Exchanges

Sustainability Culture

- Re-imagining the Anthropocene and 'the good life'
- Indigeneity and sustainability
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Exchanges is a scholar-led, peer-reviewed, diamond (non-fee charging) open access, interdisciplinary, online-only journal dedicated to the publication of high-quality work by researchers in all disciplines for a broad scholarly audience. Since 2013, the title has attracted innovative research articles, critical essays and interviews from emerging domain experts and early career researchers globally. The title also publishes scholarly work by practitioner authors and independent scholars.

A Managing Editor-in-Chief based at the University of Warwick oversees development, policy and production, while an international Editorial Board comprised of early career researchers provide advice and practically contribute to editorial work. Associate editors are recruited to participate in producing specific special themed issues. Exchanges usually publishes two issues annually, although additional special themed issues are periodically commissioned in collaboration with other scholars.

Exchanges' major missions are to encourage intellectual exchange and debate across disparate research communities, along with developing academic authorial and editorial expertise. These are achieved through providing a quality assured platform for disseminating research publications for and by explicitly cross-disciplinary audience, alongside ensuring a supportive editorial environment helping authors and editors develop superior academic writing and publishing skills. Achieving enhanced contributor esteem, visibility and recognition within these broader scholarly communities is a further goal.

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Because We're Wild Animals?
Editorial, Volume 3, Issue 1

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They say our tree may never grow back, but one day something will. Yes, […] these apples look fake, but at least they've got stars on them. I guess my point is we'll eat tonight, and we'll eat together. So let's raise our [juice] boxes. To our survival.
(***The Fantastic Mr. Fox**, 2009*)

Introduction

Welcome to the thirty-third edition of *Exchanges: The Interdisciplinary Research Journal*. This special issue on Sustainability Culture is our first issue of 2026, and my first issue as editor-in-chief, but I look forward to many more. Inspired by the *Blade Runner*–quoting sign-off from *Exchanges'* former EIC—the recently departed, much-missed, and still oft-consulted Gareth 'Gaz' Johnson—I have begun this issue with another epigraph from a film, this time a mock-heroic speech from Mr. Fox (voiced by George Clooney), in the form of a toast, from Wes Anderson's adaptation of Roald Dahl's beloved children's book *The Fantastic Mr. Fox*. Why? Well, perhaps I should begin my explanation by way of introducing myself, apropos of this Introduction.

I joined *Exchanges* as chief editor late last year, transferring from Film and Television Studies at the University of Warwick, where *Exchanges'* publisher, the Institute of Advanced Study, is based. Before taking the helm of the journal, I had been serving on the editorial board since 2022. But long before that, before even earning my doctorate in film studies and embarking on scholarly research, I worked as an editor and freelance film journalist. You could say that movies are 'in my blood', but words are too.

For those of you previously unfamiliar with *Exchanges,* this isn't a film journal (although articles about film are among our most popular). Rather, the journal covers the full breath of subjects and disciplines, with an emphasis on scholarship that considers how various disciplines intersect. Like films themselves, *Exchanges* is interdisciplinary, encompassing the full spectrum of human thought and inquiry, and I have always considered my own research to embrace this interdisciplinary spirit. It's a spirit that

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fosters connections between seemingly disparate subjects; these connections might not necessarily be intuitive, but often by virtue of their counter-intuitiveness, their unexpected combination expands human knowledge and moves scholarship in exciting new directions.

It's one of the things that first drew me to *Exchanges*, and it encompasses the approach of this new issue on Sustainability Culture, an issue that addresses some of the most profoundly important challenges of our era or any other—climate change, habitat loss, food insecurity, overconsumption—through the lens of social attitudes, customs, and relations—in other words, through culture. It asks, how do we actually promote a *culture* of sustainability, one that actively embraces the steps necessary to reverse the destructive (and self-destructive) path humankind is headed down? How can attitudes be shifted, if they can at all? And whose attitudes (and actions) are really the problem? When we use seemingly universal terms like 'Sustainability Culture', whose culture do we speak of?

In my 2019 monograph (shameless self-promotion alert!), I write about *The Fantastic Mr. Fox* in the context of 'American pastoralism', a form of 'New World' Romanticism that suggested wild, bountiful nature should be both venerated for its sublime power and beauty but ultimately moulded by human hands and minds into something made by us and *for* us, demonstrating our own imaginative power to shape the world (**Devereaux, 2019**). The goal, establishing a 'middle-ground' between nature and culture, was seen as a necessary 'pastoral compromise' that tamed the brutishness of our natural human 'instincts' with the civilising effects of culture (**2019: 128**). But as Anderson's film shows, this 'compromise' between 'the opposing forces of civilization and nature' (**Marx, 1964: 3**) is eventually overridden by human hubris. As a result, 'civilization' wins out, leading to human-made perversities like supermarkets full of painted apples and other fake food. All the while we justify our own self-destruction by lamenting that it's in our 'nature' to be selfish, to desire to live unsustainably, even though unsustainable living flies in the face of the natural world. Mr. Fox, the self-professed 'wild animal', adapts to living within his means. Why, seemingly, can't we?

If *The Fantastic Mr. Fox* strikes a somewhat ironic, ambivalent tone about the compromising influence of culture on nature, this issue on Sustainability Culture is rather *uncompromising* about its negative effects. What might look like survival comes at the expense of our very souls, leading to, as Courtney Work details in her Critical Reflection, 'alienation, addiction, and generational trauma' (see **Work, 'The Royal We and the Good Life', p. 111**). It could also spell not our survival but our doom; unsurprisingly, it is the most vulnerable among us that first suffer the

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consequences. At any rate, it is catching up with all of us—the past two hundred years of human behaviour, shaped largely by cultural attitudes from the West, is seemingly leading us to global catastrophe never before witnessed by human eyes (or fox eyes, for that matter).

In the following pages, scholars living and working around the world grapple with how culture has altered nature and might be impacting our own survival—and, crucially, what we might be able to do about it. How can we alter human attitudes enough to establish a true culture of sustainability, one that encourages long-term thinking and the wellbeing of other humans and non-humans alike? In the future, will we be resilient enough to survive, and if so, will we be able to do more than simply eke out an existence as a species and as a planet?

Guest editor Theodoor A.M. Richard outlines what is at stake, wondering, if our very survival depends on the embrace of Sustainability Culture, why does Sustainability Culture seem to be failing and how can we make it succeed? In his issue Introduction (**Richard, p. 1**) Richard outlines the terms of Sustainability Culture: what it means, how it works, and how we might begin to truly achieve it in this age of the Anthropocene, our current (unofficial) epoch when the planet is largely shaped not by natural events, but by human actions. In interdisciplinary fashion, he explores the concept of 'glocal' culture, which reflects both local and global considerations of sustainability and how both intersect.

Emerging from multiple editions of the International Conference on Sustainability Culture (ICSC), a series of events organised by Richard and hosted by National Chung Hsing University, Taiwan, the issue addresses Sustainability Culture from a variety of global perspectives: it spotlights multiple Indigenous cultures (**van Velzen, p. 14; Bayrak, p. 78**), social science and anthropological studies (**Cassa, p. 56; Work, p. 111; Nwe et al. p. 135)**, 'hard' science-based inquiries (**Farquhar et al., p. 93**), art-based responses (**Sabin, p. 38**), and even philosophical approaches (**Wood, p. 124; Richard, p. 158**).

Industry-based approaches are considered, which may prove somewhat controversial; many argue that a 'neoliberal' problem can't be solved by neoliberal, market-based solutions. This brings up another provocative question: What 'compromises' are we willing to make, if any, in order to make living sustainably—ethically, responsibly, with care for others and ourselves—the only acceptable way to live? Given the current state of our world as I write in March 2026, making Sustainability Culture the norm seems more unattainable than ever, but as a matter of literal life and death, it is certainly up to those who recognise its importance to try.

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Calls for Papers

On that happy note, I'd like to remind everyone that, in addition to special issues, *Exchanges* currently has an open call for papers. You can register for our email newsletter and/or follow our social media channels to keep up with the latest announcements and opportunities—links to these are found towards the end of this editorial.

Open calls for papers

Exchanges continues to invite manuscript submissions throughout the year on any subject which can either (a) demonstrate a degree of interdisciplinary thinking or research or (b) are written for a wide-reaching academic audience from within a singular discipline. Hence, while pieces which draw directly or indirectly on interdisciplinary methods, methodologies, praxis and thinking are especially welcome, this is not a prerequisite for consideration in our pages.

Additionally, *Exchanges* accepts submissions from researchers, practitioners, and independent scholars globally. We consider manuscripts from authors at any scholastic level and especially encourage submissions from early-career researchers, but all submissions must meet the same minimum academic standards to be published.

See our Selection Policy for more information.

Deadlines: There are **no manuscript submission deadlines** on our open call, and submissions will be considered throughout the year. Manuscripts therefore may be submitted for consideration via our online submission portal at any point.

Formats: Manuscripts can be submitted for consideration as traditional **peer-reviewed** research or review article formats, which will undergo a rigorous, double-anonymised external review process. Alternatively, they may be submitted under our **editorially reviewed formats** for briefer works (up to 4,000 words), which often are able to transit to publication faster.[i] Editorially reviewed formats can be especially suitable for first-time authors or those looking to embrace reflexivity, posit an opinion, or share professional insights. It is notable that all article formats receive extensive reader attention and downloads.[ii]

Requirements: Word counts and requirements for all content formats vary, so prospective authors are strongly encouraged to review our Author Guidance.[iii] Where an exception to

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	these standards is required, authors should discuss this with the chief editor ahead of submission. Manuscripts passing our review processes and accepted for publication will subsequently appear in the next available regular issue, which are normally published in spring and autumn.
Review:	All submitted manuscripts undergo initial scoping (suitability and initial quality) and originality checks by the chief editor before being accepted for further editorial review. Manuscripts seeking publication as research articles additionally will undergo one or more rounds of formal peer-review by two or more suitable anonymised assessors. Editorial decisions on manuscript acceptance are final, although unsuccessful authors are normally encouraged to consider revising their work for later reconsideration by the journal.
Authors:	Notably, *Exchanges* has a mission to support the development and dissemination of research by early-career and post-graduate researchers (**IAS, 2025**). Consequently, we are especially pleased to receive manuscripts from emerging scholars or first-time authors, although contributions from established and senior scholars are also welcomed.

Further details of our open call requirements can be found online (**Exchanges, 2024a**). To make a submission, visit:

- exchanges.warwick.ac.uk/index.php/exchanges/submission

Informal approaches

Exchanges has always welcomed approaches from potential authors to discuss prospective article ideas or concepts with the editor-in-chief. However, abstract submission or formal editorial discussions ahead of a submission are *not* normally a prerequisite, and authors may submit complete manuscripts for consideration without any prior communication.[iv] During the submission process authors are encouraged to include a note to the editor outlining the article format or call under which their manuscript is to be considered or any other considerations they wish to bring to our attention.[v] *Exchanges* regrets we cannot offer extensive feedback, advice or critique on outline manuscripts or text ahead of formal submission and review.

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Author fees

Exchanges is a 'diamond' (a.k.a. 'platinum') open-access, scholar-led journal, meaning there are **no fees or charges** for readers or authors. All published content is made freely available online globally (**Fuchs & Sandoval, 2013; Bosman et al, 2021**). Furthermore, authors retain all rights over their work, granting *Exchanges* first publication rights during submission as a pre-requisite for publication consideration. *Exchanges* is also happy to support translations of our published articles subsequently appearing in other suitable journals, and requests only that a link back to the original piece is incorporated. Authors may wish to consult *Exchanges'* journal policies for further information on how we handle author contributions (**Exchanges, 2024b**).

Further advice for prospective authors can be found on the *Exchanges* and IAS websites (**Exchanges, 2024c, IAS, 2025**), as well as in editorials, podcast episodes, and blog entries.

Forthcoming Issues and Continuing the Conversation

We will be announcing the Call for Papers for a new special issue very soon. I am particularly excited about this one. Please keep an eye on our social media channels and subscribe to our newsletter for updates. You can find us via the following links:

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The Exchanges Discourse Podcast

The Exchanges podcast has been dormant since Gaz's departure in late 2025, but the hope is it will be resurrected soon. It will likely continue the tradition of inviting journal authors to talk about their papers and work and offer publishing advice for early-career scholars. The journal archive includes episodes looking at academic podcasting, early career monographs and the emerging practice of 'open' monographs, as well as Gaz's valedictory episode, in which he discusses his lengthy tenure as *Exchanges'* editor-in-chief.

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All episodes are free to listen on [Spotify for Podcasting](), and many other podcasting platforms. You can also find a full listing of past episodes from this year, and all previous ones, on the *Exchanges* website.

exchanges.warwick.ac.uk/index.php/exchanges/podcast

Contacting

For general inquiries (for instance, to discuss a potential submission), contact us at: exchanges-journal@warwick.ac.uk.

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I would also like to thank Dr Fiona Fisher for her support, empathy, and guidance, and the staff at the Institute of Advanced Study, IAS Director Prof Alison Cooley, Dr Hannah Shaw, Rachel Hitchcox and former staff Dr Katie Reynolds and Abbie Pritchard. Thank you all for making me feel so welcome. Finally, I want to thank Dr Chris Rose for bringing me complicated drinks and walking me home at night even when it rains, which in West Yorkshire is a lot.

Dr Michelle Devereaux is the managing editor-in-chief of *Exchanges* and a former Leverhulme Trust Early Career postdoctoral fellow in film and television studies at the University of Warwick. Her 2019 monograph, *The Stillness of Solitude: Romanticism and Contemporary American Independent Film,* was published by Edinburgh University Press, and her other work appears in *Screen*, *Film Quarterly*, *The Bloomsbury Guide to Sofia Coppola* (Bloomsbury Academic, 2023) and *Television with Stanley Cavell in Mind* (University of Exeter Press, 2023). Her research interests include romantic and post-romantic philosophy, contemporary screen culture, gender and feminist theory, film aesthetics, critical neurodiversity studies, and genre studies. She has worked as an editor for various print and web publications in North America and the UK.

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Endnotes

[i] **Editorially Reviewed Formats**: i.e., Critical Reflections, Conversations (interviews) or Book Reviews, which do not undergo external peer review and are thus usually able to be more swiftly published. While the acceptance rate is higher for these types of material, those which fail to meet our required editorial standards in any respect will be declined and returned to their authors.

[ii] **Top Articles**: This diversity of format interest is frequently reflected in our annual Top Articles list, which appears in the IAS annual report, and on our blog.

[iii] **Word counts**: We do not typically include abstracts, references, endnotes or appendences when considering word count. Submissions slightly over/under our required word count limits will be considered for review at the chief editor's discretion. However, significant excess will normally be automatically declined.

[iv] **Expressions of Interest**: We do on occasion solicit expressions of interest ahead of submissions for special issues, as promoted on our Announcements page, blog, and other social media channels. For regular (open or themed) issue submissions, authors may submit their manuscripts without any prior contact.

[v] **Formats**: For more on formats, word counts and other requirements for any prospective submissions, see: https://exchanges.warwick.ac.uk/index.php/exchanges/guidance#formats.

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Introduction: the pivotal role of culture in the drive for sustainability

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Abstract

In this Introduction to Exchanges' *special issue on Sustainability Culture, I argue that the concept of culture plays a crucial role in understanding the sustainability crisis. I propose that the concept of Sustainability Culture that originally developed in organisational studies may be expanded to a more generally applicable concept, which may serve the purpose of understanding our experienced anthropocenic life situation more deeply. After discussing the organisational concept, I examine the ideas of cultural dynamics that can clarify how people form their cultural awareness. I argue that even though people may have the wish to be more sustainable, they may not act upon this wish, to the extent they have a belief system that makes them think the world does not allow them to live sustainably. And finally, I conclude that the concept of sustainability culture could provide answers to questions surrounding how people could want to live more sustainably.*

Keywords: sustainability, Anthropocene, sustainability culture, cultural dynamics

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Introduction

It is with great pleasure that I write this Introduction to *Exchanges*' special issue on Sustainability Culture. I was doing a small research project for my university on the interdisciplinary issue of culture in the field of agriculture—a pilot online study of youths in Italy, Taiwan and the United States—when I first came upon the concept of Sustainability Culture. The research focused on the re-migration of young people from the cities to the countryside out of a desire to leave behind the stressful lives of techno-economic bureaucracy and start new ones as farmers, especially organic farmers. These young people were motivated by the belief that it was important for them to 'go back to the land' and contribute to healthy food security by changing their lives in this way. They made the explicit choice to become more sustainable in their ways of living and working as an essential part of their (new) value system.

This Introduction, and the special issue itself, position themselves exactly in this culturally dynamic space where people decide to live and work (more) sustainably. In my research, I find that the same core question arises time and again: how is it possible that even though we already have all the knowledge and technology required to live and work sustainably, we do not seem to be able to fully achieve sustainability? I postulate that the answers are found in how we form our culture and how we relate to the technology that gives us our comforts. Which values do we have, how do we think the world works, and do we really want to be sustainable in our daily lives no matter what? I propose that this is, at the same time, the basis for the definition of the concept of Sustainability Culture. I examine the role and importance of culture in the drive for sustainability and, more precisely, sustainable development as defined by the United Nations' 17 Sustainable Development Goals (SDGs). The extent of this drive, I argue, will be decided by whether people believe that sustainability is important and *also* wish to behave in ways that support Sustainability Culture.

In order to reach this point, it is important to become aware of how culture —the general customs, norms and beliefs of people—influences the attainability of sustainability goals. A successful transition to sustainable development in any aspect of life and society will not only depend on technological developments but also on the generation of systems of meaning that are conducive to this transformation. Such systems are to a large degree structured by narratives (**Bruner, 1990; Ghosh, 2016**). Accepting sustainability as a core value through which to enact our daily lives depends on which narrative we tell ourselves about the Anthropocene and how we shape the cultural dynamics that decide on how that narrativisation will play out.

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My introduction therefore seeks to further the debate on how 'glocal' culture—culture that reflects both local and global considerations—defines our drive toward sustainability through an interdisciplinary approach. It seeks to further the dialogue on what exactly Sustainability Culture means in the twenty-first century and seeks to explore the issues that hinder or promote the drive for sustainable development. It explores how to develop the cultural awareness needed for adapting to, or fighting, climate change, and what cultural change is needed to advance this.

Sustainability Culture and Organisational Studies

Nowadays, sustainability is literally a 'hot' topic. Generally, sustainability means 'the ability to maintain at a certain level', with the common varieties being 'sustainable living' and 'sustainable development'. This last term is used by the United Nations to frame discussions of how to sustain life in a way where present needs are met without compromising the ability of future generations to meet their own needs. The UN has formulated its famous 17 Sustainable Development Goals (SDGs) on this principle. This elaborate framework was introduced more than ten years ago, but so far it has failed to achieve its ultimate goal of curbing climate change. We are still releasing more (and not less!) climate change–driving greenhouse gases into our atmosphere every year, with record-high emissions in 2024 (**World Meteorological Organization, 2024**).

By 1964, Kenneth Boulding had already coined the term the 'Great Transition', what he called the process of change that humanity needs to go through to transition from modernity into a postmodern civilisation in a sustainable manner (**Boulding, 1964**). For this transition to succeed, there is a general need to adopt and prepare for the entering of the Great Transition. While many governments have underwritten SDGs and have been working towards 'greening' their policies, many of their attempts relate to technological and operational activities only, executed from the top down through policies and changes in laws and regulations and an overall focus on technological solutions like carbon capture, renewable energies, smart buildings, and recycling programs. But the literature shows that technological solutions are not enough and do not deliver durable effects (**Adams et al., 2018: 435**).

Sustainability Culture attempts to address this shortcoming. The idea of Sustainability Culture is drawn from the Sustainable Management Studies concept of 'organisational culture'. Based on the work of renowned MIT management professor Edgar Schein (**Schein, 1985: 1997**), organisational culture is 'a collection of values and norms that are shared by people in an organisation which governs members' behaviours and actions in pursuit of organisational goals' (**Adams et al., 2018**). For Jacobs et al., (**2013**), 'the culture of an organization provides a sense of identity, it is central to the

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sense of "who we are as an organization" and makes consistent and coherent organizational action possible'. In Sustainability Culture, this focus on shared values and norms is applied to the question of how to cultivate a culture of sustainability within organisations such as corporations and higher education institutions (HEIs).

There is some literature on how to achieve this cultural change in HEIs through application of management principles on changing corporate/business culture. I propose to look at these ideas and concepts to learn how to achieve the cultural shift to sustainability. In the field of organisational studies, it is commonly argued that groups of people bound within individual organisations like universities have their own culture in the form of shared values, belief systems, and understandings that are expressed in the routines, practices, symbols, and narratives of their community (**Adams et al., 2018**). These understandings become visible in how people work in their community and are reflected in a shared identity about 'who we are' and 'how things are done here', while behaviour and culture show patterns of reciprocal interaction (**Schneider & Barbera**, **2014**). According to Adams et al.:

> [S]ustainability is conceived as a journey recognisable as a set of transformatory stages in which the behaviour and attitudes of groups of people within an organization become increasingly aligned around and consistent with the principles embodied in and implied by sustainable development (**Adams et al., 2013**).

An important insight from Sustainability Culture, as seen through the lens of organisational studies, is that a community culture is generally made up of two layers, a visible cultural layer and an invisible one (**Adams et al., 2018, 437**). Visible culture is formed by outwardly visible factors, including 'group behaviours and actions, which are more observable and easier to measure and change' (**Adams et al., 2018: 437; Kotter & Heskett**, **2011**). Invisible culture is formed by the deep-seated, implicit beliefs of people regarding how the world works, 'shared values that tend to persist over time and are self-evidently less visible and so less amenable to change' (**Adams et al., 2018: 437**). To make a structural cultural shift, both these levels of culture need to change. Generally, invisible culture is formed by the structural enactment of visible cultural elements, meaning change must be driven by these visible factors, which over time will transform into 'invisible' beliefs. Change must be made on the level of these implicit beliefs, or it will not be embedded properly or deeply. But it also must be made gradually: 'The process of changing deep-seated, implicit beliefs and assumptions that govern action takes place slowly and through the manipulation of visible factors: for example, changing a mission statement or reward structures' (**Adams et al., 2018: 438**).

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Any proposed cultural changes in aid of transforming attitudes toward sustainability and achieving sustainability goals need to follow these same principles, from local communities all the way up to humanity as a whole. As Adams et al. say, organisational Sustainability Culture can be seen as the 'aggregate of people's beliefs, values, customs and norms to the extent that it regulates their [sustainability] behaviour in an organization' **(Adams et al., 2018**); or, as the former chief executive of Barclays Bank, Bob Diamond, expressed it, what matters is 'how you behave when nobody is looking' (quoted in **Adams et al., 2018: 438**). On the basis of their analysis, Adams et al. conclude that the development of sustainability culture is:

> *a process of organizational change, that (i) requires change across diverse groups, (ii) is composed of visible and invisible elements, (iii) in which the visible elements are manageable and accessible via quantitative research methods, and (iv) in which invisible elements less amenable to management, change slowly over time in response to changes at the visible level and observable only through rich insights derived from a qualitative approach (**Adams et al., 2018: 439**).*

Naturally, this time-consuming process requires a long-term commitment by universities to constantly evaluate and renew their policies and practices throughout the whole of their organisation and in co-operation with all stakeholders involved, including staff and students.

The Difficulty of Embedding Sustainability Culture

Unfortunately, to my knowledge no research has been done on Sustainability Culture with any international or even national scope. At present, only organisations such as universities and corporations have done Sustainability Culture surveys, for example. Such surveys have proven to be an important tool for universities because they allow them to not only take inventory of current attitudes and beliefs among their various stakeholders, but also to explore what needs improvement and what can further be done. The study done by Adams et al., focusing on the University of Worcester in the United Kingdom, shows that the university's new 'green' programmes raised awareness about campus sustainability to levels of 25 percent for students and 53 percent for staff, but that they then became static around those levels (**Adams et al., 2018: 439**). The University of Michigan in the United States, which also monitored the student and staff awareness levels on its key sustainability initiatives, found similar levels of awareness, which remained stable despite all the activities done (**Maranz et al., 2017, 2018**). These surveys generally show that there seems to be a gap between peoples' proclaimed attitudes and their subsequent behaviours: they may say they support sustainable action, but they struggle to incorporate it into their everyday lives.

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Lasting results of initiatives taken by universities in the context of greening campuses or to rise up the various green sustainability rankings, such as UI GreenMetrics and the Sustainability Tracking, Assessment & Ratings System (STARS), are lacking. This is likely because of the unwavering beliefs and behavioural systems of the people within the organisational structure of the universities. Changes on the levels of behaviour and systems are needed, changes that move beyond the technological. As Adams et al. write, 'The sustainable organization will remain elusive until, at least, sustainability becomes embedded within the culture of the organization' (**Adams et al., 2018**). The university should be viewed as a holistic organisation where structural changes can only be made from the bottom up through cultivation of awareness and the heartfelt engagement of staff, teachers, students, and outside stakeholders. In this way, their value and behavioural systems need to be redirected away from 'Business as Usual' (BAU) toward wanting to live sustainably, for themselves and others. For universities to achieve an integrated and holistic sustainable organisation, they need to transform their structures, processes, practices and culture. This requires a strong cultural shift. Attempts at introducing Sustainability Culture have been criticised for being technologically opportunistic (**Cotton & Alcock, 2013**) and for an overall lack of coordination, leadership and coherence (**Ramos et al., 2015; ISCN Secretariat, 2014; Butt et al., 2014; Martin et al., 2013**), while leaving major components undealt with, such as the social dimension of sustainability (**Bone & Agombar, 2011**). For Cotton & Alcock, 'embedding of sustainability in higher education has been far from straightforward […] implementation has been patchy both in terms of disciplinary spread and in terms of the understandings of sustainability' (**2013: 1458**).

The obvious gap between people's proclaimed attitudes and their actual behaviour is not new (**Argyris & Schoen, 1978**). This gap has also been observed in organisational culture studies, where it is argued that change fails to occur because the target is in 'conflict with deeply held internal images of how the word works' (**Senge, 1982: 5, quoted by Adams et al.: 441**). There is an obvious irony here: community members express their support for sustainability practices, but they do not act upon them. This is a situation where there are two levels of reality people are grappling with: the ideal situation and the practical one (See 'Reimagining the Anthropocene by Examining Sustainability Culture Through the Lens of Paradox' in this issue). There may be other complicating factors: the desired action may be too difficult or costly in a world that supremely values time-based productivity and low-cost efficiency. The case study of the University of Worcester mentioned earlier found that students had difficulty with the uptake of smart heating controls despite their general expressed support of them due to three potentially factors: insufficient

motivation levels, apparent absence of fuel poverty, and privacy concerns (**Adams et al., 2018: 441**).

The comprehensive field sweep done by Adams et al. shows that a crucial element in whether people act sustainably and how they behave 'when nobody is looking', is in fact their belief in how the world works. This is confirmed by a study done by Nuttasorn Ketprapakorn and Sooksan Kantabutra in 2022, which resulted in their proposed model and theory of Sustainability Organisational Culture, where the first basic theoretical proposition is founded on the 'sustainability assumptions' of people. For Ketprapakorn and Kantabuttra, 'sustainability assumptions lead to a sustainability vision' (their 'theoretical proposition #1'), which then leads to 'aspiring sustainability values', or 'theoretical proposition #2' (**Ketprapakorn & Kantabuttra, 2022**). Their theory includes ten more propositions, but the main takeaway for my purposes is its starting point about sustainability assumptions and belief systems about how the world works. In the end, the core question seems to be: Do people (really) believe that acting sustainably will reward them on a scale large enough to be important to them?

The Findings of Cultural Dynamics

To get closer to the heart of this matter we need to turn to the psychology of culture and the study of cultural dynamics, to how culture is formed. I will be leaning here on the work of one of the main experts in the field, Professor Yoshihisa Kashima (**2019**), who offers a valuable perspective on sustainability and climate change and discusses culture as a method of adaptation. To better understand how culture forms, it is important to be aware of the dynamics of it. For example, when we talk about networking and hybridisation in the context of inter- or transcultural studies, we in fact refer to the ways people acquire cultural information. According to cultural dynamics, knowledge accrues through genetics, individual learning and social learning (**Kashima, 2014**). These three methods of information gathering play a major role in the three main processes of cultural dynamics, which, according to Kashima, are (1) generation of variation of information, (2) transmission of cultural information among individuals, and (3) retention of information, where some information is kept and some lost (**Kashima, 2014**). These processes of generation, transmission and retention shape the distribution of cultural information among a population in a community and therefore determine how a culture develops over time.

If we bring this framework of cultural dynamics into our discussion of the embedment of Sustainability Culture, it seems obvious that our biggest challenges are in the proper transmission of the relevant information, and maybe even more so, in the retention of the information by the people

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who are receiving it. They need to then make this information part of their value system and act on it, or, as expressed above, they need to at least think the world will meaningfully reward them for it. According to Kashima, there is a major functionalist drive in this process of information retention. Often information that is functional, adaptive and useful for survival is likely to increase in frequency while the opposite information is likely to decrease. Yet it is not only through selection that retention takes place. Attraction also plays a part, meaning that cognitive or communicative biases can work to guide and/or maintain retention of information. A very important part of cultural dynamics addresses the issue of adaptation to threats to the intragroup environment. Social integration is not a given and requires cultural ideas and practices to maintain. Kashima says that the most fundamental problem here is the maintenance of social cooperation among large numbers of people who are genetically not related to each other. It is generally understood that humanity as a species can gain greater benefits when everyone cooperates and contributes to the greater good. However, individually, it is also true that a person may gain bigger benefits for themselves (saving costs or getting rewards) by not participating and not contributing to the greater good. So here we have a Great Dilemma: can a person be expected to contribute to the greater good—for example, fighting climate change—at their own expense? If it is easy and profitable to get a 'free ride', how can cooperation be achieved? Right now, for example, being in the oil and gas industry is simply too profitable to give up for many. Our cultural norms based on free-market principles are not directed to its phasing out. Crucially, economic rewards are determined by a neoliberal system that has become dominant in the Western world, one in which money 'rules and efficiency and productivity set the standard for meaningful activity.

Research has provided some possible solutions to this dilemma, with the most important mechanism for sustained, large-scale cooperation among strangers being the formation and maintenance of a cooperative cultural norm where government plays a crucial role (**Chudek & Henrich, 2011**). Another mechanism that can enhance social integration is emotion sharing: 'emotionality of cultural information tends to facilitate its diffusion because people tend to share emotional experiences' (**Rimé, 2009, as quoted by Kashima, 2019**). Social sharing of emotional experiences facilitates social bonding between those who share information and has an important social solidarity function (**Peters & Kashima, 2007; Páez et al., 2015**). A third mechanism is the performance of ritual, which increases social solidarity. In particular, low-arousal and high-frequency rituals (like drills or morning classroom rituals) can increase participants' identification with a large-scale social unit or purpose (**Atkinson & Whitehouse, 2011**).

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Kashima offers a further theory on how humanity can develop a culture of sustainability which is based on the concept of human environment (or 'niche') construction and has four critical elements: human–nature connectedness, human–artifact relations, interpersonal conversations, and visions of an achievable utopia (**Kashima, 2020**). If we look at the foundational element in his theory, Kashima suggests that the development of Sustainability Culture starts with an improved sense of connectedness between human beings and nature. This model proposes the assumption should be that the world will reward people meaningfully if they feel more connected to nature. This is a reasonable assumption: the disconnect between people and their environment is a foundational problem in the Anthropocene and for sustainable development. But it is also clear that this disconnect is not going to be solved by drawing up a theoretical model. However much sense his theory makes, Kashima ends up in the same loop of logical paradox, concluding that a culture of sustainability is 'what makes such niche construction possible', while proposing that it is through the appropriate niche construction that sustainability culture can be developed (**Kashima, 2020**).

Conclusion

It is the purpose of this Introduction to show that culture plays a crucial role in the processes that could hopefully lead to a more sustainable development of our lifeworld. As the above examination has shown, even though people largely may wish to be more sustainable, they may not actually act upon it if they also feel they will not be rewarded for it because that's 'the way the world works'. It is clear that culture, in the sense of a shared value system, often decides whether we make individual sustainable life choices. A very important question is still left unanswered: how do people meaningfully connect with their environment if their overarching belief system equates environmental sustainability with personal reward?

As the proud lead editor of this special issue, I hope the articles gathered here contribute to the clarification not only of what Sustainability Culture is or entails, but also to the factors that may help solve the Great Dilemma surrounding its proliferation. Many of the papers assembled here arose from contributions made to the International Conference on Sustainability Culture (ICSC) editions one through three, held from 2022 through 2024 and hosted by National Chung Hsing University in Taichung, Taiwan. I founded and organised the ICSC exactly for the purposes of exploring the above issues, triggered by my curiosity regarding why young people would move from their prosperous, relatively easy city lives into the difficult life of organic farming in the countryside. Why would these people, or any people, want to live more sustainably? That is the question.

