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Behaviour is the Missing Half of Climate Policy

What four years of experiments with more than 14,000 participants tell us about carbon pricing, climate communication and the demand side of the energy transition

TRANSCLIMA · PID2021-123686OB-I00

Opportunities in the transition towards a low-carbon economy mitigating climate change: Stimulating low-carbon consumption through behavioural incentives and nudges

PRINCIPAL INVESTIGATORS	INSTITUTION	PERIOD
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Resumen ejecutivo

El proyecto TRANSCLIMA ha medido, en 24 estudios experimentales y encuestas (14.233 participantes en total) cómo responden realmente las personas a los instrumentos con los que Europa y España pretenden descarbonizar el consumo. La conclusión central es incómoda y accionable: varios de los instrumentos funcionan peor de lo previsto, y a veces al revés, porque el diseño ignora mecanismos psicológicos identificables y corregibles.

LOS DIEZ MENSAJES PRINCIPALES

1. **Hacer visible el precio del carbono puede anular su efecto.** Un aumento de precio del 15 % redujo significativamente la intención de compra cuando se presentó como una subida de precio sin más ($\Delta = -0{,}27$; $p = 0{,}001$), pero **no** la redujo cuando el mismo incremento se identificó explícitamente como impuesto al carbono ($\Delta = +0{,}04$; $p = 0{,}65$). Saber que se paga un impuesto al carbono activa una licencia moral que legitima la compra. La condición saliente combinó el desglose explícito del importe con una explicación de su finalidad climática, de modo que el diseño no permite separar el efecto del desglose del de esa explicación. Efecto agregado de los cuatro estudios principales ($N = 2.900$): d de Cohen = 0,31 (IC 95 %: 0,19–0,43).
2. **El efecto es mayor precisamente entre quienes muestran mayor preocupación por el clima** y entre quienes se identifican como menos conservadores, es decir, entre el público del que la política climática espera más colaboración.
3. **Comunicar "buenas noticias climáticas" puede ser contraproducente, y las normas sociales son el antídoto.** Un mensaje que informó de la caída de emisiones durante la COVID-19 y la atribuyó expresamente al esfuerzo colectivo y al sacrificio personal de quien lo leía elevó el autoconcepto moral ($M = 3{,}10$ frente a 2,87; $|d| = 0{,}26$) y, **a través de ese aumento**, redujo las intenciones posteriores de comportamiento bajo en carbono (efecto indirecto $b = -0{,}05$; IC 95 %: −0,09 a −0,02). Añadir un mensaje normativo anuló esa vía indirecta.
4. **Los encuadres de equidad polarizan más de lo que persuaden.** Un encuadre redistributivo elevó la aceptación del impuesto entre votantes demócratas de forma solo descriptiva (4,25 → 4,43; n.s.) pero la hundió significativamente entre republicanos (3,25 → 2,66), ampliando la brecha de 1,00 a 1,77 puntos.
5. **En renovables de proximidad manda la norma de grupo, no el encuadre del mensaje.** El rechazo a los parques eólicos cercanos está mucho más polarizado en lo que la gente *declara* ($d = 1{,}09$) que en lo que *siente de forma implícita* ($d = 0{,}26$): hay margen de acuerdo que el debate público está destruyendo.
6. **La salud moviliza tanto o más que el clima.** En el coche eléctrico, la preocupación por el efecto de la contaminación del aire sobre la **salud propia** predijo la adopción con más fuerza ($\beta = 0{,}28$) que la preocupación climática ($\beta = 0{,}23$), y alcanzó $\beta = 0{,}37$ en personas con alta orientación a la salud.
7. **La percepción de greenwashing y el cinismo social son barreras estructurales del mercado verde.** En ropa sostenible ($N = 600$, muestra representativa australiana), los motivos de consumo visible ($\beta = 0{,}32$) y la eficacia percibida del consumidor ($\beta = 0{,}31$) predijeron la compra declarada con mucha más fuerza que la preocupación ambiental ($\beta = 0{,}13$) o la confianza en la marca ($\beta = 0{,}13$), mientras que la percepción de greenwashing la redujo. El cinismo social se asocia con menor confianza en las marcas verdes a través de esa percepción de greenwashing.
8. **El compromiso climático cambia cómo se perciben los productos, no solo cuánto se valoran.** Entre 800 consumidores estadounidenses, la preocupación climática predijo un mayor compromiso climático. En un modelo de mediación secuencial, ese compromiso se asoció

con percibir los sustitutos de la carne como más sostenibles, más naturales y de mejor sabor: los tres atributos que con más frecuencia bloquean el cambio de dieta. Comunicación climática y aceptación del producto no son, por tanto, dos problemas de política separados.

9. **No todo el contenido de influencers funciona igual.** En una encuesta a 550 usuarios australianos de Instagram, el activismo ambiental del influencer (recomendar transporte público, apoyar a grupos ecologistas, difundir peticiones o criticar a empresas contaminantes) se asoció con la intención de actuar frente al clima con casi el doble de fuerza que la **promoción comercial de estilo de vida sostenible** ($\beta = 0{,}41$ frente a $0{,}22$; $Z = 3{,}94$; $p < 0{,}001$). El mecanismo es el *liderazgo verde inspirador* percibido, y solo el activismo aumentó la credibilidad del influencer. Implicación para las campañas públicas: **seleccionar** mensajeros con trayectoria de defensa ambiental en lugar de convertirlos en prescriptores de producto.
10. **El consumo de IA se ha convertido en un punto de contacto climático, pero solo si se informa.** En una encuesta prerregistrada a 845 usuarios estadounidenses de IA, quienes la usan con más intensidad declararon *mayores* intenciones proclimáticas ($r = 0{,}42$), a través de una cadena de ansiedad climática y compromiso climático. La condición decisiva es la **conciencia del impacto ambiental de la IA**: entre quienes la desconocen, la cadena no llega a activarse (efecto indirecto 0,024; IC 95 % [−0,001, 0,052], no significativo); entre quienes son muy conscientes, se multiplica casi por cinco (0,113; IC 95 % [0,082, 0,147]). Implicación regulatoria: la conciencia del impacto ambiental condicionó la vía indirecta observada. La divulgación obligatoria de la huella energética, de carbono y de agua de los servicios de IA es, por tanto, una intervención prometedora que conviene probar experimentalmente, no una condición previa ya demostrada. Debe acompañarse de opciones de acción creíbles y viables, sin recurrir al alarmismo.

POR QUÉ AHORA

Tres decisiones en curso convierten estos resultados en información operativa inmediata. La primera es el objetivo europeo para 2040, una reducción neta de las emisiones de gases de efecto invernadero del 90 % respecto a 1990, en vigor desde el 7 de abril de 2026: exige una reducción de emisiones del lado de la demanda sin precedentes. La segunda es el aplazamiento del ETS2 a 2028, que abre una ventana de dos años para decidir cómo se traslada y se muestra al ciudadano el precio del carbono en combustibles y calefacción. La tercera es la Directiva (UE) 2024/825 de empoderamiento del consumidor, aplicable desde el 27 de septiembre de 2026 mientras la Directiva de Alegaciones Ecológicas sigue paralizada. Ello deja la lucha contra el greenwashing en manos de criterios de aplicación que nuestros resultados pueden informar.

QUÉ PROPONEMOS

Este informe traduce la evidencia en una **caja de herramientas de instrumentos climáticos conductuales**: para cada instrumento, el mecanismo psicológico que lo hace funcionar, el fallo conductual que lo degrada y la corrección de diseño que lo recupera. Cerramos con diez recomendaciones dirigidas a la Administración española, a las instituciones europeas y a las empresas del sector energético, de distribución, alimentación y movilidad. Añadimos una oferta concreta de colaboración: nuestro equipo puede pre-testar experimentalmente diseños de comunicación, etiquetado y precios antes de su despliegue, con muestras representativas y en plazos de semanas.

Executive summary

Climate policy in Europe has become very good at setting targets and reasonably good at pricing carbon. It remains weak at one thing: predicting what people actually do when a policy reaches them. TRANSCLIMA spent four years measuring exactly that, in 24 experiments and surveys, about half of them using online quota panels matched to census benchmarks, totalling 14,233 participants. The headline result is that several flagship instruments underperform, and some backfire, for reasons that are identifiable, measurable and fixable at the design stage.

14,233
participants across the 24 datasets behind this report

24
experimental studies and surveys, several core studies pre-registered

33
peer-reviewed articles directly related to the project

9
book chapters · 3 doctoral theses completed, 2 ongoing

TEN FINDINGS THAT CHANGE POLICY DESIGN

1. A visible carbon price can cancel its own effect

Across four main experiments with US-representative quota samples (N = 2,900) and two supporting pilot studies (N = 600; 3,500 participants in total), a 15% price increase reduced purchase intention when presented as an ordinary price rise (ΔPI = −0.27, 95% CI [−0.43, −0.11], p = .001). The identical increase had **no significant demand-reducing effect** when consumers were told it was a carbon tax (ΔPI = +0.04, p = .646). Paying a carbon tax is construed as a moral act that licenses the purchase. The salient condition bundled the explicit tax amount with an explanation of its climate purpose, so the experiment does not identify the effect of a receipt line item on its own. Pooled effect size across the four main studies: Cohen's d = 0.31, 95% CI [0.19, 0.43], which matches the average magnitude of moral-licensing effects estimated by Blanken et al. (2015) in their meta-analysis.

2. The backfire is concentrated among your allies

In all four studies the salience effect was strongest for the most climate-concerned and least conservative participants (bsalience×concern = 0.56, p < .001; bsalience×conservatism = −0.32, p < .001). Carbon pricing loses effectiveness precisely among the citizens most likely to support it. Tax level (5% vs 15%) did not change the pattern; adding a carbon footprint label did not correct it.

3. Publicising climate progress can license backsliding, unless you attach a norm

Telling a representative US sample (N = 500) that emissions had fallen, and crediting that fall to their collective effort and their own sacrifice, raised their moral self-concept (M = 3.10 vs 2.87, |d| = 0.26, p = .004) and, **through that boost**, *lowered* low-carbon behavioural intentions (indirect effect b = −.05, 95% CI [−.09, −.02]) while raising climate-harmful ones (b = .02, CI [.01, .05]). A simple environmental-norm message removed the effect entirely (2.87 vs 2.88, n.s.). This is the cheapest design fix in the report.

4. Fairness framing polarises more than it persuades

A redistribution ("distributional fairness") frame raised Democrats' carbon tax acceptance from 4.25 to 4.43 but pushed Republicans from 3.25 down to 2.66, widening the partisan gap from 1.00 to 1.77 points (interaction F(2, 294) = 3.40, p = .035). A market-freedom ("personal fairness") frame did not recover Republican support either. Identity-targeted framing is not a dependable depolarisation instrument.

