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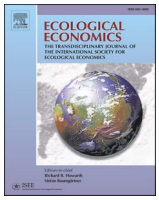

Eco-paradox USA: The relationships between economic growth and environmental concern generally, and by different income groups

Marina Requena-i-Mora [a,*], Dan Brockington [a,b,c], Forrest Fleischman [d]

[a] Institut de Ciència i Tecnologia Ambientals ICTA, Universitat Autònoma de Barcelona, Catalonia, Spain
[b] Institució Catalana de Recerca i Estudis Avançats ICREA, Catalonia, Spain
[c] Department of Private Law, Universitat Autònoma de Barcelona, Catalonia, Spain
[d] Department of Forest Resources, University of Minnesota, United States of America

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ABSTRACT

Environmental values are commonly explained through three theories: post-materialism suggests affluence enables environmental concern, materialism argues environmental harm drives concern, while disconnection theory posits economic growth creates both concern and degradation. We test these frameworks at two levels. First, using aggregate U.S. time-series data (1990–2021), and Vector Autoregression Analysis (VAR) analysis to examine how resource use and environmental impact, economic growth and concern are related. We show that these three theories can complement each other. Both material and carbon footprint growth lead to subsequent GDP growth, supporting materialist views. GDP growth then increases environmental concern, aligning with post-materialist predictions. This causal chain supports disconnection theory: the very process that generates environmental concern - economic growth - simultaneously intensifies environmental degradation.

Second, at the individual level (2000−2023), we examine how income relates to environmental preferences and impacts. Contrary to post-materialist expectations of wealthy groups showing greater environmental concern, logistic regression analysis controlling for sociodemographic variables reveals lower-income groups consistently prioritize environmental protection over economic growth. Carbon emissions analysis reveals that carbon footprint inequality among income groups has been rapidly increasing, with the p99/p50 income ratio rising since 1990. By 2019, top1% of income emitted 250 COeq/t per capita and bottom 50 % only 10 COeq/t per capita, while lower-income groups consistently rate environmental conditions as poor and worsening, further supporting materialist theories linking environmental harm to concern.

At the societal level, our findings reveal that environmental concern is structurally intertwined with economic growth—a process that simultaneously drives environmental degradation and poses significant challenges for degrowth transitions. In contrast, at the individual level, lower-income groups consistently prioritize environmental protection over economic growth while exhibiting a lower environmental impact. This pattern suggests the potential for a "degrowth from below," initiated by low-income individuals whose heightened preference for environmental protection directly reflects their experience of poor and worsening environmental conditions.

1. Introduction

Environmental values in the Global North have changed significantly over the 20th century, often in concert with patterns of economic growth. While it is widely acknowledged that economic development influences environmental concern, scholars debate the nature of this relationship. Understanding it is crucial for addressing ongoing ecological challenges because environmental values are seen as important precursors to individual and collective environmental action (Herberlein, 2012). If, as is widely believed, environmental concern rises with increasing wealth and leads to a rise in pro-environmental behaviors, it may be reasonable to expect economic growth to lead, in the long-run, to the resolution of many environmental problems. On the other hand, if economic growth does not lead to increased environmental concern, or if that concern is not translated into action, then there may be fundamental tensions between economic and environmental goals.

Three prominent theories offer differing explanations for how

* Corresponding author.
E-mail address: marina.requena@uab.cat (M. Requena-i-Mora).

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economic growth affects environmental values:

The first, the materialist explanation, suggests that environmental concern arises directly from the tangible impacts of environmental degradation caused by economic growth. As environmental problems become severe and visibly affect people's lives, public concern increases due to direct experiences with pollution, resource depletion, and ecological harm. This theory distinguishes among individuals, noting that the poor often bear the brunt of environmental harm while the wealthy contribute disproportionately to its causes through high levels of resource use and emissions.

The second theory, the post-materialism thesis, states that when people or societies become wealthy enough to meet their basic needs, they start caring more about environmental protection. This increased environmental concern among wealthy countires and individuals translates into better environmental outcomes - meaning less pollution, better conservation, and lower environmental impact.

The third perspective, the disconnection or alienation hypothesis, offers a paradoxical view. It suggests that economic growth leads to increased environmental concern but simultaneously intensifies ecological harm. Economic development often results in urbanization and technological mediation of daily life, distancing individuals from direct interactions with nature and obscuring the consequences of environmental degradation. This alienation can hinder effective advocacy and action for necessary environmental change despite heightened concern.

