Designing for Active Engagement, Enabling Resilience and Fostering Environmental Change

Identifying challenges for “design-led, nature activities”... supporting design for environmental change.

Contemporary societies are increasingly distancing themselves from nature; driven by rapid urbanisation, biodiversity loss, lack of connection, industrialisation, loss of green space and parental fear... all factors are reducing our care/empathy for nature. Conservation and grass roots reporting highlight nature’s wellbeing, requires impactful citizen led responses. Youth leaders of our time are reflecting the mirror on adult humankind, stating ‘our world is on fire’, and demanding action. It is well known that interactions with the natural world provide: health benefits, resilience, and prove transformative to our attitude, values and behaviour.

The My Naturewatch project facilitates people’s engagement with their local environment, and by doing so, helps its comprehension. Observations of nature help connect, engage, and foster custodians, at a time where growing separation with wildlife necessitates active engagement. The work specifically challenges our understanding of ‘designed engagement(s)’, not as passive activities but as impactful active engagements, open to all.

This article proposes criteria encouraging public participation within the natural world. It presents value to; NGOs, change makers, design agents, individual agents and funding bodies. Thirty experts from; design, ecology, conservation, museology, engagement, rewilding, wildlife and community work, were interviewed, informing ‘design for environmental change through active engagement’. The work identifies design’s role; in creating interventions that better engage people with the surrounding natural world, yielding long-term mutual benefits? The objective fosters active public nature engagement; identifying barriers, opportunities, and pitfalls leading to nature engaged interaction(s).

Keywords;
Social responsibility, Design for Environmental Change, Sustainability, Nature, Design for Active Engagement

Research Objective
Revealing expert insights and perspectives on: how design practices can be employed to better ‘design for nature engagements’, fostering environmental change through active public contribution(s).

Introduction
Defining ‘Nature’

The State of Nature Report, combines data and expertise from over 50 organisations, providing an update on how wildlife is faring across the UK. The 2016 report, stated, “between 2002 and 2013, 53% of species [have] declined, with 7% of urban species threatened with extinction from Great Britain”, wildlife is facing the biggest challenge of its time (Burns, Eaton et al. 2013: 6). This context presents a design space requiring action to engage audiences who might not be aware of their impacts on wildlife, or even what their surrounding wildlife is. During the last 20 years environmental issues have had more media coverage and agencies authored “enhanced environmental legislation” (Law Commission, Reforming the Law 2012: 52). The authors present ‘Engaging Design’, directly instigating
our interaction with wildlife and the natural world, shifting beyond mere mitigation of consequence to design ‘direct action’ for the benefit of nature. The view is taken from a design perspective, comparing different approaches combining design and wildlife, and integrating co-constructive processes of trial and action (Koskinen, Zimmerman et al. 2011: 18). Buckley identifies eco-tourism and increased traffic, as having adverse effects including “soil erosion and compaction, damage to vegetation, disturbance to wildlife, water pollution, vandalism and noise” (Buckley, Pannell 1990: 25). Whilst national parks encourage public engagement, “biologists [comment] that protected areas are not playgrounds”: wildlife “parks are assets for tourism, but they are not tourism assets” (Buckley 2009: 26). The authors use design to foster community engagement through the prism of co-defined issues and questions situated within public contexts. The opportunity does not deal with consequence(s) but how you/we; enable people to comprehend their impact(s) and moreover their role in the proliferation of species (rather than the dominating narrative of their demise). Naturalist Sir David Attenborough, advocate and spokesperson of the natural world, states, “no one will protect what they don’t care about; and no one will care about what they have never experienced” (Shepherd 2017: 5). Nature’s value is immeasurable, and whilst agents place great importance in connecting to the natural world, it continues to be undermined by human activity. The 2015 Nature Awareness Study (Kuchler-Krishun, et al 2015) highlights the importance of our nature relationship:

“People with mid-level education, and citizens between the ages of 50 and 65 show an above-average degree of support for the principles of a sustainable use of nature, whereas the figures for people aged between 18 and 29 are lower than the population average” (Kuchler-Krishun, Jonna. et al 2015: 11).

The report comments, “urban nature is predominantly associated with parks and public green spaces”, not wild spaces or gardens (Kuchler-Krishun, et al 2015: 12). As designers, this raises the question: what role can design play in creating interventions that better engage people with the natural world surrounding them? What can be created to enable long-term change or better custody of the natural world? Authors borrow from Voros’s ‘probable futures’ highlighting topics ‘likely to happen, extrapolating from current trends” (Hancock, Bezold 1994: 24).

This article reports and analyses on a leading expert representative round table, including: Urban Birders, Game and Wildlife Conservation Trust, Biodiversity Consultants, Countryside Education Trust, Bronze Oak Project, The Wildlife Trusts, The Design Museum, Citizen Science Expertise and more, helping audiences ‘engage with nature’.

‘Engaging Design’
Currently we design for worlds of convenience, created to: ‘purchase in a click’, publicly share and connect. Sustainable design practice engages with the consequence of materials, manufacturing processes, and human behaviour to highlight our negative habits. Often design is tasked with the tacit incentivisation of people to ‘do good’ as a means to facilitate more positive impacts on the environment. Human activity with sprawling cities, funding reductions, and extended working hours have transformed our relationship with wildlife, natural systems and landscapes. We are at a distance from protecting or connecting with our surroundings by ‘othering’ nature (Uggla, Y. and Olausson. U. 2012: 98). Additionally, whilst sustainable design indirectly seeks to engage with implicit notions of ecological benefit, it is often preoccupied with symptoms of production and consumption within a paradigm of growth for economic sustenance. It rarely explicitly undertakes design directions with the specific intent of propagating bio-diversity and benefiting nature.
Von Hippel introduces ‘lead users’, people whom “present strong needs [to] become general in a marketplace months or years in the future” (Von Hippel 2005: 6). In Politics of the Everyday, Manzini comments the “role of design experts is [to] build a collective design intelligence” producing “design capability of participants” providing agency (Manzini 2019: 19). Creating tools, techniques or processes to enable others is foundational to the Training scheme reported on. Traditionally ‘inclusive design’ remains within the realms of customising for “physical needs for agility/ability” (Dong, Keates et al. 2004: 306). The authors believe design for inclusion removes; financial barriers, age or gender issues, and opens items to adaption, reducing barriers to all.