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Acknowledgements

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An Applied History of Indigenous Deer Hunting: Lessons in human-environmental relationships from Dutch Formosa

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Abstract

In the context of global environmental change and increasing calls for sustainability, history can provide critical lessons on how to initiate a transition towards a more equitable, sustainable, and environmental-friendly future. This research seeks to uncover such lessons through a case study that examines deer and deer hunting in seventeenth-century Dutch Formosa, drawing connections to contemporary discussions on Indigenous hunting practices. By reading archival materials from the Dutch East India Company and Chen Di's travel records against the grain, this research foregrounds the historical agency of Indigenous peoples and non-human actors. It posits that current frictions between Indigenous hunters and the Taiwanese state must be understood through the lens of settler colonial history. Borrowing from Povinelli's concept of geontopower, this study argues that ongoing transformation of Indigenous hunting practices and human-deer relationships resemble seventeenth-century geontological power formulations. These findings offer valuable lessons that can inform current debates on Indigenous hunting practices in Taiwan as well as wider debates on sustainability cultures.

Keywords: **Dutch East India Company; Taiwan; Indigenous peoples; deer hunting; geontopower; applied history**

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Introduction

In 2013, Tama Talum, an elderly Bunun tribesman, was arrested and subsequently sentenced to three and a half years in prison by the Hualien Country District Court in Taiwan. Talum was convicted of killing two protected deer species with an illegal weapon, breaching both the Wildlife Conservation Act and the Controlling Guns, Ammunition and Knives Act. His defence vainly argued that hunting forms an intrinsic part of Bunun culture and that Talum's motive was to support his ailing mother. Talum's arrest and conviction sparked a prolonged and fierce debate on indigenous hunting rights in Taiwan. The case was taken to the Supreme Court, which, in the notable Interpretation No. 803 of 2021, declared certain provisions of the Controlling Guns Act unconstitutional, including the requirement that Indigenous hunting weapons be handmade. However, the Conservation Act was upheld as constitutional, and Talum's sentence was not overturned. A rare presidential pardon issued by President Tsai Ing-wen two weeks after the court ruling spared Talum from imprisonment.

What are we to make of this case? Why did it lead to such a protracted legal battle that even attracted foreign media attention? The Talum case epitomised the ongoing frictions between Indigenous communities and settler colonial states regarding differing perceptions and epistemologies about human-environmental relationships. Talum's defence invoked the right to practice traditional Indigenous lifestyles and argued that Bunun hunting fundamentally differs from commercial hunting and does not threaten animal populations. In contrast, the Government of the Republic of China (ROC), which controls Taiwan, delineated appropriate hunting practices and regulated interactions with certain wildlife through its legal statutes. The Conservation Act of 1989, implemented to prohibit commercial hunting, imposes significant restrictions on Indigenous hunting by requiring hunters to specify the number and types of animals to be hunted through an administrative process. And what about the deer? They have become central to these discussions on conservation and animal rights but are themselves represented and shaped by the island's four-hundred-year history of settler colonialism.

This research analyses the historical origins of this coming together of deer, Indigenous hunters, and state courts in Taiwan. It first provides an overview of existing research into the seventeenth-century origins of deer hunting on the island and proposes a more inclusive, posthumanist approach to this history by using the concept of 'geontopower'. Second, it provides a brief overview of Taiwan's deer history, providing space for deer in history-making processes. Third, this research outlines the geontopower formulations under Sino-Dutch settler colonisation through primary source analysis. Fourth, and last, it argues that these geontopower

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formulations under the first colonial power structures in Taiwan help to understand current discussions on Indigenous hunting rights on the island. By doing so, this study provides valuable insights into the historical and violent processes underpinning the transformation of human-environment relationships, which are integral to sustainability cultures in settler colonial states such as Taiwan. These insights not only help contextualise the conflicts exemplified by the Talum case but also highlight the potential for rethinking current human-environment relationships.

Histories of Dutch Colonial Taiwan

The continuous salience of four centuries of settler colonialism in Taiwan is reflected in the asymmetrical historiography of colonial, Indigenous, and deer history. The arrival of the Dutch East India Company on Taiwan in 1624 is frequently regarded as the beginning of the island's modern history. This period has been used ideologically to support state-building and 'Chinese nationalism' by depicting it as the symbolic beginning and advancement of Chinese immigration (**Chiu, 2008: 9**). This national narrative has been challenged by various global histories that highlight the complexities of the relationship between the Company and the many Chinese merchants, hunters, and sugar farmers who migrated to the island under the Company's institutional framework during its forty-year presence (**Blussé, 1986; Shepherd, 1993; Heyns, 2003; Andrade, 2008**). Besides Sino-Dutch interactions, these global historical analyses of seventeenth-century Taiwan have also incorporated histories of Japanese sovereignty claims (**Clulow, 2016**) and the brief Spanish presence in the northern part of the island (**Borao, 2007**).

Despite challenging nationalistic narratives, historical research on Indigenous Peoples in Taiwan is still characterised by the primacy of settler agency. Although the emergence of the Indigenous rights movement in the 1980s and 1990s has led to increased scholarly attention on both historical (**Blussé and Roessingh, 1984; Kang, 2003; 2018; Chiu, 2008**) and contemporary developments (**Huang et al., 2021: 1-2; Simon et al., 2023**) within Indigenous communities, research on Indigenous hunting practices in seventeenth-century Dutch Formosa—referring to the former Company-controlled area on Taiwan's southwestern coastal plain—have largely maintained a settler-focused narrative.

This is also evident in global histories of the wider Southeast Asian deerskin trade (**Winters, 2020; Laver, 2012; Sprey & Hall, 2020**) and settler exploitation of the environment (**Richards, 2003: 89–111**) as well as micro-histories detailing the Sino-Dutch exploitation of deer through systems of hunting licences and village leaseholds (**Liu, 1998; Shepherd, 1998;**

Andrade, 2005; Tseng, 2011; Koo, 2011; Cheng, 2017). In contrast, research on contemporary Indigenous hunting practices has provided more space for Indigenous agency, analysing the tensions between Indigenous hunting rights and state law (**Charlton et al., 2017; Simon, 2009**), the potential benefits of Indigenous hunting for wildlife conservation (**Simon and Mona, 2015**) and sustainability (**Fang et al., 2016**), as well as the conservation of Indigenous hunting education (**Chang et al., 2015**). However, these contemporary analyses remain largely anthropocentric, often neglecting the role of the hunted animals and treating the early settler colonial structure and context in which Indigenous hunting transformations and contemporary frictions have emerged as self-evident.

Towards More Inclusive Notions of Historical Agency

In writing an environmental and deer history, this study aims to create analytical space for Indigenous epistemologies and animal agency. Deer history is understood here as the human record of deer-human interactions from which deer agency can be uncovered. By doing so, it responds to posthumanist calls within the fields of environmental and animal history for less anthropocentric notions of historical agency (**Domanska, 2018**). Many animal histories have explored the connections between (settler) colonial transformations of (domestic) animals in colonised (**Coleman, 2004; Swart, 2010**) and colonising spaces (**Landry, 2008**) as well as the changing perceptions of animals and animal agency over time (**Datson & Mitman, 2005; Ritvo, 2010; Pearson, 2013; 2016**). These histories have been extended by research on animal geographies, analysing 'how the ways in which human and nonhuman agencies have shaped each other through time' (**Rutherford & Wilcox, 2018: 3**).

This study continues these efforts for more inclusive notions of historical agency by going beyond a narrow analysis of deer hunting from the perspective of contesting sovereignty claims or settler colonial policies. In doing so, it aims to do justice to the historical development of Indigenous hunting practices as well as the contested histories of Taiwan's different deer species, which have experienced successive waves of settler colonialism in various ways. Thus, this study ventures into the field of posthumanism and engages with species entanglements (**Harraway, 2008**) and assemblages (**Tsing, 2015**) that have materialised within the consecutive settler colonial structures of exploitation and resistance in Taiwan's modern history.

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Geontopower

This coming together of deer, Indigenous contestations, and state power also exposes underlying notions of what constitutes the ordering of Life and Nonlife, as defined by Elizabeth Povinelli's concept of geontology (**2016**). Are deer merely entities that need to be conserved or hunted for their 'products', living within an inanimate landscape? Or do we regard these animals as integral members of our community and cosmologies, with whom we coexist or *become with* (**Harraway, 2008**) in a perpetually changing landscape of ever-changing forms (**Kohn, 2013: 161–165**)? According to Povinelli (**2016**), the power to define this ordering and division of Life and Nonlife constitutes 'geontopower': 'a set of discourse, affects, and tactics used in late liberalism to maintain or shape the coming relationship of the distinction between Life and Nonlife' (**2016: 4**). The Talum case illustrates how this power is codified in laws that directly regulate the lives of Indigenous peoples, confining them to a cramped space in which they struggle to preserve their 'critical analytics and practices of existence' (**2016: 6**). As Povinelli argues, this formulation of power is particularly evident in settler colonialism:

> *This division, and the hierarchical relations it creates, has long operated 'in the open' in settler colonialism. It allowed colonialism and capitalism to sever and then to relate a hierarchy of things, rights, and values— the rock and mineral, the indigenous and black, the white and his glorious future* (**Povinelli, 2019**).

Dutch colonial Taiwan is an interesting case study, since racial hierarchies were less distinct as Chinese settlers shared and expanded settler geontopower, surpassing the notion of Asian settler colonialism as merely the (un)conscious appropriation of Indigenous physical and socio-cultural landscapes within a white settler system (**Saranillio, 2013**). Moreover, the division and the hierarchal ordering of Life and Nonlife not only cramped Indigenous space but also initiated transformations in various deer populations in Taiwan that persist today.

By incorporating the concept of geontopower into a historical analysis of the interactions among deer, Indigenous hunters, and settler geontologies in Dutch colonial Taiwan, this research goes beyond anthropocentric biopolitical notions of settler colonialism (**Morgensen, 2011**). It demonstrates that, in addition to Indigenous ways of life, belief systems, and coexisting, animals—specifically deer—have also experienced the settler colonial logic of elimination (**Wolfe, 2006**), as evidenced by the extinction of Sika deer. This study contends that seventeenth-century settler colonial formulations of geontopower are still relevant for understanding contemporary debates on Indigenous deer hunting in Taiwan.

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Methods and Sources

By contextualising and historicising current debates regarding deer hunting, this study aims to inform current stakeholders and help them avoid falling into the geontological pitfalls of the past. Therefore, this study constitutes an applied history. Similar research on the Company's hunting of the eastern Arctic Bowhead whale has provided insights for contemporary environmental regulations and wildlife conservation policies (**Allen & Keay, 2004**).

However, this study aims to go beyond a mere policy analysis by making a methodological contribution as well. By comparing early modern and contemporary forms of settler colonialism in Taiwan, this research expands on the three general epistemological concerns of applied history outlined by Mens (**2023: 96–98**): focusing on the particular rather than the universal, emphasising qualitative over quantitative analysis, and highlighting human agency. Through qualitative analysis of contemporary and historical archives, this research identifies 'seemingly recurrent patterns of behaviour' in settler colonial geontopower related to Indigenous deer hunting practices, thus addressing the first two concerns (**Mens, 2023: 97**). Additionally, this study demonstrates the potential for applied history to incorporate non-human forms of historical agency, illustrating that 'applied history can consider the long-term implications of decisions' that are not exclusively human (**Mens, 2023: 98**).

This study analyses a combination of Dutch and Chinese historical records, including the Dutch East India Company's daily registers (*Dagregisters*) which were originally held at Fort Zeelandia (**Blussé et al., 1986**), archives of Dutch-Formosan encounters compiled by Blussé et al. (**1999; 2000; 2006**), and the *Dongfan ji* (東番記) written by Chen Di (陳第), a Ming military advisor and literatus (**Thompson, 1964**). By reading the Company records against the grain, looking for the unwritten (**Stoler, 2009**) we can uncover both Formosan agency (**Chiu, 2008: 10**) and animal agency (**Fudge, 2014: 264**). Additionally, Chen Di's record of Formosan deer hunting practices, understood by one critical scholar as an example of Chinese imperial discourse based on legitimate otherness rather than inherent superiority (**Jenco, 2021**), provides valuable insights into early modern Ming-Formosan geontological debates.

The Lamentation of the Taiwan Deer

The Formosan Sika (*Cervus nippon taiouanus*), the Formosan Sambar (*Rusa unicolor swinhoei*), and Reeve's Muntjac (*Muntiacus reevesi*) are the three deer species most frequently documented in historical and contemporary

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human records of Taiwan. Successive waves of settler colonialism over the past four centuries have impacted these deer differently.

The Sika are most prevalent in historical accounts due to their behaviour, habitat preferences, and interspecies competition. Sika migrated from southern China to Taiwan approximately twelve thousand years ago (**McCullough, 2009: 550**). They rapidly adapted to the island's environment due to a lack of natural enemies and the abundance of grasslands and forests (**Chen, 2000**). Sika usually form herds and prefer open- and mixed-feeding spaces with grasses, forbs, and browse, thriving even in areas disturbed by natural events or human agriculture.

Historically, this adaptability led to numerous human-deer encounters in Taiwan (**McCullough, 2009: 552–553**), further facilitated by the island's landscape. The central mountain range, characterised by dense forests and difficult terrain, was impassible for the Sika due to occasional mudslides caused by earthquakes, typhoons, and heavy rainfall. Competition with the larger Sambar deer, which were physically stronger and better adapted to this challenging landscape, further hindered the Sika's migration to higher elevated areas (**McCullough, 2009: 551–552**). Consequently, Sika remained confined to the human-populated southwestern coastal plain, resulting in frequent Sika-human interactions.

The seventeenth century marked the beginning of a period of continuous hardship for Sika deer, during which their numbers were reduced as the settler frontier continued to expand. Eventually, overhunting, facilitated by settler geontopower, led to their extinction on the island in the 1970s. Subsequent efforts by the ROC government to establish a recovery programme and reintroduce Sika deer into the wild were closely connected to the historical Sika-human encounters in Taiwan and China (**McCullough, 2009: 555–556**). Sika have become ingrained in the island's historical memory and continue to be celebrated, as evidenced by their depiction on Taiwan's 500 New Taiwan dollar (NTD) bill and their presence in numerous deer sanctuaries and national parks in which they serve as tourist attractions.

The Sambar and Muntjac are also closely connected to the island's colonial history, as reflected in their nomenclatures that trace back to the nineteenth-century British naturalists and British East India Company employees, Robert Swinhoe and John Reeves, respectively. Besides Taiwan, both species have also inhabited the English landscape since the late nineteenth century after being introduced there in captivity (**Cooke, 2019: 3-4**). The Muntjac, in particular, has a complex migration history and is now part of heated debates on wildlife conservation in various European countries (**Ward et al., 2021**).

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In Taiwan, the Muntjac and Sambar have only recently gained prominence in human records due to several factors. Firstly, both deer were likely less favoured hunting targets than the Sika for medicinal purposes due to their short antlers (**Cooke, 2019: 21**). Moreover, their habitats in higher elevations and hills were less accessible to seventeenth-century settlers. Furthermore, the Muntjac, being a solitary and significantly smaller animal than the Sika, does not have a specific rutting season (**Yen, 2017: 49**), reducing the risk of overhunting during these periods. However, these sheltered conditions have changed in recent decades, especially for the Sambar, which is now farmed for their velvet antlers (**Chan et al., 2009**).

The violent displacement of Indigenous communities to the central mountain range over the past four centuries likely increased human-deer encounters since these communities moved closer to the habitats of the Muntjac and Sambar. In the 1980s, with the implementation of international conservation policies at the national level, both the Sambar and Muntjac were granted protected status in Taiwan. This combination of marginalising Indigenous hunting practices and stricter conservation policies has led to increased tensions between the state and Indigenous hunters. This tension culminated in the Talum case, where Talum was convicted for poaching a Muntjac. Thus, these deer have become prominent in human records primarily due to the restriction of Indigenous hunting territories and the perpetuation of settler geontopower.

Due to their incidental and inconsistent presence in archival records, it remains challenging to construct a comprehensive history of Taiwan from the perspective of these deer, as it is impossible to directly convey their experience or, from a subaltern perspective, 'speak for them' (**Spivak, 1988**). Nevertheless, imaginative endeavours, such as Hsieh Pi-hsiu's *Lamentation of the Taiwan Deer*, offer a glimpse into what a historical, first-animal account could look like:

> *We could once leisurely stroll in the forests*
>
> *A beautiful view on the face of Formosa*
>
> *We were closer to this island prior to mankind*
>
> *Should beauty equate sorrow?*
>
> *Should a rarity become a target?*
>
> *Should extinction be the fate of escape?*
>
> *The greed of mankind*
>
> *The bloodiness of mankind*
>
> *Wearing our branched antlers*

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Striding with raised heads in urban jungles

Yet still cannot conceal that intrinsic ugliness

We cannot be transplanted or replaced

Hereafter

We will only be a frame-mounted scenery

of a deep and verdant forest (**2022: 77**).

Contested Indigenous Hunting

Hsieh's poem captures the transformation of deer from experiences of abundance, freedom, and Life into experiences of hardship, containment, and Nonlife. This transformation also extends to Indigenous hunting practices and deer relationships, which were subjected to oppressive geontological power formulations of settlers. The records of Chen Di and early Dutch missionaries residing in the Sirayan villages on the southwestern coastal plain reveal insights into pre-settler Indigenous hunting practices and deer relationships, documenting Indigenous hunting methods, customs, and rituals. For example, in Soulang, a Sirayan village, hunters employed fire to drive deer herds into ambushes where they were speared using assegais (**Blussé et al., 1999: 21**). The account of Chen Di reveals how hunters encircled deer herds (**Thompson, 1964: 175; Liu, 1998: 172, 173**), a method also used by the Favorolang tribes north of Tayouan (**Chiu, 2008: 16, 17**). Accounts of Dutch missionary George Candidus also include these encircling methods in 1628 and mentions the use of bells attached to assegais to track speared deer that had escaped. Other hunting methods included snares made from bamboo, rattan, or rope that were placed in dense foliage or open fields, and bows and arrows that were used by smaller hunting parties or individual hunters (**Blussé et al., 1999: 116, 117**). Hunting regulations, such as the prohibition of individual deer hunting and the restriction of the main hunting season to winter, ensured the recovery and health of deer herds over long periods of time (**Thompson, 1964: 175; Liu, 1998: 172, 173**).

Although deer hunting was not primarily practiced for commercial purposes, Sirayan villages did trade various deer parts with Chinese and Japanese merchants. Chinese traders were mostly interested in the organs and venison of deer used for medicinal purposes. Japanese traders valued deerskins because of their water-resistant character, which made them a suitable fabric for different kinds of clothing and armour used by the samurai classes (**Laver, 2012: 14; Sprey and Hall, 2020: 218**).

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However, as evidenced by early Dutch accounts of Soulang in 1623, the use of procured deer parts went beyond mere economic purposes:

The treasure of their house (…) consists of deerskins which they lay down for each other at their gatherings, to sit or to sleep on. They also show off their assegais, swords, or choppers, of which even the handles are made of deerskin, nicely or artfully drilled and engraved, in which they are extraordinarily skillful. There is no doorpost, pillar or anything that can possibly have something attached to it in or around the house that has not been covered with deerhorns, heads, jaw-bones or other trumpery. Why they do this, out of peculiarity, superstition or some other reason, I do not know (**Blussé et al., 1999: 16, 17**).

The use of deer parts for Sirayan military purposes is also evidenced by deerskin utilised in war drums and warrior's garlands (**Chiu, 2008: 17**). However, as the passage above shows, human-deer relationships also developed on a sociocultural level. Sirayan wedding gifts often consisted of deerskins and wedding rings were made of deer bone (**Blussé et al., 1999: 17**). Furthermore, deer also featured prominently in spiritual practices, with skulls of deer and boar used in offerings to bless rice harvests. This might be related to the abstention of consuming certain foods in some Sirayan villages to prevent deer and boar from destroying the crops (**Blussé et al., 1999: 86; Chiu, 2008: 16; Andrade, 2008: 15**). The Dutch accounts correspond to that of Chen Di who also notes the various uses of deer parts (**Thompson, 1964: 175**). This interconnection between humans and deer shows a form of human-animal communication aimed at fostering a beneficial interrelationship.

This interrelationship found in the archival sources is also significant for contemporary discussions on Indigenous–deer relationships. For example, potential traces of these historical hunting customs, rituals, and purposes are found in contemporary Indigenous hunting practices. The Atayal and Truku communities, for example, limit hunting seasons and enforce rules to ensure animal recovery (**Fang et al., 2016: 38; Simon, 2023b: 82–84**). Additionally, Scott Simon's ethnographic research highlights that hunting among the Sediq and Truku goes beyond the mere practice of killing an animal:

Hunting is important for the intergenerational transmission of lifeworlds, as hunting provides a rare context in which Sədeq men transmit bodily skills and the ethics of Gaya to their sons in their own languages. Hunting is a relationship with deceased ancestors, whom hunters invoke in rituals surrounding the hunt and remember while traversing the pathways of the forest (**2023a: 81**).

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Because of the continuous salience of deer and other hunted animals in Taiwan's Indigenous cosmology, society, and economy, both historical and contemporary records show no evidence of overhunting by Indigenous peoples (**Thompson, 1964: 177; Simon, 2009: 410; Weng et al., 2022**). There is convincing evidence that Indigenous hunting customs are designed to reduce the stress on wildlife and ensure the sustainability of animal populations (**Fang et al., 2016: 37–39**). Although Indigenous beliefs and customs have been affected by conversion efforts of Catholic and Presbyterian missionaries throughout Taiwan's settler colonial history, ethnographic research illustrates their persistence in contemporary Indigenous hunting practices (**Fang et al., 2016: 39; Simon, 2023b: 87**).

This does not imply that all Indigenous hunting should be viewed through the lens of Rousseauian 'noble savagery'. Contemporary ethnographic research has highlighted significant issues associated with the illegal bushmeat trade, where traders exploit the socioeconomically marginalised position of Indigenous communities by offering income in exchange for hunting (protected) wildlife (**Simon, 2023b: 86–87**). As mentioned before, historically, trade activities by Indigenous communities surrounding deer were not uncommon prior to the arrival of the Company. However, the key difference between these past and present practices lies in the nature of the trade. While historical Sirayan deerskin trade supported both a high standard of living and healthy wildlife populations, contemporary hunters face pressure from market forces and legal restrictions imposed by the state (**Simon, 2023a: 86**), which echo the constraints imposed by settler colonialism.

Seventeenth-Century Settler Geontopower

The coming to be of the cramped space within which Indigenous hunters find themselves today can be traced back to the arrival of the Dutch East India Company in the seventeenth century. This period marked the onset of Chinese settler colonialism and the earliest coming together of various deer, Indigenous, Dutch, and Chinese assemblages, which brought about significant geontological transformations. Even the Company's decision to settle in Tayouan was partly influenced by the presence of large deer herds on the southwestern coastal plain (**Blussé et al., 1999: 1–3**). A 1623 scouting report on the Sirayan village of Soulang by Dutch merchants Jacob Constant and Barend Pessaert indicates the Company aimed to maximise its procurement of deerskins from the very beginning of their settlement:

…we do not doubt that this country has less abundance of game than Siam or any other place, for, as soon as you go ashore, across from the roads of Tayouan it leaps up before your eyes in great number, just like

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the wild boars whose plenitude in our opinion can be compared only to that of few other countries. The interior of the land consists more or less of clay and it would be fertile (in my opinion) if the natives did not lack knowledge, diligence, and industry, or if the Chinese who live among the natives were not too weak to turn their hands to the plough. […] there are only a few things available that would be of use to Your Honour's Company. These are well known to everybody: a good roadstead and safe anchorage for ship. A steady supply and considerable quantity of deerskins (for which we would have to wait with patience) (**Blussé et al., 1999: 21**).
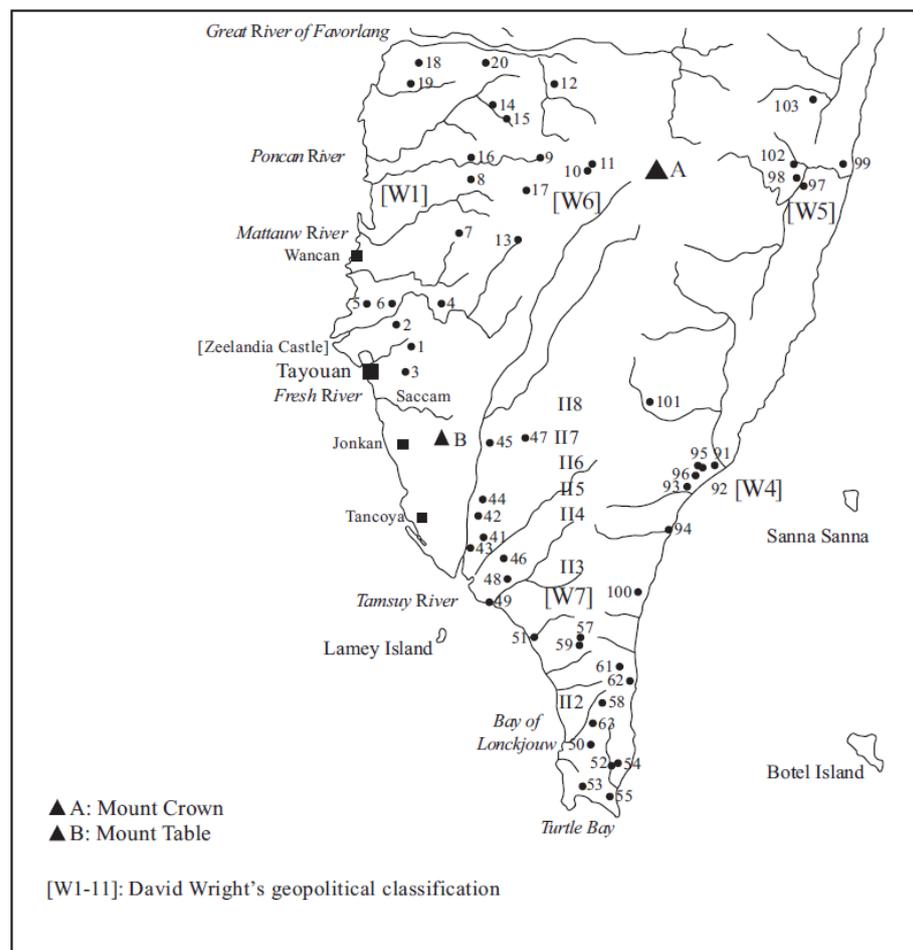
*Figure 1. Chiu's (2008) Overview of the Geographic Distribution of Formosan Villages in Southern Formosa. Source: Chiu (**2008, xxv**). Chiu based this map on two different maps in Shepherd (**1993: 11**) and Kang (**2005: 24, 169**). David Wright's geopolitical classification refers to the work of Scottish Company servant David Wright, who described the power relations between different Formosan villages and the Company in Taiwan. Chiu divides these into eleven categories (see **Chiu 2008: 112**). The Sirayan area constitutes of the villages 1 through 3 and 5 through 6, which are respectively Sincan, Bacaluan, Tavakan, Soulang and Mattau. The full list of villages can be found in **Chiu 2008: xxvii**. This map was used with permission from the author.*

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From 1636 onwards, the Company gradually achieved this goal due to the materialisation of relatively stable and peaceful relations with Indigenous villages in the southwest (see Figure 1) (**Andrade, 2008: 135, 136**). This *Pax Hollandica* was primarily constructed through the Company's divide-and-conquer strategies, which also resulted in the violent subjection of the Favorolang villages north of Tayouan in 1638 by a Dutch-Sirayan military force. As a result, already-present Chinese deer hunters were more protected from Indigenous resistance, transferring a large amount of hunting fields to Dutch and Chinese hunters, who gained two-thirds of the total hunting territory (**Blussé & Everts, 2000: 227**). The intrinsic difference between the Company's objectives in procuring as much deer as possible and those of the Sirayan communities is also evident in the passage above. These objectives were underpinned by distinct geontologies which were most clearly manifested through the various policies issued by the Company concerning Chinese deer hunters and deerskin traders.

The peace treaty between the Company and the long-resistant village of Mattau in 1635, which served as a blueprint for subsequent treaties (**Andrade, 2008: 121–122**), provides an early glimpse of changing geontologies on the island. The treaty included a condition granting Chinese deerskin traders a free passage through the village (**Blussé et al. 1999: 304**), reflecting the perception that deer were first and foremost perceived as a commodity. Additionally, Mattau was forced to deliver a large sow and a boar to the governor at the fortress annually, symbolising the transfer of sovereignty to the Company (**Blussé & Everts, 2000: 16, 19, 39**). This underscored the geontological transformation of animals into Nonlife, a monetary tool used to secure the transfer of sovereignty. This transformation was further reinforced by the introduction of taxonomies *cabessa*, *bariga*, and *pee* for determining the price of deerskins based on their quality. In 1644, four *cabessa* skins were worth eight *bariga* and sixteen *pee* (**2000: 433**). Nonlife, therefore, does not imply that deer are seen as lifeless beings, but that they are subject to a colonial and hierarchal ordering in which their economic potential is taken as the most important feature of their aliveness.

Following the conquering of Mattau, the Company began issuing the first hunting licences exclusively to Chinese settlers (**Blussé & Everts, 2000: 22; Andrade, 2008: 121–122**). These licences enabled the Company to increase the procurement of deerskins. Hunters used pitfalls to trap large herds of deer at once (**Andrade, 2008: 137, 138**), severely depleting Sika deer and confining Indigenous hunting to the margins. In 1639, the Company banned pitfalls, not out of concern for deer populations or Indigenous hunting practices, but because pitfalls caused many deer to tremble and bleed, resulting in blood-stained skins that reduced their market value (**2008: 136**). As early as 1636, when the first licences were

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issued, Formosan Governor Putmans disregarded multiple warnings from missionaries in the Sirayan villages regarding the depletion of deer (**Blussé & Everts, 2000: 22, 28**). It was only when it became evident that pitfalls threatened the profitability of deerskin procurement that the Company acted. Therefore, the Company's attempts to 'conserve' deer by banning harmful hunting practices maintained settler geontologies, in which the economic potentiality of deer was perceived as the most important aspect of their being.

These geontologies were perpetuated in settler formulations of power even after the abolition of the licence system. In 1644, the village leasehold system was introduced, granting exclusive trading rights to Chinese merchants to trade with 'pacified' Indigenous villages. The Company's intent was to retain the profits from licences while gradually shifting hunting practices back to Indigenous inhabitants, who would sell their produce to Chinese leaseholders, forcing them to participate in the colonial market. In practice, lease prices skyrocketed, and Chinese leaseholders faced intense pressure to break even. This resulted in leaseholders squeezing Indigenous communities financially to the extent that the Company began providing subsidies to some villages, funded by a fraction of the profits from the deerskin trade and leasehold system (**Blusse & Everts, 2006: 222, 269; Andrade, 2008: 149, 150, 167–169**).

Geontological transformations of deer were furthered by the tribute system implemented by Governor Traudenius in 1643, which built upon the conditions of the peace treaty with Mattau. This system demanded tribute from villages, often in the form of deerskins, symbolising the Company's power over conquered villages (**Blussé & Everts, 2000: 351, 432–433**). In some cases, such as in the village of Parissinawan, inhabitants had to barter deerskins with more remote villages to meet the Company's tribute requirements (**2000: 474**). In the northeast of Formosa, villages were even forced to pay in gold or silver due to their lack of deerskins (**2000: 577**). As a result, deerskins began to function as currency in several parts of the island by 1649 (**2000: 352**). This tribute system exemplifies how geontologies were mirrored in treaties, often backed by military power, constructing hierarchies and regulating what counts as valuable or exploitable. This even affected villages that had previously remained unaffected by the deerskin trade and the colonial market.

The geontological transformations and the forceful incorporation of Indigenous hunting practices into settler markets, made possible by the implementation of the licence, lease, and tribute systems, led to various conservation policies by the Company aimed at safeguarding the steady 'supply' of deer which was threatened by the self-inflicted problem of overhunting. The previously mentioned ban on pitfalls in 1639 and the

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1647 ban on snares issued by the Batavian government are examples of this. However, there were other considerations for implementing such policies, for example, in 1647, to maintain political stability:

You will not allow to set snares for catching deer on Formosa until our further notice, so that the deer and hinds will have some breathing space, and the indigenous peoples will have no reason whatsoever to complain that we are diminishing their sustenance by that measure; for if their animals do become extinct, they will have a hard time finding any food at all (**Blusse & Everts, 2006: 199**).

Additional motivations for issuing 'conservation' policies were related to the Company's aim to increase Indigenous farming activities. In 1651, the Company issued a ban on snares and nets for Sirayan inhabitants, hoping this would compel them to abandon their hunting practices, deemed as lazy, and to take up farming instead:

Therefore we now have once more unanimously decided completely to abolish this setting of snares and the spreading of nets for this year [...] notwithstanding the fact that Reverend Gravius residing in Soulang is raising some not unreasonable objections, that are however in our opinion essentially unfounded, because he seems to be more concerned about looking after the interests of the Soulang people in particular, than about our goal of the general preservation of hunting in Formosa. Even nowadays the inhabitants, by employing their old practices (when they did not yet know anything about these methods), and by hunting without setting nets or snares, can catch as much game to support themselves, while in addition these lazy people will also be engaged in steady physical exercise through which they might in time be stimulated to take up farming and other gainful labour (**Blusse & Everts, 2006: 363**).

These passages highlight the Company's main interest in maintaining the economic potential of deer. They also uncover a different worldview regarding deer hunting and deer populations compared to Sirayan inhabitants whose societal and cosmological relationships with deer populations were erased by these policies, following Wolfe's notion of settler colonialism as constituting an inherent logic of elimination (**2006**).