Building on these three theoretical perspectives, we present findings from data on public opinion and environmental outcomes in the United States that explore the relationship between economic growth and income, environmental concern, and ecological outcomes at both the societal level and among different socioeconomic groups. First, we use Vector Autoregression Analysios (VAR)to show that resource consumption and emissions are strongly linked to GDP growth, aligning with the materialist hypothesis that environmental degradation and economic expansion are interconnected phenomena. Second, aligning with the post-materialism thesis, we find that at the societal level, certain types of environmental concern increase with economic growth. Our analysis of long-term public opinion data in the United States reveals that as economic prosperity rises, so does the public's expressed concern for environmental issues. This suggests that economic growth facilitates a broad societal shift in values toward greater environmental awareness. Third, reflecting the disconnection or alienation hypothesis, we demonstrate that heightened societal concern for the environment is paradoxically associated with greater environmental destruction. Ecological harm intensifies alongside economic growth, indicating a disconnect between growing environmental awareness and actual environmental outcomes. This paradox highlights how economic development may simultaneously foster environmental concern while exacerbating ecological degradation, likely due to societal alienation from the material realities of environmental harm.

When examining differences across individuals, our findings reveal complex dynamics that touch on both materialist explanations and broader socioeconomic disparities. Higher-income individuals tend to have larger ecological footprints, consistent with the materialist explanation that wealthier groups contribute more significantly to environmental harm. At the same time, we observe that lower-income individuals, despite having smaller ecological impacts, often express stronger pro-environmental attitudes. This could reflect the heightened vulnerability of lower-income groups to environmental degradation, which is disproportionately driven by wealthier groups. In our analysis, we demonstrate that individuals with lower incomes are more likely to rate environmental conditions poorly, perceive them as worsening, and express greater concern about environmental inequality compared to their wealthier counterparts. These disparities highlight the importance of considering socioeconomic factors in understanding environmental values and impacts.

Examining these findings through a degrowth lens reveals crucial insights for both theory and practice. At the societal level, we find that environmental concern has become structurally dependent on economic growth itself, creating a paradox where efforts to build environmental awareness through growth ultimately depend on increased environmental degradation. However, at the individual level, lower-income groups' consistent prioritization of environmental protection over economic growth, despite their economic challenges, suggests possibilities for a degrowth from below. That is, where alternatives to growth-centered development emerge from lower-income individuals who are also most impacted by environmental harm.

Our study integrates long-term public opinion data with environmental indicators and highlights how income disparities shape environmental values and impacts. By addressing both societal and individual dimensions, we provide a more nuanced understanding of the complex relationship between economic growth, income, environmental values, and ecological outcomes.

The paper is structured as follows. First, we review the relationships between economic growth, public support for the environment, and enviromental outcomes. Second, we explain our methods. Third, we analyse associations between economic growth and environmental outcomes. Fourth, we analyse the preference for protecting the environment over economic growth and environmental outcomes. Fifth, we analyse the relation between the three variables—economic growth, material footprint and preference for protecting the environment— in a VAR model. Finally, we also analyse differences between high and low income individuals within the USA in terms of carbon footprint using differences among data and also public support for the environment and environmental outcomes using logistic regressions and controlling for sociodemographic variables over time.

2. Too rich or too poor to be green? What social theory says

Our three theories of environmentalism suggest different hypotheses. We present the theories in more detail here.

2.1. Environmentalism as post-materialism

Modernization theory in classical social thought conceptualizes societal development as a transition from traditional to institutional structures characterized by the adoption of universalistic values and progressive ideals. This theoretical framework suggests that socioeconomic development catalyzes the emergence of "superior" value systems, leading to value convergence across nations.[1] Within this paradigm, environmental concern—defined as the prioritization of environmental health and opposition to ecological degradation—has been theorized as an inherent component of modern value systems.

Building upon this foundation, Inglehart's (1977) "Silent Revolution" proposed that unprecedented post-war prosperity fostered a fundamental shift in societal values. This transformation marked a departure from materialist concerns centered on physical security and economic stability toward post-materialist priorities emphasizing self-expression and quality of life. Inglehart argued that this value transformation was particularly pronounced among younger generations who experienced unprecedented prosperity and educational

[1] Examples include Weber's approximations about the progressive "rationalization" of society and the passage of affective action according to values to the most rational action according to ends; those of Durkheim on the progressive development of the division of social work and the transition from mechanical solidarity to organic solidarity; those of Comte who proposed a theory of sociocultural evolution that society progresses by a general law of three stages; those of Spencer who conceptualized society as a social organism evolved from the simpler state to the more complex according to the universal law of evolution; those of Parsons on the development of individualism; those of Giddens on the unlocking of modern societies.

opportunities during their formative years.

