

## **Defining Ecological Citizenship;** Case-studies, Projects & Perspectives; Analysed Through a Design-led Lens, Positioning 'Preferable Future(s)'.

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A 'citizen' is a member of society who undertakes duties and obligations. Authors define *Ecological Citizenship* (EC) as accessible activities and skills which establish sustainable practice(s) and/or address ecological inequalities. Unsustainable practices (and consequences) are not constrained to individual countries, single industries, or discrete societies. Our life-supporting ecosystems (for example, oceans we eat from and the air we breathe) are impacted by contemporary resource exploitation, pollution, material misuse and inadequate protection.

We are (all) citizens of the world, with the natural environment sustaining all life on earth. Our human existence is intertwined with our environment; we live in and are 'citizens' of our environment. EC fosters positive, ecological behaviours involving and benefiting communities through individual and collective action(s). Infamous author *Enzo Manzini* advocates that designs' contemporary role and purpose is to 'create the conditions' to enact change.

We also describe a new network, *Ecological Citizens*\*, funded by UK Research & Innovation, which aims to catalyse sustainable practices in the digital economy, through activities which unite diverse groups of people to address a sustainable digital society. This network unites community-focused approaches including citizen science, activism, collective learning, advocacy, design strategies, manufacturing, environmental science, and engineering practices. We describe the activities that we will develop to co-create tangible outputs that are scalable and actionable.

This position paper outlines transdisciplinary approaches in addressing environmental challenges that benefit, communities, industry, academia, and other species. EC draws on previous projects, contemporary literature, and multidisciplinary perspectives. The EC position is 'post sustainability', exploring practices mitigating consequences and 'desiloing' expertise. EC offers; new research topics, supports tangible public roles, all within contemporary sustainable challenges. This position paper offers signposting to enable community and public(s) agency, challenging hegemonies rather than adopting conventional practice(s).

**Keywords:** design-led; cross-disciplinary; citizenship; post-sustainable; futures; agency; citizens.

**Research Objective:** Authors analyse interdisciplinary literature and case studies defining 'Ecological Citizenship' (EC), resulting in design-led 'preferable futures'. Authors built-off contemporary material, creating transferable contemporary 'design values'.

## Introduction

Our relationship with resources, materials and natural world(s) are unsustainable. Nature's function(s) and our interaction(s) are no longer intertwined but are critically co-dependant to sustain all life on earth. Personal wildlife experiences impact our 'nature connectedness' and can steer our subsequent action(s). We unite current territories, design literacy, citizen science practice and contemporary issues defining 'Ecological Citizenship' (EC): an activity or a skill that anyone can do, which helps establish sustainable practice(s) and address ecological inequalities. This includes community-led sustainability approaches leading to scalable, transferable 'design values' for wider application(s).

We need skilled and critical producers, consumers, empowered citizens, designers, and decision-makers. Such sustainability approaches must mutually benefit citizens, ecological environments, non-human species, and wider society. Design (as a discourse) is transitioning from capitalist approaches to providing experiences revolutionising behaviours through "interactions' transforming behaviour for positive natural world impacts" (Burke, *et al.*, 2018). Professional designers must design for longevity, opposed to 'throw-away' societies, enabling decision makers to become... conscious consumers.

Author's position and present; Ecological Citizenship, delineating a contemporary approach beyond sustainability practices. The territory is valuable as UK government "austerities have stripped local municipalities capacities" (Slawson, 2019), with "limited resource provision" (Oxfam, 2013), leaving third sectors woefully "under capacity pressures" (Hyndman, 2020). Summarising, citizens cannot rely (solely) on governments. We advocate for extending citizens' agency, into activities impacting them. Our approach presents opportunities for community-led actions, leading to a 'distributed environmental sustainment', through Ecological Citizenship (EC). EC is defined as "activities that go beyond your own agenda, benefiting the wider ecologies, systems or communities surrounding you" (Phillips, *et al.*, 2020). EC contextually includes: donating digitally captured air quality data to wider audience(s), or eating only seasonal food, reducing impacts of exported non-seasonal grocery production. Authors seek to empower stakeholders enabling responsibility and care for creative ways of living together with animals, people, and plants, through design. Authors guide readers through literature, the design space, contemporary examples, preferable futures, defining EC and its values.

Citizenship is defined as contributions towards the lives of others, outside of volunteering or without relying on individuals' kindness. It is noted that we do not use the term citizen to denote legal status of people in a country, though we recognise the term is problematic (see Eitzel *et al.*, 2017 and Cooper *et al.*, 2021). In *Citizens*, Alexander *et al.* clarify;

"To be a citizen is to care, to take responsibility, to acknowledge one's inherent power. To be a citizen is to cultivate meaningful connection to a web of relationships and institutions. Citizenship benefits from a free and expansive imagination, the ability to see how things could be" (Alexander *et al.*, 2022, 11).

