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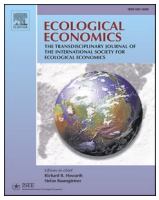

Behavioural ecological economics - Positioning the field and introducing the special issue☆

1. Introduction

The purpose of this special issue is to explore the relationship between ecological economics (EE) and behavioural economics (BE). We invited submissions of experimental, theoretical, and empirical papers on integrating behavioural economics into ecological economics, including behavioural levers, policy instruments, analytical models of collective action, and social, cultural, and ethical values. The aim was to understand how individual behaviour and collective actions can foster an ecological transition, and whether the contours of a distinct "behavioural ecological economics" (BEE) can be defined.

In 2023, Drews (2023a) noted that there is "a growing amount of behavioural research in the journal of *Ecological Economics*, but some (or perhaps most) of it is difficult to distinguish from behavioural environmental economics and other related fields". Drews (2023b) also provided an early attempt to define this emerging field. He describes it as a term that broadly captures the growing body of interdisciplinary research at the interface of ecological economics and the behavioural sciences. These observations reflect a central motivation for the special issue: to promote articles that truly integrate the two fields, in order to clarify the scope and boundaries of BEE and identify its differences from related areas such as behavioural or experimental environmental economics.

This ambition was also at the core of a workshop on Behavioural Ecological Economics,[1] which we organized at the University of Florence, in July 2023, following an initial meeting in December 2022 where we discussed the need of defining this field of research. The workshop brought together a mix of junior and senior scholars, nurturing stimulating discussions and giving us hope for the potential success of the call for this special issue.

The interest generated was considerable. Within six months, we received 146 manuscripts, covering a diverse array of topics, approaches, and contexts. About 48 % were desk-rejected or transferred to other outlets as out of scope, and 25 % were rejected after peer review. Ultimately, 41 papers (28 %) were accepted into this special issue. This level of engagement confirms the vitality of research at the interface of BE and EE and shows the diversity of theoretical perspectives, empirical approaches, and problem framings present in this emerging space.

Building on these contributions, this special issue aims to further define and positions Behavioural Ecological Economics, clarifying its scope and methodological foundations and identifying its emerging frontiers.

1.1. Ecological economics: roots and core principles

The basic tenet in Ecological Economics (EE) is eloquently stated in the seminal paper by (Røpke, 2004, p. 296): "the human economy is embedded in nature, and economic processes are also always natural processes". The field gained formal recognition with the founding of the *International Society for Ecological Economics* in 1988, followed by the launch of the journal *Ecological Economics* in 1989 and the first international conference in 1990 (Røpke, 2004). It emerged after several unsuccessful attempts to make environmental economics more grounded in physical reality and less constrained by its rigid methodological assumptions. In response to this rigidity, the scholars who founded the EE society and journal opted for openness: any opinion or method could in principle be considered, debated and possibly dismissed only *ex post*. This stance reflects EE's commitment to methodological pluralism (Norgaard, 1989), rooted in the belief that no single approach can adequately capture the full complexity of socio-ecological challenges.

Pluralism also stems from EE's inherently interdisciplinary nature. As Costanza (1989) stated in the editorial of the first issue of *Ecological Economics*, the journal's aim was to foster dialogue between ecology and economics and encourage collaboration across disciplines. This interdisciplinary engagement extends beyond the natural and social sciences to include any relevant discipline or other forms of knowledge, leading to trans-disciplinarity.

Recognising the importance of physical reality and focusing on living systems implies adopting complexity as the guiding epistemological paradigm. The logical consequence is the awareness that we face radical uncertainty – or even ignorance - requiring a post-normal science approach to decision-making on issues characterised by urgency, values in dispute, and high stakes (Giampietro, 2003; Funtowicz and Ravetz, 1993, 2025). Especially in such contexts, the knowledge of non-academics becomes highly relevant: participatory processes are seen not as means to secure public approval for policies, but essential tools for advancing knowledge. They serve to "extend the peer-community" by including stakeholders whose lived experiences and contextual insights can help navigate complexity.

Acknowledging uncertainty leads to another basic tenet of EE highlighted by Costanza (1989), namely, the need to adopt a precautionary approach to policy. It is considered unethical for public authorities to put citizens at risk by taking decisions that may maximise payoff, but could, in the unfortunate case, result in severe harm. The issue is, therefore, not of being optimistic or pessimistic, but rather of being

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[1] https://ecologicaleconomicstuscany.ec.unipi.it/workshop/2023-2/

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prudent when making decisions that affect others. The relevance of the precautionary principle has been clearly stated by the European Environment Agency in the early 2000s (Gee et al., 2013).

A more specific interpretation of EE entails stronger theoretical requirements, again grounded in complexity theory. Economic phenomena emerge from interactions across multiple hierarchical levels, rendering reductionist approaches – such as those focusing solely on individual behaviour - inadequate. This view aligns with the "s-frame" approach (system-level change) (Chater and Loewenstein, 2023), embedding the economy in society, and extends to the "n-frame" (nature/planetary boundaries), by embedding society within Earth's ecosystems (Raworth, 2016). Complexity also implies that systems must be described and analysed using multiple variables and across different scales, much as geographical maps with different mapping variables reveal natural features or administrative units. This perspective underlies the principle of incommensurability: alternatives can be compared without the need to reduce them to a single metric (Martinez-Alier et al., 1998). This implies rejecting monetary valuation in public decision-making, although it may still be acceptable for purposes such as legal claims for damages. Monetary evaluation undermines the democratic principle of 'one person, one vote', by privileging the preferences and economic power of wealthier individuals, while failing to represent poorer citizens and future generations who may be more affected by environmental degradation. In this stronger version of EE, multiple-criteria decision methods are preferred because they aim to help decision-makers consider the many facets of reality, rather than offering them a "right" option that arises from arbitrarily collapsing reality into a single number. For the same reason, incommensurability should lead scepticism toward composite indicators - such as ecological footprint or attempts to correct GDP - in favour of dashboards of distinct indicators that preserve the diversity of information needed for decision-making.