The post-materialist framework positions environmental concern as a direct outcome of economic development. This perspective suggests that societies achieving higher levels of education and socioeconomic security are more likely to embrace post-materialist values, including environmental protection. Empirical evidence supports this relationship between post-materialism and environmental concern (Inglehart, 1995; Brechin and Kempton, 1994; Gelissen, 2007; Kidd and Lee, 1997). Recent research by Booth (2020) suggests that the global proliferation of post-material values can facilitate reduced consumption patterns, environmentally conscious lifestyles, and enhanced political support for environmental initiatives, potentially catalyzing a transition toward a "post-growth green economy." Gugushvili's (2021) findings further corroborate this perspective, demonstrating stronger support for environmental protection over economic growth among post-materialists, politically progressive individuals, and those with higher educational attainment, whereas materialists, right-wing individuals, and disadvantaged groups prioritize the economy over ecological concerns. However, the theory acknowledges that environmental concern may diminish during periods of economic instability (Inglehart and Norris, 2017).

This theory suggests that economic development serves as a catalyst for environmental concern, which in turn motivates actions to reduce environmental degradation. Societal wealth may ultimately contribute to environmental improvement through the mediating role of changing social values. This is important because while alternative theoretical perspectives have explored the relationship between economic growth and environmentalism, they often bypass environmental concern as a mediating variable. (Huber, 1999) emphasized the role of economic growth in making environmental improvements financially feasible, suggesting that wealthy nations possess greater capacity to develop and implement green technologies. This technological-deterministic perspective suggests that wealth accumulation, independent of value transformation, can drive environmental behavior. Similarly, Diekmann and Franzen (1999) conceptualized environmental quality as a "superior good," proposing that demand for environmental protection increases proportionally with income as societies become capable of simultaneously maintaining private consumption and environmental quality. The Environmental Kuznets Curve hypothesis (Grossman and Krueger, 1995) posits a curvilinear relationship between income and environmental degradation, suggesting that while initial economic growth in low-income societies may exacerbate environmental degradation, continued development eventually facilitates environmental improvement through enhanced resources for conservation movements and government initiatives that tackle environmental ills (Torras and Boyce, 1998). All these aspects (technical, financial, political) are important, but here we will focus specifically on values, as discerned through public opinion data in order to explore the origins of pro-environmental values.

2.2. Environmentalism as a product of environmental degradation

Some scholars argue that environmental concern is more closely associated with poverty than wealth. Environmental justice activists and researchers on "the environmentalism of the poor" (Guha and Martinez-Alier, 1997; Martínez-Alier, 2002) emphasize that poor communities, particularly in the Global South, often exhibit high levels of environmental concern and awareness. This concern stems from their direct dependence on natural resources for survival and prosperity. For these communities, 'the environment' is not a luxury, or something remote and distant, but an immediate and essential necessity.

Moreover, environmental justice scholars highlight that the poor are disproportionately affected by environmental degradation despite contributing minimally to its causes (e.g., Bullard, 1990). This inequity often fuels environmental awareness and activism among affected populations. Brechin and Kempton (1994) suggest that individuals who have personally experienced environmental harm may be more likely to engage in pro-environmental behaviors than wealthier individuals who are less directly impacted. Recent studies reinforce this by showing that communities exposed to environmental hazards, such as toxic pollution in Texas (Liu et al., 2023) or urban environmental risks (Ho et al., 20233), often develop heightened environmental concern and advocate for justice.

Environmental justice perspectives focus on how economic growth implies environmental degradation and creates *ecological distribution conflicts* (Martinez-Alier, 1995)). Ecological degradation, in this view, is an inevitable outcome of the production of goods and services, most of which rely on natural resources, and thus this degradation is increased by economic growth (see for instance Wiedmann et al., 2015; Requena-i-Mora and Brockington, 2021). Environmental justice scholars focus on *where* this degradation occurs, and *who* experiences it most closely.