Authors present ‘Engaging Design’ (ED), an emerging approach going, beyond ‘product’ and aiming for impactful positive engagement of audiences, with the exemplar being the My Naturewatch project. The perspective compares different approaches aligning design and natural world integration of co-constructive processes of trial and action (Koskinen, Zimmerman et al. 2011: 45). Understanding the world beyond products, as “design can change or evolve behaviour”, enacting transformation, even if it remains local (Lilley 2007: 3). In this context ED, instigates our interaction(s) with wildlife and the natural world, shifting beyond mitigation of consequence to direct design action for the benefit of nature. For example, engaging “in a forest school can contribute to the development of collaborative learning skills, by encouraging children to work with others on challenging outdoor activities” (Coates, 2019). These are designed experiences, interactions and engagements.

Design researchers often classify this approach as ‘research in the wild’ as it “evaluates prototypes in context and integrated within people’s lives” (Chamberlain, Crabtree et al. 2012: 795). However, it is about engaging audiences through those integrated prototypes. The authors acknowledge that “sustainable development goes well beyond the level of the individual [as it is] too hard to alter by one person”, so targeting engagements with communities is more successful (Grund, Brock 2019: 893). Co-design however, is about material development in partnership with design(ers) and sometimes participants are ‘test subjects’ validating concepts. Authors see the powerful shift ED can bring. ED is not about designers co-habiting or just co-designing with participants. Instead, it is about providing ‘designed agency’ to the participants so they can empower communities by proxy, resulting in embedded interventions. It is more specifically about deeply ‘activating audiences’ (meeting mutual agendas) and then providing impact where they want and require it, from a grassroots perspective. The Natural England, Access to Nature Report, stresses nature engagements can “increase communities’ sense of ownership within local natural places, by establishing strong partnerships between communities, voluntary organisations, local authorities and others” (England 2016: 10). In Citizen Designer, Perspectives on Design Responsibilities, Heller et al, advocating for Human Centred Design, highlight “Human-centred design develops solutions based on direct interaction with actual individuals [opposed to] user-centred design [that] relates to consumers” (Heller, Vienne 2003: 22). Authors believe that to achieve ‘ED’, we should design for humans and communities, not scenarios and personas.

**Designed Engagements in nature/design contexts**

Designers are questioning creative decisions and their impacts, and looking for challenges focusing on specific affects rather than operating in traditional fields i.e.; good manufacture, services, experience etc. The latter requires stakeholder engagement at different levels and differing depths, nurturing long-term positive engagement. Design for ‘active engagement’ seeks to connect with audiences and culture enacting change, a recognisable trait in a great
deal of sustainable design. ‘Flip-flopsam and Jetsam (Gant and Dean 2011) and Seachair (Studio Swine and Kieran Jones 2013) both seek to protect the marine environment by addressing issues of plastic pollution, but this is indirectly achieved through engaging ‘publics’ in a cultural conversation and connection. A digital design engagement example is BBC’s Weather watchers “Shar[ing] what’s happening to the weather” in your location. At the time of writing it has “165,000 registered Weather Watchers across the UK” (BBC 2018b). Hackalay presents “DITOs Escalator”, demonstrating 7 levels of ‘engagement; from everyone to high engagement in DIY Science (Hackalay 2018). Hackalay states that the number of people at the engagement level of BBC programmes Blue Planet II (BBC 2018a) and Planet Earth II (BBC 2016) has viewing figures of 14 million and 10 million. Estimating these “passive consumers” at 25% of the population (Hackalay 2018). The most engaged level “include those in DIY Science, exploring DIY Bio, developing sensors, etc. estimating 0.001% of the UK population at most” are engaged (Synenergene 2014). Engagement is in itself a designed process; the intension promotes sustainability, environmental action or protection.

Natures ‘Value’

Placing a monetary value on nature is impossible, but elements can be measured, especially in global economics, e.g. “Mexico’s mangrove forests provide an annual $70 billion, to their economy through storm protection, fisheries support, and ecotourism” (Sukhdev 2018). In 2001, the United Kingdom suffered a Foot and Mouth disease epidemic, with “2,000 cases” during the outbreak, when “overseas visitors to the UK dropped by 10%” (Bates 2016). Impacting tourism, outdoor recreation/sports, highlight some of nature’s interdependencies. The Natural Choice: Securing the Value of Nature presents economic values of nature including “eco-tourism is the fifth largest industry in the UK supporting 2.2 million jobs, contributing £97 billion to the [UK] economy” (HM Government 2012: 52). What Has Nature Ever Done For Us presents; Natural Health service(s), soil care, pollination, the oceans and business cases including, “25-50% proportion of $640 billion pharmaceutical market is based on biodiversity” (Juniper 2013: 45). Juniper highlights “statins [antidepressants] cost £9,500 per year, while exercise-based activity costs about £440”, twenty times less, offering a ‘National Nature Healthcare Service’ (Juniper 2013: 18). Juniper stresses “children with attention deficit disorder have been found to show significant improvements if they play in natural areas, or have views of trees and grass outside homesteads” (Juniper 2013: 28).

Findings supported by the State of Nature Report, unite 50 nature conservation agencies “giv[ing] a cutting edge overview of the [UK’s] state of nature”, highlighting “between 1970 and 2013, 56% of species declined, with 40% showing strong or moderate declines” (Hayhow, Burns et al. 2016: 12).