Last but not least, the "stronger" version of EE pays attention to socio-institutional dimensions, including the role of power, vested interests, and ecological injustice. These concerns were anticipated, among others, by Kapp (Luzzati, 2010, 2023) - a forerunner of EE whose model of human agency diverged sharply from the neoclassical one (Kapp, 1965)) and was partly aligned with Simon's notion of procedural rationality (Simon, 1976). Simon's work helped inspire the behavioural revolution of the 1980s, which soon influenced EE (Van Den Bergh et al., 2000; Foxon, 2006). EE recognizes that not all human actions are goal-driven; many are shaped by social norms, history, and collective dynamics. This calls for a broader theoretical foundation that also integrates systemic interdependencies.

1.2. Behavioural economics: roots and ecological integration

Behavioural Economics (BE) emerged as a challenge to the central assumptions of Neoclassical Economics (NE). While NE assumes that individuals act as maximisers automata, BE recognizes that human decision-making is also shaped by intuitive, emotional and context-dependent processes. Dual process theories distinguish between fast, intuitive 'System 1' thinking and slower, deliberative 'System 2' thinking, reflecting the fact that much behaviour is reactive and shaped by experience, emotions, and heuristics rather than purely calculated optimization (Kahneman, 2011).

BE departs from NE in three important ways. First, it acknowledges systematic, predictable deviations from instrumental rationality, rather than treating mistakes as random noise with a zero mean (Grüne-Yanoff and Hertwig, 2016). Cognitive biases—such as loss aversion, framing effects, and present bias—can lead to consistent patterns of suboptimal decision-making. Second, BE incorporates other-regarding preferences, recognising the influence of fairness, reciprocity, and social norms, in contrast to NE's exclusive focus on self-interest (Sacco and Zarri, 2003). Third, it challenges the idea that economic agents operate with unlimited cognitive resources (Kahneman, 2003).

Despite these differences, NE and BE share an underlying commitment to methodological individualism: the assumption that macroeconomic outcomes can be explained entirely through the aggregation of individual choices. This orientation reflects what Chater and Loewenstein (2023) term the "i-frame" (individual frame), which centres analysis and intervention on individuals, aiming to understand and change behaviour through their cognition, preferences, or biases—rather than addressing the broader social or structural conditions shaping those behaviours. This focus on the individual has allowed BE to enter the economic mainstream, but it also limits its ability to address systemic and structural drivers of behaviours. In contexts such as environmental sustainability—where problems are deeply interconnected and embedded in socio-ecological systems—this individual-centric perspective can miss critical feedback, power dynamics, and institutional constraints.

Nevertheless, BE's individual-level focus has policy advantages. It offers precise, targeted tools that can untap intrinsic motivations to address collective challenges by complementing large-scale structural measures. Rather than abandoning this perspective, there is an opportunity to integrate BE's micro-level insights with the systemic vision of EE, by combining individual behavioural understanding with a broader awareness of environmental constraints, institutional dynamics, and collective action.

BE is often perceived as being mainly about irrationality and cognitive biases, but this view is too narrow. While it does examine how heuristics, emotions, and mental shortcuts can lead to systematic deviations from instrumental rationality, BE also addresses adaptive strategies that people use to navigate complex and uncertain environments. This goes back to Herbert Simon's original idea of procedural rationality: in contexts where human computational capacity is insufficient given the difficulty of the context – such as in playing chess - it is irrational to act according to what NE indicates as rational; rather a rational agent may rely on routines and heuristics (Luzzati et al., 2022). This broader perspective is essential for understanding the kinds of behavioural and systemic changes needed to meet today's ecological challenges.

Environmental themes have gained increasing prominence in BE research in recent years. Scholars have explored how individuals respond to climate change, pollution, and resource scarcity, as well as the effectiveness of behavioural interventions in promoting sustainable choices. In constructing behavioural models, BE recognizes that decisions are influenced not only by economic incentives, but also by rules of thumb, heuristics, emotions, habits, desires, moods, and other psychological elements (Angner, 2015). One major insight is that individuals tend to undervalue future environmental outcomes - a bias known as hyperbolic discounting (Laibson, 1997) - leading to constant underinvestment in long-term sustainability, even when environmental risks are well recognized. At the same time, behavioural patterns of ordinary individuals differ from those of large investors or institutional actors who influence the broader economic system. Whereas individual decision-making often reflects cognitive biases and limited information, systemic actors operate within different incentive structures and constraints that shape aggregate outcomes. This distinction highlights that behavioural deviations from neoclassical assumptions occur not only at the micro level of individual choice, but also at the macro level, where institutional behaviour contributes to the persistence of certain economic and environmental dynamics.

Addressing ecological challenges requires more than technological solutions and policy reforms. It demands a profound social and behavioural transformation that reshapes the relationship between citizens, democracy, and the economy (Jensen et al., 2023). Historically, large-scale transitions—such as those in the energy sector, were often top-down processes led by a small group of experts and stakeholders. In contrast, the current energy transition calls for the active participation of a broad range of actors—especially citizens who are directly affected by these changes (Lennon et al., 2019). This requires explicit attention to procedural justice - ensuring that policy processes are fair, participatory,

and transparent, and that all affected citizens and communities have the opportunity to influence decisions in a meaningful way (Mundaca et al., 2018).

1.3. Behavioural ecological economics

This is where behavioural ecological economics (BEE) comes in. While traditional BE tends to operate within the i-frame, focusing on individual-level interventions like nudges, BEE integrates two additional perspectives: the s-frame (system-level change) and the c-frame (collective action) (Boncinelli et al., 2025). While the i-frame can be useful for targeting specific behavioural barriers, it is often insufficient for addressing broader structural issues (Dupoux et al., 2025). The s-frame provides a complementary perspective, focusing on the top-down policy and institutional level, while the c-frame seeks to connect the two approaches by engaging citizens in co-designing solutions. These bottom-up collective processes likely make policies socially more legitimate and, hence, more effective in ensuring long-term environmental and social sustainability. The i-frame targets behavioural change at the individual level, often through choice architecture modifications. Nudges — such as setting green defaults, sending reminders, or framing information differently — can help overcome cognitive barriers. However, these approaches are limited in scope. They can be easily reversed if not institutionalised, and they do little to address structural drivers of unsustainable behaviour. Encouraging people to buy electric cars, for instance, cannot substitute for public transport investments or broader decarbonisation policies. The s-frame addresses the systemic and structural conditions that shape behaviour. This includes tackling the root causes of environmental and social injustices, reforming policies and institutions, and redesigning infrastructure to make sustainable behaviour the default. Examples include restructuring energy markets to eliminate fossil fuel subsidies, introducing regulations to reduce corporate environmental impacts, or investing in large-scale renewable energy and retrofitting programmes to address energy poverty. By changing the material and institutional context, s-frame interventions ensure that behavioural changes are reinforced and sustained over time. The c-frame emphasizes citizen empowerment through participatory governance. This frame views people not merely as consumers or policy recipients, but as political actors with the capacity to shape the systems they live in. Participatory tools such as citizen assemblies, deliberative forums, and participatory budgeting enable communities to co-design solutions, increasing legitimacy, ownership, and public support.

