AN INSTITIÚID UM THAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

How well do economic games model collective climate action? A scoping review

Lucie Martin, Shane Timmons & Pete Lunn

ESRI Working Paper No. 823

March 2026

How Well do Economic Games Model Collective Climate Action? A Scoping Review.

Lucie Martin[1,2]* Shane Timmons[1,3] Peter D. Lunn[1,2]

[1] Economic and Social Research Institute (ESRI), Dublin, Ireland
[2] Department of Economics, Trinity College Dublin, Ireland
[3] School of Psychology, Trinity College Dublin, Ireland

* lucie.martin@esri.ie

Abstract: This study critically and constructively assesses how 'economic games' contribute to climate policy research via a pre-registered systematic scoping review of 165 sources. Researchers use economic games as empirical tools to measure cooperation while experimentally controlling the presence, absence or levels of potential influencing factors. This review covers multiple game structures, including public goods games, common pool resource problems and threshold games. It describes how, by simplifying trade-offs between individual and collective interests, economic games have been fruitful in advancing our understanding of relevant cooperative behaviour. However, because the climate crisis is a complex, multi-dimensional cooperation problem on a global scale, translating the empirical findings from this research to climate policy is not straightforward. Assessing the body of relevant research, the scoping review systematically evaluates the most significant challenges in aligning economic games with real-world climate policy problems. It identifies seven specific discrepancies between economic games and the context of climate policy and action: (1) Games usually begin at a neutral starting point with no pre-existing cooperation level or communication; (2) Game outcomes are often abstract or symbolic; (3) Games commonly do not involve cooperation towards a true public good; (4) Almost all games model cooperation as giving money to a common pot, or taking it from a common pot, not as refraining from harmful activity; (5) Games use salient, direct choices between private and public payoffs rather than avoidance of (often uncertain) externalities; (6) Games frequently focus on preventing a probabilistic catastrophe determined by a binary threshold, rather than altering a distribution of outcomes over time and space; (7) Games involve a single cooperative behaviour (giving or taking tokens) that does not reflect real-world heterogeneity of climate actions. The review considers the implications of these findings for policy, offers constructive suggestions for game design, and highlights new research questions that, if addressed, might increase the contribution of economic games to climate policy.

Keywords: climate, economic games, cooperation, collective action, free-rider problem

Policy insights:

- Researchers have used economic games to identify factors likely to boost cooperation to address climate change.
- This scoping review assists interpretation of these findings for policy by critically and constructively assessing the current body of research, analysing how games map onto real-world climate policy problems, helping to inform better inferences.
- The review identifies seven specific issues to consider when making inferences from economic games to policy contexts.
- The review suggests new research questions and game designs that can assist policymaking and make findings more relevant to specific climate policy problems.

1. Introduction

The climate crisis is a collective action problem on a global scale (Ostrom, 2010a): we would be collectively better off if we all cut our greenhouse gas emissions, but our individual incentives generally conflict with this collective goal. The consequent rising emissions are a pernicious externality that threatens the public good of a liveable climate, impacting billions of people (IPCC, 2023).

Social scientists have studied climate change as a collective action problem for decades, seeking to understand drivers of cooperation towards common climate goals. This is often done by using 'economic games' such as social dilemmas and public goods games, which consist of simplified situations (either in controlled experiments or field studies) where the common good conflicts with individual incentives. For example, in a public goods game, players decide how much of a private endowment to contribute to a common pot, which is then multiplied and redistributed equally regardless of each person's contribution. Such methods have strong advantages, as cooperation can be measured with experimental control over contextual factors. This paper offers an extensive scoping view of how economic games are deployed to study climate cooperation, providing a constructive critique and identifying new pathways for research.

Economic games have been fruitful in advancing our understanding of cooperative behaviour, showing that people often make sacrifices in pursuit of collective goals, but also frequently 'free-ride' or withdraw cooperation (Ledyard, 1995; Ostrom, 2010b). Cooperation varies across contexts depending on communication, comprehension, group identity, opportunities for punishment, leadership, inequality, and involvement in rule-setting, among other factors (Fehr & Schurtenberger, 2018; Martin et al., 2024). For example, people are more willing to cooperate when they expect others to cooperate and can hold others accountable via punishment (Fehr & Gächter, 2000; Fischbacher et al., 2001).

However, translating findings from economic games to climate policy is not straightforward. Economic games use simplified models of the more complex real-world environment that they seek to imitate and, therefore, the implications of empirical findings depend on how well these models map to the policy context. This policy context is particularly complex in the case of climate change, given the global nature of the problem, the multiple sources of emissions, the habitual and embedded nature of relevant behaviours, the differences between actors and the uncertainty of outcomes. Nevertheless, many researchers take on the challenge of deploying economic games as models for understanding climate action and improving climate policy. The present study documents how this challenge is being met.

This study critically assesses how economic games are being used in climate research via a pre-registered systematic scoping review of 165 sources. It identifies challenges in aligning economic games with real-world climate policy problems and considers potential solutions. In doing so, the study makes three contributions. First, it informs evaluations of how evidence from economic games can guide climate cooperation. Second, it provides input for designing realistic economic games that map better to climate action. Lastly, by identifying current limitations in how well economic games model climate policy problems, this review locates new and, we think, urgent research questions.

The study builds particularly on previous research aiming to tailor economic games to climate problems, such as 'threshold games' (Milinski et al., 2008), where players must collectively contribute enough to prevent a catastrophe that afflicts all players. The current study looks at the broader canvass, reviewing how different game types and features affect external validity across many dimensions of real-world climate problems, including some not addressed in any existing games. To our knowledge, while there

are reviews that aggregate insights from climate games (Jacquet, 2015; Andrews et al., 2024; Constantino et al., 2024), this is the first systematic assessment of how these games model climate cooperation.

2. Method

This study builds on a recent review of cooperation factors in climate collective action problems (Martin et al., 2024), by focusing exclusively on studies that use economic games to study climate cooperation.

The pre-registered study protocol is available at: https://osf.io/myk5z.[1] The choice of a scoping review was based on how large and diverse the evidence base was expected to be, spanning across disciplines (e.g., economics, environmental science), policy areas (e.g., climate treaties, energy, agriculture), and methods. Our review method was based on PRISMA-ScR standards (Peters et al., 2020; Tricco et al., 2018) and guidance on rapid Cochrane reviews (Garrity et al., 2021) for feasibility purposes.

In line with best practice, the review followed a pre-registered, three-step process. First, we systematically searched five databases (Scopus, Web of Science, ScienceDirect, JSTOR, and Google Scholar) for English-language studies published since 2000 (including working papers) that examine behaviour in climate collective action problems (full list of keywords used available in protocol). We also searched the bibliographies of included studies.[2] Second, we screened the 1,266 unique results against our selection criteria, using the software Covidence. This included an initial screening based on the title and abstract, and then further screening of retained studies based on their full text. For this study, we applied an additional (not pre-registered) criterion: 'Does the study use an economic game?'. Figure 1 shows a PRISMA diagram (see Page et al., 2021) summarising these steps. The search was originally run in November 2023, then updated in December 2025 to search for new publications.[3]

[Figure 1 here]

For the third step of the process, we extracted data from the 165 included studies (full list in Appendix A), using a data charting plan (shown in Appendix B), recording features such as the type of game used or the use of incentives. Following this systematic process, we critically reviewed the features of studies on climate cooperation that use economic games. We discuss our findings in the next section.

3. Results

3.1. How are games used to study climate cooperation?

A total of 165 studies[4] were included in the review. Of these, 158 studies were empirical games, and the other 7 studies were theoretical or review studies (including book chapters and one meta-analysis).

[1] This protocol covers both games and non-games studies as it is part of a broader review on human behaviour in climate collective action problems (see Martin et al., 2024), but the present study includes economic games only.
[2] Applies to the first search only, see next footnote.
[3] A first search was conducted in November 2023 on all five databases. A second, updated search was conducted in December 2025 on the largest two purpose-built databases only (Web of Science and Scopus, including pre-prints). In this second search, we added a search criteria for sources to include 'game' or 'experiment' (or their plurals). The second search provided 31 out of the 165 sources in our study.
[4] Within these studies, categories often overlap (e.g., a single study using several game types), hence there are discrepancies between numbers per category and total number of studies throughout the results section.

3.1.1. Game types

Public goods games were commonly used to model climate dilemmas (61 studies, including modified versions such as 'public bad' games). In the basic version (Thielmann et al., 2021), players receive a monetary endowment and decide how much of it to contribute to a common pot, which is then multiplied and redistributed equally among all players. The tension between the collective incentive to contribute the full endowment and the individual incentive to free-ride generates the social dilemma.

Threshold games (or 'collective-risk social dilemmas') are a modified version of the public goods game developed specifically to model climate dilemmas (Milinski et al., 2008), and they were the most common game in the review (67 studies). In this game, the aim is to reach a target amount of contributions into the common pot. If the target is not reached, a probabilistic 'catastrophe' will destroy everyone's endowments. Groups frequently approach but fail to attain the target. This design aims to model the negative consequences of climate change.

Common-pool resource games were used in another 23 studies. In these games, players decide whether and how much of a common resource to take for themselves (i.e., the starting point is a fully-funded common pot). Taking too much reduces the amount available to others and risks depleting the pool past the point where it will not replenish itself. These games often model 'tragedies of the commons' in contexts such as forestry, fishing, or fossil fuel extraction (e.g., Dengler et al., 2018).

Among the 16 studies that used economic games over than these three (or their variants), most used games that measure social and fairness preferences, such as dictator games (where one player decides how much of their endowment to split with a recipient, e.g., Bosetti et al., 2022), ultimatum games (where the recipient can accept or reject the split, and rejection leads to both player receiving nothing, e.g., Anderson et al., 2017), or trust games (where one player decides how much to send to a recipient, who receives a multiple of this amount and then decides how much to send back, e.g., Paul et al., 2016).

3.1.2. Game topics

Most games focused on climate change mitigation challenges (132 studies), while a minority were about climate adaptation (15 studies), or about both and/or geoengineering (16 studies). While most games (112 studies) were about climate change in general (e.g., players contribute to a 'climate fund'), many also discussed implications for international climate treaties, or modelled their games as treaty negotiations (53 studies, with significant overlap with 'general' topics). A minority of studies (38 games) focused on a specific policy area, for example agriculture and fisheries, land-use, energy, or transport.

The countries that the games focused on are also notable, with games spanning countries such as China, (biggest worldwide emitter, 12 studies); the USA (highest worldwide per-capita emissions, 27 studies); and Germany (highest EU emitter, 45 studies) (Friedlingstein et al. 2023). Studies in the global South (e.g., five games in Colombia) were more likely to use common-pool resource games.

Finally, the behavioural factors that the games investigated varied broadly, with examples including expectations (Barrett & Dannenberg, 2017), reciprocity (Safarzynska, 2017), punishment (Jiang et al., 2023), communication (Tavoni et al., 2011), identity (Sadowski et al., 2015), inequality (Burton-Chellew et al., 2013), leadership (Helland et al., 2018), and rules and systems (Barrett & Dannenberg, 2016), among other factors of interest (see Martin et al., 2024, for an in-depth discussion of games' findings).

