

Environmental behaviours within ecological and social limits: integrating well-being with behavioural research for sustainability

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There is a pressing need to reduce inequalities and bring everyone above a foundational level of well-being whilst simultaneously staying within planetary boundaries. Yet, there is a limited understanding of how moving into and maintaining such 'safe and just' spaces affect environmental behaviours. To fill this gap, we argue for integrating human well-being and behaviour research. In particular, to 1) implement social thresholds when investigating environmental behaviours; 2) investigate the impact of social inequalities on environmental behaviours directly and 3) incorporate well-being domains with controlled behavioural experiments. Such understandings will be crucial for anticipating the implications of realising safe and just spaces for people and the planet.

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Introduction

One of the core questions of the 2020s is how to move into a safe and just space for people and the planet [1••]. This involves reducing inequalities in society and bringing everyone above a foundational level of well-being whilst simultaneously reducing global pressure on natural resources to levels within planetary boundaries [2]. Significant efforts are underway to define and

navigate towards this space [3••], for example, by defining specific social and ecological limits and translating safe and just targets to actors across scales [1,4]. However, little is known as to how human behaviours impacting the natural environment (environmental behaviours) might change when faced with changing inequalities and social and ecological limits. How, for example, will environmental behaviours of individuals and groups of people change when they are brought out of serious harm? Will this lead to heightened stewardship of nature, or the reverse? And what is the effect of looming ecological thresholds beyond which serious change might occur? How might different extents and types of inequalities shape how people interact and use the environment? And how will these inequalities and social and ecological limits interact to shape environmental sustainability?

We propose that an integration of human well-being and behaviour literature is needed to answer these urgent questions. Both research fields have grown thriving communities that deeply engage with human actions vis-à-vis the environment, but have arguably rarely shared each other's perspectives, tools and insights. For decades, behavioural research has been providing valuable insights into factors that can explain pro-environmental behaviours and under what conditions cooperation and sustainable natural resource use and consumption is achieved [5,15••,23,36]. This includes work on how knowledge and awareness of specific ecological thresholds can affect levels of cooperation and the ways in which groups extract natural resources and impact the natural environment [6–8,50]. Simultaneously, well-being literature has made considerable headway into understanding human behaviours as the pursuit of well-being far beyond economic considerations only [9]. It has also considered how being below a social foundation and in multidimensional poverty can affect how individuals and communities can behave towards the environment [10•] by, for example, restricting capabilities and choice [11]. Integrating these two key research areas would further our understanding of feedbacks between well-being of people and their behaviours towards the natural environments on which they depend in light of both changing inequalities and social and ecological thresholds.

Both well-being and behavioural research have limitations that have been reviewed in the literature — for

example, with the former being criticised to assume that people make reasoned choices and to not pay attention to contextual factors [12,13] and the latter's focus on the individual as driver of change argued to limit causal understanding and perpetuate rather than challenge the way that capacities and power are distributed in society [14–16]. However, rather than reviewing and summarising these critiques, we highlight concrete and constructive spaces for improvement in both fields of research. We posit that well-being and behavioural research provide complementary perspectives, tools and insights for understanding how environmental behaviours are affected by inequalities as well as ecological and social thresholds. For example, environmental behaviour research could be significantly advanced by explicitly considering different dimensions of well-being (e.g. subjective and objective) as well as social thresholds (e.g. a multidimensional poverty line or basic needs thresholds), which the well-being literature has highlighted to be of crucial importance for a more holistic and human-centred understanding of peoples' needs and wants [17,18]. Conversely, there have been decades of behavioural research across disciplines, investigating human behaviours vis-à-vis the environment [19••]. Research tools and approaches (such as controlled behavioural experiments) and gained insights could be valuable to better understand how impacts on well-being and the pursuit of well-being can influence behaviours and ultimately environmental sustainability.

There are a number of studies that evaluate and assess the repercussions and impacts of programmes that bundle poverty reduction and environment goals across scales. At a more global scale — these show that whilst the world has come closer to eradicating poverty, this has come at the expense of the environment [4,20]. At more local scales, whilst some case studies highlight that poverty reduction can go hand in hand with environmental conservation (such as reducing deforestation), many have highlighted that there are tensions between achieving environmental and poverty-reduction goals as epitomised in the payments for ecosystem-service literature [21]. In more recent years, it has become clear that the relationship between poverty reduction and environmental behaviours is complex, yet these arguments are mostly based on theoretical rather than empirical grounds [22•]. Further, much of the empirical research on this issue focuses on economic dimensions only, suffers from problems of endogeneity [21] and considerations of social and ecological limits are nearly absent. Combining well-being and behavioural approaches may shed light on whether meeting basic needs (rather than a sole focus on income) or reducing inequalities affects individuals' pro-environmental action by focusing on multiple dimensions of well-being or poverty and having the tools to explore the causal relationships between them and behaviours. Conversely, it

may also explain in which contexts actions carried out to meet individual 'wants' are detrimental for the environment and how strongly (i.e. whether or not ecological limits are likely to be crossed). Such insights could be pivotal for achieving long-term sustainability objectives by anticipating how behaviours might change in response to bringing people out of serious harm and reducing inequalities whilst remaining within environmental limits. The purpose of the paper is two-fold: 1) to synthesise our understanding of how environmental behaviours are affected by inequalities as well as social and ecological thresholds, and 2) to suggest concrete future research directions to advance our understanding of the environmental implications of bringing everyone above a foundational level of well-being and reducing inequalities whilst staying within planetary boundaries.