BEE also rethinks what is meant by rationality. Traditional BE, influenced by the heuristics-and-biases approach, often frames cognitive shortcuts as flaws. By contrast, the concept of ecological rationality (Gigerenzer et al., 2011), views heuristics as adaptive tools that allow people to make effective decisions under uncertainty and limited information. From this perspective, the policy challenge is not only to "fix" cognitive biases and deficiencies, but to design environments that support good decisions. In behavioural public policy, this is reflected in boosting - interventions aimed at strengthening individuals' competencies and deliberative capacities (Hertwig and Grüne-Yanoff, 2017). Boosting shifts the focus from short-term behavioural compliance to long-term empowerment, by providing knowledge and skills that enhance decision-making. Examples in ecological contexts include energy literacy programmes and capacity-building for democratic deliberation (Della Valle and Sareen, 2020). Boosting also aligns with Amartya Sen's capabilities approach, which stresses expanding the freedoms and abilities that allow people to act autonomously and effectively.

This vision moves beyond seeing behavioural tools as a way to make policies more "acceptable" in the short term, as is often the case in BE. BEE promotes a shift from passive acceptance to active co-creation of policies. Two promising approaches in this direction are "thinks" and "nudges plus" (Vandyck et al., 2023). Thinks are deliberative interventions that bring citizens together to reflect, discuss and propose solutions, for instance through citizens' assemblies, participatory budgeting, or local social movements. "Nudges plus" combine behavioural insights with deliberative engagement, enabling citizens to make informed choices while contributing to the design of policy measures. This participatory approach is particularly valuable in addressing environmental justice. It ensures that marginalized communities, such as those experiencing energy poverty, have a platform to express their needs and influence policy design (Della Valle and Czako, 2022). It also enables us to move beyond the narrow 'policy acceptability' strategies, which often focus on framing policies to match public fairness perceptions (Johansson-Stenman and Konow, 2010). For example, instead of merely framing a carbon tax in a way that makes it more palatable, policymakers could involve citizen assemblies directly in deliberating how carbon revenues should be redistributed. Such co-creation processes allow citizens to co-create policies that are more just, fostering procedural justice in the decision-making process. They enable not only the addressing of cognitive biases, but also to empower citizens to engage in transparent, democratic, and informed decision-making to demand systemic changes.

By combining BE's tools for empowering informed and contextually adaptive decision-making with EE's systemic, participatory, and justice-oriented vision, BEE can establish a bridge between micro-level behavioural change and macro-level socio-ecological transformation. Nudges, social norm interventions, and boosts can be deployed not merely to correct cognitive biases, but also to expand citizens' capabilities to participate in shaping the systems they inhabit. When combined with structural reforms that address root causes — such as infrastructure redesign, institutional change, and regulatory frameworks — these behavioural tools can help ensure that transformations are both politically feasible and socially legitimate. Governments can draw on behavioural insights to complement investments in low-carbon infrastructure, public services, and environmental regulation; businesses can apply them to reorient production and consumption systems in ways that go beyond marketing tactics or greenwashing; and civil society can use them to mobilise collective action and democratic engagement. Aligning bottom-up behavioural initiatives with top-down systemic interventions can not only better enable the acceleration of the ecological transition, but also to create a foundation of fairness, transparency, and resilience — ensuring that change endures and benefits all members of society.

This conceptual discussion has outlined the historical roots, theoretical pillars, and integration pathways that define the emerging space of behavioural ecological economics. Yet these remain, for now, largely at the level of aspiration and programme. The real test lies in how the scholarly community is engaging with these ideas in practice. The contributions to this special issue provide an opportunity to take stock: to see where we stand in building BEE as a coherent and distinctive field, and to assess the extent to which recent research is moving beyond behavioural environmental economics or ecological economics in isolation. The next section turns to the manuscripts themselves, examining how they reflect, challenge, or advance the integration of behavioural and ecological perspectives in concrete research settings.

2. Positioning the contributions along the behavioural–ecological economics integration

To explore the diversity of contributions in this Special Issue, we classified papers into four categories that capture different forms of interaction between behavioural economics (BE) and ecological economics (EE). This typology is necessarily interpretative, but it helps to shed light on the different ways in which human agency, institutional design, and ecological limits have been conceptualised and operationalised.

2.1. Empirical behavioural studies in ecological contexts

The first category represents an entry point into BEE, comprising studies that apply established behavioural methods—such as field, lab and online experiments, surveys, and mixed approaches—to environmental and ecological contexts—such as energy efficiency, climate mitigation, waste reduction, biodiversity conservation—that are central to EE's concern with ecological limits and sustainability. These contributions focus on immediate behavioural processes and interventions, forming a foundation for works that connect behavioural insights with wider systemic or ecological dimensions.

I. Experimental approaches: The majority of studies employ *laboratory and online experimental designs* to test specific behavioural interventions aimed at promoting pro-environmental behaviour. These controlled settings allow researchers to isolate causal effects and explore the psychological mechanisms.

