



Cultural shift for pro-environmental behavioural change: Developing and validating the Environmental Culture in Organisations (ECO) scale

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ARTICLE INFO

Keywords:

Organisational culture
Workplace pro-environmental behaviours
Organisations
Environmental culture in organisations

ABSTRACT

Organisations are key to shaping individual pro-environmental actions. To drive substantial workplace pro-environmental behaviours among members, organisations must develop a coherent culture i.e., consistently foster environmental sustainability across various levels and day-to-day operations. Drawing on organisational culture theory, and predictors of workplace pro-environmental behaviours, we develop the Environmental Culture in Organisations (ECO) scale (25-item long version and 15-item short version) to assess an organisation's culture around environmental sustainability. Across four studies we: 1) theorised dimensions and developed and refined items through expert interviews; 2) determined that the ECO scale has a five-factor structure through factor analysis ($n = 1272$ UK adults); 3) confirmed ECO's factor structure in a new, pre-registered study ($n = 1224$ UK adults) and found evidence for its convergent, discriminant validity, and predictive validity; 4) found that ECO is positively predicted by organisational features such as employees' occupational roles ($n = 604$ participants). Our findings suggest that an organisation's environmental culture is comprised of five organisational features— leadership and management norms, co-worker or team norms, organisational policies, organisational values, and feasibility of action in employees' day-to-day job roles. And this resultant environmental culture has important implications for employees' workplace pro-environmental behaviours. ECO can chart a clear path to organisational interventions— using the ECO scale, researchers and practitioners can assess an organisation's current culture, and identify specific aspects of an organisation that can be intervened upon to drive members' pro-environmental behaviours.

1. Introduction

To help mitigate climate change, organisations must enact rapid and co-ordinated shifts in both strategy (e.g., in investments and operations) as well as day-to-day behaviours of individuals (e.g., reducing work related travel emissions) (Shukla et al., 2022). To this end, employees' pro-environmental actions at work can have considerable impact on carbon emissions. First, in their organisational roles, employees can take major sustainability-related decisions such as budget allocation to air travel, choice of environmentally sustainable vendors, and choice of investments (Nielsen et al., 2021). Moreover, even everyday employee actions (e.g., switching to public transport, conserving energy) can influence co-workers, compound to environmental impact over time, and catalyse positive spillovers in other behavioural domains (e.g., pro-environmental behaviour at home) (Composto et al., 2023; Wang et al., 2022; Zhang et al., 2023).

Organisations provide the structures, infrastructure, and systems that promote or deter individual action, therefore shaping individual pro-environmental behaviours (Gurtner & Moser, 2024; Schmitt et al., 2020; Wiedmann et al., 2020). Past models identify some organisational factors (e.g., stated commitment to sustainability, organisational policies) associated with workplace pro-environmental behaviours (Composto et al., 2023; Norton et al., 2015). However, organisations may, at times, take conflicting environmental actions. For example, they may state their commitment to sustainability but encourage employees to continue carbon emissions intensive activities (e.g., using single-use plastic, air travel) to maximise profit and convenience (de Freitas Netto et al., 2020; Sherrington, 2021). In such cases, the isolated presence of these distinct organisational factors (e.g., pro-environmental communication to employees) may not sufficiently reflect whether an organisation, on the whole, promotes members' pro-environmental actions. To our knowledge, the literature lacks a holistic framework and

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<https://doi.org/10.1016/j.jenvp.2025.102597>

Received 11 April 2024; Received in revised form 26 January 2025; Accepted 22 April 2025

Available online 24 April 2025

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measurement of the extent to which an organisation promotes pro-environmental actions and deters environmentally damaging actions among employees.

In the present research, we address this gap by adopting an organisational culture approach. We develop the Environmental Culture in Organisations (ECO) framework which identifies and measures the aspects of organisational culture (in terms of values, policies, and practices) that enable organisations to foster members' pro-environmental behaviours. The ECO scale provides a granular assessment of an organisation's current culture and guides researchers and practitioners to target behaviour change interventions to specific aspects of organisational culture. As such, through ECO, researchers and practitioners can leverage organisations to drive employees' pro-environmental actions.

To conceptualise the ECO framework, we draw upon literature on organisational culture in other behavioural domains that address similar challenges (ethical and safety cultures) (Kaptein, 2008; Reader et al., 2015). And ECO's specific features or dimensions (e.g., organisational values, and leadership and management practices) are derived from research concerning influences on workplace pro-environmental behaviours (See Section 1.3.). ECO contributes to the burgeoning literature on workplace pro-environmental behaviours by identifying the various features that must be embedded within organisational culture (i.e., consistently present in an organisation's day-to-day practices) to drive pro-environmental actions in the workplace.

1.1. The need for a cultural framework to explain workplace pro-environmental behaviours

Despite their stated intentions to improve their environmental impact, many organisations take limited and contradictory actions (Li et al., 2022). Major companies in the oil and gas industry (e.g., BP, Exxon, Shell), for instance, invest in clean energy and communicate the need for climate action to employees. Yet their operations, and therefore many employees' day-to-day roles, remain focussed on fossil fuel extraction, with this remaining highly profitable (Sherrington, 2021). Similarly, many other organisations also now claim to prioritise sustainability, but tend to enact this through individual-level messaging (e.g., pro-environmental communication, and stated commitment to sustainability) without making substantive changes in their everyday practices (e.g., in incentives to employees, directives on engaging more sustainable vendors etc.), thereby revealing the stated values to be somewhat hollow. These conflicting and superficial actions often reflect deeper operational realities such as trade-offs between shareholder vs. stakeholder values, and competing goals (e.g., environmental sustainability vs. profit) (Love & Eccles, 2022).

Echoing Kerr's observation on "the folly of rewarding A, while hoping for B" (Kerr, 1975), such mixed organisational signals on the importance of environmental sustainability will likely reduce the compulsion among employees to engage in pro-environmental behaviours. In such cases, the mere presence of a few behavioural drivers (e.g., pro-environmental communication, stated commitment to sustainability, or a one-off sustainability initiative) will not be sufficient to drive substantial employee pro-environmental actions. Instead, behaviour change will require that organisations consistently foster environmental sustainability across various operations and organisational levels (leadership, management, and employees).

In other domains of work where institutions face similarly competing demands – for example on the balance between safety and productivity in high-risk sectors such as energy production – scholars have shown the importance of organisational culture: namely, developing a shared system of values, underlying assumptions, and norms that guide behaviour (e.g., error reporting, even if this disrupts production) (Cooke & Rousseau, 1988; Kerr & Slocum, 2005; Mearns et al., 2001; Scherbaum et al., 2008). The overarching idea of culture in these domains (e.g., safety culture) is that by fostering a set of norms in relation to how safety is managed in the day-to-day, and ensuring these are consistent

with strategic decisions (e.g., on resources and incentives), organisations create a culture that guides people to consistently think and behave in ways that support safety, even where tensions with other goals arise (Reader et al., 2015).

Applied to environmental sustainability, this suggests that to guide employees to engage in consistent pro-environmental behaviours (e.g., recycling, carpooling to work) and decision-making (e.g., investments, product development, developing infrastructure), organisations must embed norms and values that promote sustainability across various practices, hence creating a coherent culture. Therefore, when evaluating an organisation's capacity to drive pro-environmental behaviours, the traditional psychological approach of simply measuring the presence of specific behavioural drivers (e.g., organisational communication regarding sustainability, or perceived supervisory support) (Ramus & Steger, 2000) may not be sufficient. Instead, establishing whether the organisation has a culture that promotes environmental sustainability consistently at multiple levels (e.g., policies, operations and day-to-day practices) is essential (Cadez et al., 2019; Jeswani et al., 2008; Kolk & Pinkse, 2005).

Accordingly, we develop the ECO framework of the collection of features embedded in an organisation's culture that guide how members think and act in relation to environmental sustainability. ECO translates macro-level organisational culture theory into a tool to explain and encourage workplace pro-environmental behaviour. ECO can therefore help assess and enhance organisational culture to drive transformative behavioural change.

1.2. Conceptualising environmental culture in organisations

We conceptualise the specific features of ECO in terms of latent dimensions of norms (i.e., expectations about members' beliefs and behaviours) relating to environmental sustainability (Glendon & Stanton, 2000; Rousseau, 1990; Schein, 1985). The literature on organisational culture argues that the myriad elements of organisational culture coalesce into shared norms. Indeed, norms, depending on the extent to which they are shared (i.e., consistency between people) and their intensity (i.e., the extent to which they are endorsed), reflect institutional values (e.g., on sustainability), drive organisational practices, and provide insight into future aspirations and likely activity around climate change (Chatman & O'Reilly, 2016; Van Den Berg & Wilderom, 2004).

Our focus on norms is also supported by research on workplace pro-environmental behaviours. First, this research calls for such a normative approach because norms account for influences of different organisational levels (e.g., how management norms impact employees, teams norm impact individuals), broader societal forces (e.g., how industry norms shape organisational strategy), and motivational factors (e.g., employees' personal norms) on behaviour (Norton et al., 2015). Second, norms are co-created by top-down and bottom-up influences: They reflect the strategic decisions and priorities of leaders (top-down influences), they are shaped by both internal and external demands (bottom-up influences; e.g., employee expectations, customers, regulators, shareholders), and they filter down into the day-to-day operations (Schwartz et al., 2005; van Dierendonck, 2011).

We theorise that where organisations develop strong normative expectations and practices that people should prioritise climate change mitigation, a range of positive and discretionary pro-environmental behaviours (e.g., pro-environmental decision making in their occupational roles) among employees will become more likely. And we develop the ECO scale to assess the specific norms (i.e., dimensions of ECO) within an organisation's culture that are fostering/obstructing pro-environmental behaviours, therefore outlining potential points of intervention. See Box 1 for a summary of key concepts relating to ECO.

1.3. Dimensions of the ECO framework

To identify the specific dimensions of the ECO framework, we refer

Box 1**Key Concepts of the Environmental Culture in Organisations Framework**

Organisational Culture: A shared system of values, underlying assumptions, and norms that guide behaviour within the organisation (Cooke & Rousseau, 1988; Kerr & Slocum, 2005; Mearns et al., 2001; Scherbaum et al., 2008).

Environmental Culture in Organisations (ECO) Framework: The aspects of an organisation's culture that guide how members think and act in relation to environmental sustainability. An organisation is said to have a strong ECO when it consistently guides employees to think and act pro-environmentally, across its levels and operations.

Dimensions of ECO: Each component dimension of the ECO framework represents an institutional norm (i.e., organisational expectations) relating to environmental sustainability (Glendon & Stanton, 2000; Rousseau, 1990; Schein, 1985). For example, the dimension "Leadership and Management Norms" represents expectations of how leaders and managers act regarding environmental sustainability and the dimension "Organisational Policy" represents expectations of how policies regulate matters of environmental sustainability in the organisation. The present research identifies five dimensions of ECO: Leadership and Management Norms, Team Norms, Feasibility, Organisational Policy, and Organisational Values (Table 4).

to literatures on safety and ethical cultures (e.g., Guldenmund, 2007; Kaptein, 2008), and the determinants of workplace pro-environmental behaviours (e.g., Composto et al., 2023).

1.3.1. Building ECO from ethical and safety culture models

Our rationale for deriving ECO from existing models of culture in other behavioural domains is the following: Research on safety culture and ethical culture focusses on norms within organisations for activities that are secondary to the main purpose of the organisation (e.g., energy companies exist to produce energy, not to be safe), yet are integral to their continued and successful functioning because they pose organisational risks (i.e., energy companies must avoid safety hazards for continued functioning and employee wellbeing), permeate key aspects of operations (e.g., design, innovation, policies), and can necessitate challenging trade-offs (e.g., where safety or ethics run contrary to goals such as productivity or profit) (Kish-Gephart et al., 2010; Reader et al., 2015). Rather than being instantiated through a single value that sits apart from the organisation's main purpose (e.g., a safety value separate from the organisation's other operations of delivering energy, transporting people etc.), safety culture and ethical culture arise through different norms across contexts and spheres of organisational life (e.g., leadership, collaboration, personal goals, work pressure), and tendencies for people to behave in a safe and ethical manner (e.g., raising concerns, following rules, avoiding excessive risk-taking, citizenship). We suppose that organisational culture around environmental sustainability is like this: unless an organisation is specifically focussed on climate change, sustainability is likely to be a secondary goal that may conflict with primary goals (e.g., transport, production of plastic). Therefore, ECO is relevant to all organisational activities rather than focussed on one, and it is enabled through different norms that combine to emphasise and guide pro-environmental behaviours (or the reverse) in different contexts.

In models of safety and ethical culture (Bisbey et al., 2021; Kaptein, 2011), common organisational-level dimensions include norms for leadership and management commitment (Kilcullen et al., 2022), and policies that guide safe and ethical operations (Leaver & Reader, 2019; Treviño et al., 1998). At the level of the group, past frameworks underscore the normativity of co-workers' support and commitment (Gembalska-Kwiecień, 2017; Kaptein, 2008), and at the individual-level, culture is shaped by the extent to which employees themselves hold personal norms of safety/ethical practices (Ardichvili et al., 2012; Geller, 1994; McElveen, 2019). We build the ECO framework by bootstrapping it to the above literatures and adapt it to pro-environmental behaviours. This process is detailed in Study 1.

1.3.2. Incorporating determinants of workplace pro-environmental behaviour in ECO

To customise the dimensions of the ECO scale to the context of climate change mitigation, we refer to the rich literature on the determinants of pro-environmental actions which identifies organisational determinants including policies, infrastructure and social norms (Fritzsche et al., 2018; Lülfs & Hahn, 2014; Papagiannakis & Lioukas, 2012), and motivational determinants such as personal values (Sabherwal & Shreedhar, 2022; Stern et al., 1999). Specifically, to explain workplace pro-environmental behaviours, psychological models invoke various intrapersonal, motivational, interpersonal, and organisational factors (See SI Table S1 for model summaries) (Composto et al., 2023; Farooq et al., 2021; McDonald, 2014; Norton et al., 2017; Papagiannakis & Lioukas, 2012; Ramus & Killmer, 2007; Scherbaum et al., 2008). Synthesising some of this literature, a multi-level model of employee green behaviour posits that contextual factors pertaining to features of the organisation (e.g., policies), leadership (e.g., attitude), and teams (e.g., activities) not only drive employee behaviour independently, but also moderate the extent to which person factors (such as environmental attitudes) will translate into behaviour in the workplace (Norton et al., 2015). Similarly, in recent research, Composto et al. (2023) find that individual variables (worry about climate change, environmental responsibility attitudes, and pro-environmental behaviour at home), social variables (perceived overlap in identity with co-workers), and contextual variables (perceived organisational support) are all positively associated with workplace pro-environmental behaviour.