Understanding environmental behaviours: insights from behavioural research

There is a growing body of work, spanning across different research fields and disciplines (such as psychology, behavioural economics, collective action and commons literature), that investigates human behaviours vis-à-vis the environment [19••]. This work plays a key role in addressing both causes and consequences of global environmental change and can identify ways to realise and maintain safe and just spaces from a behavioural point of view [6,15••,23]. For example, behavioural research helps us to understand why societies struggle to act in the face of the ever-greater threats of climate change, biodiversity loss or disease outbreaks (e.g. [24–26]). In most cases, it is not about having the 'right' information but because changing lifestyles and behaviours can be difficult, undesirable or simply not an option. Numerous psychological barriers for behavioural change have been identified (e.g. status-quo bias, climate-change beliefs or extinction of experience [27–30]), as well as reasons for why environmental-policy tools (such as payments for ecosystem services or food and cash-transfer programmes) might not work as intended (e.g. because of crowding out of pre-existing intrinsic motivation to cooperate or protect the environment, see e.g. [31,32]). Such knowledge has been proven valuable to design more effective policies (e.g. [15••,33,34]). Moreover, no individual or nation has the incentive to take an action on their own, even though everyone involved would benefit from that action (such as drastically cutting emissions). This behavioural work on collective action and sustainable resource use around local-to-global commons (such as fisheries and the climate) is probably also one of the best-known behavioural work for environmental-sustainability researchers [35–37]. It is of central importance since collective action will be indispensable to safeguard vital systems and resources. Drawing on insights generated from decades of

observational studies in the field [38], controlled behavioural experiments in the lab (with students as participants) and in the field (with resource users as participants) have provided robust empirical evidence that, under enabling conditions (e.g. communication), people cooperate to maintain the shared resources on which they depend, and are not well-described by theories of the rational economic agent [36,37,39–41]. Instead, human actions are characterised by reciprocity, trust and are shaped by social norms [36,41].

Behavioural work has also highlighted how profoundly behaviour is shaped by the social groups people identify with, as well as the sociocultural and ecological contexts individuals are embedded in [19••,40,42,43]. These intersecting contexts and groups shape, for example, people's cognitive processes [14,44,45•] and what moves people to action in the first place [46,47]. This work provides key insights for designing policies and sustainability interventions beyond more 'conventional' tools, which typically do not regard the context dependency of human behaviour [15,19••,45,48].

Whereas the focus of behavioural work is indeed the individual and groups of individuals, there are perspectives emerging in the behavioural-sustainability literature that do not only highlight the just-mentioned role of broader, more durable contexts in shaping human behaviour, but also how human behaviour continuously co-evolves with these changing contexts [19••]. Such perspectives allow to consider both individual agency and structural constraints, as well as social practices [15,19••] hence, moving away from placing the onus on individuals' need to change their lifestyles for a sustainable future to a focus on the types of contexts that can enable larger-scale behaviour change in favour of sustainability [19••]. This describes a critical research frontier to which well-being research can significantly contribute by emphasising how a consideration of relational well-being, which emphasises the dynamic and coevolving relations of humans with their environments, can lead to transformative change [10•,49,84].

Behavioural research has started to investigate how environmental behaviours may be impacted in contexts where people are confronted with ecological limits. There is an emerging body of experimental work that is concerned with individual and collective behaviours in the face of catastrophic thresholds in ecosystems and the climate (e.g. [7,8,50–53]). Once such thresholds are crossed, they can have devastating impacts on human well-being [54]. In the absence of large uncertainties about the magnitude or location of critical thresholds, and provided that participants can coordinate their actions (allowed communication), the results are hopeful because people are likely to avoid crossing critical thresholds [55,56]. A certain or very likely ecological

threshold can stimulate collective action by providing a reference point around which to coordinate actions [7,8]. However, if there are large uncertainties about the magnitude or location of critical thresholds, prospects might be bleaker, as such, conditions are likely to lead to a breakdown of cooperation [50,52,55]. This is not the case in the face of uncertainties regarding the existence of critical thresholds, given enabling institutions [53,57]. It is important to be aware that most of these insights — such as the majority of behavioural evidence — are based on lab experiments with students from 'WEIRD' (Western, Educated, Industrialized, Rich, and Democratic) countries [58]. Hence, it is imperative to conduct more behavioural studies across different social groups and contexts, which certainly also differ in well-being [15••].

With regard to how environmental behaviours may respond to social thresholds, behavioural work about the effects of bringing people above a minimal level of well-being is, to our knowledge, completely lacking. However, there is a considerable body of behavioural work about the relationship between inequality (within groups), cooperation, and the environment dating back to the early 2000s (e.g. [59,60]). Whereas in some contexts inequality inhibits cooperation around environmental commons, in others, it does not, highlighting the complex relationships between inequality and collective action [59]. Experimental studies have shown that 1) inequality might have a negative effect on cooperation only when it is observable by everyone in the group [61]; 2) face-to-face communication can drastically improve the negative effects of inequality [56] and 3) real-life wealth distributions might play a role, so it matters who is part of the group [60]. These studies focus on the effect of inequality on cooperation, with the implicit assumption that cooperation inevitably leads to sustainable use of the commons or higher environmental quality [62•]. Yet, behavioural work has also shown that cooperative groups are not necessarily managing their resources sustainably [7,63]. The *direct* effect of inequality on pro-environmental behaviour has been seldom investigated (with the exception of [60]). This is why work is needed on how inequalities affect environmental behaviours *directly*, including investigations on how inequalities in relation to being above a certain level of well-being (e.g. a poverty line) influence environmental behaviours. Moreover, we are not aware of any behavioural work in the sustainability domain explicitly focusing on 'subjective' or perceived inequalities (as opposed to 'objective' economic indicators, such as wealth distributions). Recent work shows that it is not inequality per se but rather how inequalities are perceived (e.g. as fair or unfair) what shapes behaviour [64–66].