Citizens are literally 'together people', (translated from Latin) humans defined by their togetherness. All "life on Earth is an ecosystem, and it could be an ecosystem of generosity, a virtuous circle. If we improve things at any point, we improve them at all points" (Alexander *et al.*, 2022, 12). In *The Politics of the Everyday*, Manzini states we should focus on "project centred democracy, meaning a participatory enabling ecosystem in which everybody can develop their projects and achieve results", i.e., designing conditions for others to excel (Manzini, 2019). Public Interest Technologies (PIT's), an emerging design discipline, empower communities and municipalities alike, creating 'optimum' conditions. PIT's enable data sharing for the greater good, leading to 'evidence based' societal change. PIT's inform the digital economy and "how data is forming a currency that people want a stake in", benefiting human and non-human species rights (McGuinness, T.D. & Schank, H., 2021). In *Ecological Justice* Weston, *et al.* state

“human rights advocates, champion the ecological rights of future generations”, i.e., our human rights and ecological justice are intertwined (2012). Simply put “our societies [and] descendants depend on achieving ecological justice for future generations” (Weston, *et al.*, 2012, 43) i.e., we must protect future generations through Ecological Citizenship. Design practice(s) uses Design Futures, a process of scoping new territories. Design Futures (or foresight) work has three laws: “1) the future is not predetermined, 2) the future is not predictable and 3) future outcomes can be influenced by our present choices” (Voros, *et al.*, 2001). We leverage Voros, *et al.*'s preferable futures, concerned with ‘what we want to happen’. These futures are emotional, rather than cognitive, being subjective and being derived from value judgements (Voros, *et al.*, 2001). These instances of ‘future(s)’ should be determined by all citizens who suffer from the impacts of polluting industrie(s), practices and exploitative politics, not just the privileged few.

### **Our Natural Environment**

Nations typically measure economic success in GDP but fail to measure impacts on nature or sustainability improvements. 2021 witnessed rising public concern regarding nature, with nine out of ten adults in England concerned about increasing threats to natural environments and biodiversity loss (Natural England, 2019). Sprawling cities (Cox, *et al.*, 2017) funding reductions (Burke, *et al.*, 2018) and extended working hours (Ganster, *et al.*, 2018) have transformed our relationship with natural systems (Richardson, *et al.*, 2018). We are distanced from protecting and/or connecting with our surroundings by an “othering” of nature (Ugglå, *et al.*, 2012). Traditional nature relationships were defined by; food (Uhlmann, *et al.*, 2018), forest, (Cincinelli, *et al.*, 2019), seasonality and self-sufficiency (Kelobonye, *et al.*, 2019). It is suggested that two hours of nature engagement could join ‘five pieces of fruit a day’, as official health advice (Carrington, 2019). The benefits of Nature engagement(s) benefits include community forming (Moss, 2012) including building connections and relationships, between youth (Muñoz, 2019), opportunities for play (Brown *et al.*, 2017), understanding of risk and connectedness (Lumber, *et al.*, 2017). It also provides economic benefits (Bockstael, *et al.*, 2000). The Office for National Statistics estimated the UK's ‘nature capital’ at over £1.5 trillion with rural tourism alone, worth £14 billion, with 17% of UK tourism involving wildlife watching (Juniper, 2013). There are many health benefits from contact with nature, e.g., reduction in ADHD, improved well-being (McEwan *et al.*, 2019) and mental health (Cox, *et al.*, 2018). Increasing nature engagements could save the UK health service £2.1 billion annually (Moss, 2012), and is dubbed nature's health service (Moss, *et al.*, 2012). Authors advocate for ‘sustainment’: embedding sustainable proposals within and for communities, over wholesale redesign strategies.