5. On local renewables, group norms dominate, and there is more latent agreement than the debate suggests

With 1,300 US participants we measured attitudes to nearby wind farms both implicitly (IAT) and explicitly. The partisan gap more than quadrupled in effect size when people answered consciously (implicit $d = 0.26$ vs explicit $d = 1.09$; $Z = 7.03$, $p < .001$). Perceived within-party support drove explicit attitudes; issue framing barely moved them. Energy-security framing helped only among very conservative Republicans who already believed their party was supportive; among those unsure of their party's position it backfired ($\Delta = -1.31$, 95% CI [−2.12, −0.50]).

6. Personal health matters at least as much as climate concern for electric vehicle adoption

In a representative US survey ($N = 800$), concern about the personal health impacts of air pollution predicted BEV adoption intention at least as strongly as climate concern ($\beta = 0.28$, $t = 6.54$ vs $\beta = 0.23$, $t = 5.45$). For highly health-oriented individuals the health pathway was the single strongest predictor in the model ($\beta = 0.37$ at +1 SD; interaction stronger than climate concern, $z = 2.24$, $p < .01$). Cost, charging infrastructure and range remain significant barriers ($\beta = -0.12$).

7. Greenwashing perception and social cynicism are structural barriers to green markets

In sustainable clothing ($N = 600$, representative Australian sample), visible/conspicuous motives ($\beta = .32$) and perceived consumer effectiveness ($\beta = .31$) predicted self-reported purchasing far more strongly than environmental concern ($\beta = .13$) or brand trust ($\beta = .13$); perceived greenwashing reduced purchase. A companion study showed that social cynicism as a personality trait erodes trust in green brands *through perceived greenwashing, an implication for substantiation* that the studies motivate but did not themselves test.

8. Climate commitment changes how products are perceived, not just how they are valued

Among 800 US consumers, climate concern predicted stronger climate commitment which, in a sequential mediation model, was associated with perceiving meat alternatives as more sustainable, **more natural and better tasting: the three attributes that most often block dietary shift.** Climate communication and product acceptance are therefore not separate policy problems.

9. Intensive AI users are a receptive climate audience, but only where the footprint is disclosed

In a preregistered survey of 845 US adults, heavier use of AI services went with **stronger**, not weaker, pro-climate intentions ($r = 0.42$), through a sequence in which climate anxiety fed climate commitment and commitment fed intention. The result that matters for regulation is the boundary condition: awareness of AI's environmental impact conditions the chain. Among consumers with little awareness the serial indirect effect is **statistically indistinguishable from zero** (0.024, 95% bootstrap CI [−0.001, 0.052]); among the most aware it is roughly five times larger and clearly significant (0.113, 95% CI [0.082, 0.147]). Awareness was measured rather than manipulated, so disclosure of AI's energy, carbon and water footprints is a promising intervention to test rather than a demonstrated precondition — but it is where this evidence points.

10. Advocacy content outperforms product promotion in influencer campaigns

In a 550-respondent Australian survey, greenfluencers' environmental advocacy — recommending public transport, supporting environmental groups, circulating petitions, criticising polluting companies — was associated with followers' climate-action intention about twice as strongly as commercial promotion of sustainable lifestyles ($\beta = 0.41$ versus $\beta = 0.22$; $Z = 3.94$, $p < .001$). Only advocacy significantly raised perceived credibility. The contrast is correlational, but it points campaign commissioners towards selecting advocacy-led messengers rather than scripting product endorsements.

WHY THIS LANDS NOW (STATUS AS OF AUGUST 2026)

- **The EU 2040 target — a 90% reduction in net greenhouse-gas emissions compared with 1990 levels — was formally adopted on 5 March 2026** and entered into force on 7 April 2026. Meeting it requires demand-side abatement at a scale that leaves no margin for instruments that underperform by design.
- **ETS2 for buildings and road transport is scheduled to become operational in 2028.** ETS2 regulates upstream fuel suppliers; member-state and supplier decisions will determine how the cost is passed through and displayed to households. That disclosure design is where Finding 1 applies.
- **The Social Climate Fund** will mobilise at least €86.7 billion between 2026 and 2032, with national Social Climate Plans defining the accompanying communication. Findings 3, 4 and 5 apply directly.
- **Directive (EU) 2024/825 on empowering consumers for the green transition** applies from 27 September 2026, while the Green Claims Directive remains stalled. Enforcement discretion will be wide, and Finding 7 provides behavioural criteria for it.
- **Spain's updated PNIEC 2023–2030** targets 81% renewable electricity and 76 GW of PV by 2030. Delivery depends on permitting, grids, investment and social acceptance; Finding 5 speaks to the last of these.
- **Spain's 2026 automotive package** introduced new vehicle-purchase and charging-support arrangements following MOVES III. Finding 6 is directly applicable to the communication accompanying them, though the study did not evaluate the programmes themselves.
- **Spain approved the creation of a Panel Científico de Acción frente al Cambio Climático** on 28 July 2026, to be constituted in autumn 2026. Its scientific council explicitly includes behavioural sciences applied to the ecological transition, and its committee brings together the Spanish Climate Change Office and the National Science Advice Office.

WHAT WE ARE OFFERING

This report is an invitation, not a broadcast. Our group operates a standing experimental capability: Qualtrics survey experiments, choice-based conjoint and representative online panels in Spain, the EU and the US. It can pre-test a communication, labelling or pricing design in a matter of weeks, before it is deployed at national scale. Data and materials for all studies are deposited on the Open Science Framework or Zenodo. We welcome briefings, workshops, joint pre-testing and formal collaboration agreements.

1. The effectiveness gap

Climate policy models the citizen as a price-taker with stable preferences and complete information. Four decades of behavioural research say otherwise, but the implications have rarely been tested on the specific instruments Europe is now deploying at scale. That is the gap TRANSCLIMA was funded to close.

The project began from a simple hypothesis: monetary and non-monetary incentives would be more effective at stimulating low-carbon consumption **when their design and evaluation incorporate consumer behaviour and environmental psychology**. Instruments were therefore not evaluated in the abstract but in the situations where citizens actually meet them: a price on a shelf, a news item about falling emissions, a wind farm proposed near a village, a plant-based product in a supermarket, an influencer's post.

The result is not a general endorsement or rejection of carbon pricing, nudging or green marketing. It is something more useful: a map of **where each instrument leaks**, how large the leak is, and what design change closes it.

1.1 The project in numbers

Output	Result
Peer-reviewed articles directly related to the project	33
Further peer-reviewed publications by the team in the period	18
Book chapters	9 (Springer, Routledge, PUPPA)
Doctoral theses	3 completed (all cum laude; one Extraordinary Doctorate Award), 2 ongoing
International collaborations	USC Wrigley Institute · Michigan State · ICTA-UAB · La Trobe LISAF · St. Gallen IEE · Universidad del Rosario · IPADE · St Antony's College Oxford
Public engagement	Monthly science segment on Basque public radio (EITB, 2025–2027); co-organisation of the first parliamentary debate on growth limits at the Congreso de los Diputados (2025); national media coverage

Table 1. TRANSCLIMA outputs, 2022–2026.

External recognition. The evidence in this report has been recognised outside the project on five occasions: a Best Paper Award 2026 from the International Journal of Advertising for the greenfluencer nature-posts study; a Best Student Paper Award at ICORIA 2022, awarded by the European Advertising Academy, for the social cynicism study; Wiley Top Downloaded and Top Viewed Article distinctions for the two sustainable clothing papers; and a University of the Basque Country EHU extraordinary doctoral prize for the thesis underpinning the carbon pricing work.

1.2 How the evidence was produced

- **24 experimental studies and surveys. About half used online quota panels matched to census benchmarks for the adult populations of the United States and Australia; the rest used party-balanced panels, student samples and convenience samples for the pilot stages. Total: 14,233 participants.** Every dataset, with its sample and design, is documented in the open-access deposits and the source publications.
- **Randomised between-subjects designs** with manipulation checks, pre-registration on AsPredicted for the core carbon pricing studies, and robustness checks across products, price levels and purchase scenarios.

- **Analysis** by multiple regression with robust standard errors, moderated mediation (PROCESS), structural equation modelling, ANOVA and internal meta-analysis of pooled effect sizes.
- **Open science:** 22 of the 24 datasets are deposited in open access under a CC BY 4.0 licence and without embargo; the remaining two are available from the corresponding authors. The project's open-access deposits comprise 23 datasets held in 18 records with permanent identifiers: thirteen in Zenodo and five in the Open Science Framework. All twenty journal articles listed in section 13 are free to read; the two book chapters are not, although their accepted versions have been deposited in ADDI.

A note on external validity, stated honestly. These are online surveys and randomised survey experiments, not field trials. The outcomes are stated intentions, perceptions and self-reported behaviour rather than verified purchases, energy use or emissions, and stated measures typically inflate absolute magnitudes. Randomisation supports causal conclusions about the tested message or format; the mediating mechanisms are model-dependent, and the cross-sectional studies establish association rather than causation. Samples described as representative are quota samples matched on named demographics, not representative on every dimension. Results obtained in the United States and Australia need replication before direct application in Spain. What this evidence reliably gives is the **direction and mechanism** of a response and the **relative** performance of competing designs — which is what is needed to choose what to field-test, not a calibrated estimate of national policy impact.

2. Carbon pricing: the visibility paradox

The single most consequential finding of the project, and the one with the shortest path to application in ETS2.

Carbon pricing works through a price signal: raise the cost of a carbon-intensive good and demand falls. Policymakers separately face a transparency decision: whether the carbon component appears as a line item in the retail price or is absorbed invisibly into it. That decision has been treated as a communications question. It is not. It is a design parameter that changes how much abatement the instrument delivers.

2.1 What we did

Four main experiments (N = 2,900) placed participants drawn from US-representative quota panels in simulated purchase scenarios for everyday carbon-intensive goods: a mobile phone, a microwave, an LED television, premium beef hamburgers and sports shoes. Three conditions: the baseline price; the same price raised by 15% with no explanation; and the same raised price with the increase identified as a carbon tax, the amount shown explicitly and accompanied by an explanation that the tax was a climate measure introduced to lower the emissions generated in the manufacturing and transport of the product. The salient condition therefore bundles two things, the visible line item and the statement of purpose, and the design does not separate their effects. Later studies varied the tax level (5% vs 15%), added a carbon footprint label, and replicated the design in a simulated online shopping environment. Two pilot studies preceded them, a convenience sample of 200 university students and a random draw of 400 respondents from a US Prolific panel, establishing the two halves of the moral-licensing mechanism. Total participation: 3,500.