Most of the empirically grounded understanding in the behavioural literature is based on controlled behavioural experiments. It is important to be aware of the

advantages and limitations of this particular research approach, in particular when integrating perspectives and insights from different research fields, as we attempt here. Controlled behavioural experiments allow researchers to explore and test hypotheses about human behaviour in different situations (e.g. [67]), which can be purely of theoretical nature as well as having emerged from field research. Participants are randomly assigned to different groups (called treatments), which only differ with regard to the specific condition the experimenter would like to test. This ‘control’ over the different situations allows the researcher to establish a causal relationship between the observed behaviour and the specific condition [67,68•]. In sustainability research, inspired by social–ecological system thinking, controlled behavioural experiments have been mostly used to identify factors associated with effective collective action around critical natural resources [68•]. Most of these experiments are done in the lab, but this is rapidly changing. Owing to the complex and intertwined nature of sustainability problems, researchers are typically interested in context-sensitive understandings. Hence, field experiments have become more popular. Another development is that more and more experiments are designed to test the effect of specific ecosystem features and dynamics, such as path dependency, ecological thresholds or spatial heterogeneity (e.g. [7,69]). This ‘new generation’ of experiments [39] is particularly relevant for gaining understanding about environmental behaviours in changing social–ecological contexts.

When used well, controlled behavioural experiments are powerful in their capacity to establish causal relationships and to systematically investigate complex decision-making processes. However, on their own, they fall short in providing us with the understanding needed to identify and inform sustainability interventions. Many experimentalists complement this method with e.g. post-experimental questionnaires or interviews to better understand e.g. the underlying behavioural drivers and motivations [68•,70]. However, to gain context-sensitive understandings, there is significant but largely untapped potential in teaming up with other social scientists versed in engaging deeply with research participants and specific contexts. Moreover, researchers who apply experimental methods are typically trained to use them within a narrow frame strongly embedded within an established discipline, such as experimental economics or psychology [71]. As a result, variables of interest usually remain within the realm of the specific discipline. This can explain the strong focus on economic inequalities or ‘objective’ measures in behavioural experiments following the experimental economics tradition (a major share of experimental studies in the sustainability-science domain [68•]), as well as the predominant use of monetary performance-based (or task-related) incentives in order to make participants make

decisions as they would in reality (although exceptions exist [72]).

Understanding environmental behaviours: insights from well-being research

Whilst the origins of well-being thinking stem back to ancient Greece [73], research on the topic has also been growing in recent decades [74]. In particular, the concept has become prominent in discussions about sustainable development and environmental sustainability more specifically [75,76]. Well-being is now often considered a principal objective of sustainable development endeavours [77]. Equally however, the use of well-being as a concept for understanding environmental behaviours has not gone unnoticed [9,78••]. Not solely has it enabled a more holistic and multidimensional understanding of the quality of peoples’ lives in the face of environmental change and thus helping us understand well-being as an outcome, but it has also shed light on the pursuit of well-being as a process individuals go through to reach these outcomes [79]. If we frame what people do, and how they pursue their aspirations in terms of well-being, it broadens the range of motivating factors that become visible and help in understanding or predicting environmental behaviours [80]. Therefore, recognising well-being as a process — that people pursue well-being for themselves and their families [81] can be critical for understanding environmentally sustainable behaviours. Despite this, whilst correlations have been made between behaviour and economic domains, very few (if any) studies to date have empirically studied the relationship between well-being more broadly and environmental behaviours, such as the sustainable use of natural resources. Behavioural research tools (such as controlled behavioural experiments) could help investigate this relationship, but it could also further unpack the causal mechanisms at play that may explain this association.

Not only can well-being research help in understanding environmental behaviours but it can also more specifically shed light on understanding what a safe and just operating space is and how reaching or maintaining such a space could influence environmental behaviours. It has helped shift the sustainability debate away from a narrow focus on objective dimensions of poverty, in particular income poverty, to the broader discussion of well-being, incorporating what people need to be able to have, to be able to do and to be able to feel in order to be well in society [82]. Clearly, it is still important to identify those with limited resources and those with critical deprivations. The multidimensional concept of well-being has helped paved the way for recent research into poverty, which no longer measures this solely by an absence of wealth or material good but through a more holistic assessment that incorporates both subjective and

objective dimensions [83]. Well-being research is also paying increasing attention to the fact that all individuals are embedded in a place, and that the natural environment, cultural contexts and social groups individuals belong to play a significant role in shaping individuals' well-being [19••].

Conventional measures of poverty, especially if they are limited to income or material wealth, fail to recognise the multidimensional, relative and relational aspects of well-being and so may miss many people's needs and desires. This risks stigmatising the poor as 'hapless victims' and focusing on their deficits, whereas well-being recognises them as active agents capable of change and considers their capabilities. This more holistic understanding of well-being can have important ramifications for environmental behaviours. A relational understanding of well-being for example, where progress and success consider human-nature connectedness (rather than solely individual gains) can facilitate transformative change [49,84]. Well-being is a broader concept that can be developed in context and with metrics that are sensitive to local needs, customs and demands. Recent work has devised a methodology for calculating multidimensional poverty thresholds [85], building on the Theory of Human Need [86] to identify if individuals meet a range of basic human needs. A human-needs approach can enable one to assess the extent and nature of multidimensional poverty based on locally grounded indicators of deprivation to a range of specific universal needs [85]. This is also critical for efforts to move within a safe and just space as it serves as a means to identify where and when individuals are above or below a social threshold that reflects multiple domains of life (not solely economic). Crucially however, empirical investigations of the feedbacks between crossing such social thresholds and environmental behaviours are often confined to material wealth without consideration of multiple dimensions of poverty [87,88].