3.1.3. Game contexts

All games were incentivised, with players generally earning money based on their decisions. The most common study setting was the laboratory with 109 studies, followed by 24 online or survey studies and 15 field or lab-in-field studies. The remaining 10 studies were carried out in multiple settings.

The type of participants who played the games varied. Most games (92 studies) used student samples only, and 16 studies used a mix of students and other samples. In addition, 38 games used general public samples (of these, 15 also used students). 21 studies used samples from populations of interest, such as climate policy-makers or people living or working in climate-affected sectors or communities.

Sample sizes also varied among studies. While information about sample size was not always reported in a comparable manner, studies typically used several hundred participants (with about half of the games involving fewer than 200 participants), while 9 studies, mostly online, used over 1,000 participants.

3.2. Do game designs reflect real-world climate decisions?

Games provide insight into how people behave in social dilemmas, but there are challenges to drawing specific implications for climate policy, because of limitations with how they model climate issues. Here we present seven such limitations.

3.2.1. Games start from a neutral point

Most games started from a neutral equilibrium point with no pre-set level of cooperation (148 studies) or any communication between players (141 studies). However, in real-life climate dilemmas, people have the context of an existing equilibrium, which is the current (insufficient) level of climate collective action. Most studies used games with multiple rounds (109 studies), successive games (43 studies), or both (previous figures overlap), so players could typically observe others' cooperation and adjust their own accordingly. However, the first decision, which influences all future decisions, was made without this information or any relationship between players, unlike real-world climate decisions.

People are generally worried about climate change and see it as a serious threat (UN Development Programme, 2024), which suggests they understand that current cooperation is insufficient. This is likely to affect their own cooperation as most people are 'conditional cooperators' who decide what to do based on what they expect others to do (Fischbacher et al., 2001). Compounding the issue, there is evidence that people significantly underestimate others' support for climate action (Andre et al., 2024). Allowing players to communicate can help to solve this issue and increase cooperation (Tavoni et al., 2011), but few games involved communication opportunities (17 studies, mostly testing pledges or other formal cooperative signals in games designed to imitate climate treaty negotiations), unlike many real-world climate dilemmas where local and even international communication (e.g., between governments, online, etc.) is possible.

Some games did not start from a neutral starting point. Gallier et al. (2017) found that adding ambitious pre-set but non-binding default contribution levels can help to achieve climate targets. Others studied the effect of forced minimum contributions (e.g., Abraham et al., 2025). Chang et al. (2021) and Bosetti et al. (2022) demonstrated inter-generational reciprocity by showing new players the actions of previous players. Some games introduced a 'bad' starting point by highlighting climate deterioration (Liu & Hao,

2020), manipulating atmospheric quality (Castro-Santa et al., 2024), or framing collective action as moving from polluting to green industries (Gerlagh & van der Heijden, 2024) with mixed effects. Others introduced a 'good' starting point through initial games that build trust (Lo Iacono et al., 2024) or by providing information about existing cooperative actions of local institutions (Gleue et al., 2025). The fact that some of these manipulations alter cooperation indicates the importance of the initial conditions.

3.2.2. Climate issues in games are abstract

About half of the studies in the review (83 studies) described the game to participants as being about climate change, but a significant share (51 studies) used a neutral framing (framing was unspecified for a further 24 studies), sometimes arguing that this is due to the sensitivity of the topic (Branas-Garza et al., 2022). While we did not find any studies comparing neutral and climate frames directly, people may behave differently if they know the outcome is climate change. For example, it could trigger psychological factors specific to climate change (attitudes, expectations, risk perceptions, beliefs, etc.) that are not fully over-ridden by the game's incentive structure.

In addition, most games had a generic goal of stopping climate change (112 studies) and/or informing climate treaties (53 studies), with participants often contributing to a single, abstract, overarching fund the size of which determined everyone's outcomes. This is a large simplification of the multiple levels (local, national, global) and forms of climate action, which are likely to require a polycentric approach, that is, one where units across scales and locations are working together and learning from each other, rather than a monocentric hierarchy (Ostrom, 2010a; Milinski & Marotzke, 2022).

By contrast, 38 games focused on explicit policy areas, allowing the game to be framed around common real-life climate dilemmas, such as transport choices (e.g., Marek, 2018), energy use (e.g., Skatova et al., 2016; 2017), local energy schemes (e.g., Milinski & Marotzke, 2022, who also found that using local sub-goals instead of a global goal promotes cooperation), and farming, fishing, or forestry practices (e.g., Mina et al., 2016; Fan et al., 2019; Lefebvre et al., 2020; Zhang et al., 2021), although there was no game that compared the effects of using concrete and neutral frames. Overall, there are significant evidence gaps regarding many (potentially impactful) real-world forms of collective climate action, beyond support for abstract pro-climate policy.

3.2.3. Public good provision in games is limited

Most games (150 studies) studied a collective benefit such as a liveable climate or a renewable resource. This benefit was typically conveyed via additional private payoffs at the end of the game, for example by redistributing a common fund, rather than by providing a true 'public good', likely because doing so creates additional challenges for study design. However, overcoming this challenge would be beneficial to ensure that games reflect the real-world provision of climate-related public goods.

One way to provide public goods in climate games is to use players' contributions to fund climate efforts: 35 studies had real-world climate outcomes, such as buying carbon credits (e.g., Berger and Wyss, 2021; Wyss et al., 2021; Weimann et al., 2022), donating to climate charities (e.g., Tarditi et al., 2020; Klein et al., 2017; 2022), publishing climate ads (e.g., Milinski et al., 2006; 2016; Jacquet et al., 2013; Marotzke et al., 2020), or planting trees (e.g., Vicens et al., 2018).

While there is to our knowledge no study directly testing the effect of playing the same game with and without a real-world outcome, two studies (Goeschl et al., 2020; and Roggenkamp, 2025) compared participants' cooperation in economic games with their carbon credit donations in a separate task and found that in-game cooperation may not be a good predictor of climate public good provision.

3.2.4. People cooperate in games by giving money

Most games were 'giving' games where players contributed to a common goal (107 studies); a minority (31 studies) were 'taking' games involving (refraining from) exploiting a common resource. A further 16 studies involved both giving and taking, and the remainder involved neither. While some real-world climate efforts involve giving (e.g., charity donations, buying expensive green technologies), many impactful climate behaviours involve limiting private benefits that create emissions (e.g., flying, using energy, buying high-emissions products). This matters for two reasons. Firstly, cooperation levels may vary between taking and giving: Cloos et al. (2025) compared 'give' and 'give-and-take' threshold games and found tentative evidence that adding a 'take' option makes it more difficult to reach the common target. Secondly, neither giving nor taking maps accurately onto many relevant behaviours. 'Giving' games frame cooperation as action (giving to the pool), while many climate efforts involve inaction (not driving, not eating meat). 'Taking' games do require inaction (not taking from the pool), but the action not taken is to consume something that belongs not to the individual but to everyone. Refraining from a behaviour that generates emissions is subtly, but perhaps importantly, different: the behaviour has negative effects for others but does not involve taking ownership of common property. For example, failing to upgrade an inefficient boiler does not violate ownership boundaries (at least not obviously).

Almost all games also used monetary tokens to represent cooperation (exceptions included Shogren et al., 2021; and Schütze & Wichardt, 2025). In reality, climate cooperation often involves non-monetary dimensions, such as time, effort, or convenience (e.g., when eating a plant-based diet or avoiding flying). This matters if people make different decisions when the costs they face are not (only) monetary. For example, Schütze & Wichardt (2025) found that effort-based public goods games result in lower contributions and more free-riding than standard (monetary) public goods games.

3.2.5. Cooperation in games is a direct, salient choice

In most games (101 studies), players' decisions directly targeted climate change, for example by giving to a climate fund. Fewer studies modelled climate outcomes as an externality of players' decisions (38 studies, often common-pool resource games), with the remainder using either both or neither framing. This pattern is at odds with real-world climate outcomes where, excluding treaty negotiation contexts, greenhouse gas emissions are an externality created by private actions (such as industry production decisions or everyday travel or dietary choices) rather than being the direct object of decision-making. This was addressed in studies such as Pevnitskaya & Ryvkin's (2013) 'public bad' game, where players decided on production levels that generate both private revenue and emissions, or Fan et al. (2019)'s common-pool resource game, where farmers made fertiliser use decisions with pollution externalities.

In addition, for players in economic games, private payoffs depend clearly on cooperation, because the collective outcome of climate change is always salient, even as an externality. Indeed, players are often tested via a screening question to ensure that they understand the payoffs (e.g., seminal paper by Kelley & Grzelak, 1972). In contrast, in the real world people are often unaware of which behaviours create climate externalities, or of the relative sizes of such externalities, for example in the context of dietary choices (Camilleri et al., 2019; Timmons et al., 2024). Thus, even in games that frame climate change as

an externality (such as Berger & Wyss' 2021 carbon game, where people weigh private financial benefits with real emissions reduction opportunities), decision-making may be distorted by the salience and precision of the externality. More broadly, it is not clear whether people are able to recognise that climate change is a collective action problem (i.e., that it involves conflict between individual and collective incentives and thus requires cooperation to be solved), as there is little research on this topic despite evidence that such awareness can promote cooperation (discussion in Martin et al., 2024).

3.2.6. The goal in games is to prevent a catastrophe

In most games, players aimed to avoid a catastrophe at the end of the game by reaching a collective contribution threshold (70 studies). Fewer games focused on splitting gains (42 studies) or splitting gains while avoiding losses (29 studies). By modelling the risk of an eventual loss, threshold games may have higher external validity than public goods games (Jacquet, 2015), especially where the aim is to model international climate treaties in which countries pledge to stay under an emissions threshold (e.g., Barrett & Dannenberg, 2016; Feige et al., 2018; Greiff & Kempa, 2025; Grimalda et al., 2022; Hagel et al., 2017). That said, in the real world, climate cooperation and negative impacts from climate change are already occurring. Moreover, threshold games often involve fixed, binary thresholds so cooperation succeeds or fails at a known level, except in the few studies that focus on threshold uncertainty (e.g., Barret & Dannenberg, 2012; 2014a; 2014b; Dannenberg et al., 2015), yet appropriate real-world emissions targets are contestable. More generally, threshold games may not be well-suited to understand individual-level climate cooperation, which is remoter still from certain and salient thresholds.

Additionally, compared with economic games, people's evaluation of catastrophes (or gains, or losses) may be influenced by the delayed effects of emissions, as often it is either the future self or future generations who will experience catastrophes. Several studies have incorporated delayed or multi-generational effects (e.g., Jacquet et al., 2013; Aaldering et al., 2024; Tahzeeda, 2025). For example, Ghidoni et al.'s (2017) public bad game delayed emissions effects, while Bosetti et al. (2022) used successive dictator games to model how future generations cannot control what is handed to them by previous generations. Similarly, climate change effects are likely to be geographically differential, which may also distort evaluations of catastrophic impacts. In general, unlike game payoffs, real-world payoffs are often not known, salient, or accurately perceived.