For example, Belaïd and Flambard (2024) use a contextualised lab experiment in France to assess two descriptive norm nudges aimed at increasing household participation in an energy-efficiency retrofit programme via a third-party financing scheme. Renovation decisions were simulated through a real-effort counting task mimicking retrofit actions. The nudges did not significantly raise uptake overall, but proved more effective among participants with pre-existing environmental values, highlighting the moderating role of prior attitudes. This suggests that norm-based interventions for energy efficiency may be most effective when targeted to environmentally committed groups or combined with broader outreach to shift underlying values. Building on this, d'Adda et al. (2024) examine how social norms and moral self-perception interact in decisions about air-conditioning use. In a contextualised online experiment, they vary both the salience of norms and the magnitude of the requested behavioural change—either a modest reduction in cooling or a substantial cut. Norm-based nudges were effective for small adjustments, but large demands triggered "moral wiggle room" behaviour, with participants avoiding information or adjusting beliefs to justify inaction. This implies that norm nudges should be reserved for incremental changes and paired with structural measures when substantial behavioural shifts are required. A similar caution emerges in Suri et al. (2025). By relying on a large online experiment among US citizens, the authors find that providing information that others are more climate-engaged than assumed does not noticeably increase participants' pro-environmental effort; instead, personal factors like altruism, prosocial values, and environmental attitudes matter more for motivating climate action, suggesting that policy makers should prioritize these motivations rather than relying on social information alone.

Other studies highlight how framing and attention shape sustainable choices. Amasino et al. (2025) investigate consumer responses to ethical certifications in lab and online experiments, focusing on wilful ignorance and framing effects. Negative framing ("avoid harm") increased the use of certification information, even when hidden, while the ability to choose certified products reduced avoidance. Variation in consumer attention—both in revealing and weighting information—played a major role in decision-making. This suggests that policy design for sustainable consumption should emphasise harm-avoidance framing and ensure certified options are accessible by default to reduce information avoidance. In a large-scale incentivized survey combined with online experiments, Pace et al. (2025) explore how uncertainty about the carbon impact of everyday products affects willingness to mitigate emissions. Although many respondents were uncertain about actual carbon footprints, this did not substantially affect mitigation via motivated beliefs. They also find that willingness to mitigate declines with each additional unit of emissions avoided, suggesting that framing each reduction as a distinct, tangible action—rather than as part of an aggregated total—may help sustain engagement. For policymakers, this means providing carbon information may reduce uncertainty but is unlikely to drive substantial voluntary cuts on its own; policies should therefore combine information provision with structural measures and frame each reduction as a distinct, tangible action to sustain engagement. On the basis of two online experiments, Campigotto et al. (2025) find that making the carbon emissions from consumption more salient increases voluntary offset contributions, while individuals with lower environmental concern tend to avoid information about their own impact and consequently donate less; moreover, allowing people to actively seek out emissions information results in higher donations than simply providing it by default, suggesting that targeted information campaigns and increased salience can effectively promote voluntary climate mitigation.

Feedback interventions also prove effective. Berlin et al. (2025) make use of a laboratory experiment to analyse the effect of providing feedback information on individual sorting behaviour. They find that giving feedback on participants' own sorting performance (but not on their partners' performance) increases both their confidence and effective coordination in a collective task similar to waste sorting, suggesting that individualized feedback is more effective for improving pro-environmental behaviour. Policy should thus prioritize self-performance feedback over social comparison to enhance both the quality and quantity of citizen participation in sorting and recycling initiatives. In contrast, in an online experiment with dictator games, Fanghella et al. (2025) find evidence that people are willing to incur costs to avoid requests for private pro-environmental donation – driven primarily by self-image rather than cause commitment – and that providing social information about average donations lowers contributions and increases avoidance. They also find that spillover effects between sequential requests depend on initial motivations and context. This suggests that fundraising strategies for environmental NGOs should support donors' self-image and use careful social information framing to maintain engagement and mitigate negative spillover effects. Finally, Abraham et al. (2025) warn of unintended consequences of mandatory minimum contributions, which may crowd out voluntary engagement among intrinsically motivated participants. They investigate the unintended consequences of imposing minimum contribution levels for global public goods provision, using an experimental approach where participants allocate part of their endowment to offset CO_2 emissions. The study compares two regimes in a laboratory setting: one where individuals can freely contribute and another where a minimum contribution is mandatory. Based on the experimental results, the authors conclude that policymakers should be cautious in setting minimum contribution levels for addressing global challenges, like climate change. A poorly calibrated minimum may reduce overall engagement, particularly among previously highly-motivated individuals, due to "crowding out" their voluntary contributions and diminishing their optimism about peers' efforts.

Beyond consumption and donations, social identity and fairness norms also matter. Arpinon (2024) combines experimental methods with ecological concerns, showing how social identity, fairness norms, and context shape the acceptance of sustainable dietary practices. This paper analysed whether vegetarians and vegans face discrimination (*vegephobia*). In an online experiment with over 1200 participants, omnivores acted as "dictators" in allocation games toward recipients identified by dietary identity. Pre-registered analyses found no systematic bias: plant-based eaters were not treated less fairly than omnivores. Exploratory results, however, showed that *vegephobia* can arise depending on individual traits and social contexts. Interestingly, vegans reported experiencing bias in everyday life, but expected fairness in the experiment, suggesting that neutral, anonymous settings may reduce discrimination.

II. Field experiments and real-world applications: Moving into field settings, several studies tested BE interventions at scale.

Sasaki et al. (2025) conducted a field experiment with 830 users of a Japanese app to test prosocial (donation per unique species post) and financial (cash reward per post) incentives for biodiversity reporting. Incentives were offered across two treatment weeks. Financial rewards

significantly increased posts, especially common and invasive species, but effects weakened in the subsequent weeks and varied by subgroup. Prosocial incentives did not raise posting volume, but increased the share of rare species. These results reveal incentive-specific trade-offs between data quantity and ecological quality. Raineau et al. (2025) examine the ethical and cognitive implications of social comparison nudges in a field experiment with winegrowers, showing that the effectiveness of these interventions depends on how information about others' behaviours is presented—partial or full—suggesting that simplified information can prompt change but may also distort perceptions of social norms. Finally, in a natural field experiment conducted in a big grocery chain in Armenia, Antinyan and Corazzini (2025) find that both environmental nudges and competitive financial bonuses can significantly reduce demand for single-use plastic bags in grocery shopping. While the bonus scheme was more effective, it also decreased store visits and sales (as customers try to avoid bag purchases and win the prize), and the use of free reusable bags was highest among frequent shoppers. This suggests that nudges are a low-cost way to promote eco-friendly behaviour and that reusable bag distribution should be targeted to frequent customers for maximum sustainability impact.