A holistic view of well-being can also help in uncovering different types of inequalities. Recent research has highlighted that inequality can be a potent driver of environmental behaviours [62•] either through one's aspirations, perceptions of fairness stemming from one's well-being in relation to others or through how inequalities can affect the ways in which people cooperate together when faced with shared resources such as common pool resources. Whilst economic inequalities have dominated most analyses past and present [89], there is now a call for a consideration of different forms of inequalities and how these can influence environmental behaviours. The well-being literature, which can consider objective and subjective criteria across material, relational and subjective domains [18], is well placed to identify the multiple different types of

inequalities that can shape the way we behave in relation to the environment either individually or collectively.

Well-being research has not provided specific insight as to how crossing ecological thresholds could influence people and their environmental behaviours. There is, however, a large and increasing body of work that has uncovered the many ways through which humans derive well-being from the natural environment [76,90], which could also prove useful in predicting how humans will respond to future environmental change. Whilst this does not explicitly investigate how behaviours are impacted when specific ecological thresholds have been crossed, this work can give us an indication as to how individuals may respond with regard to such ecological limits. A number of studies, for example, have sought to understand how fishers may behave under different hypothetical situations where there has been a significant and irreversible decline in catch [91–93]. Surprisingly, fishers often remained in the fishery, despite the large negative economic ramifications for them and their household. It is only when looking at how adapting to such shocks can impact their well-being that these fishing behaviours can be more clearly understood. In many instances, strong attachment to fishing as a way of life prevented many from exiting the fishery, despite continued decreases in catches [94].

Well-being research can therefore help further our understanding of environmental behaviours by focusing on behaviours as the pursuit of well-being. Further, through an appreciation of multiple dimensions of well-being, new approaches have been developed to assess social thresholds or poverty lines that when crossed can push individuals or groups into harm. A focus on how crossing such thresholds can influence environmental behaviours will be key for sustainable development that seeks to operate within environmental and social limits. Finally, a holistic understanding of well-being and the differences in well-being between groups and individuals can uncover multiple forms of inequalities that are increasingly seen as being important predictors of environmental behaviours.

Future research directions by integrating well-being with behavioural research

Whilst it is clear that well-being and behavioural literature has and is continuing to contribute significantly to our understanding of environmental behaviours, there is an opportunity to reconcile these two bodies of work to see how they complement each through a combination of their different perspectives, tools and insights. This is particularly the case for gaining insights about environmental behaviour in the light of both changing inequalities and social and ecological thresholds. Here, we

propose three future interrelated research directions pertinent for environmental-sustainability objectives.

Implementing social thresholds when investigating environmental behaviours

Recent behavioural work has investigated the role of critical thresholds in both ecosystems and the climate system in shaping environmental behaviours and cooperation [6,8]. Depending on the circumstances, prospects about cooperation and sustainable behaviours are more or less hopeful. Whilst these critical thresholds are frequently discussed by environmental-sustainability scholars (e.g. [54,95,96]) and recently applied in the field of behavioural economics, the notion of social thresholds has not yet been significantly explored in such a context. By implementing a social threshold in experimental work, such as a multidimensional poverty line, it will become possible to test, for example, under which conditions poverty alleviation and sustainable use of natural resources can go hand in hand. Other methodologies associated with well-being research could also be employed, such as longitudinal ethnographies [97] to find out how individuals and groups of individuals interacted with the natural environment when crossing in and out of poverty. Such methodologies are inductive and can be well placed for exploring the intended and unintended consequences of environmental or social change. This proposed research direction will allow us to investigate possible tensions between development and environmental agendas and the social feedbacks that arise by changes to well-being and poverty by understanding whether bringing people out of poverty — considering its multiple dimensions — leads to higher levels of pro-environmental behaviour (or not).

Investigating the direct impact of different types and extents of inequality on environmental behaviours

Growing inequalities and accelerating global environmental change represent key challenges of our time [98]. We know today relatively well how both extreme events and gradual environmental change impact inequalities, but there is a massive research gap about how different types and extents of social inequalities influence environmental behaviours [62,89]. Whilst there has been both theoretical and empirical work on the role of inequality in shaping social cohesion [84,85] and collective action around shared natural resources [99], this does not explore the impact of inequality on sustainable behaviours *directly* and only infers the impact of inequality on the environment. Using insights from both behavioural and well-being work could offer up an interesting research avenue to investigate how inequalities affect environmental behaviours through perceptions of fairness, injustice or through competition driving individual aspirations. Such work would be able to answer what impacts different types and levels of inequality have on environmental behaviours.

Incorporating different domains of well-being with controlled behavioural experiments

As discussed above, many controlled behavioural experiments in the sustainability domain focus on objective and mostly monetary dimensions of well-being. Advances in multidimensional poverty and well-being research, however, highlight that multiple domains can shape behaviours above and beyond economic ones. We suggest therefore to develop innovative research designs that allow to investigate how different domains of well-being, for example, food security or health, and changes thereof, affect cooperation and environmental actions. This could be done by employing a range of research designs, varying in time and effort needed for their implementation. A low-hanging fruit would be for experimentalists to make use of the literature on multidimensional well-being by including questions about different well-being domains in post-experimental surveys or interviews. A much more resource-intensive but perhaps most promising approach would be to systematically compare environmental behaviours across people that are more or less well off in relation to different well-being criteria. Using controlled behavioural experiments to answer these questions has the advantage that rival explanations could be much more effectively eliminated in comparison with observational studies [100]. But as discussed above, their strength for sustainability research can only unfold in combination with context-sensitive approaches.