3.2.7. People in games all contribute in the same way

Some games incorporated heterogeneity. For example, 41 studies involved wealth inequality between players, or inequality in climate change effects. This is useful to represent inequality between countries (e.g., Milinski et al., 2011) and to test how it affects cooperation (e.g., Malthouse et al., 2023). However, another dimension of heterogeneity is missing. In games, all players cooperate in the same way, by giving (or not taking) monetary tokens, but in real-world climate dilemmas, different groups are expected to cooperate in many different ways: urban residents by driving less, farmers by switching to greener production methods, and so on. In other words, climate cooperation can take place via multiple actions on many different, nested, overlapping levels (Ostrom, 2010a; see also Milinski & Marotzke's 2022 nested game).

This heterogeneity of actions may influence cooperation. People's willingness to cooperate depends on their perceptions of others' willingness (Fischbacher et al., 2001), which they often underestimate (e.g., Andre et al., 2024). Perceptions of others' climate efforts may be further affected if they consist of

actions undertaken in different or unfamiliar domains relative to the individual's own efforts (e.g., food vs. energy) as part of the same collective action. Such perceptual barriers may harm cooperation. Even within one domain, cooperation can take different forms (e.g., conserving energy vs. installing solar panels). Heterogeneity also creates potential for spillovers: there is to our knowledge no evidence on how people's experiences of free-riding or cooperation in one context (such as air travel) might impact their choices in another context (such as energy use) or at different levels in one context (such as personal travel choices vs. flight tax support).

4. Discussion

The study of economic games has been instrumental to current understanding of when people are more likely to cooperate to reach a collective goal. Our pre-registered review of 165 studies highlights challenges in mapping these games onto climate policy problems. The specific issues identified include: games typically begin at a neutral starting point with no pre-existing cooperation level or communication; the outcomes of games are often abstract or symbolic; games generally do not involve cooperation towards a true public good (with exceptions such as buying carbon credits); games model cooperation as giving money to a common pot (most commonly) or taking it from a common pot (less commonly), not as refraining from activity; games use salient, direct choices between private and public payoffs rather than avoidance of (often uncertain) externalities; games frequently focus on preventing probabilistic climate events determined by a binary threshold; payoffs in games typically do not model the distribution of outcomes over time and space; and games involve a single cooperative behaviour (giving or taking tokens) that does not reflect real-world heterogeneity of climate actions.

These findings can help policy-makers to evaluate evidence from existing games. A useful rule of thumb when seeking to apply such evidence to a specific policy problem is to ask: 'Does this game include the same basic incentive and information structure as the policy problem?'. The current review should assist in identifying potentially important departures. It is then a matter of judgement as to how much these departures matter and, ultimately, what weight to give the empirical findings. Evidence from different game types may also map onto different problems. Threshold games map well onto treaty negotiations, common-pool resource games replicate unsustainable consumption and production patterns, and public goods games may apply best to local climate collective action problems with salient collective gains (e.g. local shared energy schemes). Each of the different features of the array of economic games fit some climate problems better than others.

In identifying factors that are missing from economic games but potentially important for climate cooperation, the review also has constructive implications for the design of new, more realistic games. Incorporating variation in the initial conditions of games could significantly improve external validity. There is a straightforward need to test whether some of the challenges listed above meaningfully affect cooperation, including for example the role of game frames (neutral or climate-focused, generic or specific policy area, symbolic or real-world outcome). In addition, incorporating realistic features such as heterogeneity could answer new research questions, such as whether people recognise others' cooperation when it looks different than their own, or whether experiences in one domain spill over to affect cooperation in other domains. Finally, economic games are arguably under-utilised for studying outcomes that are not abstract or treaty negotiations. Much might be gained from tailoring game designs to map onto the everyday climate dilemmas faced by most of the population, such as travel, energy and food choices, or policy support.

This study naturally has some limitations. Although we pre-registered the study and used a systematic approach, we also used rapid review methods for feasibility reasons. In addition, it is possible that our search terms missed important relevant keywords (although we searched bibliographies to help limit this issue). Overall, we cannot claim that our review covers every instance of using games to study behaviour in climate dilemmas. Nevertheless, we uncovered consistent patterns across a large number of studies that would be unlikely to be altered meaningfully by the inclusion of a small number of additional studies.

In conclusion, this study located and reviewed 165 studies that used economic games to investigate behaviour in climate collective action problems. While these games provide many insights on potential drivers of climate cooperation, the review identified significant challenges in mapping their design and features onto real-world climate dilemmas. This has implications both for policy-makers (and others) seeking to use evidence from games to inform climate policy or promote climate action, and for researchers seeking to design realistic and externally valid climate games. Solutions to bridge the gap between the evidence base and policy needs may include carefully matching existing game designs to policy problems that share similar features, incorporating more realistic features in new games, and tailoring games to everyday climate decisions across policy areas.

Declaration of interest statement
The authors declare that they have no conflicts of interest.

References

Aaldering, H., Arora, P., & Bohm, R. (2024). Promoting prosociality toward future generations by tailoring to group-based social preferences. *Journal of Environmental Psychology, 98*, 102387.

Abraham, D., Glejtkova, K., & Krcal, O. (2025). The hidden costs of imposing minimum contributions to a global public good. *Ecological Economics, 227*, 108346.

Anderson, B., Bernauer, T., & Balietti, S. (2017). Effects of fairness principles on willingness to pay for climate change mitigation. *Climatic Change, 142*, 447-461.

Andre, P., Boneva, T., Chopra, F., & Falk, A. (2024). Globally representative evidence on the actual and perceived support for climate action. *Nature Climate Change, 14*(3), 253-259.

Andrews, T. M., Delton, A. W., & Kline, R. (2024). *Climate games: experiments on how people prevent disaster*. University of Michigan Press.

Barrett, S., & Dannenberg, A. (2012). Climate negotiations under scientific uncertainty. *Proceedings of the National Academy of Sciences, 109*(43), 17372-17376.

Barrett, S., & Dannenberg, A. (2014a). Negotiating to avoid “gradual” versus “dangerous” climate change: An experimental test of two prisoners' dilemmas. In *Toward a New Climate Agreement* (pp. 61-75). Routledge.

Barrett, S., & Dannenberg, A. (2014b). Sensitivity of collective action to uncertainty about climate tipping points. *Nature Climate Change, 4*(1), 36-39.

Barrett, S., & Dannenberg, A. (2016). An experimental investigation into ‘pledge and review’in climate negotiations. *Climatic Change, 138*, 339-351.

Barrett, S., & Dannenberg, A. (2017). Tipping versus cooperating to supply a public good. *Journal of the European Economic Association, 15*(4), 910-941.

Berger, S., & Wyss, A. M. (2021). Measuring pro-environmental behavior using the carbon emission task. *Journal of environmental psychology, 75*, 101613.

Bosetti, V., Dennig, F., Liu, N., Tavoni, M., & Weber, E. U. (2022). Forward-looking belief elicitation enhances intergenerational beneficence. *Environmental and Resource Economics, 81*(4), 743-761.

Branas-Garza, P., Cabrales, A., Espinosa, M. P., & Jorrat, D. (2022). The effect of ambiguity in strategic environments: an experiment. arXiv preprint arXiv:2209.11079.

Burton-Chellew, M. N., May, R. M., & West, S. A. (2013). Combined inequality in wealth and risk leads to disaster in the climate change game. *Climatic change, 120*, 815-830.

Camilleri, A. R., Larrick, R. P., Hossain, S., & Patino-Echeverri, D. (2019). Consumers underestimate the emissions associated with food but are aided by labels. *Nature Climate Change, 9*(1), 53-58.

Castro-Santa, J., Moros, L., Exadaktylos, F., & Mantilla, C. (2024). Early climate mitigation as a social dilemma. *Journal of Economic Behavior & Organization, 224*, 810-824.

Chang, C. C., Kristensen, N. P., Nghiem, T. P. L., Tan, C. L., & Carrasco, L. R. (2021). Cooperating with the future through natural resources restoration. *Sustainability Science, 16*, 1285-1293.

Cloos, J., Greiff, M., & Kempa, K. (2025). The effect of exploiting the public good on climate cooperation: evidence from a collective-social risk dilemma experiment. *Environment, Development and Sustainability*, 1-20.

Constantino, S., Nichols, K. L., Matt-Navarro, J., Doiron, M., D'Adda, G., & Weber, E. (2024). On the Predictive Power of Economic Preferences Assessed in the Lab for Environmental Behavior: A Qualitative Synthesis and Meta-Analysis. Available at SSRN 4839937.

Dannenberg, A., Löschel, A., Paolacci, G., Reif, C., & Tavoni, A. (2015). On the provision of public goods with probabilistic and ambiguous thresholds. *Environmental and Resource economics, 61*, 365-383.

Dengler, S., Gerlagh, R., Trautmann, S. T., & Van De Kuilen, G. (2018). Climate policy commitment devices. *Journal of Environmental Economics and Management, 92*, 331-343.

Fan, L., Yuan, Y., Ying, Z., Lam, S. K., Liu, L., Zhang, X., ... & Gu, B. (2019). Decreasing farm number benefits the mitigation of agricultural non-point source pollution in China. *Environmental Science and Pollution Research, 26*, 464-472.

Fehr, E., & Gächter, S. (2000). Cooperation and punishment in public goods experiments. *American Economic Review, 90*(4), 980-994.

Fehr, E., & Schurtenberger, I. (2018). Normative foundations of human cooperation. *Nature Human Behaviour*, 2(7), 458-468.

Feige, C., Ehrhart, K. M., & Krämer, J. (2018). Climate negotiations in the lab: A threshold public goods game with heterogeneous contributions costs and non-binding voting. *Environmental and Resource Economics, 70*, 343-362.

Fischbacher, U., Gächter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics letters, 71*(3), 397-404.

Friedlingstein, P., O'Sullivan, M., Jones, M. W., Andrew, R. M., Bakker, D. C. E., Hauck, J., ... & Zheng, B. (2023). Global Carbon Budget 2023. *Earth System Science Data, 15*(12), 5301–5369. URL: https://essd. copernicus. org/articles/15/5301.

Gallier, C., Kesternich, M., Löschel, A., & Waichmann, I. (2017). Ratchet up or down? An experimental investigation of global public good provision in the United Nations Youth Associations Network. *CAWM Discussion Paper*. https://www.wiwi.uni-muenster.de/mep/en/research/publications/133687

Garritty, C., Gartlehner, G., Nussbaumer-Streit, B., King, V. J., Hamel, C., Kamel, C., ... & Stevens, A. (2021). Cochrane Rapid Reviews Methods Group offers evidence-informed guidance to conduct rapid reviews. *Journal of clinical epidemiology, 130*, 13-22.