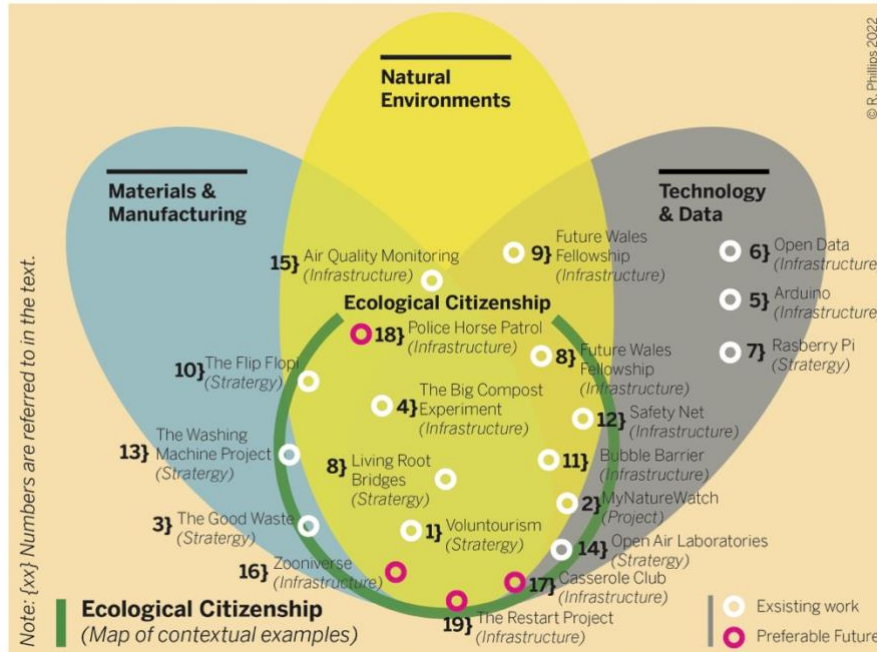
Sustainment implies an “economic paradigm that enfolds redistributive justice, but its initiation requires change” (Fry, 2010). The Covid pandemic presented alternative world(s): “A sharp dip in air pollution across China, Europe, and the US, with carbon emissions from the burning of fossil fuels [presenting a] record 5% annual drop and Venice waters [were] clear” (Milman, 2020). This demonstrates rapid changes can happen, although systems quickly returned to pre-pandemic states. Authors promote designing for and with ecological systems which actively preserve and propagate people's actions. We over-manicure environments, e.g., in the UK over the past 4 years a 220% increase in artificial grass sales has occurred, impacting local wildlife (Laville, 2018). Contemporary *BBC SpringWatch* programming comments, “saving wildlife starts in your back garden”, within their ‘Garden Watch’ campaign's objective to calling communities to action (BBC, 2019). The combination of the biodiversity and climate crisis's, our disconnection from nature, and underfunded charities(s) unify the need for a ‘strategic re-design’ enabling citizens a role in sustaining natural worlds. Ecological Citizens is not a metaphorical ‘silver bullet’ fixing challenges, but uniting; design value, cross-disciplines, perspectives and require carefully crafted collaborations to succeed. In summary, the natural world is hugely important for human life on earth, our lives are intertwined and co-dependent on our environment. To continue co-existing with nature, we must empower citizens to comprehend their impacts and inform subsequent actions.

### **Our Resource / Material Relationship(s)**

Our relationship with the natural environment is distanced by our modern lives, material uses and perceivably time poor lives. In (1994) Photographer Peter Menzel, documented everything citizens owned. Menzel's portraits exhibit the breadth of materials and products we own (Menzel), demonstrating our belongings and material interconnectedness, regardless of location or culture. Contemporary products (artefacts) are built within systems, using multi-materials and sub-assemblies reliant on global resourcing and transportation. Traditional processes are disrupted by; circular economies (Geissdoerfer, *et al.*, 2017), regenerative processes (Wahl, 2019), design for disassembly (Crowther, 2005) and planet centred design (Jones, 2022). Material ownership requires redefining to 'material custody', comparative to architectural "listed buildings" (Williamson, 2010). Our material and resource use can be framed as an act of 'citizenship' through custody, use and repair. The Materials Science Research Centre (Royal College of Art) focuses on the invention and the experience of materials to address real world challenges, specifically environmental sustainability, and human health and wellbeing. Systems approaches allows us to create couplings between materials circularity, supply chain configuration and consumer experience to propose an alternative model for apparel that will reduce the consumption of materials resources and associated pollution, and to grow wellbeing - economic (equitable prosperity), social (community, identity), environmental (enhancing the health of our planet and its capacity to support life).

### **Ecological Citizenship (EC)**

Heller & Vienne's *Citizen Designer* states designers should "develop solutions based on direct interaction with individuals", transforming cultural approaches (Heller & Vienne, 2003). Culturally we are disconnected with material value and underestimate the damage of extracted natural resources in objects. The disconnection creates a loss of "consumption perspective", impacting our choices (Young, *et al.*, 2019). We advocate for 'Ecological Citizenship' (EC), transcending consumerism, impacting culture, enacting sustainable change, and encouraging resilience. An EC example is voluntourism, combining tourist locations and volunteering to benefit localities. Important work, as tourism can be damaging to local ecosystems. For example, in 2019 the Faroe Islands closed to reduce impacts of tourism on wildlife, conserving landmarks and habitats [1]. EC should be embedded within communities (of all sizes): urban, suburban, from all social classes and cultures.