The Continuous Salience of Settler Geontopower

The seventeenth-century geontological transformations described here reshaped the position of deer within the hierarchy of Life and Nonlife, leading to their systematic elimination and permanently altering their status in Taiwan. Today, the animal continues to be regarded as a pest by

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people who compete with deer for (farm)land and grazing space for settler-introduced cattle (**Pei, 2002: 15**). The paradox of deer conservation due to self-inflicted problems of overhunting persists as well. Sika deer, though protected by the textual reality of state conservation laws, continue to be commercialised as tourist attractions in zoos, farms, and national parks. The construction of national parks in Taiwan, based on US models rooted in colonial and racialised ideas of Indigenous peoples (**Ramutsindela, 2020: 207, 208**), has especially been significant in the containment of Sika and other protected deer species, as well as the restriction of Indigenous hunting activities (**Wang, 2021: 227–228**).

Similarly, the seventeenth-century geontological transformations that marginalised Indigenous hunters and led to a forced participation in the colonial market through licence, lease, and tribute systems continue to be resembled by contemporary state policies on Indigenous hunting practices. Restrictions on hunting weapons, which continue to impede Indigenous hunting possibilities, resemble the Company's colonial policies aimed at forcing Indigenous people to intensify farming by restricting hunting methods. Furthermore, the disruption of Indigenous relationships with deer through imposed settler systems continues to resonate, as Indigenous hunters remain bound by licences issued by local authorities. In response to the No.803 interpretation and the Talum case, an amendment was proposed to increase Indigenous self-management of hunting practices through different regulative stages: maintaining current hunting regulations, a self-management trial, and complete self-management (**Zheng, 2022**).

Even in the most autonomous scenario of self-management, hunters continue to be restricted by administrative contracts with the local authorities. In practice, the most common scenario for Indigenous hunting, under current regulations, requires hunters to declare in advance the number and kind of animals they intend to kill, reflecting a persistent unwillingness to acknowledge Indigenous hunting practices and underlying geontologies (**Zheng, 2022**). Put differently, it shows the continuous cramming of Indigenous space 'to keep relevant their critical analytics and practices of existence' through state policies (**Povinelli, 2016: 6**). Current problems surrounding the illegal bushmeat trade show how difficult it is to escape this process (**Simon, 2023b**).

There are, however, some glimpses of hope. A recent report from the Forest Bureau in Chiayi on the prospect and development of Indigenous hunting self-management now includes sections on Indigenous culture, epistemologies, and hunting customs, including notions such as Gaya (**Zeng & Weng, 2021**). Moreover, academic evidence in support of Indigenous hunting autonomy is growing. For instance, a study by Weng

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et al. (**2022**) found that deer and other animals categorized as protected or endangered thrive in areas where Indigenous hunting occurs, demonstrating the positive relationship between healthy wildlife populations and Indigenous hunting practices.

Conclusion

The seventeenth-century geontological transformation that occurred under Sino-Dutch settler colonialism was characterised by prioritising the economic potential of deer life and the politically controlling Indigenous hunting rights. This transformation has irreversibly altered human-animal relationships on the island. However, between the first hunting policies of the Dutch Company and contemporary policies on Indigenous deer hunting, four hundred years of history have reshaped and remade human-animal relationships under different colonial regimes in Taiwan in distinctive ways. Further research can analyse how this process has exactly been shaped throughout Taiwan's colonial history.

Whether it is desirable to completely restore hunting practices prior to the first period of colonisation in Taiwan or whether it is possible to keep current hunting practices from being corrupted by profit motives are discussions beyond the scope of this study, as this calls for a discussion on the desirability of the broader capitalist system in which these hunting practices take place; a system in which labour and nature are continuously made cheap (**Patel & Moore, 2020**). Moreover, this pertains to discussions on the current political system and Indigenous governance in Taiwan.

Despite its limitations, this study can still offer valuable lessons for reflecting and uncovering potential perpetuations of settler-colonial geontological underpinnings of current state policies regarding Indigenous deer hunting. In doing so, it can avoid current stakeholders falling into the geontological pitfalls of the past. Clearly, the Talum case has revived societal debates regarding Indigenous hunting practices in Taiwan that have been around since the seventeenth century. This research has shown that applied history can play an important part in informing these larger democratic and open debates. Particularly, when these histories include more inclusive notions of human agency. Additionally, it reveals that the underlying frictions between Indigenous hunting communities and the geontological power structures enforced by the central state through laws and amendments, must be understood within the context of Taiwan's colonial past. Therefore, (re)thinking Sustainability Culture requires a critical attitude towards historically (in)formed geontological underpinnings of decision- and policy-making processes.

Acknowledgements

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Unsettling the Chemical Gaze: Artistic research on pesticides and toxic labour in European foodways

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Abstract

This article advances a reformulation of Hannah Landecker's concept of the 'chemical gaze' through artistic research. Instead of framing matter as a site of extraction and profit, the chemical gaze is reimagined as affective, uncertain, and embodied, attentive to uneven toxic relations in contemporary food production. The discussion centres on Exposición, an art-science exhibition created during a residency in Bern, which examined pesticide exposures and the precarious, gendered labour underlying strawberry cultivation in Huelva, southern Spain. Through multisensory installations combining sound, scent, visual media, and ethnographic testimony, the exhibition invited audiences to engage with the entanglements of agrochemicals, migration, and reproductive justice. The article situates this practice within interdisciplinary debates in feminist science studies and environmental humanities, demonstrating how arts-based methods can unsettle dominant imaginaries of agrochemicals and vulnerability. It reflects on the ethical and political stakes of representing toxic labour, the curatorial challenges of working with testimony, and the limitations of aestheticization. Ultimately, it argues that art-science collaborations can generate plural, critical, and sensorially attuned ways of witnessing and contesting toxicity across intimate and planetary scales.

Keywords: chemical gaze; art-science; arts-based research; toxic labour; environmental justice; agrochemicals; Huelva

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Introduction

This article centres on an art-science exhibition in which multimedia, research-based installations highlighted the intensive conditions under which strawberries are cultivated in southern Spain. *Exposición* attempted to open a multisensory space for grappling with pesticide exposures within an agricultural system that relies heavily on exploitative and gendered labour. Through the frame of *Exposición*, this paper reflects on artistic research as an experimental means of making chemical pollution perceptible, while foregrounding the need for multiple perspectives and sensitivity to systemic injustices. Looking back on the exhibition and prompted by notes in my project journal, I contemplate and contextualise *Exposición* as an interdisciplinary inquiry into systemic and uneven toxic residues. I explore how and where concepts from science studies, especially Hannah Landecker's 'chemical gaze' (**Landecker, 2019**), resonate with aesthetic theories and practices, generating insights for future interdisciplinary experiments. In particular, I tentatively propose a reformulated version of the chemical gaze in contexts of artistic research, one which replaces scientific and extractive tendencies with uncertainty and affective experience.

Exposición was developed during a residency at the University of Bern, which had been established to support artists and researchers from a mixture of disciplines to explore a shared research topic. As an artistic researcher with a background in cultural geography, I joined forces with social geographer Nora Komposch and soil scientist Adrien Mestrot (**Sabin, Komposch & Mestrot, 2024**). Together we coordinated an events program at Bern on the topic of pesticides in Europe to coincide with the residency. This program formed a basis for continuing our interdisciplinary exchanges, which had previously taken place online, with a wider community of staff and faculty, students, and local publics. The program featured fieldtrips to local farms in Switzerland and guest lectures from environmental scientists, leading to opportunities for interdisciplinary knowledge exchange. We also focussed on a regional case study for the end-of-residency exhibition, which featured ethnographic data and multimedia responses (**Sabin, 2022**). Our case study centred on the conditions of strawberry production in Huelva, Andalusia, where Komposch was already conducting fieldwork on labour conditions and reproductive justice (**Komposch, 2025**).

It is my intention with this essay (or 'assay') to carefully consider some of the affective and political implications of aestheticizing uneven toxic exposures (**Peeples, 2011**), drawing on anticolonial feminist science studies and spatiotemporal imaginaries of chemical relations from across the social sciences and humanities. In recent years, scholars have

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underscored the environmental injustices of chemical pollution, as well as practices of care and more-than-human kinship among affected communities (e.g., **Murphy, 2017; Liboiron et al., 2018; Balayannis & Garnett, 2018; Nading, 2020**). These bodies of literature resonate with creative practices and coalitions that have highlighted how industrial chemicals are not isolated entities but mix with other substances and bodies in social and political contexts. Several performance-based artworks have attempted to ritualise or reimagine practices of measuring, sensing or responding to pollution in immersive, speculative and collective ways (e.g., **Born & Barry, 2011; Calvillo & Garnett, 2019; Woolmore, 2024**). In this paper, I attempt to articulate these aesthetic moves by thinking with a concept from science historian Landecker's work on food as exposure, namely, the 'chemical gaze' (**Landecker, 2019**).

As I explain later, Landecker has described the chemical gaze as an act of prospecting for molecular solutions in industrial agriculture. In contrast, I seek to explore how the chemical gaze might be rethought, perhaps as a sensibility for creative practices that engage critically with pollution and power relations. In the first part of the article, I outline the origins of the chemical gaze and provide some considerations for reimagining said gaze in feminist and postcolonial ways. Second, I explore how the configuration of matter and media in *Exposición* mobilised novel ways of tracing relations between bodies, systems, and agrochemicals (**Agard-Jones, 2013**). I emphasise the importance of incorporating local perspectives and sensory accounts, while acknowledging some specific representational limits we faced when curating stories that had previously been gathered from a community who continue to experience precarity. Lastly, I sketch visitor responses to the exhibition along with some lessons on tracing chemical relations via multiple disciplines and sites. Fluid, faltering, and intimate, the ways in which I experiment with the chemical gaze shift throughout this piece as I seek to open further questions around chemical exposures in disciplinarily liminal spaces of intervention.

The chemical gaze according to Landecker

Where the annoyed passerby might see a riot of smelly detritus—beet pulp, fishheads, corncobs—the chemical gaze perceives carbohydrate and nitrogen. Where the naturalist might see species and kingdoms—plants, microbes, animals—the chemical gaze traces a *metabolic map* of enzymatic and energetic conversions between different kinds of matter connecting one body to another across taxonomic boundaries (**Landecker, 2019, 531**).

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The chemical gaze, according to Landecker, is a conceptual and practical frame that typified the history of agricultural intensification in North America during the early 1900s. During this time, waste from food production and processing was increasingly repurposed as animal feed or reused for the industrial production of chemicals. The gaze Landecker describes was therefore not about seeing objects, but rather *perceiving* matter in terms of its chemical properties and commercial potential. The capacity to regard waste in this way, and thus wield a chemical gaze, was not just an intellectual exercise but a prerequisite for increasing profit margins. Growth, Landecker observes, was the main object of the chemical gaze, not the toxicants that began circulating *en masse* through the food chain, ecosystems, and bodies. These phenomena were conveniently external to its field of perception.

Through speculative vignettes, Landecker illustrates the operations of the chemical gaze, as exemplified by the previous quotation. Through hypothetical encounters with beet pulp and corncobs, Landecker brings the chemical gaze to life in our imaginations. Each scene involves a comparison between modes of perception. In both examples, the subject (passerby, naturalist) is usurped by a deindividuated force known as the chemical gaze. Thus, the chemical gaze becomes that which mobilises and embodies a specific mode of relating to the more-than-human objects of its attention: food waste, plants, microbes, and non-human animals. Now, a working definition of 'the gaze' in the Oxford English Dictionary refers to a '*way of regarding* people or things which is considered to *embody* certain aspects of the relationship between the observer and the observed' (**OED, 2002**, my italics). This is a deliberately concise definition; the gaze (*le regard*) has, of course, been churned over by cultural theorists and practitioners for the past half century. Many have sought to debunk, contest, and counteract the notion of a hegemonic gaze by directing attention to feminist, postcolonial, and queer alternatives, among others.[i]

Staying with an interpretation of the gaze in the context of history of science, Landecker explains in a footnote how the initial inspiration for a chemical gaze harks back to Foucault's concept of a '*clinical* gaze' to describe the mindset of the nineteenth-century physician towards their patients (**Landecker, 2019, 544**, my italics). This connects Landecker's work with broader discourses on situating scientific practices in social, political, embodied contexts (see, also **Haraway, 1988**). In a similar vein, Evelyn Fox Keller has revealed how what she calls the 'biological gaze', once equivalated to stargazing or observing from a distance, is—in the act of setting up and focussing a microscope—'inevitably enmeshed in actual touching, in taking the object in hand, in trespassing on and transforming the very thing we look at' (**Keller, 1996, 108**). In Keller's study, the gaze of the scientist is no longer distant but relational. Turning to chemical

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pollution today, critical scholars and activists are reimagining the industrial chemical not as an isolated entity floating in whitespace but as part of systemic 'chemical relations' between corporations, states, and more-than-human communities who are disproportionately exposed (**Murphy, 2017**).

Figure 1. Polytunnels in Huelva (photograph author's own, March 2022)

Situating the research: Huelva, politics, visibility

This brings me to the case study for *Exposición*. While physically located in Huelva, the selected case transcended national borders. By focussing on the Andalusian berry industry, we designated a specific geographic area, while also unspooling the mobilities of labour migration, European foodways, and pesticides that travel through and transform ecological networks.[ii] In preparation for my art residency, I visited Komposch in Huelva to shadow aspects of her fieldwork. I learned how a long history of mineral mining in the region has in recent decades coincided with intensive agriculture, agro-industrial activities, and toxic waste dumps. Locals are disproportionately exposed to industrial pollution and seasonal workers in the berry industry are vulnerable to sprayed pesticides, especially within the concentrated atmospheres of the polytunnels (Figure 1), which, in some parts of Andalusia, extend as far as the eye can see.

Although exact figures are hard to come by, out of 100,000 workers in the Andalusian strawberry industry, around half are migrants from different regions, including ten- to twenty-thousand women who travel from Morocco on a seasonal basis (**author communication, Komposch, 9 July 2025**). Their labour takes place under precarious and exploitative conditions with little protection from toxic and endocrine-disrupting

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agrochemicals that can harm general and reproductive health (**Saxton, 2014; Mrema et al., 2017, Rahimi et al., 2020**).[iii] These circumstances are shaped by systemic gender, racial, and anti-immigrant inequities (**Théroux-Séguin, 2017**). In many cases, the legal status of the workers is temporary and contingent on a bilateral agreement between Spain and Morocco which leverages the necessity for the women to return home to their children when the season is over (**Hellio, 2013, 12; Komposch, Schurr & Escriva, 2024**). The immense struggles faced by this community is the subject of Komposch's doctoral research on 'the planetary-intimate in agricultural labour migration' (**Komposch, 2025**). It is from this research that some of the stories shared in *Exposición* are drawn.

When I visited Huelva, Komposch was already immersed in a period of long-term ethnographic fieldwork and qualitative research on reproductive justice and labour migration. Alongside ethnographic observation, Komposch conducted interviews with seasonal workers in Spanish or Arabic (with a translator), a process which required gaining each interviewee's trust due to the risks of whistleblowing in a situation of precarious employment.[iv] Several women that Komposch encountered expressed a fear of being 'blacklisted' if they were seen to speak out against working conditions. To respect the integrity and context of Komposch's research in the field, workers' identities remained protected in the exhibition and no identifying photographs were used. Instead, we incorporated quotations from the interviews, on the basis that these anonymous narrative elements were not co-produced during the artistic residency itself but shared with care and ethical consideration; I explain our approach to curating these elements later.

The process of gathering worker testimonies was, moreover, shaped by a broader political atmosphere that frequently curtails access to information and efforts to raise awareness about these issues taking place in Andalusia. Activist groups like *Ecologistas en Acción* continue to demonstrate against environmental injustices in the region[v] while local researchers, journalists, and artists have been known to face pressure from industry when it comes to gathering and sharing information on these topics.[vi] On one occasion, we stopped to take photos of a chemical plant from a public road, all of which was adjacent to the strawberry fields, and the temporary accommodation where workers live during the strawberry season between February and June (Figure 2). I remember feeling overwhelmed by the white noise of machinery and an acrid smell that stung my nostrils. But we could only stay for a moment. We were swiftly approached by private security guards, possibly after tracking our movements via surveillance cameras, who questioned us and requested to inspect my camera. After explaining our research and affiliation with foreign universities, we declined their requests, returned to our car, and drove

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away without further repercussions. This incident, while seemingly minor, pointed to routine issues of access and control (even in 'public' spaces) that condition how chemical relations are rendered perceptible.

Figure 2. Temporary homes for seasonal workers. Fieldwork photography, C-type prints (photographs author's own)

Sensing chemical relations in the art exhibition

Circling back to the chemical gaze, Landecker's conceptualisation shifts attention from surfaces to processes, from appearances to metabolic transformations. In this section, I explore how the notion of a chemical gaze might be reimagined from a plurality of situated perspectives and through artistic practices or encounters, developing on the broader political and ethical considerations surrounding the case study as outlined above. To deepen this framing, I add Mel Chen's concept of a 'toxic sensorium', which attends to the totality of ways that bodies sense toxicity but also experience sensorial changes due to toxicity (**Chen, 2011**). Serena Stein and Jessie Luna apply this concept in their discussion of worker perceptions of agricultural pesticides in African contexts. Stein and Luna reaffirm that 'pesticides [...] may be invisible in some regards, but for farmers applying them, pesticides are highly visible and tangible' (**Stein & Luna, 2021, 89**). Over time—through texture, rhythm, and the accumulation of experience—bodies develop their own practices for sensing and responding to toxicants (**Shapiro, 2015**) or indeed 'attuning' to atmospheres (**Stewart, 2011**) which might contain them. What would it

mean, then, to rethink the chemical gaze as a distributed, partial, and embodied means of attuning to chemical relations, taking power relations and politics of representation into account? How to resist abstract and individualised notions of harm from industrial pollution (**Murphy, 2017**)?

In this section, I describe how the exhibition in Bern took form, how it comprised multisensory encounters and gradually allowed for connections and relations to emerge, extending from the bodies of visitors as they were initiated and immersed into the fabric of the exhibition, pulling them towards the polytunnels of Andalusia, while also evoking the movements of bodies, chemicals, and commodities over time and space. *Exposición* took place in the Institute of Geography, so the context already primed audiences for a more geographic understanding of chemical relations (**Barry, 2017**). Yet the construction of an art exhibition within this building was unprecedented; I am told that our small-scale exhibition was the first of its kind. In this regard, *Exposición* opened a new speculative dimension where, through poetics, sensory experience, and collective witnessing, alternate gazes and relations might emerge.

Words and vignettes will need to suffice here in communicating the materiality, design, and multisensory dimensions of *Exposición*, which comprised several interlinked installations. These installations formed a constellation that invited visitors to move, pause, and feel their way through spaces that echoed the conditions of life and labour in Huelva.

Figure 3. Inside the greenhouse installation (photograph author's own).

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A single polytunnel stood conspicuously in the centre of the room. Visitors were invited by exhibition signage to enter the tunnel after donning plastic overshoes, a small ritual which evoked concerns about contamination, hygiene, and permeability. The immersive space was dimly lit by a camping lantern suspended from the central arc—its glow filtered through and accentuated the fog (Figure 3). Although vaporized glycerine is generally regarded as safe, careful attention was paid to ventilation and fog levels, a balancing act which contrasted with the lack of choice that workers face in the strawberry fields of Huelva. The remote location of Huelva was further evoked by the soundscape inside the greenhouse. A speaker nestled amid the soil emitted a layered composition of field recordings made in Huelva: a cacophony of industrial hums, passing trucks, voices in Spanish and Arabic, and trickling water. Adding to the atmospherics, the soil released a distinctive scent, which might be described as earthy and slightly metallic, infusing the artwork with its non-human, molecular contribution.

An eight-metre windowsill displayed a range of accounts from seasonal workers in Huelva, which contributed additional—sensory and affective— information which visitors might conceivably connect or compare with their own experiences of the greenhouse installation. The stories derived from interview materials gathered by Komposch earlier in that year's strawberry season, which, by the end of May when the exhibition was showing, was coming to an end. The anonymous quotes were printed on paper and affixed to the ledge at intervals, so that visitors would pause beneath the windows to read them. These literally vignettes contained vivid imagery highlighting how workers are acutely exposed and expressed the tacit knowledge that they have developed through sensing these exposures (their toxic sensorium). Examples included, 'When they fumigate next to you, you have no protection whatsoever' and 'They are applying it now, when it is cold, because it warms the strawberries. The powder, if you are allergic to it, can make you cough, like me'.

At the same time, we were conscious to not only portray members of this community as victims but to instead foreground the capacity of members of this community to self-determine, in other words, for their lived experiences to not be reduced or fully grasped, but framed with complexity and agency (**Tuck, 2009**). It was important to add narrative threads which might challenge assumptions around vulnerability, such as, 'You have to be very strong for this work, physically and mentally. People in countries like yours should know that and respect our hard work'. They also portrayed the desires of the community: 'The work here is very important for me because […] I can pay the studies of my children […] my son is studying geography'. The minimalist installation beneath the windows was a humble and imperfect attempt to piece together lived

experiences from Komposch's fieldwork. In this way, visitors might begin to fathom (but not presume to fully understand) how the wellbeing of workers is compromised in the pursuit of marketable strawberries, while illustrating a plurality of values, hopes, and strategies.

Outside the tunnel, a triptych of print photographs showed strawberry fields bordered by plastic tunnels, towering chemical silos, and temporary housing with vibrant laundry lines—further traces of the worker community whose anonymity in the exhibition was (as mentioned earlier) essential given the sensitive nature of Komposch's research. Along a long white table, an assemblage of policy documents, artefacts, scientific reports, and maps were scattered, evidencing the broader social and environmental injustices in and beyond Huelva (Figure 4). The documents that we curated for display reflected my artistic research and the interdisciplinary exchanges from the residency. They included a text by Komposch on reproductive justice along with a passage from Rachel Carson's *Silent Spring* describes how pesticides 'lie long in soil, entering into living organisms, passing from one to another' (**Carson, 1962, 6**). The documents were fixed in place by small stones seemingly picked from the soil, ensuring a material continuity between the microclimate of the greenhouse and the pieces of paper beneath each visitor's gaze.

Figure 4: Assemblage, Exposición, Bern (photograph author's own).
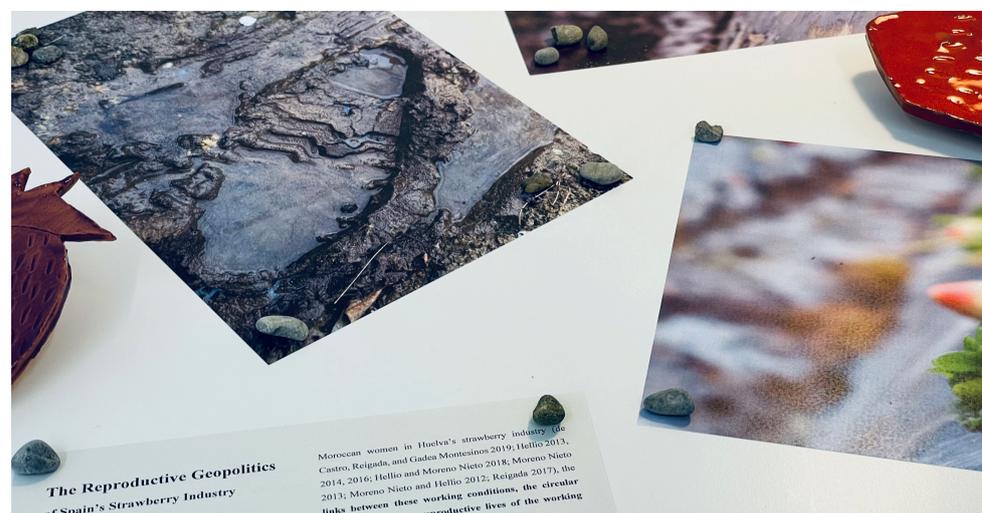
Encounters and responses: the visitor's gaze

The exhibition was the culmination of an events program that Komposch, Mestrot, and I coordinated to coincide with the residency in Bern, featuring excursions to local farms and guest lectures. Lasting only three days and initially conceived as a prototype, the exhibition was well-

attended, publicised primarily via university networks, and incorporated into postgraduate teaching. While no formal method was established to gather visitor feedback during the exhibition itself,[vii] I recorded anecdotal evidence in my project journal, highlighting the affective responses of the visitors I observed and encountered. While vigilantly monitoring fog levels, for example, I noted that several visitors found the greenhouse installation to be 'claustrophobic' or 'oppressive'. Some chose not to enter for these reasons, which prompted me to lower the setting on the fog machine at the end of day one. This alteration allowed people to linger in the space, reposing on the burlap sacks to converse or just listen to the soundscape, which a documentary filmmaker described as 'meditative', perhaps implying how the immersive experience allowed them to enter a receptive or altered state. Indeed, colleagues at Bern have since drawn attention to the 'multisensory' aspects of the exhibition space as fundamental to the process of co-creating meaning (**Winkel et al., 2024**) (Figure 5).

One visitor, a soil scientist from Morocco, moved slowly through the exhibition. He asked me about the project, whether we would publish on it, and if we could stay in touch. He noticed that I looked tired. I was. 'It's very sad, isn't it?' he said. In these small moments, I was brought back to questions of witnessing and partial perspective. I saw the exhibition not as a comprehensive documentation or even a primarily informative format, but as a space for disrupting and disturbing the familiar, for performing alternate relations with matter, food, and chemical imaginaries (**Roe and Buser, 2016**). *Exposición* assembled vignettes, material relations, and multisensory encounters with the intention of gradually opening up modes of perceiving and tracing chemical relations in systems. In retrospect, projects like *Exposición* might be seen as opportunities for invoking an alternate chemical gaze.

Exposición engaged both literally and metaphorically with the 'metabolic pathways' where nutrition and chemicals intertwine—not to the benefit of industrial growth, as per Landecker's chemical gaze (**Landecker, 2019**), but as a means of tracing where and how agrochemicals perpetuate social and environmental injustices. I am reminded of the words of art historian Claire Bishop, who affirmed that 'research-based art' must 'go through a body' to be 'metabolized by an idiosyncratic thinker who feels their way through the world' (**Bishop, 2023**). The reformulated chemical gaze I am describing, mediated by bodies and artistic encounters, subverts the gaze of scientific objectivity and extractive logics. Its modus operandi is not to prospect for material gain, but to dwell in uncertainty and curiosity. Distance is replaced with intimacy and emotions, from sadness and concern to sensory wonder and enchantment. The value of this chemical gaze resides not only in understanding, educating, or analysing, but in

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expressing and surfacing tensions around chemical exposures that may only be accessible through affective and aesthetic practices.

Figure 5: Diagram of *Exposición (adapted from **Winkel et al., 2023**).*

Exposición invited visitors to be present with their curiosity while imagining what was absent and inexpressible. It exposed them in creative and performative ways in one spacetime to more sinister and extensive forms of exposure. The power to witness and make visible was both acknowledged and questioned during the exhibition programming and class visits when I presented my processes to local audiences, also in my project journal. Notably, the exhibition was mounted in Bern in a context of academic privilege, using this privileged and partial perspective (**Haraway, 1988, 579**) to trace metabolic and geopolitical connections to

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the distant fields of Huelva and beyond. Importantly, there have been plans to revisit the project through a future intervention, ideally in a more locally accessible space. Such a step would allow the work to resonate closer to the lives it references, opening further questions about reciprocity and voice. Future projects would also benefit from systematic visitor feedback, which would allow for deeper reflection on the role of the visitor's gaze in the exhibition.

Conclusion: Opening sensory worlds

In this paper, I have started to tentatively experiment with how Landecker's chemical gaze might be reimagined and pluralised in contexts of creative and embodied inquiry. In this sense, the chemical gaze would attend not only who speaks or what is shown, but where, how, and with whom such gestures unfold. After defining the chemical gaze in Landecker's work, I explained how and why such a gaze might be reimagined, engaging with wider critical theories on chemical pollution, especially calls for relational and creative approaches. I then outlined the case study in Huelva, the political circumstances surrounding the case study, and the exhibition itself as a performative space for encountering and reflecting on chemical entanglement in food production across multiple scales. *Exposición* sought to foreground alternate epistemologies and underrepresented perspectives. Future developments of this project may include more direct engagement with workers, local co-curation, and systematic evaluation of audience reception.

Zooming out from *Exposición*, while the case study of strawberry production certainly draws parallels with Landecker's research on food waste, metabolism, and toxicity across histories of intensive agriculture, the notion of a chemical gaze could conceivably be mobilised in other interdisciplinary efforts to narrate and witness toxicity from situated perspectives. Such a chemical gaze might illuminate how the chemical properties of food, air, soil, and water are not 'out there' but permeate environments and bodies in uneven concentrations, eliciting and indeed necessitating novel practices of sensing and modes of representation. Industrial chemicals accumulate in specific places and bodies, but they also travel and persist, drift and transform with intimate and planetary ripple effects. These concerns deserve deeper attention in interdisciplinary projects that engage critically and creatively with the possibilities, limitations, and political tensions of their own becoming.

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Acknowledgements

List of Tables/Images

Lucy Sabin (she/her) is a researcher and practitioner trained in geography and communication design. Situated in the environmental arts and humanities, and inspired by feminist science studies and media studies, her work explores air, atmospheres, weather, wind, breathing, care, reflexivity, sensing, politics of knowledge, affect, art-science, speculative fiction, ecofeminism, and environmental justice. She has experience in participatory arts, film production, podcasting, exhibition design, interface design, and front-end development. Lucy is currently a Research Fellow in the Digital Humanities Lab at the University of Sussex.

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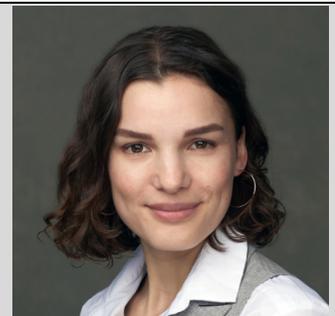
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Endnotes

[i] While this paper lacks the scope for a more comprehensive history of reinvented gazes, I signpost said history here as a premise for reimagining the chemical gaze. My introduction to gaze theory was through media studies, especially Laura Mulvey's concept of the 'male gaze' in cinema (see Mulvey, 'Visual Pleasure in Narrative Cinema' in *Screen*, Volume 16, Issue 3, Autumn 1975, Pages 6–18, https://doi.org/10.1093/screen/16.3.6).

[ii] I refer mostly to 'pesticides' (plant protection products) in discussing the case study but use the term 'agrochemicals' (which can include fertilisers and pesticides) frequently to situate the case study in a broader context that connects with Landecker's work. I also mention 'industrial chemicals' to potentiate broader resonances.

[iii] Acute symptoms of exposure are well-documented (skin irritation, eye irritation, difficulty breathing), also in Komposch's research, but the long-term health impacts have not been studied in the region. I cite comparative studies from other locations to show associations between pesticide exposure and health outcomes.

[iv] Komposch gained workers' trust by offering services to the community, such as driving them from the remote fields where they lived and worked to hospital appointments.

[v] Among these injustices: an enormous deposit of radioactive waste (phosphogypsum) from fertiliser manufacturing lies just several hundred metres from the nearest residences and adjacent to the river that bisects the town.

[vi] In 2006, local artist Isías Griñolo was prevented from exhibiting artworks that documented 'the environmental degradation that Huelva is suffering due to the pollution caused by big companies along the riverfront' (see Molina 2006, my translation).

[vii] This was a learning curve for my first exhibition outside of a cultural institute or arts school. While in-exhibition feedback mechanisms can sometimes feel transactional, I would incorporate a visitor's book or similar in future projects.

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Caring Earth, Caring People, Shared Present: Permaculture pathways beyond sustainability in Sardinia

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Abstract

The article reflects on how permaculture offers a framework for signifying sustainability on a daily basis, focusing on practices and projects carried out by permaculturists in Sardinia. Three ethics of permaculture—earth care, people care, and fair share—emerge as pivotal in driving actions and choices. Projects are modelled on an ecological resilience-oriented model mimicking nature, which allows for structuring the world based on relationships that can address growing environmental concerns. Through ethnographic examples of wheat production and customs among visiting friends, the article illustrates how nature serves as a model for people, merging with local agro-pastoral traditions and claims to island identity. In Sardinia, permaculturists' ethical orientation towards every living and non-living element of the system combines with local cultural customs, in a shift from agricoltura *to* agricultura. *This alternative ontology based on relatedness blurs the boundaries between human and non-human and between past, present, and future. Caring for humans thus becomes caring for soils, microbes, vegetation, winds, and rain; caring for future generations means fairly sharing the world between humans and non-humans in the present.*

Keywords: ethnography; Sardinia; permaculture; sustainability; relatedness; alternative economies

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Introduction

Saviana Parodi, a well-known Italian teacher of permaculture, begins her book *Manuale di permacultura integrale*, or *The Handbook of Integral Permaculture*, with the following:

> *Permaculture means designing and building human-made environments, adopting the biophysical laws of nature, creating neither waste nor pollution while respecting the needs of all living beings.* (**Parodi, 2019: 7**).

From Parodi's words emerge some pivotal points of the permaculture approach: nature teaches us how to design our world, and any human-made system can be sustainable if it works with nature instead of against it, taking into account and caring for all forms of life. Permaculture has to do with action and disarticulates the Western ontological divide between nature and culture. As Puig de la Bellacasa suggests, 'I see this movement as a timely intervention at the heart of a renewed contemporary awareness that we live in a natureculture world' (**2010: 151**).