Conclusion

Whilst work into understanding environmental behaviours has developed significantly, what remains largely unexplored is to what extent people behave differently towards the environment when facing inequalities, ecological and social thresholds. This is particularly important when considering sustainable development that strives for safeguarding the biosphere and, reducing inequality and eradicating poverty in all its forms [101]. To fill this gap, we posit here to integrate well-being with behavioural research. Concretely, we suggest three future research directions for scholars working at the interface of human behaviour and the environment: 1) implement social thresholds (such as a poverty line) when investigating environmental behaviours; 2) explore the impact of different types and extents of inequality on environmental behaviours directly and 3) incorporate well-being domains with controlled behavioural experiments. Such understandings are crucial for informing interventions aiming for an environmental and poverty-alleviation win-win. Identifying where reductions in inequality and improvements to well-being can influence environmental action positively will be essential for identifying virtuous cycles that promote environmental sustainability. As such, it can challenge development organisations and policy-makers alike to anticipate the implications of reducing inequalities and bringing

everyone above a foundational level of well-being whilst staying within ecological and social limits.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

- of special interest
- of outstanding interest

1. Rockström J, Gupta J, Lenton TM, Qin D, Lade SJ, Abrams JF, Jacobson L, Rocha JC, Zimm C, Bai X: **Identifying a safe and just corridor for people and the planet.** *Earths Future* 2021, **9**:e2020EF001866, <https://doi.org/10.1029/2020EF001866>.
- Provides a thorough overview of what a safe and just space entails and how to reach it through navigating social and ecological limits.
2. Raworth K: **A safe and just space for humanity: can we live within the doughnut.** *Oxfam Policy Pract Clim Change Resil* 2012, **8**:1-26.
3. O’Neill DW, Fanning AL, Lamb WF, Steinberger JK: **A good life for all within planetary boundaries.** *Nat Sustain* 2018, **1**:88-95. This research quantifies the national resource use associated with achieving a good life for over 150 countries. It shows that meeting the basic needs of all people on the planet would result in humanity transgressing multiple environmental limits, based on current relationships between resource use and human well-being.
4. Cole MJ, Bailey RM, New MG: **Tracking sustainable development with a national barometer for South Africa using a downscaled “safe and just space” framework.** *Proc Natl Acad Sci* 2014, **111**:E4399-E4408.
5. Bamberg S, Möser G: **Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour.** *J Environ Psychol* 2007, **27**:14-25.
6. Dannenberg A, Barrett S: **Cooperating to avoid catastrophe.** *Nat Hum Behav* 2018, **2**:435-437.
7. Lindahl T, Crépin A-S, Schill C: **Potential disasters can turn the tragedy into success.** *Environ Resour Econ* 2016, **65**:657-676.

8. Schill C, Lindahl T, Crépin A-S: **Collective action and the risk of ecosystem regime shifts: insights from a laboratory experiment.** *Ecol Soc* 2015, **20**:48.
9. Coulthard S, Sandaruwan L, Paranamana N, Koralgama D: **Taking a well-being approach to fisheries research: Insights from a Sri Lankan fishing village and relevance for sustainable fisheries.** Palgrave Macmillan; 2014:76-100.
10. Masterson VA, Vetter S, Chaigneau T, Daw TM, Selomane O, Hamann M, Wong GY, Mellegård V, Cocks M, Tengö M: **Revisiting the relationships between human well-being and ecosystems in dynamic social-ecological systems: implications for stewardship and development.** *Glob Sustain* 2019, **2**.
- This article describes how the ways in which people derive well-being from the natural environment can shape their stewardship and environmental behaviours.
11. Ballet J, Bazin DJA, Komena BK: **Unequal capabilities and natural resource management: the case of Côte d’Ivoire.** *World Dev* 2020, **134**:105016.
12. Steg L, Vlek C: **Encouraging pro-environmental behaviour: an integrative review and research agenda.** *J Environ Psychol* 2009, **29**:309-317.
13. Zielke J: **Towards a queer epistemological framework for wellbeing research.** A Modern Guide to Wellbeing Research. Edward Elgar Publishing; 2021.
14. Lamont M, Adler L, Park BY, Xiang X: **Bridging cultural sociology and cognitive psychology in three contemporary research programmes.** *Nat Hum Behav* 2017, **1**:866-872.
15. Nielsen KS, Clayton S, Stern PC, Dietz T, Capstick S, Whitmarsh L: **How psychology can help limit climate change.** *Am Psychol* 2021, **76**:130-144.

Focusing on how the psychology scholarship can help in mitigating climate change, the authors provide both a critique of current approaches as well as an extensive overview about so far misplaced focus or overlooked dimensions (e.g. high-impact behaviours, role of socio-cultural context). The authors focus on psychology, but highlight the need for interdisciplinary efforts to achieve the proposed agenda.

16. Barr S, Prillwitz J: **A smarter choice? Exploring the behaviour change agenda for environmentally sustainable mobility.** *Environ Plan C Gov Policy* 2014, **32**:1-19.
17. McGregor A, Sumner A: **Beyond business as usual: what might 3-D wellbeing contribute to MDG momentum?** *IDS Bull* 2010, **41**:104-112.
18. McGregor JA, Camfield L, Woodcock A: **Needs, wants and goals: wellbeing, quality of life and public policy.** *Appl Res Qual Life* 2009, **4**:135-154.
19. Schill C, Anderies JM, Lindahl T, Folke C, Polasky S, Cárdenas JC, Crépin A-S, Janssen MA, Norberg J, Schlüter M: **A more dynamic understanding of human behaviour for the Anthropocene.** *Nat Sustain* 2019, **2**:1075-1082.
- The authors provide a useful bibliography for anyone interested in human behaviour and sustainability in a changing world. They start off from cognitive psychology and behavioural economics, then expand to other fields of psychology, sociology, and sustainability science.
20. Barbier EB, Burgess JC: **Sustainable development goal indicators: analyzing trade-offs and complementarities.** *World Dev* 2019, **122**:295-305.
21. Zabala A, Sullivan CA: **Multilevel assessment of a large-scale programme for poverty alleviation and wetland conservation: lessons from South Africa.** *J Environ Plan Manag* 2018, **61**:493-514.
22. Malerba D: **Poverty alleviation and local environmental degradation: an empirical analysis in Colombia.** *World Dev* 2020, **127**:104776.
- This article focuses on the links between poverty and the environment in Colombia; however, it provides a comprehensive and up-to-date review of the lack of evidence of this relationship and reasons as to why this area is so rarely investigated.
23. Stern PC: **Psychological dimensions of global environmental change.** *Annu Rev Psychol* 1992, **43**:269-302.