Yet, adopting a cultural approach, we recognise that the isolated presence of one or a few of these organisational features, such as organisational policies and perceived organisational support (Composto et al., 2023; Lülfs & Hahn, 2014; McDonald, 2014), is unlikely to alone explain and change employee behaviour. For example, management communication about the importance of environmental sustainability alone may not be effective if job expectations make it unfeasible to act sustainably. Rather, and different from past approaches to understand workplace pro-environmental behaviour, we argue that these aspects will only be effective in driving substantial pro-environmental behaviour if they become embedded in the organisation's culture itself, i.e., contribute to creating a culture that fosters environmental sustainability consistently across organisational levels (e.g., leadership, co-workers), and coherently across institutional norms (e.g., agreement across policies, every-day practices, communication).

In Study 1, we derive from the literatures on ethical and safety cultures and determinants of workplace pro-environmental behaviours to propose potential dimensions of ECO. The dimensions (i.e., norms) pertain to various levels including higher-level organisational aspects (e.g., policies and values), leadership and management, and co-workers.

Although these norms primarily assess everyday decisions and practices such as the day-to-day actions of leadership and co-workers and policies about the same, they are not disconnected from larger strategic decisions. In fact, they represent the manifestation of strategic decisions in everyday work. Organisational culture theory and related empirical research finds a bi-directional relationship between the culture (assessed via day-to-day norms at various organisational levels) and strategic planning processes of organisations (Ghobadian & O'regan, 2002). Therefore, the broader strategic and business decisions of an organisation (e.g., whether to invest in renewable energy) trickle down into organisational norms (e.g., expectations that managers will prioritise environmental sustainability). And, by shaping employee behaviours, organisational culture may in turn impact broader strategic decisions (e.g., in a culture that prioritises environmental sustainability, employees may feel empowered to advocate for/support pro-environmental strategies and policies such as divesting from fossil fuels).

1.4. Advancement from past conceptualisations of green organisational culture

Research in neighbouring disciplines of management and corporate sustainability recognises this role of green organisational culture—the extent to which an organisation's values, norms, and assumptions reflect its commitment to environmental sustainability (Harris & Crane, 2002a, 2002b)—in driving organisational performance and emissions (Aggarwal & Agarwala, 2022), employees' commitment (Pham et al., 2018, 2019), and stakeholder satisfaction (Kantabutra, 2021). Similarly, the related construct of green psychological climate—employees' perceptions of pro-environmental policies, practices, and procedures—has been shown to predict workplace pro-environmental behaviours (Norton et al., 2017).

Generally, this research operationalises green organisational culture as a one-dimensional construct pertaining to employee perceptions of top managements' beliefs and practices (Pham et al., 2018). Where research has differentiated culture into component dimensions, these tend to focus on general perceptions of whether sustainability is valued in the organisation, for example, in terms of the extent to which green values are present in the organisation (degree), how strongly green initiatives are valued (depth), and how widely green beliefs and values spread across the organisation (diffusion) (Aggarwal & Agarwala, 2022; Harris & Crane, 2002a, 2002b). Other approaches attribute organisational sustainability performance to two cultural dimensions—the organisation's internal vs. external focus (focus on internal organisational dynamics or external stakeholder demands) and flexibility vs. control (preference for structuring and co-ordination or flexibility in operations) (Linnenluecke & Griffiths, 2010).

While the above research has been valuable in conceptualising an organisation's current culture around sustainability, there is a lack of granularity in understanding and measuring the specific features within organisational culture that promote or deter workplace pro-environmental behaviours. For example, although extant operationalisations of culture measure employees' perceptions of general trends (e.g., whether their management supports environmental practices), it is unclear from them *which* environmental practices are supported, and whether other organisational features (e.g., demands of one's job role, policies) are consistent with these practices (Pham et al., 2018). Moreover, measures tend to assess employee perceptions about either senior management, or the "organisation" as a diffuse and un-differentiated entity (Kantabutra, 2021), not accounting for the various organisational levels (e.g., leadership, management, co-workers) from which culture may emerge (Chou, 2014; Norton et al., 2014a, 2012b).

These gaps in behavioural specificity and a multi-level emphasis may be because existing tools are not generally rooted in psychological and behavioural insights on workplace pro-environmental behaviours (e.g., Composto et al., 2023; McDonald, 2014; Ruepert et al., 2016; Stern et al., 1999). Instead, they tend to be focussed on management (e.g.,

green human resource management) and corporate sustainability. As a result, although they provide a general and high-level assessment of organisational culture, they offer limited insights on how aspects of high-level culture relate to individual behaviour.

Despite extant measures (such as green organisational culture), crucial questions remain unanswered: What are the *specific* policies, practices and values in the organisation's culture that are strengthening and/or weakening its ability to encourage pro-environmental actions among members? Which organizational level(s) is(are) more or less responsible for its current culture around environmental sustainability? And what aspects of its culture (in terms of values, practices, and policies) can an organisation change to further promote employees' pro-environmental behaviours? Addressing these questions is critical to charting a path to behavioural interventions—identifying which organisational levels to target and what practices to change to drive pro-environmental action among members. Therefore, we develop ECO to have the following functions: 1) Like extant measures, provide a high-level assessment of the organisation's culture pertaining to environmental sustainability and 2) Measure component dimensions to identify specific aspects of the organisation's culture that can be strengthened to drive workplace pro-environmental behaviours. Advancing from extant measures, this function of ECO will provide detailed understanding of potential levers of behaviour change within the organisation.

1.5. Present research

The present research develops the ECO framework through four empirical studies. First, drawing on the literature, we ideate the dimensions that underlie the ECO framework, develop items, and interview experts to ensure relevance and acceptability of items (Study 1). Next, we determine the factor structure of the initial ECO framework and measurement scale through a large-scale study (Study 2). We then refine the scale and confirm its factor structure with a pre-registered study on a new sample, and examine its convergent, discriminant, and predictive validity, with a focus on predicting workplace pro-environmental behaviours (Study 3). Finally, we conduct a study to assess the relationship between organisational features (employees' job roles and overall extent of greenhouse gas emissions) and ECO (Study 4).

2. Study 1

In study 1 we identified the norms (dimensions) that potentially comprise the ECO framework, and generated items reflecting these norms from first principles. Following the recommended procedure of scale construction widely adopted in the organisational behaviour and culture literatures, we generated items through an iterative and cyclical process of literature review, expert interviews, and participant interviews (Haynes et al., 1995; Hinkin, 1998; Schmitt & Klimoski, 1991; Schwab, 1980).

2.1. Method

2.1.1. Phase 1: literature review

We consulted relevant scales that measure culture in sustainability and other domains such as safety and ethical culture (Bisbey et al., 2021; Kantabutra, 2021; Kaptein, 2008; Mearns et al., 2013). We also referred to behavioural models measuring employee green behaviour (e.g., Lülfs & Hahn, 2014; Norton et al., 2015), organisational performance on environmental sustainability (e.g., Fairfield et al., 2011), and social psychological factors such as pro-environmental values (de Groot & Steg, 2008), beliefs (Fritzsche et al., 2018), and attitudes (e.g., Clayton et al., 2021).

2.1.2. Phase 2: item writing

Following recommended procedures (Carpenter, 2018), we worded items to be close ended, brief, and unambiguous. We measured

responses on 5-point Likert scales (1 = Strongly disagree to 5 = Strongly agree) to incorporate variance in participants' valence and intensity of response (Hinkin, 1998). We also incorporated some items that were framed negatively to avoid acquiesce (Bruin, 2011). The first author developed items, and other authors independently reviewed and modified them. The authors then came together to discuss fit and framing of specific items.

2.1.3. Phase 3: interview with experts in industry roles

To assess the relevance and representativeness of items (facets of content validity), and the overall acceptability of the measure (face validity), scale development practices recommend open-ended interviews with experts, and relevance ratings from users (Haynes et al., 1995; Nevo, 1985). First, we interviewed experts responsible for creating and implementing sustainability strategic plans in a diverse range of organisations including a large university in the UK, a company in the private sector, and a UK government department. We asked the experts their experiences of communicating and implementing sustainability policies within their organisation, feedback on our initial list of items, and additional aspects of organisational culture that we should consider when creating our scale.

2.1.4. Phase 4: consultation with graduate respondents

We conducted focus groups and a follow-up survey with 21 graduate students in organisational psychology and behavioural science. As per standards of content validation, we collected responses about the clarity and ease of understanding for each item (5-point Likert Scales). To assess the relevance of each item to the construct, we asked them to speculate what each item was testing. Finally, respondents also had the option of suggesting alternate wording for the item or recommending that it be dropped from the scale.

2.2. Results

2.2.1. Phase 1: literature review

2.2.1.1. Identifying dimensions. Consistent with organisational culture research in other domains (Cooper, 2000; Kaptein, 2008) and previous models of pro-environmental behaviour (see SI Table S1), we theorised that the ECO scale should measure potential norms at three levels: organisational, group, and individual (See Table 1 for all proposed dimensions).

Organisational Level Dimensions. From past models of ethical and safety culture, we identified norms around organisational signals and procedures. Organisational signals included organisational sharing of information about the issue (ethics/safety) to employees (*organisational communication*), perceptions of the management's commitment to the issue (*management commitment*) (Bisbey et al., 2021; Kantabutra, 2021; Kaptein, 2008; Linnenluecke & Griffiths, 2010). Norms concerning organisational procedures focussed on whether organisational procedures make it possible for ethics/safety related decisions to be enacted in one's job role (*feasibility*), monitored (*transparency*), rewarded (*sanctionability*), and discussed (*discuss-ability*) (Kaptein, 2008; Kilcullen et al., 2022; Mearns et al., 2013). From models of workplace pro-environmental behaviours, we identified the dimension of environmental sustainability related *infrastructures* and *practices* (Norton et al., 2017; Treviño et al., 1998).

Group and Individual Level Dimensions. Beyond top-down dimensions (such as organisational communication and perceived management commitment) identified by past research on corporate sustainability practices (Kantabutra, 2021), we also assessed group and individual level norms. We conceptualised the group-level norm as the extent to which co-workers were committed to environmentally

Table 1
Proposed dimensions of ECO post literature review.

Proposed Dimension	Definition	Example Item	Intellectual Origin	Number of items
<i>Organisational Communication</i>	Extent to which pro-environmental goals and values of the organisation are clearly communicated to employees.	The organisation makes it clear to me how I should conduct myself in an environmentally sustainable way at work.	Dimension of ethical culture, dimension of Safety Culture	4
<i>Management Commitment</i>	Extent to which the management is committed to values of environmental sustainability in their actions and expectations.	My managers set a good example in terms of environmentally sustainable behaviour.	Dimension of safety Culture; Driver of workplace Pro-Environmental Behaviours, Expert interviews	4
<i>Feasibility</i>	Extent to which organisational conditions enable employees to meet the environmental expectations set for them.	In my job, I sometimes have to take decisions that damage the environment (Reverse coded).	Dimension of Ethical Culture	3
<i>Transparency</i>	Extent to which others' pro (and anti) environmental behaviours are observable to management and other employees.	Management is aware of any environmentally damaging conduct that occurs at my workplace.	Dimension of Ethical Culture	3
<i>Discuss-ability</i>	Extent to which employees feel comfortable discussing their questions, transgressions, and beliefs about environmental sustainability.	I know the proper channels to direct questions regarding the environment in this office.	Dimension of Ethical Culture	4
<i>Sanction-ability</i>	Extent to which there are clear positive and negative consequences for those who take pro and anti-environmental actions.	If I reported environmentally harmful conduct to management, I believe those involved would be called out regardless of their position.	Dimension of Ethical Culture	5
<i>Organisational Policy</i>	Whether the organisation has an updated sustainability policy that is available to employees.	My organisation has a sustainability policy that is freely available to employees and has been published or updated within the last 5 years.	Expert Interviews	4
<i>Organisational Infrastructure & Practices</i>	Whether the organisation has in place practices (e.g., trainings) and infrastructure (e.g., energy efficient appliances) to promote sustainability in day-to-day dealings.	My organisation provides sufficient employee training and development related to sustainability.	Drivers of workplace Pro-Environmental Behaviours	6
<i>Teamwork & Support</i>	Extent to which co-workers support environmental actions	At my workplace, everyone has the best interests of the planet at heart.	Drivers of workplace Pro-Environmental Behaviours	6
<i>Personal Norms</i>	Extent to which the employee (i.e., participant) espouses internalised feelings or obligations to act pro-environmentally	I feel obligated to try to do my part to mitigate climate change.	Drivers of workplace Pro-Environmental Behaviours	6

Note. This is the initial list of proposed dimensions of ECO identified in Study 1. For the final set of dimensions and items see Table 4. Specific models from which items are derived can be found in-text (in the literature review section of Study 1) and in SI note 2.

sustainable actions (*teamwork and support*) (Gembalska-Kwiecień, 2017; McDonald, 2014). Finally, at the level of the individual, we accounted for the *individuals' personal pro-environmental norms* that have been identified as predictors of pro-environmental behaviour (Gembalska-Kwiecień, 2017; Lülfs & Hahn, 2014; Ruepert et al., 2016).

2.2.1.2. Developing items. To measure dimensions at the organisational level, we adapted items from safety and ethical culture scales: Corporate Ethical Virtues Model (Kaptein, 2008), safety culture in air traffic management (Mearns et al., 2013) and the safety attitudes questionnaire (Sexton et al., 2006). We also consulted measures of Sustainability Practices (Fairfield et al., 2011), and items used in studies on corporate sustainability (Kantabutra, 2021; Linnenluecke & Griffiths, 2010).