In this article I address actions and choices made by people who have adopted a permaculture approach in order to trace the meaning of sustainability in the specific context of Sardinia, Italy, at a particular time: when political and economic agendas are multiplying, overlaying the way permaculture is transformed into different visions of the future, different values and ethics. I use a narrative recollection disclosing my personal journey and relationship with permaculturists. The article concerns permaculture practitioners in northern Sardinia between the years of 2019 through 2025, whose practice I analyse from an anthropological perspective.

A couple of years ago I was visiting one of my permaculture teachers, an environmental economist, farmer, researcher, and friend. Sitting in his yard, accompanied by the cackling of our children playing and the clucking of chickens, we reflected on the activities and actions of our local network of Sardinian permaculturists. As an economist he referred to Karl Polanyi's work, pointing out how, on a daily basis, permaculturists' choices tend to foster reciprocity and redistribution rather than market exchanges, seemingly in search of forms of economic activities that promote closeness rather than impersonal and contractual relationships (**Polanyi, 1957**). During that conversation the core issue of my research as an anthropologist began to emerge, uncovering a possible different economic ontology shifting from a law of cheap nature (**Moore, 2015**) to a law of relatedness (**Cassa, 2024**) and addressing how this shift is producing a new ground of possibility (**Gibson-Graham, 2008**). The questions we asked ourselves that day are still guiding my reflections in this article on a

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different culture of care in current discussions on sustainability. Is this economic ontology of relations (**Cassa, 2024**) driving peoples' choices to work around a sustainable future? Which operational tools does permaculture offer to manage these choices? How do discourses on identity and traditions in Sardinia resonate with permaculture? And finally, how do we, researchers and permaculturists, contribute to the very creation of a different world?

The first section presents the research, studies, and theories that made it possible to integrate the reflections on the data with the researcher's responsibility towards the object of study. After a brief overview on how permaculture has been understood within the existing literature, the second section reads the ethnographic case studies as evidence of a radically different way of being in the world, based on the importance of the interrelationships between each element of a system. Sardinia's context is presented in the third section along with some of my interlocutor's experiences and an explanation of the permaculture tools they refer to for designing their life projects. This also provides an opportunity for assessing how categories of culture, identity, and tradition shape the role of care for enhancing systems' resilience. In the conclusion, the threads of the various themes touched upon throughout the article are woven back into a tapestry of a possible new, more sustainable, culture which is ontologically based on care and relatedness.

Engaging Research: Working side-by-side with permaculturists

The reflections proposed in this article are part of independent research conducted since 2019, when I attended my own basic design course in permaculture, the 72-hour Permaculture Design Course (PDC), standardized in 1985 by Bill Mollison. I decided to take part in the PDC proposed by the Sardinia Permaculture Association (SarPa), even though I did not live there in Sardinia at the time, because they organised the course differently compared to other regions: not a two-week fully immersive course, but into six three-day meetings once a month, from January to June. Each lesson featured a different teacher with a currently active project on the island. This was done to allow students to better know the network and to give the projects involved an opportunity to strengthen the connections with each other.

Indeed, each long-weekend course was also a festive occasion to meet for all the SarPa members and their friends and neighbours. Some of them arrived beforehand to help hosts in prepare additional field kitchens and dry toilets.[i] During the course, some took care of cooking the produce from the gardens of the various projects to provide healthy meals for course

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participants and all others who came. (There were fifteen students in my class, but sometimes twice as many people were at dinner.) Caring for the land and its produce became caring for the people who would consume it, sharing food, nutritious conversation and, of course, locally produced wine. That was a way of practicing the three permaculture core ethics: earth care, people care, and promoting the fair share of resources. (I will discuss this more later.)

*Image 1: Permaculture Ethics and Principles (**PermaculturePrinciples.com, n.d.**)*
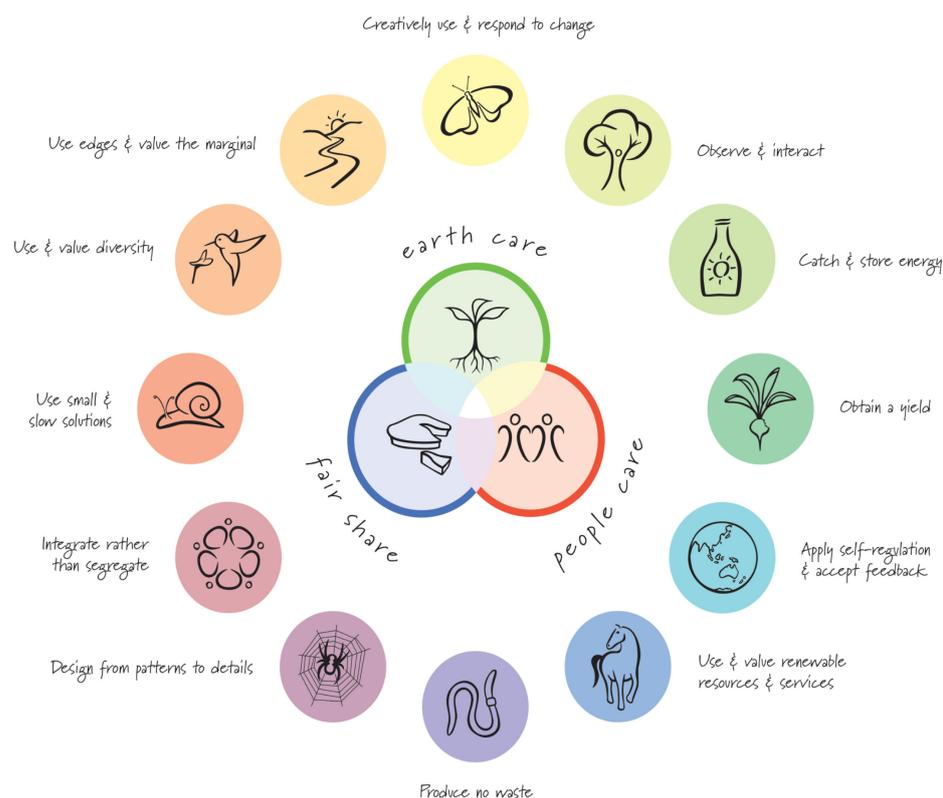
At that time SarPa counted more than 100 members[ii], and by joining the course I had the great opportunity to meet a good number of them. Together with the permaculturists of the Italian Permaculture Association[iii], the members and sympathisers of the Sardinian association are my main interlocutors here. They consist of a heterogeneous sample of people: men and women from the very young to the retired, families with children, agronomists, naturalists, economists, architects, informaticists, agricultural labourers, teachers, social workers, medical doctors, and university researchers. They are Sardinian and mainland natives as well as immigrants, mainly from other parts of Europe. All interviews were held in Italian and translated into English by the author, and the names of interviewees have been changed to anonymize them. My interlocutors are a sample comparable to other studies on the subject (**Ferguson & Lovell, 2015**).

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While it would be beneficial to delve into more detailed statistics about research subjects and methods, this would require further acknowledgement of how people define themselves as permaculturists (or not) when participating in permaculture initiatives. This topic deserves its own dedicated article. For the purposes of my present argument, I find it more significant to cite what a permaculture teacher said during an interview:

> *I think they [permaculturists] are all people who, at some point in their lives, felt that something wasn't working, that they weren't happy and needed to change their lives. Eventually, they grew tired of institutions and political responses to meet human needs fairly. Some leave everything: job and home. Some just—just! [laughs]—change their approach to everyday life. All were looking for a closer relationship with the environment... about what environment is. [...]the place where they live, the food and the people. Permaculture offered them a framework for an existential redesign (**author interview, October 2023**).*

After my 2019 PDC course I continued to visit projects, meet people, and conduct interviews. In 2021, I also moved to Sardinia, became an active member of the association by joining the management team, and took part or co-organised the participatory design meetings and joint work sessions. Spending time working together with permaculturists and following them to national and regional meetings has been, and still is, a great opportunity for learning by doing and for sharing reflections together. I have come to regard participant observation, conversations, co-conducted video narrations of their projects, and semi-structured interviews as more effective methodologies to collect data than structured interviews or questionnaires. Indeed, it often happened that while working with our hands, our conversations fell on meanings and values incorporated into practical actions. For example, during one meeting I took out a bioclimatic region map, and someone started to point out and write on it the locations of the permaculture network households. Forty-six points were marked on the map, each indicating a family or an individual permaculturist who recognised themselves in the association's network (as well as three 'homeless' individuals, who did not live in a specific place but collaborated on multiple projects of others). In the ensuing years, I have visited most of these points, and these people and I have reflected on how they designed their lives and dwellings according to the principles of permaculture. Therefore, the data I collected is the result of both a scientific and personal journey.

This scientific and personal journey has led me to rethink my place in the environment as well as my role as a researcher engaged with other humans and non-humans in the making of a different world. Gibson-

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Graham, calling for academic researchers to work with people who are already making these new worlds, affirms the importance of hybrid research collectives that are able to 'co-create knowledge and foster an environment where new facts can survive' (**Gibson-Graham, 2008: 629**). This specific way of engaging also involves an ethical choice to contribute to generating alternative worlds (**Puig de la Bellacasa, 2010: 2017**). If my fellow permaculturists and I are part of a hybrid research collective, we are all dealing with the production of knowledge and therefore all implicated in the very existence of the world:

> *Every question about what to study and how to study it becomes an ethical opening; every decision entails profound responsibility. [...] Ethics in our understanding involves not only continually choosing to feel, think and act in particular ways but also the embodied practices that bring principles into action* (**Gibson-Graham, 2008: 620**).

Along with the diverse economies approach, Science and Technology Studies (STS) help in recomposing the fracture between the 'social/cultural' world and the 'natural/technical' one, and in re-positioning the techno-scientific knowledge role; because the way we study and represent things depends on a specific socio-technical and political asset, scientific and technological knowledge co-produce the world itself. Latour introduces the definition of 'matters of concern', where scientific matters of fact become a 'mode of fabrication [...] their stabilising mechanisms clearly visible' (**Latour, 2004: 246**). Puig de la Bellacasa pushes forward Latour's suggestion:

> *The insight that things are matters of concern addresses the ethico-political relevance of constructivist approaches beyond social constructivism and humanist ethics. It also brings us closer to include the importance of care in the life of things, including the affective attachments involved* (**2017: 66**).

Bellacasa points out that scientific matters of fact are actually 'matters of care':

> *The notion of 'matters of care' is a proposition to think with: rather than indicating a method to unveil what matters of fact are, it suggests that we engage with them so that they generate more caring relationalities. It is thus not so much a notion that explains the construction of things than it addresses how we participate in their possible becomings* (**de la Bellacasa, 2011: 100**).

During my fieldwork, turning things into matters of care helped uncover the involvement of the cited hybrid research collective, especially when it came to how to deal with a troubled world, needing not only critical analysis but also a positive approach able to emphasise caring

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responsiveness in technoscience, integrating humans and other-than-humans into a shared world. This approach was also useful in addressing the hypothesis that the three permaculture ethics of care not only drive permaculturists' choices, but also ontologically found a world based on care and relatedness. When a permaculturist tries to define permaculture beyond the standardised definitions (such as those from **Mollison, 1981** or **Holmgrem, 2002)**, they generally agree that it is a personal and radical life choice that changed the way they see the world.

Permaculture: A Difficult Definition

In last fifteen years of humanities literature on the environment, political ecology emerged along with public interest in climate change and sustainability. Contributions on permaculture grew too, within geography, ecological economics, and political ecology, even if they are still underrepresented, especially within anthropology or as the central focus of monographs. However, among people outside academia, permaculture had proliferated globally since its formulation in the 1970s, especially in Australia. As such it has emerged at various stages as a point of reference, an approach, and an ethical and practical framework, both within the broader analysis of ecological and grass-roots movements seeking an alternative to the capitalist model of nature commodification and consumption, and in studies of groups looking for alternative human relationships within small communities (**Aistara, 2013; Brawner, 2015; Hockin-Grant & Yasué, 2017; Didarali & Gambiza, 2019; Kelly-Bisson & Massicotte 2019; Flores, 2023**).

Each account defines permaculture in relation to a specific group of people or as a practical example within a specific theoretical approach:

> *[P]ermaculture offers a distinctive perspective on social-ecological transition, with key principles that parallel or prefigure themes in sustainability-oriented scholarship, such as landscape multifunctionality, ecosystem mimicry, ecoagriculture, intervention ecology, and adaptive management* (**Ferguson & Lovell, 2015: 2**).

Permaculture has been defined as 'an ecotopian methodology' (**Lockyer & Veteto, 2013: 45**) for eco-villagers or bioregional movements and described as 'an example of [...] ecosophy' (**Aiken, 2017: 3**). Permaculture's ethical considerations echo in Puig de la Bellacasa's works on care (**2011; 2015; 2017**) as is, as she describes it, 'an example of alter-biopolitical intervention' (**2010: 151**). It can be multi-labelled and has been defined as a design system, best practices framework, worldview, and movement (**Ferguson, Lovell, 2014: 2015**). Above all, it is important to remember that it is an approach for designing life pathways beyond sustainability (**Holmgren, 2002**).

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Beyond such scholarly interest, it is not surprising that perrmaculture remains under-represented in scientific literature, given that it broke with the mechanisms of academia from the outset, as Mollison himself explained back in 2005 (**Bosco's Garden, 2024**). The early formulations of permaculture scandalised the researchers who were embedded in the system because it brought together so many different fields well before the contemporary tendency to cross-disciplinary research strands. Mollison decided to copyright the term in order to deny the possibility of permaculture becoming an academic discipline, desiring it remain exclusively for the use of students and practitioners. After a period of social and political engagement for environmental preservation, he decided to step out and bring about a 'peaceful revolution' (**Mollison, 1981**) made by people's concrete actions. It is perhaps for these reasons that permaculture continues to elude clear definitions, its approach eschewing institutionalisation in favour of personal and community engagement in food production, subsistence, and resource management under the stewardship of those who are in charge (**Ferguson & Lovell, 2015: 4**). For the same reasons, many permaculture associations, Sardinian and Italian included, are strongly oriented towards a participative, horizontal, and non-hierarchical organisation.

The aim of this section is not to offer an update of the literature review nor a critical reflection on permaculture history. It is rather to frame one of the themes emerging from ethnographic data—the pivotal role of interconnections and relatedness—within the broader hypothesis of permaculture as producing a different ontology. It is therefore worth briefly analysing the 'culture' of permaculture, before diving into the importance of interrelationships with a focus on Sardinia, for, as Holmgrem notes, 'The original permaculture vision of permanent or sustainable agriculture has evolved to one of permanent or sustainable culture' (**Holmgrem, 2020: 3**). Note the tension between *culture* and *agriculture* here. In Italian, the word for agriculture is *agricoltura* (with an *o*) while culture is *cultura* (with a *u*); the term *permaculture* is translated into *permacultura* and not *permacoltura*, with a *u*, indicating that it is a real *cultural* change. Permaculture effectively blurs and challenges the boundary between nature and culture (**Cassa, 2024**), unhinging the centrality of human agency (**Puig de la Bellacasa, 2010**) and shifting attention to the space in-between humans, non-humans, and landscapes. As such the distance between the two categories of the Western world seems to fall apart to generate a world ontologically different.

Among the rare, anthropological, extensive contributions, the one of Lockyer and Veteto offers a description of bioregionalism and permaculture as a 'moral philosophy' (**2013: 107**) motivating a commitment towards sustainability, a concept compelling the

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prioritisation of long-term consideration over short-term ones (**2013: 22**). By doing this, they compare permaculture to religions offering a system of values within a moral frame. On the one hand, this helps to explain how permaculture 'builds moral economies grounded in forms of discourse other than dominant Western economic rationality and guided by the compass of justice and sustainability' (**Lockyer & Veteto, 2013: 22**), while on the other hand, it seems to overlap moral values with ethics. With its three ethics, twelve design principles, and an international network of practitioners organised in local groups, it is easy to think of permaculture as a 'religion of sustainability'. However, these facets 'promote ethical obligations that do not start from nor aim at moral norms, but that are articulated as existential and concrete necessities' (**Puig de la Bellacasa, 2010: 159**). As Puig del la Bellacasa points out, ethical doings go beyond the definition of right and wrong; ethics are a living technology 'with material implications in remaking human and non-human ontologies' (**2010: 162**), precisely rooted in care. Therefore, practitioners often define permaculture as a radical change in their ways of 'being in the world' because through ethical doings they enter a world governed by different laws and economies. Because ethics are not moral norms, they are situated here and now, their 'actualization [...] are always created in an interrelated doings with the needs of a place, a land, a neighbourhood' (**Puig de la Bellacasa, 2010: 161**). In the next section a brief description of the Sardinian context is provided to better understand, through ethnographic data, how ethics are actualised in Sardinia, affecting possible meanings that sustainability can assume at the intersection of permaculture and regional identity construction.

Growing Wheat, Exchanging Sheep, Being Bees: Sardinia and relatedness as a diverse law rooted in tradition

Sardinia is a region where many discourses on its peculiar identity are produced, where 'bibliographic and record series, museum projects and protection laws are dedicated to identity, [and] dozens of seminars and conferences [on identity] are held every year' (**Bachis, 2015: 696**). All of this is 'accompanied by a notable production of para-scientific discourses on uniqueness, genuineness and ancestrality of some cultural traits' (**Bachis, 2015: 698**). This discussion on identity contains two sides. First, it is defined by the region's controversial relationship with mainland Italy related to its subalternity, especially when it comes to production relations and socio-political management of land (**Angioni, 1982; Cassa, 2024**). Second, this discussion on identity deals with variable symbolic belongings composed by various concentric circles, from the local to the regional, the national, up to the wider European context and back (**Bachis 2015**).

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The expression *sos estrangios* ('the strangers') can equally indicate people coming from the next town, the 'Continentals' (Italians from the mainland), or non-Italians. The many local belongings are underlined by the many regional variations of the language but are also supported and reinforced through the valorisation of local culinary peculiarities (I myself counted at least thirty different types of bread) (**The University of Sassari, 2024**).[iv] Sardinia is discursively built as marginal and peculiar within the Italian context, both from inside and from outside politics and rhetorics: isolated but at the same time dependent on the outside, rich in local traditions that mobilise the past in relation to the contemporary.

Sardinia's great public interest in food safety and sustainable agriculture is demonstrated by the fact that the only Italian case study in the European Union–funded ARSINOE project (2021–2025) featured southern Sardinia as 'a proof-of-concept with regards to its applicability, replicability, potential and efficacy within the Mediterranean area' (**ARISNOE Project, n.d.a.**). The project aims to shape the pathways to climate change adaptation and resilience in relation to increasing air temperatures, more erratic rainfall, and land degradation. It prioritises the focus on durum wheat and its associated local production chains for bread and pasta, a crucial agronomic and economic issue in Sardinia and the rest of the Mediterranean region (**ARSINOE Project, n.d.b.**). During the Roman Empire Sardinia was referred to as 'the granary of Rome', and this image has been preserved over time. Even during the Fascist period, great importance was placed on cereal cultivation in southern Italy (Sardinia included) for bread and pasta production. From 1920, Mussolini made cereal production the main weapon of his 'Battle of Wheat' programme to make Italy self-sufficient.

One symbolic case is that of Senatore Cappelli, a hard-grain cultivar promoted in that period for its resistance, then forgotten after the war in favour of more productive varieties. It was recovered in the 1990s thanks to an elderly farmer from Nurri, southern Sardinia, who had kept a handful of grains. The cereal is now back in the sights of major national and international companies for its nutritional properties, and it has been at the centre of a convoluted legal dispute over the obtaining of the exclusive licence to multiply and market it granted to a mainland company. Beyond the legal aspects, the affair has been at the centre of regional debates and claims, reinforcing the perception of an extractive and predatory attitude of the mainland towards the island. In Sardinia, in the case of this wheat variety, 'a mythology has been built (I mean by the term the historical falsehood of the antiquity of this cereal [...]). [...] On the other hand, Sardinian identity has often been built around food, using food also as an identity marker' (**Guigoni, 2015: 89**). As said in Sardinia, the different

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world promoted by permaculture is also rooted into the valorisation (sometimes even mythologization) of some local traditions.

Growing wheat with Matteo

Matteo, who hosted one of my PDC weekend courses, is a permaculturist who lives in northern Sardinia where he grows and promotes old varieties of wheat, including Senatore Cappelli. He explained how he reclaimed the uncultivated land of his family and neighbours. The lessons focused on the analysis of soil structure, the interaction between the roots of plants and the soil, and the techniques for regenerating and nourishing the soil through the multiplication of bacteria by fermentation. With his extensive knowledge of wild herbs, aromatic plants and trees, Matteo was able to convey to his students the importance of the interactions between each of these elements. In designing his garden, he explained the rationale behind the inclusion of guilds, an association of plants in which each makes a particular contribution so that the whole is stronger, healthier, and more productive than the mere sum of its parts. He included a bench at the side of the guild to ensure a space of wellbeing and contemplation for people who wish to pause there. During that weekend we touched the dirt with our hands and smelled it with our noses, and experienced that the world of permaculture is not a utopian paradise of goodness and harmony; it is rather a multilayered and complex exchange system, governed by laws that humans have to respect to prosper, a very efficient and resilient economical market where every element gives and takes and every capital (financial, social, biodiversity, and knowledge) is budgeted.

After I moved to Sardinia and adopted my hens, Matteo became one of my main grain suppliers, guaranteeing me a supply of wheat that could not be milled for human consumption. For him it was waste product, but for me it is a great resource grown without pesticides. In return, I guaranteed some eggs and help working his land. Our collaboration, operating mainly outside the traditional money market, has allowed us to maintain a relationship of mutual exchange, support and trust. In 2024, I promoted a project for the valorisation of local food production traditions with a group of mental health services users. Matteo's farm is one of the partners for the bread trail: from wheat cultivation to the transformation and production of traditional breads using sourdough, which included lessons on wheat cultivation along with some sowing and harvesting sessions using traditional, manual methods. During one of these sessions, Matteo shared the reasons for his choice of wheat cultivation:

> *I am not an agronomist [...] why did I start growing wheat when it was not part of my background? It is a crop that was very present, but then, under market pressure and with the competition by multinational agricultural production companies, it was slowly abandoned because of*

*the high costs of cultivation, storage, and processing. [...] So we eliminated wheat cultivation in a large part of northern Sardinia, but we did not replace it with something else to create unity between communities, like bread. [...] I chose ancient cereals because they have ecological characteristics that modern ones do not have: they are more resistant to diseases, they are better adapted to the ecological context in which they have been cultivated for centuries [...] even if they certainly have lower yields (**author interview, November 2024**).*

For Matteo, the value of his work, in addition to production, is the possibility of not using chemicals, thus preserving soil health, but above all the possibility of preserving the social relations that revolve around the production and consumption of bread.

*Image 2: Loading wheat into a manual seed drill (**Photo by author**)*

The project envisioned funding which would pay for these lessons. However, the funding did not arrive. Despite the knowledge that his contribution would not be remunerated with money, a few days after the first lesson I received a proposal from Matteo to continue the meetings, as he had found it enriching and stimulating to work side by side with a diverse group of people. Within his energy balance, the lack of financial capital had been compensated for by an increase in his relational capital. Rather than considering himself as a benefactor acting on an altruistic

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impetus, Matteo acted as he did because of his profound awareness that it was a way to get involved in a more resilient system.

Giving away sheep to assure prosperity

During a three-day permaculture course in 2019, one of the teachers, Riccardo, brought up his hometown, in which 'the roof of a house burned, and the entire village collected money to help the family […] and in three months they could return back in their home' (**author interview, February 2019**). One of the other permaculturists listening to this story explained to me (the only non-native student in the course) the Sardinian agro-pastoral tradition of *sa paradura*, which means 'the (re)creation'. It is a kind of gift between shepherds: if one loses his livestock, all the others give one sheep to restore the flock. The offer of a single sheep does not affect the personal patrimony but allows those who have been damaged resume their activity. It is also an insurance against future thefts because a shepherd without his flock could become a thief himself to survive.

Practices of sharing and mutual support do not have to be understood as merely expressions of solidarity; they can also derive from a different way of valuing resources, outside the mere exchange of capital, in order to face crises in the most effective way and promote the greatest resilience possible. During another permaculture course a few months later, a teacher invoked *sa paradura* to explain how relationships within a system are important not because they are intrinsically 'a good value', but because they are at the very base of ecological survival. A shepherd is not part of a network of shepherds linked by a reciprocal commitment to help because he is living in an ancient bucolic paradise, but because it is a way deal with possible future disasters; there is not a world without relatedness. The importance given to relatedness offers an ethical and philosophical framework to renew traditions, and it is also a way to face environmental concerns. Indeed, within permaculture, it is common to say 'think for extremes and design for disasters' to foster resilience. If you have too many rabbits plundering your garden vegetables, you don't have a problem with too many rabbits, but too few foxes; if hurricanes, floods, or fires destroy your project, it is not the wind, water, or fire that is the problem; it means you have not designed your system to be sufficiently interconnected with those elements that could provide protection against these them.

Adelmo the pollinating bee

Adelmo is a permaculture tutor and practitioner. After living for fifty years in the wealthiest regions of Italy with a well-established, professional job, he felt his life was still lacking. Although he enjoyed his good salary, the

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relations with his work colleagues were competitive and conflictual; during time off, he felt so tired that he had no energy left to meet with friends. He would later describe this condition as an energy-eroding spiral, where the energies he invested in work gave him financial capital, but led to great poverty in relationships and experiences. He wanted to reverse the direction of that spiral, from one of erosion to one of abundance, and from an unsustainable situation to a sustainable one. He decided to reduce his expenses, leave his home and job, and move to Sardinia. He lived for more than a year in a camper van equipped with a mechanical carpentry workshop and started visiting permaculturalist projects to work and learn more about the way of living permaculture.

In Sardinia it is customary to enter people's homes by knocking with your feet because your hands are not free but full of things to share, almost always food or drink. In his choice of mobile living, Adelmo had no home-grown food to share, but he shared his ability to fix things, building objects from wood and iron. In return, he received a wealth of food and products, often more than he could consume alone, so he brought it with him to the next project he visited. Many of the permaculturists hosting him, knowing that he would visit another friend of the network after them, deliberately gave him extra so he could offer it when he entered the next house. Then, on the way back, he would stop again to bring news and products. This is an example of an intentional, small-scale exchange economy based on a local tradition named *s'imbiatu*, the sending back and forth of goods (usually food) to share:

> *This system is meant to strengthen not only ties of cooperation and solidarity amongst the villagers but also to maintain a way of life and of 'being', which refers to group and community identity* (**Zene, 2007: 293**).

As an old Sardinian saying goes, *Si cheres chi s'amore si mantenzat, prattu chi andet, prattu chi benzat* ('if you want love to endure, for every plate that leaves, let a plate return') (**Gallini 1973: 60**).

I explored elsewhere the close relationship between healthy food production, the three permacultural ethics, and Sardinian traditions, with particular reference to the symbolic role of fermented foods and the collaboration between soil, humans, and bacteria (**Cassa, 2024**). Here it is important to note that, by bringing back humans to their very essence of 'nature working', the rules of nature also serve as a guide to building human relationships and actions.

When I met Adelmo's tutor, Antonio, he argued, with a certain esteem, that Adelmo's mobility and attitude had played an important role in maintaining and strengthening the network of permaculturists in the area:

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> *He was like a pollinator bee, bringing news from one to the other, encouraging connection and contamination between projects, even when the various permaculturists had not had the opportunity to meet physically* (**author interview, April 2023**).

Antonio's use of a pollinating bee as a metaphor is both a way to understand the role of one person within a system and also emphasise the vital importance of interconnections to the flourishing of permaculture projects. As mentioned, in a permacultural understanding of a good system (of humans and non-humans), nature provides patterns and models for a more just and sustainable context. Adelmo's choice to live in a camper van can been seen as a way to increase abundance—perhaps not the abundance of money or material things, but an abundance of nourishing connections. This has been possible because of the fusion of two cultural frames of reference: the local one, which sees food as a fundamental element in building human relationships, and that of permaculture, itself inspired by abundance and interconnections of natural systems.

Indeed, permaculture emerged from the observation of how forests work: a single tree produces more than the seeds that will generate other trees; its surplus of production is not a waste but becomes biomass to feed the soil and provide food for animals. Every element has a function and shares a product, which enters a circularity of mutual relationships and exchange. For example, the serviceberry tree's abundance of berries provides birds with food, and that then the bird's excrement distributes the tree's seeds far and wide. Thus, 'the birds provide services to the Serviceberries, who provide for them in return. The relationships created by the gift weave myriad relations between insects and microbes and root systems' (**Kimmerer, 2024: 69**). As Kimmerer (**2024**) suggests, this compels a different approach toward exchanges and a different way for budgeting capital such as energy and materials.

A tool for abundance

Permaculture suggests designing abundance through connections, mimicking the resilience of nature. Indeed, every element of a system produces several outputs and involves several functions, and every output should be an input for another element so that every element is connected. The more connections an element has, the more it is integrated in the system, and the more the system is enriched. The tool of the functional analysis used in permaculture design helps observing each element's characteristics, needs, and possible connections. With the functional analysis used in a design project, every element of the system is located following the rule of connecting inputs and outputs (what their

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needs are and what they offer to the system) as much as possible, with the intention of maximizing efficiency and resilience.

A classic example is the hen on the farm: What does a hen need to grow rich, and what does she give to the system? A hen needs protection from predators, food, space, and sociality with other chickens. She gives eggs, excrement, meat, and rakes the ground. So, a chicken is connected to humans, who eat eggs and meat and give back by providing food and night shelter from predators, trees to perch on, and soil to rake grains and insects. The soil is nourished by the hen's excrement, which produces more fresh grass. Crammed into a cemented henhouse, they are completely dependent on human food and protection, and if this bond fails, they will starve, and humans will lose both meat and eggs. If chickens have more than one way to feed and shelter themselves, humans have less work to do and are less likely to run out of chickens. If chickens cannot scratch, the soil will not benefit from the surface tillage done by their feet, snails will not be preyed upon and will increase, and chickens will also find their need to scratch the ground unfulfilled. Through functional analysis, a permaculturist ensures the design of a system is as interconnected as possible and sustainable over time, one in which energies can circulate rather than being fed into the system by a single element, ultimately ensuring abundance rather than erosion.

Of course, these are not new concepts, whether in economics, circular economy, or ecology; what has changed is the centrality of the needs being considered, based on the ethic of care. It is not the needs of human production and profit extraction that are placed at the centre, but the needs of each element in the system. When mutual relationships and connections flourish, this enriches the whole system by reducing the need for energy inputs to maintain it. When each element is a subject, a partner with agency, the centrality of the human is undermined and equal rights are acknowledged for all, so that resources taken and given are shared equally. This is the meaning of the third ethic: unhinging the centrality of human needs means guaranteeing a fair distribution of the surplus within the system, ensuring sustainability over time for the system as a whole. Moreover, if 'care is a form of relationship, then it also creates relationality' (**Puig de la Bellacasa, 2010: 523**): if one lives in a world were interrelationships are vital for subsistence, then caring for all the elements in relation to one to the other is not a moral stance, a good or bad attitude, it is just the way things work. Consequently, actions of care in the present are also actions of care for future generations. As Mollison states in his 1981 book (after citing Lewis Tomas on bacteria, which 'live by collaboration, accommodation, exchange, and barter'): 'cooperation, not competition, is the very basis of existing life systems and of future survival' (**1981: 2**).

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Connections and relatedness, then, are at the very core of the sustainability concept for permaculture. Fair observation of needs and products of all the elements is promoted using functional analysis. Permaculturists experiment with a different economic balance to act and interact, following a different law of value. In this balance, the importance of growth remains unchanged, but (changing the cultural frame) what we need to grow becomes not human profits, or the availability of natural resources for humans to extract, but relatedness. The turning point proposed by permaculture seems to be a move to the relatedness of care: between different humans, humans and the soil, soil and its bacteria, bacteria and food, and animals and the environment, which finally leads to care about the way infrastructure and climatic events interact, including winds, hurricanes, waters, floods, heat and fires.

Conclusion

My reflection has been guided by four main questions. The first three are: Is the economic ontology of relations (**Cassa, 2024**) driving peoples' choices to work around a sustainable future? Which operational tools does permaculture offer to manage these choices? And how do discourses on identity and traditions in Sardinia resonate with permaculture? As permaculture has been defined as an approach for designing life pathways beyond sustainability (**Holmgren, 2002**), I have attempted to provide some answers by considering sustainability as a category to be re-signified within permaculturist worlds and projects. A few designing tools and concepts have been named (such as functional analysis, the abundance/erosion spiral, the budgeting of other capital); these have been considered significant in relation to local Sardinian habits, often referred as traditional and cultural elements shaping the island's identity.

