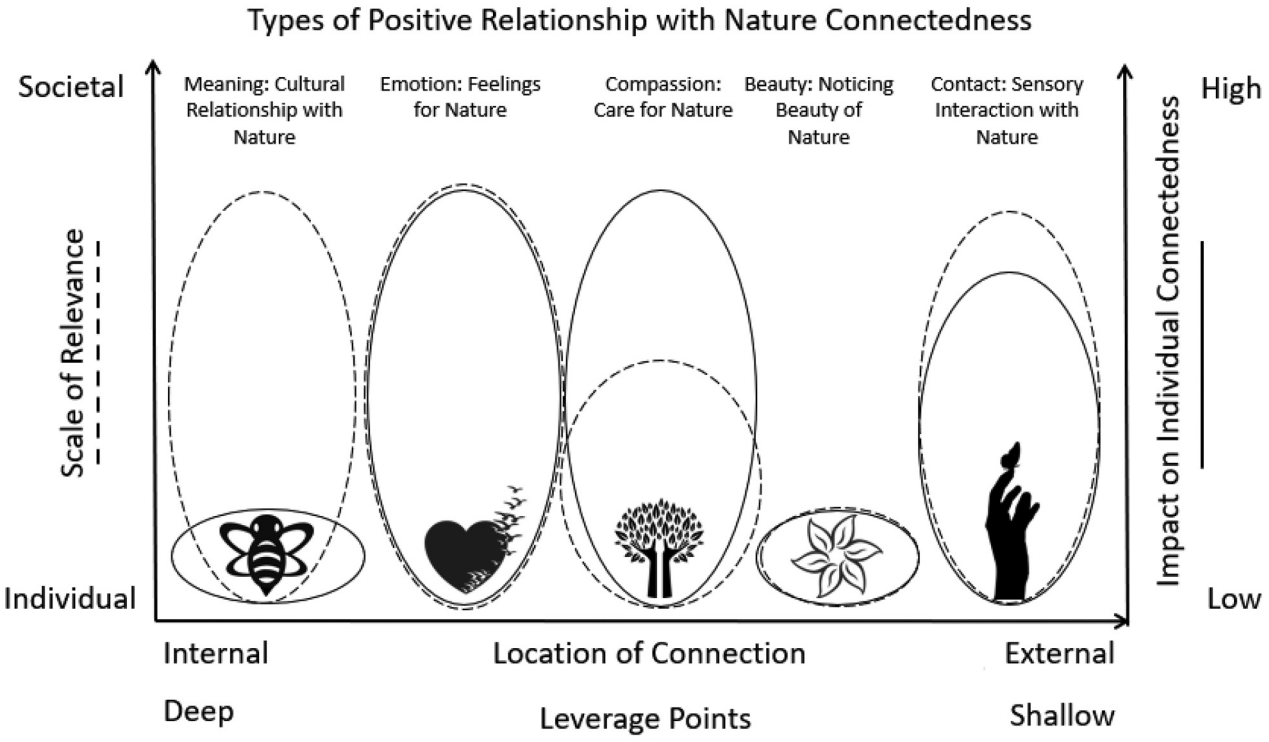

Figure 2. Types of positive relationship with nature and scale of relevance and leverage. The statistical importance for nature connectedness identified by Lumber et al. (2017) is represented by the solid oval. The proposed scale of relevance is represented by the dashed oval.

individual nature connectedness identified statistically (standardized regression coefficients) by Lumber et al. (2017) is represented by the solid oval. The proposed scale of relevance, individual to societal, is represented by the dashed oval; the size being proposed through factors considered in the discussion below.