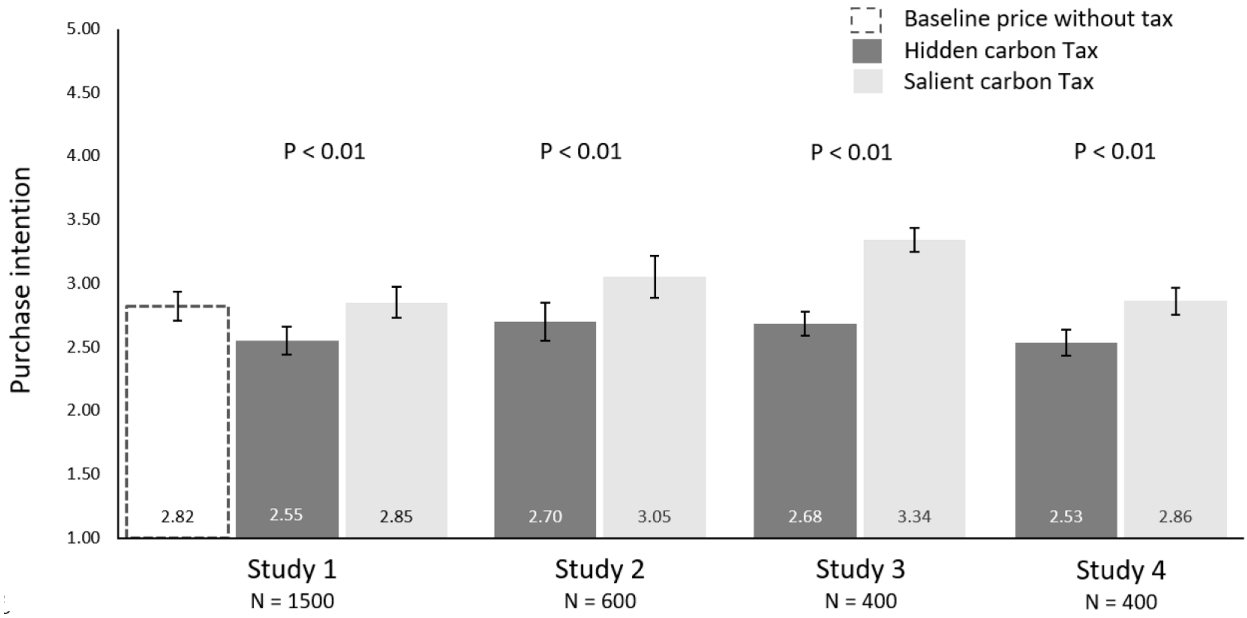


Figure 1. Purchase intention by experimental group across four studies. The dashed bar is the baseline price without any tax. Dark bars: the price increase presented without explanation (hidden carbon tax). Light bars: the identical price increase identified explicitly as a carbon tax, with its climate purpose explained. In every study, making the carbon tax visible raised purchase intention. Error bars: 95% confidence intervals.

Source: Hartmann, Marcos & Barrutia (2023), Global Environmental Change 78, 102635 (CC BY).

2.2 What we found

- **The hidden price increase worked.** A 15% rise with no explanation cut purchase intention significantly (ΔPI = −0.27, 95% CI [−0.43, −0.11], t(1497) = −3.33, p = .001).
- **The visible carbon tax did not.** The same 15% rise, labelled as a carbon tax, produced no significant reduction relative to the untaxed baseline (ΔPI = +0.04, 95% CI [−0.12, 0.20], p = .646). What the studies compare is a bundled disclosure (amount plus climate rationale) against an unexplained price rise; whether itemisation on its own produces the effect is untested.
- **The gap between the two is the size of the policy leak**: ΔPI = 0.31, 95% CI [0.14, 0.47], p < .001 in Study 1, replicated in Studies 2, 3 and 4 (ΔPI = 0.35, 0.66 and 0.33 respectively).
- **The mechanism is moral licensing.** Participants who saw the carbon tax reported a significantly higher moral self-concept (M = 3.51 vs 3.12, ΔM = 0.38, 95% CI [0.23, 0.53], t(598) = 4.94, p < .001), and this boost mediated the increase in purchase intention. Paying the tax feels like doing one's part, and doing one's part licenses the purchase.
- **It is not an environmental-friendliness effect.** Study 4 ruled out the alternative explanation that a salient carbon tax signals a greener product (ΔM = 0.14, 95% CI [−0.08, 0.36], t(398) = 1.27, p = .205).
- **Raising the tax does not solve it.** The salience effect did not differ significantly between a 5% and a 15% carbon tax (bsalience×tax level = 0.23, 95% CI [−0.05, 0.50], t(1596) = 1.64, p = .101).
- **Carbon footprint labels do not correct it.** Adding product carbon labels neither reduced purchase intention nor interacted with tax salience (b = −0.06, p = .705).

Study	N	PI, hidden tax	PI, salient tax	Difference	Cohen's d
Study 1	1,500	2.55 [2.44, 2.66]	2.85 [2.73, 2.98]	+0.31 [0.14, 0.47]	0.23 [0.10, 0.35]
Study 2	600	2.70 [2.55, 2.85]	3.05 [2.89, 3.21]	+0.35 [0.11, 0.57]	0.25 [0.09, 0.42]
Study 3	400	2.68 [2.59, 2.78]	3.34 [3.24, 3.43]	+0.66 [0.52, 0.79]	0.48 [0.38, 0.58]

Study 4	400	2.53 [2.42, 2.63]	2.86 [2.75, 2.96]	+0.33 [0.18, 0.48]	0.25 [0.14, 0.36]
Pooled, four main studies (random effects)	**2,900**	—	—	—	**0.31 [0.19, 0.43]**

Table 2. Purchase intention (1–5 scale) under a hidden versus a salient carbon tax, all at the same increased price. All differences p < .001. The internal meta-analysis pools the four main studies only; the two pilot studies (N = 600) tested the two halves of the mechanism separately. The pooled estimate matches the average magnitude of moral-licensing effects reported by Blanken et al. (2015). Source: Hartmann, Marcos & Barrutia (2023).

2.3 The uncomfortable moderation

The effect is not uniform across the population. It is concentrated among the climate-concerned and the non-conservative: the citizens whose cooperation carbon pricing depends on.

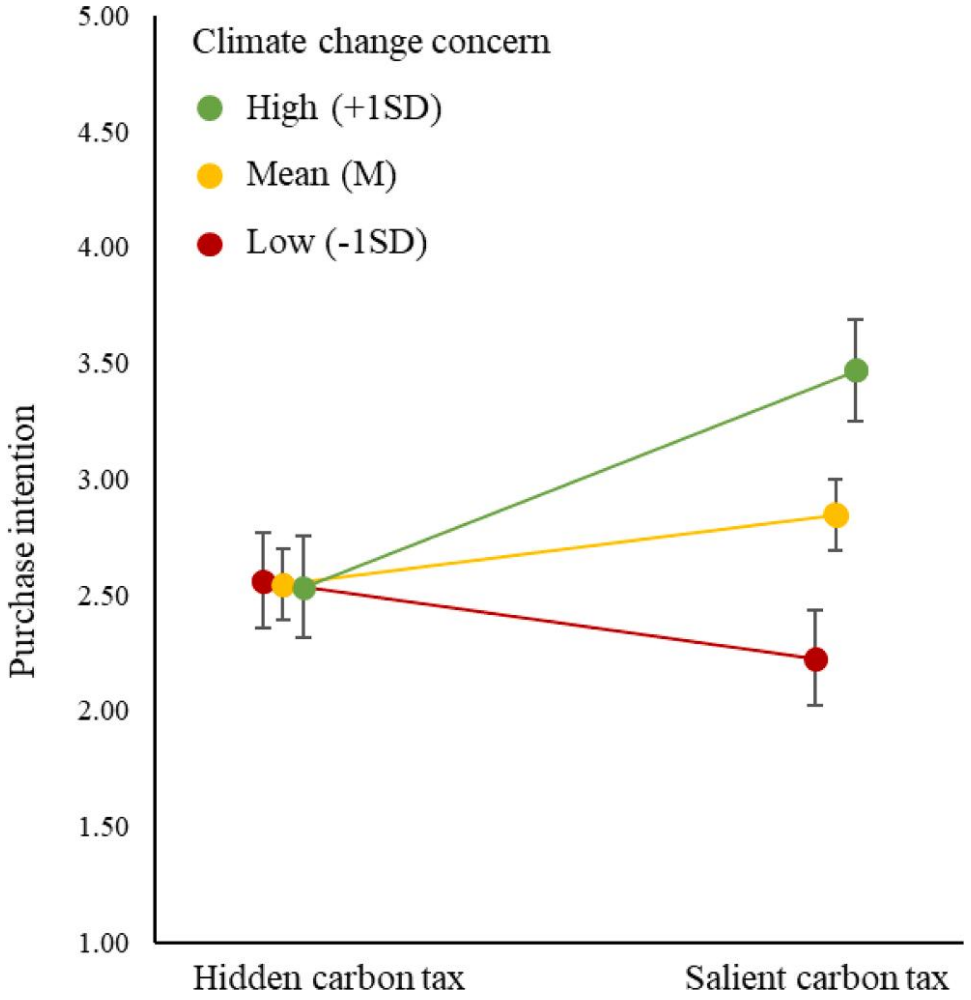


Figure 2. The carbon tax salience effect by level of climate change concern. For highly concerned consumers (green), making the carbon tax visible raised purchase intention sharply. For the least concerned (red), it slightly reduced it. The same pattern appeared, inverted, for political conservatism.

Source: Hartmann, Marcos & Barrutia (2023), Global Environmental Change (CC BY).

Interpretation matters here. Highly concerned consumers are more likely to construe paying a carbon tax as a moral act, so the moral credential they earn is larger. Less concerned consumers do not read the tax as a moral act at all and simply see a higher price. The instrument therefore works closest to textbook expectations on the segment least sympathetic to it, and leaks most on the segment most sympathetic, the exact inverse of what communication strategies assume.

DESIGN IMPLICATIONS FOR ETS2 AND NATIONAL CARBON PRICING

(a) Treat point-of-sale carbon-price disclosure as a policy variable, not a communications afterthought. The evidence suggests separating two kinds of transparency: high transparency at the *policy* level (what the price is, where the revenue goes, who is compensated) sustains legitimacy; itemised *point-of-sale* labelling of the carbon component appears to reduce the demand response. **(b) If salience is retained for legitimacy reasons, which is a defensible choice, quantify the attenuation before setting the rate.** Our studies establish that the leak exists and is larger among the climate-concerned, but they were not designed to estimate the price increment that would restore a given demand response; that requires field or high-realism demand studies. **(c) Pre-test before ETS2 enters into force in 2028.** Fuel receipts and heating bills are the largest carbon-price salience experiment Europe will ever run; running it without prior behavioural testing would be an avoidable error. **(d) Do not rely on carbon labels to repair the effect** — they did not.

3. Climate communication: good news, bad consequences

The cheapest fix in this report: pair a climate-progress message with a normative cue, and pre-test the pair before it goes out.

Governments and agencies routinely communicate environmental progress (emissions down, renewables up, targets met) on the assumption that success motivates further effort. We tested that assumption with a representative US sample (N = 500) using the emissions drop of the COVID-19 period as the progress message.

3.1 What we found

- Awareness of the emissions reduction **increased moral self-concept** (M = 3.10 vs 2.87, t = −2.89, p = .004, |d| = 0.26).
- Through that boost it **reduced intentions to engage in low-carbon behaviour** (indirect effect b = −.05, 95% CI [−.09, −.02]). The effect on behaviour runs through the mediator: the raw group differences in stated behaviour were not themselves significant.
- It also **increased the disposition to perform climate-harmful behaviours** (indirect effect b = .02, 95% CI [.01, .05]).
- **Activating an environmental social norm eliminated the effect.** In the norm condition, moral self-concept was 2.88 in the low-awareness and 2.87 in the high-awareness group, a null difference. Without the norm, it rose from 2.86 to 3.31 (t = −4.33, p < .001).
- A strong pre-existing environmental self-identity **weakened but did not remove** the effect: the negative indirect effect was still detectable at +1 SD of self-identity (b = −.07, 95% CI [−.14, −.01]) when no norm was present. In the norm condition it fell to approximately zero.