The National Trust’s Natural Childhood presents natures positive effects: health benefits, mental health, reduction in ADHD and comments that more nature engagements could offer “sav[ings] to the health service [to] the order of £2.1 billion per annum in England alone” (Moss 2012: 5). Dr William Bird, (medical advisor to Natural England) comments, “the outdoors can be seen as a great outpatient department whose therapeutic value is yet to be fully realised” (Bird 2007). The office for national statistics made a “first attempt to put a monetary value on ‘nature capital’ for the UK in 2011 as £1,573 billion (over £1.5 trillion)” (Juniper 2013: 18). Britain’s “nature is an economic and security asset with enormous social value” (Juniper 2013: 59). Finally, “rural tourism is believed to be worth £14 billion per year, with an estimated 17 percent of all UK tourism trips involved nature or wildlife watching” (Juniper 2013: 23). The recent 2018 Living Planet Report presents “All economic activity depends on services provided by nature, estimated to [annually] be worth US$125 trillion”

“Without healthy natural systems researchers are asking whether continuing human development is possible, our health, food and security depend on biodiversity. From medical treatments to food production, biodiversity is critical to society and people’s well-being” (Grooten, M. and Almond, R.E.A. (Eds). 2018: 11).

Contextual Perspectives on Nature

Nature is complex, polemical, generating contention and disagreement for best practice. A contextual example Ragwort (a common English weed) prolific in abandoned urban areas, road sides, countryside and gardens divides experts and is a contextual reference (Butterfly Conservation Trust 2018). In 2003, the Ragwort Control Act, was created restricting the weeds spread (London Stationary Office 2003); if eaten by “horses or livestock, ragwort can be poisonous with long term irreparable liver damage” (World Horse Welfare 2018). The plant also “provides nectar for numerous butterfly species”, so is favoured by wild gardeners, permaculture experts and rewilding projects (Nikon 2018). Designing ‘natural engagement(s)’ requires consideration and must be contextually approached. In Can We Save Britain’s Wildlife Before It’s Too Late, Cocker states “the overarching goal is to radically change the ethic and methods by which nature is governed”, potentially influencing behaviour and comprehension over time (2018: 18). Miller suggests, “more effort [needs to] be invested in making the natural world part of people’s lives” (2005).

Nature Engagements

‘Securing Nature for Future Generations’ questions “What role should the natural environment play in the UK’s future”, commenting, “climate change, consumption, population growth, changing land use and competition for resources are already impacting nature heavily” (British Ecological Society 2018). Cornel supports this in Deep Nature Play, explaining that “play is a great learning tool that energizes us, fosters creativity and helps build relationships”. We must “awaken enthusiasm, focus attention, offer direct experience and share inspiration” (Cornell 2017: 22), something that good nature engagements should embed. Bird defines "the critical age of [nature] influence” as pre-teen (12 years old), as “contact with nature in all its forms, in particular wild nature, appears to strongly influence a positive behaviour towards the environment" (Bird 2007: 22). Sterling, comments in Sustainable Education, Revisioning Learning and Change, that we must evolve “educational culture which both develop and embodies the theory and practice of sustainability in a way, which is critically aware” (Sterling 2001: 18).

In Beyond Knowing Nature: Contact, Emotion, Compassion, Meaning, and Beauty are Pathways to Nature Connection, the authors list “contact, meaning, emotion, compassion and beauty indicators of, pathways towards nature connectedness” as five strong indicators for positive nature engagement (Lumber, Richardson et al. 2017: 12). Robert M Pyle defines the Extinction of Experience as “the loss of neighbourhood species endangers our experience of nature. If a species becomes extinct within our own radius of reach, it might as well be gone altogether. Local extinction has much the same result as global eradication” (Soga, Gaston 2018: 223). Miller presents Shifting Baseline Syndrome as a “psychological and sociological phenomenon whereby each human generation accepts as natural or normal the situation in which it was raised. With ongoing local, regional and global deterioration in the natural environment, this results in a continued lowering of people’s accepted norms for these environmental conditions” (Soga, Gaston 2018: 223).
Conservationist Chris Packham established the *Peoples Manifesto for Wildlife*, stating “we have plenty of tools in the conservation box – we can rebuild, restore, reinstate or reintroduce. But we have one collective [disability] – we shy away from seeing the bigger picture” (Packham, C, et al 2018: 5). These expert perspectives frame exploration and experience, and foster practical embodiment of sustainable learning, transforming public resilience in environmental change. These engagements have different depths for the public:

*Observational Engagements.* Wildlife viewing, the RSPB pioneering engagements including ‘The Big Wild Sleep out’, “encouraging anyone to spend a night immersed in nature” and ‘The Big Garden Bird Watch’ (with 600,000 participants in 2011) demonstrates the public’s motivation to participate (RSPB 2018). 17,000 people participated in City Nature Challenge (Higgins 2018) and 73,000 participants in the Christmas Bird Count (BirdNote 2018).

*Participatory Engagements.* Calls to action e.g. The National Trusts’ 50 things to do before you’re 11 ¾ (The National Trust 2018). Activities range from building dens to bug hunts, around their national properties. Another participatory mechanism is 30dayswild, a social media campaign run by The Wildlife Trusts, fostering activities for one month annually (The Wildlife Trusts 2018a). In 2016 “12,400 people formally signed up for 30dayswild, (The Wildlife Trusts 2018a).

*Equipped Engagements.* Quitmeyer’s work creates ‘Digital Naturalists’, “helping ecologists design and build personal computational tools, extending[ing] their tool-making traditions into the digital realm” (Quitmeyer 2017: 185). Digital Naturalists empower experts with computational tools, investigating local content. A second example is the WonderSphere (Stoudemire 2018), a sealed, mobile chamber empowering paediatric patients with scientific and “natural wonders through multi-sensory learning experiences, promoting joy and well-being” (Stoudemire 2018). Built-in “gloves enable hospitalized children (with compromised immune systems) to plant, dig, water, and touch nature without danger of infection, providing a bedside hands-on field trip” (Stoudemire 2018).