The meaning pathway is related to cultural aspects that have great resonance at a societal scale, as noted in the similar 'philosophical' dimension of Ives et al. (2018). Lumber et al. (2017) found the influence of meaning on individual nature connectedness was weaker than the other pathways, as it is likely to be dependent on the cultural level of nature connection and social norms, which are in decline (Kesebir and Kesebir 2017). At present, population surveys in the UK indicate that the level of nature connectedness is relatively low (Richardson et al. 2019). Nature means less and less in people's lives. However, it is argued that the meaning pathway provides an opportunity for deep leverage as culture influences values and goals, hence the large scale of relevance indicated by the dashed circle in Figure 2. The meaning pathway relates to deeper relationships with nature, the symbolic use of nature to represent ideas, aspects of folklore such as the 'green man' and engagement with the signs and cycles of nature. These cultural conceptualisations of nature are reflected in societies and impact on individual connection (Kenter et al. 2015). This effect is shown, for example, by the powerful negative cultural associations of some bird species, such as corvids, which can limit the benefits of nature through biasing perceptions of nature such that it is less restorative (Ratcliffe et al. 2013). In practice, the objectives of cultural programmes could be focused on developing these deeper relationships, with arts funding directed to the cultural celebration of our connections with the natural world through festivals and encouraging the inclusion of nature in cultural products, thus providing an opportunity for a wider scale of relevance and deep leverage. Although festivals with relevance to nature connectedness exist, the programming is not designed around the pathways, nor has evaluation been done on their impact on nature connectedness. However, there is evidence that arts-based approaches can work on a small scale (Bruni et al. 2015; Passmore and Holder 2017; Richardson and Sheffield 2017), and that large-scale nature engagement campaigns with carefully designed content can have a positive and sustained impact (Richardson et al. 2016, 2018b; Richardson and McEwan 2018). Interventions that attempt to create a positive cultural environment require further design and testing, ideally with evaluation that meets public health interventions checklist criteria, such as well-defined sampling and design (Des Jarlais et al. 2004).

The scale of relevance of the emotion pathway is relatively important at an individual level (Figure 2), because emotions are a fundamental part of nature connectedness. In contrast to Ives et al. (2018), we also propose greater importance on the societal scale because history and research tells us that individual emotions can be targeted on a large scale (e.g. consumerism). Emotions are a driving force behind decision-making and motivation for action and targeting emotions has become ubiquitous throughout marketing (Bagozzi et al. 1999). To understand this, it is important to remember that emotions aren't just feelings and by-products of life, they are fundamental features of human function, linked to our nervous system, heart, brain and decision-making. Tyrell and Curtis (2002) remind us that we have long known that humans are fundamentally emotional and irrational creatures. As long ago as 1928, Edward Bernays applied understanding from Sigmund Freud's *The General Introduction to Psychoanalysis* to manipulate people, creating modern public relations and ways of appealing to people's emotions for marketing, advertising and politics through the use of symbols and the language of metaphor (Bernays 1928). Bernays developed the modern techniques of mass-consumer persuasion systematically linking mass-produced consumer items to people's unconscious desires to make people want items they didn't need. These ideas helped develop mass consumerism and self-absorption in Western society. For decades, the technique of appealing to emotions and the self has been exploited successfully by business to create markets for ultimately unneeded items, while environmental organisations have only recently started to realise the importance of understanding human behaviour, for example, focussing their aims on nature connectedness, with a much lower advertising budget than major business corporations. Bernays used emotions as a deep leverage point in the 1920s, using them to mould public desire, shape a consumer culture and shift social norms. Building on the reconnecting people with nature realm highlighted by Abson et al. (2017), it is suggested that emotion, through well-designed public relations campaigns, can change social norms to a situation where a good life is seen as a nature-connected life, rather than a consumerist life. The shift towards experiences over consumer goods (Pine and Gilmore 2011) provides an opportunity to include nature-based experiences based around the five types of activity suggested by the pathways. Further, planning and urban design can be used to create spaces to experience the joy and calm of nature. Finally, there is evidence that nature helps people manage their emotions (Richardson 2019) and approaches based on eliciting positive emotions can improve nature connectedness. For example, through engaging with the good things in

nature (McEwan et al. 2019) and as presented in the practical examples above (*30 Days Wild*). However, design and robust evaluation of other approaches, such as urban design and public relations campaigns as used by nature conservation organisations, is required.