**Figure 1.** Contemporary examples within the Ecological Citizenship framework. {xx} numbers are in the text.

This article guides through interdisciplinary examples, grounding the EC space. We hope this will inspire designers, communities, charities, and other organisations to leverage scalable and transferable ‘design values’. Figure 1, unites our frame, through; Materials & Manufacturing, Natural Environments and Technology & Data. There is immense value in providing citizens with (appropriate) explorative systems to environments they do not understand, with interactions they do. Design is the practice of sensemaking, interaction and intention(s) to multiple stakeholders. These are complex inter-twinned situations, for example, after the 2021 Glastonbury festival, “drug traces from on-site urination harmed rare eels, [as] scientists found dangerous levels of MDMA in nearby rivers” (Snapes, 2022). Unknown interactions proliferate, exacerbated by natural world disconnections. Another challenge is how citizens undertake roles within their ecological surroundings, over time. Historically, recycling ‘waste’ was conceptually alien, and now is resourced by municipalities. In time (hopefully) citizens ecological responsibilities will also be resourced. The unification of our material and resource use, the state of nature, new digital opportunities present design-led opportunities for ‘citizens’. Part of designs role is translating and communicating potential climate impacts, making tangible the intangible, and thus enabling citizens to act.

### Contextual Ecological Citizenship Example(s)

#### Design-Led Approach

Design (as a discourse) is transitioning from capitalist approaches to providing experiences revolutionising behaviours and producing “interactions’ transforming behaviour for positive natural world impacts” (Burke, *et al.*, 2018). The design territory is valuable as; UK government austerity measures have stripped local municipalities capacities (Slawson, 2019), with “limited resource provision” (Oxfam, 2013), leaving third sectors woefully “under capacity pressures” (Hyndman, 2020). Summarising, citizens cannot rely (solely) on governments. We are not advocating for resourcing ‘cheap community labour’ (note that often running citizen science

projects is costly and time-consuming Alfonso *et al* 2022) but extending citizens' agency, into activities impacting them. The design space is intertwined with consequences and impacts. The "transition to a sustainable society requires design approaches, informed by new and different values" (Irwin, *et al.*, 2015). Often non-design literate / familiar parties cannot always see the potential, so it is reliant on designers to 'create the conditions'. The collaborative economy is defined "as practices and business models based on horizontal networks and participation of a community" fostering transition to more sustainable futures (Manzini, 2019). These design-led 'technologies' are not just 'smartphone apps' but embedded propositions in places, communities, and institutions. The examples illustrate projects, across the design discipline.

**My Naturewatch** {2} *The My Naturewatch* (NW) project features an accessible DIY camera trap, fostering beneficial nature engagements regardless of; location, technological and/or wildlife expertise (*mynaturewatch.net*) (Figure 2). NW designed by the Interaction Research Studio, with engagements led by the Royal College of Art, Design Products programme is an EC example. Participating within NW is an act of ecological citizenship, as participants actively rewilded gardens and instilled wider impacts. NW camera traps used off-the-shelf parts and assembled in anyone's home, without 'specialist tools'. The cameras are repairable, use CE certified components, reusable and utilise components from schools. The NW project fosters 'active community engagement', a form of CS, in the scenarios where data was used for scientific purposes. NW embodies inclusive design in the digital age, as the activity engages a wide demographic, and can be used by all.

**The Good Waste** {3} (GW) (*goodwaste.net*) transforms 'waste' materials into interiors and objects through design. They intercept industrial waste from landfill, integrating strict circular economy principles. They believe in social sustainability as much as environmental sustainability, balancing their commercial output with social impact initiatives, bringing local communities into the design, and making process. Selfridges commissioned GW to produce items (made from local waste), sold in store and online. A vision of local, circular production model, furnishing homes with offcuts from neighbouring industrial sites. The GW is an EC example embodying; reuse, up-cycles material, and challenges material production.

**The Big Compost Experiment** {4} The BCE (*bigcompostexperiment.org.uk*) investigates the role and effectiveness of biodegradable and compostable packaging. The experiment is a short survey, then asks participants to place biodegradable plastic items in their compost under controlled conditions, reporting about its status and breakdown. Participants help determine the viability of biodegradable and compostable plastics, feeding directly into a 'composting map'. The BCE actively includes participants in the process of learning about biodegradable plastics and enables a role in contributing to its development.

Design-led examples contribute: Design specifically gives people agency, sustainability, responsibility, accessibility, through digital tools that are accessible regardless of finance and/or status. A catalyst for alternate actions, adaptable, appropriate. Design is a mediator between technology and people. Finally, it is imperative to consider how people are upskilled to inform their decisions, rather than being dedicated to. between technology and people. Finally, we must consider upskilling people to inform their decisions, rather than dictating to them.



**Figure 2.** Design Led projects embodying Ecological Citizenship, material, manufacture, and interaction attributes.

### Technologically-Led Approach

We use the term ‘technologies’ broadly: encompassing goods, materials and interventions transitioning us to more sustainable practice(s) but are not exclusive to ‘powered artefacts’. Technology can enable environmental resilience and has transformed: data transparency, public agency, and accessible data monitoring (Pratapa, *et al.*, 2022). Accessible tech has become publicly distributed with countless hardware and API’s propositions including: *Arduino* {5}, *Open Data* {6}, and *Raspberry Pi’s* {7}. These infrastructures transform our civic role with technologies, their use, application, and delivery. *Public Interest Technologies* (PITs) empower public stakeholders and municipalities (McGuinness, *et al.*, 2021). PITs unravel “intractable problems, through design, data, and delivery, thus providing user agency and yielding wider societal benefit(s)” (McGuinness, *et al.*, 2021). Authors question (how and if) digital technologies can transition ‘public(s)’, to more ‘sustainable approaches’, through digitally sustainable society approaches. Technologies producing data provide legacies, interoperability and yield a longtail of our physical actions.