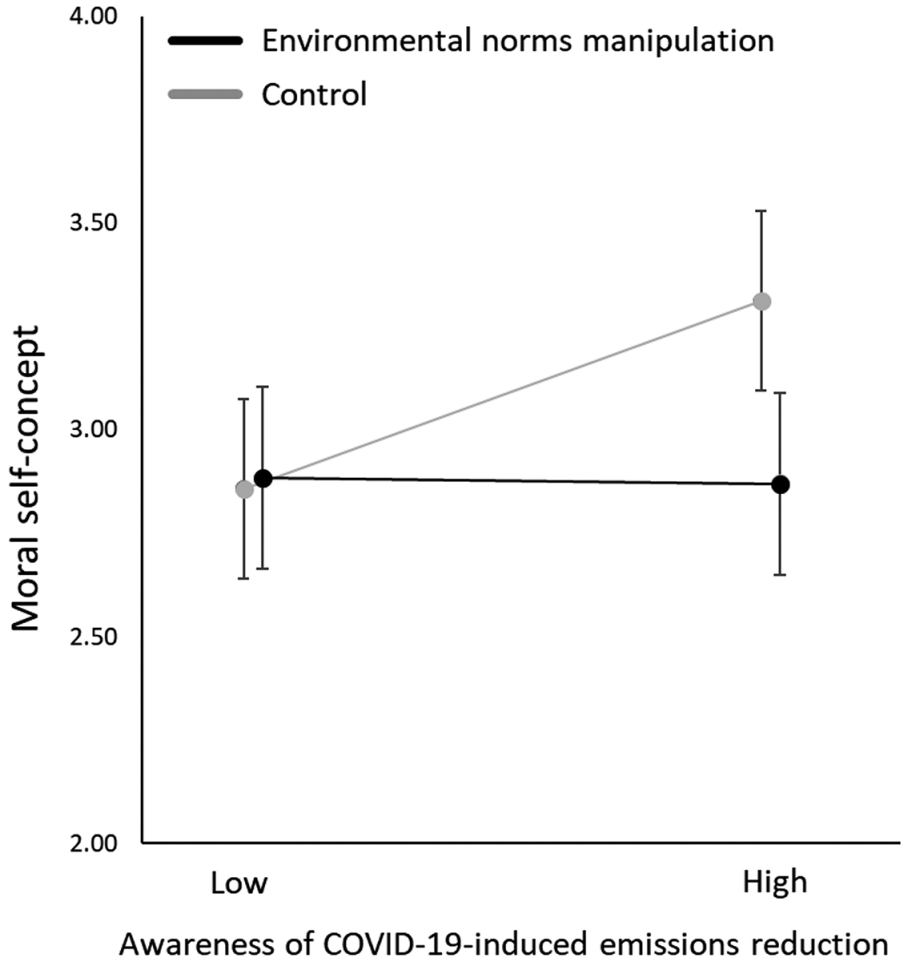


Figure 3. Moral self-concept after exposure to a message about falling emissions, with and without an accompanying environmental norm. The grey line is the progress-plus-personal-credit message that was tested: awareness of emissions reduction inflates moral self-concept, which in turn licenses less climate-friendly behaviour later. The black line shows the same message accompanied by a normative appeal: the licensing effect disappears.

Source: Marcos, Hartmann & Barrutia (2023), Environmental Values 32(3), 337-370.

DESIGN IMPLICATION: A ONE-LINE CHANGE TO COMMUNICATION PROTOCOLS

Every public communication reporting climate progress should carry a normative component: what people around you are doing, and what remains expected of you. Concretely, and as an illustration rather than a tested wording, replace “Spain’s emissions fell X% last year” with “Spain’s emissions fell X% last year because a growing majority of households changed how they heat, travel and eat, and the next stage depends on the rest following.” The cost of this change is zero; the evidence from this experiment says the second version removes the licensing pathway the first one opens. Three caveats: the tested message concerned COVID-19 emissions reductions specifically and credited the reader’s own sacrifice; the norm cue actually tested was a statement that more than 65% of the public were very concerned about climate change together with a reminder that close others may expect the reader to cut emissions; and a normative claim must be empirically true before it is used. This applies to MITECO and OECC communications, to IDAE campaigns, to Social Climate Plan messaging and to corporate sustainability reporting aimed at customers.

3.2 Who is already receptive: feminist identity predicts climate action, gender does not

Climate communication usually assumes one motivational entry point, concern about climate change itself, and one obvious way to segment an audience: gender. A preregistered representative US survey (N = 840, quotas on gender, age, income and education against 2020 census

benchmarks) tested both assumptions and found the second one wrong. Self-identification as a feminist correlated strongly with climate action ($r = .59$, $p < .001$); respondent gender did not ($r = .03$, n.s.). The relationship ran through three parallel routes, each significant: awareness of how climate change bears unequally on women ($b = .14$, 95% CI [.10, .18]), empathy with nature ($b = .16$, [.12, .19]) and climate change concern ($b = .20$, [.16, .24]), with a total indirect effect of $b = 0.49$ [0.44, 0.55] and a direct path still remaining afterwards ($b = 0.13$, $p < .001$). Exposure to climate news in the media strengthened only the first of the three ($b = 0.06$, $p < .01$), and the indirect effect through gender inequality awareness was largest among the most media-exposed ($b = 0.15$, [0.10, 0.20]). The design is cross-sectional, so these are associations within a fitted model rather than demonstrated causal effects. For campaign design the reading is twofold: an equity frame reaches a motivational route that a purely environmental frame does not, and segmenting a climate campaign by gender is the wrong cut. The food section reaches the same conclusion for dietary change (section 7.2). Source: Apaolaza, Hartmann, Rincón & Paredes (2026), Journal of Business Ethics 206, 635–650 (open access).

4. Polarisation: what framing can and cannot do

Two studies, one conclusion: identity-targeted message framing is an unreliable instrument. Group norms are the lever.

4.1 Carbon tax acceptance in a polarised electorate

We measured the fairness of carbon taxes **relative to ordinary consumption taxes**, both implicitly (Implicit Association Test) and explicitly, in a politically balanced US online-panel sample ($N = 405$; 202 Democrats, 203 Republicans, balanced by party rather than census-weighted). We then tested two message frames on a second sample ($N = 300$) split evenly between Democrats and Republicans. One frame emphasised distributional fairness (revenue returned to low-income and affected communities); the other emphasised personal freedom and market flexibility.

- Fairness perceptions were **already polarised at the implicit, unconscious level, but the gap more than doubled** when participants reported their views consciously.
- The distributional frame **widened** the partisan gap from 1.00 to 1.77 points on a 5-point acceptance scale (interaction $F(2, 294) = 3.40$, $p = .035$). The movement was almost entirely Republican: their acceptance fell from 3.25 to 2.66, while the Democratic rise from 4.25 to 4.43 was descriptive only and not statistically significant ($F(2, 294) = 0.51$, $p = .601$).
- The personal-freedom frame did not significantly move Republicans either (gap 1.27).
- Because the divergence is concentrated at the explicit, deliberated level, which is more malleable than implicit attitudes, the positions **are not irreconcilable**. But they are not bridged by frames that carry partisan signatures.

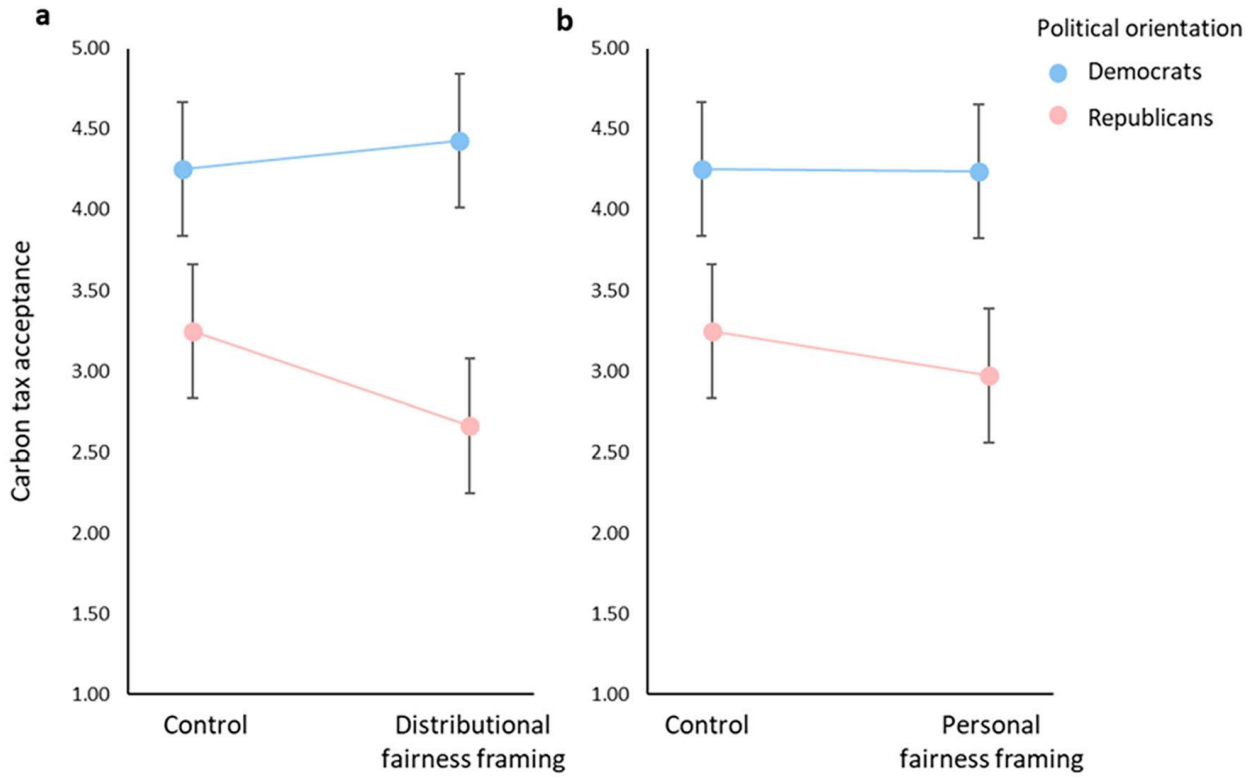


Figure 4. Carbon tax acceptance by political orientation and message frame. Panel (a): a distributional fairness frame raised Democrats' acceptance slightly and reduced Republicans' sharply. Panel (b): a personal freedom frame failed to recover Republican support. Error bars: 95% confidence intervals.

Source: Marcos, Barrutia & Hartmann (2023), Climate Policy 23(7), 885-900.