Although care for nature is an overall goal for sustainability, Figure 2 suggests that the compassion pathway does not necessarily present opportunities for deep leverage. This is because it is likely that other changes are required first. Those engaged with pro-nature conservation behaviours typically have higher levels of nature connectedness (Hughes et al. 2018; Richardson et al. 2019). So before engaging people with pro-nature conservation behaviours that can require personal commitment, there is a need to increase connectedness through meaning and emotion. Even then, there is a disparity between the concerns people often express for nature and changing behaviours to care for nature, termed the value-action gap (Flynn et al. 2009). However, nature connectedness is about relationships and it has been argued that one dimension of its benefits to wellbeing relate to fulfilling the human need for connectedness, typically met through social connections (Capaldi et al. 2014; Zelenski and Nisbet 2014). This benefit arises because humans are a social species, one that places an importance upon social connectedness with others as a direct result of our biology and evolutionary history (Caccioppo and Patrick 2008), with psychological connections with one another formed through similarity (Larkin et al. 2003). This similarity together with emotional bonds underpins humanity's capacity for co-operation and compassionate helping – something which could offset any destructive tendencies we possess (Gilbert 2014). Therefore, rather than focussing on developing concern for nature directly, focussing on the similarity of people with nature and developing emotional bonds may function as a more effective societal leverage point. Societal change where the similarity of nature is emphasised as a common discourse in contrast to consumptive and dominance frames is required. Activities that utilise emotional framing to promote compassion and compassionate acts would be required to counter the dominant human exemptionist paradigm. This requires the provision of opportunities for people to care for wildlife, for example, through access to places where people can easily engage in pro-nature conservation behaviours. There is evidence that participating in such nature conservation activities has a positive impact on nature connectedness (Rogerson et al. 2017). Thus, there is also a need to change parameters, for example, from simple access to nature, to access for specific activities related to the five pathways, to affect deep leverage points and then evaluate the impact.

Lumber et al. (2017) found that rather than a strong direct effect, the beauty pathway had a mediating role as a pathway to nature connectedness, hence the smaller oval in Figure 2. The mediation was particularly noticeable for the compassion pathway where engagement with nature's beauty was a factor in predicting care for nature. However, beauty is a strong theme when people are asked to note the 'good things in nature' (Richardson et al. 2015) as part of interventions designed to increase nature connectedness. This suggests that the beauty pathway works together with other pathways, such as when deriving meaning or evoking emotions. Further, as the quality and quantity of nature through the sensory contact pathway provide opportunities to engage with nature's beauty it is suggested that this pathway doesn't lever transformational change on its own. Rather, beauty needs to be available for sensory contact and wider meaningful engagement with nature, which can include compassion.

Finally, the scale of relevance of the sensory contact pathway relates to interaction with an external resource. Ives et al. (2018) suggest that external dimensions such as contact with nature provide shallower leverage and greater contact does not necessarily lead to increases in nature connectedness (Schultz and Tabanico 2007; Arbuthnott et al. 2014; Williams et al. 2018). This differential between nature exposure and nature connectedness has been recently confirmed by a population survey in the UK which showed that nature visits are independent from nature connectedness (Martin et al. 2020), with connectedness rather than visits also related to pro-nature conservation behaviours. Easily accessible nature does not have to be engaged with, and the pathways and interventions delivering sustained improvements in nature connectedness show that nature needs to be engaged with in the 'right way' for greatest benefit. This suggests that activities provided need to foster sensory contact, rather than, for example, simple provision of green spaces where activities unlikely to improve nature connectedness, such as physical activity, can be a focus. Further, sensory contact with nature is needed to evoke emotions and notice nature's beauty. Therefore, it is argued that the provision of more nature contact has a large scale of relevance and can enable societal impact on nature connectedness *when* the pathways relationships are fostered. When sensory contact is prompted, for example, through noting the good things in nature or campaigns such as *30 Days Wild*, there is evidence of a positive and sustained impact on nature connectedness (Richardson et al. 2016; McEwan et al. 2019). These interventions highlight that the pathways to nature connectedness rarely work alone. Sensory contact involves noticing beauty, it elicits emotions, brings meaning and can involve care for nature.