Technology does not provide all the solutions, and to believe so is folly (Morozov, 2013). Tech requires context, stakeholder access, transparency, and appropriate consideration for its environment(s). Finally technological ‘appropriateness’, means deeply considering tech interventions, befit their circumstances. An example of this, is UK road markings painted directly on asphalt (Satisfying Road Painting, 2020). The reflective paint(s) is a simple interface for a complex system, however (Highways UK) currently reproduces the signage by hand. I.e., they are cost effective, efficient, don’t require power, and are used appropriately. *Lo-TEK, Design by Radical Indigenism*, demonstrates ‘appropriateness’ as the interconnectedness of communities, natural worlds, and knowledge (Watson, 2019). Appropriate technological examples include ‘living root bridges’ {8} (suspension bridges formed of living plant roots), in Meghalaya leveraging indigenous material knowledge, structures and ecologies (Watson, 2019).

Authors believe that *EC technologies* enable stakeholders, to make transitional choices, mitigate against negative consequences and empower local agency, in different localities. In Wales the *Well-being of Future Generations Act* (2015) recognizes that cultural capital is an asset and aims for a society that promotes and protects culture. At the time of writing, we understand Wales is the only country in the world with legislation requiring public bodies such as local authorities and health boards. This puts long-term sustainability at the forefront of their thinking and to work together with the public enhancing wellbeing. One of the seven wellbeing goals for the Act

is “a Wales of vibrant culture and thriving Welsh language” (Cymru., *et al.*, 2020). Technology and “arts play a key role in fulfilling goals and also contribute to a globally responsible Wales, Resilient and prosperous more equal Wales of cohesive communities” (Cymru., *et al.* 2020). One example is ‘*The Future Wales Fellowship*’ {9}, an opportunity leveraging art to demonstrate climate change impacts on everyday life. Fellows are given opportunities to develop artistic and technological works, challenging people’s perception of climate change, encouraging people to live more sustainable lifestyles. Fellowships explore the impact(s) of climate change on the people of Wales focusing on the three main themes of Energy, Food and Transport (Dylan, *et al.*, 2020). The value of the circular economy as a business model, drives ecological citizens by mapping practical projects i.e., Flip Flopi (Larsson, 2019) {10}, encouraging plastic(s) reduction through the creation of a sea-worthy boat from flip flops and other discarded plastic. “The Flip Flopi 500-kilometre expedition captured global media attention, inspiring the government, NGOs and orgs to act against single-use plastic” (Northumbria University, 2018).

#### **Technologically Led Examples**

**Bubble Barrier** {11} (*thegreatbubblebarrier.com*). The bubble ‘barrier’ creates an upward current directing detritus plastic to the surface. Placing the barrier diagonally across rivers, pushes plastic debris into a catchment system. The components work in unison: 1) Bubble curtain; provides vertical airflow, adapted to the flow dynamics of waterways. 2) Air supply; The bubble curtain is created by using compressed ambient air. 3) Catchment System; retains gathered detritus. An EC example on a town / city scale, considering how the technological intervention can be removed (without harm) over time.

**Safety Net** {12} (*sntech.co.uk*). SafetyNet Technologies is an LED system enabling experimentation into how light can segregate between ages and species of fish. It aids the reduction in undersized bycatch for trawler fishing, helping fisheries to catch the right fish. The industrial application enables fishing fleets to make proactive decisions, caring for environments they financially rely on.

**The Washing Machine project** {13} (*thewashingmachineproject.org*). The project is a world-leading organisation, uniting innovation, research, and development to solving the world’s pressing humanitarian challenges. They provide displaced and low-income communities with accessible, off-grid washing solutions. Their mission empowers women with time, transforming their lives. The project, improves people’s quality of life, offering a repairable solution.





**Figure. 3** Technology Led projects include analogue and digital processes, tied together by Ecological Citizenship.

In summary the technology-led examples are; created appropriately to their environment, cost effective and solely driven by the least amount of intervention. Subtly they are working for fixed periods and design for exit (i.e., once challenges are solved, they remove themselves).