24. Selinske MJ, Garrard GE, Bekessy SA, Gordon A, Kusmanoff AM, Fidler F: **Revisiting the promise of conservation psychology.** *Conserv Biol* 2018, **32**:1464-1468.
25. Van Bavel JJ, Baicker K, Boggio PS, Capraro V, Cichocka A, Cikara M, Crockett MJ, Crum AJ, Douglas KM, Druckman JN: **Using social and behavioural science to support COVID-19 pandemic response.** *Nat Hum Behav* 2020, **4**:460-471.
26. Whitmarsh L, Poortinga W, Capstick S: **Behaviour change to address climate change.** *Curr Opin Psychol* 2021, **42**:76-81, <https://doi.org/10.1016/j.copsyc.2021.04.002>
27. Gaston KJ, Soga M: **Extinction of experience: the need to be more specific.** *People Nat* 2020, **2**:575-581.
28. Gifford R: **The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation.** *Am Psychol* 2011, **66**:290-302.
29. Hoogendoorn G, Sütterlin B, Siegrist M: **The climate change beliefs fallacy: the influence of climate change beliefs on the perceived consequences of climate change.** *J Risk Res* 2020, **23**:1577-1589.
30. Weber EU: **Breaking cognitive barriers to a sustainable future.** *Nat Hum Behav* 2017, **1**:1-2.
31. Alix-Garcia JM, Sims KR, Yañez-Pagans P: **Only one tree from each seed? Environmental effectiveness and poverty alleviation in Mexico's Payments for Ecosystem Services Program.** *Am Econ J Econ Policy* 2015, **7**:1-40.
32. Kaysay GA, Kassie WA, Beyene AD, Hansen LG: **Pro-environmental behavior under bundled environmental and poverty reduction goals: empirical evidence from Ethiopia.** *Land Use Policy* 2022, **112**:105798.
33. Cinner J: **How behavioral science can help conservation.** *Science* 2018, **362**:889-890.
34. Fehr-Duda H, Fehr E: **Sustainability: game human nature.** *Nat News* 2016, **530**:413-415.
35. Janssen MA: **A behavioral perspective on the governance of common resources.** *Curr Opin Environ Sustain* 2015, **12**:1-5.
36. Ostrom E: **A behavioral approach to the rational choice theory of collective action: presidential address, American Political Science Association, 1997.** *Am Polit Sci Rev* 1998, <https://doi.org/10.2307/2585925>
37. Ostrom E, Gardner R, Walker J, Walker JM, Walker J: **Rules, Games, and Common-Pool Resources.** University of Michigan Press; 1994.
38. Ostrom E: **Governing the Commons: The Evolution of Institutions for Collective Action.** Cambridge University Press; 1990.
39. Cardenas J-C, Janssen M, Bousquet F: **Dynamics of rules and resources: three new field experiments on water, forests and fisheries.** *Handb Exp Econ Environ* 2013, **319**-346.
40. Henrich J, Boyd R, Bowles S, Camerer C, Fehr E, Gintis H, McElreath R, Alvard M, Barr A, Ensminger J: **"Economic man" in cross-cultural perspective: behavioral experiments in 15 small-scale societies.** *Behav Brain Sci* 2005, **28**:795-855.
41. Ostrom E: **Collective action and the evolution of social norms.** *J Econ Perspect* 2000, **14**:137-158.
42. Gifford R: **Environmental psychology matters.** *Annu Rev Psychol* 2014, **65**:541-579.
43. Hoff K, Stiglitz JE: **Striving for balance in economics: towards a theory of the social determination of behavior.** *J Econ Behav Organ* 2016, **126**:25-57.
44. Nisbett RE, Peng K, Choi I, Norenzayan A: **Culture and systems of thought: holistic versus analytic cognition.** *Psychol Rev* 2001, **108**:291-310.
45. Constantino SM, Schlüter M, Weber EU, Wijermans N: **Cognition and behavior in context: a framework and theories to explain natural resource use decisions in social-ecological systems.** *Sustain Sci* 2021, **16**:1651-1671, <https://doi.org/10.1007/s11625-021-00989-w>.