4. Recommendations: nature connectedness, system characteristics and leverage points

Here we move on from scale of relevance and turn to Abson et al.'s (2017) typologies of system characteristics

and Meadows (1999) discussion of leverage points to examine how nature connectedness can act upon multiple leverage points within systems. Abson et al. (2017) note the 12 leverage points fall into four broad types of system characteristics that can be targeted. The shallowest are parameters, for example, standards, a typical target of policy. Next, interventions can target feedback, the interactions between system elements, manipulated via incentives for example. Third is the design of the social structures that manage feedbacks and parameters. Finally, the deepest type are intentions, the underpinning values and goals of the system that shape the emergent direction. The following discussion is divided into these four broad types of system characteristic. It considers where nature connectedness could have greatest leverage and therefore points to where the pathways approach could be applied for maximum effect.

4.1. System intentions: values and goals

Intentions cover the underpinning values and goals of the system that shape the emergent direction and provide the deepest leverage points. Changing the emergent values and goals in systems relies, at least in part, on the establishment of new systems of meaning as well as generating factual knowledge about different potential societal goals. As Jasanoff (2010, p. 235) puts it, 'scientific facts arise out of detached observation whereas meaning emerges from embedded experience', especially true for nature connectedness. Scientific research indicates that nature connectedness has benefits to wellbeing and pro-nature behaviours that have clear meaning for people's experience, such as being four times more important for living a worthwhile life than socio-economic status (Martin et al. 2020). With the benefits to human wellbeing and pro-nature behaviours, nature connectedness can be a desirable system goal based on factual knowledge. The pathways to nature connectedness approach provides a structured means to intentionally create new and embedded experiences with the potential to establish a new system of meaning and societal goals. This will inform the values humans ascribe to their connections to nature and their ideas of what constitutes desirable 'system goals'. For example, receiving benefits from a close relationship with nature demands systems that encourage a close relationship. Further, recent experience of having to stay close to home in response to the COVID-19 pandemic have shown how new experiences can change perceptions of meaning and value of greenspaces (Baillie 2020; Rousseau and Deschacht 2020).

As outlined earlier, nature connectedness is a basic psychological need (Baxter and Pelletier 2019; Hurly and Walker 2019). Such thinking suggests that a close relationship with nature could be considered as a universal human right, similar to the right to family life and social connections (www.un.org/en/universal-declaration-human-rights/index.html). Formally recognising the value of a right to a close relationship with nature would not only create a legal right whose loss would necessitate a form of redress, it would help to embed a recognition that being closely related to the rest of nature is part of what it means to be human. Such an initiative would create deep leverage potential through the impact on systems values and goals. Finally, and importantly, a human right for a close relationship with nature requires a healthy natural world.

To challenge incumbent paradigms and help alternatives become mainstream, Sievers-Glotzbach and Tschersich (2019) highlight the need for initiatives to address deep leverage points through the creation of alternative narratives and visions in communication and campaigning strategies. Harari (2016) highlights the importance of narratives and combined with Bernays' appeal to emotions and the self, discussed above, this could help societal change to occur. Harari (2014) tells the story of the human journey from a deep embeddedness in the reality of nature to powerful imagined realities, created by the written word, that have become more meaningful than the reality of nature. Through new perspectives and narratives that resonate with the public, Harari (2014) can inform transformational change through bringing an alternative sense of the system to the mainstream. Such narratives can be used by change agents to question the current paradigm in order to impact on values and actions towards revised goals. Through highlighting the types of values and actions required for a beneficial relationship with nature, the pathways to nature connectedness approach has considerable potential for new sensemaking, stories and narratives and therefore a potential to provide deep leverage in relation to the underpinning values and goals that shape and constrain systemic transformative change (Waddock 2020). For example, a culture of caring for the rest of nature can help embed social meanings that emphasise the common interests of the human and more-than-human worlds as seen in 'one health' models of wellbeing (Rabinowitz et al. 2018). This can be achieved by integrating nature connectedness in social practices. For example, health and social care standards that stipulate *enjoyment* of natural environments as a core element of person-centred care could provide positive outcomes and results that could be shared within and across societal systems.