III. Survey-based and mixed-method approaches: Another strand relies on *large-scale surveys, structural modelling and mixed qualitative–quantitative* methods to investigate the determinants of pro-environmental behaviour and the psychological pathways through which values, norms, and contextual factors influence pro-environmental action. Baumgartner et al. (2025) use nationally representative samples from Germany, France, and Switzerland ($N = 979$) to test a dual-pathway model of adoption for vehicle-to-grid technology. Structural equation modelling shows that both personal motivations (including ecological values) and community factors (such as membership in energy initiatives) significantly drive adoption interest. Initiative membership directly predicts adoption and indirectly strengthens personal norms, while egoistic values unexpectedly also boost personal norms—suggesting monetary and status motives can complement ecological ones. Community social–environmental motivation enhances norms and adoption interest but does not predict initiative membership. Patterns are broadly consistent across countries, though direct effect sizes vary. These findings suggest that policies combining value-based messaging with support for community energy initiatives—and recognising diverse motivational drivers—can provide a multi-level strategy to accelerate sustainable technology adoption.

Similarly, Hoffmann et al. (2024) analyse the reasons why people who express pro-environmental values often fail to translate these values into actual behaviours – a phenomenon known as the "value-action gap." The paper uses a combination of an incentivized online laboratory experiment and a vignette experiment, along with survey measurements. The implications are that addressing climate change requires not just raising awareness or fostering environmental values, but actively reducing psychological and behavioural barriers. Extending this focus to the agricultural side, Ober et al. (2025) investigate how behavioural factors influence farmers' willingness to participate in agri-environmental schemes in Germany. Using Q-methodology and thematic analysis, they show that cognitive, social, and dispositional aspects—such as knowledge, risk aversion, and flexibility—shape engagement with biodiversity-enhancing policies.

IV. Conceptual and review contributions: Complementing empirical studies, a set of conceptual and review contributions synthesises behavioural insights relevant to environmental contexts. These works integrate findings from experimental and applied research to identify recurrent cognitive biases, motivational patterns, and ethical considerations, thereby linking behavioural evidence to broader theoretical developments in behavioural ecological economics. Constantino et al. (2025) provide a systematic review and meta-analysis assessing whether lab-elicited economic preferences (risk, time, social preferences) predict real-world sustainable behaviours. Across 75 studies (over 37,000 participants), they find that prosocial preferences—especially cooperation—are the most consistent predictors, with stronger relationships in contextualised, lab-in-field settings. These findings suggest that policies should leverage cooperative norms and be embedded in real-world contexts rather than relying solely on generic, lab-derived behavioural measures. Congiu et al. (2025) review how biases hinder the transition toward a circular economy, identifying cognitive and motivational distortions that shape waste-related behaviours and highlighting the importance of tailoring nudges to the specific bias driving consumer decisions.

V. The organisational dimension: Finally, moving from individual to organisational levels, another strand investigates how behavioural mechanisms operate within firms and collective settings. Szymczak et al. (2025) investigate how CEOs' early-life experiences shape corporate climate policies. Drawing on data for 447 US-born CEOs and firm-level climate policies from 1991 to 2018, they link historical exposure to natural hazards with subsequent corporate climate performance. The analysis shows that general hazard exposure is associated with stronger climate policies, whereas experiences explicitly classified as climate change-related do not exhibit this effect. Results are robust across alternative climate-policy measures. By emphasizing managerial heterogeneity and psychological distance, the study highlights the influence of individual life experiences on corporate climate action.

Overall, the studies under this first category empirically address issues that are central to EE's concern with ecological limits and sustainability. By situating behavioural insights within these contexts, they contribute evidence that can inform broader systemic strategies for sustainability transitions.

2.2. *Behavioural interventions for systemic and equitable change*

The second category gathers studies that apply behavioural interventions but explicitly incorporate ecological economics' core concerns—such as equity, fairness, systemic change, and citizen empowerment. These papers go beyond altering individual choices to shaping acceptance of sustainability policies with explicit justice dimensions, or to strengthening knowledge, skills, and agency for systemic change.

I. Boosts: strengthening knowledge, skills, and agency.

A first strand focuses on behavioural interventions that strengthen knowledge, skills, and agency—often referred to as "boosts". These include educational and practice-boosts that build competences through learning, feedback, and experiential engagement. Rather than steering choices externally, these studies emphasise participatory and empowering processes that foster literacy, systemic thinking, and autonomous pro-environmental action.

For instance, Igei et al. (2024) conduct a randomised controlled trial in Japanese primary and junior high schools, combining a goal-setting nudge with an environmental educational boost delivered through a board game simulating a tragedy of the commons. The boost increased environmental awareness and goal-setting, and the combination of boost and nudge enhanced adoption of energy-saving behaviours. While initially framed around correcting individual cognitive deficiencies, the study ultimately positions boosts as more ethical than nudges—empowering competences, fostering energy citizenship, and enabling autonomous climate change mitigation. The study highlights that embedding nudges within empowering educational experiences can strengthen systemic thinking and support long-term sustainability action.

Complementing this, Galeotti et al. (2024) conduct a systematic review of 86 empirical climate change education interventions through a behavioural economics lens. Most studies focused on developed, urban populations and targeted low-impact behaviours such as waste treatment and household energy use, despite their relatively small mitigation

potential. Common activities included discussions and role-playing, but many interventions relied heavily on one-way knowledge transfer, limiting their ability to close the intention–action gap. The methodological weaknesses they found included social desirability bias and a lack of high-impact behaviour targeting. While the study is primarily individual-focused, it incorporates an ecological economics lens by considering intergenerational justice and the role of educational boosts. For policymakers, the findings suggest that shifting climate change education away from lecture-based or purely informational formats toward participatory, problem-solving, and community-embedded learning that equips individuals to take part in collective sustainability transformations.