Gerlagh, R., & van der Heijden, E. (2024). Going green: Framing effects in a dynamic coordination game. *Journal of Behavioral and Experimental Economics, 108*, 102148.

Ghidoni, R., Calzolari, G., & Casari, M. (2017). Climate change: Behavioral responses from extreme events and delayed damages. *Energy Economics, 68*, 103-115.

Gleue, M., Luigs, T., & Ziegler, A. (2025). The relevance of non-state climate protection activities as motivation for individual climate protection: Results from a framed field experiment. *Resource and Energy Economics, 81*, 101473.

Goeschl, T., Kettner, S. E., Lohse, J., & Schwieren, C. (2020). How much can we learn about voluntary climate action from behavior in public goods games?. *Ecological Economics, 171*, 106591.

Greiff, M., & Kempa, K. (2025). Avoiding catastrophic climate change: Heterogeneous abatement costs and voting on redistribution in a threshold public good experiment. *Journal of Economic Behavior & Organization, 236*, 107067.

Grimalda, G., Belianin, A., Hennig-Schmidt, H., Requate, T., & Ryzhkova, M. V. (2022). Sanctions and international interaction improve cooperation to avert climate change. *Proceedings of the Royal Society B, 289*(1972), 20212174.

Hagel, K., Milinski, M., & Marotzke, J. (2017). The level of climate-change mitigation depends on how humans assess the risk arising from missing the 2 C target. *Palgrave Communications, 3*(1), 1-7.

Helland, L., Hovi, J., & Sælen, H. (2018). Climate leadership by conditional commitments. *Oxford Economic Papers, 70*(2), 417-442.

IPCC (2023). Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. doi: 10.59327/IPCC/AR6-9789291691647.001

Jacquet, J. (2015). Experimental insights: testing climate change cooperation in the lab. *Social Research: An International Quarterly, 82*(3), 637-651.

Jacquet, J., Hagel, K., Hauert, C., Marotzke, J., Röhl, T., & Milinski, M. (2013). Intra-and intergenerational discounting in the climate game. *Nature Climate Change, 3*(12), 1025-1028.

Jiang, L. L., Chen, Z., Perc, M., Wang, Z., Kurths, J., & Moreno, Y. (2023). Deterrence through punishment can resolve collective risk dilemmas in carbon emission games. *Chaos: An Interdisciplinary Journal of Nonlinear Science, 33*(4).

Kelley, H. H., & Grzelak, J. (1972). Conflict between individual and common interest in an Nperson relationship. *Journal of Personality and Social Psychology, 21*(2), 190.

Klein, S. A., Hilbig, B. E., & Heck, D. W. (2017). Which is the greater good? A social dilemma paradigm disentangling environmentalism and cooperation. *Journal of Environmental Psychology, 53*, 40-49.

Klein, S. A., Horsten, L. K., & Hilbig, B. E. (2022). The effect of environmental versus social framing on pro-environmental behavior. *Journal of Environmental Psychology, 84*, 101897.

Ledyard, J. O. (1995). Public goods: some experimental results. Chapter 2 in *Handbook of Experimental Economics* (J. Kagel & A. Roth, Eds.). Princeton: Princeton University Press.

Lefebvre, M., Midler, E., & Bontems, P. (2020). Adoption of environment-friendly agricultural practices with background risk: experimental evidence. *Environmental and Resource Economics, 76*, 405-428.

Liu, C. J., & Hao, F. (2020). The impact of social and ecological factors on environmentally responsible behavior. *Journal of Cleaner Production, 254*, 120173.

Lo Iacono, S., Sonmez, B., & Fairbrother, M. (2024). The effect of trusting contexts in social dilemmas with collective and individual solutions. *Scientific Reports, 14*(1), 26048.

Malthouse, E., Pilgrim, C., Sgroi, D., & Hills, T. T. (2023). When fairness is not enough: The disproportionate contributions of the poor in a collective action problem. *Journal of Experimental Psychology: General, 152*(11), 3229.

Marek, E. M. (2018). Social learning under the labeling effect: Exploring travellers' behavior in social dilemmas. *Transportation research part F: traffic psychology and behaviour, 58*, 511-527.

Marotzke, J., Semmann, D., & Milinski, M. (2020). The economic interaction between climate change mitigation, climate migration and poverty. *Nature Climate Change, 10*(6), 518-525.

Martin, L., Timmons, S., and Lunn, P. (2024). Encouraging cooperation in climate collective action problems. *Environmental Protection Agency Behavioural Insights Series No. 3*. https://www.epa.ie/publications/monitoring--assessment/climate-change/encouraging-cooperation-in-climate-collective-action-problems.php

Milinski, M., Hilbe, C., Semmann, D., Sommerfeld, R., & Marotzke, J. (2016). Humans choose representatives who enforce cooperation in social dilemmas through extortion. *Nature Communications, 7*(1), 10915.

Milinski, M., & Marotzke, J. (2022). Economic experiments support Ostrom's polycentric approach to mitigating climate change. *Humanities and Social Sciences Communications, 9*(1), 1-9.

Milinski, M., Röhl, T., & Marotzke, J. (2011). Cooperative interaction of rich and poor can be catalyzed by intermediate climate targets: A letter. *Climatic change, 109*, 807-814.

Milinski, M., Semmann, D., Krambeck, H. J., & Marotzke, J. (2006). Stabilizing the Earth's climate is not a losing game: Supporting evidence from public goods experiments. *Proceedings of the National Academy of Sciences, 103*(11), 3994-3998.

Milinski, M., Sommerfeld, R. D., Krambeck, H. J., Reed, F. A., & Marotzke, J. (2008). The collective-risk social dilemma and the prevention of simulated dangerous climate change. *Proceedings of the National Academy of Sciences, 105*(7), 2291-2294.

Mina, J. S. A., Fernández, D. A. R., Ibarra, A. A., & Georgantzis, N. (2016). Economic behavior of fishers under climate-related uncertainty: Results from field experiments in Mexico and Colombia. *Fisheries Research, 183*, 304-317.

Ostrom, E. (2010a). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change, 20*(4), 550-557.

Ostrom, E. (2010b). Analyzing collective action. *Agricultural economics, 41*, 155-166.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., 56 Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71.

Paul, C. J., Weinthal, E. S., Bellemare, M. F., & Jeuland, M. A. (2016). Social capital, trust, and adaptation to climate change: Evidence from rural Ethiopia. *Global Environmental Change, 36*, 124-138.

Peters, M. D., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., ... & Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI evidence synthesis, 18*(10), 2119-2126.

Pevnitskaya, S., & Ryvkin, D. (2013). Environmental context and termination uncertainty in games with a dynamic public bad. *Environment and Development Economics, 18*(1), 27-49.

Roggenkamp, H. (2025). A comment on 'growth and inequality in public good provision': Testing the robustness and generalizability of dynamic public good games. *Journal of Behavioral and Experimental Economics, 115*, 102333.

Sadowski, J., Spierre, S. G., Selinger, E., Seager, T. P., Adams, E. A., & Berardy, A. (2015). Intergroup cooperation in common pool resource dilemmas. *Science and engineering ethics, 21*, 1197-1215.

Safarzynska, K. (2017). Intergroup cooperation prevents resource exhaustion but undermines intra-group cooperation in the common-pool resource experiment. *Ecology and Society, 22*(4).

Schütze, T., & Wichardt, P. C. (2025). A real effort vs. standard public goods experiment: Asking for effort does make a difference. *Social Science Research, 129*, 103171.

Shogren, J. F., Hochard, J., Lee, K. D., & Varelas Henderson, L. (2021). Experimental mindset for environmental challenges: the puzzling case of public good contributions. *European Review of Agricultural Economics, 48*(4), 785-804.

Skatova, A., Bedwell, B., & Kuper-Smith, B. (2016). When push comes to shove: Compensating and opportunistic strategies in a collective-risk household energy dilemma. *Frontiers in Energy Research, 4*, 8.

Skatova, A., Spence, A., Leygue, C., & Ferguson, E. (2017). Guilty repair sustains cooperation, angry retaliation destroys it. *Scientific Reports, 7*(1), 46709.

Tahzeeda, J. (2025). Gender Dynamics in Climate Change Adaptation: Experimental Study in Coastal Bangladesh. Available at SSRN 5081535.

Tarditi, C., Hahnel, U. J., Jeanmonod, N., Sander, D., & Brosch, T. (2020). Affective dilemmas: The impact of trait affect and state emotion on sustainable consumption decisions in a social dilemma task. *Environment and Behavior, 52*(1), 33-59.

Tavoni, A., Dannenberg, A., Kallis, G., & Löschel, A. (2011). Inequality, communication, and the avoidance of disastrous climate change in a public goods game. *Proceedings of the National Academy of Sciences, 108*(29), 11825-11829.

Thielmann, I., Böhm, R., Ott, M., & Hilbig, B. E. (2021). Economic games: An introduction and guide for research. *Collabra: Psychology, 7*(1), 19004.

Timmons, S., Andersson, Y., Lee, M., & Lunn, P. (2024). What is preventing individual climate action? Impact awareness and perceived difficulties in changing transport and food behaviour. *ESRI Research Series No. 186*.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Annals of internal medicine, 169*(7), 467-473.

UN Development Programme. (2024). *The Peoples' Climate Vote 2024: Results*. https://www.undp.org/publications/peoples-climate-vote-2024