The ethnographic data presented here suggests that permaculture fosters a way of *being in the world*, in which caring people, caring earth, and the fair sharing of resources form a world of inter-relatedness, in which each element is valued as important, not because of any intrinsic permacultural 'good attitude' towards nature, but because it is the very mechanism of life on the planet. Human commitment towards the environment is not supported by a romantic vision of a good nature 'out there' to preserve, it is rather the only way for contributing to a wider system, constituting of elements of living and non-living beings which each possess agency: the continuation of life. If each element gives and takes, has multiple functions and interconnections, the result will be abundance. Therefore, ethics—especially in the caring for earth and caring for people—does not point to a future, but rather an everyday ethical doing in the here and now. Having a future is the consequence of permaculture. Within a permaculture

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project, sustainability equates with every choice and every technology that ensures, in a given time and in a given system, an equitable care for generating kinship towards each element. Sustainability is an intertwined system in which humans are only one of the actors at stake and all energies are equally budgeted to promote growth: not only human financial capital, but also biodiversity, local culture, and interconnections. Permaculture fosters a multi-species world made up of care and relatedness. This gives rise to a new economic ontology based on abundance and reciprocity rather than on scarcity (**Kimmerer, 2024**). In Sardinia, this framework also integrates a particular local identity rooted in the rehabilitation of ancient practices of sharing and cooperation. Intentional actions and choices always generate different socio-political assets and, by confronting current environmental concerns with permaculture ethics, the researcher and the permaculturists of Sardinia, as a hybrid research collective, are implicated in the very creation of another world.

This leads to the last of my four questions: How do researchers and permaculturists contribute to the creation of this different world? This interconnected world can be understood as emerging from an ethical engagement with the object of study as a matter of care:

> *That scientific and technological assemblages are not just objects, but knots of social and political interests. [...] This naming can help to emphasize caring responsiveness in technoscience in an integrated way, in the life of things themselves, rather than through normative added values (**Puig de La Bellacasa, 2011**).*

Thus, to continue this investigation of permaculture in Sardinia also means to look beyond the research findings by adding a strong sense of attachment and commitment, an ethical responsibility for their effects on the creation of a caring ecological system, fostering alternative economies, and towards local communities, for, 'at its best, anthropology has always been about exploring real possibilities for a more just and sustainable world' (**Lockyer & Veteto, 2013: 31**).

Acknowledgements

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Image 1: Permaculture Principles, n.d. *What is Permaculture?* Creative Commons license CC BY-NC-ND 2.5 AU. URL: https://permacultureprinciples.com

Image 2: Loading wheat into a manual seed drill (Photo by author).

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Endnotes

[i] With compost (or dry) toilets, urine and faeces are separated, the former going into the phytoremediation system and the latter into a bucket mixed with sawdust. Solid excrement is conserved for a few years in its composting caissons and used as a good nutrient source to enrich the soil.

[ii] At the end of 2022, SarPa members decided to close the official association due to increased bureaucracy created by new Italian Third-Sector regulations, which they felt were stifling the convivial and spontaneous spirit of their meetings. However, a more informal collaborative network is still in operation.

[iii] The Italian Permaculture Association, founded in 2003, convenes two national meetings a year, collaborates with other similar associations throughout Europe, and promotes a network of trained tutors via its permaculture designer diploma (see https://www.permacultura.it for more.)

[iv] The Faculty of Agriculture in Sassari houses the university's microbial collection, which includes an archive of the 'mother' yeasts used to produce typical Sardinian breads. The project is managed by Professor Marilena Budroni, a microbiologist who is also involved in spreading knowledge about fermentation techniques (see **The University of Sassari, 2024**).

A Political Ecology of 'Adaptation': Critical perspectives on case studies in Taiwan and Vietnam

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Abstract

The current global climate crisis, a result of the Anthropocene, has forced the global community to reconsider current notions of adaptation, vulnerability and resilience. This has especially been true for smallholder local and Indigenous farmers, who on the one hand have proven to be excellent at adapting to changing environmental conditions but on the other hand are also disproportionally affected by the global climate crisis. In this article, I will critically examine the concept of adaptation from a political ecology perspective, both conceptually and using examples from Taiwan and Vietnam. I argue that 'adaptation', as we know it, is often a neoliberal mechanism which puts the responsibility on individual farmers, instead of looking at the many structural barriers and power relations underlying unequal vulnerabilities and resiliencies. Instead of seeing adaptation, resilience and vulnerabilities as linear and causal processes, it would be better to reconsider these definitions from a critical perspective. On the one hand, we do need to prepare for the adverse effects of climate change, but on the other hand we need to be aware of what causes structural inequalities to co-exist. This awareness will then hopefully lead to better bottom-up strategies towards coping with the global climate crisis from smallholders' perspectives, while tackling other inequalities and unequal power structures at the same time.

Keywords: political ecology; adaptation; Taiwan; Vietnam; Indigenous peoples; climate crisis, Anthropocene; smallholder farming; resilience

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Introduction

The global climate crisis has severe consequences for the world's Indigenous peoples, as they are often directly dependent on natural resources and subsistence-based livelihoods (**Reyes-García et al., 2024**). Instead of solely portraying them as victims of climate change, an increasing number of studies, international reports, and advocacy groups argue that it is better to study how Indigenous and other subsistence-oriented communities cope with, adapt to, and mitigate the adverse impacts of climate change (**Ford et al., 2020**). Therefore, the concept of Indigenous resilience becomes more widely used in climate change adaptation literature (**Bayrak et al., 2023; Berkes et al., 2021**). Indigenous and other subsistence-oriented communities are able to observe temperature changes that align with scientific climate models and provide essential information on how these climatic shifts affect local ecosystems, agricultural systems, and food security (**Savo et al., 2016**). Various Indigenous communities have demonstrated remarkable proficiency in climate change adaptation through the use of their locally specific Traditional Ecological Knowledge systems (TEK) and their holistic relationship with their land and community (**Berkes, 2018; Gómez-Baggethun et al., 2013; Paneque-Gálvez et al., 2018**). Indigenous communities must therefore be recognized as equal partners in climate change adaptation and mitigation initiatives, across all scales from global to local (**Reyes-García et al., 2024**).

With the advent of the Anthropocene, and given that the climate crisis presents a global threat with very much localized impacts, the call for adaptation at all levels has become the new 'creed' (**Watts, 2015**). The underlying idea in conventional resilience theory is that everyone has a certain level of resilience, and by adopting appropriate adaptation measures in response to certain (climate-related) stressors, this resilience can be enhanced. Resilience theory has faced criticism from scholars for failing to really consider broader social, economic, and environmental processes, political economy, unequal power relations, and discourses on adaptation (**Turner, 2014; Watts, 2015**). Adaptation does not occur in a vacuum; it involves more than just reacting to internal and external stressors, such as climate change, and is influenced by various structural determinants and micro-level factors (**Marks et al., 2022; Taylor, 2013, 2015**). More often than not, it is not even clear what people 'adapt' to: climate change, top-down solutions to climate change, other human-made disasters, market restructuring, or all of these?

In this article, I critically examine the concept of adaptation from a political ecology perspective. By taking three cases of Indigenous and local smallholder communities in Taiwan and Vietnam as examples, I highlight

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how dominant scientific discourses on climate adaptation and mitigation are essentially a neoliberal mechanism putting the responsibility upon the individual while proposing market-based solutions as a means to 'stay in place'. This article builds on my previous research, consisting of various surveys and field visits conducted in both countries with local and Indigenous communities, who, on the one hand, face the tangible threat of the climate crisis, and on the other hand, must cope with top-down enforced adaptation solutions.

In the following section I concisely outline how concepts such as adaptation, resilience and vulnerability can be approached from a political ecology perspective. The article then continues to present three case studies: the impact of the Reducing Emissions from Deforestation and Forest Degradation (REDD+) program, a global climate change mitigation program, on the Indigenous M'nam in Vietnam; Indigenous tourism as a proposed post-disaster recovery solution for the Indigenous Tsou in Taiwan; and the Vietnamese government's use of agricultural upscaling as proposed adaptation strategy for local smallholder farmers in the Mekong Delta. While all three case studies describe very diverse situations, I argue that the proposed adaptation solutions are essentially based on very similar presumptions. The final part of this article offers concluding remarks and proposes ways forward.

Political Ecology of Adaptation, Resilience, and Vulnerability

It would be erroneous to assume that this article introduces the political ecology of adaptation, resilience, and vulnerability as a new approach given the extensive body of research already conducted (**Corbera et al., 2017; Eriksen et al., 2015; Eriksen and Lind, 2009; Pelling, 2011; Sovacool, 2018; Sovacool et al., 2015**). It is not my goal here to propose a novel framework nor provide an exhaustive review on the literature on the political ecology of adaptation. What this article, however, proposes is a relatively straightforward hypothesis or proposition: most top-down climate change adaptation solutions are essentially neoliberal. Those who implement adaptation policies (e.g., governments, international organizations, non-governmental organisations, or NGOs) often place sole responsibility—whether intentionally and unintentionally—on individuals to adapt, advocating for market-based solutions without critically incorporating structural determinants, political economy, unequal power relations, pre-existing social and economic inequalities, and the micro-level factors that shape and reshape people's adaptation pathways (**Marks et al., 2022**). If anything, many ill-fitted adaptation and mitigation solutions exacerbate pre-existing inequalities and reshape power dynamics and processes of marginalisation within and among communities (**Corbera et al., 2017; Eriksen et al., 2015**).

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Contrarily, adaptation is not merely about reacting to or coping with climate change; it is an inherently socio-political process (**Eriksen et al., 2015**). While the dominant assumption is that individuals need to adapt, the broader processes driving the Anthropocene are largely ignored. Consequently, if individuals fail to adapt, it is often considered their own fault (in technocratic terms, 'maladaptation'), or they are left to bear the brunt of the climate crisis if they choose to remain in place. Conventional studies and international policy reports on climate migration then often imply that failure to adapt will inevitably result in massive out-migration, leading to an urban future for millions of rural poor in the Global South, leaving their lands for large-scale industrial agriculture (**Paprocki, 2020**).

The question then becomes, Who decides which individuals need to 'adapt'? Is it simply determined by the negative impacts of the global climate crisis on the individuals and their households, or are there other factors at play? Here, two concepts play an important role: vulnerability and resilience. The Sixth Assessment Intergovernmental Panel on Climate Change (IPCC) report, which is probably the most influential authority on climate change adaptation, defines resilience as

> *the capacity of social, economic and ecosystems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure as well as biodiversity in case of ecosystems while also maintaining the capacity for adaptation, learning and transformation* (**IPCC, 2023: 7**).

The report defines vulnerability as 'the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt' (**2023: 5**). What both definitions have in common is that they are apolitical; fail to recognize people as autonomous agents; do not consider the intersectionality of resilience and vulnerability; and do not acknowledge how both resilience and vulnerability are deeply relational—in other words, some people are resilient or vulnerable because others are not (**Taylor, 2013**). Nonetheless, many conventional studies 'measure' one's 'resilience' and 'vulnerability'—with numerous indices created and quantified—to determine how much 'adaptation' is needed.

Instead of questioning the drivers and root causes of the negative consequences of the Anthropocene, which I argue are undeniably linked to global capitalism, solutions are often sought solely within the market system (**Escobar, 1996**). Escobar explains how the sustainable development discourse purports 'to reconcile two old enemies—economic growth and the preservation of the environment—without any significant adjustments in the market system (**1996: 328**). Discourses on adaptation, vulnerability, and resilience should be viewed as a subset

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within dominant sustainability discourses abiding the same internal logic: rather than questioning the system that caused the climate crisis in the first place, we seek solutions within that very same system. The dominant logic seems to suggest that, simply put, what we need is not less but *more* capitalism (**Escobar, 1996; Fairhead et al., 2012**).

REDD+ and Indigenous Communities in Vietnam

The Reducing Emissions from Deforestation and Forest Degradation (REDD+) program is a multilateral initiative under the Paris Agreement aimed at mitigating global climate change. It is implemented by various multilateral organizations, including United Nations agencies and the World Bank, as well as by NGOs, governments, and private companies. It was established and further negotiated during the many Conferences of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC). The premise of REDD+ is quite simple: developed countries pay developing countries for conserving carbon in their forests as a means to halt CO_2 emissions. Ever since CO_2 became a commodity, an outcome of the Kyoto Protocol, carbon markets, both global and voluntary, emerged, and REDD+ was developed to achieve a triple-win situation: mitigate climate change, conserve the world's forests, and improve livelihoods of those depending on forests. Activities in REDD+ include not only avoiding deforestation and degradation but also sustainable forest management, enhancement of carbon stocks, and conservation. These activities very often involve and impact local forest-dependent communities. As of today, most countries in the Global South with significant forest covers, as well as a few without, are involved in REDD+ readiness or implementation activities, though the COP meetings and REDD+ negotiations seemed to be on hold for now.

During my PhD research from 2011 to 2015 (**Bayrak, 2015**), I analysed the local impacts of REDD+ on Indigenous communities in Vietnam. Among the communities I researched, the implementation process of REDD+ in the M'nam communities, one of Vietnam's Central Highlands groups, particularly stood out. REDD+ was implemented by an international NGO with the goal of not only conserving carbon to sell in a voluntary carbon credit market but also using REDD+ to transfer forestland from former state forest enterprises back to the communities. The underlying assumption was that if communities owned the forestland, they would have a vested interest in preserving it. Additionally, sustainable forest management was perceived as a good adaptation measure against climate-related stressors. The M'nam communities in this study were highly forest-dependent, conducting swidden agriculture, hunting and collecting non-timber forest products (NTFPs). When the NGO approached them to participate in REDD+, the involved communities voted in

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accordance with the principles of Free, Prior, and Informed Consent (FPIC). The main aim of FPIC is that people have a clear understanding of what REDD+ is, and they are able to vote unrestrained in a democratic manner. REDD+ had yet to pay out carbon payments at the time of the research, but the communities were involved in various readiness activities.

My study revealed that the local M'nam communities did not have a clear understanding of what REDD+ entailed, even though they voted to participate in the program. Being forest-dependent, they assumed that they could collect carbon in the forest and sell it on the market like any other NTFP. Additionally, interviewees claimed that REDD+ was something about the air. The reason why they decided to participate in REDD+ was that they wanted to receive formal land titles for forestland. They wanted these forestlands not for preservation but for growing coffee and other commercial crops, the very antithesis of REDD+ (**Nguyen et al., 2022; To et al., 2017**). While REDD+ is primarily a mitigation rather than an adaptation program, its premise is highly problematic: it shifts the responsibility for global climate mitigation onto local and Indigenous communities, who live what conventional scientists describe as 'carbon-negative' lifestyles. These communities are told, often implicitly, that if they do not participate in REDD+, they will have to bear the negative consequences of climate change, whereas participation could potentially provide them with significant financial benefits. International and other powerful actors attempting to impose a highly alien concept of forest management on local and Indigenous communities—who have developed deep and spiritual relationships with their surrounding forests through their TEK systems—may be a key reason why REDD+ has failed to succeed in many pilot projects around the world.

Indigenous and Community-based Tourism in Taiwan

Regarding the second case study, we conducted a research project on post-disaster recovery and Indigenous tourism among the Tsou communities, one of the sixteen officially recognized Indigenous groups in Taiwan, who live in Alishan Township, a mountainous and forested area rich in biodiversity (**Bayrak, 2022**). We were interested in studying the impact of Typhoon Morakot, which swept across Taiwan in 2009, leaving behind a deadly trail of devastation. We analysed the role of Indigenous tourism—defined as a subset of community-based tourism (CBT)—in post-disaster recovery among three communities in South Alishan.

The first community, Shanmei (or *Saviki* in the Tsou language) had developed a very successful CBT model prior to Typhoon Morakot, which focused on community-based river ecosystem and local fish fauna (*Onychostoma alticorpus*) management. The community established the Danaiku Nature Ecological Park (DNEP), which involved most of its

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community members working in the park, and it is generally considered to be among the most successful CBT models in Taiwan as well as the world (**Hipwell, 2007**). The second community, Chashan (*Cayamavana*), transformed the village into a cultural eco-village, in which most visitors stayed in home-stays to experience the unique Tsou culture. The third community, Xinmei (*Sinvi*), was situated right between Shanmei and Chashan and faced challenges in developing a tourism niche. When Typhoon Morakot struck the communities, the tourism industries and local economies of all three communities collapsed. The ecological disaster was so severe that the number of visitors to DNEP dropped to zero in 2010.

During the post-disaster recovery efforts, significant attention was given by the government to CBT and Indigenous tourism as means to restore the local economy and ravaged ecosystems. Consequently, the government prioritized communities already engaged in CBT before Typhoon Morakot, such as Shanmei, in receiving the necessary resources for recovery. It took six years following the typhoon to reach the same visitor levels as 2008 (around 110,000 annual visitors) in DNEP. Communities like Xinmei, which were less involved in tourism, felt somewhat neglected; many interviewees from Xinmei, for instance, reported that their hiking trails were still unrepaired as of 2019. Indigenous tourism thus contributed to inequalities between communities in post-disaster recovery settings. We also observed intra-community disparities, such as those between households actively engaged in tourism and those that were not. Those actively involved in tourism prior to Typhoon Morakot in Chashan reported being better financially recovered from the typhoon compared to those with other non-tourism livelihoods.

More problematically, many Indigenous communities in Taiwan are expected to copy other successful models like Shanmei to develop their own CBT initiatives to cope with the negative effects of climate change, but also to find means to remain in the village. Villages in rural Taiwan, including those in our study, not only face the negative consequences of climate change, but also super-aging, economic stagnation, and out-migration. Additionally, there is an underlying assumption that everyone has the potential to be a tourism entrepreneur. This pressure for many individuals and communities to adopt the same CBT model of more successful communities illustrates how responsibilities have shifted to households and communities, while solutions are expected to be found in the market. Although it is not official government policy, few alternatives besides tourism are provided to keep the village economy alive.

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Agricultural Upscaling and Climate Change in the Mekong Delta

An official government policy to use market-based solutions as a form of climate change adaptation can be found in the Mekong Delta of Vietnam. Around 75 percent of the people's livelihoods depends on agriculture in the Mekong Delta (**Van Aalst et al., 2023**). It is perhaps one of the most human-modified, politically contested deltas in the world. Since French colonialism prompted massive canalisation projects in the delta, the Mekong Delta has been intrinsically linked to Vietnam's changing political economy and national development plans. After the end of the American war and the reunification of Vietnam, the main purpose of the Mekong Delta was to produce rice for the entire nation, earning the title of 'rice basket of Vietnam' (and later of the entire Asian region). Many rice farmers practiced monocrop single-rice agriculture, growing rice during the dry season and allowing their fields to be flooded during the rainy season. In order to improve efficiency, the Vietnamese government invested heavily in flood infrastructure, such as dike and sluice gate systems, to prevent flooding and enable farmers to not only double but also triple their rice crops annually. As rice farmers traditionally depended on flooding to replenish soil nutrients, the lack of flooding heavily increased the use of chemical fertilizers and pesticides. The Vietnamese government adopted the paradigm that flooding had to be prevented at all costs (**Tran, 2020**). With an increase of intensified flooding events however, the Vietnamese government proposed the idea to 'live with floods' starting from the late 2000s.

The Mekong Delta faces various environmental and non-environmental challenges, which include sea-level rise, increasing salinisation, droughts, intensified flooding events, and changing weather patterns. They also include the negative impacts of upstream hydropower development in upstream Mekong countries such as China and Laos, which remove sediments from the river and exacerbate droughts downstream; coastal and riverbank erosion; illegal sand mining; the negative impacts of (faulty) flood infrastructure; and the lack of flooding, which in many cases is also considered a disaster (**Bayrak et al., 2022**).

It should be noted, though, that the above description of the Mekong Delta is somewhat of a generalisation, considering the diversity of its agricultural systems. In our project, we focused on local smallholder farmers in Kien Giang province, a coastal province in the Mekong Delta. As a means to cope with increasing salinisation, the government started to promote aquaculture to the local farmers, particularly (rotational) rice-shrimp farming. Rice-shrimp farmers raise shrimp during the dry season and grow rice during the rainy season. The general idea is that since shrimp

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thrive in a brackish and saline environment, it would be better to let brackish water in (i.e., live with brackish water). The shift to rice-shrimp farming could fulfil three goals: adapt to increased salinisation; increase income as aquaculture is more profitable than rice farming; and upscale agriculture in the delta. This shift was linked to the national government's broader plan to upscale the agricultural value chains and industries in the delta. Aquaculture, as well as fruit tree farming, is currently being actively encouraged and implemented. In its 2017 Resolution 120/NQ-CP, which outlines the Vietnamese government's vision for the Mekong Delta, the government no longer referred to its farmers as smallholder farmers but rather as agri-entrepreneurs (**Bayrak et al., 2022**). While the shift to rice-shrimp farming provided significant financial benefits to rice-shrimp farmers, not all smallholder farmers had the capacity, start-up capital or land to make this transition (**Poelma et al., 2021**). However, by allowing brackish water in to enable rice-shrimp farming, mono-crop rice farmers have few choices but to either engage in rice-shrimp farming themselves or lease out their farmlands to others due to shared water resources.

While aquaculture and fruit production have been increasing in the Mekong Delta, outmigration rates to urban areas have also reached an all-time high. While I do not argue that there is a causal relationship between these two factors, the government, as well as many other organizations and academics, link these out-migration rates directly to the negative impacts of climate change (**Bayrak et al., 2022**). Climate change, being an external threat, is easier to blame than other political economy factors, such as the government's top-down plan to upgrade agriculture in the delta or the negative impacts of upstream hydropower development, which make it more difficult for farmers to cope with environmental changes.

When we refer to adaptation of farmers in the Mekong Delta, it is equally difficult to pinpoint what it is farmers are actually adapting *to.* To make matters more complicated, both COVID-19 and the war in Ukraine affected farmers in Kien Giang. Urban migrants returned to rural areas due to COVID-19 lockdowns, while the war caused fertilizer prices to significantly increase for local farmers. What the case above has shown is that future studies should no longer ascribe changes in the Mekong Delta solely to climate change, and the effects of broader land-use challenges, government policy, geopolitical relations, power relations and transboundary water governance issues need to be better understood (**Tran, 2020**).

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Conclusion

The above cases have shown how powerful stakeholders, such as governments and international organizations, have turned 'environmental subjects' into carbon-, tourism- or agri-entrepreneurs as solutions in order to cope, adapt to, or mitigate the negative impacts of climate change. Indigenous communities in Vietnam were even expected to carry the burden of global climate change through engaging in REDD+. We also found Indigenous tourism in Taiwan and the shift to rice-shrimp farming in Vietnam have caused inequalities within and among communities. Some households were able to successfully transition into rice-shrimp farming or become successful tourism entrepreneurs, but other households were left behind. Whether it was to sell carbon, a unique tourism experience, or shrimp, all proposed solutions were based on market mechanisms while shifting focus onto the individual responsibility of households.

In this article, I do not argue that engaging in tourism, sustainable forest management, or transitioning to rice-shrimp farming are necessarily negative. For many farmers in the Mekong Delta, for instance, rice-shrimp farming was seen as highly profitable, providing local farmers with new opportunities to improve their lives and livelihoods. I argue, however, that adaptation solutions should be (co-)developed by Indigenous and local communities. They need to be bottom-up approaches that also address existing inequalities and power imbalances in addition to other structural problems that communities face, all while considering peoples' aspirations and dreams.

This can be achieved in two ways. First, we need to perceive adaptation as a cultural practice (**Marks et al., 2022**). Adopting a cultural lens allows us to better situate adaptation within a specific socio-cultural and historical context and adopt an intersectional perspective, appreciating the diversity within communities. Instead of viewing adaptation through a checklist of 'adaptation actions', we need a more grounded approach that reflects what adaptation truly encompasses from the perspectives of local and Indigenous peoples. Secondly, we need to adopt a more grounded approach by decolonising research. Decolonising research refers to, according to Datta, 'a continuous process of anti-colonial struggle that honors Indigenous approaches to knowing the world, recognizing Indigenous land, Indigenous peoples, and Indigenous sovereignty— including sovereignty over the decolonization process' (**2018: 2**). This puts Indigenous epistemologies and voices at the center of the research process (**Datta, 2018; Kovach, 2021; Smith, 2012**). While these calls to action are not new, this article hopefully serves as an important reminder.

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Acknowledgements

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Soil Carbon Projects: A pathway to sustainability, global agricultural productivity, and meaningful climate action

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Abstract

The Australian 2021 Soil Carbon Method (2021 Method) enables drawdown of atmospheric CO_2 to soil. The 2021 Method creates a basis for project development and a market for trade in soil carbon Australian Carbon Credit Units. Standardised measurement, innovation in farm management, and monetary incentives are keys to its success. This paper reports on the early successes of industry participants. Soil carbon markets are an emerging paradigm in sustainability culture.

Official and private sources are used to tabulate data from the first projects to earn soil carbon credits under the ACCU (Australian Carbon Credit Unit) Scheme. A new index of sustainability culture, Soil Carbon Effective Sustainability Culture Index (SCESCI), measured in years, is presented. Globally, over 150 Gigatonnes of soil carbon has been lost from agricultural soils. Replacing this carbon pool would draw down much of the current excess of atmospheric carbon. The related step-change increase in agricultural productivity is significant to global security in a changing world. Monitoring SCESCI at national and regional levels is a success indicator for required transformative change with speed and scale.

Keywords: *sustainability culture index; soil carbon; ACCU; carbon removal; soil carbon sequestration*

Introduction

Soil carbon projects are parts of a system whereby farmers are given an incentive through carbon markets to increase on-farm soil carbon. These projects are delivering landscape-scale regeneration whilst sequestering atmospheric carbon in soils. This system is described below as a needed advance in sustainability culture that is gaining momentum.

Soil carbon is the key indicator of soil health. It feeds microbiological communities, which play a key role in healthy soil structure and function, nutrient fixation and cycling, and resilience against pests and disease. Regenerative grazing practices (**Machmuller & Dillon, 2021**) encourage full groundcover and maximise biomass, which reduces erosion and nutrient runoff, increasing water quality. Regenerative management to increase diversity, such as the use of multi-species pastures, increases insect populations and diversity, which in turn supports broader landscape biodiversity and pollination. A range of ecological services and natural capital co-benefits can be linked to good soil health as measured by increased soil organic carbon (**Lehmann et al., 2020**). These soil health advantages and increases water holding capacity from sequestered soil carbon, also increase agricultural productivity. The need for change in managing soil carbon has imperatives from ecological, productivity and climate perspectives.

Operation of the global economy in the Anthropocene has been driven by extractive industries based on fossil fuels (**Ashworth, 2022**; **Foster, 2024, 2024**; **Fu et al., 2023**; **Görg et al., 2020**; **Oldfield et al., 2014**; **Peša & Ross, 2021**; **Stephens, 2022**; **United Nations, 2021**). The need to move away from extractive fossil-based energy systems and toward renewable energy sources is well understood from a policy perspective and also from an operational and investment standpoint (**Gielen et al., 2019**; **Gielen & Boshell, 2021**; **United Nations, 2024**). Conversely, the need to move away from extractive agricultural systems and towards regenerative systems is only beginning to be articulated. Agriculture is far behind energy systems in terms of policy, operational, and investment imperatives (**Massy, 2020**; **Masterton, 2021**; **Schulte et al., 2022**).

Soil carbon is currently the fastest growing category under the ACCU Scheme, now with 712 registered soil carbon projects (**Clean Energy Regulator, 2025**). The 2023 Proceedings of the Soil Carbon Industry Summit (**Farquhar et al., 2023**) present a snapshot of the Australian soil carbon industry. Previous reviews (**McDonald et al., 2023**) have revealed management impacts on soil carbon. New results from the soil carbon projects credited under the Australian ACCU scheme offer emerging evidence of transformational, cultural, and systemic change. Creating and sustaining a culture of regenerative agriculture has the potential to

positively disrupt existing extractive agriculture systems and decelerate climate change. This paper presents data from these early crediting soil carbon projects under the Australian ACCU Scheme.

Investing, through offset markets, in the cultural change from extractive to regenerative agricultural systems promises to deliver better results for people, profit, and the planet (**Honegger et al., 2021**). The opportunity exists to quantify parts of a regenerative agriculture (**Jayasinghe et al., 2023**) and incentivise innovative management practices that meet emerging Environment, Social and Governance (ESG) markets. Three components are necessary: 1) standardised measurement (**Dupla et al., 2024**), 2) innovative farm management practices (**Field et al., 2024**), and 3) monetary incentives (**Amin et al., 2020**). These components are brought together by companies and landowners implementing the 2021 Soil Carbon Method under the Australian Carbon Credits Units (ACCU) scheme.

Figure 1: ESG (Environmental Social Governance) markets driving transformative change from extractive to regenerative agricultures and systems.
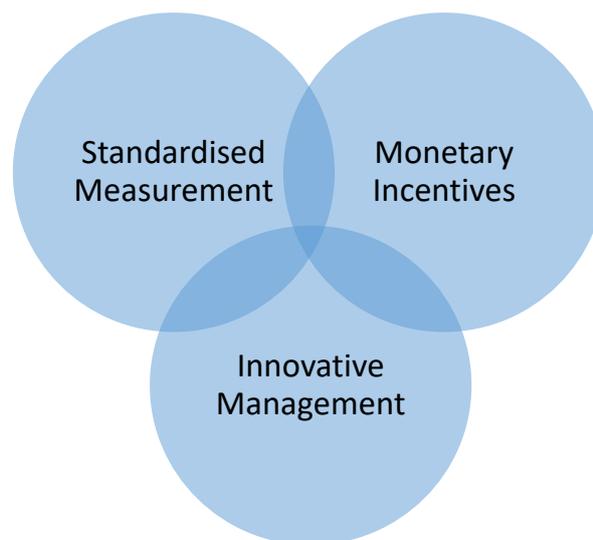
Standardised Measurement

The Australian 2021 Soil Carbon Methodology has a legislated protocol requiring the physical sampling and measurement of soil carbon stock (**Australian Government Federal Registrar of Legislation, 2021**). Importantly, the 2021 Method includes a measurement-and-models approach to soil carbon measurement. Regular randomised physical sampling and laboratory analysis of soil carbon to one metre depth is required. These measures can be used to verify modelling with analytical measures of carbon stock, meaning that any modelling used in the project has an integrity check of physical sampling at the project level. This

internal verification does not rely on publicly available data of variable applicability and depth that have been used for training other models (FullCAM, for example) (**Richards & Evans, 2004**). The 2021 Method details how modelling can be included in projects, providing a commercial incentive for the development of models that are effective in better understanding carbon stock at the project level. Under the 2021 Method, measurement is required where modelling is an optional enhancement. Use of variance discounts, risk of reversal discounts, and a first measure buffer discount provide strong integrity pillars (**Clean Energy Regulator, 2024**). Measurement integrity underpins market confidence, enhancing commercial viability, which in turn gives confidence for landholder participation. Measurement requirements of the 2021 Method is an important policy setting in place in Australia.

Funding of innovation in soil carbon measurement is another policy initiative to drive the adoption of soil carbon sequestration at scale. The Australian Government is now actively investing in innovation in soil carbon measurement (**Australian Government, 2026**). The aim of the National Soil Carbon Innovation Challenge is to improve the commercial viability of soil carbon projects by funding research and development of accurate and low-cost soil carbon measurement technologies. Funded projects include those considering technologies such as Near Infrared (NIR) spectroscopy, the use of proximal and remote sensing imagery, and advanced modelling-based approaches. These innovations encourage the adoption of soil carbon sequestration by reducing measurement costs.

Advanced modelling technologies are delivering promising results for increasing the accuracy of soil carbon measurement. This includes next-generation process-based models (for example biophysical processes like photosynthesis, microbial activity and rainfall). Use of remote sensing technologies (for example synthetic aperture ground penetrating radar), digital soil mapping to precisely map on-ground variability and enhance sampling efficiency), and the use of hyperspectral imagery (for example, focussing on plant health–related spectral regions) add powerful spatial layers (**Coelli et al., 2021; Ma et al., 2023**). Artificial neural networks (systems that flexibly integrate weightings of variables into model forecasts) and deep learning (stacking of neural networks) are bringing new intelligence to enhance the accuracy of soil organic carbon models (**Datta et al., 2024; Guo et al., 2021**).

By meeting the 2021 Method requirements, soil carbon project developers are rapidly accumulating the world's largest soil sample databases. This data can be used to further inform innovation in measurement via calibration of models and novel measurement technologies as outlined above. This data can also inform innovation in on-farm management

practices. This helps farmers to secure measured increases in soil carbon through adjusting their cropping and grazing management.

Innovative Management

Soil organic carbon levels have declined by 160 Gigatonnes (1GT = 1000 million metric tonnes) due to land management culture (**Sanderman et al., 2010**). There is an opportunity for soils to be a significant (840 GT) sink for atmospheric carbon (**Lal, 2001**). This turnaround means that different management cultures are required (**Blakemore, 2024**). The wider sustainability culture includes institutions such as Australia's Clean Energy Regulator and government policy instruments. Our home country of Australia has an established carbon offset market. These institutions, policies and incentives are beginning to be effective for farmers. Early crediting projects show that with feedback from measurement and financial incentives the on-farm cultural turnaround is possible.

Under the ACCU scheme soil carbon projects, land managers are implementing new management practices that are successfully sequestering carbon in soils. Whilst eleven 'eligible activities' are detailed in the 2021 Method, changes in management practices often involve integrating changes in these activities with normal cropping and grazing programmes. Case studies in applied science point the way to overcoming barriers to 'farmer-centric' on-farm experimentation, empowered by spatial technologies to drive improved land management (**Bramley et al., 2022**; **Song, et al., 2022a**; **Song, et al., 2022b**). A focus on measurement allows for farmer flexibility in changing management.