- The authors present a framework that assists with the integration of cognitive and social science insights into sustainability science and governance. This framework ('HuB-CC') is envisioned to be a 'living' platform to inspire the development of new theories at the intersection of social sciences and natural resource management.
46. Markus HR, Kitayama S: **Culture and the self: implications for cognition, emotion, and motivation.** *Psychol Rev* 1991, **98**:224-253.
47. Markus HR: **What moves people to action? Culture and motivation.** *Curr Opin Psychol* 2016, **8**:161-166.
48. Nyborg K, Anderies JM, Dannenberg A, Lindahl T, Schill C, Schluter M, Adger WN, Arrow KJ, Barrett S, Carpenter S, et al.: **Social norms as solutions.** *Science* 2016, **354**:42-43.
49. West S, Haider LJ, Stålhammar S, Woroniecki S: **A relational turn for sustainability science? Relational thinking, leverage points and transformations.** *Ecosyst People* 2020, **16**:304-325.
50. Barrett S, Dannenberg A: **Sensitivity of collective action to uncertainty about climate tipping points.** *Nat Clim Change* 2014, **4**:36-39.
51. Lindahl T, Jarunggrattanapong R: **Avoiding catastrophic collapse in small-scale fisheries through inefficient cooperation: evidence from a framed field experiment.** *Environ Dev Econ* 2022, in press.
52. Milinski M, Sommerfeld RD, Krambeck H-J, Reed FA, Marotzke J: **The collective-risk social dilemma and the prevention of simulated dangerous climate change.** *Proc Natl Acad Sci* 2008, **105**:2291-2294.
53. Rocha JC, Schill C, Saavedra-Díaz LM, Moreno R, Maldonado JH: **Cooperation in the face of thresholds, risk, and uncertainty: experimental evidence in fisher communities from Colombia.** *PLoS One* 2020, **15**:e0242363.
54. Scheffer M, Carpenter S, Foley JA, Folke C, Walker B: **Catastrophic shifts in ecosystems.** *Nature* 2001, **413**:591-596.
55. Barrett S, Dannenberg A: **Climate negotiations under scientific uncertainty.** *Proc Natl Acad Sci* 2012, **109**:17372-17376.
56. Tavoni A, Dannenberg A, Kallis G, Löschel A: **Inequality, communication, and the avoidance of disastrous climate change in a public goods game.** *Proc Natl Acad Sci* 2011, **108**:11825-11829.
57. Schill, Caroline and Rocha, Juan C., **Uncertainty can Help Protect Local Commons in the Face of Climate Change** (October 12, 2019). Available at SSRN: <https://ssrn.com/abstract=3468677> or <http://dx.doi.org/10.2139/ssrn.3468677>.
58. Henrich J, Heine SJ, Norenzayan A: **Most people are not WEIRD.** *Nature* 2010, **466**:29.
59. Baland J-M, Platteau J-P: **Collective action on the commons: the role of inequality.** *Inequal Coop Environ Sustain* 2007, **10**-35.
60. Cardenas JC, Stranlund J, Willis C: **Economic inequality and burden-sharing in the provision of local environmental quality.** *Ecol Econ* 2002, **40**:379-395.
61. Anderson LR, Mellor JM, Milyo J: **Inequality and public good provision: an experimental analysis.** *J Socio-Econ* 2008, **37**:1010-1028.
62. Hamann M, Berry K, Chaigneau T, Curry T, Heilmayr R, Henriksson PJ, Hentati-Sundberg J, Jina A, Lindkvist E, Lopez-Maldonado Y: **Inequality and the Biosphere.** *Annu Rev Environ Resour* 2018, **43**:61-83.
- This review provides a detailed summary of the work linking inequalities to the natural environment. Importantly, it describes a number of mechanisms through which inequalities may shape environmental behaviours and sustainability more broadly.
63. Schill C, Wijermans N, Schlüter M, Lindahl T: **Cooperation is not enough—exploring social-ecological micro-foundations for sustainable common-pool resource use.** *PLoS One* 2016, **11**:e0157796.
64. Hauser OP, Norton MI: **(Mis) perceptions of inequality.** *Curr Opin Psychol* 2017, **18**:21-25.