New technologies are tested as practice-boosts. Attanasi et al. (2025) test the effectiveness of augmented reality (AR) as a tool for environmental education, exploring whether immersive visualization of plastic pollution reduces psychological distance and increases pro-environmental engagement. Despite widespread optimism about such technologies, the experiments find no significant behavioural effects, revealing a gap between technological enthusiasm and empowerment. By contrast, using immersive virtual reality (IVR), Luzzati et al. (2025) investigate whether making the environmental consequences of everyday actions more perceptually salient would foster pro-environmental choices. Participants were asked to choose between using a tumble dryer or a clothesline after experiencing simulated feedback. Conducted with 270 participants at two Italian universities, the study finds that exposure to vivid environmental feedback significantly increased the likelihood of selecting the energy-saving option. Methodologically, it shows that even simplified immersive environments can effectively elicit behavioural change, suggesting that experiential feedback can function as a practice-boost empowering sustainable action.

II. Fairness, reciprocity, and cooperation in governance.

A second group of studies explores how behavioural mechanisms interact with principles of fairness, reciprocity and cooperation in climate and environmental governance. These contributions examine how justice considerations, institutional design and social norms shape cooperation, compliance, and burden-sharing in collective environmental action.

In a series of incentivized experiments with real CO_2 reduction impacts, Kölle et al. (2024) investigate climate policy preferences among participants assigned the role of impartial policymakers—free from personal stakes. Participants chose between carbon pricing, production caps, voluntary offsets, and no intervention. Most were willing to limit decision-makers' autonomy to cut emissions, with carbon pricing generally preferred over production caps or no intervention. The most favoured option was earmarked carbon pricing (revenues funding carbon offsets), followed by voluntary offsetting, and general carbon pricing. Internalised norms, education, and beliefs about others' cooperation shaped these policy preferences. These results suggest that framing carbon pricing as funding specific environmental benefits, and building public trust through fairness and cooperation cues, can increase policy acceptability.

Similarly, Del Ponte et al. (2025) test pledge-and-review systems for international climate cooperation using a novel public bads game in a lab experiment. Treatments included pledge-and-review alone, pledge-and-review with monetary penalties, and a no-agreement baseline, with some conditions adding peer evaluation. Participation and compliance rates were high, but pledges were generally unambitious and emissions reductions minimal. Financial and reputational penalties increased compliance but failed to raise ambition, while peer evaluation sometimes encouraged more conservative pledges. Game-theoretic analysis predicted that in voluntary frameworks, actors have incentives to opt out or make minimal commitments. The experimental results confirm these predictions. For policy makers, this implies that voluntary climate agreements should be paired with binding mechanisms or ambition-raising incentives to avoid stagnation at minimal commitments.

Further, Baranski and Kim (2024) analyse a game in which participants negotiate how to divide costs arising from negative externalities, such as economic losses caused by pollution. They show that ex-post negotiations over how to share the costs of environmental harm (like climate damage) fail to reduce pollution effectively, whether decisions require unanimity or majority, because veto power and strategic agenda-setting often allow high polluters to avoid paying; thus, fair-sharing norms do not reliably carry over to loss domains, highlighting major obstacles for international climate compensation agreements and the need for stronger enforcement mechanisms to ensure accountability.

From another angle, Bähr et al. (2025) examine whether payments for ecosystem services (PES) can shape social norms in Costa Rican farming communities. Using a modified dictator game, they find that PES not only crowd in pro-environmental motivations among recipients but can also alter their normative beliefs, influencing broader community attitudes toward environmental stewardship. However, the study also warns that peer communication can transmit counterproductive beliefs, showing the complex social dynamics of behavioural interventions in collective ecological outcomes.

III. Behavioural modelling and policy assessment.

Finally, another line of research integrates behavioural assumptions into modelling and policy assessment frameworks. Huber et al. (2024) use an agent-based modelling framework to integrate empirically grounded behavioural factors—such as cognitive biases, social influences, and dispositional traits—into ex-ante assessments of agricultural policies in Switzerland. Their findings reveal that neglecting behavioural heterogeneity leads to substantial overestimations of policy effectiveness, while social interactions can substantially enhance adoption of sustainable practices. The study underscores the need for policy designs that move beyond economic incentives to foster networks and cooperative learning—central themes in ecological economics.

Together, these studies show how fairness-oriented framings, empowerment through educational and practice boosts, and behaviourally informed policy and modelling approaches can help bridge the micro-level focus of BE with the institutional, systemic, and normative priorities of EE.

2.3. Ecological economics approaches engaging behavioural perspectives

This category encompasses studies grounded in EE's systemic orientation—such as modelling ecological limits, analysing commons governance, or evaluating equity-oriented policy instruments—while drawing on behavioural theory beyond the rational-actor model. These contributions apply modelling and empirical approaches to examine how structural, institutional, and value-based factors shape sustainability transitions.

Employing micro-level data, De Palma et al. (2025) find that regional energy programs in Germany aimed to engage citizens in the energy transition surprisingly led to lower household adoption of solar panels and energy efficiency measures, and even increased energy use—suggesting that such initiatives may foster a false sense of progress or moral licensing. This implies that future policy should prioritize direct citizen engagement to promote meaningful energy citizenship for genuine behavioural change. Álvarez-Antelo et al. (2025) develop a coupled system dynamics model that integrates transport demand with an endogenous behavioural change component to explore pathways for shifting from air to rail travel. By combining scenario discovery methods and Monte Carlo simulations, the study captures the interplay between policy design, social dynamics, and individual environmental values in shaping mobility transitions. The results highlight that personal environmental values can significantly accelerate behavioural change, and

that well-designed educational and economic policies can compensate for their absence.

Together, these studies exemplify how ecological economics can incorporate behavioural dimensions in a targeted way. By situating behavioural factors within broader structural and systemic contexts, they underline the importance of aligning policy design with ecological limits and citizen engagement.

2.4. Toward behavioural- ecological- systemic - normative frameworks

The final category brings together contributions that are both conceptually and empirically grounded in the principles of ecological economics, while also applying and extending the behavioural economics toolkit. In these studies, behavioural interventions are not stand-alone tools but are embedded within systemic and normative frameworks that account for equity, governance, and ecological limits.