#### **Citizen Science-Led Approach**

A method which can combine design, technologies and the natural environment is citizen science. ‘Citizen science’ emerged as a term in the 1990s but has been around for centuries – it is non-professional scientists or volunteers doing research to answer scientific questions (Dickinson, *et al.*, 2012). Over the past few decades, however, the number of citizen science projects has burgeoned. Partly this is down to the rise in ownership of personal devices connected to the internet, and other technologies (Newman, *et al.*, 2012). Many citizen science projects focus on recording features of the natural world, for example, volunteers noting down the emergence of cherry blossom (Miller-Rushing, *et al.*, 2012), the arrival of migrating birds, or logging weather (Figure. 4). Benefits of using citizen science approaches can be divided into those for science, for participants, and for wider society. Benefits for science include that it can be a useful way of collecting data over wide geographic areas, or from places professional scientists can’t usually reach (for example, private gardens).

The act of participating in a citizen science project can give people new knowledge and skills, for example, about the environmental topic being explored, provide a space for social connections, and generate locally relevant data. It can also encourage people to change their behaviour, for example, recording butterflies encouraged a shift to more sustainable gardening practices (Deguines, *et al.*, 2020). Citizen science has often been described as a democratising movement, a way of bringing diverse voices into the scientific process, amplifying their causes, which benefits society. Citizen science approaches are being used to help achieve the Sustainable Development Goals (see Fritz *et al.*, 2019). Data collected by citizen scientists are being used for environmental protection (Owen and Parker, 2018). There are different forms of citizen science, from contributory projects, where volunteers mainly get involved in collecting data as instructed by scientists, through to co-created projects where volunteers can be involved in all stages of the scientific process, from project inception to completion (Bonney *et al.*, 2009). These co-created projects have the most potential to be transformative for participants (Rameriz-Andreotta, 2015).

### Citizen Science-led Examples

**OPAL** (Open Air Laboratories) {14} was a UK-wide citizen science project which supported individuals, community groups and schools to explore their local environment through surveys, for example of earthworms and soil types. A million people participated and learned about their local area, collected data that was used locally for decision making and contributed to novel research (Lakeman-Fraser *et al.*, 2016).

**Air Quality Monitoring** {15} using low-cost sensors took place in Nairobi in 2016, at the request of local residents, highlighting the high levels of particulate matter pollution. As a result of this citizen science project, the Kenya Air Quality Network was formed (West *et al.*, 2020) and a new Air Quality Bill for Nairobi will be in place in 2022 (SEI, 2022).



**OPAL (Open Air Laboratories):** Participants conducting an OPAL Soil survey. Community groups and schools to explore their local environment through surveys, for example of earthworms and soil types.



**Air Quality Monitoring:** Low-cost sensor deployment on participants backpacks in Nairobi, resulting in forming the Kenya Air Quality Network.

**Figure. 4** Citizen Science Led examples, demonstrate the importance of creating custodians within communities and internationally.

### Preferable Future(s)

Authors built-off; cross-disciplinary references, contemporary projects, scoping work, and extensive literature review.

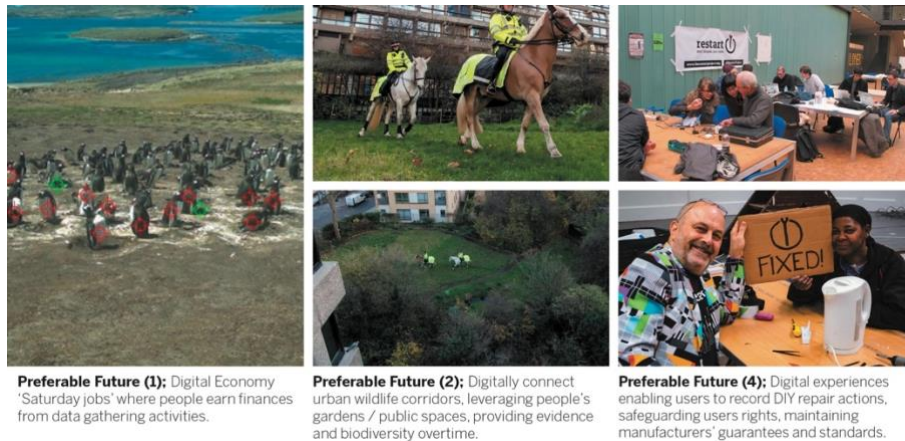
**1) Zooniverse** (2013) {16}, a platform enabling crowdsourcing and analysis of data and imagery. The platform shares webcam footage and public members visually identify species/anomalies for scientific purposes. We see the potential for Digital Economy ‘Saturday jobs’ where people earn finances from data gathering activities. For example, digital beach clean check-ups through publicly owned drones, water quality checks, earning volunteer’s accreditation(s) / finance. Including ‘ground truthing’ satellite data for local and global environmental protection. These would integrate motivations, communities, and activities for mutual gain.

**2) Casserole Club**, (n.d.) {17}, people with excess food share meals with residents, building communities and care. Authors foresee building digital systems for sharing food (leveraging voluntary purchasing data), reducing ‘food waste’ before shopping. Applied in dense populations and/or seen as a public resource. The challenge is designing technologies to evolve transitional behaviours, that remove themselves... because users’ subsequent actions have transitioned.