65. Schmalor A, Heine SJ: **The construct of subjective economic inequality.** *Soc Psychol Personal Sci* 2021,, <https://doi.org/10.1177/1948550621996867>
66. Starmans C, Sheskin M, Bloom P: **Why people prefer unequal societies.** *Nat Hum Behav* 2017, **1**:1-7.
67. Friedman D, Sunder S: *Experimental Methods: A Primer for Economists.* Cambridge University Press; 1994.
68. Lindahl T, Janssen MA, Schill C: **Controlled behavioural experiments.** *The Routledge Handbook of Research Methods for Social-Ecological Systems.* Routledge; 2021:295-306.
- This book chapter provides an accessible introduction about controlled behavioural experiments for environmental sustainability with a specific focus on collective action and sustainable use of environmental commons. It describes typical research questions, experimental designs, limitations and resource implications. It also specifically refers to the herein cited experiments about collective action in the face of ecological thresholds.
69. Janssen MA, Holahan R, Lee A, Ostrom E: **Lab experiments for the study of social-ecological systems.** *Science* 2010, **328**:613-617.
70. Anderies JM, Janssen MA, Bousquet F, Cardenas J-C, Castillo D, Lopez M-C, Tobias R, Vollan B, Wutich A: **The challenge of understanding decisions in experimental studies of common pool resource governance.** *Ecol Econ* 2011, **70**:1571-1579.
71. Arieli D, Norton MI: **Psychology and experimental economics: a gap in abstraction.** *Curr Dir Psychol Sci* 2007, **16**:336-339.
72. Voslinsky A, Azar OH: **Incentives in experimental economics.** *J Behav Exp Econ* 2021, **93**:101706.
73. Stoll L, Short A: **History of wellbeing research.** *Wellbeing.* American Cancer Society; 2014:1-19.
74. Dodge R, Daly AP, Huyton J, Sanders LD: **The challenge of defining wellbeing.** *Int J Wellbeing* 2012,**2**.
75. Dietz T, Rosa EA, York R: **Environmentally efficient well-being: rethinking sustainability as the relationship between human well-being and environmental impacts.** *Hum Ecol Rev* 2009, **16**:114-123.
76. Schreckenberg K, Poudyal M, Mace G: **Ecosystem Services and Poverty Alleviation: Trade-offs and Governance.** Taylor & Francis; 2018.
77. Schleicher J, Schaafsma M, Burgess ND, Sandbrook C, Danks F, Cowie C, Vira B: **Poorer without it? The Neglected Role of the Natural Environment in Poverty and Wellbeing: the neglected role of the natural environment in poverty and wellbeing.** *Sustain Dev* 2017, **26**:83-98, <https://doi.org/10.1002/sd.1692>
78. Searle BA, Pykett J, Alfaro-Simmonds MJ: **Introduction to wellbeing research.** *A Modern Guide to Wellbeing Research.* Edward Elgar Publishing; 2021.
- This book chapter provides an up-to-date review of well-being research. Importantly, it explains limitations of behavioural and psychological research and how the concept of well-being can help in explaining and understanding behaviours.
79. Coulthard S, Johnson D, Mcgregor JA: **Poverty, sustainability and human wellbeing: a social wellbeing approach to the global fisheries crisis.** *Glob Environ Change* 2011, **21**:453-463.
80. Coulthard S: **What does the debate around social wellbeing have to offer sustainable fisheries?** *Curr Opin Environ Sustain* 2012, **4**:358-363, <https://doi.org/10.1016/j.cosust.2012.06.001>
81. Deci EL, Ryan RM: **The “ what” and “ why” of goal pursuits: human needs and the self-determination of behavior.** *Psychol Inq* 2000, **11**:227-268.
82. Gough I, Mcgregor JA: *Wellbeing in Developing Countries: From Theory to Research.* Cambridge University Press; 2007.
83. Szaboova L, Brown K, Chaigneau T, Coulthard S, Daw TM, James T: *Resilience and Wellbeing for Sustainability.* Routledge; 2018.
84. Searle BA: **Subjective wellbeing and transformation.** *A Modern Guide to Wellbeing Research.* Edward Elgar Publishing; 2021.
85. Chaigneau T, Coulthard S, Brown K, Daw TM, Schulte-Herbrüggen B: **Incorporating basic needs to reconcile poverty and ecosystem services.** *Conserv Biol* 2018, **33**:655-664, <https://doi.org/10.1111/cobi.13209>
86. Doyal L, Gough I: *A Theory of Human Need.* Palgrave Macmillan; 1991.
87. Cinner JE: **Poverty and the use of destructive fishing gear near east African marine protected areas.** *Environ Conserv* 2009, **36**:321-326.
88. Fiorella KJ, Milner EM, Salmen CR, Hickey MD, Omollo DO, Odhiambo A, Mattah B, Bukusi EA, Fernald LC, Brashares JS: **Human health alters the sustainability of fishing practices in East Africa.** *Proc Natl Acad Sci* 2017, **114**:4171-4176, <https://doi.org/10.1073/pnas.1613260114>
89. Leach M, Reyers B, Bai X, Brondizio ES, Cook C, Díaz S, Espindola G, Scobie M, Stafford-Smith M, Subramanian SM: **Equity and sustainability in the Anthropocene: a social-ecological systems perspective on their intertwined futures.** *Glob Sustain* 2018, **1**:E13.
90. Díaz S, Pascual U, Stenseke M, Martín-López B, Watson RT, Molnár Z, Hill R, Chan KMA, Baste IA, Brauman KA, *et al.*: **Assessing nature's contributions to people.** *Science* 2018, **359**:270-272.
91. Cinner JE, Daw T, McClanahan TR: **Socioeconomic factors that affect Artisanal fishers' readiness to exit a declining fishery.** *Conserv Biol* 2009, **23**:124-130.
92. Daw TM, Cinner JE, McClanahan TR, Brown K, Stead SM, Graham NAJ, Maina J: **To fish or not to fish: factors at multiple scales affecting artisanal fishers' readiness to exit a declining fishery.** *PLoS One* 2012, **7**:e31460.
93. Muallil RN, Geronimo RC, Cleland D, Cabral RB, Doctor MV, Cruz-Trinidad A, Aliño PM: **Willingness to exit the artisanal fishery as a response to scenarios of declining catch or increasing monetary incentives.** *Fish Res* 2011, **111**:74-81.
94. Coulthard S, Britton E: **Waving or drowning: an exploration of adaptive strategies amongst fishing households and implications for wellbeing outcomes.** *Sociol Rural* 2015, **55**:275-290.
95. Lenton TM, Held H, Kriegler E, Hall JW, Lucht W, Rahmstorf S, Schellnhuber HJ: **Tipping elements in the Earth's climate system.** *Proc Natl Acad Sci* 2008, **105**:1786-1793.
96. Rocha JC, Peterson G, Bodin Ö, Levin S: **Cascading regime shifts within and across scales.** *Science* 2018, **362**:1379-1383.
97. Camfield L, Crivello G, Woodhead M: **Wellbeing research in developing countries: reviewing the role of qualitative methods.** *Soc Indic Res* 2009, **90**:5-31.
98. Folke C, Polasky S, Rockström J, Galaz V, Westley F, Lamont M, Scheffer M, Österblom H, Carpenter SR, Chapin FS, *et al.*: **Our future in the Anthropocene biosphere.** *Ambio* 2021, **50**:834-869.
99. Baland J-M, Bardhan P, Bowles S: *Inequality, Cooperation, and Environmental Sustainability.* Princeton University Press; 2007.
100. Brady HE, Collier D: *Rethinking Social Inquiry: Diverse Tools, Shared Standards.* Rowman & Littlefield Publishers; 2010.
101. Griggs D, Stafford-Smith M, Gaffney O, Rockström J, Öhman MC, Shyamsundar P, Steffen W, Glaser G, Kanie N, Noble I: **Sustainable development goals for people and planet: policy.** *Nature* 2013, **495**:305-307.