I. Bridging behavioural, systemic, and value-based approaches.

A first group of papers develops integrative conceptual frameworks that embed behavioural insights within systemic and value-centred perspectives. These studies expand the analytical scope of behavioural economics by linking individual decision processes to collective value transformation, post-growth strategies, and contextualised behavioural design. Drews (2025) offers a programmatic reflection on the emerging subfield of behavioural ecological economics, calling for a stronger systems orientation in behavioural research. The paper critiques the narrow scope of nudges, noting that they often treat environmental problems as a series of isolated "i-frame" choices. In response, Drews proposes integrative frameworks—such as combining behavioural science with systems analysis—to capture the dynamic interactions between human behaviour, economic systems, and the natural environment. The policy implication is that behavioural interventions should be deployed as part of post-growth and systems-change strategies, supporting structural transformations rather than being used as one-off, stand-alone tools.

Complementing this programmatic reflection, Boncinelli et al. (2025) propose a comprehensive theoretical synthesis that embeds behavioural economics within the systemic ontology of ecological economics through what they term "c-frame thinking". While behavioural economics typically operates at the individual level (i-frame), and ecological economics addresses social systems (s-frame) and natural boundaries (n-frame), c-frame thinking emphasizes collective, intermediate-level interventions. This approach bridges behavioural insights with systemic change, as illustrated in the participatory transformation process of the ex-GKN factory in Italy—a real-world example of democratic, worker-led industrial reconversion. The paper offers both a conceptual framework and a practical demonstration of how behavioural insights can support inclusive and transformative sustainability transitions.

In a related but distinct direction, Osberg et al. (2024) link behavioural insights to value transformation, emphasizing the role of value literacy in policy-making. They develop a conceptual framework, grounded in social psychology, that links terminal values—such as care for others and ecological integrity—and instrumental values—such as efficiency or innovation—to ecological decision-making and climate policy support. By introducing the notion of 'value literacy', they highlight the potential for policy processes to deliberately cultivate regenerative value paradigms, fostering shared social, cultural, and relational values that align individual and collective action with long-term ecological goals. This work highlights that systemic change requires more than technical or market-based solutions; it requires institutions that make value transformation an explicit objective of sustainability policy.

Adding an applied perspective, Argentiero et al. (2025) propose a contextual behavioural framework to enhance nudges for waste prevention and recycling. Based on a systematic review of 21 experiments, the study critiques cognitive-based approaches for their short-term and information-heavy focus. Drawing on the Relational Frame Theory, the authors introduce "contextual behavioural informed nudges" that embed interventions in social, environmental, and value-driven contexts. These can offer two key advantages: more precise prediction of biased behaviours and greater durability of pro-environmental actions.

II. Integrating dimensions of justice, responsibility and reflexivity.

A second group of studies explicitly engages with justice, responsibility and reflexivity across temporal, social, and epistemic dimensions. These studies address restorative and intergenerational justice, the legitimacy and framing of transformative climate policies, and the cognitive and methodological boundaries of behavioural approaches, highlighting the need for ethically grounded and context-sensitive behavioural–ecological integration.

Cecchini Manara et al. (2025) highlight the restorative justice component by examining a combination of a common-pool resource game with a public good game to examine ecological restoration decisions in the context of urgent climate, biodiversity, and pollution crises. They find that individuals inheriting depleted resources are more willing to restore them than those who have both exploited and restored the same resource, revealing a behavioural lock-in effect from prior exploitation. For policy, this suggests two routes: targeting restoration responsibilities toward actors without prior exploitation history—where pro-restoration motivations may be stronger—or designing interventions to disrupt exploitative behavioural lock-in, such as social norm shifts or restorative justice mechanisms.

Extending the focus on intergenerational justice, Ajdukovic et al. (2025) test three motivational levers—value-linked messages (V-Links), regulation, and technological interventions emphasizing resource salience—in an intergenerational common-pool resource experiment. All levers reduced extraction relative to baseline, with regulatory and technological interventions substituting for the V-Links condition. Technological salience proved the most effective overall, while regulatory interventions only succeeded when publicly endorsed, reflecting conditional cooperation. The levers operated by activating normative goals linked to collective intentionality, fostering intergenerational justice. This highlights that durable intergenerational justice in resource governance is likely to require both effective technological interventions that make resource depletion more salient and democratically legitimate regulation to reinforce cooperative norms across generations.

Turning to public support for degrowth-aligned policies, O'Dell et al. (2025) use a pre-registered discrete choice experiment with a U.S. sample to measure public support for degrowth-aligned policies, including work-time reductions, fossil fuel downscaling, universal basic services, and advertising restrictions. Respondents preferred resource caps over full bans and supported advertising restrictions in public spaces. Support was strongest among those already engaged in sufficiency behaviours, particularly for fossil fuel bans, though some groups—such as 'Dedicated Environmentalists'—did not extend this support to all degrowth measures. Framing policies within a degrowth narrative increased acceptance for some measures, such as universal healthcare. These findings suggest that policy narratives connecting proposals to citizens' lived sufficiency practices—and framing them as joint social–ecological solutions—can broaden public acceptance of transformative policies.

Mundaca and Wamsler (2025) further nuance this perspective by focusing on Sweden's highest-income households, the group with the greatest emissions and mitigation potential. Survey experiments reveal that reframing a climate levy as a "sustainability contribution" as opposed to an "eco-tax" significantly increased acceptance, while injunctive norms and emotion-based prompts had no measurable effect. A preference for economic incentives and maintaining the status quo,

along with evidence of self-deception ('I am not a high-income earner'), likely limited treatment effects. Biospheric values, outcome efficacy, and personal norms emerged as the strongest predictors of willingness to act. These findings point to the value of targeting high emitters with fairness-oriented frames, both to enhance the perceived legitimacy of climate policy and to unlock disproportionately large emissions reductions.

At a more theoretical level, Becchetti et al. (2025) conceptualize the climate change challenge as a multiplayer prisoner's dilemma, emphasizing how individual ecological actions (like adopting green lifestyles or buying electric cars) are costly for individuals, while the benefits are shared among all. In such a context, the Nash equilibrium for self-interested players is to do nothing, meaning climate actions are socially optimal but individually disincentivized. By combining game theoretic modelling and empirical analysis, the authors conclude that greater perceived severity of climate change and belief that other governments will act both increase personal ecological responsibility and action, implying that policy should focus on raising awareness about environmental risks and promoting visible international cooperation while fostering social trust to encourage unconditional climate engagement.