**3) Police Patrol**, (Weston, 2020) {18}, redirecting existing police horse patrols in public park areas, as ‘trotting’ promotes wildflower cultivation. Offering a mutually beneficial preferable future, leveraging public services to serve communities. We see methods to digitally connect urban wildlife corridors, leveraging people’s gardens / public spaces, providing evidence and

biodiversity overtime. Leveraged through key stakeholders, schools, councils, and private gardens. This enables the public to witness positive consequences, promoting community custody.

4) *The Restart Project*, (2022) {19}, advocating to reduce e-waste, legislating for training and repair culture. Contemporary EU laws insist manufacturers provide ‘access to spare parts’ for 10 years. Manufacturers could provide digital repositories of (IP controlled) parts & repair techniques, accompanied by AR applications. Digital experiences could enable users to record DIY repair actions, (supported by manufacturers) safeguarding users rights, maintaining manufacturers’ guarantees and industry standards.



**Preferable Future (1):** Digital Economy 'Saturday jobs' where people earn finances from data gathering activities.

**Preferable Future (2):** Digitally connect urban wildlife corridors, leveraging people's gardens / public spaces, providing evidence and biodiversity overtime.

**Preferable Future (4):** Digital experiences enabling users to record DIY repair actions, safeguarding users rights, maintaining manufacturers' guarantees and standards.

**Fig 5.** Scenarios of 'Preferable Futures', based on equitable and accessible Ecological Citizenship.

### Values (preferable futures)

We dissected preferable futures, examples, literature and created design-led values, defined by interdisciplinarians:

1. **Accessibility** | Our collaborative vision intends to create, foster, and instill cutting edge approaches, creating public benefit.
2. **Nothing For Us Without Us** | Working WITH communities.
3. **Trans-disciplinary** | Working beyond academic institutions with cultural locations, communities' industries and third sector organisations. Working with experts alongside contemporaries and communities, giving people choice over their destiny.
4. **Consequence Considerate and Appropriate** | Designing for grounded contexts within 'real-world' challenges, through appropriate/accessible materials and technologies. Seeking diversity, inclusion and environmentally, informing best practice.
5. **Designing for Exit** | Create ambassadors, training programmes, CPD's and other resources. We are intent on leaving elements of the network to be self-sustaining and growing positively.
6. **Design-led** | Informed by contextual issues, communities' experts, and scientific evidence. We are experimentally defined, (pushing boundaries) but reliant on being evidence based.
7. **Research Scoping** | Our mission is to foster appropriate and instigate territories, strategically uniting 'unusual suspects'.
8. **Open to Strategic Serendipity** | Working within a defined remit, and we are keen to explore the edges and beyond. We encourage others to be open and undertake strategic decisions that can try new initiatives.
9. **A Catalyst** | A process that increases the rate of change, transition, and activities.

- 10. Designing the Conditions for Regeneration** | Fostering positive transition, with impacts on all / other species, helping communities set their own KPIs and evaluation criteria & cooperatively tracking value / benefit / impact.
- 11. Agency** | To provide individuals and participants with the tools to help people have a voice within the sustainability of their environments.
- 12. Citizen Co-created** | Creating activities that include people with the intent to continue activities well beyond the EC projects funding period. Nothing for us without us.
- 13. Ensure Fair Oversight** | Providing an infrastructure that sits above the project working in the best interests of all stakeholders.
- 14. Redistribute Technologies** | Work to ensure that outputs are accessible, with source code and/or platforms that can be leveraged by others (internationally).
- 15. Design for Regenerative Action(s)** | Creating outputs that constantly consider the regeneration of; communities, digital societies, the planet, with the objective of being a good ancestor.
- 16. Creating Stories of Hope** | Counteracting feelings of helplessness, giving people agency to make positive change.

### Discussion

Authors believe that we are (all) allowed a voice in environment(s) that impacts us. For example, we are all entitled to vote on the advocates that represent us. Covid, changed our traditional relationship(s) as we were 'responsible' for the health of others, through our actions. I.e., mask wearing, distancing, hand washing and gatherings. This EC space is rarely explored through 'design-led' approaches as they are driven by capitalism, and this is not a capitalist approach. These types of intervention would usually be 'custodian-led'; i.e., council / municipality, etc., however authors believe "community-led interventions can be impactful" (Koss, 2020). The work explores mechanisms to engage within the: material world, natural world, inspiring proactive, mutually beneficial interaction(s), and encouraging behaviour to do less environmental harm. Conventional practice (in this space) is mainly conservation-led and / or education-led, often dictating processes without agency. Often non-design literate / familiar parties cannot always see the potential, so it is reliant on designers to 'create the conditions', i.e., the collaborative economy is defined "as practices and business models based on networks and community participation" fostering transition to sustainable future(s) (Manzini, 2019).