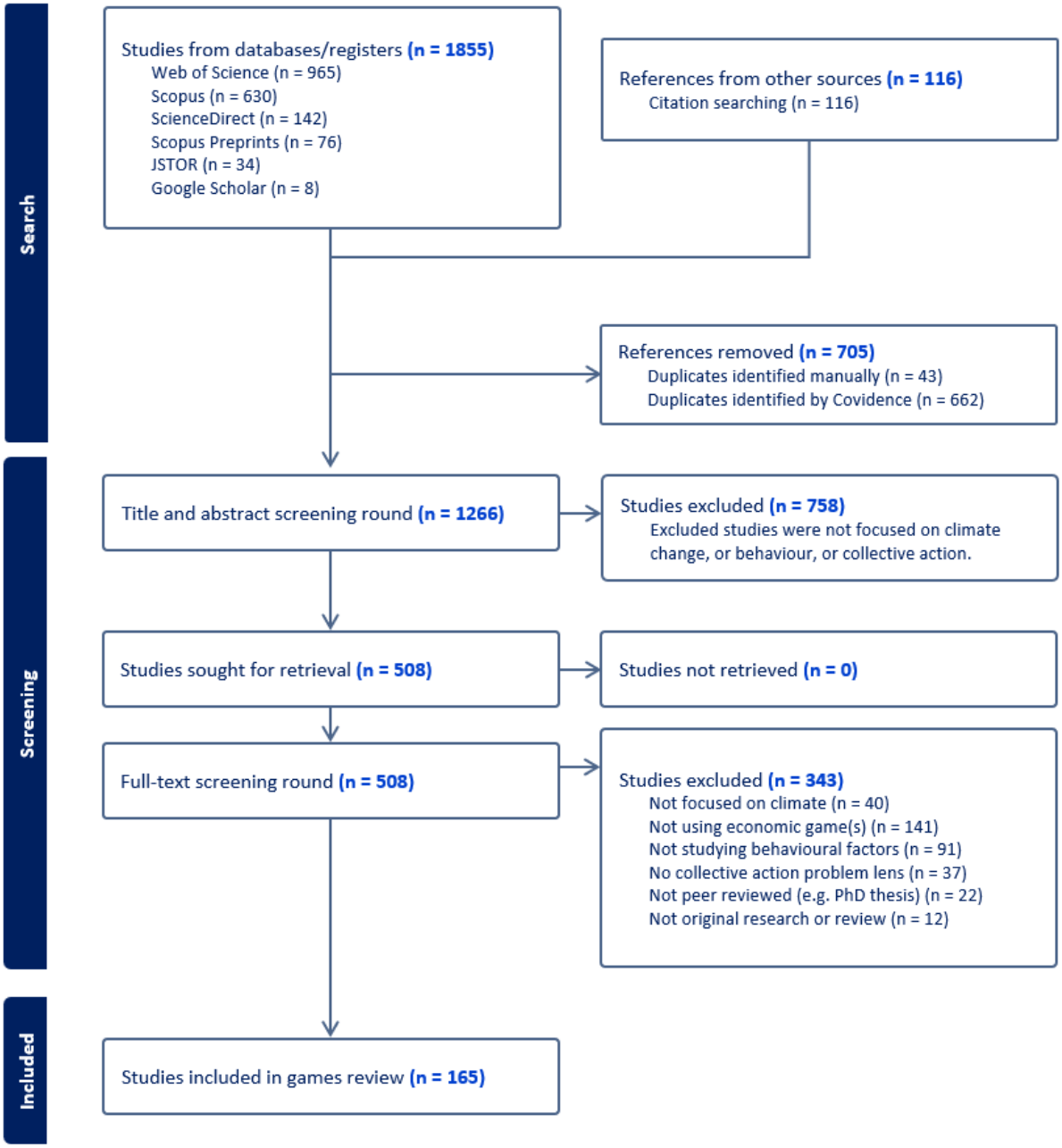
Vicens, J., Bueno-Guerra, N., Gutiérrez-Roig, M., Gracia-Lázaro, C., Gómez-Gardeñes, J., Perelló, J., ... & Duch, J. (2018). Resource heterogeneity leads to unjust effort distribution in climate change mitigation. *PloS one, 13*(10), e0204369.

Weimann, J., Brosig-Koch, J., Heinrich, T., Hennig-Schmidt, H., & Keser, C. (2022). CO2 Emission reduction–Real public good provision by large groups in the laboratory. *Journal of economic behavior & organization, 200*, 1076-1089.

Wyss, A. M., Berger, S., Baumgartner, T., & Knoch, D. (2021). Reactions to warnings in the climate commons. *Journal of environmental psychology, 78*, 101689.

Zhang, Y., Gao, Y., & Jiang, J. (2021). An unpredictable environment reduces pro-environmental behavior: A dynamic public goods experiment on forest use. *Journal of Environmental Psychology, 78*, 101702.

Figure 1. PRISMA diagram



Appendix A. List of reviewed studies

1. Aaldering, H., Arora, P., & Bohm, R. (2024). Promoting prosociality toward future generations by tailoring to group-based social preferences. *Journal of Environmental Psychology, 98*, 102387.

2. Abatayo, A. L., & Lynham, J. (2023). Resource booms and group punishment in a coupled social-ecological system. *Ecological Economics, 206*, 107730.

3. Abatayo, A. L., Bosetti, V., Casari, M., Ghidoni, R., & Tavoni, M. (2020). Solar geoengineering may lead to excessive cooling and high strategic uncertainty. *Proceedings of the National Academy of Sciences, 117*(24), 13393-13398.

4. Abraham, D., Glejtkova, K., & Krcal, O. (2025). The hidden costs of imposing minimum contributions to a global public good. *Ecological Economics, 227*, 108346.

5. Akpalu, W., Abidoye, B., Muchapondwa, E., & Simbanegavi, W. (2017). Public disclosure for carbon abatement: African decision-makers in a PROPER public good experiment. *Climate and Development, 9*(6), 548-558.

6. Alpizar, F., & Gsottbauer, E. (2015). Reputation and household recycling practices: field experiments in Costa Rica. *Ecological Economics, 120*, 366-375.

7. Alpizar, F., Carlsson, F., & Naranjo, M. A. (2011). The effect of ambiguous risk, and coordination on farmers' adaptation to climate change—A framed field experiment. *Ecological Economics, 70*(12), 2317-2326.

8. Alt, M., Gallier, C., Kesternich, M., & Sturm, B. (2023). Collective minimum contributions to counteract the ratchet effect in the voluntary provision of public goods. *Journal of Environmental Economics and Management, 122*, 102895.

9. Anderies, J. M., Janssen, M. A., Lee, A., & Wasserman, H. (2013). Environmental variability and collective action: Experimental insights from an irrigation game. *Ecological Economics, 93*, 166-176.

10. Anderson, B., Bernauer, T., & Balietti, S. (2017). Effects of fairness principles on willingness to pay for climate change mitigation. *Climatic Change, 142*, 447-461.

11. Andrews, T. M., Delton, A. W., & Kline, R. (2022). Anticipating moral hazard undermines climate mitigation in an experimental geoengineering game. *Ecological Economics, 196*, 107421.

12. Andrews, T. M., Delton, A. W., & Kline, R. (2023). Who Do You Trust? Institutions That Constrain Leaders Help People Prevent Disaster. *The Journal of Politics, 85*(1), 64-75.

13. Andrews, T. M., Delton, A. W., & Kline, R. (2024). *Climate games: experiments on how people prevent disaster*. University of Michigan Press.

14. Böhm, R., Gürerk, Ö., & Lauer, T. (2020). Nudging climate change mitigation: a laboratory experiment with inter-generational public goods. *Games, 11*(4), 42.

15. Barclay, P., & Barker, J. L. (2020). Greener than thou: People who protect the environment are more cooperative, compete to be environmental, and benefit from reputation. *Journal of Environmental Psychology, 72*, 101441.

16. Barrett, S., & Dannenberg, A. (2012). Climate negotiations under scientific uncertainty. *Proceedings of the National Academy of Sciences, 109*(43), 17372-17376.

17. Barrett, S., & Dannenberg, A. (2014). Negotiating to avoid “gradual” versus “dangerous” climate change: An experimental test of two prisoners' dilemmas. In *Toward a New Climate Agreement* (pp. 61-75). Routledge.

18. Barrett, S., & Dannenberg, A. (2014). Sensitivity of collective action to uncertainty about climate tipping points. *Nature Climate Change, 4*(1), 36-39.

19. Barrett, S., & Dannenberg, A. (2016). An experimental investigation into ‘pledge and review’in climate negotiations. *Climatic Change, 138*, 339-351.

20. Barrett, S., & Dannenberg, A. (2017). Tipping versus cooperating to supply a public good. *Journal of the European Economic Association, 15*(4), 910-941.

21. Barrett, S., & Dannenberg, A. (2022). The decision to link trade agreements to the supply of global public goods. *Journal of the Association of Environmental and Resource Economists, 9*(2), 273-305.

22. Baumgartner, T., Lobmaier, J. S., Ruffieux, N., & Knoch, D. (2021). Feeling of guilt explains why people react differently to resource depletion warnings. *Scientific reports, 11*(1), 11988.

23. Berger, S., & Wyss, A. M. (2021). Measuring pro-environmental behavior using the carbon emission task. *Journal of environmental psychology*, 75, 101613.

24. Blanco, E., Lopez, M. C., & Villamayor-Tomas, S. (2015). Exogenous degradation in the commons: Field experimental evidence. *Ecological Economics, 120*, 430-439.

25. Boldrini, M., Bosetti, V., & Nunnari, S. (2024). Negative emission technologies and climate cooperation. CESifo Working Paper No. 10905.

26. Bosetti, V., Dennig, F., Liu, N., Tavoni, M., & Weber, E. U. (2022). Forward-looking belief elicitation enhances intergenerational beneficence. *Environmental and Resource Economics, 81*(4), 743-761.

27. Bosetti, V., Heugues, M., & Tavoni, A. (2017). Luring others into climate action: coalition formation games with threshold and spillover effects. *Oxford economic papers, 69*(2), 410-431.

28. Brick, K., & Visser, M. (2015). What is fair? An experimental guide to climate negotiations. *European Economic Review, 74*, 79-95.

29. Brick, K., & Visser, M. (2020). Meeting a national emission reduction target in an experimental setting. *Climate Policy, 10*(5), 543-559.

30. Brick, K., Visser, M., & Van der Hoven, Z. (2016). Cooperation and climate change: can communication facilitate the provision of public goods in heterogeneous settings?. *Environmental and Resource Economics, 64*, 421-443.

31. Branas-Garza, P., Cabrales, A., Espinosa, M. P., & Jorrat, D. (2022). The effect of ambiguity in strategic environments: an experiment. arXiv preprint arXiv:2209.11079.

32. Brown, T. C., & Kroll, S. (2017). Avoiding an uncertain catastrophe: climate change mitigation under risk and wealth heterogeneity. *Climatic Change, 141*, 155-166.

33. Brucks, W. M., & Van Lange, P. A. (2008). No control, no drive: How noise may undermine conservation behavior in a commons dilemma. *European Journal of Social Psychology, 38*(5), 810-822.

34. Burton-Chellew, M. N., May, R. M., & West, S. A. (2013). Combined inequality in wealth and risk leads to disaster in the climate change game. *Climatic change, 120*, 815-830.

35. Calzolari, G., Casari, M., & Ghidoni, R. (2018). Carbon is forever: A climate change experiment on cooperation. *Journal of environmental economics and management, 92*, 169-184.

36. Casari, M., & Tavoni, A. (2024). Climate clubs in the laboratory. *Journal of Behavioral and Experimental Economics, 110*, 102211.

37. Castro-Santa, J. (2023). Climate change mitigation under uncertainty and inequality: A classroom experiment. *The Journal of Economic Education, 54*(2), 128-144.

38. Castro-Santa, J., Moros, L., Exadaktylos, F., & Mantilla, C. (2024). Early climate mitigation as a social dilemma. *Journal of Economic Behavior & Organization, 224*, 810-824.

39. Chang, C. C., Kristensen, N. P., Nghiem, T. P. L., Tan, C. L., & Carrasco, L. R. (2021). Cooperating with the future through natural resources restoration. *Sustainability Science, 16*, 1285-1293.

40. Cherry, T. L., Kallbekken, S., Sælen, H., & Aakre, S. (2021). Can the Paris Agreement deliver ambitious climate cooperation? An experimental investigation of the effectiveness of pledge-and-review and targeting short-lived climate pollutants. *Environmental Science & Policy, 123*, 35-43.

41. Cherry, T. L., Kroll, S., & McEvoy, D. M. (2023). Climate cooperation with risky solar geoengineering. Climatic Change, 176(10), 138.