*My Naturewatch* is an example of Designing Active Engagement as it “connects audiences young and old in fun or serious activity” (www.mynaturewatch.net). The My Naturewatch Camera is designed to capture pictures of wildlife when it detects movement, and as it uses off the shelf parts it can be assembled on a kitchen table without tools. Designed to be inexpensive, easy for people to make themselves and aligned to the interests of the BBC’s Natural History Unit, it is specifically designed for use in people’s gardens or local green spaces, to record images of nearby wildlife. *My Naturewatch* engagements (to date) include: film trailers with local independent cinemas, design workshops (Figure. 1 & 2), passive engagements, expert engagement, television broadcasts, Bio-Blitz’s, talks, and an expert training scheme. The work has also fostered independent nature engagement activities documented live on social media. In My Naturewatch Camera: Disseminating Practice Research with a Cheap and Easy DIY Design, authors comment “the fact that so many people have made My Naturewatch Cameras shows that, with appropriate design and adequate publicity, research products can circulate widely outside commercial markets” (Gaver., et al, 2019: 302).
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Design Space Summary

The authors have defined the coalescing themes as a ‘design space’, e.g. *Nature* is perceived as the natural world and ecosystem that surrounds us, not solely the ‘countryside’ but all environments within reach. *Nature’s ‘Value’* is evident in material provision; health, wellbeing and preserving the ecosystem relied on for life on earth. *ED* is a new strategy, offering a deeper level of active engagement amongst audiences. Created to instil ‘active responses’ rather than mere ‘participation’, and consider the ‘buy in’ from audiences for different levels of engagement. *Open Design*, and the transparency of making, gives people agency and brings different complexities of repair, re-skilling, assembly and appropriateness. Design is transforming to a more open and sustainable system, enabling re-use or repurposing, and adding complexity by substituting and adapting designs. To address this design space, authors required a cross-disciplinary position, as the theme combinations are exceptionally complex, sensitive and require expertise. Design is comfortable in numerous areas of discourse. However, it needs to cope with the integration of sustainable ecosystems and work in parallel with our natural world, instilling ownership and responsibility into local...
communities who reside within it. As the topic areas (Open Design, Engaging Design and Nature) unite, the complexities require processes for navigation. The following question unites presented literature and themes:

*What role can design play in creating change/interventions that better engage people with the natural world surrounding them? With the specific intention of yielding long-term benefits to both people and the natural world.*

**Method**

The areas (Open Design, ED and Nature) combine and foster active engagement, as motivation to preserve nature is intrinsic, but the interdependencies are complex, with far reaching impacts. The authors see the value in this design space to enact change over time. The roundtable united national experts (Figure. 3), accompanied by facilitators and pre-trained interviewers. Senior experts presented their fields with 10 minute ‘topic shares’; this demonstrated to attendees their perspectives on the interpretations of terms above. The participants mapped their expertise to help define their interests, which is included in the analysis. The method probed the combination of the areas, as there is topic bleed between the experts. The agenda was not just a future casting exercise, but unpicked how these design spaces function, as our civic responsibilities change over time. The authors do not see this as co-design as the entire process was intent on encouraging engagement with the public and not just their ‘participation’, but sought their active engagement. Authors presented the opportunity for the proposed design space uniting the elements and wanted to unpick potential pitfalls and opportunities. The participants were carefully selected based on the research teams mapping of expertise, and participants then mapped themselves (Fig.3).

![Expertise mapping of roundtable participants](Image Credit: Authors)
Figure 4: Roundtable presentations, Image Credit: Isaac Reeves

The scoping presentations grounded audiences in each other’s cultures and approaches, creating an inclusive approach undetermined by a hierarchy of knowledge. During the round table discussions, all attendees were interviewed. The participants were front line workers and close to the issues at hand, making them key stakeholders. Key informant interviews “allow[ed] a free flow of ideas and information, interviewers frame questions spontaneously, probe for information and takes notes, which are elaborated on later” providing information directly from experts (Binnendijk 1996). The key informant interviews “provide flexibility to explore new ideas and issues not anticipated during planning” (Binnendijk 1996). Participants were interviewed individually, avoiding the “Hawthorne effect where participants behave differently when they know they are being observed” (Chipchase 2018: 41). The interviewers were briefed, initiating from an identical script “enabl[ing] strict comparison between interviews” as it “is easier for a novice to follow” (Chipchase 2018: 68). This processed levelled all of the interviewees ensuring parity and clarity of activities. Questions were sent to interviewees in advance, avoiding participant discomfort or pressure. The topics went from “closed responses to answers that are more open” keeping “the questions short” (Chipchase 2018: 82). Questions covered; measurements of success in engaging people with nature, occurrences of negative nature impacts, designs role in this change, and potential long-term positive effects of change for society and mitigation of negative impacts. Interviews were recorded, transcribed and comparatively analysed, through coding “covering key themes, concepts, questions and ideas” (Binnendijk 1996). The key points and excerpts have been extracted and should be read in context to the question and the expert’s discipline. The responses were then affinity mapped into themes of importance. They were prioritised by topics and insights previously unidentified in design and nature literature. The experts of that area were then given priority, based on where they mapped themselves, during the accompanying activity.

Results

Q1: Identifying challenges for the public to engage with nature and barriers informing change?

Question context: A “disconnected relationship with nature is a consequence of an anthropocentric viewpoint”, this is compounded by ‘busy lives’, distance working and complex issues (Merchant 2006: 514). Current barriers to nature include peoples’ perception of; weather (Lumber et al. 2017), access to green space (Cox, Shanahan et al. 2018),
perception of lack of knowledge (Schultz 2002), urbanisation (Cox et al. 2018), social mobility (Maas, Van Dillen et al. 2009), smart phone use (Richardson, Hussain et al. 2018), lack of understanding (Barry 2009), people not having the time (Guiney, Oberhauser 2009), peoples’ willingness/motivation (Kals, Schumacher et al. 1999), public perception that they have to “go somewhere”, motivation as people expect a certain type of interaction and or the reward can be frustrating (Monroe 2003: 115) and increase of indoor activities (Nordbakke 2019: 359). The following challenges are specific to the organisations; however, they have been extrapolated and key themes identified, which were then re-validated by stakeholders.