4.2. System design: institutions and social structures

Social structures manage feedbacks and system parameters. The rules of the system, such as constraints, incentives and punishments, create the social environment. In this context, policy and organisation goals should acknowledge the climate and environmental emergency, acknowledge the failing relationship with nature and commit to fostering a closer and sustainable relationship between

people and the rest of the natural world. The psychological construct of nature connectedness can be coupled into structures as an institutionalizable target measurable at population scale (Richardson et al. 2019) and has been adopted as a key performance indicator (KPI) by Natural England, the Government advisory body on the natural environment in England (Natural England 2019). The pathways to nature connectedness highlight the five types of relationship with nature to foster (e.g. sensory, emotional, aesthetic, meaningful and compassionate) and the types of relationship to moderate (e.g. dominionistic, utilitarian, negativistic) in order to achieve such targets. The Durrell example above shows how a strategic plan and intention to improve nature connectedness and apply the pathways to nature connectedness feeds through to design of activities and spaces. Similarly, public policy can open spaces to promote nature connectedness. A 'wildlife wellbeing week', for example, integrated with social care and arts events, transport and housing, could encourage citizens to take action to notice and care for their local wildlife, improving the environment where they live.

4.3. System feedbacks: the extinction of experience

Feedback includes self-reinforcing feedback loops, and balancing feedback loops, which act as systems dynamics regulators. A key reinforcing feedback loop in relation to human–nature relationships is 'extinction of experience' (Soga and Gaston 2016). The reduction in experience of nature provides social feedback to reinforce the social norm (Nyborg et al. 2016) of reduced experience of nature. The extinction of experience is underpinned by two key factors: loss of opportunity to experience nature and loss of orientation towards engaging with nature (for review see Soga and Gaston 2016). By reducing the quantity, quality, and diversity of natural spaces (e.g. Lekies and Brensinger 2017), through ill-informed system goals and poor system design, increased urbanisation drives the loss of opportunity to experience nature directly, reducing feedback and social norms. This loss of native habitats has a homogenizing effect on the variety of wildlife and the increasing numbers of people living urban lives encountering greater biological uniformity (Miller 2005), which is again a form of negative feedback. From a pathways perspective, there is less opportunity for sensory contact, emotional and meaningful engagement, to notice beauty and care for nature. The second factor leading to extinction of experience is directly related to nature connectedness, arising from a reduced emotional affinity with nature (Soga and Gaston 2016) and loss of orientation towards engaging with nature.

The loss of orientation to engage with nature is reflected in cultural feedback, for example, the decline of references to nature in cultural products such as fiction books, song lyrics, and film storylines. This trend has been linked to the increased use of new technologies (Kesebir and Kesebir 2017) and electronic media (Pergams and Zaradic 2006). This move to videophilia (a human tendency to focus on activities involving electronic media; Pergams and Zaradic 2006) is therefore a factor in extinction of experience and reduces positive feedback loops related to nature connectedness. This allows the more utilitarian, dominionistic, scientific and negativistic relationships with nature to dominate social norms. Therefore, the human relationship with nature becomes anthropocentric and transactional, focussed on the goal of utilitarian resources use, scientific understanding and control such that there is an instrumentalization of the human–nature relationship, rather than the close psychological relationship captured by nature connectedness. This process and trend of reduced positive feedback and increasingly instrumentalised relationships influences and reinforces system goals.