42. Cherry, T. L., Kroll, S., McEvoy, D. M., Campoverde, D., & Moreno-Cruz, J. (2023). Climate cooperation in the shadow of solar geoengineering: an experimental investigation of the moral hazard conjecture. *Environmental Politics, 32*(2), 362-370.

43. Cherry, T. L., & McEvoy, D. M. (2013). Enforcing compliance with environmental agreements in the absence of strong institutions: An experimental analysis. *Environmental and Resource Economics, 54*, 63-77.

44. Chongo, A., & Clot, S. (2024). Exploring the Influence of Flood Exposure on Cooperative behavior in a Common-Pool Resource Experiment: A Case study in Zambia. Available at SSRN 4813516.

45. Claessens, S., Kelly, D., Sibley, C. G., Chaudhuri, A., & Atkinson, Q. D. (2022). Cooperative phenotype predicts climate change belief and pro-environmental behaviour. *Scientific reports, 12*(1), 12730.

46. Cloos, J., Greiff, M., & Kempa, K. (2025). The effect of exploiting the public good on climate cooperation: evidence from a collective-risk social dilemma experiment. *Environment, Development and Sustainability*, 1-20.

47. Constantino, S., Nichols, K. L., Matt-Navarro, J., Doiron, M., D'Adda, G., & Weber, E. (2024). On the Predictive Power of Economic Preferences Assessed in the Lab for Environmental Behavior: A Qualitative Synthesis and Meta-Analysis. Available at SSRN 4839937.

48. Dannenberg, A., Löschel, A., Paolacci, G., Reif, C., & Tavoni, A. (2015). On the provision of public goods with probabilistic and ambiguous thresholds. *Environmental and Resource economics, 61*, 365-383.

49. Dannenberg, A., Sturm, B., & Vogt, C. (2010). Do equity preferences matter for climate negotiators? An experimental investigation. *Environmental and Resource Economics, 47*, 91-109.

50. Dannenberg, A., & Tavoni, A. (2017). Collective action in dangerous climate change games. In Botelho (Eds.). World Scientific Reference on Natural Resources and Environmental Policy in the Era of Global Change: Volume 4: Experimental Economics (pp. 95-120).

51. Dengler, S., Gerlagh, R., Trautmann, S. T., & Van De Kuilen, G. (2018). Climate policy commitment devices. *Journal of Environmental Economics and Management, 92*, 331-343.

52. Dipierri, A. A., & Zikos, D. (2020). The role of common-pool resources' institutional robustness in a collective action dilemma under environmental variations. *Sustainability, 12*(24), 10526.

53. Druen, P. B., & Zawadzki, S. J. (2021). Escaping the Climate Trap: Participation in a Climate-Specific Social Dilemma Simulation Boosts Climate-Protective Motivation and Actions. *Sustainability, 13*(16), 9438.

54. Echeverría, J. M. A. (2022). Drivers of adaptation to water scarcity: Extraction capping in field experiments. *Groundwater for Sustainable Development, 19*, 100827.

55. Ertör-Akyazi, P., & Akçay, Ç. (2021). Moral intuitions predict pro-social behaviour in a climate commons game. *Ecological Economics, 181*, 106918.

56. Fan, L., Yuan, Y., Ying, Z., Lam, S. K., Liu, L., Zhang, X., ... & Gu, B. (2019). Decreasing farm number benefits the mitigation of agricultural non-point source pollution in China. *Environmental Science and Pollution Research, 26*, 464-472.

57. Faralla, V., & Innocenti, A. (2025). Evaluating behavioural strategies for environmental cooperation: evidence from a public goods game. *Journal of Behavioral and Experimental Economics*, 102464.

58. Farjam, M., Nikolaychuk, O., & Bravo, G. (2018). Does risk communication really decrease cooperation in climate change mitigation?. *Climatic change, 149*, 147-158.

59. Farjam, M., Nikolaychuk, O., & Bravo, G. (2019). Experimental evidence of an environmental attitude-behavior gap in high-cost situations. *Ecological Economics, 166*, 106434.

60. Feige, C., Ehrhart, K. M., & Krämer, J. (2018). Climate negotiations in the lab: A threshold public goods game with heterogeneous contributions costs and non-binding voting. *Environmental and Resource Economics, 70*, 343-362.

61. Fleiß, J., Ackermann, K. A., Fleiß, E., Murphy, R. O., & Posch, A. (2020). Social and environmental preferences: measuring how people make tradeoffs among themselves, others, and collective goods. *Central European Journal of Operations Research, 28*, 1049-1067.

62. Freytag, A., Güth, W., Koppel, H., & Wangler, L. (2014). Is regulation by milestones efficiency enhancing? An experimental study of environmental protection. *European Journal of Political Economy, 33*, 71-84.

63. Gallier, C., Kesternich, M., Löschel, A., & Waichmann, I. (2017). Ratchet up or down? An experimental investigation of global public good provision in the United Nations Youth Associations Network. CAWM Discussion Paper. https://www.wiwi.uni-muenster.de/mep/en/research/publications/133687

64. Gallier, C., & Sturm, B. (2021). The ratchet effect in social dilemmas. *Journal of Economic Behavior & Organization, 186*, 251-268.

65. Gampfer, R. (2014). Do individuals care about fairness in burden sharing for climate change mitigation? Evidence from a lab experiment. *Climatic change, 124*(1-2), 65-77.

66. Gerlagh, R., & van der Heijden, E. (2024). Going green: Framing effects in a dynamic coordination game. *Journal of Behavioral and Experimental Economics, 108*, 102148.

67. Geschwind, S., & Lambsdorff, J. G. (2025). Does scarcity induce hostility? An experimental investigation of common-pool resources. *Ecological Economics, 227*, 108388.

68. Ghidoni, R., Abatayo, A. L., Bosetti, V., Casari, M., & Tavoni, M. (2023). Governing Climate Geoengineering: Side Payments Are Not Enough. *Journal of the Association of Environmental and Resource Economists, 10*(5), 1149-1177.

69. Ghidoni, R., Calzolari, G., & Casari, M. (2017). Climate change: Behavioral responses from extreme events and delayed damages. *Energy Economics, 68*, 103-115.

70. Gleue, M., Luigs, T., & Ziegler, A. (2025). The relevance of non-state climate protection activities as motivation for individual climate protection: Results from a framed field experiment. *Resource and Energy Economics, 81*, 101473.

71. Gnagey, M., Grijalva, T., Koford, B. C., & Roberts, G. (2024). Threshold Inequality in a Public Good Experiment. Available at SSRN 4987508.

72. Goeschl, T., & Perino, G. (2012). Instrument choice and motivation: Evidence from a climate change experiment. *Environmental and Resource Economics, 52*, 195-212.

73. Goeschl, T., Kettner, S. E., Lohse, J., & Schwieren, C. (2020). How much can we learn about voluntary climate action from behavior in public goods games?. *Ecological Economics, 171*, 106591.

74. Goeschl, T., & Solda, A. (2024). (Un) Trustworthy pledges and cooperation in social dilemmas. *Journal of Economic Behavior & Organization, 223*, 106-119.

75. Gosnell, G., & Tavoni, A. (2017). A bargaining experiment on heterogeneity and side deals in climate negotiations. *Climatic Change, 142*(3-4), 575-586.

76. Greiff, M., & Kempa, K. (2025). Avoiding catastrophic climate change: Heterogeneous abatement costs and voting on redistribution in a threshold public good experiment. *Journal of Economic Behavior & Organization, 236*, 107067.

77. Grimalda, G., Belianin, A., Hennig-Schmidt, H., Requate, T., & Ryzhkova, M. V. (2022). Sanctions and international interaction improve cooperation to avert climate change. *Proceedings of the Royal Society B, 289*(1972), 20212174.

78. Gueth, W., Levati, M. V., & Soraperra, I. (2015). Common and private signals in public goods games with a point of no return. *Resource and Energy Economics, 41*, 164-184.

79. Güth, W., & Sääksvuori, L. (2012). Provision of multilevel public goods by positive externalities: Experimental evidence. *The BE Journal of Economic Analysis & Policy, 12*(1).

80. Hagel, K., Milinski, M., & Marotzke, J. (2017). The level of climate-change mitigation depends on how humans assess the risk arising from missing the 2 C target. *Palgrave Communications, 3*(1), 1-7.

81. Hasson, R., Löfgren, Å., & Visser, M. (2010). Climate change in a public goods game: investment decision in mitigation versus adaptation. *Ecological Economics, 70*(2), 331-338.

82. Hasson, R., Löfgren, Å., & Visser, M. (2012). Treatment effects of climate change risk on mitigation and adaptation behaviour in an experimental setting. *South African Journal of Economics, 80*(3), 415-430.

83. Heinz, S., Otto, I. M., Tan, R., Jin, Y., & Glebe, T. W. (2022). Cooperation enhances adaptation to environmental uncertainty: evidence from irrigation behavioral experiments in South China. *Water, 14*(7), 1098.

84. Helland, L., Hovi, J., & Sælen, H. (2018). Climate leadership by conditional commitments. *Oxford Economic Papers, 70*(2), 417-442.

85. Hepp, J., Klein, S. A., Horsten, L. K., Urbild, J., & Lane, S. P. (2023). Introduction and behavioral validation of the climate change distress and impairment scale. *Scientific Reports, 13*(1), 11272.

86. Hoffmann, S., Mihm, B., & Weimann, J. (2015). To commit or not to commit? An experimental investigation of pre-commitments in bargaining situations with asymmetric information. *Journal of Public Economics, 121*, 95-105.

87. Huang, L., Liu, L., Dang, J., Wei, C., Liang, Y., Gu, Z., & Li, J. (2022). Humanization of outgroups promotes justice in carbon allocation. *Journal of Environmental Psychology, 84*, 101911.

88. Hurlstone, M. J., Price, A., Wang, S., Leviston, Z., & Walker, I. (2020). Activating the legacy motive mitigates intergenerational discounting in the climate game. *Global Environmental Change, 60*, 102008.

89. Hurlstone, M. J., Wang, S., Price, A., Leviston, Z., & Walker, I. (2017). Cooperation studies of catastrophe avoidance: implications for climate negotiations. *Climatic Change, 140*, 119-133.

90. Jacquet, J. (2015). Experimental insights: testing climate change cooperation in the lab. *Social Research: An International Quarterly, 82*(3), 637-651.

91. Jacquet, J., Hagel, K., Hauert, C., Marotzke, J., Röhl, T., & Milinski, M. (2013). Intra-and intergenerational discounting in the climate game. *Nature Climate Change*, *3*(12), 1025-1028.

92. Jiang, L. L., Chen, Z., Perc, M., Wang, Z., Kurths, J., & Moreno, Y. (2023). Deterrence through punishment can resolve collective risk dilemmas in carbon emission games. *Chaos: An Interdisciplinary Journal of Nonlinear Science, 33*(4).