O'Connor (1988, 1997) argues that capitalism's profit-driven depletion and pollution of natural resources constitutes a "second contradiction," as it undermines its own productive conditions by increasing costs and sparking socio-ecological conflicts when communities resist the destruction of their environments and livelihoods. This aligns with Polanyi's (1957) concept of the double movement, where environmental abuses prompt waves of protest and regulation, followed by periods of rollback. Such perspectives suggest that environmental concern is deeply rooted in material and political struggles rather than being solely a product of postmaterialist values, and could thus be seen as the result of the experience of degradation caused by economic growth. From this perspective, economic growth not only causes environmental degradation but also heightens environmental concern as the effects of degradation become more visible and tangible. However, a critical point emerges in analyzing differences among individuals: who is causing the environmental degradation, and who is suffering its effects? Studies like Chancel (2021) show that the top 1 % of global earners are responsible for a substantial share of carbon emissions—surpassing the combined emissions of the poorest 50 % of the global population. This disparity underscores the importance of distinguishing between the agents of environmental harm and its victims when assessing environmental concern. In line with this reasoning, Hickel (2020) argues that environmental degradation exacerbates global inequalities through the exploitation of resources from poorer regions, while Sultana (2021) highlights how climate crises, rooted in colonial legacies, deepen vulnerabilities and material dependence on fragile ecosystems.

2.3. Disconnection between environmental concerns and pro-environmental behaviors

Dauvergne (2016) argues that rather than causing increased environmental concern which in turn leads to effective action, economic growth contributes to what he calls the "Environmentalism of the Rich." The Environmentalism of the Rich posits that as wealth grows, wealthier individuals do experience increased environmental concern, but act on it through personal consumption choices that are ineffective at improving environmental quality. In particular, the environmentalism of the rich focuses on the consumption of "sustainable" products which may achieve minor reductions in energy and water usage, but do not address the underlying environmental degradation created by the use of natural resources. While such individual actions are commendable, Dauvergne contends that they can be harmful when presented as substitutes for more systemic action. Uribe and Chapman-Ludwig (2023) suggest that forms of environmentalism characterized by pro-environmental consumerist behavior create a sense of complacency which does not align with the actual impacts of material use. Hence environmental concerns accompanying economic growth may paradoxically contribute to environmental degradation.

There is some evidence to support these contentions. Despite the rise of environmentalism over the past 50 years, many environmental indicators show increased degradation. Re-evaluations of the

Environmental Kuznets Curve hypothesis reveal that apparent environmental improvements often result from methodological errors (Stern, 2004, 2017) or the displacement of environmental harms to poorer countries through practices like relocating environmentally harmful mining and manufacturing processes (Busa, 2013).

Kennedy et al. (2015) examined three aspects of individual environmental support: concern for the environment, private-sphere pro-environmental behavior (e.g., household actions like buying energy-efficient light bulbs), and ecological or carbon footprints. Using Canadian survey data, they found no significant link between private-sphere pro-environmental behavior and household carbon footprints. Moreover, higher education and income levels were associated with larger household carbon footprints, indicating that more affluent and educated households tend to consume more resources despite engaging in some pro-environmental actions. Similarly, Chen et al. (2016) conducted a study in Chapel Hill, North Carolina, and found that pro-environmental attitudes correlated with low-impact pro-environment behaviors, such as green consumerism, but not with high-impact behaviors that drive household electricity or vehicle fuel consumption. More recently, Nielsen et al. (2022) found that while psychological factors like attitudes and personal norms strongly predict self-reported pro-environmental behavior in clothing purchasing, they only weakly predict the actual greenhouse gas emissions associated with clothing purchasing.