These 'technologies' are not an 'app' but embedded propositions in, places, communities, and institutions. They should also evolve and consider how they design themselves out over time. Design proposals work within deployable and accessible means and could be 'digital-only' items. Design practice "is centrally located in society's agendas by discourses of the creative economy" (Cope, *et al.*, 2011). Designers are increasingly engaging people's experience(s) as "design puts people first, challeng[ing] thinking and making lives better" (Design Council, 2020). Authors combine; Ecological Citizenship, our material relationship, nature relationship all present a frame for design opportunities and a transference of people becoming "Ecological Citizens", promoting local and global nature (Phillips *et al.*, 2020). The work questions: mechanisms to engage within the natural world, inspiring proactive, mutually beneficial engagement(s), to do less harm. *Human-Wildlife Conflict and Coexistence* demonstrates the challenges of coalescing human-wildlife interactions, asking "can novel methods and emerging technologies such as mobile phones, social networks, and drones inform human-wildlife coexistence" (Nyhus, 2016). In 2016 an independent study reviewed 274 articles published between 1981-2015 on the effects of human recreation on a variety of animal species across all geographic areas and recreational activities (In the United States). The study found the "decreased species diversity, decreased survival, reproduction, or abundance of species, and behavioural or physiological disturbance, such as decreased foraging or increased stress" (Guiden, 2016). Given this, are we simply documenting a mass extinction, or can we inspire everyone to be Ecological Citizens and put us on a new path of sustainability?

The challenge is how public, novice interactions are scaled and their impacts? The United States National Park Service has a proactive response to 'recreate responsibly' encouraging people to; "investigate prior to travel, know your [personal] limits, if you bought it take it home", regarding litter (National Park Service, 2020). There is an inherent link between 'increasing public access without knowledge', yielding negative impacts on surroundings. Scientists linked Covid-19 to wild animals "transfer[ing] viruses to other animals, as natural habitats shrink, wild animals concentrate in smaller territories, such as homes and barns" (Watts, 2020). On 18th May 2020, thousands of visitors "descended on [US] Yellowstone national park, opening for the first time since the coronavirus pandemic", their refusal to social distance or wear masks, demonstrates uncharitable perspectives to the natural world (Gilbert, 2020).

Enhanced relationships "between people and nature staves off a collapse of all life-supporting ecosystems" (Bucher, 2020). Pet ownership / custody, has risen in the US and UK since the pandemic, raises challenges disrupting ecosystems. Known as "livestock worrying, dog attacks on farm animals result in fatal injuries. Distress of a chase can cause sheep to miscarry lambs and sometimes die from exhaustion" (NFU, 2020). An estimated "900 million dogs in the world, with 89.7 million pet dogs in the US" (Kiss, 2019). The CDC says, "dog waste can spread diseases including campylobacter, tapeworm, hookworm, roundworm, giardia and E. coli" (Kiss, 2019), and urine and faeces can cause habitat changing eutrophication on popular dog walking routes. The most recent figures of creatures killed by cats from the Mammal Society, estimate annually "UK cats catch up to 100 million prey of which 27 million are birds" (RSPB, 2020). In summary we must re-question our values and approach to the natural world, the challenge is who (if anyone) should dictate terms?

The Royal Horticultural Society (RHS) shares "there are 1,377 non-native plants in the UK, but only 108 (8%) are considered invasive" (RHS, 2020). Invasive species "change ecosystems and habitats with non-biotic effects, such as reducing water flow leading to flooding or pH change or the chemical composition of the soil, lock up nutrients, outcompete native species either by habitat change or spreading rapidly crowding out slower growing species, threatening long-term species survival" (RHS, 2020). Our materials, pollutants, and abundant litter cost; "clearing one bag of roadside rubbish costs £40 because of road closures" (Coward, 2018). Wildlife experts stated that 'public' interactions need to increase over time, as we should aim to engage new participants and then foster their literacy of contextual needs and localities.

Finally, we must enable wildlife to stay 'wild'. The Natural Health Service recants "a [human] couple approaching a red stag, grinning with a selfie stick, the beast weighing 200 kilograms, could move at 40 miles per hour, and was so full of testosterone that he would chase and potentially gore them" (Hardman, 2020). In Summary, we cannot dictate to people. We (the public) need retraining in uncommon nature circumstances, our material use as both are not part of our common sense and (for most people) part of our cultural upbringing.

### **Conclusion**

We believe that we are in a transition to more 'ecologically centred times'. Transition design provocation(s) believes that "while many have called for design-led societal change, few have articulated how to undertake and lead/catalyse such change, nor have they identified the areas of knowledge and investigation required to do so" (Irwin *et al.*, 2015). Transition Design should be based upon "a deep understanding of the social history of technology, and a post-planning approach to how the introductions of new technologies impact society" (Irwin, *et al.*, 2015). Rather than just 'being more sustainable' we endeavour to explore how people can take individual or collective action(s). The approach builds the opportunity for 'citizenship' by creating catalysts and legacies.

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