In contrast, Binder et al. (2025) argue that arguments for a "double dividend" of pro-environmental behaviour, both benefitting the environment and making individuals happier despite a potential material sacrifice, rest on an exaggerated evidence base. Reassessing the evidence from a recent meta-analysis, they argue that only few studies provide strong or even weak empirical evidence in favour of this narrative. The authors provide methodological guidance on how to improve empirical practice when using observational data and exemplify this using survey data from $n = 1073$ residents of a German municipality. They employ directed acyclic graphs (DAGs) for principled covariate selection, power analysis, and equivalence testing. Finding no reliable association between pro-environmental behaviour and life satisfaction and equivalence tests robustly reject potential effects larger than $r = \pm 0.11$ ($p < .001$). With this, authors show that even null results are informative.

Finally, Suter et al. (2024) examine how cognitive framing influences expert assessments of optimal GDP development, revealing that even trained academics are subject to psychological biases when conceptualizing economic growth. When growth is framed in terms of "rates" rather than "factors", experts consistently prefer substantially higher GDP trajectories, regardless of discipline or country context. The study highlights the profound implications of framing effects in shaping societal visions of progress, suggesting that even expert discourse on growth and sustainability remains vulnerable to behavioural distortions. This reinforces the need for reflexive awareness in policy and academic debates about economic development within planetary boundaries.

Taken together, these contributions operate simultaneously at the level of individual decision-making and the structural, institutional and ecological conditions that shape those decisions, offering both conceptual clarity and practical pathways for embedding behavioural change within the institutional and ecological transformations.

3. Concluding reflections

This special issue establishes the foundations of Behavioural Ecological Economics (BEE) by demonstrating how behavioural insights can be integrated with ecological economics' systemic orientation toward justice, participation, and ecological limits. Across its four strands, the contributions collectively map the contours of this emerging field.

A central theme emerging from this special issue is the need to confront the role of power in shaping both economic and ecological outcomes. As we question the paternalistic logic of nudging, new possibilities arise for collective and participatory approaches that not only identify alternative means to pre-defined ends, but also redefine the ends themselves. Given the current trajectory of many major economies, which continue to devote vast resources to other objectives rather than to renewable energy transitions, it becomes essential to ask whether BEE should actively develop conceptual and analytical tools to address and rebalance power asymmetries. Only through this step can decisions, concerning energy transitions, geopolitical conflicts, and resource governance, be understood as democratic and socially legitimate processes. Empirical evidence within this issue also shows that confronting power is not only a theoretical imperative but a practical necessity. Mundaca and Wamsler (2025), for instance, showed that the highest-income households—those with the greatest emissions and mitigation potential—respond differently to policy framing, and that fairness-oriented communication can increase their willingness to contribute. Targeting those with disproportionate environmental impacts and decision-making power therefore becomes a key strategy for accelerating systemic change, further supporting the call for a power-sensitive behavioural ecological economics.

While such considerations may seem to extend beyond the traditional remit of behavioural economics, they represent a logical consequence of moving beyond individual reductionism. Neoclassical economics has long relied on reductionist assumptions to depoliticise economic analysis. Yet, as ecological economists since Martinez-Alier et al. (1998) have emphasized, the distribution of power fundamentally shapes both preferences and outcomes. They are particularly ill-suited for analysing systemic challenges—including climate change, ecological degradation, and inequality—where outcomes are strongly influenced by institutional structures and concentrated power. In reality, a small number of actors in the energy, financial, and information sectors exert disproportionate influence over both material trends and public discourse. Global mobilisations—such as Fridays for Future and Occupy Wall Street— demonstrate the persistence of civic engagement but also the structural barriers that limit its impact. Reintegrating power relations into economic analysis is therefore essential to move beyond the illusion of a value-free science and for recognising that the ecological transition - particularly the shift away from fossil fuels- is an epochal change whose success depends on confronting the underlying power structures that define both economic behaviour and the boundaries of possible futures.

Another emerging theme is the importance of strengthening the empirical foundations of BEE. Publishing even null results is vital for BEE, especially when coming from well-powered studies. Binder et al. (2025), for example, showed that the absence of a significant link between pro-environmental behaviour and life satisfaction is not a failure but an informative result when tested against meaningful effect size thresholds. They also argue that when using observational (cross-sectional) data, researchers must move beyond uncontrolled or poorly-controlled correlations. This approach would strengthen the empirical foundations of this emerging field and guard against inflated claims or policy recommendations based on underpowered evidence. In doing so, it contributes to more credible, behaviourally informed assessments of sustainability policies and helps build cumulative knowledge across studies and contexts.

Building on these insights, the Special Issue identifies several directions for further development that can consolidate BEE as a mature framework. Much of the research, including several contributions in this issue, still analyses individual biases and tests micro-level interventions such as nudges or information provision. While useful, this perspective often treats the institutional context as fixed. Future work should design and evaluate interventions that are inherently multi-level—linking individual decision contexts with collective action, organisational change, and policy design. Embedding behavioural tools within participatory and democratic processes would help reconnect behavioural research with ecological economics' concern for agency, governance, and justice.

The field remains heavily reliant on laboratory, field, and survey experiments. These methods identify causal mechanisms but struggle to capture the dynamic, non-linear nature of socio-ecological systems. Future research should adopt a more pluralistic methodological toolkit, combining experiments with system dynamics modelling, agent-based simulations, participatory action research, ethnography, and

comparative case studies. This methodological expansion would allow BEE to analyse how behavioural patterns interact with social learning, institutional evolution, and ecological feedback over time.

Finally, the transition to sustainability requires simultaneous change in individual values and institutional structures, and these processes are mutually reinforcing. Policies and infrastructures shape behaviour, while evolving norms and everyday practices influence policy legitimacy and design. Understanding these feedback processes should be a central aim of Behavioural Ecological Economics. Future research must therefore explore how micro-level behavioural change can feed into systemic transformation, helping to inform post-growth, just transition, and circular-economy agendas that link behaviour to structural reforms.

Taken together, the contributions to this Special Issue show that Behavioural Ecological Economics can offer both conceptual clarity and empirical depth by embedding behavioural insights within the political, institutional, and ecological realities of our time. Its challenge now is not only to refine behavioural tools but to ensure that they contribute to expanding the social and material conditions that make sustainable and just choices possible. In this sense, what we present here is not an endpoint, but a beginning.

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