For example, the Howson Carbon Project in the town of Banana, Queensland has generated 9,214 ACCUs from across a 550-hectare area as part of a larger 3,745-hectare soil carbon project (**AgriProve, 2024**). Farming family the Gunthorpes manage the Howson Carbon Project. They have achieved soil carbon gains through the implementation of holistic planned grazing management, increased the number of paddocks through subdivision, and installed watering points to enable greater control of grazing intensity, timing, and longer recovery periods. They have also invested in pasture improvement with increased legumes and multi-species pastures. Remote sensing is used to monitor grazing and overall project performance. Soil carbon project design allowed spatial identification of farm areas that were successful at building soil carbon.

Similarly, the Moora Plains Carbon Project in Gogango, Queensland, generated 85,262 ACCUs across 3,553 hectares, the second-largest number of ACCUs awarded to a single soil carbon project under the ACCU Scheme (**CarbonLink, 2023**). Project landowners the Lawrie family successfully used rigorous, time-controlled planned grazing alongside

increasing the number of paddocks and installation of water infrastructure, enabling greater grazing density and longer recovery periods, up to 300 days in pasture dieback-affected areas. They also improved pastures from monocultures to diverse natural pastures.

Finally, the Fife Carbon Project was issued 4,077 ACCUs across 157 hectares to become the first project in a cropping system to generate soil carbon ACCUs. This project integrates six steps to regenerate soil carbon (**LawrieCo, 2025**), which involve proprietary products to stimulate small root growth (humic acids) and enhance rhizosphere biology (including vesicular arbuscular mycorrhizae, fungi which can assist plants access scarce nutrients). These changes challenged the farmer's perception of productivity, but he is now considering living soil microorganisms and naturally occurring plant hormones and stimulants much more in his management.

It is difficult to argue in favour of any form of regenerative agriculture practice where soil conditions are in decline because of management practice. The crediting projects demonstrate an effective turnaround toward soil carbon regeneration. All three of these projects are part of commercial enterprises, and early discussions with landowners and project developers point to productivity gains. Production advantages have so far been unclear or insufficient to lead farmers to effective regeneration of soil carbon stocks at scale. Financial incentives from ACCUs can help align farmer and wider societal interest in sustaining and accelerating regeneration of soil carbon.

Monetary Incentives

Offsets play a central role as a mechanism in climate action. In this approach companies purchase offsets at a level that relates to the tonnes of carbon dioxide emitted and in accordance with accounting standards, company commitments and compliance requirements. Offsets are particularly effective because they contain two incentives, one on either side of the transaction. Companies that participate in offset markets are more ambitious and take more action to reduce emissions in their value chain (**Ecosystem Marketplace, 2023**). On the other side, offset developers are encouraged to invest in mitigation, in this case by measurably increasing soil carbon.

Offsets are also morally defensible as internalising an externalised cost. The cost of emissions is borne by the world, and imposing this cost back on the emitters activates this double incentive mechanism. Whilst these costs are likely to be passed on to consumers, it could be argued that this makes things simpler for them in the long run: Price is a more accurate reflection of the total cost of producing goods. If these impacts have been

offset, consumers don't need to do additional calculations to factor in the global climate impact of their purchase. Without a requirement to offset emissions, companies do not need to consider impacts on the wider world.

In the case of soil carbon, drawing down atmospheric carbon via photosynthesis nourishes soil biology. This builds landscape productivity, resilience, and function. As soil carbon projects are implemented across Australia and the world, there will be a step-change in agricultural productivity.

Economic incentives promote the change to sustainable practices, especially in the short term (**Piñeiro et al., 2020**). Under the 2021 Method, measured Soil Organic Carbon (SOC) increases are rewarded with ACCUs, which provide these incentives. The existing market for ACCUs is external to standard agricultural markets, and this reduces farmers' risk through income diversification.

To achieve enough soil carbon sequestration to begin to counteract climate change these new management practices need to be implemented on a globally relevant scale. The most likely investment mechanism to be able to achieve this scale will be emerging Environmental Social and Governance (ESG) markets. These policy, accounting and standards arrangements could be considered cultural assets for sustainability.

In Australia, the ACCU scheme and its markets are underpinned by the Australian Safeguard Mechanism; such compliance mechanisms (requiring large emitters to buy offsets) increase market certainty for farmers and are likely to significantly enhance uptake. This ESG enhancement is a cultural asset for the carbon farming system and for society but a liability for large emitters.

Generally, there are no trade-offs between economic and environmental outcomes for farmers with soil carbon projects, and these win-win economic and environmental benefits should promote rapid uptake (**Farquhar et al., 2023: 320–40; Piñeiro et al., 2020**). Yet across Australia, soil carbon levels continue to decline due to agricultural practices despite considerable effort and a range of government initiatives to stimulate soil health. This new monetary incentive through the ACCU scheme provides a stimulus for a necessary farmer-level cultural shift. The size of this incentive programme governs the speed of action, where the higher the credit price the faster the project uptake.

Methods and Results

This paper reports on the first 34 soil carbon projects to be issued credits under the Australian ACCU Scheme. One ACCU (Australian Carbon Credit Unit) represents a tonne of carbon dioxide. In these projects, a total of 343,626 tonnes (ACCUs) were removed from the atmosphere to soil.

While these headline statistics are of interest, more detail will also provide a guide to assist farmers and advisors in assessing a business decision to embark on carbon farming. ACCUs per hectare per year is a measure of yield that can be factored into farm business models and plans. These figures will also inform researchers and innovators as to the scale of gains that are possible. This can encourage examination and optimisation of the biological processes that led to these gains.

New farming practices and sustainability cultures can be refined with experience. This special issue on Sustainability Culture led us to consider the accumulation of culture and experience in soil carbon farming. The approach developed below draws on adoption analysis using the CSIRO ADOPT model (**Farquhar et al., 2023: 324–334**). The Australian ACCU scheme project register (**Clean Energy Regulator, 2025a**) was accessed on 30 June 2025, and the full register was downloaded. The crediting soil carbon projects provided the data for ACCUs issued to soil carbon projects.

Project sampling dates are not required to be disclosed on the scheme register. Companies managing these projects were contacted for sampling dates, which were used to accurately determine over which period these ACCUs were issued for CO_2 sequestration from the atmosphere to the soil.

Shapefiles of the land area (Carbon Estimation Areas) to which these ACCUs were credited were accessed from the ACCU Scheme Project Register (**Clean Energy Regulator, 2025a**). These files enabled the calculation of areas in hectares using QGIS open-source software (**qgis.org, 2024**). This data is tabulated in Figure 2. One project, 'Grounds Keeping Carbon Project,' has had three ACCU issuances.

The area-weighted average accumulation rate (see Figure 3) is 6.0 ACCUs (tonnes) per hectare per year. The total area for the 34 projects is 16,415 hectares, and these have been issued with 343,626 ACCUs. These credits have a value more than $10M Australian dollars at a 2025 spot market price of around $35 per ACCU (**Clean Energy Regulator, 2025b**).

Figure 2: Australian ACCU Scheme Soil Carbon Projects for which ACCUs have been issued as of 30 June 2025

Project Name	Project ID	Project location	Baseline sampling date	Last sample date	ACCUs issued	CEA Area	Credits per hectare	Credits per hectare per year
Grounds Keeping Carbon Project	ERF104781	Victoria	16.12.2016	26.01.2021	3067	100	30.67	7.45
Moora Plains Soil Carbon Project	ERF105067	Queensland	10.11.2016	11.07.2021	85262	2616	32.59	6.98
Bonnie Doone Soil Carbon Project	ERF108333	Queensland	30.10.2016	29.07.2021	94666	3877	24.42	5.14
Turpentine Carbon Project	ERF102074	Queensland	22.11.2016	12.09.2021	66050	2872	23.00	4.78
Cheyenne Soil Carbon Project	ERF104527	New South Wales	09.12.2016	08.10.2021	12486	578	21.59	4.47
Smith Carbon Project	ERF158470	Queensland	12.09.2020	07.09.2022	1362	505	2.70	1.36
Fysh Carbon Project	ERF143770	Queensland	09.10.2020	14.09.2022	3559	394	9.03	4.68
Lynch Carbon Project	ERF159853	South Australia	24.11.2020	11.11.2022	641	156	4.11	2.09
McLachlan Carbon Project	ERF162497	New South Wales	08.04.2021	19.12.2022	2110	93	22.69	13.36
Swartz Carbon Project 9	ERF168650	Queensland	05.03.2022	16.03.2023	2976	177	16.81	16.32
Scully Carbon Project	ERF166967	New South Wales	17.02.2022	03.04.2023	4478	226	19.78	17.61
Swartz Carbon Project 4	ERF168644	Queensland	14.03.2022	25.04.2023	3176	148	21.46	19.24
Lazzarini Carbon Project 2	ERF167123	New South Wales	14.04.2022	26.04.2023	2234	276	8.08	7.83
Mountain View Carbon Project	ERF160172	Victoria	27.04.2022	02.05.2023	457	100	4.58	4.52
Watson Carbon Project	ERF149373	New South Wales	16.04.2020	09.05.2023	5585	268	20.84	6.80
Howson Carbon Project 14	ERF169446	Queensland	13.04.2022	30.05.2023	5623	309	18.20	16.12
Howson Carbon Project 7	ERF169439	Queensland	10.05.2022	31.05.2023	3591	250	14.36	13.58
Fife Carbon Project	ERF175975	Victoria	21.07.2022	24.07.2023	5435	158	34.49	34.20
Hodges Carbon Project	ERF175981	Victoria	07.07.2022	03.08.2023	290	132	2.20	2.05
Morrison Carbon Project 1	ERF172195	Western Australia	02.06.2022	08.08.2023	1693	184	9.20	7.77
Morrison Carbon Project 2	ERF172197	Western Australia	02.06.2022	08.08.2023	1980	109	18.10	15.29
Lyne Carbon Project	ERF154609	Queensland	07.09.2022	21.09.2023	1114	210	5.30	5.11
Howson Carbon Project 4	ERF169436	Queensland	20.04.2022	03.11.2023	5009	166	30.17	19.60
Howson Carbon Project 15	ERF169476	Queensland	13.04.2022	07.11.2023	3706	991	3.74	2.38
Lazzarini Carbon Project 3	ERF167124	New South Wales	21.03.2022	18.12.2023	4009	229	17.51	10.03
Duncan Carbon Project 2	ERF180115	Queensland	13.12.2022	20.12.2023	481	113	4.26	4.18
Barwick Carbon Project 3	ERF170334	Victoria	19.07.2022	16.01.2024	5610	248	22.59	15.10
Barwick Carbon Project 1	ERF170331	Victoria	18.07.2022	17.01.2024	3035	173	17.55	11.69
Barwick Carbon project 4	ERF170337	Victoria	17.07.2022	17.01.2024	1903	123	15.51	10.31
Killen Carbon Project	ERF173466	New South Wales	29.06.2022	31.01.2024	1711	47	36.40	22.87
Ryan Carbon Project 2	ERF179167	New South Wales	18.12.2022	05.02.2024	4839	294	16.46	14.52
Morrison Carbon Project 5	ERF172203	Western Australia	01.06.2022	17.04.2024	1484	111	13.32	7.09
Morrison Carbon Project 7	ERF172205	Western Australia	01.06.2022	17.04.2024	1495	122	12.24	6.51
Viner Carbon Project	ERF174333	Queensland	23.06.2022	20.07.2024	2509	59	42.60	20.51

Figure 3: Formula for calculation of area weighted average accumulation rate.

$$\frac{ACCU}{ha \cdot yr} = \frac{\sum_{p=1}^{n} ACCU_p}{\sum_{p=1}^{n} (a_p \cdot t_p)}$$

$where: ACCU_p$ is the ACCU issuance per project

a_p is the issuance area in hectares of the project

t_p is the number of years elapsed between baseline and subsequent sampling for issuance for each crediting project p
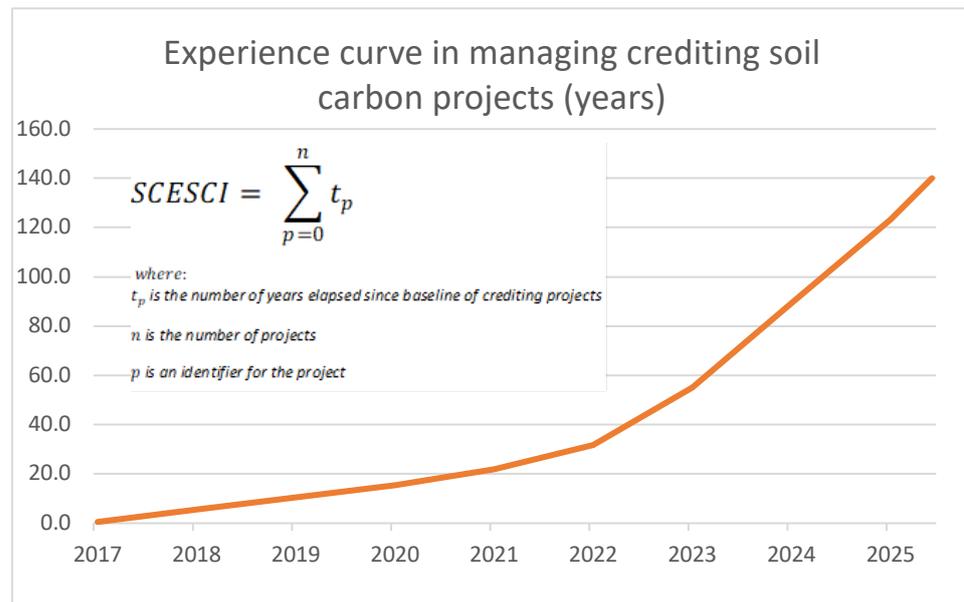
n is the number of projects

Figure 4: s Revenue sensitivity to ACCU price and average annual ACCU accumulation rate. The circle shows the current average ACCU price and accumulation rate of around $200 per hectare per year.

ACCU/ha/y	\$/ACCU 10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	400	1000
1	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	400	1000
2	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	800	2000
3	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	1200	3000
4	40	80	120	160	200	240	280	320	360	400	440	480	520	560	600	1600	4000
5	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	2000	5000
6	60	120	180	240	300	360	420	480	540	600	660	720	780	840	900	2400	6000
7	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	2800	7000
8	80	160	240	320	400	480	560	640	720	800	880	960	1040	1120	1200	3200	8000
9	90	180	270	360	450	540	630	720	810	900	990	1080	1170	1260	1350	3600	9000
10	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	4000	10000
11	110	220	330	440	550	660	770	880	990	1100	1210	1320	1430	1540	1650	4400	11000
12	120	240	360	480	600	720	840	960	1080	1200	1320	1440	1560	1680	1800	4800	12000
13	130	260	390	520	650	780	910	1040	1170	1300	1430	1560	1690	1820	1950	5200	13000
14	140	280	420	560	700	840	980	1120	1260	1400	1540	1680	1820	1960	2100	5600	14000
15	150	300	450	600	750	900	1050	1200	1350	1500	1650	1800	1950	2100	2250	6000	15000
16	160	320	480	640	800	960	1120	1280	1440	1600	1760	1920	2080	2240	2400	6400	16000
17	170	340	510	680	850	1020	1190	1360	1530	1700	1870	2040	2210	2380	2550	6800	17000
18	180	360	540	720	900	1080	1260	1440	1620	1800	1980	2160	2340	2520	2700	7200	18000
19	190	380	570	760	950	1140	1330	1520	1710	1900	2090	2280	2470	2660	2850	7600	19000
20	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	8000	20000
21	210	420	630	840	1050	1260	1470	1680	1890	2100	2310	2520	2730	2940	3150	8400	21000
22	220	440	660	880	1100	1320	1540	1760	1980	2200	2420	2640	2860	3080	3300	8800	22000
23	230	460	690	920	1150	1380	1610	1840	2070	2300	2530	2760	2990	3220	3450	9200	23000
24	240	480	720	960	1200	1440	1680	1920	2160	2400	2640	2880	3120	3360	3600	9600	24000
25	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	10000	25000

The sustainability effectiveness of management culture could be considered proven when soil carbon ACCUs are issued. Figure 5 shows an accumulation curve of this Soil Carbon Effective Sustainability Culture Index (SCESCI). The chart shows accumulation to 140.1 years of SCESCI by 30 June 2025.

Figure 5: Experience curve in managing crediting projects is postulated as an indicator of the stock of sustainability culture. SCESCI is the Soil Carbon Effectiveness Sustainability Culture Index measured in years.

Experience curve in managing crediting soil carbon projects (years)

$$SCESCI = \sum_{p=0}^{n} t_p$$

where:

t_p is the number of years elapsed since baseline of crediting projects

n is the number of projects

p is an identifier for the project

Discussion

SCESCI is an outcome measure of how well the world's cultures are integrating sustainable development. For high-quality soil carbon credits to be issued under the Australian scheme, many stakeholders have to 'get real and get on with it' (**Chubb, 2022**). This includes farmers, project developers, the government regulatory system, and ACCU buyers.

Measurement at the project level provides project internal integrity for soil carbon stock estimation. These measures provide clear feedback for farmers and provide assurance for purchasers of offsets. These measures as SCESCI also provide feedback on what makes for an effective culture of sustainability. To achieve the transformative changes and outcomes measured as SCESCI, three components are necessary: measurement, monetary incentives, and innovative management. Once a high-integrity soil carbon measurement and crediting system is in place, price can be a single signal to drive innovation and the adoption of an effective sustainability culture.

ESG institutions and governments can establish a dynamic price by requiring that emissions are offset. Requiring emissions offsets is a clear instrument for morally appropriate quantities required. Setting this requirement presents a clear policy for speeding action on climate change. It is clear that an integrated socioecological system is required (**Amin et al., 2020**). Lag times are measured in years as high-integrity crediting systems develop and markets align, plants grow, and farming systems adapt to build soil carbon. SCESCI targets can be the key metric for bringing forward effective transformative change. ESG markets are a cultural mechanism poised to do so, and SCESCI can be used to bring focus on effectiveness to these markets.

Conclusion

This paper is the first comprehensive presentation of soil carbon projects crediting under the Australian ACCU scheme, the first calculation of an average crediting rate, and the first presenting this data in the context of global, national, and farm-level sustainability culture. While being a complex system of measurement, policy, and land management, two simplifications of this process have emerged. First, the Soil Carbon Effective Sustainability Culture Index (SCESCI) can be a straightforward index of the effectiveness of an integrated culture at multiple scales of public interest. Secondly, once the cultural and policy infrastructure is in place, the price of carbon credits offers a clear incentive to accelerate this innovation system.

Reversing soil carbon loss is surely a cornerstone of any global Sustainability Culture. Crediting soil carbon projects are showing strong productivity gains. These observations for soil carbon are in contrast to the commonly reported trade-offs for sustainable practices (**Piñeiro et al., 2020**). The necessary cultural ingredients of measurement, innovation, and finance are brought together in soil carbon markets to enable meaningful drawdown of atmospheric carbon and regeneration of landscapes at scale.

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Figure 4: s Revenue sensitivity to ACCU price and average annual ACCU accumulation rate. The circle shows the current average ACCU price and accumulation rate of around $200 per hectare per year.

Figure 5: Experience curve in managing crediting projects is postulated as an indicator of the stock of sustainability culture. SCESCI is the Soil Carbon Effectiveness Sustainability Culture Index measured in years.

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The Royal We and the Good Life: Alienation, addiction, and generational trauma

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Abstract

This Critical Reflection problematizes the notion of a collective 'we' who cannot seem to achieve sustainability. The fiction of this notion creates a split in that we, between the simultaneous existence of a 'comfortable we' and an unmarked collective of that same 'we' which makes their comfort possible. It is the 'comfortable we' who seem unable to achieve sustainability. While it remains difficult to look at the unsustainable luxury of the 'comfortable we' and not desire it too, its costs are becoming increasingly visible. What my twenty years working at the resource frontier in Cambodia, where forest economies give way to the market, have shown me is that there seem to be no winners in this game. There are victims and there are perpetrators, each traumatized in different ways. I argue that the deep historical melancholy of 'civilization' is born of real trauma, the effects of which have been passed through generations of the privileged as well as the human labourers and the more-than-human world of mountains, rivers, and other species who make their privilege possible. The 'global we' certainly exists, but it includes far more actors than are currently acknowledged by the 'comfortable we', who are riddled with a deep and barely recognized anxiety.

Keywords: global development; sustainability culture; forest economy; resource management; generational trauma; Cambodia

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Introduction

The call for papers for this special issue on Sustainability Culture asks the question, 'How is it possible that even though we already have all the knowledge and technology required to live and farm sustainably, we do not seem to be able to fully achieve this?' This paper asks, more pointedly, who is this *we*? Certainly, it is not the 'global we', which encompasses the subsistence farmers and fishers, factory labourers, and hotel maids whose lives are spent ensuring that they and their children have food, homes, and clothing. These lives have few options for acquiring the basics, let alone the luxuries necessary to tip the scales of biospheric balance. Including this massive swath of precarious humanity in a 'global we' incapable of using resources responsibly is a bit of a violence, but it is one justified by the undisputed fact that the majority of the struggling masses do, in fact, aspire to the life of privilege, a life that is unsustainable. By invoking 'the technology that gives us our comforts', the call for papers gestures toward an elusive good life, one which I address by attending to key elements tangled with this orientation toward comfort and privilege.

The first key element is what I refer to as the 'royal we', who cannot achieve sustainability. The invocation of 'we' ostensibly includes the disenfranchised as well as the enfranchised in a powerfully democratic move that acknowledges the sovereign agency of all *homo sapiens*. But that democratic inclusion is not what this 'we' is doing. The invocation of a totalizing 'we' that is responsible for the ongoing catastrophe of a profoundly broken political economy is part of the cultural grammar that obfuscates the simultaneous existence of a 'comfortable we' and an 'unmarked we', which makes that 'comfortable we' possible. This paper proceeds to discuss some important and forgotten aspects of this unjustly inclusive 'we' and attempts to put its emergence into historical context as part of what I argue is a founding trauma of 'civilization'.

I use scare quotes around the term 'civilization' to signal an alternate interpretation of a common term. 'Civilized' spaces are explicitly hierarchical social systems founded by tribute-taking kings, who transformed landscapes and livelihoods toward the increased production of tribute-friendly grains and the scaling and industrialization of existing technologies like metallurgy, stone craft, and weaving. This production only increased with modernity. It has long been suggested that the growth and industrialization of these technologies is pathological (**Carson, [1962] 2002; Rappaport, [1967] 1984**), a claim supported by the continuing degradation of conditions favourable for sustaining the current biosphere. Humans and their self-produced food account for nearly one quarter of all greenhouse gas emissions, and the contemporary food regime is intimately connected to the earliest land and economic transformations of

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the earliest kings (**Marshman et al., 2019; McMichael, 2013**). These transformations are intimately connected to the creation of comfort for the few, while the exploitation of all others is politely naturalized. In the time of the early kings, this supposedly natural inequality was approved by immaterial gods that supported royal lineages, and also their usurpers through time. Ancient kings ruled as 'we', both the king and the god are implicated in the administration of social life, and the king's power and the effectiveness of his pursuits implies favour from god. In contemporary democracies, this lineage of privilege, supported by inherited wealth, is naturalized into a competitive economic model of winners and losers. The winners are simply smarter and better than the losers.

The frame of winners and losers is an important part of the way the 'comfortable we' engages with technology and the social organizations that deploy those technologies toward particular ends. The love affair with comfort and technology is entangled with a privileged social position and the addictive idea of being a winner. Even in secularized societies, winning implies being blessed in some way. For many, these are still blessings from the god(s). It is difficult to rationalize a good life that entails all food on demand, massive wardrobes, and luxury vacations when these are causing the conditions through which the entire biosphere will transform and end those privileged lives. And into this situation returns the god in the form of a 'we' that collectively fails to sustainably manage itself.

At the same time, agro-ecological 'solutions' to the problem of planetary biospheric transformations look suspiciously like the food-getting practices of swidden cultivators, backwards and unproductive relational economies long suppressed by kings and other aggrandizers in the name of progress and civilization. There is a perfect irony to the solution existing in the purposefully destroyed Traditional Ecological Knowledge (TEK) and other practices of those not privileged enough to live unsustainably. This will be addressed in the next section, followed by an unpacking of the link between the privilege of unsustainability and the invocation of a 'we' that is clearly not inclusively implicated in planetary transformations.

In the final section, I discuss addiction and alienation as twin effects of the creation of both the privilege, and the lack thereof, to behave unsustainably. I argue that the invocation of the 'royal we' by the privileged, who lack the desire or wherewithal to live sustainably, cannot be understood in isolation from the people who lack that privilege yet are still included by default in this global 'we'. My twenty years of research in the forests of Cambodia, as they are transformed from sustainable social systems into landscapes that feed unsustainable market systems, provides the evidence to support the claim that progress for some creates disenfranchised others. This is not a new claim. What often goes

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unremarked, however, is that their disenfranchised status helps create enfranchised others. The view from the forest suggests that the cruelty required to disenfranchise these others, whose loss is a condition of the enfranchised's gain, lays a foundation for intergenerational trauma. This might be driving the self-destructive, addictive behaviours that are visible in communities of rich and poor alike.

The 'Aspirational We'

The 'aspirational we' are key players in sustaining the logic of unsustainable development. These are the losers, alienated from their relational economies, who legitimately desire inclusion as participating members of the privileged economy. Inclusion comes at the cost of collapsed social relations with the water, rocks, and animals with whom they achieve subsistence. The social contract for economic production established between people and the land, often mistaken for religion (**Work, 2023**), can be productively understood as a form of relational economics. Risking simplification, acknowledging that extractive economics and universal 'religion' changes practice through time (**Sprenger, 2018**; **Stolz, 2019**), this section proceeds to describe *ancestral economics*, a concept that emerged through engagements with rural and Indigenous people in Cambodia and readings from other times and places (**Kimmerer, 2013**; **Povinelli, 2021**). It looks like this:

> *We came just the three of us, my husband, child, and me. There were a few other families here and we found this place along the stream. We walked the edges of the place where we hoped to build our home, introducing ourselves to the ancestors of this place and asking if we could build a house here. We burned incense, and the smoke carried our voiced intentions: We want to make a home here, grow rice, and raise our children. We promise to take only enough and live happily together here…* **(author interview, woman in her late 30s, February 2014, Kampong Chhnang province, Cambodia***)*.

This contract for land use and subsistence is based on amiability and taking only what's needed. These sentiments are repeated in pursuit of technological life enhancements:

> *When we find a tree good for making a house, we ask the tree to consider becoming a house with us. After asking, we wait one night. Does the wind remain calm, are there signs of illness? We watch for accidents, watch our dreams, listen to the birds, and watch the actions of other animals. With no sign of disagreement, we proceed to cut tree and create house. The energy of the builder and the energy of the tree combine to make the house, and the excess energy is called 'the skill of*

> *the house (*jamniang ptha*)', which watches over the house, ensuring that the contract with the tree for kindness and conservative living is upheld (**author interview, male, 60 years old, June 2020, Kampong Thom province, Cambodia***).

These brief stories come from my intimate conversations with people and describe the broad contours of an ancestral economics based in social relations, mutual care, conservation, and consumption.

No one in this economy is exempt from being eaten. When there is an incurable illness and the social healing ritual does not lift its effects, the ancestor is hungry. Ancestors eat people in the same way that people eat pigs (**Gibson, 2006; Remme, 2014**). The mutual consumption and regeneration between and across species in interaction with the minerals and microbes of soil and water is a basic scientific fact. When 'religious myth' and 'local lore' are analysed scientifically and economically a new understanding of economics and the politics of representation emerges. In this economy, 'gods' are revealed to be the physical rains, stones, and soils that are the means of production, which is what superstitious natives were saying (see also **Sahlins, 2013**). Extraction, consumption, and regeneration are implicated in all relationships. Ancestors eating people is not metaphorical. My colleagues in Cambodia say that Grandfather's mountain and tiger are their ancestors, 'They were here before we were, and we follow them' (**interview, woman in her 40s, Kratie Province, February 2024**). These relational political economies are often misrecognized by scholars as religion and myth, which renders them make-believe. My time in Prey Lang helped me see that these are biophysical and economic exchanges discussed in the register of kinship.

None of the people engaged in ancestral economics has anything to do with the unsustainable management of global resources and the ensuing ecological transformations—except inasmuch as the laws and practices of the contemporary economy constrain them into new roles as peasant farmers, domestic servants, factory workers, sex workers, etc., who all aspire to the luxurious life of the 'comfortable we'. For the disenfranchised, the alienation experienced firsthand and then passed down through generations via enslavement, degradation, and devaluation by the 'civilized' creates its own pathologies. The subjugated desire to become the subjugator—not necessarily to dominate others, but certainly to enjoy the comforts of elite privilege so visible in the hierarchical, extractive, exclusive economies of the kings (and their democratic-authoritarian-communist successors). In this environment, not only do my Kuy colleagues fiercely defend 'their' forest, degraded only in the past decade, many engage aggressively and strategically in the accumulation of capital and the status it brings. Social, symbolic, and monetary capital are

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all highly desired by formerly sustainable subsistence cultivators. As one elder man told me, 'We do not know what the new road will bring. Will it be good or bad? We cannot know, but we want the road' (**field interview, man in his mid-60s, February 2019, Steung Treng Province, Cambodia**).

The 'Royal We'

The capture of territory and the enslavement of original inhabitants is an undisputed characteristic of economic growth, which is justified by a 'right to rule' articulated by the mandate of heaven (Confusion/Dao), the god-king (Hindu), and the righteous ruler (Christian/Buddhist). If we scratch at the surface of any ancient kingdom, we find heavenly or 'supernatural' support for the ruler. The details of these rituals reveal mountains, rivers, apex species, and most humans all undergoing particular economic activities in the service of a divine king (see **Qian, 2007; Lewis, 2007; Beban & Work, 2014**). The unchanging baseline of these economic activities, forest conversion for intensified grain and monocrop production, mountain disruptions for expanding metallurgy technologies, the creation of consuming elites, is hidden within discourses of development and progress.

The alienation of regular people from their relational economies is essential for building the privileged lifestyles implied in the 'greater good'. Across the ethnographic record, people living at the margins of kingdoms report being given permission or protection from contract-breaking ancestral extraction by royal or official order (**Boomgaard, 1991**; **Wessing, 2006**). The possibility for unsustainable living emerges from the sacred right of kings to develop the land, and to grant rights to others for both exploitation and the extraction of tribute. I point explicitly to the life of ease and luxury that comes from alienating, as opposed to relational, extraction. When relieved of the responsibility to care for the ancestor and share with immediate kin, wealth accumulates rapidly. This accumulation eventually exceeds the boundaries of royal lineages, and those endowed with wealth demand recognition and access to luxury. Voting, self-determination, and rights for all humans are understood as contracts enabling social progress. All humans are entitled to access luxury in an unsustainable political economy. Other species, and the mountains, rivers, and fungi that create them, remain excluded, devalued, and alienated from their rights to free economic sociality. Of course, these unruly actors cannot really be contained, but human economies are constrained by beliefs and activities that break the ancestral contract of mutual creativity, sharing subsistence, and death. These beliefs uphold rights to privilege and democracy, and the idea of 'we the people'.

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The king speaks as a divine 'we' of all things, owner of the water and the land. As extractive success permeates privileged society, the 'royal we' broadens to include the 'comfortable we', those who can achieve capital and the luxuries of power, and with it the favourable light of divine 'right' spreads through society.

This process is clearly visible in the disenchanted modern economy, where the divine glow of extreme wealth and power is secularized, but not erased. The disenchantment does not fully cover the alienated relationships that privilege requires. Accepting the 'natural' servitude of poor members of society, and especially the disavowal of the social contract with ancestors of water and rock, through which technologies and subsistence were negotiated, registers as trauma in the social body. This can be understood as a 'primitive psychological force' resulting in 'ego inflation, addiction to power, and mindless acquisition' (**Bernstein, 2020: 47**). An important element of this trauma is visible in the transforming economy in Cambodia, as only a few members of formerly collaborating social groups make an effective transition to privilege. Those willing to mine the ancestors and prey upon their neighbours succeed first (see **Work, 2023**). The need for greed and selfishness in the non-relational colonized economy is unmistakable in landscapes transitioning from relational to alienated economies.

In a market-controlled landscape, free access to resources (a.k.a. ancestors) like wild game and land is criminalized. Getting food, buying land titles, and hunting licenses all require cash, which at the resource frontier can only be acquired through selling tigers, trees, and other ancestors or converting forest to market crops. This breaks the ancestral social contract described above. Humility, economic restraint, and moderation are simply not effective strategies for survival in a market economy, and generations of social adaptation to this situation create a 'comfortable we' who find it impossible to live sustainably. While there certainly *seem* to be winners in this game, destabilizing the geo-hydro-biological foundation of life on this small planet might not be a win. When viewed with a wider lens, it looks as if this game has only victims and perpetrators. While the plight of the former is strongly marked by the latter for improvement through sustainable development, the generational trauma of the perpetrators, a.k.a. winners, goes unremarked under the mantle of a secularized and meritorious success.

By what right do we claim the privileges we enjoy? And here I speak directly to the readers of this article. There is not a 'global we' of humanity that can claim the rights to a life of privilege. Many are consigned by divine intervention (bad luck, bad character…), into serving privilege, although some wear more comfortable shackles. What are the privileges for which

'we' have given up our relatedness to the rest of the living world? Is it hot and cold running water? Housekeepers? Or cashews and cows on demand?