<table>
<thead>
<tr>
<th>Agent</th>
<th>Benefits</th>
<th>Pitfalls</th>
<th>Challenges</th>
<th>Opportunities</th>
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<tbody>
<tr>
<td>Jane Cooper, CEO, Countryside Education Trust</td>
<td>Encourage the exploration of new under explored areas for interactions.</td>
<td>Tourism, specifically repeat visits, i.e. car parks result in mass habitat degradation.</td>
<td>Tourists not considering their impact and viewing it as someone else’s challenge.</td>
<td>GPS navigation and way finding systems calibrating to footfall and impact.</td>
</tr>
<tr>
<td>Kate Lewthwaite, Citizen Science Manager, Woodland Trust</td>
<td>Route planning that can adjust with the season.</td>
<td>Leaving the path and trampling the ground will have impacts on bulbs next year, even if they cannot be seen.</td>
<td>Visitors prefer to come to locations “technology free”</td>
<td>Embedded experiences that cater to all ages and abilities and print on demand information.</td>
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<tr>
<td>Nick Oliver, Engagement Manager, Wildfowl &amp; Wetlands Trust</td>
<td>Design interventions for specific groups to include and encourage engagement.</td>
<td>Vista segmentation, inviting attendance to different areas of wildlife sites.</td>
<td>Increased footfall in sensitive areas of sites.</td>
<td>Remote sensing and observation, deployed appropriately due to seasonality.</td>
</tr>
<tr>
<td>Bernard Hay, Senior Learning Producer, The Design Museum</td>
<td>Creating a series of interactions that build on each other providing citizen science data over time with active participants.</td>
<td>People require time, motivation and appropriate means to engage.</td>
<td>Creating a long-term sense of collective responsibility for nature and the urban environment.</td>
<td>Encouraging all to participate in local community preservation.</td>
</tr>
<tr>
<td>Chris Sandom, Rewilding expert, Head of Sandom Labs</td>
<td>Reviewing the volunteering economy.</td>
<td>Humans can have a negative impact on nature just through over-disturbance.</td>
<td>If everybody is connecting with nature and there is not a lot of nature left.</td>
<td>We can deploy ‘eco-tourism’ and encourage managed positive engagement through volunteering.</td>
</tr>
</tbody>
</table>

Table 1. Identifying challenges for the public to engage with nature and barriers informing change?

Lucy Robinson, Head of Citizen Science, Natural History Museum highlights the key theme of large ‘ill-informed or ill-managed’ engagement(s). The public “perceive loads of people going to nature reserve[s] and trampling plants. Once people have a level of engagement with nature and understanding of it, they don't trample plants because they know the impacts. I think you have to accept that there might be a short-term negative impact, but it's for long-term positive gain”. “It’s not that everyone has to love nature or [be a] super-nature enthusiast, but people appreciating that nature touches different parts of your life. It's the food you eat. It's if you have asthma, that could be something to do with pollen etc.”. “We [the NHM] don't tend to look at what actual features of projects hinder learning or engagement, or foster it. I think evaluating it and recognising it would actually be digging into the specific designs of programmes and understanding impacts”.

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Q1: Summary
The experts continually highlighted the biggest challenge is managing impacts over time in specific areas because untrained visitors do not foresee their impacts. There is an opportunity in perceiving impacts and encouraging responses during different seasons/specific events, often highlighting to the public their potential impact. This could be through designing out challenges and/or educating participants to make wiser, less impactful choices. Projects of this nature need to design out ‘over disturbance’ in engagements, either in holiday booking, visiting or education reducing high level impacts.

Q2: What can design (as a practice) do to transform/change how we engage with nature?

Question context: Design can be a force for large-scale change, “tackling the biggest challenges of our time, bringing about positive change in people’s lives” (Design Council 2017). In the future “companies will need to demonstrate their products’ positive contribution to society as well as minimising their negative environmental/social impacts” (Shin, Colwill et al. 2015: 368). These impacts can also be used to create engagements as a force for good (Shin, Colwill et al. 2015: 368). Some examples of this ‘design/nature’ alliance include the following projects: The Animal Diplomacy Bureau (ADB), featuring designed game experiments which provide agency to participants, Pokemon Go (PokemonGo 2018), and 30dayswild (The Wildlife Trusts 2018b). Experts believe increasing people’s ‘nature engagements’ can lead to regenerative cultures, potentially affecting participants’ mind-sets (Phillips, Kau 2019).

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<tr>
<td>Dr Julia Lorke, Post doc, Natural History Museum</td>
<td>My Naturewatch is the only example where I feel environmental education and connecting with nature overlaps</td>
<td>Adding another activity that excludes locations and individuals due to geographic location.</td>
<td>Finances, resources and facilities to achieve within the curriculum and or parental learning.</td>
<td>Explore the link between education and nature connectedness.</td>
</tr>
<tr>
<td>Teresa Dent, CEO, Game and Wildlife Conservation Trust</td>
<td>Could lead to another economy for agricultural industry on a small/medium scale.</td>
<td>Invite to many ‘nature enthusiasts to see it’.</td>
<td>Finding ways to measure agricultural / nature trends from baselines to satisfy farmers that they're succeeding.</td>
<td>Digital intervention that celebrates ‘bragging rights’ for individuals that can be safely shared.</td>
</tr>
<tr>
<td>Chris Sandom, Rewilding expert, Head of Sandom Labs</td>
<td>Increase in health and wellbeing.</td>
<td>Only works in countryside locations.</td>
<td>We need to consider how we design our nature connection back into our lives.</td>
<td>Designing landscapes and or daily interactions that build over time.</td>
</tr>
<tr>
<td>Lucy Robinson, Head of Citizen Science, Natural History Museum</td>
<td>Top-down outputs have sustainable future and ‘design for exit’</td>
<td>Things naturally occur in a top-down way because organisations exist to achieve particular outcomes.</td>
<td>Outputs becoming to ‘top-down’ and not reaching the appropriate audience.</td>
<td>Co-create with the intended audience and find mutual intrinsic motivation for participation / engagement.</td>
</tr>
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Table 2. What can design (as a practice) do to transform/change how we engage with nature?