93. Jiang, L. L., Gao, J., Chen, Z., Li, W. J., & Kurths, J. (2021). Reducing the bystander effect via decreasing group size to solve the collective-risk social dilemma. *Applied Mathematics and Computation, 410*, 126445.

94. Jiang, L. L., Wang, Z., Zhou, C. S., Kurths, J., & Moreno, Y. (2016). Assessing the impact of costly punishment and group size in collective-risk climate dilemmas. *arXiv preprint arXiv:1604.04762*.

95. Kim, H., Iris, D., Lee, J., & Tavoni, A. (2025). Representation, peer pressure and punishment in a public goods game. *Environmental and Resource Economics*, 1-27.

96. Klein, S. A., Hilbig, B. E., & Heck, D. W. (2017). Which is the greater good? A social dilemma paradigm disentangling environmentalism and cooperation. *Journal of Environmental Psychology, 53*, 40-49.

97. Klein, S. A., Horsten, L. K., & Hilbig, B. E. (2022). The effect of environmental versus social framing on pro-environmental behavior. *Journal of Environmental Psychology, 84*, 101897.

98. Kline, R., Seltzer, N., Lukinova, E., & Bynum, A. (2018). Differentiated responsibilities and prosocial behaviour in climate change mitigation. *Nature Human Behaviour, 2*(9), 653-661.

99. Koessler, A. K. (2019). Setting new behavioral standards: sustainability pledges and how conformity impacts their outreach. *Available at SSRN 3369557*.

100. Kreitmair, U., & Bower-Bir, J. (2021). Too different to solve climate change? Experimental evidence on the effects of production and benefit heterogeneity on collective action. *Ecological Economics, 184*, 106998.

101. Krendelsberger, A., Alpizar, F., de Vries, L., & van Dijk, H. (2025). Don't blame it on ethnicity: The role of group identities and climate risks in farmer-herder relations in Senegal. *Journal of Peace Research*, 00223433251361301.

102. Krendelsberger, A., Alpizar, F., Syll, M. M. A., & van Dijk, H. (2025). Climate change, collective shocks, and intra-community cooperation: Evidence from a public good experiment with farmers and pastoralists. *World Development, 189*, 106941.

103. Kumar, M., & Dutt, V. (2019). Collective risk social dilemma: role of information availability in achieving cooperation against climate change. *Journal of Dynamic Decision Making, 5*, 2-1.

104. Lefebvre, M., Midler, E., & Bontems, P. (2020). Adoption of environment-friendly agricultural practices with background risk: experimental evidence. *Environmental and Resource Economics, 76*, 405-428.

105. Li, Z., Liu, P., & Wang, R. (2025). Two-stage Contribution Mechanisms in Climate Negotiations: An Experimental Investigation. Available at SSRN 5413330.

106. Liu, C. J., & Hao, F. (2020). The impact of social and ecological factors on environmentally responsible behavior. *Journal of Cleaner Production, 254*, 120173.

107. Lo Iacono, S., Sonmez, B., & Fairbrother, M. (2024). The effect of trusting contexts in social dilemmas with collective and individual solutions. *Scientific Reports, 14*(1), 26048.

108. Lohse, J., Goeschl, T., & Diederich, J. H. (2017). Giving is a question of time: response times and contributions to an environmental public good. *Environmental and Resource Economics, 67*, 455-477.

109. Löschel, A., Sturm, B., & Uehleke, R. (2017). Revealed preferences for voluntary climate change mitigation when the purely individual perspective is relaxed–evidence from a framed field experiment. *Journal of Behavioral and Experimental Economics, 67*, 149-160.

110. Luo, H., de Boer, H., Musshoff, O., & Hermann, D. (2025). Cooperative climate action under background risk. *Scientific Reports, 15*(1), 27118.

111. Ma, T. (2024). Adoption of abatement technology in an uncertain world: An experiment. *Journal of Economic Behavior & Organization, 225*, 51-87.

112. Mahajan, A., Kline, R., & Tingley, D. (2022). Collective risk and distributional equity in climate change bargaining. *Journal of Conflict Resolution, 66*(1), 61-90.

113. Malthouse, E., Pilgrim, C., Sgroi, D., Accerenzi, M., Alfonso, A., Ashraf, R. U., ... & Hills, T. (2024). Assessing private solutions to collective action problems in a 34-nation study. Working paper. https://osf.io/preprints/psyarxiv/jr4km_v1

114. Malthouse, E., Pilgrim, C., Sgroi, D., & Hills, T. T. (2023). When fairness is not enough: The disproportionate contributions of the poor in a collective action problem. *Journal of Experimental Psychology: General, 152*(11), 3229.

115. Malthouse, E., Pilgrim, C., Sgroi, D., & Hills, T. T. (2025). Luck framing supports the avoidance of collective disaster when inequalities in vulnerability exist. *Journal of Environmental Psychology*, 102592.

116. Marek, E. M. (2018). Social learning under the labeling effect: Exploring travellers' behavior in social dilemmas. *Transportation research part F: traffic psychology and behaviour, 58*, 511-527.

117. Marotzke, J., Semmann, D., & Milinski, M. (2020). The economic interaction between climate change mitigation, climate migration and poverty. *Nature Climate Change, 10*(6), 518-525.

118. McEvoy, D. M., Haller, T., & Blanco, E. (2022). The role of non-binding pledges in social dilemmas with mitigation and adaptation. *Environmental and Resource Economics, 81*(4), 685-710.

119. Milinski, M. (2021). The collective risk social dilemma. In *Research Handbook on Environmental Sociology* (pp. 168-186). Edward Elgar Publishing.

120. Milinski, M., Hilbe, C., Semmann, D., Sommerfeld, R., & Marotzke, J. (2016). Humans choose representatives who enforce cooperation in social dilemmas through extortion. *Nature Communications, 7*(1), 10915.

121. Milinski, M., & Innocenti, S. (2026). Climate extreme events and climate change are enforced by extortionate freeriders overloading those who mitigate: An economic experiment. *Ecological Economics, 241*, 108866.

122. Milinski, M., & Marotzke, J. (2022). Economic experiments support Ostrom's polycentric approach to mitigating climate change. *Humanities and Social Sciences Communications, 9*(1), 1-9.

123. Milinski, M., Röhl, T., & Marotzke, J. (2011). Cooperative interaction of rich and poor can be catalyzed by intermediate climate targets: A letter. *Climatic change, 109*, 807-814.

124. Milinski, M., Semmann, D., Krambeck, H. J., & Marotzke, J. (2006). Stabilizing the Earth's climate is not a losing game: Supporting evidence from public goods experiments. *Proceedings of the National Academy of Sciences, 103*(11), 3994-3998.

125. Milinski, M., Sommerfeld, R. D., Krambeck, H. J., Reed, F. A., & Marotzke, J. (2008). The collective-risk social dilemma and the prevention of simulated dangerous climate change. *Proceedings of the National Academy of Sciences, 105*(7), 2291-2294.

126. Mina, J. S. A., Fernández, D. A. R., Ibarra, A. A., & Georgantzis, N. (2016). Economic behavior of fishers under climate-related uncertainty: Results from field experiments in Mexico and Colombia. *Fisheries Research, 183*, 304-317.

127. Mokos, J., Vasarhelyi, Z., Kiss, H. J., Kovacs, Z., & Kral, A., & Scheuring, I. (2024). The Role of Competition, Earned Money and Personal Characteristics in Climate Games. Available at SSRN 5037767.

128. My, K. B., & Ouvrard, B. (2019). Nudge and tax in an environmental public goods experiment: Does environmental sensitivity matter?. *Resource and Energy Economics, 55*, 24-48.

129. Naime, J., Angelsen, A., Molina-Garzón, A., Carrilho, C. D., Selviana, V., Demarchi, G., ... & Martius, C. (2022). Enforcement and inequality in collective PES to reduce tropical deforestation: Effectiveness, efficiency and equity implications. *Global Environmental Change, 74*, 102520.

130. Neef, N. E., Zabel, S., & Otto, S. (2024). Climate change mitigation: A question of humanitarian or environmental motivation?. *Journal of Environmental Psychology, 100*, 102483.

131. Nhim, T., Schuch, E., & Richter, A. (2023). Water scarcity and support for costly institutions in public goods: Experimental evidence from Cambodia. *Ecological Economics, 212*, 107932.

132. Nockur, L., Nielsen, Y. A., & Pfattheicher, S. (2022). Setting an example: The effect of unequal endowments on cooperation in sequential public goods games. *Current Research in Ecological and Social Psychology, 3*, 100059.

133. Pansini, R., & Shi, L. (2025). Collectivist values help solve the climate dilemma Authors. *Frontiers in Human Dynamics, 7*, 1613898.

134. Paul, C. J., Weinthal, E. S., Bellemare, M. F., & Jeuland, M. A. (2016). Social capital, trust, and adaptation to climate change: Evidence from rural Ethiopia. *Global Environmental Change, 36*, 124-138.

135. Pevnitskaya, S., & Ryvkin, D. (2013). Environmental context and termination uncertainty in games with a dynamic public bad. *Environment and Development Economics, 18*(1), 27-49.

136. Pönitzsch, G. (2017). Pro-Social Behavior by Groups and Individuals: Evidence from Contributions to a Global Public Good. *Available at SSRN 2940249*.

137. Ponte, A. D., Delton, A. W., Kline, R., & Seltzer, N. A. (2017). Passing it along: Experiments on creating the negative externalities of climate change. *The Journal of Politics, 79*(4), 1444-1448.

138. Reindl, I. (2022). Wealth and Vulnerability to Climate Change: An Experimental Study on Burden Sharing among Heterogeneous Agents. *Environmental and Resource Economics, 82*(4), 791-823.

139. Rocha, J. C., Schill, C., Saavedra-Díaz, L. M., Moreno, R. D. P., & Maldonado, J. H. (2020). Cooperation in the face of thresholds, risk, and uncertainty: Experimental evidence in fisher communities from Colombia. *PLos One, 15*(12), e0242363.

140. Roggenkamp, H. (2025). A comment on 'growth and inequality in public good provision': Testing the robustness and generalizability of dynamic public good games. *Journal of Behavioral and Experimental Economics, 115*, 102333.

141. Sadowski, J., Spierre, S. G., Selinger, E., Seager, T. P., Adams, E. A., & Berardy, A. (2015). Intergroup cooperation in common pool resource dilemmas. *Science and engineering ethics, 21*, 1197-1215.

142. Safarzynska, K. (2017). Intergroup cooperation prevents resource exhaustion but undermines intra-group cooperation in the common-pool resource experiment. *Ecology and Society, 22*(4).

143. Schill, C., & Rocha, J. C. (2023). Sustaining local commons in the face of uncertain ecological thresholds: Evidence from a framed field experiment with Colombian small-scale fishers. *Ecological Economics, 207*, 107695.

144. Schmidt, K. M., & Ockenfels, A. (2021). Focusing climate negotiations on a uniform common commitment can promote cooperation. *Proceedings of the National Academy of Sciences, 118*(11), e2013070118.