Alienation and Addiction

One regular complaint among my Kuy colleagues is the disappearance of forest cows to hunt and fish to catch, coupled with the ubiquity of fish and beef available to buy from motorcycle vendors coming daily from the district capital (**Work, 2024**). Accessing food without money is now impossible, but it is possible to use money rather than local social relations to build a house, have sex, or gain local authority. My colleagues in Prey Lang speak persistently of fractured communities, drugs, debt, and economic precarity in the context of development and progress. This provocation feeds into a corrective discourse about generational trauma in Cambodia, which transformed from an 'underdeveloped' country into one with a growing population wealthy enough to live unsustainably.

I argue that the dramatic transformation of relational into market economies traumatizes people accustomed to food abundance and social solidarity. Emerging research confirms parts of this, revealing intimate connections between trauma and the kinds of addictive, compulsive behaviours visible in the blasted landscapes of planetary transformations (**Maté, 2022; LaCapra, [2001] 2014**). Addiction can be understood as 'the defenses of an organism against suffering it does not know how to endure' (**Maté, 2022: 164**). Behaviours that provide pleasure and relief from suffering, like roads that bring food daily, can also induce craving and create negative consequences (**2022: 170**). When parents disavow ancestral rules of economic comportment, what do they say to their children? Stories can also provide pleasure and relief from suffering: 'The old ways were wrong, child. Look how people following the old ways are hungry and poor.' Industrial and small-holder plantations and mines create wealth and privilege for some, who use this wealth to send children away to school or to factory work. This is the alienating engine that drives the good life and underscores its cruel optimism (**Berlant, 2011**). Cars, computer chips, fast fashion, electricity on demand…these are now considered basic rights for all 'divinely favoured' citizens, not just the ruling class.

The 'comfortable we' respond nobly to revelations of the violence of the economic system that gives them their privilege. They advocate for rights, for the universal value of *homo sapiens*, and for middle-class lifestyles for all alienated brethren, miners, factory workers, and maybe even sex workers, whose labour provides pleasure and relief for the comfortable

we. More-than-human ancestors, like mountains and rivers, remain largely excluded from this noble frame, despite or perhaps because of their centrality to all economic activity. The active and continued degradation of the ancestors that are soil, rock, water, and trees at the resource frontier is accompanied by continued failure to achieve middle-class comforts, which defines poverty for the major development donors (**Berrio Calle, 2023; Wade, 2004**). This need to extract and consume is a sneaky kind of noble addiction draped with the wealth that signifies favour of the god(s). The evidence supporting my thinking that addiction is an important frame for the generational trauma of the privileged perpetrator is complex, but it has key indicators in the violence of success within a 'cultural complex' that demands an alienated other (**Singer, 2020**).

The 'royal we' points directly at this economic system in which success depends on violent exclusive acts towards kin, both human and non-human. Invoking the inclusive 'we' in declarations of intent and responsibility, a king implicated both himself and god(s). The idea that continued good health and economic success is a passive indicator of ancestral agreement to the breach of contract supports this continued mandate from heaven: In January 2023, a ritual specialist and caretaker of an ancient temple declared as much when I asked if the ancestral energies he cared for in the ancient site supported the industrial gold mine recently erected close by. He said, 'If they did not agree, activities would not continue' (**Interview, 2023 February 06, Prasat Trapiang Prus, Kampong Thom, Cambodia;** see also **Anderson, 1990**; **Baumann, 2020**). There is an implied 'we' in the divine violence of the wealth-producing land grab, what Karl Marx famously called 'primitive accumulation', and also, I argue, in the structural violence through which individuals are born, either in privilege or servitude. Even indirect participation in this violence creates trauma, and its psychological effects often manifest in violence, cruelty, excess, and self-destructive behaviours. This trauma is multi-layered, generational, and understudied in the context I suggest (see **Mate & Mate, 2022** and **Wyatt, 2023** on the generational trauma of war and genocide).

The deep historical melancholy of 'civilization' has not gone unremarked by pundits, scholars, healers, and philosophers (**Freud, 1961 [1930]**; **Kiernan, 2001**; **Nietzsche, 1999**). My provocation here suggests that this is a discontent born of real trauma, the effects of which have been valorised and passed down through generations of the privileged, who continue to vilify the human labourers and non-human ancestors and kin who make their privilege possible. Neither greed nor culture can account for the non-transformation of activities so obviously destined to destroy the system supporting current forms of the planetary biosphere. The persistence of these behaviours, their justifications, and the strangeness of the solutions put forward—like 'renewable' energies embedded in fossil-fuel extraction,

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manufacture, and distribution—all point toward addiction's avoidance behaviours. But this is not a simple addiction, it is generations deep and embedded in everything contemporary humans have been taught to value. The addictive behaviours are perceived to be virtuous, and all this 'virtue' seems to be forcing a planetary reboot. If there is a 'global we', it includes both comfortable and alienated people, as well as their technologies and structures, their disavowed ancestors (of water, rock, and pond), and their extended kinship networks, including ants, trees, tigers, and catfish. Perhaps the 'Misanthropocene' rests in the loneliness of a fractured 'we', the repair of which requires neither more funding nor new technologies.

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Twenty Open Questions to Prompt and Perpetuate Sustainability Culture

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Abstract

In this Critical Reflection, twenty open questions relating to sustainability are presented and discussed. It is suggested that asking, answering, and then acting upon the answers to these questions is essential to both prompt and perpetuate Sustainability Culture. The process is undertaken with no expectation about what answers will emerge, but rather answers emerge through examining individual and group assumptions, beliefs, and values. A number of worldviews, conceptual frameworks, and theoretical distinctions are discussed. In conclusion individual and group action are briefly considered.

Keywords: **sustainability culture; sentiocentrism; anthropocentrism; intrinsic value; instrumental value; objective value; pragmatic ought; moral ought**

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Introduction: The Twenty Questions

Socrates asserted that an unexamined life is not worth living (**Plato, 1966: 38a**). Motivated by Socrates, here I assert that an unexamined endorsement and pursuit of 'sustainability' is not itself sustainable. A balance must perpetually be maintained between practically living 'sustainably' and critically examining what 'sustainability' means.

More recently, Mill asserted that:

> *the only way in which a human being can make some approach to knowing the whole of a subject, is by hearing what can be said about it by persons of every variety of opinion, and studying all modes in which it can be looked at by every character of mind* (**Mill, 2011: 37**).

And that:

> *However unwillingly a person who has a strong opinion may admit the possibility that [their] opinion may be false, [they] ought to be moved by the consideration that however true it may be, if it is not fully, frequently, and fearlessly discussed, it will be held as a dead dogma, not a living truth* (**Mill, 2011: 64**).

Motivated by Mill, here I assert that without full frequent and fearless discussion of one's own understanding of 'sustainability' one risks that understanding becoming 'a dead dogma' and not 'a living truth'.

Here I present twenty questions that can be asked, answered, and acted upon in perpetuity. The asking and answering of these questions is, I claim, a necessary feature of any Sustainability Culture. After I present the questions, I discuss how to apply them. Then I introduce worldviews conceptual frameworks and philosophical distinctions to illustrate what might inform the answers to the questions. Finally, I discuss how answers to the twenty questions can be acted upon both individually and collectively.

What Sustainability Culture looks like now will not be what it looks like in one thousand years or ten thousand years. Human cultures must perpetually critically reflect upon what sustainability means. The questions found below (see Table 1) can provide a framework to explore what 'sustainability' means. They are completely open questions. There should be no expectations about how this process unfolds nor any constraints upon what subjects are considered. However, a useful starting point is to assume each column is concerned with the same subject, and that the subjects of each of the four columns may (or may not) have some relationship amongst them. One possibility is to pick a 'what' question and then move down the same column and follow a similar pattern in other parts of the table.

Table 1: The Twenty Open Questions.[i]

20 Qs	Is	Is not	Ought	Ought not
What…	What is being sustained?	What is not being sustained?	What ought to be sustained?	What ought not to be sustained?
Why …	Why is it being sustained?	Why is it not being sustained?	Why ought it to be sustained?	Why ought it not to be sustained?
Who …	Who/what is doing the sustaining?	Who/what is not doing the sustaining?	Who/what ought to be doing the sustaining?	Who/what ought not be doing the sustaining?
Whom …	For whom/what is it being sustained?	For whom/what is it not being sustained?	For whom/what ought it to be sustained?	For whom/what ought it not to be sustained?
How …	How is it being sustained?	How is it not being sustained?	How ought it to be sustained?	How ought it not to be sustained?[1]

Another option is to pick any question anywhere in the table and answer that question simply because that is the most salient question for the individual person or group of people undertaking the process. Having reflected upon one question, other issues may emerge as a direct result of that reflection, and a different question in a completely different part of the table becomes the focus of reflection. These questions serve to prompt reflection, but importantly they are not meant to set any boundary on such reflection.

Sometimes there may be a lack of agreement between answers to related questions such as 'What is being sustained?' and 'What ought to be sustained' or between 'What is not being sustained?' and 'What ought not to be sustained?' At other times there may be a harmony. At yet other times, answers to these questions lead to exploration at the 'why' and 'how' levels of the table that take the analysis in a completely new direction. Importantly, the answers to questions given at one point in the process may be replaced by completely different answers at some later point. Indeed, one may find that one answer prompts a total re-examination of previous answers such that many, or all, are discarded and the process begins again.

The point is that the analysis uncovers new ways of thinking and new ways of engaging with sustainability. This process can be undertaken at any scale, on any topic, and at any time in the future. Importantly, in such reflection, there should be no expectation about what answers will emerge. What 'sustainability' means for any individual or group of people will emerge out of critical reflection on the context, assumptions, perspectives, experiences, and values of that individual or group of people. Any person or group will begin the process from a different starting point. But the value of the process is to facilitate appropriate conceptual change.

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The perpetual asking and answering of these questions allows for the answers (and the actions that follow from the answers) to change over time, such that the start point and the end point of each iteration of the process can change over time, reflecting the changing conditions of humans.

Part of the process of asking and answering the twenty questions involves critical examination of the type of 'ought' answers being explored. There are several ways the word 'ought' can be understood. For example, is it a 'moral ought' or (merely?) a 'pragmatic ought'? A pragmatic 'ought' relates to some pragmatic relationship between X and Y. If one wants Y and in order to get Y one must do X, then pragmatically one ought do X. But if one does not want Y, there is no pragmatic implication about X. And this pragmatic 'ought' may hold in relation to 'merely' personal prefences (say), rather than anything more consequential.

A 'moral ought', however, is one that has moral meaning and should be understood as such (a full metaethical analysis of the nature and status of 'moral oughts' is beyond the scope of this discussion). When considering answers to the 'ought' and 'ought not' questions it is important to determine the (1) nature of the 'oughts' that are being considered and (2) the appropriate attitude toward them.

There are many ways that the concept 'sustainability' can be understood. It can vary over time (particularly over long periods of time), and across cultures. Consider for example the five periods of culture ecology suggested by Thompson (**1989**) and used by Simmons (**1993**): Hunter-gatherer and early agriculture; Riverine Civilisations (e.g., Mesopotamia, Ancient China, and Egypt); Agricultural Empires (e.g., the Roman Empire); The Atlantic-industrial era (i.e., the Industrial Revolution); and the Pacific-global era (i.e., the era beginning in the late twentieth century). I suggest that the concept 'sustainability' varies across these forms of cultural ecology. Furthermore, the concept varies across different parts of the world, for example, between the 'Global North' and the 'Global South'. What is understood by the term 'sustainability' or 'sustainable' varies greatly across human cultures and ages.

Now recall Mill's distinction between 'dead dogma' and 'living truth'. Without full, frequent, and fearless discussion (or Socratic examination), one's understanding of sustainability may become misplaced, inapproiate, or impractical over time. To illustrate this, consider an example offered by Partridge (**2001: 385**). Before the fossil fuel era whale oil was used for lighting (in oil lamps) and lubrication (in machines). In the pre-fossil fuel era, in the minds of people acting out of a sense of duty to future generations, the initial answer to the question 'What ought to be sustained?' may have been 'sufficient reserves of whale oil to meet the

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needs of future generations'. But having undertaken a process of critical reflection using the twenty questions, they might have subsequently answered 'sufficient reserves of *energy* and resources to meet the needs of future generations'. And then they would be conceptually open to searching for a different, practical answer (unrelated to whale oil) that corresponded to this reconceptualisation.

Alternatively, consider a person or group of people discussing the healthcare system by asking and answering the twenty questions. The answer to 'What is being sustained?' might be a large, complex and centralised system. What is *not* being sustained might be flexible, responsive, and effective service delivery distributed across the community. Answering the 'why' and 'how' questions would shed further light on the challenges and opportunities of the healthcare system. For example, why are healthcare budgets predominantly directed to one set of health conditions (perhaps more common later in life) as opposed to some other set of health conditions (perhaps more common earlier in life)? Or why are healthcare budgets predominantly directed at cures rather than preventions?

Or consider a person or group of people discussing the transport system. What is being sustained? Perhaps the answer is large numbers of single-occupancy vehicle journeys. What is not being sustained? Perhaps the answer is large numbers of multiple-occupancy vehicle journeys. Again, answering 'why' and 'how' questions could shed further light on the challenges and opportunities of the transport system. For example, why are societies structured in such a way that vehicle journeys are required in the first place?

What Might Inform the Answers to the Twenty Questions?

Many things will affect how these questions are answered. The below review is by no means exhaustive; it merely illustrates the breadth of things that may affect the process.

Worldviews

The most fundamental thing that will affect how these questions are answered is the worldview of the individual or group answering them. Here, I follow van Inwagen (**2002: 3–4**) by firstly, using the term 'world' to denote everything that exists, and secondly, by characterising a worldview as answers to the following questions:

> 1. *What are the most general features of the World, and what sorts of things does it contain? What is the World like?*

2. *Why does a World exist, and more specifically, why is there a World having the features and the contents described in the answer to Question 1?*

3. *What is our place in the World? How do we human beings fit into it?*

Over human history, different individuals and groups have answered these questions very differently.[ii] My point here is not to endorse one set of answers over another set. It is simply to note that the worldview a person or group holds will affect their process of answering the twenty questions.

Conceptual frameworks

A worldview is the most extensive 'view' one has of existence. As such, it can be considered as a single, unified conceptual framework. However, there are other conceptual frameworks that don't correspond to the scope of a worldview, but they are none-the-less worth examining here. Anthropocentrism is a conceptual framework that prioritizes human interests and purposes over the interests and purposes of all else. An example of a non-anthropocentric conceptual framework is Leopold's 'Land Ethic', which states that 'a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community' and 'wrong when it tends otherwise' (**1966: 262**). The non-anthropocentric nature of the Land Ethic is illustrated by Leopold's position that we should understand our species not as conqueror of the land but as a 'plain member and citizen of it' (**1966: 240**). Rather than being anthropocentric, the Land Ethic is biocentric.

Another example of a non-anthropocentric conceptual framework is sentiocentrism. Rather than placing all of the biotic community at the centre, sentiocentrism prioritizes the interests and purposes of sentient organisms. Singer, a proponent of this view, argues that it does not make sense to claim that non-sentient entities have interests and purposes:

> *If a tree is not sentient, then it makes no difference to the tree whether we chop it down or not. It may, of course, make a great difference to human beings, present or future, and to non-human animals who live in the tree, or in the forest of which it is a part. […] Imaginatively, we can put ourselves in the place of [a] being, and ask: how would I like it if I were in that situation? This works for sentient beings, but it does not work for trees, species, or ecosystems. There is nothing that corresponds to what it is like to be an ecosystem flooded by a dam.* (**Singer, 2001: 419–421**).

Importantly, sentiocentrism does not prioritise humans over other sentient organisms.

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Instrumental values and intrinsic values

Implicit in Singer's argument quoted above is the theoretical distinction between intrinsic and instrumental values. Singer observes that it 'makes no difference to the tree whether we chop it down or not'. However, he goes on to say that cutting the tree down may make a lot of difference to human or non-human (sentient) animals who have some relationship to the tree. Perhaps the tree forms part of a non-human sentient animal's habitat or a human's livelihood depends on cutting this tree down. In both the cases of (1) the tree being part of a habitat and (2) the tree being a source of income, the tree has instrumental value. In such cases there may be tension between the two instrumental values, and often only one instrumental value can be retained. A tree used as habitat cannot be cut down, and a tree cut down cannot generally be retained as habitat.

Some entities have both instrumental value and intrinsic value. For example, each time I use a bus to go somewhere the bus driver is *instrumentally* valuable to me (for getting me where I'm going) but is also *intrinsically* valuable (as a person). This respect for the intrinsic value of humans is captured in Kant's Categorical Imperative: 'Act so that you use humanity, as much in your own person as in the person of every other, always at the same time as end and never merely as means' (**Kant, 2018: 42**). Thus, I should treat the bus driver not only as a means to get me to my destination, but also as an end in themselves.

Being 'an end in itself' is not the only way to understand the 'intrinsically valuable' (see **O'Neill 2001** for further analysis and distinctions), but it is important because it highlights the relation between the concept of intrinsic value and ethical standing. The power of Kant's Categorical Imperative rests on the assumption that humans are ends in themselves and thus have ethical standing. For Kant (**2018**) this ethical standing arises from the nature of humans as rational and autonomous beings. But this is not the only way to understand ethical standing that may arise out of intrinsic value. Another way to understand intrinsic value is in terms of objective value, and it may be that entities that are objectively valuable also have ethical standing (**O'Neill 2001**).

Objective value is an important but contested concept in metaethics. Mackie (**1977: 15**) characterises objective value as 'value that an object possesses independently from the valuations of valuers'. But not everyone accepts the existence of such objective values (including Mackie himself). In order to explore the concept of objective value Mackie asks the question 'What would objective values be like if they existed?'. He answers:

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> *Plato's Forms give a dramatic picture of what objective values would have to be. The Form of the Good is such that knowledge of it provides the knower with both a direction and an overriding motive; something's being good both tells the person who knows this to pursue it and makes him pursue it. An objective good would be sought by anyone who was acquainted with it, not because of any contingent fact that this person, or every person, is so constituted that he desires this end, but just because the end has to-be-pursuedness somehow built into it. Similarly, if there were objective principles of right and wrong, any wrong (possible) course of action would have not-to-be-doneness somehow built into it.* (**1977: 40**).

The relation between objective value and ethical standing is made explicit in the final sentence in the passage quoted above. Consider the possibility that an ecosystem was objectively valuable, if so then (to use Mackie characterisation of objective value, even though he does not endorse it) destroying the ecosystem would have a 'not-to-be-doneness' built into it. A fundamental challenge is to understand how to know if there are objective values. But addressing this challenge takes us well beyond the scope of this discussion. However, I hope that this brief analysis gives some sense of how worldviews, conceptual frameworks, theoretical distinctions, beliefs, and values will be relevant when people answer the twenty questions.

Conclusion

Some might choose to answer these twenty questions individually and then seek to act on them individually to the extent they are able to, given their personal agency and the resources at their disposal. Some might answer these questions collectively and then act on those answers as a group, for instance, through political action. How different groups act politically will depend on the socio-political realities of their time and place. Consider for a moment all the different forms of political reality that have existed over the past ten thousand years. Now try to imagine all the forms of political reality that may exist over the next ten thousand. While people can engage in political activity most openly within liberal democracies, it is important to note that such a system might not exist in perpetuity. At any point in the future of human existence these questions can and should be considered within any number of imagined—or as-yet-imagined—realities. [iii]

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[i] Admittedly some of these questions are phrased awkwardly, but the phrasing is kept uniform across all questions for simplicity and ease of recall. With respect to the meaning of the question 'How ought it not to be sustained?' this question means 'How should it be ensured that this is not sustained?'. With respect to the meaning of the question 'For whom/what is it not being sustained?' this question means 'Who or what is causing it not to be sustained, or who/what has an interest in it not being sustained?'. With respect to the meaning of the question 'For whom/what ought it not to be sustained?' this question means 'Who or what benefits from the alternate state of affairs in which it is not sustained?' or 'If it were the case that it is not sustained, who or what benefits?'

[ii] Other worldviews include traditional Indigenous worldviews (**Whitt et al., 2001**), worldviews from Classical China (**Lai, 2001**), Classical Theism (**Attfield, 2001; Haq, 2001; Katz, 2001**), and a range of Western philosophical positions from the eighteenth, nineteenth, and twentieth centuries, including Idealism and Naturalism (**Brennan, 2001**). See Jamieson (**2001**) for more.

[iii] The following video links are relevant to both the twenty questions process and to prompting and perpetuating Sustainability Culture more generally: https://www.youtube.com/watch?v=1EQgMPQFHHo; https://www.youtube.com/watch?v=ELQSMGcdEVg.

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Agricultural Development Means for Food Security and Sustainability in Palau

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Abstract

Agriculture in Palau plays a vital role beyond food production, supporting both social and ecological resilience in the face of climate change and global economic pressures. This paper highlights key challenges to achieving food security and suggests pathways forward. We recommend: (1) promoting climate-resilient, traditional crops like taro, cassava, and sweet potato using conservation practices; (2) investing in soil improvement and agricultural capacity building; and (3) enhancing research on sustainable agro-ecosystems, including organic recycling methods. Revitalizing traditional agriculture through these strategies can strengthen food self-sufficiency and build a healthier, more resilient Palauan community.

Keywords: agriculture; climate change; food security; soil improvement; food conservation; climate resilience

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Introduction

The Republic of Palau is a small Pacific Island well known for its exceptionally rich terrestrial and marine biodiversity. Tourism is the major industry, accounting for more than 40 percent of total gross domestic product (GDP). Traditional agroforestry and taro farming with marine and swine livestock production used to play major roles in the subsistence economy but have been replaced due to import availability and the emergence of the cash economy.

Palau is located in the Micronesian region of the west Pacific Ocean, directly south of Japan, east of the Philippines, and northeast of Indonesia, covering a land area of 535 square kilometers (**Kitalong & Mason, 2021**). It stretches approximately seven hundred kilometers along a northeast-to-southwest axis and consists of more than five hundred islands (Figure 1). Only nine are inhabited, with a total population of 17,614 as of 2020 (**Republic of Palau, 2020**). The landscape of Palau is a medium to low volcanic island chain having all three island types: volcanic, limestone, and atolls (**Omae et al., 2021**). Babeldaob, the largest volcanic island, accounts for 80 percent of the total land area, covering an area of 334 km² (**Koshiba et al., 2014**). The island has a series of ridge systems that extend from north to south, which are characterized by small, narrow valley systems and coastal plains, with tidal flats and dense mangrove forests (**Phear, 2008**). The volcanic soils on the island's surface are heavily weathered and form loose, somewhat unstable hill slopes.
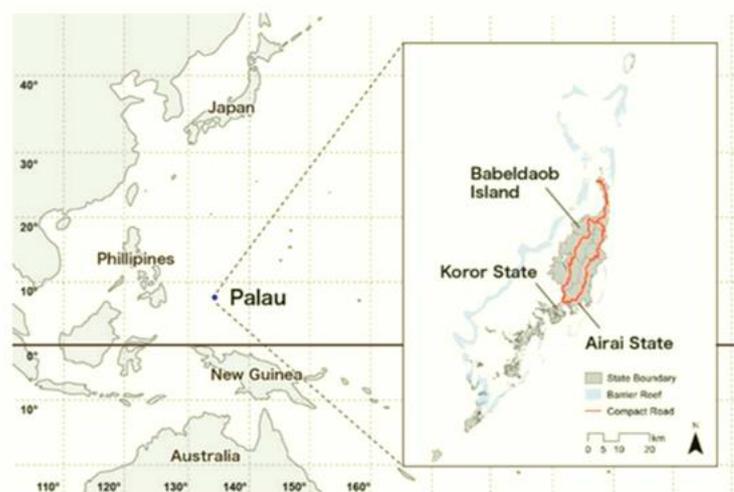

*Figure 1: Location of Palau (reprinted with permission from **Iida et al., 2020**).*

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Palau's climate is tropical and rainy throughout the year, with an average air temperature slightly higher than 28° Celsius and annual rainfall of 3,800 millimeters, contributing to high marine and terrestrial biodiversity (**Iida et al., 2020**). It conserves the largest tract of tropical lowland forest in the Pacific and the highest number of endemic species per area in Micronesia, with over 1,389 species of plants, including 802 native and at least 150 endemic plant species, as well as 130 types of fungi, an estimated 5,000 species of insects, 92 kinds of snails, 46 species of reptiles and amphibians, 47 species of freshwater fish, as well as 141 species of birds, 400 types of coral reefs and 1200 species of reef fish (**Golbuu et al., 2005, Iida et al. 2020, Kitalong et al., 2008**). The reef systems of Palau are considered the richest in the Pacific, with the highest species diversity (**Phear, 2008**). Palau's vegetation comprises a diverse range of types, including mangroves, swamp forests, interior volcanic forests, savannahs and grasslands, limestone forests, strand vegetation, ravine and riparian forests, as well as homestead and agricultural vegetation (**Kitalong et al., 2021**).

Despite its richness in biodiversity, Palau's food sovereignty is vulnerable, relying heavily on imported food, accounting for over 85 percent of all consumption. Revitalizing agriculture while coping with sound ecosystem conservation is a major developmental challenge. Agriculture, fisheries, and livestock sectors have been encouraged at the national level to improve local food production. Although the largest island, Babeldaob, has available land area with the potential to increase productivity, only 6.6 percent of it is suitable for crop production. Most upland soils of the Babeldaob are acidic, high in red clay and aluminum contents, and not recommended for commercial crop production. Proper soil amendments and erosion controls are necessary to reduce the risks of ecosystem degradation.

Although taro farming is still culturally important, taro production is decreasing. Traditional wetland taro patches (*mesei*) are well-established in lowland areas where the soil is rich, on flatland alongside the coastal area before mangroves. These are threatened by sea level rise and storm surges, accelerating saltwater intrusion, and damage due to global climate change issues. Increased upland taro farming (*sers*) is a favorable option with proper soil erosion control. Past land-use practices had led to a reduction in forested areas on Babeldaob. During the Japanese era (1921–1947), unmitigated farming and mining practices led to a decrease in the forested areas from 74 to 60 percent.

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The Pacific region, including Palau, has been integrated into global trade since the 1970s, bringing benefits for information, education, and health, although small island countries have negative trade balances (**Georgeou et al., 2022**). Heavy dependence on the global market has threatened food security and sustainability. The COVID-19 pandemic has seriously affected the Palauan economy, which mainly relies on tourism, reminding them of the importance of developing domestic agriculture (**Republic of Palau, 2022**). Revitalizing agriculture while maintaining sound ecosystem conservation is a key development challenge in efforts to enhance food security.

In Palau, agriculture has been prioritized within the framework of the United Nations' Sustainable Development Goals (**Republic of Palau, 2019**). Additionally, the 2021 Food Systems Dialogues identified 'Increasing production' as a top priority for improving food security and achieving an optimal diet (**Republic of Palau, 2021**). This review covers Palau's economic context, historical land use, the impacts of climate change, and the role of agriculture—particularly taro farming—in advancing strategies to revitalize agriculture and strengthen food security. It proposes that improving the traditional farming systems of food crops can strengthen resilience to climate change. At the national level, revitalizing agriculture based on traditional knowledge and adaptation strategies, soil quality improvement, capacity building, and investment in soil laboratory development other and research and development sectors could all contribute to a more resilient and healthy community in Palau.

The Role of Agriculture and Taro Farming

Agriculture is vital in Pacific Island countries as a source of livelihood and food for their communities (**Iese et al., 2020**). Since the Inter-independence Compact Agreement with the United States of America of 1994 (ICA), major economic activities in Palau have focused on tourism. The country's per-capita income has since become one of the highest in the region (**Iese et al., 2020; Iida et al., 2020**). On the other hand, agricultural production in Palau has been growing very slowly.

Traditional Palauan agriculture runs on a sustainable agroforestry system, utilizing multi-story or forest farming. Agroforestry combines agriculture and forestry technologies to create more integrated,

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diverse, productive, profitable, healthy, and sustainable land-use systems (**USDA, 2019**). The agroforestry system in Palau integrates fruit and forest trees with major staple crops such as taro, cassava, and sweet potato. It also incorporates a variety of vegetables, including eggplant, okra, bitter gourd, cucumber, and mustard, along with medicinal and ornamental plants. Traditionally, agroforestry systems in Palau were integrated with coastal components and managed under an agroecological approach. Preparing taro patch fertilizers out of weeds and mulching with leaves of banana and others around the taro patch keeps the soil rich and the marine ecosystem healthy (**Koshiba et al., 2014**). Traditional taro patches located on natural wetlands are reportedly able to trap on average 90 percent of sediment, therefore sheltering coastal coral reefs and their fisheries from the negative impacts of terrestrial runoff (**Koshiba et al. 2014**). Taro patches are mostly distributed in areas that are less than ten meters in elevation, within one kilometer from seawater, and on slopes below 3 percent (**Yamada et al., 2018**).

For over two thousand years, Palauans have sustained their islands through environmental changes as well as societal development using flexible survival strategies (**Koshiba et al., 2014**). Rational adaptation, persistence of wealth-exchange customs, and competition characterize Palauan society. They have adapted to a century of colonial intrusion by the Spanish, German, Japanese, and Americans (**Iese et al., 2020**). The village structure and food (culture) can be assumed as the basis of their resilient adaptation strategies.

Figure 2: Traditional Palauan village in the early twentieth century, illustrating the taro patch at its centre (courtesy of the Bureau of Arts & Culture, Palau).

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The traditional village structure is based on interconnected ridge-to-reef ecosystems, combining terrestrial and marine ecosystems (**Iida et al., 2020**), securing the main supply of starch from taro fields and protein from reef fish. The traditional Palauan village of the early twentieth century (pictured in an illustration by Palauan artist Ado Imetuker in Figure 2) highlights the cultural significance of taro (**Iida et al., 2020**) with the taro patch at its centre.

The structure of the taro field (*mesei*) as first laid down by the Palauan ancestors, mostly after about 900 to 1100 CE, was presumably the culmination of accelerated erosion in the island's interior following extensive clearing of the vegetation on slopes (**Koshiba et al., 2014**). Although *Cyrtosperma* (giant yellow taro) and *Colocasia* (purple taro) are both grown and eaten quite often, *Colocasia* has a special meaning, found in many aspects of Palauan cultural practices (funerals, first birth ceremonies, transfer of title ceremonies) and used symbolically in chants, dances, proverbs, and stories with moral lessons (**Koshiba et al., 2014**). However, land use changes and intensive cultivation have both increased resulting in traditional taro patches being abandoned (**Koshiba et al., 2014**) (Figure 4). The promotion of continued use of taro farming has the dual benefit of providing food security as well as buffering coral reefs from the impacts of soil erosion (**Koshiba et al., 2014**).
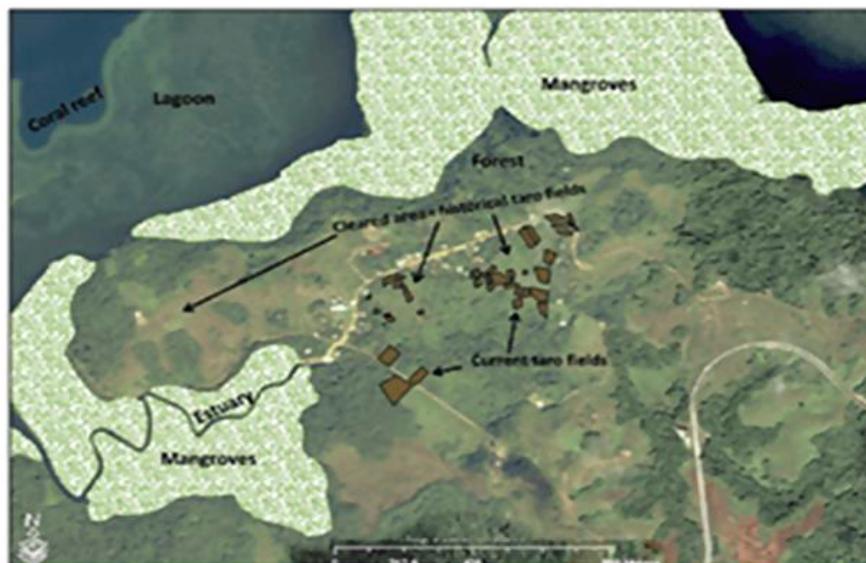

*Figure 4: A satellite photograph of the coastline in Ngardmau State, on the western part of Babeldaob Island, showing both the current taro fields and the abandoned historical taro fields that were constructed in the lowland forested floodplain (**Koshiba et al., 2014**, used with permission).*

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The Palauan Economy

Palau, being a small island country, faces several sustainable development challenges, including low resource availability, geographic isolation, high exposure to hazards, excessive dependence on imports, and (over) susceptibility to global trade (**Filho et al., 2021**). The government is the country's largest employer, with approximately 30 percent of the workforce, and in 2021 the GDP was approximately $14,243 per capita (**USDS, 2022**). Agriculture is the main source of income for just three percent of households, with the other sources being government employment (29 percent), tourism (18 percent), the service industry (28 percent), and construction (11 percent) (**USDS, 2014**).

Palau remains highly reliant on development assistance, particularly budget support and special funds from the United States, under the Compact of Free Association agreement between the US and Palau. It receives additional aid from Australia, Japan, Taiwan, and international organizations such as the World Bank and the Asian Development Bank (ADB) (**ADB, 2017; ADB, 2024; USDS, 2022**).