4.2 Wind farms: the gap between what people feel and what they say

We recruited 1,300 US participants: a politically balanced Prolific sample of 650 Democrats and 650 Republicans, of whom 1,240 remained after prespecified quality exclusions. We applied the same implicit/explicit logic to attitudes toward nearby wind farms relative to nearby gas-fired power plants, the acceptance problem that most directly constrains Spain's 2030 renewable build-out.

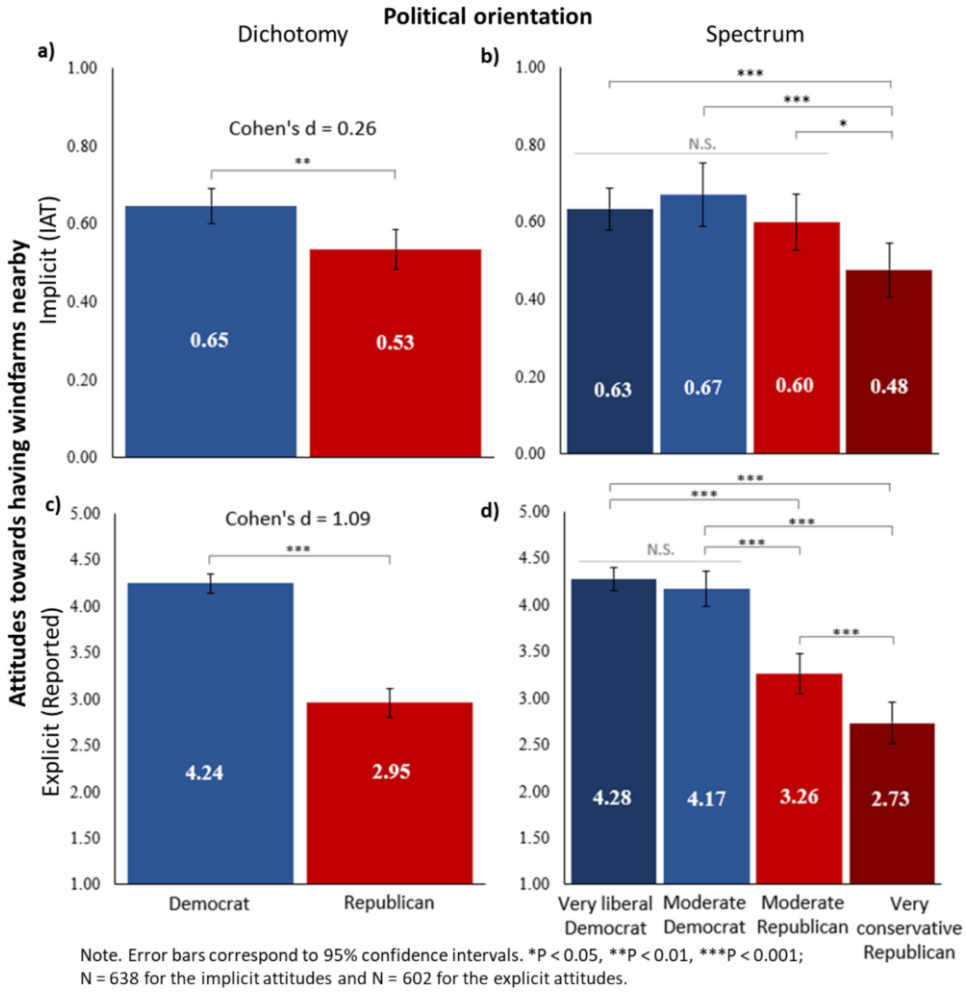


Figure 5. Attitudes toward having wind farms nearby, measured implicitly (top row, Implicit Association Test) and explicitly (bottom row, self-reported), by political orientation. The partisan gap is modest when measured implicitly (d = 0.26) and large when measured explicitly (d = 1.09). Panels (b) and (d) show that moderate Republicans' implicit attitudes are statistically indistinguishable from Democrats'.

Source: Marcos, Hartmann, Bessette & Árvai (2025), Energy Research & Social Science 119, 103848. Implicit attitudes are measured relative to nearby gas-fired power plants.

- **Explicit attitudes are far more polarised than implicit ones** ($Z = 7.03$, $p < .001$). This is consistent with greater identity expression in deliberate responses, although the design does not establish that publicly declaring a position produced the gap.
- **Perceived within-party support was strongly associated with explicit attitudes** and moderated the partisan gap: people appear to calibrate their stated position to what they believe their own group thinks. This perception was measured, not manipulated.
- **Issue framing produced mixed and conditional effects.** Energy-security framing improved attitudes among very conservative Republicans **only where they already perceived high within-party support** ($\Delta = +0.98$). Among those unsure of their party's position the same frame **backfired**, reducing attitudes by 1.31 points relative to control (95% CI [−2.12, −0.50], $F(2, 569) = 6.57$, $p = .002$); where perceived support was low it had no significant effect. A frame is not safe to deploy without first measuring the group norm.

DESIGN IMPLICATIONS FOR RENEWABLE SITING AND CLIMATE POLICY COMMUNICATION

(a) Stop optimising the message and start correcting the norm. The highest-leverage intervention is credible information about what people's own reference group actually thinks — where a community is shown to overestimate local opposition. **(b) Use trusted local and in-group messengers** rather than national institutional voices, which carry partisan signatures. **(c) Do not deploy an energy-security frame blind.** It helped only where conservative audiences already believed their party supported wind, and backfired where they were unsure, so measure perceived in-group support first. **(d) Measure latent, not just stated, acceptance** in siting consultations; stated preferences may overstate opposition relative to implicit measures.

5. Trust, greenwashing and what actually drives green purchase

Directly relevant to Directive (EU) 2024/825, applicable from 27 September 2026.

Two papers analysed the same representative Australian consumer sample (N = 600) to examine why the green consumption attitude–behaviour gap persists in a sector responsible for roughly 10% of global carbon emissions: clothing.

5.1 The drivers are not the ones policy assumes

Predictor of self-reported sustainable clothing purchasing	Standardised effect (β)	Interpretation
Conspicuous consumption motives	**.32** (t = 9.18)	Visible, status-signalling sustainability
Perceived consumer effectiveness	**.31** (t = 7.66), interaction β = .51	"My choice makes a difference"
Environmental concern	.13 (t = 3.25)	Real but comparatively weak
Trust in the sustainable brand	.13 (t = 3.80)	Necessary but not sufficient
Perceived greenwashing	−.08 (t = −2.27, p = .02)	Active barrier in the fitted model

Table 3. Predictors of self-reported sustainable clothing purchasing frequency, representative Australian sample (N = 600). Cross-sectional survey: associations within a fitted model, not causal effects. Source: Apaolaza, Policarpo, Hartmann, Paredes & D'Souza (2023), Business Strategy and the Environment 32(6).

The strongest single result in the model was an interaction: conspicuous consumption motives are associated with purchasing **much more strongly when consumers believe their choice matters** (interaction $\beta = .51$, $t = 3.81$, $p < .001$). The association is already positive and significant at low perceived effectiveness ($\beta = .28$, $t = 5.33$, $p < .001$) and rises to $\beta = .40$ at the mean and $\beta = .51$ at +1 SD. Efficacy does not switch status motivation on; it roughly doubles its strength.

5.2 Perceived greenwashing carries the link between cynicism and lower trust

A companion analysis of the same sample found that social cynicism (a general belief that people and institutions act self-interestedly) is associated with lower trust in green clothing brands, with the association running **through heightened perceptions of greenwashing**. Cynical consumers do not merely distrust green claims; they reinterpret them as deception. The indirect association weakened as conspicuous consumption motives rose and was no longer distinguishable from zero at +1 SD. The design is cross-sectional, so this is a consistent mediation model rather than a demonstrated causal chain.

DESIGN IMPLICATIONS FOR GREEN CLAIMS REGULATION AND CORPORATE COMMUNICATION

(a) With the Green Claims Directive stalled, enforcement of Directive (EU) 2024/825 will carry the load. Our results argue for prioritising *verifiability* over *volume* of environmental information: perceived greenwashing was associated with lower trust and carried the link from consumer cynicism to distrust, although verified and unverified claims were not compared directly. **(b) For companies: environmental concern is a weak lever; efficacy and visibility are strong ones.** Communication that shows consumers the concrete, quantified consequence of their individual choice outperforms communication that appeals to concern. **(c) Third-party substantiation is the most promising route to defensible green premiums**, particularly with cynical segments — though our studies motivate this conclusion rather than directly comparing certified with uncertified claims.

6. Electric mobility: sell the air, not only the climate

A directly applicable communication proposition for Spain's vehicle incentives and municipal low-emission zones, and a strong candidate for experimental pre-testing.

Battery electric vehicle policy in Spain and the EU is communicated almost exclusively through climate and cost arguments. A representative US survey (N = 800) tested whether a third motive, concern about what internal combustion emissions do to one's own respiratory and cardiovascular health, carries independent weight.

- **Air pollution health concern predicted stated BEV adoption intention at least as strongly as climate concern** ($\beta = 0.28$, $t = 6.54$ vs $\beta = 0.23$, $t = 5.45$; both $p < .001$).
- **Health orientation moderated the relationship**, and the interaction was the strongest single effect in the model, stronger than climate concern itself ($z = 2.24$, $p < .01$).
- For highly health-oriented individuals, the conditional association of air-pollution health concern reached $\beta = 0.37$ (vs $\beta = 0.17$ for the least health-oriented). The survey is cross-sectional, so these are predictive associations rather than demonstrated causal effects.
- **Adoption barriers remain real and significant** ($\beta = -0.12$): purchase price, charging infrastructure, driving range, repair costs, performance and resale value.