To assess the group-level dimension i.e., teamwork and support, we consulted ethical and safety culture scales, as well as measures of workplace pro-environmental behaviours (Lülfs & Hahn, 2014; McDonald, 2014). Finally, to assess the individual-level dimension of personal pro-environmental norms, we consulted research on the value-beliefs-norm theory and collective climate action (e.g., bio-spheric values and efficacy beliefs) (Roser-Renouf et al., 2014; Stern et al., 1999). See SI note 2 for the list of initial items.

2.2.2. Phase 2: item writing

The first author developed 117 items (See SI Note 2 for list). Upon modifications and multiple rounds of discussions between authors (e.g., focussing on relevance, clarity, and uniqueness of items), we arrived at a list of 67 items. These items were developed to speak to the average employee experience (e.g., most employees have managers, are assigned to teams within the organisation, and receive some degree of formal communication). However, optimising the items for the prototypical employee necessitated some trade-offs in applicability to all types of occupations. For example, not all items may be applicable to those who are self-employed or work in a freelancing role. As such, in robustness analyses in Study 3, we accounted for participants' self-assessment of how applicable the items were to their case.

2.2.3. Phase 3: interviews with experts

Expert interviews underscored two missing elements—management support and organisational policy. The experts elaborated that employees' day-to-day sustainability decisions are often contingent on whether immediate managers take pro-environmental behaviours and support them in doing so. They also pointed us to objective standards of sustainability policy that organisations should strive to meet. Based on this feedback, we added questions about managers' pro-environmental behaviour as part of the management commitment dimension and added an *organisational policy* dimension. For the latter, we adapted items from sustainability awareness questionnaire and governmental agencies' sustainability checklist (Office Energy Checklist, n.d.; Oriade et al., 2021). The experts also provided feedback on specific items. For example, on the item "I have adequate time at my disposal to carry my tasks in an environmentally sustainable way," an expert suggested that we replace "time" with "resources" to encapsulate a broader range of barriers (e.g., finances, time) to take sustainable action.

2.2.4. Phase 4: consultation with graduate respondents

Graduate students provided feedback on terms and framing that were unclear or misleading, and confirmed relevance and clarity of most items. As per respondents' suggestions, we defined terms that were ambiguous (e.g., environmental sustainability, organisational infrastructure), reframed some items to avoid double-barrel framing, capitalised and bolded negative framing (e.g., "NOT"), and removed items that multiple respondents viewed as repetitive.

2.2.5. Proposed scale

Based on the above phases, our proposed scale comprised 45 items (Table 1 for proposed dimensions, and Table 2 for all proposed items) measured on 5-point Likert scales (1 = Strongly disagree to 5 = Strongly agree). In Study 2, we determine the factor structure of this scale. And refine it accordingly in Study 3.

3. Study 2

Study 2 employed Exploratory factor Analysis (EFA) to determine the factor structure of the items of the ECO scale proposed in Study 1.

3.1. Method

3.1.1. Participants

1272 UK adults ($M_{\text{age}} = 34.15$ years, $SD_{\text{age}} = 10.57$ years; 629 Female identifying, 632 Male identifying, 11 other gender identifying) from the online survey platform Prolific completed the study. Since the scale measured people's perceptions of norms at their workplace, only those who were employed (either part time or full time) were invited to participate. A majority were permanent employees (86.87 % of sample) and worked in the for-profit sector (63.29 % of employees). See SI note 3 for detailed demographic information. Our sample size was determined based on availability of funds and was substantially larger than the sample size of 200 recommended by best practices in scale development (Hinkin, 2005; MacCallum et al., 1999), and more conservative estimates calling for a sample size ratio of 1:10 (items: participants) (Schwab, 1980). No participants who completed the study were excluded from the analysis.

3.1.2. Procedure and measures

After providing informed consent, participants first read a brief definition of environmental sustainability. They were then instructed to answer all items in the survey keeping in mind their experience working at one organisation and were asked to name this organisation. Next, participants answered 45 questions about their organisation's ECO, reporting their agreement (1 = Strongly disagree to 5 = Strongly agree) to survey items (Table 2). Item order was randomised. Finally, participants provided information about their employment and socio-demographic features. The protocol for all studies was approved by the university's Research Ethics Committee.

3.2. Results

The data files and analysis script can be found here https://osf.io/w97by/?view_only=b2788fb2a62449cc9abba7a8201df223.

3.2.1. Principal Component Analysis (PCA)

To determine the number of factors, we subjected the 45 items to a PCA. Seven dimensions emerged with eigenvalue > 1. Moreover, a choice of 7 dimensions was supported by Optimal co-ordinates, Parallel analysis, and Kaiser criterion methods (Hayton et al., 2004; Kaiser, 1991).

3.2.2. Exploratory Factor Analysis (EFA)

As such, we performed a maximum likelihood exploratory factor analysis (ML EFA) with 7 factors. The analysis employed oblique rotation because we expected the factors to be intercorrelated. We decided to discard the sixth factor because it only had two items with high standardized loadings (>0.50), and both were conceptually similar to items in factor 1. Moreover, the items in both factors four and seven represented organisational policies (emissions and infrastructural policies). Since our theoretical interest was in perceived organisational policies, we decided to combine these two factors.

Table 2

Proposed items and standardised factor loadings from the EFA in study 2.

Item	Leadership & Management Norms	Team Norms	Employee Personal Norms	Organisational policy	Feasibility
1 The organisation makes it clear to me how I should conduct myself in an environmentally sustainable way at work	0.74				
2 The organisation makes it clear to me how I should deal with external entities (e.g., clients and contractors) in an environmentally sustainable way.	0.78				
3 In my organisation, all employee inductions cover organisational sustainability policy, strategy and areas for employees to engage.	0.67				
4 Information about environmental sustainability related changes within this organisation is NOT communicated clearly to employees	0.63				
5 My managers set a good example in terms of environmentally sustainable behaviour.	0.52	0.30			
6 My managers DO NOT communicate the importance of caring for the environment convincingly.	0.65				
7 My managers are honest and reliable in taking eco-friendly action (e.g., refraining from business-class travel, following environmental regulations, reducing waste).	0.51	0.30			
8 My managers would never authorise environmentally damaging conduct to meet organisational goals		0.35			
9 People who raise environmental sustainability issues are seen as troublemakers					
10 Everyone I work with in this organisation feels that caring for the environment is their personal responsibility.		0.73			
11 My colleagues are NOT committed to being green.		0.66			
12 At my workplace, an atmosphere of mutual commitment to safeguarding the environment prevails.		0.65			
13 At my workplace, everyone has the best interests of the planet at heart		0.79			
14 At my workplace, NOT everyone takes the existing norms and standards of environmental sustainability seriously.		0.53			
15 In order to be successful in my organisation, I sometimes have to sacrifice my personal values about protecting the environment.					0.62
16 I have adequate resources at my disposal to carry out my tasks in an environmentally sustainable manner.	0.33				
17 In my job, I sometimes have to take decisions that damage the environment.					0.56
18 If my manager does something which is environmentally harmful, someone in the organisation will find out about it.	0.39				
19 At my workplace, NOT enough checks are carried out to detect violations of environmental sustainability.	0.51				0.31
20 Management is aware of any environmentally damaging conduct that occurs at my workplace.	0.37				
21 At my workplace, there is NOT enough scope to discuss moral dilemmas related to environmental sustainability.	0.53				
22 At my workplace there is NOT enough scope to correct environmentally harmful conduct.	0.47				0.33
23 I know the proper channels to direct questions regarding the environment in this office.	0.63				
24 My organisation encourages employees to take part in the development and monitoring of the organisation's environmental sustainability policies and practices.	0.54				
25 At my workplace, environmentally responsible conduct is valued highly.	0.42	0.30			
26 At my workplace, green conduct is rewarded.	0.49				
27 At my workplace, employees will be criticised if they behave in an environmentally damaging way.	0.34				
28 My colleagues disapprove of environmentally harmful behaviour in the workplace.		0.48			
29 If I reported environmentally harmful conduct to management, I believe those involved would be called-out regardless of their position.	0.36				
30 Protecting the environment is NOT important to me.			0.72		
31 I believe that employees like me, working together, can affect what my organisation does about climate change.			0.52		
32 It is personally important to me that my organisation make efforts to protect the environment			0.79		
33 I feel obligated to try to do my part to mitigate climate change.			0.75		
34 My organisation DOES NOT have a responsibility to help mitigate climate change.			0.57		
35 I believe that organisations like mine, working together, can mitigate climate change.			0.56		
36 My organisation DOES NOT have a sustainability policy.				0.84	
37 My organisation has a sustainability policy that is freely available to employees, and has been published or updated within the last 5 years.				0.81	
38 I DO NOT understand the industry practices of sustainability.	0.42				
39 In my organisation, sustainability is included within the portfolio of responsibilities of one or more employees.				0.55	
40 My office building has features that make it environmentally friendly.	0.32				
41 In my office building, all equipment that is not in use is turned off to conserve energy.	0.42				
42 Employees are encouraged to be sustainable during work from home (e.g., conserve energy, reduce waste, adopt active commute etc.).	0.48				
43 My organisation provides sufficient employee training and development related to sustainability.	0.68				
44 My organisation provides sufficient incentives for employees to act sustainably.	0.61				

(continued on next page)

Table 2 (continued)

Item	Leadership & Management Norms	Team Norms	Employee Personal Norms	Organisational policy	Feasibility
45 My organisation takes sufficient measures to reduce its carbon emissions.	0.41				
% Variance Explained	0.42	0.23	0.13	0.14	0.09
Factor Correlations					
Leadership & Management	–	0.70	0.18	0.61	0.30
Team Norms		–	0.26	0.38	0.36
Employee Personal Values			–	0.20	0.05
Organisational policy				–	0.20

Note. Factor loadings are standardised factor loadings from a five-factor exploratory factor analysis with oblique rotation. We only report factor loadings ≥ 0.30 . At the bottom, we report variance explained by each factor, and inter-correlations between factors. The EFA is on items proposed in Study 1. Insights from the EFA inform scale refinement in Study 3.

Subsequently, we re-ran a ML EFA with five factors and oblique rotation. See Table 2 for factor loadings, inter-correlations, and variance explained by each factor. The emergent factors represented *Leadership and Management Norms* (pertaining to practices of organisational leadership in communicating and promoting environmental sustainability; e.g., “My managers set a good example in terms of environmentally sustainable behaviour”), *Team Norms* (perceptions of co-workers’ commitment to sustainability, e.g., “Everyone I work with in this organisation feels that caring for the environment is their personal responsibility”), *Employee Personal Norms* (e.g., “It is personally important to me that my organisation make efforts to protect the environment”), *Organisational policy* (perceived policy measures, e.g., “My organisation DOES NOT have a sustainability policy.”), and *Feasibility* (how viable it is to take environmental action alongside other job requirements, e.g., “In my job, I sometimes have to take decisions that damage the environment.”) respectively. In study 3, we utilise the results of the EFA to arrive at the final version of the ECO scale. Therefore, in Study 2, the PCA and EFA pointed to a 5-factor structure of ECO.

As a robustness test, we also preliminarily tested how well the 5-factor structure fit the data. For this we conducted a CFA on Study 2 items with high standardised factor loadings (>0.50) and low standardised cross-loading (<0.30). The preliminary CFA showed good fit—SRMR = 0.05, RMSEA = 0.06, 90 % CI [0.05, 0.06], CFI = 0.93, TFI = 0.92 (See SI note 4 for details).

4. Study 3

In study 3, we aimed to confirm the factor structure of the ECO scale on a different sample and shorten the final list of items to arrive at a psychometrically robust, theoretically grounded yet short scale. We also pre-registered and tested hypotheses about convergent, discriminant and predictive validity. We had the following hypotheses:

H1. The 5-factor structure of the ECO scale will be confirmed (i.e., show good fit).

H2. The final ECO scale will have convergent validity with theoretically relevant, and previously validated, constructs—Climate Change Risk Perceptions, Environmental Identity Scale, Biospheric Value Orientation, Altruistic Value Orientation, Green Organisational Culture scale and Green Psychological Climate scale (Clayton et al., 2021; de Groot & Steg, 2008; Norton et al., 2015; Pham et al., 2018; van der Linden, 2015).

H3. The final ECO scale will have discriminant validity with the above constructs. As pre-registered, we tested ECO’s convergent validity with all six predictors, and discriminant validity with a subset of these predictors that were highly correlated with ECO (>0.50).

H4. ECO will have predictive validity i.e., it will positively and significantly predict self-reported Organisational Citizenship Behaviours for the Environment (OCBE) (Boiral & Paillé, 2012).

4.1. Method

From Study 2, we refined the ECO scale in three ways—first, from the EFA in Study 2, we selected a smaller pool of items. As per recommended scale development practices, we made our selection based on quantitative results (high standardised factor loadings (>0.50), low standardised cross-loading (<0.30) in Study 2), theoretical fit of the item with the factor, and principles of parsimony (Hinkin, 1995). Next, we modified this pool of items by adding new items to the feasibility and organisational policy factors to better represent these constructs and ensure that, as per best practices, all our factors contained at least three items (Tabachnick et al., 2019). Finally, upon re-evaluating the *employee personal norms* factor, we concluded that it was theoretically distinct from other factors that measured organisational-level, rather than individual-level, norms. Therefore, we modified this factor to represent organisational values or employees’ perceptions of the extent to which the organisation values environmental sustainability (See Table 4 for pool of items). With these changes, we aimed to improve theoretical and statistical fit for the five-factor model.

This study was pre-registered, https://osf.io/kpjr8/?view_only=d1553f8777b04c53876cdfc81d4e3e0f and data files as well as analysis scripts can be accessed here: https://osf.io/w97by/?view_only=b2788fb2a62449cc9abba7a8201df223.

4.1.1. Participants

1224 UK adults ($M_{age} = 39.06$ years, $SD_{age} = 11.94$ years; 604 female identifying, 613 male identifying, 7 other gender identifying) from the online survey platform Prolific completed the Study. Like Study 2, only those who were employed (either part time or full time) were invited to participate. The sample size was decided based on available funds. And, as in Study 2, this sample size was considerably larger than scale-development recommendations (200 participants or 1:10 items: participants ratio). (Hinkin, 2005; MacCallum et al., 1999; Schwab, 1980). A majority were permanent employees (88.81 % of sample) and worked in the for-profit sector (61.2 % of employees). No participants who completed the Study were excluded from analysis (See SI note 5 for more details on sample).