Heavy reliance on imports, combined with a limited export base and production capacity of Palau make it highly vulnerable to external shocks (**USDS, 2022**). The primary economic challenge for Palau is to ensure long-term viability by reducing its dependence on foreign assistance (**USDS, 2015**) and ensuring an adequate supply of food and crops. To sustain Palau's economy, it is essential to maintain a proper balance among the domestic market, subsistence agriculture, and fisheries.

History of Land Use

Palau's history of land cultivation started with taro (*Cyrtosperma merkusii*) more than three thousand years ago (**Liston, 2008; Athens and Ward, 2002**). Early settlers transformed the landscape of Babeldaob from forest to terraced fields, taro fields, and vast savannah (**Welch, 2008**). The interior of Babeldaob was heavily altered by human activity during the Earthworks Era, which is believed to have occurred around 3100–2400 BP (Before Present, which indicates before 1950 CE), when hills and terraces cover around 20 percent of the island were artificially constructed (**Koshiba et al., 2014**). The first sign of disturbance indicators is proposed to mark swidden agriculture activities (e.g., burning), followed by a

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decline in indicators from 3000 to 2700 BP, which is seen to represent a shift from extensive to intensive agriculture through terrace construction done to keep up with population growth (**Phear, 2008**).

The Palauan landscape has been continuously altered by political, socioeconomic, cultural, and demographic changes. For example, vast areas of the landscape were disturbed and altered by the establishment of coconut plantations and trading posts during the 1800s (**Hezel & Berg, 1979**) and in the German era from 1899 to 1919 (**Spennemann, 1999**). The unmitigated exploitation of commercial agriculture, mining, and fishing peaked during the Japanese period from 1921 to 1947, which reduced total non-mangrove forest cover by 16 percent (**Peattie, 1988; Dendy et al., 2022**). By 1940, four plantation villages cultivating pineapples and cassavas of 2,236 hectares, and two bauxite mining sites of 106 hectares, were the biggest industries of Babeldaob Island (**Iida et al., 2011**). From 1947 to 2006, almost forty square kilometers of deforested area was reforested, but more than thirty square kilometers remained as grass or bare land (**Iida et al., 2011**). Those lands are currently used for infrastructure development, homes, and agriculture. As a result of urbanization, eroded soil has reached the ocean, decreasing coral cover by forty percent over a decade (**Omae et al., 2021**).

Palau and Climate Change

The Pacific Island region accounts for only 0.03 percent of the world's total greenhouse gas emissions but is one of the regions that is facing the greatest impacts of climate change. These include rising sea levels, warming oceans, drought, coral ecosystem destruction, ocean acidification, and extreme weather (**Kumar et al., 2020**). In the 1990s, the cost of extreme weather events in the Pacific Island region is estimated to have exceeded US$1 billion (**FAO, 2008**). As a Small Island Developing State (SIDS), Palau is included among the countries most vulnerable to climate change, owing to its smaller size, insularity, and remoteness (**Kumar et al., 2020; Republic of Palau, 2015; Saleem et al., 2024**). Climate-related disasters adversely affect food systems, particularly fisheries and agriculture, as well as freshwater availability, tourism, coastal infrastructure, and buildings (**Godde et al., 2021; Thornton, 2010**).

Sea-level rise poses a significant threat to SIDS, as people, assets, and infrastructure are highly concentrated in coastal zones (**Martyr-Koller et al., 2021**). Palau's buildings and infrastructure are scattered along the coastal fringe, and a substantial proportion of the

population lives near the sea: almost 60 percent of residents are located within approximately five hundred meters of the coastline, 16 percent within one hundred meters, and 7 percent live within fifty meters (**Kumar et al., 2020**). This emphasizes how important it is for Palau's population to be able to adapt to future coastal hazards, which could require community relocation (**Kumar et al., 2020**).

Extreme weather can influence the timing of reproduction in plants and animals, animal migration, length of cropping seasons, distribution of species, population sizes, and availability of food species. It also impacts natural indicators that Palauans have used for generations as signals of fishing and hunting seasons for specific species. Rising sea levels and storm surges, which cause saltwater inundation, intrusion, and salt spray, are contributing to the decline of coastal agricultural land, especially in atolls (**Kumar et al., 2020; Saleem et al., 2024**). Water and soil salinity in atolls and coastal areas will increase with rising sea levels, and the risks to food security will grow due to reduced land area and soil degradation caused by inappropriate ecosystem management practices.

During Typhoon Surigae in 2021, an estimated 1,500 houses were damaged and 150 were destroyed (**IFRC, 2022**). Saltwater inundation also damaged the rainwater system in Kayangel (**IFRC, 2022**), and landslides were observed on Babeldaob Island. Changing weather patterns and warming temperatures can contribute to shifting pests, diseases, and weed distribution and increase stress on key pollinator species (**Godde et al., 2021; Subedi et al., 2023**). Elevated carbon dioxide can increase yields but won't benefit all crops equally (**Godde et al., 2021**). Drought impacts feed supplies, posing a risk to livestock retention, while increased prevalence of pests and diseases will affect livestock negatively (**Godde et al., 2021**). Temperature changes can affect fisheries by changing the habitats and migration ranges of many aquatic creatures (**Brierley & Kingsford, 2009**).

In adapting to climate change, large uncertainties remain, and consequently, adaptation choices based on traditional knowledge and centered on soil health will need to account for a wide range of possible futures (**Godde et al., 2021; Iese et al., 2020**). In these circumstances, it is highly recommended to use the systems approach, which focuses on soil health and water availability, as well as how farming management techniques, climate parameters, and other biological and human impacts affect the balance of the system (**Iese et al., 2020**).

Revitalizing Agriculture

Soil

Revitalizing agriculture while balancing ecosystem conservation is a major development challenge in Palau (**Republic of Palau, 2016**). Agriculture is a sector that stretches from the ridge to the reefs— involving different formal and informal sectors, different land tenure systems, diverse ecosystems, and different regional and international development partners (**Iese et al., 2020**). Palau is challenged with limited land areas, poor soils, and large distances between islands. According to soil taxonomy, major soil types in most vegetation areas of Palau belong to Entisols, Histosols, Inceptisols, Oxisols, and Ultisols, which differentiate between mineral soils and organic soils. Palau's landscape and diverse soil types play a vital role in sustaining crop and livestock production. A combination of traditional knowledge and scientific research guides agricultural development in the country.

Increased development activity and agriculture without soil erosion mitigation by land use of foreign occupancy in Palau have resulted in increased acidification of the soil and loss of arable topsoil (**Kitalong & Mason, 2021**). The most effective way to revitalize agriculture is by building resilience through the integration of traditional production systems (**Government of Tonga, 2016**). Almost all agricultural systems in Palau are rain-fed, making them highly vulnerable to variations in rainfall. The lands of Babeldaob are characterized by steep slopes and highly erodible volcanic soils, making them particularly vulnerable to heavy rainfall, which contributes to the degradation of soil quality (**Koshiba et al., 2013**). Taro patches are located close to coastal areas where they are vulnerable to saltwater inundation and intrusion. Ongoing pressure from population growth, urbanization, and infrastructure development reduces the land available for agriculture. Increasing incidences of pests, diseases, and the introduction of invasive species also contribute to the vulnerability of Pacific agricultural systems (**Sisifa et al., 2016**).

Soil is the foundation of crop production, and soil health is very important for the resilience of agricultural systems (**Iese et al., 2020**). Conventional/full tillage and current industrial agricultural practices can cause rapid loss of organic matter, biological fertility, and resilience of soil, leading to a high potential for soil degradation and a decline in environmental quality (**Nwe et al., 2021**). To

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revitalize its agricultural sector, Palau is strongly encouraged to adopt Conservation Agriculture (CA) practices, which involve minimal soil disturbance, permanent soil cover through mulching, and diverse crop rotations **(Nwe et al., 2021).**

Labor

Labor scarcity presents a significant obstacle to the revitalization of agriculture in Palau. As of 2020, less than six percent of the labor force was employed in the agricultural sector (**Government of Palau, 2020**). Traditionally, farm labor has been performed by women. However, changing lifestyles have shifted 92.4 percent of women into the service sector. While some female farm owners continue to engage in subsistence and semi-commercial taro farming, they rely on foreign labor to sustain production (**Government of Palau, 2008**).

Despite a low national unemployment rate (0.8 percent), youth unemployment remains a concern at 3.3 percent. Similar to other Pacific Island nations, this disparity is driven by limited attractive employment opportunities, skills mismatches, and inadequate job readiness of youth (**ILO, 2017**). Addressing youth unemployment through targeted capacity-building programs offers potential to fill critical gaps in the agricultural workforce.

Migration also significantly affects Palau's domestic labor market. The country has one of the highest migrant-to-native population ratios globally. In 2020, 2,656 Palauans were living abroad, primarily in the United States, under the Compact of Free Association, with remittances contributing 0.9 percent to national GDP (**ILO, 2017**). To address these labor challenges, national strategies should prioritize youth-focused agricultural training, promotion of low-labor-demand crops, and small-scale partial mechanization to reduce farm workloads. These measures would help improve agricultural productivity while reducing reliance on external labor.

Budget Allocation

Limited budget allocation by the government to the agriculture sector is a challenge in the development of a resilient agricultural system in Palau. Although one of the government's goals for achieving sustainable agriculture is to triple agricultural production—including fruit trees, livestock, root crops, and vegetables—only 2.9 percent of the total executive national budget is allocated to the Ministry of Agriculture, Fisheries, and the Environment (MAFE) (**Republic of Palau, 2023**). It is obvious that such a limited budget

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allocation will not be sufficient to achieve this. Resources for the implementation of national agriculture policies mainly come from development partners in the Pacific Island countries (**Iese et al., 2020**). Investment in technologies such as soil laboratory development, crop models, geographic information system (GIS), remote sensing tools, and resilient cropping systems continues to be a challenge.

Agriculture and Food Security

Traditionally, root crops play a major role in the Palauan diet. But in Pacific Island societies, as is the case in many parts of the world, food not only fulfills a biological function; it also represents a variety of social, cultural, and spiritual values (**Connell, 2020**). Agriculture is an important sector for sustaining culture and maintaining social bonds and practices (**Iese et al., 2020**). High-value cultural items are exchanged during weddings, funerals, ceremonies for forgiveness, and marriage proposals (**Iese et al., 2020**). These items are raw and processed agricultural products such as fine mats, tapa, root crops, pigs, betel nuts, and handicrafts (**Iese et al., 2020**). In Palau, a staple carbohydrate, purple taro, as well as specific species of fish, turtle, and pigs, have special status. While subsistence agroforestry is a traditional farming system, the increasing abandonment of traditional wetland taro patches indicate that current agricultural production is below the self-sufficiency line (**Koshiba et al., 2014; Nwe et al., 2021**).

After trade liberalization in the mid-1990s, Palau experienced a surge of cheap food imports, making local production more vulnerable and marginal (**Connell, 2020**). Subsistence agriculture has almost disappeared from some Micronesian islands; as populations have become more urban, agricultural work offers fewer attractions (especially to youth). Other stumbling blocks to agriculture include the conversion of land, an ageing farmer population, inadequate prices and weak marketing infrastructure, 'parcelization' of land into tiny plots through inheritance, 'modern' education and higher wages in other sectors (**Connell, 2020**). Food security has long been identified as a special sustainability challenge in the Pacific Islands due to natural, topographical, social, environmental, political, and economic constraints. Globalization has brought nutrient-poor imported foods that have driven an increase in non-communicable diseases (NCDs) in Pacific communities (**Cauchi et al., 2021**).

Palau has one of the highest urbanization rates in the Pacific, with 78 percent of the population residing in the urban area (**Mason et al., 2020**). This population shift caused an increase in rural poverty, primarily due to urban migration, which resulted in less manpower for farming and, thus, less food production (**FAO, 2008**). Although various challenges prevail, Palau is trying to increase domestic food products, extending the tourism sector to substitute imported foods with sustainable farming. Most of the farms are managed by family labor, producing food commodities from taro, sweet potato, cassava, and some fruits. These farms mainly exist along the coastal areas where the soil is rich in nutrients. Mulch agroforestry farms, in combination with diverse agriculture and livestock, are still active in several areas of the villages of Babeldaob Island (**Iida, 2011**). For future agricultural development, the land of Babeldaob has been classified into categories based on topography (especially slope), soil productivity, and current land use (**Kikuchi, 2021**, see Table 1).

Category	Area (ha)	Share (%)	Description	Slope (%)	Depth of soil with organic matter above 1% (cm)	Current land use
1	2,476	6.6	Recommendable for agriculture	< 12	≥ 30	Non-forested*
2	1,141	3.1	Recommendable for agriculture with attention to soil erosion	12-30	≥ 30	Non-forested*
3	2,488	6.7	Soil amendment required for agriculture	< 30	< 30	Non-forested*
4	11,197	30.1	Recommendable for agroforestry with attention to deforestation	< 30	≥ 30	Forested
5-1	19,069	51.2	Non-recommendable for agriculture	≥ 30	-	-
5-2				< 30	< 30	Forested
6	210	0.6	Others	-	-	Mines, urban lands

Table 1. Surface area descriptions and shares of each land category for agricultural development in Babeldaob Island, Palau (reprinted with permission)

In order to support the development of the agriculture and aquaculture sectors, the Palau Community College (PCC) established both a research and development (R&D) station and a multi-species hatchery. In the R&D station, research on plant tissue culture, germplasm conservation of root crops, and integrated pest management has been conducted. In the 1970s, the Palau Mariculture Centre, later renamed the Palau Mariculture Demonstration Center (PMDC), established giant-clam farming techniques with ongoing technical and financial support from international partners (**Republic of Palau, 2016**).

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A major constraint for agricultural production in Palau is its poor volcanic soil. The creation, commercialization, and widespread application of low-cost, locally produced soil amendments could improve soil quality. The local biomass sources, such as green waste, food scraps/kitchen waste, and woody/carbonaceous waste, are inputs for the local production of high-quality aerobic composts, anaerobic 'Bokashi' composts, pyrogenous carbon/biochar, and liquid fertilizers/bio-stimulants. The limestones and coral sand are readily available sources of calcium and an important amendment for buffering acidic soils commonly found in Palau.

Aquaculture waste can be upcycled through aerobic conversion into high-quality liquid fertilizers enriched with nitrogen sources. Seaweed, macroalgae, Azolla, poultry manure, composted poultry manure, feathers, and eggshells can provide balanced nutrition and organic matter to plants, as they contain all the essential nutrients required for crop production. Municipal carbon sources—such as untreated cardboard and paper—can serve as valuable inputs for aerobic composting, acting both as a carbon source and a bulking agent. This is especially important for very acidic, red iron and aluminum rich Oxisols, the dominant soil type in Palau, which are typically low in organic carbon. Incorporating carbon-rich materials into compost helps balance the carbon-to-nitrogen ratio, which enhances microbial activity and accelerates decomposition. In turn, this process improves the quality of compost and contributes to increased organic soil matter and overall soil fertility.

To address the constraints discussed above, Palau's traditional farming system with multi-story agroforestry offers a promising model. This system incorporates wetland taro cultivation, mixed tree gardening, and backyard gardening—practices that align closely with the Sustainable Development Goals. Traditional taro patches, for instance, can retain up to 90 percent of sediment, thereby playing a crucial role in safeguarding Palau's coral reefs (**Koshiba et al., 2014**). In addition, diverse crop rotations help ensure a resilient food supply and mitigate environmental and natural resource degradation, while drawing on local ecological knowledge to support sustainable practices. Effective soil management under this integrated system can boost the productivity of traditional nutrient-rich root crops and foods, thereby enhancing food security.

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Conclusion

The major role of agriculture in Palau is not only to provide food but also to facilitate social and ecosystem services and achieve a resilient community to adapt to global economic developments and climate change. In this paper we have given an overview of some of the major challenges that Palau is facing in trying to gain more food security and better food self-sufficiency in these times of climate change. We have also given some indications of where solutions might be sought. These include the production of traditional crops (taro, cassava, sweet potato), which are a good agronomic fit with the environment, within traditional farming systems and conservation techniques. Secondly, a reliable approach and investment structure for improving soil quality and developing capacity in agriculture is necessary.

Finally, we recommend enhancing research on sustainable agro-ecosystems, including organic recycling methods, and the application of organic residues and animal waste. We argue that if these recommendations are followed, more food would be generated, and ecosystems would be reasonably better conserved. In short, we propose that the promotion of revitalizing agriculture at the national level—based on traditional knowledge and adaptation strategies, soil quality improvement, capacity building, national-level investment in soil laboratory development, and increased R&D—could lead to a more resilient and healthy community in Palau.

Acknowledgements

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Re-imagining the Anthropocene by Examining Sustainability Culture Through the Lens of Paradox

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Abstract

In this Critical Reflection I seek to re-imagine the Anthropocene and its ecological crisis though a change of basic narrative from logic to paradox. Based on the proposition that the concept of culture plays a crucial role in understanding the sustainability crisis, I propose that the narrativization of the meaning of culture, as it plays its role in sustainability, may need to be changed in order to better serve the purpose of understanding our experienced Anthropocenic life situation. After discussing how the perspective of traditional logic is failing us in this quest, I examine the ideas of paradoxical lifeworlding and the Buddhist philosophical construct of the Two Truths Doctrine. I argue that the concept of living in the space between two paradoxical truths may form a better way of imagining how and why we can create a belief system that allows us to live and work sustainably. Finally, I discuss humankind's next sustainability challenge.

Keywords: sustainability, Anthropocene, sustainability culture, Two Truths Doctrine, logic, paradox; Buddhism

Introduction

While exploring what re-imagining the world in the Anthropocene could look like from a (trans)culturally informed perspective of sustainability, I realised that it can be summed up by a famous quotation from a season one episode of *Star Trek*, spoken by Spock: 'It is not life as we know or understand it. Yet it is obviously alive; it exists'. This line (often misremembered as 'It's life, Jim, but not as we know it') reflects life in the Anthropocene: still obviously life, but not life as we have previously lived it. It is this gap between living in the world as it now is and understanding the culture that permeates it which this Critical Reflection seeks to explore.

In my Introduction to this special issue I argued that the answers to the question of why 'we' as a collective cannot live more sustainably despite all our technological progress are found in how we form our culture and how we relate to the technology that gives us our comforts. The concept of Sustainability Culture is defined by questions like, 'Which values do we have? How do we think the world works? Do we really want to be sustainable in our daily lives and work, no matter what?' Here, I examine the role and importance of the formation of a cultural framework in which the Anthropocene is embedded, of the sense of interconnectedness and common-ness that we all share, expressed by a sense of belonging to the land, our (local) environment, and more broadly, to this Blue Planet, beautiful Earth. This sense of belonging or responsibility encourages people to believe that sustainability is important but also to behave in ways that actually support sustainability.

I focus on how the Anthropocene can be narrativized in such a way that we can effectively reach a culture of sustainability. Central to this debate is the reframing of the narrative, from an emphasis on differences to one on our commonalities. I argue that logic as a narrative driver needs to give way to the concept of paradox. The purpose of this journey is to seek access to a cultural space that encourages finding new commonalities (**Welsch, 2009**). This is also the space where a new culture may arise, the culture of wanting to live sustainably no matter what, or Sustainability Culture. In his book *The Great Derangement*, Amitav Ghosh sees the Anthropocene as a crisis of narrative and delivers a call for a new narrative to fight climate change (**Ghosh, 2016**). Through re-imagining and re-narrativizing the Anthropocene in this way, as the birthing ground of Sustainability Culture, I explore how to address the planetary emergency through (trans-)cultural thinking, furthering the debate on how 'glocal' culture, reflecting both local and global considerations, defines our drive and thrust toward sustainability from an interdisciplinary approach.

The Breakdown of Logic and the Rise of Paradox

It is obvious from the current state of the Anthropocene that the solutions to climate catastrophe proposed so far—in particular, ones that depend on proper government support—are not working. This shows from the collective inertia on climate change as well as the failure of world leaders to firmly commit to phasing out fossil fuels at the most recent UN Climate Change Conference, COP30. If we take the continuous rising of greenhouse gas emissions as the yardstick, it shows that governments are more or less refusing to develop effective efforts in forming a cooperative cultural norm of sustainability. Most national governments are in fact setting the opposite example by continuously and heavily subsidizing oil and gas industries and promoting increased fossil fuel extraction and development of new oil and gas licenses to boost their local economies. Governments award extraction, exploitation and natural destruction, promoting a system that goes directly against the framework of sustainable development goals (SDGs). The United Nations tracking system notes that only approximately 17 percent of all SDG indicators are on track for realisation by the deadline year of 2030 (**United Nations, 2024**). On top of all this, United Nations University recently announced that, based on their findings, as of 2026 the world has entered 'water bankruptcy', a stage of world water management where 'more and more river basins and aquifers are losing the ability to return to their historical "normal", and where droughts, shortages, and pollution episodes that once looked like temporary shocks, are becoming chronic in many places' (**Madani, 2026**). Simultaneously, the size and number of data centres using fresh drinking water for their cooling systems is exploding worldwide.

From these findings it becomes clear that world leaders are failing to stop, induce a reversal of, or even mitigate climate change. The theory of cultural dynamics, which I explore in the Introduction to this special issue, proposes that the organisational or group culture in a community is of crucial importance to whether embedment of sustainability will be successful. Leaders need to set the example so people can perceive what it means for a community to live and breathe sustainability as a core value. There seems to be something lacking in the argumentation for the cooperative cultural norm of Sustainability Culture. This is the case because these inquiries are based on an outdated narrative of logic.

When Timothy Morton introduced the term 'hyperobject', he could have had the Anthropocene in mind: it is a perfect illustrative example of 'an entity of such vast temporal and spatial dimensions that it defeats all our traditional ideas about what a thing is in the first place, and because of that, it can simply not be grasped in its depth of meaning, causes, and consequences' (**Morton, 2013**). It seems obvious that the traditional rules

of logic do not help us understand the phenomenon of the Anthropocene, and so we cannot grasp its depth of meaning or consequence. Once we realise that the Anthropocene as a phenomenon *defies* logic, we can start to appreciate that it is greatly paradoxical by nature. How else would we explain how we find ourselves an all-powerful geological force that cannot seem to put an end to or even stave off the catastrophic unfolding events that we—at least the 'we' of the so-called 'developed world'—have incited. Crucially, we know we are running towards self-destruction, but we don't seem to be able to do something about it (**Richard**, **2024**).

In the disciplines of environmentalism and eco-criticism, there has been much discussion about how people seem to have a different sense of responsibility regarding the local effects of their actions and the effects of their actions at a distance, as well as a different sense of belonging between their local communities and any so-called global community. According to Ursula Heise, these gradations of belonging show the importance of 'a sense of place as a basic prerequisite for environmental awareness and activism' (**Heise, 2013: 05**). People seem to need proximity to care, what Zygmunt Bauman terms a 'morality of proximity':

> [T]he morality which we have inherited from pre-modern times—the only morality we have—is a morality of proximity, and as such is woefully inadequate in a society in which all important action is an action on distance […] Moral responsibility prompts us to care that our children are fed, clad and shod; it cannot offer us much practical advice, however, when faced with numbing images of a depleted, desiccated and overheated planet which our children, and the children of our children will inherit and have to inhabit in the direct or oblique result of our collective unconcern (**Bauman, 1993, as quoted in Heise, 2013**).

It is this 'morality of proximity' that clouds most people's awareness of the reach of their actions. More bluntly, people find it difficult to care about the consequences of their actions if they cannot see or feel the results directly in their local environment.

Horn and Bergthaller, in their turn, offer up a model for thinking about the mechanics of this 'morality of proximity' phenomenon based on the concept of scale (**Horn & Bergthaller, 2019**). They build on the realisations presented by Heise and argue for a deeper level of understanding of the process of interaction between the local and the global, writing, 'Even in the oft-repeated ecological slogan "think globally, act locally", the local turns out to be the place where the action is, whereas the global is shunted off to a purely theoretical level' (**Horn & Bergthaller, 2019: 141**). They propose to use the concept of scale as a mechanism of understanding and furthering the awareness on this process, arguing that the Anthropocene demands that we look at our actions on an entirely different scale, not the

local, but the planetary. They analogise this shift in perspective with the theory of scale in construction. A small model made at 1:100 scale can be built out of cardboard and glue, but if the full-size building were constructed out of the same materials, it would clearly not hold together. Moving up in scale determines the change in properties, and this kind of 'gearing up' is called 'emergence'. Another example they use is the turning of a car's ignition switch. By itself, this is not an act that has planetary consequences. But if a million people do this simultaneously, their actions collectively have planetary impact.

Even though the concepts of scale and emergence are helpful, they still do not touch upon the core of the issue. They get us closer to grasping a reality where two seemingly opposite truths can equally apply, but these analogies still require us to 'shift gear' and be in one truth at a time, as prescribed by logic. As I have previously argued, if we truly seek to understand the reality of the Anthropocene we can no longer rely on the narrative provided by logic. Rather, 'all logic—meaning our habitual linear and causal thinking of a plus b makes c—must be left behind' (**Richard**, **2024**). Logic is based on thinking in opposites and premising that only one of these opposing outcomes can be true simultaneously. If there is duality, truth can be found by viewing it from only one of the dual perspectives at a time. Classical logic is what governed the 'Business as usual' (BAU) behaviour of the twentieth century, which led us to the Anthropocene, but it cannot be used to extract us from it.

As we shifted into this epoch, we have moved away from logic into a lifeworld of paradox. In the previous lifeworld, constructed by logic, we would not allow our actions to knowingly lead to the extinction of our species and do nothing to stop it. The logical approach would not allow two seemingly exclusive truths to be considered true at the same time. However, when following a narrative based on paradox, the seemingly contradictory behaviour of the Anthropocene becomes understandable. Such extremes are no longer exclusive but in fact work together as 'polarities that create a state of tension in the in-between space' (**Richard**, **2024**). It is now in this space of tension where the truth of our existence lies: yes, we do know that unmitigated, massive over-consumption is a prominent driver of climate change, but we still get our takeaway breakfasts in single-use plastic containers before driving to work in our SUVs, topping up our petrol tanks as we go, preparing for stressful days trying to meet productivity demands. There is a philosophical model that exists which can help us grasp how thinking in paradoxical truths really works. The Buddhist Doctrine of Two Truths is a possible tool for developing more awareness of the paradoxical nature of the Anthropocene and can help us better understand how to establish a balance in the space 'in between'.

The 'Two Truths' Approach

Nothing exists. Everything exists. Both propositions are true at the same time. This is a picture of reality that is constituted by (at least) *two truths* that co-exist simultaneously, absolute truth and relative truth (**Thich Nhat Hanh, 1999**). Under the Doctrine of Two Truths, our way of existence depends on how we can manage to oscillate between each while gradually moving towards one truth. This Eastern, non-hierarchal philosophy finds its complement in the Western postcolonial theory of transculturality as expounded by Fernando Ortiz and much more recently by Wolfgang Welsch. In Welsch's idea of transcultural commonalities (**Welsch, 2009**), once we have established that several levels of truth can exist simultaneously, a transcendent awareness can arise that moves us into the space in between these levels, where we can overcome boundaries or borders (**Welsch, 2001**).

When asked to visualise the lived reality of the space in between two valid truths, which thought would arise in our minds? In his volume on the lives of great Tibetan Buddhist masters, Tulku Thondup recounts a story about the first Dodrupchen Rinpoche (1745–1821 CE). One day, as he was traveling through the region of Dege, Tibet, Dodrupchen Rinpoche came upon a river that was deep and wide, with strong currents and unassailable banks. He eyed the horizons in both upstream and downstream directions but could not see any possible places to cross. He decided to enter into deep meditation to see the river in his mind *as earth* and proceeded to walk across the river as if walking on land. As he was about to reach the far riverbank, a thought sprang into his mind: 'Oh, my meditation is quite good'. Right there and then, Dodrupchen Rinpoche dropped into the river and almost drowned. From that moment on, he kept on saying that 'thoughts are dangerous' (**Thondup, 1996**). We may hold a thought or belief in our mind, but we run the risk of losing it by the mere act of recognising our efforts of doing (as opposite to the state of our being). This is the process of oscillation between two levels of truth, absolute and relative: in the absolute truth realm, there is no river to cross and we can walk on land, but in the relative truth realm, we will drop into the water. This exemplifies the Buddhist Doctrine of the Two Truths, which Thich Nhat Hanh describes as follows:

> *According to Buddhism, there are two kinds of truth, relative or worldly truth (*samvriti satya*) and absolute truth (*paramartha satya*). We enter the door of practice through relative truth. We recognize the presence of happiness and the presence of suffering, and we try to go in the direction of increased happiness. Every day we go a little further in that direction, and one day we realize that suffering and happiness are 'not two'* (**Thich, Nhat Hanh, 1999, 121**).

Buddhist philosophy is obviously a vast field of study, and I will not claim that any discussion of it for the purposes of my argument here can be either complete or comprehensive. All I mean to establish is a working knowledge of the operational mechanism of paradoxical being. For this, a basic understanding of how to experience simultaneous awareness of two different levels of truth will be necessary.

In order to get to this point of understanding, the Buddha advocates a perspective where we are in a state of 'not too loose and not too tight'. Called the 'Middle Way', this philosophy allows for something in between 'nothing exists' and 'everything is real'. To further explain this, the Buddha introduces a multi-level sense of reality where opposite experiences can be true simultaneously depending on which level of awareness we see them in. When asked how to look at the question of existence by King Menander, an ancient king of what is now Pakistan, the Buddhist sage Nāgasena answered that he himself, Nāgasena, does not exist. Questioned further by the disbelieving king, Nāgasena proposed the famous analogy of a chariot, which does not exist in any other way but as the sum of its parts. By taking it apart, it ceases to be a chariot. So where did the chariot go if the parts are still there? The chariot is nothing but a concept, a conventional designation to indicate something in need of a name. In its deepest sense, it has no existence in itself.

The great learned Buddhist scholar Je Tsongkhapa (1357–1419 CE) dedicated several chapters to this concept in his canonical work *The Great Treatise on the Stages of the Path to Enlightenment*. Tsongkhapa concludes that 'the person lacks intrinsic nature', and the 'self' does not intrinsically exist (**Tsong-kha-pa, 1402, vol. 3: 280**). Yes, I can say that my 'I' seems to encompass my body, my feelings, my mind, my thinking, but where is the 'I' exactly located? Every part of my body seems to be included in my 'I' as far as I can sense them, but my 'I' is not to be found in any one body part specifically. The same goes for my feelings and my thought. Even science cannot agree on the exact location of my mind or my consciousness. Tsongkhapa concludes by creating the paradox of opposite truths: there is no foundational self that can be known, but the self as psychological construct is real. In the sense of absolute truth, there is no self. From the perspective of the relative truth, we know a self in some way. And both are true in their own realm of awareness.

We can analyse any object by applying the same reasoning. Think of a simple table. We all know what a table is; we generally picture a hard flat surface, traditionally made of wood, supported by several legs spread apart. But what is it really? Does it exist as a table on a molecular or atomic level? Most certainly not like anything that looks like a table. If we consider all this as we go through daily life, we can try to imagine what it may feel

like to experience the truth of (lack of) existence on two different levels at the same time, or as the Buddha calls it, emptiness. We may also call it the tension created by two opposites in the space in between.

Conclusion

Upon further examination, a conundrum that starts off as a paradox (for instance, nothing exists, yet everything exists) turns into a process of truth-finding by exploring the liminal space of being created by the tension between two apparently opposing forces. The existence of this space argues that the logical approach embeds a false sense of dualism. By recognising this, it is my hope that the paradox of the Anthropocene can be addressed. It holds the key to its own dissolving by entering the space of being in between, where two seemingly opposite truths can be held together in one equal awareness (**Richard, 2024**).

The *Star Trek* (mis)quote can be seen as a reflection of these two levels of truth: yes, the Anthropocene is a lifeworld, but it is not life as we know it. It is about living with paradox, where the local is global and the global, local, just perceived from a different level of awareness. If we understand that there is no separation between the local 'us' and the planetary 'us', and realise the world works simultaneously on micro and macro levels, then our vision will be one of shared responsibility and our values will be oriented to reshaping our lives to be more sustainable. When this happens, a sustainable, human-made environment is possible. The task that Sustainability Culture sets for us is, in essence, an exercise in moving beyond borders and differences to focus on our commonalities, balancing two levels of truth that logically cannot exist together. As such, the Anthropocene 'marks the end not of comprehension of our environment, but of the old concepts of culture and logic that are being used to define the Anthropocene largely up to this moment' (**Richard, 2024**).

By practicing life in this way, a culture can develop that not only values sustainability structurally but will also allow us to integrate these values into our daily actions. It will foster a cultural perspective where we both feel proximity to our local environment and feel responsibility for the effects of our actions even if we cannot directly see them. On the relative level of cultural truth, we all form different groups, tribes or nations. But on the absolute level of cultural truth, we share a transcultural way of life. The more we can move into that space of sharing and commonality, the more we will all be able to live and work sustainably. Humankind's next sustainability challenge is not to develop more technology or even to find a more harmonious relationship with nature. It is to develop a sense of transcultural commonality among human beings on a planetary scale, without which there can be no common cultural norms that will bring us in sustainable harmony with ourselves, the Earth and nature.

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