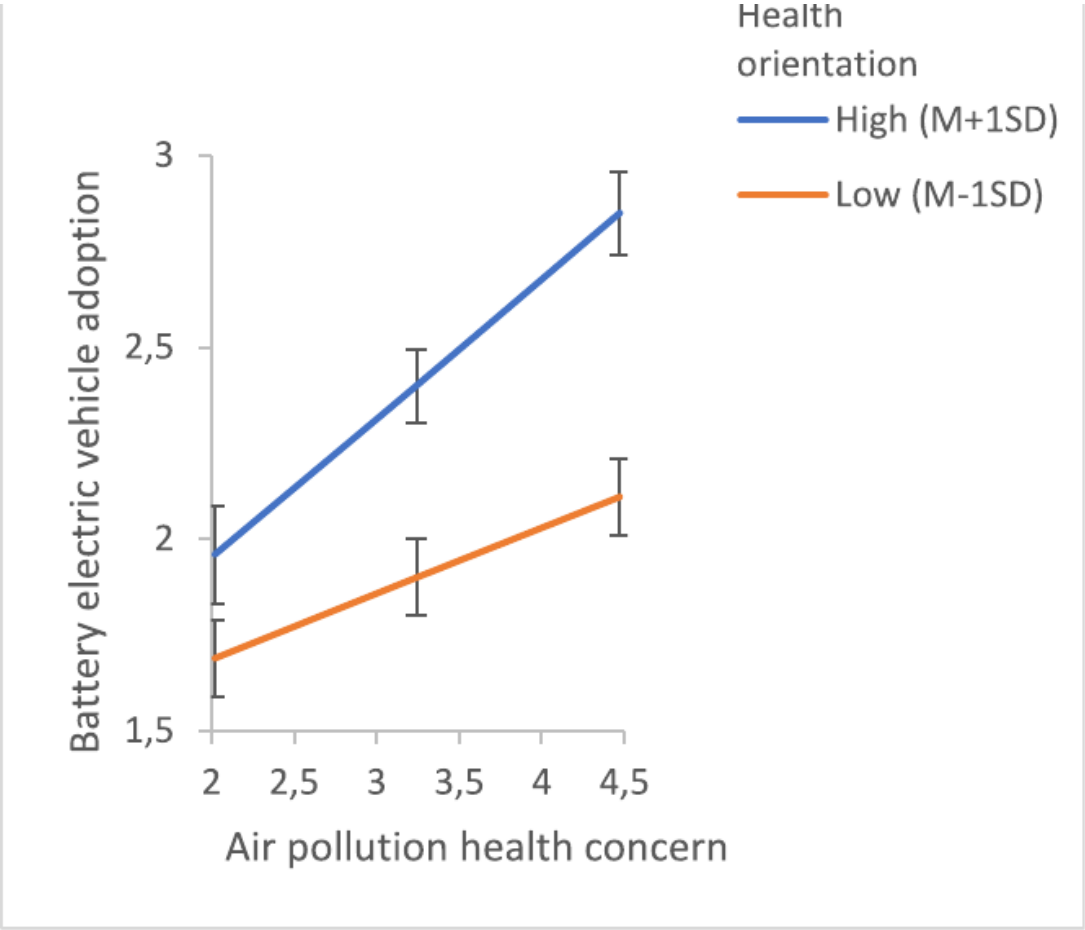


Figure 6. The moderating effect of health orientation on the influence of air pollution health concern on battery electric vehicle adoption intention. For health-oriented consumers (blue), personal health concern about air pollution is the strongest driver of adoption in the entire model.

Source: Hartmann, Apaolaza, Eletxigerra, Barrutia & Echebarria (2025), Business Strategy and the Environment 34(7), 8020-8033 (open access).

DESIGN IMPLICATION

Public campaigns and manufacturer communication should test pairing the climate argument with an explicit, evidence-based personal health argument: the documented respiratory and cardiovascular consequences of combustion emissions in the buyer's own city. The survey identifies the motive; a message experiment comparing climate-only, health-only and combined appeals would establish what it is worth. The motive reaches a segment climate framing does not, and costs nothing to add. It also creates a natural alignment between transport decarbonisation policy (MITECO, IDAE, DGT, Plan Auto 2030) and urban air-quality policy (municipalities, low-emission zones, Ministry of Health), which are currently communicated separately.

7. Food systems: how climate commitment reshapes taste

Two studies on the demand side of dietary and agricultural transition.

Livestock production is among the largest single sources of avoidable food-system emissions, and dietary shift is among the least policy-tractable behaviours. Our food studies identify why, and what moves it.

7.1 Climate commitment produces a perceptual halo

In a preregistered representative US survey (N = 800), climate concern predicted stronger **climate commitment**, which in a sequential mediation model was associated with more favourable perceptions of the **sustainability, naturalness and taste** of meat alternatives. All three are positively linked to adoption, and naturalness and taste are usually the harder two to shift. The proposed mechanism is consistency-seeking plus a halo effect. If it holds under experimental test, a campaign that strengthens climate commitment would do double duty, improving both motivation and product evaluation, exactly the kind of claim worth pre-testing before a campaign is bought.

7.2 Gender identity, not gender

A second analysis of the same 800-respondent sample found that binary gender did **not** significantly predict intention to adopt plant-based meat alternatives. Self-perceived feminine traits did, but only among men, while among women self-perceived masculine traits increased adoption. Individuals reporting traits less stereotypically associated with their gender are the most open to dietary change. Segmentation by gender is therefore the wrong cut; segmentation by gender-trait self-concept is the right one.

7.3 Regenerative agriculture needs four value logics, not one

For food forest produce (N = 845, US quota sample), stated willingness to pay a premium was associated with four distinct value logics: nature connectedness ($\beta = .25$, the strongest), perceived health risk of monoculture farming ($\beta = .20$), climate change concern, and need for uniqueness. Critically, climate concern and need for uniqueness **substitute** rather than reinforce each other (interaction $\beta = -.28$, $p = .017$): for distinctiveness-seeking consumers, collective climate appeals lose force.

8. Channels: virtual nature, influencers and the advertising question

8.1 Nature content on social media drives climate action

Two studies traced the path from social media content to climate intentions. A survey of 550 Australian Instagram users (275 of whom followed an environmental influencer) supported a sequential model: the more frequently greenfluencers post images of nature, the more their followers report **virtual nature experiences**, which are linked to **nature connectedness**, then **climate change concern**, then **climate action** (total indirect effect b = 0.28, 95% CI [0.21, 0.35]); influencer credibility strengthened the pathway in the survey, although that moderation did not replicate in the experiment ($p = .58$ for virtual nature experience and $p = .12$ for climate-action intention, where the two main effects held). A separate randomised experiment on a representative US sample (N = 600) then supplied the causal step: exposure to a higher frequency of nature posts significantly increased both virtual nature experience and climate-action intention.

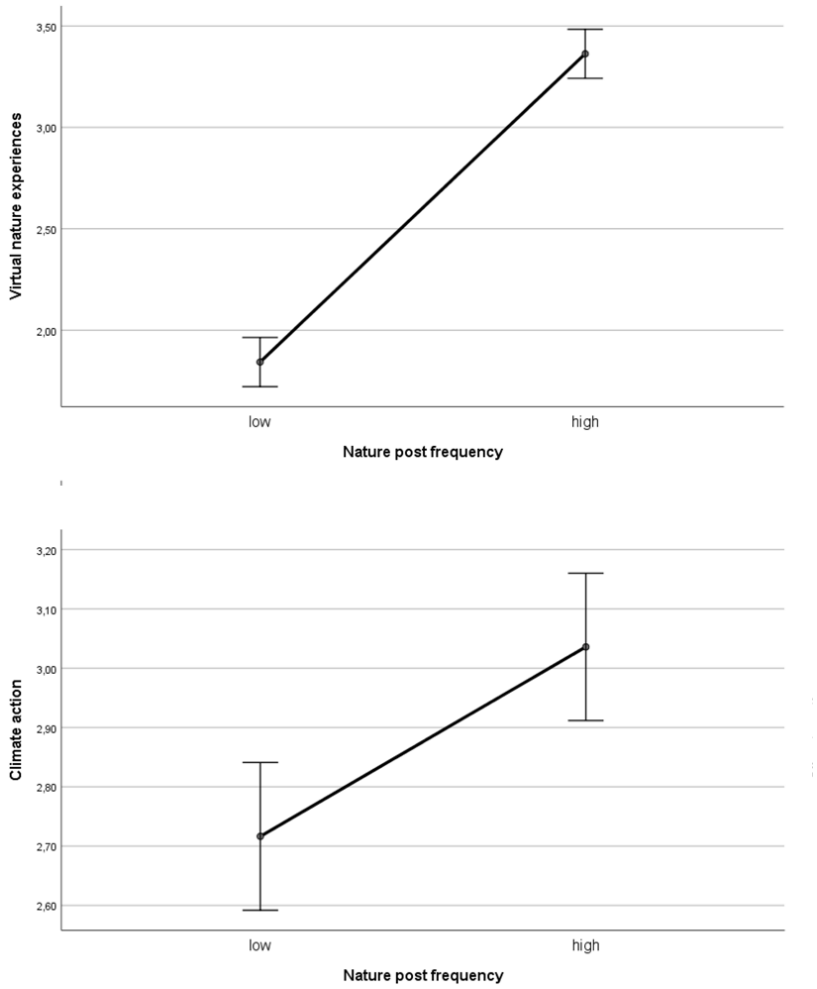


Figure 7. Experimental effect of exposure to a high versus low frequency of nature posts on Instagram (N = 600, representative US sample). Top: reported virtual nature experiences. Bottom: intention to engage in climate action. Both increased significantly. Error bars: 95% confidence intervals.

Source: Hartmann, Apaolaza, Paredes & D'Souza (2025), International Journal of Advertising 44(4), 620-650 (open access).

The practical reading is that nature imagery is a measurable behavioural intervention rather than decoration, and a low-cost content option that deserves head-to-head comparison with the threat imagery and data visualisation that dominate public climate communication. A companion paper drawing on the same 550-respondent survey asks the next question down: which kind of influencer content does the work, and through what mechanism. Because that question is the one a campaign commissioner actually faces, it is reported separately in 8.2.

8.2 Which influencer content works, and why

The same 550-respondent Australian survey answers a more operational question than whether influencer content works at all: **which content works**. The study separated two things greenfluencers do. **Green lifestyle promotion** is the commercial register: promoting sustainable brands and products, advising on greener living, posting about organic food or sustainable clothing. **Green activism** is the advocacy register: recommending public transport and energy saving, supporting environmental groups, circulating petitions to governments, joining protests, publicly criticising companies that make harmful products. Both were associated with followers' intention to act on climate, but activism roughly twice as strongly ($\beta = 0.41$ versus $\beta = 0.22$), and the difference between the two was tested directly rather than eyeballed ($Z = 3.94$, $p < .001$).

The mechanism we propose is inspirational green leadership: the degree to which a follower sees the influencer as a source of inspiration and hope about the environment rather than a source of

product recommendations. Both content types built it, activism more strongly (β = 0.50 versus 0.34), and it carried most of the effect through to intention: indirect effects of 0.25 (95% CI [0.20, 0.33]) for activism and 0.16 [0.12, 0.21] for lifestyle promotion. Perceived leadership also raised perceived climate risk (β = 0.37), which independently raised climate action (β = 0.37). The model explained 52% of the variance in climate-action intention and fitted the data well (CFI = 0.99, RMSEA = 0.05).