Of the 1250 participants that were recruited, 1224 completed the Study. The participant dropout rate (2 %) was below those observed in web-based social psychology experiments, and those considered substantial (>20 %) (Zhou & Fishbach, 2016). And the median duration was 12.60 min (Mean = 15.61 min, $SD = 34.81$ min). Shorter web-based surveys lasting less than 20 min are known to generate higher response quality and lower dropout rates (Galesic & Bosnjak, 2009).

4.1.2. Procedure and measures

Study 3 followed the same procedure as study 2. Participants first answered items from the ECO scale. Item order was randomised. Next, they answered six other measures: climate change risk perceptions, environmental self-identity, biospheric value orientation, altruistic value orientation, green organisational culture, and green psychological climate. The order in which these scales appeared and the order of items

Table 3
Descriptive statistics of study 3 measures.

	# of items (Likert scale)	Sample item	Mean	SD	Alpha
Environmental Culture in Organisations	34 initial items; 25 post CFA (5-point)	See Table 4	3.09	0.81	0.95 [0.94, 0.95]
Climate Change Risk Perception	8 (7-point)	How serious of a threat do you believe that climate change is, to you personally? (van der Linden, 2015)	5.26	1.22	0.95 [0.94, 0.95]
Environmental Self Identity	14 (7-point)	I think of myself as a part of nature, not separate from it. (Clayton et al., 2021)	5.53	0.95	0.93 [0.93, 0.94]
Bio-spheric Value Orientation	4 (9-point)	Preventing pollution: protecting natural resources (de Groot & Steg, 2008)	7.17	1.40	0.89 [0.89, 0.90]
Altruistic Value Orientation	4 (9-point)	Equality: equal opportunity for all (de Groot & Steg, 2008)	7.64	1.31	0.87 [0.86, 0.88]
Green Organisational Culture	5 (4-point)	Top management actively support environmental practices (Pham et al., 2018)	2.62	1.00	0.91 [0.91, 0.92]
Green Psychological Climate	5 (5-point)	My company is worried about its environmental impact (Norton et al., 2017)	3.52	0.99	0.92 [0.91, 0.93]
Organisational Citizenship Behaviours for the Environment	10 (5-point)	I voluntarily carry out environmental actions and initiatives in my daily work activities (Boiral & Paillé, 2012)	2.88	0.94	0.94 [0.93, 0.94]

Note. Composites created by computing the average score of items. Alpha is Cronbach's alpha for scale reliability and 95 % Confidence Intervals.

within each scale were randomised. Participants then reported their organisational citizenship behaviours for the environment (item order was randomised) and provided socio-demographic information. Due to length constraints, the Study did not include attention checks. Including these may have provided avenues for further robustness analyses (excluding inattentive participants). See Table 3 for descriptive statistics and SI note 6 for all items.

4.2. Results

4.2.1. Exploratory factor analysis

Since we refined the list of items from Study 2, we again performed a maximum likelihood exploratory factor analysis (ML EFA) with five factors and oblique rotation. See Table 4 for factor loadings, inter-correlations, and variance explained by each factor. Results from the EFA aided in finalising the list of items for Confirmatory Factor Analysis.

4.2.2. Confirming factor structure of final scale

We hypothesised that a five-factor model of ECO will fit the data well. We selected items for the Confirmatory Factor Analysis (CFA) based on the EFA in Study 3. To ensure psychometric robustness, those items that had high standardised factor loadings (>0.50) and low

standardised cross-loading (<0.30) were selected (Costello & Osborne, 2019; Tabachnick et al., 2019). Consistent with recommendations, we further streamlined selection to avoid redundancy, and to ensure that each dimension had at least 3 items (Hinkin, 1995; Tabachnick et al., 2019).

The final version of the ECO scale contained 25 items that are bolded in Table 4. Fig. 1 depicts the factor structure and Fig. 2 lists the final items. CFA with maximum likelihood estimation showed that the 25-item, 5-factor model had very good fit—SRMR = 0.05, RMSEA = 0.05, 90 % CI [0.05, 0.06], CFI = 0.96, TFI = 0.96 (Hu & Bentler, 1999; Jackson et al., 2009). Standardised loadings of items on their respective factors were also high (>0.60). Robustness checks (e.g., excluding those who found fewer than 50 % items to be applicable to their case; See SI note 7) further confirmed the five-factor structure.

4.2.2.1. Assessing ECO as a single index or as subscales. The final ECO scale had a high Cronbach's Alpha of 0.95, 95 % CI (0.94, 0.95) and correlations between its factors (Table 6). This prompts questions about whether, instead of five dimensions, ECO should be scored as a one-factor index. To address this question, we conducted a bifactor analysis. We calculated indices of a bi-factor model (with ECO as a general factor comprising all 25 items and each dimension as a specific factor comprising its respective items) (Dueber, 2017). Then, we compared the obtained bi-factor indices with criteria for assessing whether a scale can be scored as a single index (Basso & Krpan, 2022; Rodriguez et al., 2016a, Rodriguez et al., 2016a). The criteria pertain to model-level indices (Extracted Common Variance or ECV and Percentage of Uncontaminated Correlation or PUC) and factor-level indices (Omega Hierarchical Coefficient, Factor Determinacy and Construct Replicability Index). Of these, Rodriguez et al., (2016a, 2016b) emphasise the importance of ECV because it estimates the relative strength of the general factor (in terms of variance explained). The ECV, they conclude, represents the degree of one-dimensionality or the extent to which the measure can be considered essentially unidimensional (Reise et al., 2013). To reduce parameter bias, it is recommended that the ECV be interpreted in conjunction with the PUC (Reise et al., 2013; Rodriguez et al., 2016b). As shown in Table 5, we find that the indices from our bifactor model exceed the specified benchmarks of Omega hierarchical, Factor Determinacy, Construct Replicability Index, and PUC. However, the ECV (0.634) is lower than the recommended 0.70. Therefore, although the ECO scale has high internal consistency, it does not meet all criteria for being scored as a single index. We recommend that although a composite ECO score (averaging responses on all items) may be used for an overall assessment of organisational culture, that the interpretation of this culture considers scores on various ECO subscales.

4.2.3. Convergent validity

Consistent with our hypothesis, the ECO scale was significantly and positively correlated with other, less specified and higher-level measures of organisational culture and climate in neighbouring disciplines (green organisational culture and green psychological climate), and with individual-level predictors of pro-environmental behaviour (climate change risk perceptions, environmental self-identity, and bio-spheric and altruistic values). These results (See Table 6) support ECO's convergent validity with theoretically relevant constructs (Hinkin, 1995).

4.2.4. Discriminant validity

We hypothesised that ECO would be distinguishable from other measures of theoretically similar constructs. We assessed discriminant validity from other highly correlated constructs ($r > 0.50$) namely, green organisational culture and green psychological climate via the method endorsed by contemporary scale development research (Meijers et al., 2023; Wright et al., 2020). We compared model fits (via CFAs) of two competing models: Model A: a six-factor model of ECO that treats the

Table 4

Items and standardised factor loadings in EFA in study 3.

Item	Organisational Policy	Team Norms	Leadership & Management Norms	Feasibility	Organisational Values
1 My managers set a good example in terms of environmentally sustainable behaviour.			0.76		
2 My managers DO NOT communicate the importance of caring for the environment convincingly.			0.67		
3 My managers are honest and reliable in taking eco-friendly action (e.g., refraining from business-class travel, following environmental regulations, reducing waste).			0.70		
4 My managers would never authorise environmentally damaging conduct to meet organisational goals.			0.46		
5 The organisation makes it clear to me how I should deal with external entities (e.g., clients and contractors) in an environmentally sustainable way.			0.66		
6 In my organisation, all employee inductions cover organisational sustainability policy, strategy and areas for employees to engage.	0.43		0.42		
7 Information about environmental sustainability related changes within this organisation is NOT communicated clearly to employees.			0.58		
8 I know the proper channels to direct questions regarding the environment in my organisation.			0.66		
9 My organisation encourages employees to take part in the development and monitoring of the organisation's environmental sustainability policies and practices.			0.50		
10 Management is aware of any environmentally damaging conduct that occurs at my workplace.			0.55		
11 To be successful in my organisation, I sometimes have to sacrifice my personal values about environmental sustainability.				0.74	
12 Due to the nature of my job, I am unable to carry out my tasks in an environmentally sustainable way.				0.69	
13 In my job, I sometimes have to take decisions that damage the environment.				0.80	
14 Even though we are encouraged to be environmentally sustainable in our work, sometimes the demands of my job make this impossible.				0.80	
15 Protecting the environment is important to my organisation.					0.54
16 My organisation tries to do its part to mitigate climate change.					0.51
17 My organisation DOES NOT have a responsibility to mitigate climate change.					
18 I believe that organisations like mine, working together, can mitigate climate change.					
19 My organisation identifies as environmentally sustainable and responsible.					0.39
20 My organisation DOES NOT have a policy to ensure that employees act sustainably.	0.79				
21 My organisation has policies on how employees can act sustainably, that are freely available to employees.	0.78				
22 My organisation has policies on how employees can act sustainably, that are published or updated within the last 5 years.	0.90				
23 My organisation has a policy to reduce its carbon emissions.	0.77				
24 My organisation has a policy to reduce its waste.	0.56				
25 My organisation uses environmental indicators (externally verified or internally established) to determine if the organisation is meeting sustainability goals.	0.78				
26 My organisation has sustainability targets.	0.84				
27 Everyone I work with in this organisation feels that caring for the environment is their personal responsibility.		0.81			
28 My colleagues are NOT committed to being green.		0.74			
29 At my workplace, an atmosphere of mutual commitment to safeguarding the environment prevails.		0.61			
30 At my workplace, everyone has the best interests of the planet at heart.		0.78			
31 At my workplace, NOT everyone takes the existing norms and standards of environmental sustainability		0.50			
32 My colleagues disapprove of environmentally harmful behaviour in the workplace.		0.63			
33 It is important to my colleagues that my organisation make efforts to protect the environment.		0.79			
34 Protecting the environment is important to my colleagues.		0.91			
% Variance Explained	0.29	0.25	0.25	0.12	0.08
Factor Correlations					
Organisational policy	–	0.47	0.63	0.16	0.54
Team Norms		–	0.69	0.32	0.44
Leadership and Management Norms			–	0.30	0.41
Feasibility				–	0.16

Note. Factor loadings are standardised factor loadings from a five-factor exploratory factor analysis with oblique rotation. We only report factor loadings >0.30. At the bottom, we report inter-correlations between factors from the EFA. Items in bold were entered in the CFA and comprise the final ECO scale.

highly correlated construct as a separate factor and Model B: a five-factor model of ECO that combines the construct with the factor of ECO with which it is highly correlated (>0.50). Discriminant validity would be established if the model treating the highly correlated

construct as a separate factor had better fit than the models combining the construct with one of the existing five factors (Basso & Krpan, 2022; Seuntjens et al., 2015; Wright et al., 2020).

To establish the discriminant validity between these constructs and

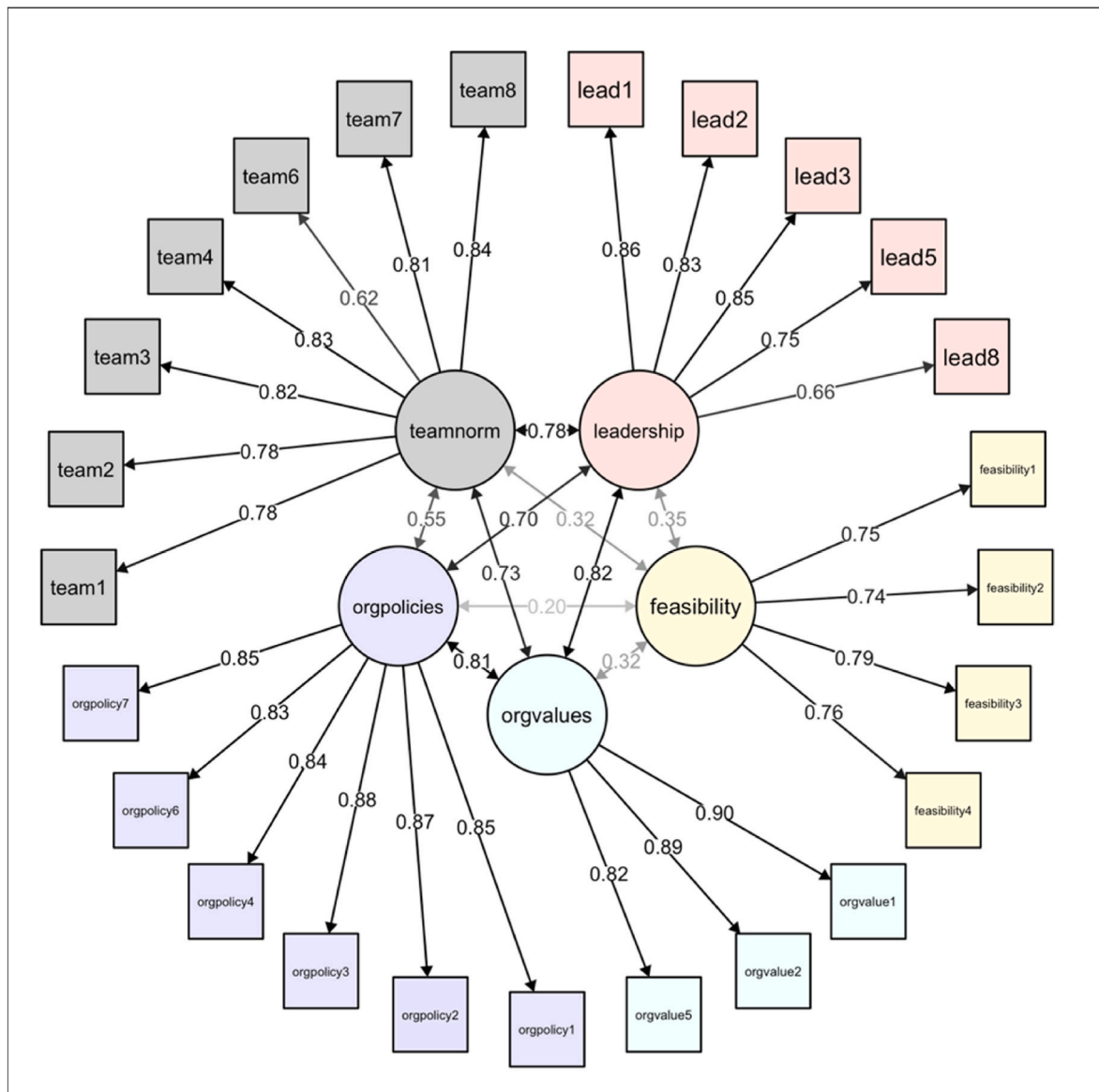


Fig. 1. Factor structure of ECO

Note. Path model depicting standardized item loadings, and covariances between latent variables in CFA. Latent variables are represented in circles, and observed variables (items) are in squares. All covariances between latent variables are significant ($p < 0.05$). The model, estimated using maximum likelihood estimation, showed good fit: SRMR = 0.05, RMSEA = 0.05, 90 % CI [0.05, 0.06], CFI = 0.96, TFI = 0.96. Orgpolicies = Organisational policy; orgvalues = Normative Organisational Values; leadership = Leadership and Management Norms; teamnorm = Team Norms.

each of ECO's subscales (or factors), we conducted subscale analyses. For this, we compared the model fits (via CFAs) of two competing models: Model C: a two-factor model that treats the highly correlated construct and the factor of ECO it correlates with as two separate factors and Model D: a single-factor model that treats the highly correlated construct and the factor of ECO with which it correlates as a single factor. Here, discriminant validity would be established if the two-factor model had better fit than the single-factor model. As a further robustness test, we assessed if the average variance extracted by factors was higher than shared variance between factors in the two-factor models (Fornell & Larcker, 1981). Finally, we assessed if the two-factor model explained greater variance in observed measures than the one factor model.