Bernard Hay, Senior Learning Producer, The Design Museum, describes the largest challenge. The bigger question is “how do we shift participants’ awareness of the surrounding environment so that they’re aware of nature and their impacts? That could be through spatial interventions, in terms of parks, that could be about signage or interaction design experiences”. We “need a greater commitment to thinking about how we change..."
people’s perceptions of what the natural world is, with design. I think there’s a standard view of nature that focuses on beautiful mountains, or these unspoilt landscapes you see on Blue Planet”. It’s “about adopting the aptitudes and skill sets that we have, for example empathic thinking, curiosity, being an amateur, prototyping, testing, getting feedback, iterating your products”.

Q2: Summary
The experts highlighted the importance of going beyond their organisations and encouraging community agency for engagement, not just top down ‘participation’ proposals. How we design nature engagement back into our lives is currently limited to resources and capabilities of NGO’s. The opportunity is creating design/engagement proposals that are mutually beneficial for all, not just the organisation.

Q3: How should change be nurtured, to influence our approach to environmental transformation?

Question context: Behaviour Centred Design (BCD), “encompasses a theory of change, a suite of behavioural determinants and a programme design process” (Aunger, Curtis 2016: 426). Professionals “including policy-makers, marketers, educationalists, environmentalists, international development practitioners, governance and justice campaigners, health promoters, city planners, sports psychologists and web designers are all looking for advice on how to change behaviour” (Aunger, Curtis 2016: 426). The approach of BCD is transformational but our (publics) approach has to change to engage with it. Parallel activities that have had a huge impact over time are; the UK’s plastic bag tax “dropping consumption by 86%” (GOV.UK 2019), the public smoking ban that reduced emergency hospital admissions (GOV.UK 2019), and the potential up and coming sugar tax (Brownell, Farley et al. 2009: 10). The following are the key stakeholder responses.

<table>
<thead>
<tr>
<th>Agent</th>
<th>Benefits</th>
<th>Pitfalls</th>
<th>Challenges</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernard Hay, Senior Learning Producer, The Design Museum</td>
<td>People could be fostered encouraging more engagement over time, without guilt or peer-to-peer comparisons.</td>
<td>It could be a short-term engagement that does not evolve and does result in any impact.</td>
<td>Participants require background knowledge, or practice, to sensitively intervene, in context.</td>
<td>Designing so volunteer efforts are acknowledged and they feel valued.</td>
</tr>
<tr>
<td>Jane Cooper, CEO Countryside Education Trust</td>
<td>Inform Policy, through Grassroots action.</td>
<td>Interventions get forced on communities.</td>
<td>A mix of policy and local approaches building economic capacity.</td>
<td>Defining at what scale a design intervention can inform policy and vice versa.</td>
</tr>
<tr>
<td>Rachel Bicker, Biodiversity consultant, Gatwick Airport</td>
<td>Designed interventions meet local need and requirement, working in parallel with international locations.</td>
<td>Outputs designed in isolation and not long-term.</td>
<td>Designed to meet a need or a demand, rather than just trying to tick boxes in a funding opportunity.</td>
<td>Include funding councils in the need and requirement for engagements to be designed.</td>
</tr>
<tr>
<td>Lucy Robinson, Head of Citizen Science, Natural History Museum</td>
<td>Designed</td>
<td>One size design solution does not always fit all.</td>
<td>Being formulaic because you know it will work.</td>
<td>Open source design to share and build from, reducing cost.</td>
</tr>
<tr>
<td>David Lindo, The Urban Birder &amp; Television Presenter</td>
<td>How we live within wildlife and can evolve our architecture.</td>
<td>It feels like ‘eating your greens’ and is not embedded.</td>
<td>Design interventions that will bring us closer to nature, without actually realising it.</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. How should change be nurtured, to influence our approach to environmental transformation?
Roberto Fraquelli, Head of Design, Schumacher College, shares the underlying point. By “designing opportunities for new paradigms that aren’t about the existing world views that we have based around gross domestic product, but to design new curricular, new ways of living… more community living, thinking more about bioregions. We must move away from the culture we have manifested, particularly in urban spaces which tends to not focus on nature and the opportunities in nature”.

**Q3: Summary**
The challenges are providing motivation that goes ‘beyond the self’ to encourage participants. Designing new paradigms, tax relief, design for transition, design to meet need for ‘sustainable change’, and creating systems that enable agency and grassroots appropriation.

**Q4: What’s the best practice to establish and engage people in, environmental change?**

**Question context:** The concept of best practice is to unify approaches that others can benefit from (Mao, Vredenburg et al. 2005: 106). In *The Knowledge Gain and Behavioral Change in Citizen-Science Programs*, Jordan et al comment that trial participants claimed the largest motivating factor for Citizen Science participation is “content knowledge” (Jordan, Gray et al. 2011: 1151). Content knowledge is the education that users experience from exploring the world through the practice of Citizen Science. Part of Citizen Science practice is to offer training opportunities where volunteers can increase their skills, expertise and ‘content knowledge’. In *The Rise of The Expert Amateur: DIY Projects, Communities, and Cultures*, Kuznetsov describes the main motivation of users contributing to DIY projects as the “learning of new skills and communal sharing” (Kuznetsov, Paulos 2010: 1). Kuznetsov and Jordan et al.’s work aligns the main motivating factors in Citizen Science and DIY activities as learning new content. In November 2012, the Centre for Ecology & Hydrology (Natural Environment Research Council) commissioned and published a report, *Understanding Citizen Science and Environmental Monitoring* (Roy, H.E. et al. 2012). Within this report, Roy et al comment:

“Volunteers are motivated by enjoyment of participation but also by having confidence in the utility of the data. Initiatives with specific aims for underpinning policy or contributing to hypothesis-driven research would be welcomed by, at least, some of the citizen science community. It is important to respect the diverse motivations of volunteers. For example, not all will be willing to modify their existing activities to engage with policy citizen science. Engagements should be innovative and imaginative combining the collation of high quality and useful data while appealing to the volunteer community” (Roy, H.E. et al. 2012: 26).