More research is needed on the role of nature connectedness in informing feedback loops. However, there is potential to shorten feedback related to the five key relationships identified by the pathways to nature connectedness, while disrupting feedback loops related to the types of relationship unrelated to nature connectedness (e.g. utilitarian and dominionistic). For example, measures can be taken to strengthen feedback regarding the positive links between people and local nature, for benefits to mental wellbeing, but also shortening feedback on the health of the natural world. A public that is aware of how well local flora and fauna are doing can take action to protect them (for example, during periods of extreme weather), thereby activating the compassion pathway. This can also help to inform public policy (for example, on planning, roads, public transport and flood protection, as well as on the protection of at-risk species and habitats). Finally, regarding disrupting feedback loops of relationships unrelated to nature connectedness, the negative links between resource use and control of nature on local wildlife can be strengthened which could also activate the compassion pathway to nature connectedness.

4.4. System parameters: standards, policy and infrastructure

Standards, policy and infrastructure provide valuable but weak leverage points. Infrastructure is particularly slow to change because it is integrated with numerous sociotechnical systems. However, policy can not only turn on or off the taps of funding and regulation but can contribute to the creation of symbolic capital, showing what is valued or not valued within the public arena (Bourdieu and Farage 1994). A policy change may be relatively ineffective in directly influencing behaviour while sending a clear signal to actors about the types of behaviour that are approved or disfavoured. Small policy changes may thus contribute to the deeper paradigm shift required for a healthier relationship between humans and the natural world. Below we

outline a series of policy changes that could inform and reinforce such a paradigm shift.

Education policy could promote a curriculum with nature, and our relationship with nature, at its heart, engaging learners with the natural world throughout. Given the rapid decline in adolescent nature connectedness (Richardson et al. 2019) this is most important for education from the age of 10 years old. For example, the current stated priorities of the UK Department for Education are to ensure academic standards, bring technical education standards in line with international systems and to ensure that education builds character, resilience and wellbeing (DfE, 2020). Goals and policies that reference the importance of the human–nature relationship would be impactful. The explicit application of a pathways to nature connectedness approach may be one way to move beyond providing knowledge and towards embedding experience through 'community knowledge in action' (Nursey-Bray et al. 2014) within education policy.

Transport policy should be geared to green commuting, not just in terms of carbon footprint, but emphasising the importance of views of natural spaces, using meaningful natural waypoints and creating natural habitats and gardens at transport hubs. 'Slow commuting' could be developed, providing places to pause and take a moment with natue. Transport policy should celebrate the beauty of the natural world visible from trains and roads, and maintain verges and roadsides to maximise enjoyment of the natural world. Similarly, planning policy should emphasise the idea of net biodiversity gain (recently promoted in UK planning guidance) to create the opportunity for a deeper relationship with nature. Planners and designers should turn the public realm, streetscapes and public spaces, into places where people can engage with nature, as informed by the pathways, in the course of their everyday activities. They should design for diversity by creating habitats for wildlife and design for calm by creating tranquil spaces. Government should work with housing and planning professions to incorporate principles of nature connectedness into design standards and encourage developers to follow them.

Housing, whether public or private, should be integrated with beautiful natural spaces, designed to maximise views, create green shelters and encourage wildlife. Housing policy should stipulate that all new developments should include spaces for an active relationship with nature. Utilizing extended pathways to nature connectedness frameworks (McEwan et al. 2020), landscape design should prompt sensory engagement with nature, resident management of wildlife-friendly gardens (compassion), and new wildlife habitats to surround people with the good things in nature. Similarly, urban planning should bring opportunities to connect with and care for nature into the everyday environment through the creation of spaces for these activities and also places that use affordances to prompt enjoyment of the good things in nature. Such design can lead to experiences that form part of a good life, reinforced through sharing by word of mouth, social media and in public discourse.