4.2.4.1. Green organisational culture. Four dimensions of ECO were strongly correlated with Green Organisational Culture: leadership and management norms ($r = 0.71$, $p < 0.001$), organisational values ($r = 0.75$, $p < 0.001$), organisational policy ($r = 0.76$, $p < 0.001$), and team

norms ($r = 0.61$, $p < 0.001$).

An analysis of model fit indices and Chi-Squared difference tests showed that the model fit of the six-factor model (SRMR = 0.04, RMSEA = 0.05, 90 % CI [0.05, 0.06], CFI = 0.96, TFI = 0.95) was better than that of five factor models that combined green organisational culture with each of the strongly-correlated dimensions of ECO: leadership and management norms (SRMR = 0.05, RMSEA = 0.07, 90 % CI [0.07, 0.08], CFI = 0.92, TFI = 0.91; χ^2_{diff} ($df = 5$) = 1210.80, $p < 0.001$), organisational values (SRMR = 0.05, RMSEA = 0.06, 90 % CI [0.06, 0.07], CFI = 0.93, TFI = 0.92; χ^2_{diff} ($df = 5$) = 772.11, $p < 0.001$), organisational policy (SRMR = 0.05, RMSEA = 0.08, 90 % CI [0.07, 0.08], CFI = 0.91, TFI = 0.90; χ^2_{diff} ($df = 5$) = 1386.90, $p < 0.001$) or team norms (SRMR = 0.07, RMSEA = 0.09, 90 % CI [0.09, 0.09], CFI = 0.87, TFI = 0.86; χ^2_{diff} ($df = 5$) = 1386.90, $p < 0.001$) respectively. This established ECO's discriminant validity. Further robustness checks found that the Average Variance Extracted (AVE) by each factor in their respective items was higher than the shared variance (i.e., squared

Dimension: Leadership and Management Norms

- My managers set a good example in terms of environmentally sustainable behaviour.
- My managers DO NOT communicate the importance of caring for the environment convincingly. ®
- My managers are honest and reliable in taking eco-friendly action (e.g., refraining from business-class travel, following environmental regulations, reducing waste).
- The organisation makes it clear to me how I should deal with external entities (e.g., clients and contractors) in an environmentally sustainable way.
- I know the proper channels to direct questions regarding the environment in my organisation.

Dimension: Feasibility

- To be successful in my organisation, I sometimes have to sacrifice my personal values about environmental sustainability.
- Due to the nature of my job, I am unable to carry out my tasks in an environmentally sustainable way.
- In my job, I sometimes have to take decisions that damage the environment.
- Even though we are encouraged to be environmentally sustainable in our work, sometimes the demands of my job make this impossible.

Dimension: Organisational Values

- Protecting the environment is important to my organisation.
- My organisation tries to do its part to mitigate climate change.
- My organisation identifies as environmentally sustainable.

Dimension: Organisational Policy

- My organisation DOES NOT have a policy to ensure that employees act sustainably. ®
- My organisation has policies on how employees can act sustainably, that are freely available to employees.
- My organisation has policies on how employees can act sustainably, that are published or updated within the last 5 years.
- My organisation has a policy to reduce its carbon emissions.
- My organisation has sustainability targets.
- My organisation uses environmental indicators (externally verified or internally established) to determine if the organisation is meeting sustainability goals.

Dimension: Team Norms

- Everyone I work with in this organisation feels that caring for the environment is their personal responsibility.
- My colleagues are NOT committed to being green. ®
- At my workplace, an atmosphere of mutual commitment to safeguarding the environment prevails.
- At my workplace, everyone has the best interests of the planet at heart.
- My colleagues disapprove of environmentally harmful behaviour in the workplace.
- It is important to my colleagues that my organisation make efforts to protect the environment.

Fig. 2. Measures in the 25-item ECO scale.

Note: All items measured on a Likert Scale (1 = Strongly Agree to 5 = Strongly Disagree); ®: Reverse Coded; For a shorter 15-item version of the ECO scale, See [Fig. 3](#).

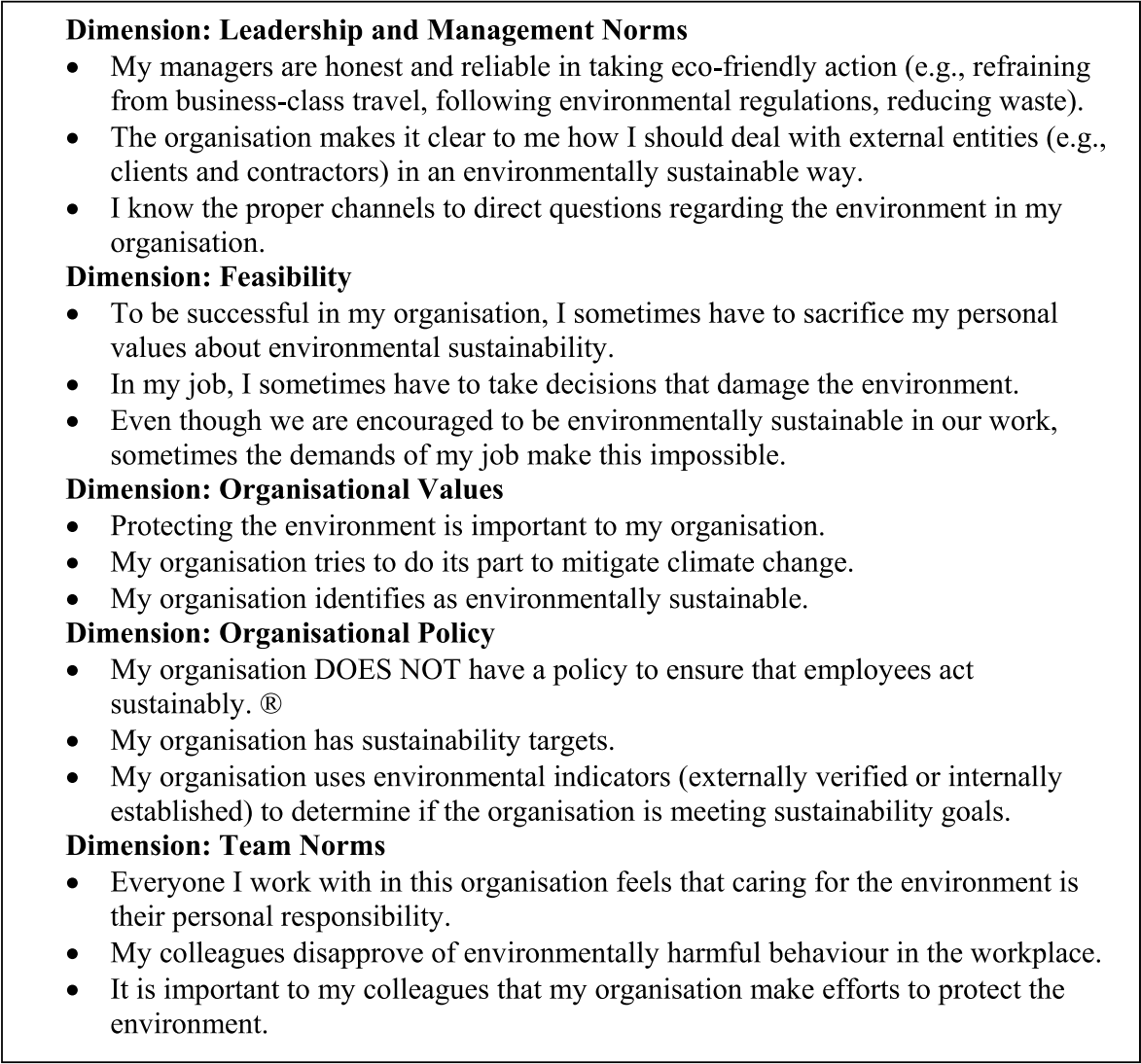


Fig. 3. Measures in the 15-item ECO scale.
Note: All items measured on a Likert Scale (1 = Strongly Agree to 5 = Strongly Disagree); ®: Reverse Coded.

Table 5
Results from Bi-factor analysis of ECO.

Bi-Factor Model Indices	Recommended Benchmarks to be Considered a Unidimensional Scale	Observed in ECO
Extracted Common Variance (ECV)	>0.70	0.634
Percentage of Uncontaminated Correlations (PUC)	>0.70	0.817
Omega Hierarchical Coefficient	>0.80	0.858
Factor Determinacy (FD)	>0.90	0.955
Construct Replicability Index (H)	>0.80	0.957

Note. Benchmarks extracted from [Basso and Krpan \(2022\)](#) and [Rodriguez et al. \(2016a\)](#).

correlations) between green organisational culture and the factor (see SI note 11). This further supported discriminant validity ([Fornell & Larcker, 1981](#); [Wright et al., 2020](#)). Therefore, discriminant validity between ECO and green organisational culture was established. Below, we present further subscale discriminant validity analyses.

Discriminant Validity of the Leadership and Management Norms

Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green organisational culture and the leadership and management norms subscale of ECO as two separate factors (SRMR = 0.04, RMSEA = 0.09, 90 % CI [0.08, 0.10], CFI = 0.96, TFI = 0.95) was better than that of a one factor model that combined green organisational culture with leadership and management norms (SRMR = 0.08, RMSEA = 0.18, 90 % CI [0.17, 0.19], CFI = 0.85, TFI = 0.81; $\chi^2_{diff} (df = 1) = 1050.30, p < 0.001$). Within this two-factor model, the Average Variance Extracted (AVE; Calculated from squared standardized factor loadings) by green organisational culture (0.6936) and leadership and management norms (0.6300) was greater than the shared variance (squared correlations) between the two factors (0.5929), further supporting discriminant validity ([Fornell & Larcker, 1981](#)). Finally, the two-factor model explained greater average variance in observed measures (69.36 % and 63.00 % for items pertaining to green organisational culture and leadership and management norms respectively) than the one-factor model (AVE = 57.79 % for all items). Between the two and one factor models, the AVE dropped from 69.36 % to 65.92 % for items pertaining to green organisational culture, and from 63.00 % to 49.66 % for items pertaining to leadership and management norms. Greater variance explained by the two-factor model pointed to the appropriateness of the two (vs one) factor model. Therefore, all analyses support

Table 6

Bivariate correlations of variables of interest for convergent validity.

	1	2	3	4	5	6	7	8	9	10	11
1 Environmental Culture in Organisations											
2 Leadership & Management Norms	0.87***										
3 Feasibility	0.47***	0.29***									
4 Organisational values	0.87***	0.73***	0.28***								
5 Organisational policy	0.83***	0.65***	0.18***	0.76***							
6 Team Norms	0.83***	0.70***	0.29***	0.66***	0.50***						
7 Climate Change Risk Perception	0.12***	0.08**	-0.07*	0.12***	0.1***	0.19***					
8 Environmental Self Identity	0.12***	0.10***	-0.05	0.13***	0.09**	0.19***	0.48***				
9 Bio-spheric Value Orientation	0.13***	0.11***	-0.02	0.13***	0.07*	0.21***	0.57***	0.66***			
10 Altruistic Value Orientation	0.12***	0.08**	0.02	0.12***	0.07*	0.18***	0.48***	0.34***	0.51***		
11 Green Organisational Culture	0.8***	0.71***	0.22***	0.75***	0.76***	0.61***	0.13***	0.11***	0.12***	0.07*	
12 Green Psychological Climate	0.8***	0.69***	0.24***	0.81***	0.72***	0.65***	0.18***	0.16***	0.18***	0.14***	0.75***

Note. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Data are Pearson's coefficients. Variables 2–6 are dimensions of ECO. All composites created by computing the average score of items.

discriminant validity between green organisational culture and the leadership and management norms subscale.