145. Schütze, T., & Wichardt, P. C. (2025). A real effort vs. standard public goods experiment: Asking for effort does make a difference. *Social Science Research, 129*, 103171.

146. Sherstyuk, K., Tarui, N., Ravago, M. L. V., & Saijo, T. (2016). Intergenerational games with dynamic externalities and climate change experiments. *Journal of the association of environmental and resource economists, 3*(2), 247-281.

147. Shogren, J. F., Hochard, J., Lee, K. D., & Varelas Henderson, L. (2021). Experimental mindset for environmental challenges: the puzzling case of public good contributions. *European Review of Agricultural Economics, 48*(4), 785-804.

148. Skatova, A., Bedwell, B., & Kuper-Smith, B. (2016). When push comes to shove: Compensating and opportunistic strategies in a collective-risk household energy dilemma. *Frontiers in Energy Research, 4*, 8.

149. Skatova, A., Spence, A., Leygue, C., & Ferguson, E. (2017). Guilty repair sustains cooperation, angry retaliation destroys it. *Scientific Reports, 7*(1), 46709.

150. Steimanis, I., & Vollan, B. (2022). Prosociality as response to slow-and fast-onset climate hazards. Global *Sustainability, 5*, e10.

151. Sturm, B., & Weimann, J. (2007). Unilateral emissions abatement: an experiment. In *Environmental economics, experimental methods* (pp. 179-205). Routledge.

152. Tahzeeda, J. (2025). Gender Dynamics in Climate Change Adaptation: Experimental Study in Coastal Bangladesh. Available at SSRN 5081535.

153. Tambunlertchai, K., & Pongkijvorasin, S. (2021). Regulatory stringency and behavior in a common pool resource game: Lab and field experiments. *Journal of Asian Economics, 74*, 101309.

154. Tarditi, C., Hahnel, U. J., Jeanmonod, N., Sander, D., & Brosch, T. (2020). Affective dilemmas: The impact of trait affect and state emotion on sustainable consumption decisions in a social dilemma task. *Environment and Behavior, 52*(1), 33-59.

155. Tavoni, A., Dannenberg, A., Kallis, G., & Löschel, A. (2011). Inequality, communication, and the avoidance of disastrous climate change in a public goods game. *Proceedings of the National Academy of Sciences, 108*(29), 11825-11829.

156. Van der Heijden, E., & Moxnes, E. (2013). Leading by example to protect the environment: Do the costs of leading matter?. *Journal of Conflict Resolution, 57*(2), 307-326.

157. Van Driessche, S., Boun My, K., & Brunette, M. (2024). Risk and ambiguity in a public good game. *Frontiers in Behavioral Economics, 3*, 1456436.

158. Vert Martin, N., & Pineau, P. O. (2024). Choosing to pay more for electricity: an experiment on the level of residential consumer cooperation. *Energies, 17*(6), 1317.

159. Vicens, J., Bueno-Guerra, N., Gutiérrez-Roig, M., Gracia-Lázaro, C., Gómez-Gardeñes, J., Perelló, J., ... & Duch, J. (2018). Resource heterogeneity leads to unjust effort distribution in climate change mitigation. *PloS one, 13*(10), e0204369.

160. Waichman, I., Requate, T., Karde, M., & Milinski, M. (2021). Challenging conventional wisdom: Experimental evidence on heterogeneity and coordination in avoiding a collective catastrophic event. *Journal of Environmental Economics and Management, 109*, 102502.

161. Wang, Z., Jusup, M., Guo, H., Shi, L., GeÄek, S., Anand, M., ... & Schellnhuber, H. J. (2020). Communicating sentiment and outlook reverses inaction against collective risks. *Proceedings of the National Academy of Sciences, 117*(30), 17650-17655.

162. Weimann, J., Brosig-Koch, J., Heinrich, T., Hennig-Schmidt, H., & Keser, C. (2022). CO2 Emission reduction–Real public good provision by large groups in the laboratory. *Journal of economic behavior & organization, 200*, 1076-1089.

163. Wyss, A. M., Berger, S., & Knoch, D. (2023). Pro-environmental behavior in a common-resource dilemma: The role of beliefs. *Journal of Environmental Psychology, 92*, 102160.

164. Wyss, A. M., Berger, S., Baumgartner, T., & Knoch, D. (2021). Reactions to warnings in the climate commons. *Journal of environmental psychology, 78*, 101689.

165. Zhang, Y., Gao, Y., & Jiang, J. (2021). An unpredictable environment reduces pro-environmental behavior: A dynamic public goods experiment on forest use. *Journal of Environmental Psychology, 78*, 101702.

Appendix B. Data charting plan

Study overview

ID (open-text), reference (open-text), aim (open-text), country (open-text), year (open-text)

Is the study a working paper? (Yes/No)

Collective action problem set-up

How is the collective action problem primarily framed?
- Collective action problem
- Public goods game
- Common-pool resource
- Tragedy of the commons
- (Collective-risk) Social dilemma
- Prisoner's dilemma
- Trust game
- Free-rider problem
- Cooperation problem
- Coordination problem
- Other

Good or bad starting equilibrium?
- Good (e.g. most cooperate)
- Bad (e.g. few cooperate)
- Neither (start from scratch)
- Unclear
- n/a
- Other

Is this a "taking" or a "giving" problem?
- Taking / not taking (pool, income, emissions...)
- Giving (resource pool...)
- Both
- n/a
- Other

What is the desired outcome of the collective action?
- Split gains
- Reduce/avoid shared losses
- Reach a threshold to avoid catastrophe
- n/a
- Other

Is climate change a direct action or indirect externality?
- Direct action (e.g. choose emissions level)
- Indirect externality (e.g. choose resource use)

- n/a
- Other

Direct link to climate policy?
- Yes, based on specific policies / actions
- Yes, refers to general policies
- Yes, via funder, grant, or author affiliation
- Yes, via publication (e.g. climate policy journal)
- No

Any other elements relevant to climate realism? (open-text)

Behavioural mechanisms

Are any social factors studied?
- Fairness preferences
- Punishment of free riders
- Norm compliance
- Peer effects
- Conditional cooperation / reciprocity
- Beliefs/expectations re: others' beliefs/actions
- Social identity or group identity
- Communities and culture
- Group size and composition
- Self-image (pro-social, pro-environmental)
- Desire to avoid guilt
- Role of leader
- Communication (content / social aspects)
- Other

Are any environmental factors studied?
- Rules about authorised consumption levels
- Group stability (partner vs stranger matching)
- Framing (e.g. community vs market game)
- Opportunities for communication
- Type and quality of information provided
- Length of problem (once-off vs repeated)
- Salience of climate as social dilemma
- (Credibility of) central enforcing authority
- Multi-level / nested problem (global/local)
- Multi-generational problem
- Transaction costs
- Other

Are any decision-making factors studied?
- Uncertainty
- Emotions/affective states
- Perceived risk or reward (except punishment)

- Perceived coherence/justification for action
- Ease of understanding/implementing action
- Priors about climate (knowledge, concern)
- Personalised information or feedback
- Other

Climate outcome of interest

What policy area(s) are studied?
- International climate agreements/negotiations
- National climate policy
- Other general/cross-cutting (CO2 emissions...)
- Electricity
- Industry
- Built environment
- Transport
- Agriculture
- Land use, land use change, forestry
- Marine environment
- Circular economy
- Climate adaptation
- Citizen engagement (e.g. education)
- Public sector (e.g. procurement)
- Other

What climate strategy is studied?
- Mitigation (cut emissions)
- Adaptation (minimise effects of climate change)
- Geoengineering
- n/a
- Other

What type of climate action or outcome is studied?
- Reduce consumption/emissions (generally)
- Reduce consumption/emissions (spec. action)
- Changing behaviour (switch to better option)
- Supporting a policy
- Complying with a policy
- Agreeing on a policy (treaties)
- Other

What specific climate action or outcome is studied? And how is it measured? (open-text)

Summary of findings. E.g. how the identified mechanism impacts climate (open-text)

Methods

Primary discipline

- Economics (including behavioural)
- Psychology
- Environmental science
- Ecology
- Law
- Computer Science
- Political Science
- Other

Is the study theoretical or empirical?
- Theory or conceptual study (new angle/insight)
- Overview
- Empirical study
- Review (systematic)
- Review (non-systematic)
- Book chapter
- Other

(If theoretical or conceptual) What is the study method?
- Psychological model
- Economics model
- Evolutionary science model
- Law essay
- n/a
- Other

(If empirical) Is the study qualitative or quantitative?
- Qualitative
- Quantitative
- Mixed
- n/a

(If empirical) How was data obtained?
- Experiment (lab, field, randomised survey...)
- Administrative (or other) existing datasets
- Interviews or focus groups
- Surveys (online/paper/etc.)
- Observation/ethnography/etc.
- n/a
- Other

(If exp.) Experimental method?
- Lab
- Online or survey
- Field (incl. lab-in-field)
- n/a
- Other

(If exp.) Incentives within experiment?
- Yes
- No
- n/a
- Other

(If experiment) Is the experiment a "game"?
- Yes - public goods game
- Yes - (collective-risk) social dilemma
- Yes - common pool resource game
- No
- n/a
- Other

(If game) Is the game one-shot or repeated?
- One-shot (single round)
- One-shot (over multiple rounds)
- Repeated (multiple games)
- n/a
- Other

(If game) How do players experience choices?
- Hypothetical or symbolic
- Monetary (play with endowment)
- Real climate-relevant choice
- n/a
- Other

(If game) How do players experience payoffs?
- Hypothetical or symbolic
- Monetary (receive/lose endowment)
- Real climate outcome (e.g. charity donation)
- n/a
- Other

(If game) Do people know they're in a *climate* game? (Yes / No / Unclear / n/a / Other)

(If game) Do people know if others contributed? (Yes / No / Unclear / n/a / Other)

(If exp.) Summarise treatment / intervention / game (open-text)

(If exp.) Any other relevant features? (open-text)

(If systematic review) Further details: (open-text)

(If general conceptual piece) Further details: (open-text)

Does this study introduce any new element, concept, method, or idea? I.e. what is the innovation of this study? (open-text)

Population

At what level is behaviour studied?
- Individual
- Community
- Country
- International
- n/a
- Other

(If empirical) What is the sample size? (open-text)

(If empirical) What is the location? (open-text)

(If empirical) Who is the study sample?
- General public
- Students
- Climate professionals/decision-makers
- Workers in relevant sectors (e.g. oil, fishing)
- n/a
- Other

(If empirical) Any other socio-economic characteristics? (open-text)

Heterogeneity

(If empirical) Is inequality / heterogeneity considered? (Yes / No / n/a / Other)

What dimension of heterogeneity is studied?
- Gender
- Age
- Wealth / resources
- Professional background
- Psychological factors (personality, beliefs)
- Heterogeneity in impact of outcomes
- n/a
- Other

How is heterogeneity studied?
- Observed (without manipulation)
- Manipulated (endowments, group make-up...)
- Both
- n/a
- Other

(If empirical) Provide details on heterogeneity (open-text)