Arts policy should recognise the close links between art, cultural expression and nature connectedness (Kesebir and Kesebir 2017). It should support a wide diversity of artistic expression, celebrate nature and our relationship with it and support installations to prompt engagement with nature. It should especially support minority and marginalised groups in expressing their own appreciation and connections with nature.

Health policy should be based on models of 'One Health' (Rabinowitz et al. 2018) that revises the concept of wellbeing (Hirvilammi and Helne 2014) through an interdisciplinary approach that stresses the connections between human, animal and environmental health. Care homes and healthcare premises should be designed and managed to bring nature into the lives of users and staff. Social prescribing should include arts-based activities that operationalise the pathways and link participants with the natural world. Social care standards should stipulate engagement with natural environments as a core element of person-centred care. Service users should be given opportunities and assistance to enjoy natural environments as part of every care plan. Primary and secondary healthcare environments should be designed and managed in light of the evidence that access to natural environments aids recovery.

In each of the potential changes noted above the physical parameters that are to be changed can be conceptualized and operationalized through the pathways to nature connectedness framework. The policy and wider suggestions outlined do not constitute a comprehensive manifesto for nature connectedness, but do suggest an implementable agenda with the potential to act on multiple leverage points in a system. If individual policy prescriptions are seen as ends in themselves, they will have little effect. If, however, they are viewed as opportunities to generate and embed new systems of meaning, they may have far greater impact on delivering a new relationship with nature.

5. Summary

The climate emergency and crisis of biodiversity loss show that the human–nature relationship is failing. The pathways to nature connectedness provide an

important framework to help deliver solutions toward a new relationship with nature. It is proposed that the meaning and emotion pathways to nature connectedness can provide the deep leverage required to increase sensory contact. These three pathways have a large scale of societal relevance and the potential to provide solutions across a range of leverage points to foster closer human–nature relationships. Resulting interventions can also encourage people to engage with the remaining two pathways, to engage with nature's beauty and to care for nature.

As a basic psychological need, nature connectedness should inform the values and goals of our systems for maximum impact on the human–nature relationship for a sustainable future. The pathways to nature connectedness provide a structured means to inform new societal and institutional goals. Using new narratives to highlight the meaning of nature to humans, such as models of health that unite wildlife and human wellbeing, can provide new values and desirable 'system goals'. Approaches from mass-consumer persuasion through appealing to people's emotions can also play a role in influencing values and goals on a large scale.

Changes in system values and goals inform the design of institutions and social structures for a new relationship with nature. As a measurable construct, nature connectedness can be a key performance indicator for institutions, such as those delivering health and wellbeing. Targets can be set and the pathways used to inform strategic plans. For example, including the enjoyment of nature in health and social care delivery.

To help create new social norms, a closer relationship with nature can be integrated into social structures with incentives, such as funding for cultural products and urban design informed by the pathways. More sensory contact, sharing of positive emotions, and structures that shorten system feedback along pathways to nature connectedness can counter the extinction of experience and renew the human–nature relationship. Feedback regarding the positive links between people and local nature for wellbeing, and on the health of the natural world can also be enhanced.

Standards and policy provide weak leverage points, but many opportunities to apply the pathways to nature connectedness. For example, education curricula can be informed by the pathways, transport policy can be used to promote pathways relationships and planning policy can help turn public spaces into places that prompt sensory contact, celebrate nature, and elicit positive emotions through engaging with nature. Arts policy should recognise the close links between cultural expression and the pathways to nature connectedness.

In sum, as humans we are deeply affected by emotions and stories with meaning. We want to believe our lives are worthwhile and meaningful. The power of emotions and trust in shared stories have been used to bring millions of people together, to create consumer culture and ultimately disconnect us from nature, damaging the natural world in the process. However, as a species, our story is nature and for a sustainable future, nature needs to re-emerge as the human story through societal values, social structures, feedback and policy. The pathways to nature connectedness provide a framework for improving human–nature relationships within that context.

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