Discriminant Validity of the Organisational Values Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green organisational culture and the organisational values subscale of ECO as two separate factors (SRMR = 0.03, RMSEA = 0.09, 90 % CI [0.08, 0.10], CFI = 0.97, TFI = 0.97) was better than that of a one factor model that combined green organisational culture with organisational values (SRMR = 0.06, RMSEA = 0.19, 90 % CI [0.18, 0.20], CFI = 0.90, TFI = 0.86; $\chi^2_{diff}(df = 1) = 654.47, p < 0.001$). Within this two-factor model, the AVE by green organisational culture (0.6923) and organisational values (0.7596) was greater than the shared variance between the two factors (0.6889). Finally, the two-factor model explained greater average variance in observed measures (AVE = 69.23 % and 75.96 % for items pertaining to green organisational culture and organisational values respectively) than the one-factor model (AVE = 65.03 % for all items). Between the two and one factor models, the AVE dropped from 69.36 % to 67.26 % for items pertaining to green organisational culture, and from 75.96 % to 61.30 % for items pertaining to organisational values. Therefore, all analyses supported discriminant validity between green organisational culture and the organisational values subscale.

Discriminant Validity of the Organisational Policy Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green organisational culture and the organisational policy subscale of ECO as two separate factors (SRMR = 0.02, RMSEA = 0.07, 90 % CI [0.06, 0.08], CFI = 0.98, TFI = 0.97) was better than that of a one factor model that combined green organisational culture with organisational policy (SRMR = 0.06, RMSEA = 0.17, 90 % CI [0.16, 0.18], CFI = 0.97, TFI = 0.84; $\chi^2_{diff}(df = 1) = 1305.50, p < 0.001$). Within this two-factor model, the AVE by green organisational culture (0.6929) and organisational policy (0.7277) was greater than the shared variance (squared correlations) between the two factors (0.6740). Moreover, the two-factor model explained greater average variance in observed measures (AVE = 69.29 % and 72.77 % for items pertaining to green organisational culture and organisational policy respectively) than the one-factor model (AVE = 64.23 % for all items). Between the two and one factor models, the AVE dropped from 69.29 % to 59.48 % for items pertaining to green organisational culture, and from 72.77 % to 68.17 % for items pertaining to organisational policy. Therefore, all analyses point to discriminant validity between green organisational culture and the organisational policy subscale.

Discriminant Validity of the Team Norms Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green organisational culture and the team norms subscale of ECO as two separate factors (SRMR = 0.04, RMSEA = 0.07, 90 % CI [0.06, 0.07], CFI = 0.97, TFI = 0.97) was better than that of a one factor model that combined green organisational culture with team norms (SRMR = 0.10, RMSEA = 0.20, 90 % CI [0.19, 0.21], CFI = 0.76, TFI = 0.70; $\chi^2_{diff}(df = 1) = 2352, p < 0.001$). Within this two-factor model, the AVE by green

organisational culture (0.6940) and team norms (0.6199) was greater than the shared variance (squared correlations) between the two factors (0.4409). Moreover, the two-factor model explained greater average variance in observed measures (AVE = 69.40 % and 61.99 % for items pertaining to green organisational culture and team norms respectively) than the one-factor model (AVE = 53.30 % for all items). Between the two and one factor models, the AVE dropped from 69.40 % to 52.20 % for items pertaining to green organisational culture, and from 61.99 % to 54.09 % for items pertaining to team norms. All analyses point to discriminant validity between green organisational culture and the team norms subscale.

4.2.4.2. Green psychological climate. Four dimensions of ECO were strongly correlated with Green Psychological Climate: leadership and management norms ($r = 0.69, p < 0.001$), organisational values ($r = 0.81, p < 0.001$), organisational policy ($r = 0.72, p < 0.001$), and team norms ($r = 0.65, p < 0.001$). Fit indices and Chi-Squared difference tests showed that the model fit of the six-factor model with green psychological climate as a separate factor (SRMR = 0.04, RMSEA = 0.05, 90 % CI [0.046, 0.052], CFI = 0.96, TFI = 0.96) was better than that of five factor models that combined green psychological climate with leadership and management norms (SRMR = 0.05, RMSEA = 0.07, 90 % CI [0.07, 0.07], CFI = 0.92, TFI = 0.91; $\chi^2_{diff}(df = 5) = 1217.70, p < 0.001$), organisational values (SRMR = 0.05, RMSEA = 0.06, 90 % CI [0.06, 0.06], CFI = 0.95, TFI = 0.94; $\chi^2_{diff}(df = 5) = 435.92, p < 0.001$), organisational policy (SRMR = 0.06, RMSEA = 0.08, 90 % CI [0.08, 0.08], CFI = 0.90, TFI = 0.89; $\chi^2_{diff}(df = 5) = 1830.50, p < 0.001$) or team norms (SRMR = 0.06, RMSEA = 0.08, 90 % CI [0.08, 0.09], CFI = 0.89, TFI = 0.88; $\chi^2_{diff}(df = 5) = 2116.00, p < 0.001$) respectively. This suggested discriminant validity. And, robustness checks comparing the square-root of the mean factor loadings of items in each factor of ECO, with correlations between that factor and green psychological climate further confirmed discriminant validity (see SI note 11) (Fornell & Larcker, 1981; Wright et al., 2020). Therefore, consistent with our hypothesis, discriminant validity between ECO and green psychological climate was established. Below, we present further analyses to establish discriminant validity between green psychological climate and the subscales of ECO with which it was strongly correlated.

Discriminant Validity of the Leadership and Management Norms Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green psychological climate and the leadership and management norms subscale of ECO as two separate factors (SRMR = 0.03, RMSEA = 0.07, 90 % CI [0.08, 0.08], CFI = 0.98, TFI = 0.97) was better than that of a one factor model that combined green psychological climate with leadership and management norms (SRMR = 0.08, RMSEA = 0.18, 90 % CI [0.17, 0.19], CFI = 0.85, TFI = 0.81; $\chi^2_{diff}(df = 1) = 1148, p < 0.001$). Within this two-factor model, the AVE by green psychological climate (0.6967) and leadership and management norms (0.6287) was greater than the shared variance (squared correlations)

between the two factors (0.5852). Moreover, the two-factor model explained greater average variance in observed measures (calculated from squared standardized factor loadings; AVE = 69.67 % and 62.87 % for items pertaining to green psychological climate and leadership and management norms respectively) than the one-factor model (AVE = 57.22 % for all items). Between the two and one factor models, the AVE dropped from 69.67 % to 65.30 % for items pertaining to green psychological climate, and from 62.87 % to 49.12 % for items pertaining to leadership and management norms. All analyses point to discriminant validity between green psychological climate and the leadership and management norms subscale.

Discriminant Validity of the Organisational Values Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green psychological climate and the organisational values subscale of ECO as two separate factors (SRMR = 0.01, RMSEA = 0.05, 90 % CI [0.04, 0.06], CFI = 0.99, TFI = 0.99) was better than that of a one factor model that combined green psychological climate with organisational values (SRMR = 0.03, RMSEA = 0.13, 90 % CI [0.12, 0.14], CFI = 0.95, TFI = 0.93; χ^2_{diff} ($df = 1$) = 373.03, $p < 0.001$). Moreover, the two-factor model explained greater average variance in observed measures (AVE = 69.81 % and 75.82 % for items pertaining to green psychological climate and organisational values respectively) than the one-factor model (AVE = 67.82 % for all items). Between the two and one factor models, the AVE dropped from 69.81 % to 67.72 % for items pertaining to green psychological climate, and from 75.82 % to 67.97 % for items pertaining to organisational values.

Within the two-factor model, the AVE by green psychological climate (0.6981) and organisational values (0.7581) was not higher than the shared variance (squared correlations) between the two factors (0.7939). Whereas the Chi-Squared difference test of model fits pointed to discriminant validity, the comparison of average and shared variance did not support discriminant validity. Given contrasting results from the two tests, we supplemented the discriminant validity analysis with an additional test: Heterotrait-Monotrait Ratio of Correlations. HTMT compares the similarity in items between factors, with the similarity in items within factors. The HTMT ratio (of average correlations of items between factors/average correlations of items within factors) was 0.89, below the required HTMT threshold (Gold et al., 2001; Henseler et al., 2015). Therefore, discriminant validity between green psychological climate and organisational values was supported by the HTMT ratio.

Three of our four discriminant validity analyses, including our primary pre-registered analysis of the Chi-Squared difference test, point to discriminant validity between green psychological climate and the organisational values subscale. Taken together, we view these findings as generally supportive of discriminant validity between the organisational values subscale of ECO, and green psychological climate.

Discriminant Validity of the Organisational Policy Subscale (2 vs. 1 Factor Models). The model fit of the two factor model treating green psychological climate and the organisational policy subscale of ECO as two separate factors (SRMR = 0.02, RMSEA = 0.07, 90 % CI [0.06, 0.08], CFI = 0.98, TFI = 0.97) was better than that of a one factor model that combined green psychological climate with organisational policy (SRMR = 0.08, RMSEA = 0.19, 90 % CI [0.18, 0.19], CFI = 0.84, TFI = 0.80; χ^2_{diff} ($df = 1$) = 1612.70, $p < 0.001$). Within this two-factor model, the AVE by green psychological climate (0.6985) and organisational policy (0.7277) was greater than the shared variance (squared correlations) between the two factors (0.5914). Moreover, the two-factor model explained greater average variance in observed measures (AVE = 69.85 % and 72.77 % for items pertaining to green psychological climate and organisational policy respectively) than the one-factor model (AVE = 62.44 % for all items). Between the two and one factor models, the AVE dropped from 69.85 % to 54.96 % for items pertaining to green psychological climate, and from 72.77 % to 68.68 % for items pertaining to organisational policy. All analyses point to discriminant validity between green psychological climate and the organisational policy subscale.

Discriminant Validity of the Team Norms Subscale (2 vs. 1 Factor Models). The fit of the two factor model treating green psychological climate and the team norms subscale of ECO as two separate factors (SRMR = 0.03, RMSEA = 0.06, 90 % CI [0.05, 0.07], CFI = 0.98, TFI = 0.98) was better than that of a one factor model that combined green psychological climate with team norms (SRMR = 0.09, RMSEA = 0.18, 90 % CI [0.17, 0.19], CFI = 0.80, TFI = 0.76; χ^2_{diff} ($df = 1$) = 1877.90, $p < 0.001$). Within this two-factor model, the AVE by green psychological climate (0.6968) and team norms (0.6207) was greater than the shared variance (squared correlations) between the two factors (0.5141). Moreover, the two-factor model explained greater average variance in observed measures (AVE = 69.68 % and 62.02 % for items pertaining to green psychological climate and team norms respectively) than the one-factor model (AVE = 55.03 % for all items). Between the two and one factor models, the AVE dropped from 69.68 % to 55.66 % for items pertaining to green psychological climate, and from 62.02 % to 54.56 % for items pertaining to team norms. All analyses point to discriminant validity between green psychological climate and the team norms subscale.

Taken together, these findings establish that the ECO scale (and all its component dimensions) are distinguishable (or discriminant) from other measures of green organisational culture and climate measured in the Study.

4.2.5. Predictive validity

We hypothesised that ECO will significantly predict Organisational Citizenship Behaviours for the Environment (OCBE). This was supported by a linear regression analysis which found that ECO composite significantly predicted OCBE, β (standardised) = 0.43, $t(1222) = 16.61$, $SE = 0.03$, $p < 0.001$. ECO significantly predicted OCBE even when accounting for socio-demographic covariates (See SI note 8).

The contribution of ECO lies in not only providing a high-level view of overall organisational culture, but also dissecting culture into specific and theoretically informed component dimensions. We investigated incremental predictive validity— whether the 5-dimension ECO scale explained additional variance in OCBE that was not accounted for by previously developed high-level organisational culture and climate measures. Regression analyses showed that ECO explained additional

Table 7
Incremental Predictive Validity of ECO scale on Organisational Citizenship Behaviour for the Environment (OCBE).

	Model 1	Model 2	Model 3	Model 4
Individual-Level Constructs:				
Climate Change Risk Perception	0.27***	0.24***		
Environmental Self-Identity	0.26***	0.23***		
Bio-spheric Value Orientation	0.005	0.03		
Altruistic Value Orientation	0.004	−0.01		
Organisation-level constructs:				
Green Organisational Culture			0.37***	0.23***
Green Psychological Climate			0.11**	−0.01
ECO Dimension 1: Leadership & Management Norms		0.33***		0.22***
ECO Dimension 2: Feasibility		−0.13***		−0.19***
ECO Dimension 3: Organisational Values		−0.03		−0.04
ECO Dimension 4: Organisational Policy		0.11**		0.02
ECO Dimension 5: Team Norms		0.10**		0.19***
R ²	0.24	0.43	0.21	0.28

Note. Models are linear regression models. Coefficients are standardized. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Models show variance in OCBE explained by relevant individual-level constructs (Model 1: $F(4,1219) = 95.86$, $p < 0.001$); individual-level constructs and five dimensions of ECO (Model 2: $F(9,1213) = 100.10$, $p < 0.001$); Previously identified organisation-level competing scales (Model 3: $F(2,1221) = 160.50$, $p < 0.001$); and Competing scales, and five factors of the ECO scale (Model 4: $F(7,1215) = 68.35$, $p < 0.001$). See SI note 8 for predictive validity accounting for covariates.

variance in OCBE, over and above green organisational culture and green psychological climate (7 % additional variance explained; See Table 7 Model 4; for additional variance explained by each ECO dimension separately, see SI note 9). In contrast, green organisational culture explained 1 % and green psychological climate explained no additional variance after accounting for ECO (See Table 8, Models 2 and 4). ECO also explained additional variance (19 %) when accounting for individual-level predictors of OCBE (See Table 7, Model 2).

These findings indicate ECO's predictive validity. They also underscore its ability to explain additional variance atop previous organisational culture and climate measures. This is likely because ECO provides a detailed assessment of various aspects of organisational culture. The scale's granular assessment of culture, we believe, is an advancement from previous high-level measures of green organisational culture and is crucial for uncovering specific levers (and/or barriers) of behaviour change within an organisation.

4.2.6. 15-Item short scale

When assessing ECO, we recommend using the 25-item ECO scale to conduct a granular assessment of various dimensions. However, we recognise that researchers and practitioners may, at times, face resource constraints and therefore benefit from administering a shorter scale (Roy et al., 2024). As such, based on findings of the EFA, we also validated a 15-item ECO scale that contains a subset of the 25 items, retains all 5 dimensions, shows good fit $SRMR = 0.03$, $RMSEA = 0.05$ 90 % CI [0.047, 0.059], $CFI = 0.97$, $TFI = 0.97$, and shows convergent, discriminant, and predictive validity. See Fig. 3 for the short version, and SI note 16 for the psychometric validation of this version (CFA, convergent, discriminant, and predictive validity). This was conducted post-hoc (i.e., was not pre-registered) upon considering the applicability of the ECO scale to organisations and research projects of varying sizes and resources.