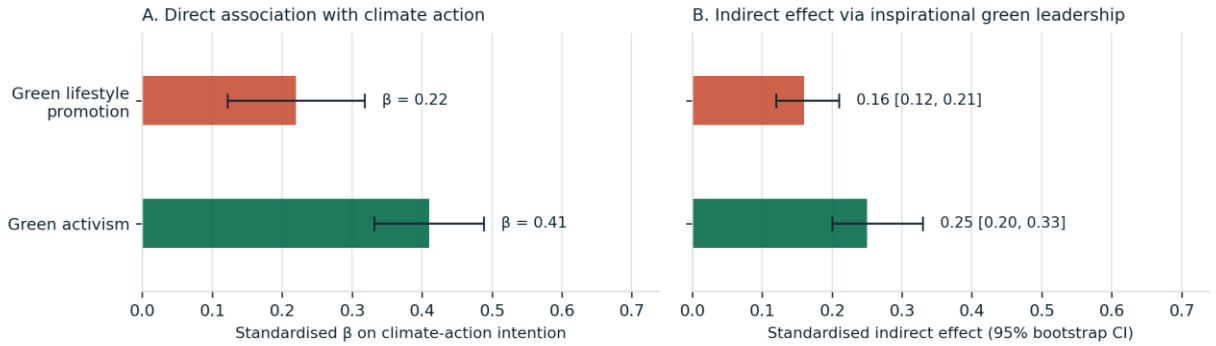


Figure 8. Two registers of greenfluencer content and their association with followers' climate-action intention (N = 550 Australian Instagram users). Panel A: direct standardised coefficients, with 95% intervals derived from the reported standard errors. Panel B: indirect effects through perceived inspirational green leadership, 95% bootstrap confidence intervals from 10,000 resamples. Advocacy content outperforms commercial lifestyle promotion on both routes.

Source: Hartmann, Apaolaza, Paredes & D'Souza (2025), International Journal of Consumer Studies 49(3), e70050 (open access).

THE CREDIBILITY ASYMMETRY

One result deserves the attention of anyone commissioning influencer work. **Green activism raised the influencer's perceived credibility; commercial lifestyle promotion did not.** The path from lifestyle content to credibility was not statistically significant and was dropped from the final model, while credibility itself fed perceived leadership (β = 0.18). Commercial green content therefore reaches climate action only by the weaker of the two routes, and contributes nothing to the trust that makes the stronger route work.

For public campaigns the reading is uncomfortable but usable. Paying influencers to showcase sustainable products is the *least* effective use of the channel; what moves followers is content that visibly costs the influencer something: advocacy, petitions and criticism of polluters. That is awkward for procurement, because activism is precisely what a public body cannot commission. The workable implication is therefore **selection rather than scripting**: partner with messengers whose existing record is advocacy-led, and resist the assumption that product endorsement builds credibility: commercial lifestyle promotion did not significantly raise perceived credibility in this survey, whereas activism did. Whether converting an advocacy-led influencer into a product endorser actively reduces credibility remains untested.

Two limits bind the claim. The design is cross-sectional, so the direction of the link between perceived leadership and climate intention is not established experimentally, since followers already motivated to act may simply perceive more leadership in those they follow. And the outcome is stated intention, not observed behaviour. The randomised experiment in 8.1 supplies causal evidence for nature-post *frequency*, but no equivalent experiment yet tests the activism-versus-promotion contrast. That contrast is a strong candidate for the kind of pre-test described in section 11.

8.3 Advertising: part of the problem and part of the solution

A project-related perspectives article, a conceptual synthesis rather than an experiment, set out the double role of the advertising industry: it has a direct carbon footprint, it greenwashes polluting products, and it stimulates consumption, although the article notes that the evidence on whether

advertising raises aggregate consumption and growth is mixed and the debate unsettled, with clearer support for an indirect route through materialism. The industry also possesses the most effective machinery available for shifting consumption toward low-carbon alternatives. The paper proposes that the industry cut ties with high-emission clients, that green advertising research shift from generic "green behaviour" to **climate-relevant behaviours** specifically, and that regulators consider the sector's aggregate emissions-inducing effect, not only the accuracy of individual claims.

8.4 Climate activism against companies: an unexpected reversal

Two experiments tested how the public reacts when climate activists target oil companies and the banks financing them. **Moderate protests outperformed disruptive ones** in shifting perceptions and customers' intentions to switch providers, particularly when aimed at banks. Disruptive protest *lowered* perceived corporate agency and responsibility, and therefore reduced the consumer pressure the protest was intended to create. Protest extremity, not the identity of the target, was the primary driver: in Study 2 the bank's direct versus indirect role in exacerbating climate change did not significantly change customer perceptions. The mechanism identified is perceived agency; the studies did not compare corporate response strategies, so whether an agency-preserving response outperforms a deflecting one remains to be tested. For the environmental movement, the result quantifies the activist's dilemma.

A larger preregistered replication, published in August 2026, extends this. With 1,200 politically balanced US participants (1,199 analysed) in a 2 × 3 design crossing protest extremity with three targets (an oil company, a bank funding oil exploration and a wind energy company), extreme protest again reduced support for the movement ($\Delta = -0.54$, 95% CI [−0.67, −0.40]), through the same chain: extreme tactics were judged more immoral ($b = 1.53$), which weakened identification with the protesters ($b = -0.18$), which in turn reduced support ($b = 0.71$). Two results sharpen the reading for campaigners and for the organisations they target. First, what the public withdraws is support for the activists' actions, not for the cause: the fall in support for the cause itself, and in willingness to join, was comparatively small. Second, the choice of target matters, but only in interaction with the audience's politics. Democrats' support fell far more when the target was a wind energy company than an oil company ($\Delta = -1.62$ under moderate protest and −0.94 under extreme protest). Republicans reacted worse to moderate protest against oil companies than against wind energy ($\Delta = -0.32$) and judged it more immoral ($\Delta = 0.49$). Target selection is therefore a segmentation decision rather than a universal one, and targeting a renewable-energy firm carries a particular cost with the audience most disposed to support the transition. Source: Kazmi, Marcos & Hartmann (2026), Journal of Environmental Psychology 114, 103183; data and materials at osf.io/6vrsg.

9. Digital consumption: AI use as a climate touchpoint

Every chapter so far has examined an instrument aimed at a consumption decision: a price, a message, a label, a product. This one examines something else: a consumption practice that nobody designed to be climate-relevant at all. Using AI services has become an everyday act for a large share of the population, and it runs on data centres with measurable energy, carbon and water footprints. The project's final study asked whether that practice has become psychologically climate-relevant for the people performing it, and what decides whether it does.

9.1 What we did

A preregistered survey of **845 US adults who use AI**, fielded in January 2026 through a commercial panel with quotas for gender, age, household income and education set against 2020 census benchmarks (52.5% female; ages 18–87, mean 51.9). Five constructs were measured with established scales: the intensity of AI use across four everyday forms; awareness of AI's environmental impact; climate anxiety, using nine of the more symptomatic items of the Climate Change Anxiety Scale; climate commitment; and pro-climate intentions across five domains: cutting one's carbon footprint, living more sustainably, buying environmentally friendly products, offsetting emissions, and switching to a green electricity contract. Measurement held up well (Cronbach's α from 0.935 to 0.975; confirmatory factor analysis CFI = 0.971, TLI = 0.969, RMSEA = 0.051, SRMR = 0.042). The model is a moderated serial mediation estimated with PROCESS and 5,000 bootstrap resamples, with gender, age and education as covariates in every equation.

9.2 What we found

Three results. First, and against the intuition that heavy technology users are disengaged from environmental concern, **AI use intensity was positively associated with pro-climate intentions** ($r = 0.42$). The association survived the full model as a small but significant direct path ($b = 0.036$, $p = .036$), so the mediators explain most of it but not all.

Second, most of the association ran through an affective-to-motivational chain. More intensive use went with higher climate anxiety ($b = 0.283$, $p < .001$); anxiety went with stronger climate commitment ($b = 0.412$, $p < .001$); and commitment was by a distance the strongest predictor of intention ($b = 0.740$, $p < .001$), in a model accounting for **75.5% of the variance** in intentions. The serial indirect effect through both mediators was significant (0.086, 95% bootstrap CI [0.062, 0.114]) within a total indirect effect of 0.225 [0.180, 0.271]. Anxiety alone did comparatively little (0.027). It is the conversion of anxiety into commitment that carries the effect, the same distinction between affective activation and motivational internalisation that runs through the food and communication chapters.

Third, and this is the finding with the policy edge, the modelled chain is conditional on awareness. Awareness of AI's environmental impact moderated the first stage (interaction $b = 0.122$, $p < .001$, $\Delta R^2 = 0.024$). Among consumers at the 16th percentile of awareness the link from AI use to climate anxiety was not significant ($b = 0.079$, $p = .061$) and the serial indirect effect on intentions was indistinguishable from zero (0.024, 95% CI [−0.001, 0.052]). At the median it was 0.066 [0.046, 0.089]; at the 84th percentile, 0.113 [0.082, 0.147], a roughly fivefold difference across the observed range, with a significant index of moderated mediation (0.037 [0.020, 0.056]).

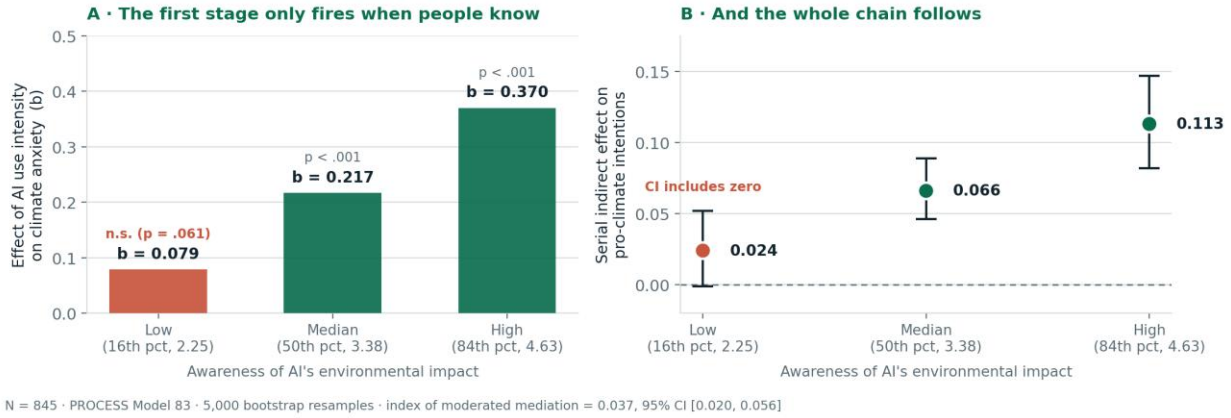


Figure 9. Awareness of AI's environmental impact as the switch on the mechanism. Panel A: the effect of AI use intensity on climate anxiety at the 16th, 50th and 84th percentiles of awareness; at low awareness the slope is not statistically significant. Panel B: the serial indirect effect on pro-climate intentions at the same three levels, with 95% percentile bootstrap intervals; at low awareness the interval includes zero.

Source: Apaolaza, Paredes, Eletxigerra & Hartmann (2026), International Journal of Consumer Studies 50(5), e70248 (CC BY). Values as reported in the article's Results section and Table 6.

THE DISCLOSURE CONDITION

The behavioural effect of AI's environmental footprint is not produced by the footprint. It is produced by knowing about the footprint. Where awareness is low, intensive AI use is psychologically decoupled from climate: the association does not merely weaken, it disappears. Disclosure requirements for the energy, carbon and water use of AI services therefore do more than inform: on this evidence they are the most promising lever to test, bearing in mind that awareness was measured rather than manipulated.

9.3 What follows for policy and practice

For regulators, the result attaches a behavioural rationale to a transparency measure usually justified on accountability grounds alone. Reporting obligations on the energy and water consumption of AI models and data centres are already moving through European and national policy. This study suggests they also determine whether the consumers using those services connect their own use to climate at all, which makes the reach of a disclosure rule, not only its accuracy, a design question.