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Nick Oliver, Engagement Manager, Wildfowl &amp; Wetlands Trust</td>
<td>Getting people on the site to see the bigger picture of what is happening.</td>
<td>At home, parents say, ‘Don’t touch that worm, it’s dirty.’</td>
<td>Getting people to look at conservation in a different way as well and giving people alternatives.</td>
<td></td>
</tr>
<tr>
<td>Roberto Fraquelli, Head of Design, Schumacher College</td>
<td>Exploring legislation for positive benefits.</td>
<td>Incentivisation through legislation change.</td>
<td>Change laws, incentivise people by, if they positively impact nature, they can reduce their council tax.</td>
<td></td>
</tr>
<tr>
<td>Helen Meech, Bronze Oak Project, Previous Director</td>
<td>The government’s 25-year plan for nature talks about a The time in which it takes to embed that culture.</td>
<td>The key measure for people’s engagement with</td>
<td>Outdoor learning has been proven to have huge benefits, both in</td>
<td></td>
</tr>
</tbody>
</table>
Policy, which will mean that every school includes an element of outdoor learning.

nature is ‘nature connectedness’, which is the extent to which people see themselves as part of nature.

terms of educational attainment and kids’ wellbeing.

Give nature the best chance to thrive in garden and urban spaces.

The notion of ‘Re-wilding’ is messy and people often do not want to overcome the ‘look’.

Encouraging people to treat gardens as small nature reserves as they are essential for biodiversity.

Your decisions have lasting consequences for both good bits in life and bad in life.

Understanding your place in that system and trying to have a positive interaction with it.

Creating inter-related international practices and approaches.

Table 4. What’s the best practice to establish and engage people in, environmental change?

Mathew Frith, Director of Conservation, London Wildlife Trust, defines what we need from the next generation. We “need ambassadors to show that things can be done. So it goes back to that point about hope; it’s not all a long, steep climb. One of the things we suffer from is a funding world, which basically does short-term projects. So we do something for three years, and then we have to walk away. So you get- One of the big issues, and a particular interest for me, are the quality of the landscapes around our housing estates in London”. “So it’s about marrying the local expertise, the local knowledge, the experience that no one else can match from actually being in that place and being part of that community, with the professional input, which is to do with strategy, in some ways”.

Q4: Summary
Provide embedded motivation or provide influence through transparent impacts. This can be through ambassadors that enable communities and building towards sustainable futures. The important element is to unite local knowledge, expertise and local communities through a clear approach and narrative.

Discussion
The section is subdivided into 4 subthemes: Spatiality, Interactions, Motivation and Impact. These areas maintained the highest frequency amongst the interview results. They also highlight the opportunities within the proposed design space. The authors acknowledge there is no ‘one size fits all’ solution as this area is complex, with legal ramifications, health and safety issues and more. This is an exceptionally multifaceted space to navigate with many long-standing forces at play. Codes of conduct could help foster independence, i.e. “take only pictures, leave only footprints”, and encouraging people to engage in this space with expert care (Mears, McNutt 2002: 8). Richard Louv, the leading nature journalist who coined ‘Nature Deficit Disorder’, The Nature Principle and Vitamin N, is a leading opinion in the area. Louv remarks on our relationship between nature and technology in Our Wild Calling. He argues that:

“Analogue and digital must merge in order to create a new space of nature in which the positive, empathetic, loving relationship between mankind and creation is the most important condition for the survival of the species. And the Internet is the key to this new space” (Louv, R., 2019: 146).
Subtheme: Spatiality
The World Wide Fund (WWF) for Nature highlights issues with smart phone apps recording wildlife sightings, specifically in Yellowstone, a national park in the United States. Not only does the app remove the ‘wild nature of discovering wildlife’ with “grizzly bear sightings at such spots are especially challenging for park rangers, who have to both direct traffic and keep people a safe distance away” (Gaukel Andrews, C., 2012). This is an extreme example of ‘logging wildlife’, but it does raise the issue of health and safety, drawing people who do not have the subsequent knowledge to cope with the environment to certain locations. The Dorset Wildlife trust has reported that smart phone apps imitating bird song have been used negatively to lure species for amateur photography (Gonzalez R., 2013). Tony Whitehead, public affairs officer for the RSPB, stated “repeatedly playing a recording of birdsong or calls to encourage a bird to respond in order to see it or photograph it can divert a territorial bird from important duties, such as feeding its young” (Gonzalez R., 2013). This intervention could have large impacts if inappropriately scaled. Finally, military grade sonar usage has been linked to whale ‘beaching’ or ‘stranding’. Reporting, “the number of whales known to have been harmed by sonar is relatively small, but until we know exactly how whales respond to sonar, and what sound exposure causes these responses, we cannot assess the full scope of the problem” (Cressey, D., 2008). All of these touch points are scenarios where people have been unaware of their impacts. The question is, how do you make them aware of scenarios that do not exist yet, or should we be continuously fearful?