5. Study 4

Study 4 examined the relationship between organisational features, ECO, and employees' pro-environmental behavioural intentions. We assessed associations with one organisational feature that is salient in employees' day-to-day work— their job role, and one that has a substantial environmental impact but may not be salient to employees—their industry's greenhouse gas emissions. We reasoned that if employees' work pertains to environmental sustainability, their work culture may especially foster normative expectations of pro-environmental actions across organisational levels. As such, we hypothesised that those in sustainability-related roles will report a stronger ECO and take greater organisational citizenship behaviours for the organisation (OCBE).

Similarly, if lower greenhouse gas emissions are reflective of an organisation's commitment to environmental sustainability, then

organisations in low emissions industries may also have a stronger ECO and may be able to take more pro-environmental actions. Therefore, we hypothesised that employees in low emissions industries will have a higher ECO and OCBE. We also assessed differences in ECO across sectors but did not have directional hypotheses.

5.1. Method

5.1.1. Participants

An a priori power analysis using G*Power version 3.1 suggested that a sample of 506 participants (253/group) was required to obtain 80 % power to detect small-to-medium effects in pairwise comparisons (Test family: t tests; Statistical test: Means: Difference between two independent means; Type of power analysis: A priori; Tails: Two; Effect size d: 0.25; Alpha error probability: 0.05; Power: 0.80; Allocation ratio: 1) (Faul et al., 2009). Anticipating participant attrition, the chances of recruiting unequal numbers of those with and without sustainability roles, and issues with classifying high and low emissions industry employees, we aimed to recruit 600 participants (roughly 300/group) from the survey platform Prolific. Post-hoc power analyses showed that this afforded us over 80 % power to detect small-to-medium differences ($d = 0.30$) across job roles (sustainability related vs. unrelated; unequal group sizes), and Industries (low vs. high emissions). Only those who were employed (part-time or fulltime) were invited to participate. We recruited an equal number of participants who were registered with the survey platform as working in industries with Low (e.g., graphic design) and high (e.g., construction) greenhouse gas emissions.

A total of 604 participants completed the survey and three failed the attention check (mis-identified a target number). Therefore, the final sample consisted of 601 participants ($M_{age} = 40.05$, $SD_{age} = 11.54$, 302 female identifying, 298 male identifying, and 1 other gender identifying). A majority were permanent employees (86.86 % of sample). See SI note 12 for detailed information on sample.

5.1.2. Procedure

After providing informed consent, participants responded to the final 25-item ECO scale (item order randomised), reported their Organisational Citizenship Behaviours for the Environment (item order randomised), and job characteristics. Finally, they provided socio-demographic information.

5.1.3. Measures

5.1.3.1. ECO. The ECO scale showed a high scale reliability with a Cronbach's alpha of 0.95 (95 % CI [0.95, 0.96]) (Table 9). This evidence of internal consistency in an independent sample further established ECO's construct validity (Hinkin, 1995). As a robustness check, we again conducted a CFA on the 25-item, 5-factor ECO scale in this new sample.

Table 8

Additional variance in organisational citizenship behaviour for the environment (OCBE) explained by other measures of culture.

	Model 1	Model 2	Model 3	Model 4
ECO Dimension 1: Leadership & Management Norms	0.27***	0.22***	0.27***	0.22***
ECO Dimension 2: Feasibility	−0.19***	−0.19***	−0.19***	−0.19***
ECO Dimension 3: Organisational Values	0.01	−0.04	−0.01	−0.04
ECO Dimension 4: Organisational Policy	0.11**	0.02	0.10*	0.02
ECO Dimension 5: Team Norms	0.22***	0.19***	0.21***	0.19***
Organisation-level Constructs: Green Organisational Culture		0.23***		0.23***
Green Psychological Climate			0.05	0.01
R²	0.27	0.28	0.27	0.28

Note. Models are linear regression models. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Coefficients are standardized. Models show variance in OCBE explained by the ECO scale (Model 1: $F(5,1217) = 88.06$, $p < 0.001$); ECO scale and the organisation-level competing scale of green organisational culture (Model 2: $F(6,1216) = 79.80$, $p < 0.001$); ECO scale and organisation-level competing scale of green psychological climate (Model 3: $F(6,1216) = 73.54$, $p < 0.001$); and ECO scale and both competing organisation-level scales (Model 4: $F(7,1215) = 68.35$, $p < 0.001$). See SI note 8 for predictive validity accounting for covariates.

Table 9
Descriptive statistics for study 4 measures.

	# of items	Sample item	Mean	SD	Alpha
Environmental Culture in Organisations (complete)	25	See Table 4 (Bolded items)	3.03	0.83	0.95 [0.95,0.96]
ECO dimension 1: leadership and management norms	5	See Table 4	3.08	1.05	0.90 [0.89,0.91]
ECO dimension 2: team norms	7	See Table 4	3.27	0.92	0.93 [0.92,0.94]
ECO dimension 3: feasibility	4	See Table 4	3.22	0.98	0.84 [0.81,0.96]
ECO dimension 4: organisational policy	6	See Table 4	3.19	1.22	0.95 [0.94,0.96]
ECO dimension 5: normative organisational values	3	See Table 4	3.46	1.10	0.92 [0.91,0.93]
Organisational Citizenship Behaviours for the Environment	10	Same as Study 3	2.92	1.00	0.94 [0.94,0.95]
Industry (Prolific coded)		High emissions (n = 301); Low emissions (n = 300)			
Industry (manually coded)		High emissions (n = 150); Low emissions (n = 258)			
		Uncategorised (n = 193)			
Sustainability role (occupation)	1	At my work, one of my roles is to deal with issues of environmental sustainability. Yes (n = 119); No/Not sure (n = 482)			
Employment sector	1	For profit (n = 430); Not-for profit (n = 59); government: local, state, or national (n = 68), self-employed/Other (44)			

Note. Composites created by computing the average score of items. Alpha is Cronbach's alpha for scale reliability and 95 % confidence intervals.

This robustness check confirmed that the 5-factor model had very good fit (See SI note 15). The average time taken to answer all 25 items of the ECO scale was 2 min and 35.5 s (SD = 93 s).

All other measures and their descriptive statistics are summarised in Table 7. The process of recruiting participants from low or high emissions industries is described below.

5.1.3.2. Low and high emissions industries. We recruited an equal number of participants from industries categorised by the Intergovernmental Panel on Climate Change as “low emissions” and “high emissions” (Shukla et al., 2022). To illustrate, low emissions industries included those working in sectors like arts, design, entertainment and recreation, broadcasting, education, graphic design, information services or data processing and “high emissions” included aviation, construction, manufacturing, mining, oil and gas, transportation or warehousing (See SI note 14 on details of categorisation). The recruitment was executed by the survey platform based on participant registration data.

However, upon data inspection, we discovered that participants' recorded industry (as per the survey company) at times differed from the industry they self-reported in our survey. For example, although a participant was recorded by Prolific as working for a low emissions industry, they self-reported their industry as “construction” (which is high emissions) in our survey. Therefore, we also employed IPCC's classification to manually categorise participants as working in low and high emissions industries based on their self-reported industry (Shukla et al., 2022). In summary, differences in ECO between high and low emissions industries were analysed twice—based on the industry as registered with Prolific and based on the self-reported industry as manually coded by authors. The latter excluded 193 participants whose self-reported industry was not classified as high or low emissions (e.g., retail). A post-hoc power analysis using G*Power version 3.1 indicated that the sample size of 408 afforded 83 % power to detect small-to-medium differences ($d = 0.30$) between participants who were manually categorised as employed in low ($n = 258$) and high ($n = 150$) emissions industries with a type-1 error rate of 0.05 (Test family: t tests; Statistical test: Means: Difference between two independent means; Type of power analysis: Post-hoc; Tails: Two; Effect size d : 0.30; Alpha error probability: 0.05; Sample size group 1 = 258; Sample size group 2 = 150) (Faul et al., 2009).

5.2. Results

The data files and analysis script can be found here https://osf.io/w97by/?view_only=b2788fb2a62449cc9abba7a8201df223.

5.2.1. Job role (sustainability related vs. unrelated)

Consistent with our hypothesis, a linear regression analysis found that participants' job role significantly predicted their ECO such that those in sustainability related roles perceived a stronger ECO than those in roles unrelated to sustainability, $b = 0.70$, $SE = 0.08$, $t = 8.75$, $p < 0.001$. This association between job-role and ECO remained significant when controlling for organisation-level factors (organisation size, sector, and industrial emissions coded as high or low by prolific), as well as socio-demographic factors (age, gender, education, income, political ideology, past pro-environmental behaviour, and ethnicity), $b = 0.68$, $SE = 0.08$, $t = 8.30$, $p < 0.001$. See Fig. 4 for standardized coefficients of this multiple linear regression.

Specifically, those in sustainability-related roles scored significantly higher in the leadership and management norms (model without controls: $b = 1.00$, $SE = 0.10$, $t = 10.06$, $p < 0.001$; model with controls: $b = 0.99$, $SE = 0.10$, $t = 9.61$, $p < 0.001$), organisational values (Model without controls: $b = 0.77$, $SE = 0.11$, $t = 7.15$, $p < 0.001$; Model controlling for the same individual and organisational factors as above: $b = 0.75$, $SE = 0.11$, $t = 6.77$, $p < 0.001$), organisational policy (model without controls: $b = 0.84$, $SE = 0.12$, $t = 6.96$, $p < 0.001$; model with controls: $b = 0.82$, $SE = 0.12$, $t = 6.77$, $p < 0.001$), and team norms (Model without controls: $b = 0.67$, $SE = 0.09$, $t = 7.53$, $p < 0.001$; Model with controls: $b = 0.66$, $SE = 0.09$, $t = 7.18$, $p < 0.001$) dimensions of ECO compared to those in occupations unrelated to sustainability.

Participants' job role also significantly predicted their OCBE, $b = 0.88$, $SE = 0.10$, $p < 0.001$ with those in sustainability related roles performing greater OCBE than those working in roles unrelated to sustainability.

5.2.2. Low and high emissions industry

Contrary to our hypothesis, linear regression analyses showed that industrial emissions (working in high or low greenhouse gas emissions industries) did not significantly predict participants' ECO ($p = 0.85$ when industries were Prolific coded and $p = 0.32$ when industries were manually coded). Industrial emissions also did not significantly predict participants' Organisational Citizenship Behaviours for Environment

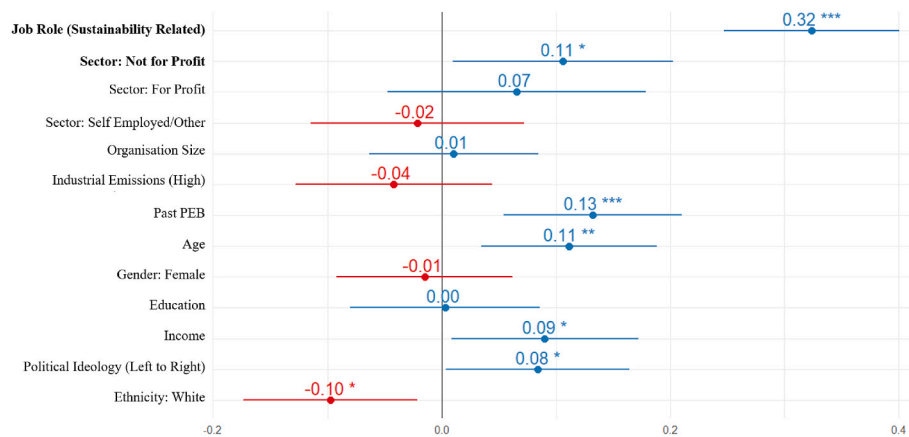


Fig. 4. How organisational and individual factors predict ECO

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Error bars are 95 % confidence Intervals. Coefficients are standardised. Omitted categories are the following: Job role—sustainability unrelated; Sector—government; Industrial Emissions—low emissions industry (Prolific Coded); Gender—Male/Other; Ethnicity—Non-White. To achieve standardization, each level of the factor variable (sector) was converted into a numerical variable (dummy coded 1 and 0), with the omitted category, government, always coded 0. Scales for numerical variables: Organisation size—continuous numerical variable (median = 200); PEB (Past environmental behaviour)—0–2 scale, Age—continuous numerical variable (median = 39), Education—Likert scale of 1 (less than O level) to 10 (Doctorate or other professional degree), Income—Likert scale of 1 (less than £20,000) to 6 (more than £100,000), Political Ideology—Likert scale of 1 (left) to 5 (right). Results are from multiple linear regression model: $F(13, 585) = 10.01$, $R^2 = 0.18$, $p < 0.001$.

(OCBE) ($p = 0.80$ when Prolific coded, $p = 0.82$ when manually coded).

5.2.3. Sector

We also explored differences in ECO across sectors. Sector was significantly associated with ECO, with those in the not-for-profit-sector reporting greater ECO than those in the government sector ($b = 0.42$, $SE = 0.15$, $t = 2.87$, $p = 0.004$). This relationship remained significant when controlling for relevant organisational (organisation size, job role, industrial emissions), as well as socio-demographic factors (age, gender, education, income, political ideology, past pro-environmental behaviour, and ethnicity), $b = 0.29$, $SE = 0.14$, $t = 2.18$, $p = 0.03$. See Fig. 3 for standardized coefficients of this multiple linear regression. Assessing the subscales, we found that the not-for-profit sector (vs. government sector) predicted greater scores on organisational values (Model without controls: $b = 0.69$, $SE = 0.19$, $t = 3.54$, $p < 0.001$; Model controlling for the same individual and organisational factors as above: $b = 0.54$, $SE = 0.19$, $t = 2.91$, $p = 0.004$), and organisational policy (Model without controls: $b = 0.71$, $SE = 0.21$, $t = 3.35$, $p < 0.001$; Model with controls: $b = 0.52$, $SE = 0.20$, $t = 2.57$, $p = 0.01$) dimensions of ECO. There were no significant differences in OCBE across sectors ($ps > 0.40$).