For AI providers and consumer-facing organisations, the practical form is a footprint disclosure placed where the service is used, paired with a specific and feasible next step. The pairing is not decoration. Climate anxiety supported engagement here only because it was converted into commitment; raising concern without offering a route to act is not a strategy this evidence supports, and the authors are explicit in cautioning against exaggeration and alarmism. The durable part of the mechanism is commitment, and commitment responds to goals a person believes they can meet.

There is also a plain audience insight. Intensive AI users are usually discussed as a source of environmental cost. On these data heavier AI use goes with stronger pro-climate intentions, which makes them a potentially underused touchpoint rather than merely a load on the grid; whether they are also more responsive to climate messaging has not been tested.

Two limits bind the claim, and a third qualifies it. The design is cross-sectional, so the ordering of use, anxiety, commitment and intention is theoretical rather than demonstrated; the authors call for longitudinal or experimental work. The sample is US-only, in a market whose AI penetration, electricity system and norms of personal environmental responsibility differ from Spain's or the EU's. And the measure of AI use does not separate voluntary from work-mandated use, a distinction that plausibly matters for whether people feel responsible for the footprint at all. A randomised test of footprint disclosure, of the kind described in section 12, would convert the central association into evidence a disclosure rule could lean on.

10. The behavioural climate instruments toolbox

The synthesis below is the project's principal deliverable for practitioners. For each instrument it states the intended mechanism, the response we observed, the implication for design and, importantly, the strength of evidence behind it. Rows marked *implication* identify a promising design change that our studies motivate but did not themselves test.

Instrument	Intended mechanism	Observed response	Design implication	Evidence
Carbon price shown at point of sale	Price signal reduces demand	Moral licensing: awareness of paying restores demand (d = 0.31)	Treat point-of-sale disclosure as a design variable; factorially test line-item display, climate rationale and revenue-use information in high-realism pre-tests before ETS2	Randomised experiments (×4), US
Carbon footprint labels	Information shifts choice	No significant demand effect; did not correct licensing	Do not assume a simple absolute footprint label offsets licensing; test comparative and normative label formats separately	Randomised experiment, US
Progress communication	Positive spillover from success	Negative indirect spillover through inflated moral self-concept	Pair progress messages with an accurate normative or continued-commitment cue, and pre-test the pair	Randomised experiment, US (COVID-era message)
Fairness framing of carbon revenue	Builds cross-partisan acceptance	Distributional frame widened the gap; movement was Republican, not Democratic	Avoid untested partisan-signalling frames in broad campaigns; test neutral framing, source credibility and superordinate identities	Randomised experiment, US
Message framing for local renewables	Shifts local attitudes	Perceived in-group support dominated; energy-security frame backfired where party position was unclear	Correct demonstrated misperceptions of in-group support and use trusted messengers; measure the group norm before deploying any frame	Experiment + measured moderator, US; needs Spanish replication
Green claims and eco-labels	Builds trust and willingness to pay	Greenwashing perception and social cynicism associated with lower trust	Prioritise substantiated, verifiable claims over volume of information	Cross-sectional survey, Australia; implication not directly tested
Environmental appeals for EVs	Motivates adoption	Health concern predicted intention at least as strongly as climate concern	Experimentally compare climate-only, health-only and combined messages before committing a campaign	Cross-sectional survey, US; implication not yet tested
Sustainability claims for novel foods	Overcomes resistance	Climate commitment associated with better perceived naturalness and taste	Test whether strengthening commitment causally improves attribute perceptions	Cross-sectional survey, US

Instrument	Intended mechanism	Observed response	Design implication	Evidence
Green product marketing	Environmental concern drives purchase	In sustainable clothing, efficacy and visible-signalling motives were more strongly associated with self-reported purchasing than concern	Design for visible, status-conferring consumption combined with high perceived consumer effectiveness; do not generalise beyond clothing without testing	Cross-sectional survey, Australia
Nature imagery and influencer content	Awareness raising	Higher nature-post frequency increased virtual nature experience and climate-action intention	Compare high-frequency nature content with alternative formats using credible messengers (b = 0.28 sequential indirect effect in the survey model)	Survey + randomised experiment, Australia and US
Influencer partnerships: choice of content register	Reach and endorsement shift behaviour	Advocacy content was associated with climate-action intention about twice as strongly as commercial lifestyle promotion (β = 0.41 vs 0.22); only advocacy raised perceived credibility	Select advocacy-led messengers rather than scripting product endorsement; the contrast is correlational and needs an experimental test before campaign money follows it	Cross-sectional survey, Australia
Disruptive climate protest	Pressures companies via customers	Disruptive protest lowered perceived corporate agency and switching intentions	Moderate protest generated stronger customer-response intentions in the tested scenarios; corporate response strategies were not compared and need separate testing	Randomised experiments (×3), scenario-based, including a preregistered replication (N = 1,199)
Disclosure of AI services' environmental footprint	Transparency and accountability	Awareness of AI's environmental impact acted as the switch on the whole mechanism: with low awareness the indirect effect on pro-climate intentions was indistinguishable from zero; with high awareness it was roughly five times larger	Put energy, carbon and water disclosures where the service is used, and pair each with one credible, feasible action; do not raise concern without a route to act	Preregistered cross-sectional survey, US; the moderator is measured rather than manipulated, so a randomised disclosure test is the next step

Table 4. The behavioural climate instruments toolbox. The Evidence column states the design behind each row: randomised experiments support causal claims about the manipulated treatment; cross-sectional surveys support associations only.

11. Ten recommendations

For Spanish national institutions

R1 Settle ETS2 consumer-facing disclosure before 2028, on evidence

The postponement of ETS2 to 2028 is an opportunity. MITECO, the Spanish Climate Change Office, IDAE and the Ministry of Finance should jointly decide, and pre-test, how the carbon cost appears on fuel receipts and heating bills. Our results show a material difference between the two disclosure formats on a 1–5 purchase-intention scale; they do not estimate a percentage-point change in real demand.

R2 Add a normative component to every climate progress communication

A protocol-level change with zero budget implications, applicable across MITECO, OECC, IDAE, regional governments and the communication accompanying Spain's Social Climate Plan.

R3 Test an air-quality and personal-health frame for electric mobility incentives

Spain's 2026 automotive package introduced new purchase and charging support following MOVES III. Adding an explicit personal-health argument to its communication would reach a motivational segment that climate framing does not, and align transport decarbonisation with municipal air-quality policy. The survey evidence identifies the motive; a message experiment would size the gain.

R4 Give the new Panel Científico a standing behavioural pre-testing function

This does not require a new institution. The Panel Científico de Acción frente al Cambio Climático, created by the Council of Ministers on 28 July 2026 and due to be constituted in autumn 2026, is the natural home. Its scientific council explicitly includes behavioural sciences applied to the ecological transition, and its committee brings together the Spanish Climate Change Office and the National Science Advice Office, precisely the bodies that would commission and use pre-tests. A standing pre-testing protocol for major instruments and campaigns, run with university partners, would capture most of the value at marginal cost.

R5 For renewable siting, invest in norm correction rather than message optimisation

In support of the PNIEC 2023–2030 build-out: measure latent as well as stated local acceptance, test whether local opposition is overestimated and correct it where a gap is verified, and use trusted local messengers. Framing alone will not deliver the acceptance the plan requires.

For European institutions

R6 Treat carbon-price salience as an explicit design parameter of ETS2 and the Social Climate Fund

For DG CLIMA and DG ENER: the behavioural attenuation of visible carbon prices should be quantified in impact assessments and, if salience is retained for legitimacy reasons, estimated in realistic demand studies before the rate is set. Those studies should separate the components that the existing evidence bundles: the line item, the statement of climate purpose and information on revenue use. We are available to design and run the pre-tests.

R7 Use behavioural criteria to fill the gap left by the stalled Green Claims Directive

With Directive (EU) 2024/825 applicable from 27 September 2026, enforcement guidance should prioritise verifiability over disclosure volume. Perceived greenwashing was associated with lower trust and carried the association between social cynicism and brand trust; verified and unverified claims were not compared experimentally, so prioritising substantiation is an implication to test.

R8 Incorporate behavioural response rates into 2040 target modelling

For the European Scientific Advisory Board on Climate Change, the JRC and the EEA: models that assume textbook price responses will overstate the abatement delivered by consumer-facing instruments.

The direction and standardised magnitude of the attenuation are measurable in stated intentions; calibrated values should be estimated in field or high-realism demand studies before they enter policy models.

For companies

R9 Move green positioning from concern to efficacy, visibility, identity and health

For energy utilities, retailers, food and mobility companies: environmental concern is a comparatively weak purchase driver. Perceived consumer effectiveness, visible social signalling, identity fit and personal health are considerably stronger, and are currently under-exploited. Claims must be verifiable, because perceived greenwashing is an active barrier, not merely a failed persuasion attempt.

R10 Test whether agency-preserving responses to activism outperform deflection

Disruptive protest against a company reduced perceived corporate agency and, in turn, the customer pressure generated by the protest. Our experiments identify perceived agency as the mechanism but did not compare corporate response strategies against one another. Companies facing activist exposure should pre-test whether responses that acknowledge capacity and responsibility protect credibility better than responses that deflect responsibility.

12. Working with us

TRANSCLIMA's formal funding period ended in June 2026, but the research infrastructure, the team and the collaboration network remain in place.

- **Pre-testing of policy and communication designs.** Randomised survey experiments with nationally representative panels (Spain, EU, US). Applicable to carbon price disclosure formats, campaign messages, labelling schemes, tariff structures and incentive designs.
- **Choice-based conjoint and demand simulation.** Conjoint designs quantifying trade-offs between instrument attributes and simulating demand shifts before deployment.
- **Briefings and workshops.** Tailored sessions for policy teams, regulators and corporate sustainability and marketing functions, delivered in Spanish, English, Basque or German.
- **Joint research and funded projects.** Horizon Europe consortia, CDTI and AEI calls, contract research through the Euskoiker Foundation (the EHU's knowledge transfer body), and endowed chair arrangements.
- **Open access to the evidence base.** Anonymised data, survey instruments and analysis materials are deposited under a CC BY 4.0 licence in Zenodo and the Open Science Framework. All twenty journal articles listed in section 13 are free to read; a full inventory is available on request.

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13. Evidence base

The findings in this report are drawn from the following peer-reviewed articles and project-related book chapters. Bold entries are the primary sources for the figures and tables reproduced above.

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Behaviour is the Missing Half of Climate Policy

What four years of experiments with more than 14,000 participants tell us about carbon pricing, climate communication and the demand side of the energy transition

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EVIDENCE BASE AND OPEN ACCESS

Open access articles and accepted versions of the project's publications are deposited in ADDI, the institutional repository of the EHU. The datasets behind the findings reported here are openly available under a CC BY 4.0 licence in Zenodo and the Open Science Framework. Figures are reproduced from the authors' own publications and are credited beneath each figure.

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