- Consider Semi-permanence, the free flow of movement and repositioning of interactions, touch points and over time not contribute to site specific increased footfall.
- ‘Wild’ is messy and risky, that’s a good thing, do not sanitise it or design it out.
- Wildlife is not just in the countryside, it is also in your public space, garden, park, place of work or outside the window.
- Designing new paradigms, rather than looking at traditional ownership models, to engage people.

Subtheme: Interactions
Hartig et al discuss the health benefits of ‘nature experiences’ including; physiological impacts, restorative aspects, learning and personal development supporting “views about nature and health, are using methods and theories now viewed as scientifically credible” (Nilsson, K, et al., 2010). One gaming platform that surprised health experts was Pokémon GO, a “Real World Gaming Platform us[ing] real locations to encourage players to search far and wide in the real world to discover Pokémon. Pokémon GO allows you to find and catch Pokémon as you explore your surroundings” (Tateno, M., et al. 2016). This platform was designed to create profit and establish exploration; it never considered the health implications of simply getting people to explore the world around them. In studies Igmar et al, (Althoff, T., et al., 2016) documented that 32,000 users “added a total of 144 billion steps to the US physical activity”. There are further cases highlighting Pokémon players going to previously unvisited locations (Colley, A. 2017), and helping people with social withdrawal (Tateno, M., et al. 2016). Recently the National Trust commissioned a report the Natural Childhood written by lifelong naturalist, Stephen Moss original producer of the BBC series SpringWatch. In the report, Moss highlights “Nature Deficit Disorder: Causes and Consequences focuses on the lives of Britain’s children, particularly with regard to their lack of engagement with nature. Three specific categories are examined: physical health problems including obesity, mental health problems, and children’s growing inability to assess risks to themselves and others” (Moss, S.M., 2012). Moss continues to identify:
“Imagine a world where our children are physically and mentally healthier, communities more cohesive and connected, and everyone enjoys a closer relationship with the natural world, and all its benefits. Reduced costs to the NHS, higher educational attainment in our schools, and happier, more fulfilled families are just the start. Ultimately, this would help produce generations of children with a more balanced approach to risk-taking, deeper bonds with their peers, and a genuine self-awareness and perspective on the wider world – ready to take their place in adult society” (Moss, S.M., 2012).

- Be aware, this approach is not about replacing ‘nature’, but enhancing experiences.
- Question how interactions function, i.e. group, at a distance to build empathy? Group interactions; work at a distance, collective medium etc…
- Design appropriate steps, for proposals that are sensitive and attuned to their surroundings.
- As many people possible need to have Access to the interventions even if they are embedded into environments for all to use.

**Subtheme: Motivation**

- Present a clear picture of what audiences are contributing to with a considered level of intrinsic motivation required, as it should align to their interest(s) or need(s).
- Create Incentives, that are opportunities, rather than regulatory driven as a negative campaign.
- Fostering Grassroots connections and projects that are embedded in local communities, rather than just top down mechanisms.

**Subtheme: Impact**

Impacts are often hard to predict as they become highlighted on mass or over time. I.e. The RSPCA has advised that ‘Sky Lanterns’ (flammable balloons released at events) can cause “ingestion, entanglement and entrapment to wildlife” (RSPCA, 2013). The public feeding of Mallard ducks with “white bread causes problems, as excess starch makes them lethargic, leading to health problems” (Furness, H. 2013). Over feeding Mallard ducks can also cause “over-populations of males in environments leading to forced mating” (Goldbogen, J.A., 2013:1765). In 2011 the RSPB documented “two wildlife photographers fined £1,100 for disturbing a pair of nesting white-tailed eagles on the Isle of Mull” (RSPB, 2011). This case could have been amplified by multiple users sharing information online. Would more awareness of codes of conduct and indirect impact in this area have a positive effect? A simple example of this unknown impact was the Foot and Mouth outbreak in 2001. Foot and Mouth is spread by foreign contaminants transferred to footwear and freely distributed. The South Downs recreation area (1600km²), located in East Sussex, was closed to reduce the spread of the disease. The public’s misunderstanding of their foot traffic’s impact exacerbated its spread. The disease claimed farms and ‘resulted in losses of £3.1 billion to agriculture’ (DEFRA, 2014). Another simple example is everyday bird feeders. Trichomonas gallinae is a common parasite to pigeons. Studies in 2012 documented a ‘30% reduction in green finch numbers’ due to the transmission of parasites to other species (Robinson, R. A, et al., 2010). The RSPB state that Trichomonas gallinae “is spread as birds feed one another with regurgitated food during the breeding season, and through food and drinking water contaminated with freshly regurgitated saliva” (RSPB 2014). The cure relies on the “public to clean their bird feeders, regularly”, as this act of kindness could erode species over time (RSPB 2014). Authors think the following points are critical in mitigating against impacts for the types of ventures discussed.
- Creation of ambassadors, on a local level that are arbiters amongst the most relevant peers, youth or community groups.
- Change of public mind set, creation of awareness that is more granular, informing potential actions or behaviours.
- Public notion of diversity in environment can be extended with more local knowledge.
- Grass roots informing policy, concepts need to be back cast, so grass roots opportunities can see what their work could inform.

Conclusion

The activities have been independently validated by the My Naturewatch project, through a research through design approach (Gaver, 2012). Designing ‘Active Engagement for Nature’ provides agency but requires expertise, time, patience, deployment and appropriate constraints. Design was recognised by participating organisations as a valued tool and set of processes, and several identifiable, traditional and perhaps more emergent design disciplines were identified as having been deployed by the contributors. These included communication design, service and systems design, and landscape design – contributors also recognised the need to ‘design engagement’ into many of their activities and approaches. Finally, the areas of: Spatiality, Motivation, Impact and Interactions must be appropriate to their context of deployment.

Future work

1) Investigating the means to provide ‘capability and capacity’ to charities/NGO’s so they can undertake this type of ‘engaging’ work.
2) Designing for ‘Science Families’, ensuring interactions are not isolated, but embedded in a community where guardians and children benefit through appropriate engagement.

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