5.3. Discussion

We find that those in occupational roles related to sustainability report a stronger Environmental Culture in their organisation. Therefore, Study 4 provides initial evidence that ECO is associated with everyday organisational realities (e.g., job role). However, these findings were obtained from a cross-sectional survey and therefore cannot provide evidence of causality between job roles and ECO.

The higher-level factor of industrial greenhouse gas emissions did not predict ECO. Therefore, ECO may be associated more so with organisational features that are closely related to, and salient to, employees such as everyday norms and practices. Moreover, an industry's emissions may not necessarily reflect the environmental commitment of its companies. For example, some industries like graphic design have inherently low emissions but this does not necessarily relate to organisations' environmental concern. Therefore, regardless of industry, ECO may be shaped by the extent to which everyday organisational features (such as job roles, communication, and infrastructure) emphasise environmental sustainability. In fact, some high emissions industries such as manufacturing and transportation may require greater emphasis on

sustainability in their day-to-day practices (and therefore stronger ECO) compared to low-emitting industries where employees' work is more tenuously related to causing climate change. However, within a specific industry, we expect that organisations with a higher ECO will expend more effort and resources to lower their impact on climate change, and their employees will act more pro-environmentally. Consistent with past research, employees in low and high emissions industries also did not differ in everyday workplace behaviours (OCBE) (Composto et al., 2023).

Unlike existing sustainability culture measures, ECO breaks down cultural differences into specific dimensions (i.e., organisational norms) that drive or deter behaviour. For example, our findings indicate that the government sector has a weaker environmental culture than the not-for-profit sector. This disparity arises because the government sector has lower prevalence of organisational policy and values relating to environmental sustainability. Similarly, we found that occupations related to sustainability foster a stronger ECO (than occupations unrelated to sustainability) because of greater leadership and management support, team support, organisational policy, and organisational pro-environmental values. By identifying these cultural differences, ECO points to potential interventions that can enhance organisational culture and drive workplace pro-environmental behaviours (e.g., implementing and publicizing pro-environmental policies, and communicating organisational commitment to environmental sustainability).

6. General discussion

The present research developed a framework and measure to understand a prominent source of societal influence on pro-environmental actions—individuals' organisations. Recognising that organisations often have competing goals and take limited and/or conflicting actions around environmental sustainability, we adopted an organisational culture approach to pose that an organisation's ability to drive pro-environmental behaviours may not be reflected in the isolated presence of behavioural drivers but is contingent on the extent to which it embeds coherent and consistent norms supporting environmental sustainability in its culture. The resultant ECO framework consisted of the specific norms that enable the organisation to drive pro-environmental action. Across four studies, we proposed dimensions of the ECO scale (Study 1), determined its factor structure (Study 2), finalised the scale and established its convergent, discriminant, and predictive validity

(Study 3), and assessed its relationship with workplace pro-environmental behaviours (Study 4).

6.1. The nature of the ECO scale

6.1.1. The structure of ECO

In Study 1, we initially probed 10 potential dimensions of ECO based on past literature and expert interviews. However, through exploratory and confirmatory factor analyses in Studies 2 and 3, we found that our proposed items coalesced into five dimensions—norms of leadership and management, teammates, feasibility within one's role, policies, and organisational values. A primary reason for this reduction in dimensions was that the “leadership and management” dimension subsumed the proposed dimensions of organisational communication, management commitment, transparency, and discussability. Although these practices have been identified as distinct dimensions in other behavioural domains such as ethical culture (Kaptein, 2008), our results indicate that in the domain of sustainability, employees do not differentiate between the management practices of communicating about environmental sustainability, modelling pro-environmental behaviours, observing employees' pro-environmental behaviours and providing channels to discuss environmental issues.

ECO is an organisation-level measure of the extent to which an organisation drives employees' pro-environmental behaviour. As such, its dimensions reflect practices relevant to everyday, employee-facing, decisions in organisations (e.g., how employees' job roles are structured, how supportive their managers are). ECO does not explicitly measure an organisation's broader strategic decisions (e.g., investment in fossil fuels, manufacturing practices etc.), although these may implicitly shape its dimensions. This distinction in ECO's scope is supported by Study 4 which finds that ECO is more strongly associated with day-to-day organisational realities (employees' job role) than the organisation's overall emissions (industrial emissions). Nonetheless, positive feedback loops likely exist between everyday practices and broader strategy. Enacting strategic decisions (e.g., targets to reduce carbon emissions) requires commensurate organisational policies (e.g., incentivising train vs air travel), and behavioural changes (e.g., employees begin making pro-environmental decisions both within and outside their occupational roles) (Zacher et al., 2023). A measure pertaining to everyday practices (i.e., ECO) therefore indicates whether: 1) high-level organisational decisions have filtered down to day-to-day practices across organisational levels, and 2) day-to-day practices have prepared members for, and supportive of, further strategic shifts.

Some of the resultant dimensions of ECO are similar to predictors identified in past models of workplace pro-environmental behaviours (Composto et al., 2023; Norton et al., 2015). However, ECO's cultural approach contends that their isolated presence in an organisation cannot explain the organisation's ability to foster pro-environmental action. Instead, the ECO scale measures the extent to which these factors are embedded in organisational culture. This means that they must be part of a culture which fosters environmental sustainability consistently across organisational levels, and coherently across relevant cultural norms. The extent to which an organisation's culture embeds these norms (i.e., the ECO score) in turn reflects the organisation's ability to drive pro-environmental behaviours and deter environmentally harmful behaviours. Consistent with this theorisation, Study 3 found that the ECO scale strongly predicts Organisational Citizenship Behaviours for the Environment and accounts for unique variance beyond widely recognised individual-level and organization-level predictors.

6.1.2. Convergence and differentiation from other measures

The ECO scale was convergent (i.e., positively related) with individual-level predictors of pro-environmental behaviour—climate change risk perceptions, environmental self-identity, altruistic and biospheric value orientations. This finding is consistent with the bi-directional relationship between organisational culture and individual

factors—member demands and values can aggregate into organisational norms (Schwartz et al., 2005; van Dierendonck, 2011), and these norms and practices may in turn impact members' personal values and behaviour (Wang et al., 2022; Wu & Paluck, 2020).

We also established ECO's discriminant validity—although positively related, ECO was significantly different from individual-level drivers of pro-environmental behaviour (e.g., environmental identity), measures of green organisational culture and green psychological climate. Primarily developed with a focus on management and corporate sustainability, existing measures operationalise sustainability culture as employee perceptions of general values, and/or the practices of a single organisational level (leadership or the “organisation” as an undifferentiated entity) (Kantabutra, 2021; Norton et al., 2014a, 2012b; Pham et al., 2018). ECO, in contrast, adds granularity and behavioural focus to these measures. ECO is informed by insights on workplace pro-environmental behaviours and is grounded in an organisational culture theory which explains workplace behaviour (e.g., related to safety and ethics) when it conflicts with other organisational goals (e.g., profit). Therefore, ECO not only assesses an organisation's current culture around environmental sustainability but also points to more specific features within the culture that are driving or hampering pro-environmental behaviours. In summary, ECO differs from existing measures of sustainability culture in neighbouring disciplines in terms of its focus (driving pro-environmental behaviours at work), level of analysis (more granular), and insights (specific normative patterns in the organisation that contribute to its current culture and can be modified through interventions).

6.1.3. Subscales of ECO

We suggest that the ECO scale be administered with the following objectives: 1) Gain a high-level assessment of organisational culture by averaging scores on all items, and 2) Gain information about how the organisation scores on various aspects of culture by averaging scores on each subscale. The latter can provide rich information on where to direct organisational interventions. We have practical, statistical, and theoretical reasons to recommend that use of subscales when interpreting ECO scores. Practically, breaking culture down into specific institutional norms can identify organisational aspects that require intervention to improve overall ECO. Statistically, as per bi-factor analyses (Study 3), ECO does not meet all criteria to be scored as a one-dimensional measure. Finally, theoretically, the five-dimension ECO framework incorporates diverse bodies of literature on organisational culture and determinants of pro-environmental behaviour, and is more nuanced (spanning various organisational levels). The strong positive correlations between ECO and other green organisational culture and climate measures (in Study 3) are also theoretically informative—they indicate that the different norms measured within the ECO scale coalesce and provide insight on the higher-level construct of organisational culture around environmental sustainability.

6.2. Implications for pro-environmental behavioural interventions

ECO can provide a blueprint for organisational interventions to drive pro-environmental behavioural transformations—it can identify the specific normative patterns within an organisation (e.g., norms of leadership and management support, policy prevalence etc.) that should be modified to drive members' pro-environmental actions. Despite robust evidence that individuals' behaviour is influenced by their social and structural contexts, most pro-environmental behaviour change interventions are “downstream”—targeted at individual-level decision-making processes (Hampton & Whitmarsh, 2023). Without commensurate “upstream” and “midstream” changes to the choice environment (i.e., providing more sustainable options), and structural elements (e.g., infrastructure, incentives, policies) respectively, downstream interventions are limited in their capacity to drive widespread behavioural change (Gardner & Stern, 1996; Hampton & Whitmarsh, 2023;

Verplanken & Wood, 2006). ECO enables researchers and practitioners to enact this necessary shift to interventions targeted at individuals' institutional context. Organisational interventions that are developed using this cultural approach can create positive feedback loops—changing relevant organisational norms can help change employee behaviours which may in-turn foster pro-environmental values and bottom-up influences on organisational culture (Olson & Stone, 2005).

6.3. Conceptual implications

Conceptually, to our knowledge, the ECO framework is one of the first efforts in environmental psychology to explain pro-environmental behaviours through a culture lens. Prominent in other disciplines (Harris & Crane, 2002a, 2002b) and behavioural domains (Kaptein, 2011; Reader et al., 2015), a cultural approach contends that behaviour may not be explained by isolated factors alone, but by the aggregate culture of individuals' social context. As such, ECO contributes to, and pushes, emergent efforts in environmental psychology to expand the explanation of pro-environmental action beyond individual psychological factors, and instead unpack the social and institutional context of decision-making (Sabherwal & O'Dell, 2023; Schmitt et al., 2020). By conceptualising organisational influence through a cultural lens, the framework also reflects wider social and economic priorities. Indeed, an organisation's culture is formed both by internal factors (e.g., employee demands and values) and societal trends (e.g., monetary incentives) (Schein, 1985). Consequently, modifying some dimensions of ECO (e.g., organisational policy and feasibility) may be aided by a shift in social and market forces.

6.4. Limitations and future directions

We measured individual level perceptions of ECO and how they relate to self-reported Organisational Citizenship Behaviours for the Environment (OCBE). These may be subject to biases such as selective access or attention to information and optimism about their organisation's actions. However, given our finding that perceptions of ECO strongly predict self-reported pro-environmental behaviours, potential misperceptions of ECO also provide an avenue for intervention.

Although establishing convergent, discriminant, and predictive validity, our analyses do not speak to the issue of inter-observer agreement or the extent to which various members of the same organisation agree on their assessment of ECO (Bajpai et al., 2015). This can be achieved by disseminating the ECO scale within a department and/or organisation and assessing inter-observer agreement. Moreover, ECO scores can be triangulated across methods (e.g., assessing whether scores on the self-report measure converge with more direct measurement of culture through textual analysis of reports and organisational communication). Therefore, future research can assess scale reliability and validity by disseminating the ECO scale within an organisation. Administering the ECO scale within an organisation can benefit from customisation to the context. To speak to the prototypical employee experience, the items make some assumptions that may not be applicable to all. For example, some items assume that employees have managers, others imply that employees have at least some care for the environment. We framed these items in line with culture measures in other domains such as ethical and safety culture that also make similar underlying assumptions (Kaptein, 2008; Mearns et al., 2013). Moreover, in Study 3, we conducted robustness analyses confirming the factor structure of ECO in a sub-sample that found at least 50 % of the items to be applicable to their case (See SI note 7). However, when administered in an organisational setting, these items can be tailored further (e.g., specifying line manager vs. senior manager in management questions).

Since self-report measures may be prone to issues of item framing, experimenter demand and social desirability (Robins et al., 2009), future research can also employ direct methods of assessing the five dimensions of ECO identified here. These methods can include

Natural-Language Processing and textual analysis of annual reports, meeting minutes, and employee feedback. Beyond individual behaviours, studies may also assess ECO's broader institutional (e.g., emissions reduction) and societal (e.g., willingness of new members to join the organisation) impacts.

Finally, our research was conducted on UK-wide convenience samples. Whereas the minimum recommended sample size for scale validation studies is 10 participants per item (Hinkin, 2005; MacCallum et al., 1999; Schwab, 1980), we recruited larger samples to allow for additional exploratory analyses and greater sample heterogeneity (in terms of income, occupation, age etc.). Our sample sizes were in line with contemporary disciplinary norms of scale validation studies in environmental psychology that tend to recruit 30–40 participants per item (e.g., Study 2 in Wright et al. (2020); (Cologna et al., 2024)). However, these practices raise critical questions about the differential access to large data samples, and resultant research outcomes, across diverse institutions, especially those with limited funding and those in the Global South (Gvirtz & Sabherwal, 2024). Moreover, although large and inclusive of various industries and work sectors, our samples provided limited (if any) insights about differences in ECO across departments, positions, professions, and contexts. Future research may assess ECO withing climate-relevant industries (such as the energy sector) and individuals (leaders and sustainability managers within organisations), and across cultural contexts (e.g., in the Global South).

CRedit authorship contribution statement

Anandita Sabherwal: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Ganga Shreedhar:** Writing – review & editing, Supervision, Resources, Methodology, Conceptualization. **Tom W. Reader:** Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Funding acquisition, Conceptualization.

Acknowledgements

We would like to thank students of MSc Organisational and Social Psychology at LSE, and the field experts we interviewed for sharing insights on early versions of the scale. We are also thankful to Dr Dario Krpan and Sabrina Paiwand for their advice on scale development and validation practices.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2025.102597>.

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