3. Methods

3.1. Data collection

In our study, we evaluate environmental concern, environmental degradation, and economic growth/income at both aggregated societal levels and disaggregated individual levels. At the societal level, environmental concern is assessed using aggregated data from the Gallup Poll spanning from 1990 to 2021. Specifically, we utilize the percentage of respondents who prioritize environmental protection over economic growth. Respondents were asked to choose between "Protection of the environment should be given priority, even at the risk of curbing economic growth," or "Economic growth should be given priority, even if the environment suffers to some extent." At a societal level Environmental impact is captured through four indicators: the Material Footprint and Carbon Footprint per capita annual growth, which are two distinct measures of global, consumption-based environmental impacts; an Air Quality Index constructed via principal component analysis of pollutants; and U.S. annual temperature anomalies as a perceptible indicator of climate change. Economic growth is represented by GDP per capita growth (constant 2015 US dollars) from the Federal Reserve Economic Data (FRED). In contrast, at the individual level, environmental concern is examined using disaggregated data from the Gallup Poll for the period 2000 to 2023. Instead of aggregated percentages, this analysis considers individual responses to the same primary question regarding the prioritization of environmental protection versus economic growth., as well as three additional variables: worry about the quality of the environment, rating environmental conditions in the U.S., and perceptions of whether these conditions are improving or worsening. Income data from the Gallup World Poll is categorized into lower, middle, and upper distributions, and individual Carbon Footprints by income group are derived from the World Inequality Database. These measures enable a detailed analysis of how income and economic position influence environmental concern and outcomes. Detailed justifications and variable sources are provided in the first section of the Supplementary Material.

3.2. Analytical methods

In this paper, we want to test the effectiveness of these three hypotheses in explaining the relationship between economic growth, environmental concerns, the environmental impact as summarised in the table below.

Post-materialism	$\uparrow Economic\ growth_{t-1}$ *or Income* $\rightarrow \uparrow Environmental\ concern_t \rightarrow \downarrow Enviroment\ degradation_{t+1}$
Materialism	$\uparrow Economic\ growth_{t-1}$ *or Income* $\rightarrow \uparrow Environmental\ degradation_t \rightarrow \uparrow Enviroment\ concern_{t+1}$ *among those who suffer the degradation*
Alienation/ Disconnection	$\uparrow Economic\ growth_{t-1}$ *or Income* $\uparrow Environmental\ concern_t \rightarrow \uparrow Enviromental\ degradation_{t+1}$

We test these theories using time-series data of environmental surveys and environmental and economic indicators in the USA. We have chosen the USA since, to the best of our knowledge, it is the only country with available time series data exploring opinions regarding trade-offs between economic growth and the environment.

At the aggregated and societal level, we argue that Granger causality tests and VAR models are well-suited to test the three hypotheses (Post-materialism, Materialism, and Alienation/Disconnection). These methods allow us to examine the directional relationships and temporal sequencing among economic growth, environmental concern, and environmental degradation. Specifically: 1. Post-materialism Hypothesis: Granger causality and VAR help test whether economic growth (t − 1) predicts increased environmental concern (t), which subsequently leads to reduced environmental degradation (t + 1); 2. Materialism Hypothesis: These methods are effective for assessing whether economic growth (t − 1) leads to environmental degradation (t), which then fosters increased environmental concern (t + 1); 3. Alienation/Disconnection Hypothesis: Granger causality and VAR provide a framework to evaluate the simultaneous effects of economic growth (t − 1) on both increased environmental concern (t) and heightened environmental degradation (t + 1). These dynamic models are particularly valuable in capturing the temporal dynamics and reciprocal influences central to our theoretical framework (see Eq. (1) to (4) at the second section of the Supplementary Material).

These three hypotheses extend beyond examining the relationship between economic growth and environmental degradation to explore how environmental outcomes and perceptions vary across different economic groups. Specifically, they investigate how income levels influence environmental perceptions and impacts. To investigate the relationship between income levels and environmental degradation, we analyzed carbon footprint data across different income groups in the USA (top 1 %, top 10 %, middle 40 %, and bottom 50 %) using data provided by Chancel (2021). We examined temporal trends in carbon inequality between 1990 and 2020, using the ratio between the 99th and 50th percentiles (P99/P50) as our measure. This analysis reveals patterns in how environmental impacts are distributed across different economic strata over time (for more details, see Section 2 of the Supplementary Material).

To further investigate how income influences environmental concern, we employ logistic regression analysis, categorizing respondents into lower, middle, and upper income groups using Gallup World Poll data. This method is particularly suitable for modeling binary outcomes—specifically whether individuals prioritize environmental protection over economic growth—while accounting for multiple predictors over time. The model incorporates established sociodemographic control variables from the literature: political ideology, sex, age, race, and education (Kulin et al., 2021; McCright and Dunlap, 2011; Dunlap et al., 2000; Inglehart, 1977 & Inglehart, 1995) (see Eq. (5) in the second section in the Supplementary Material).

Finally, we conduct adjusted standardized residuals bivariate analyses to examine income's relationship with three additional environmental measures: worry about environmental quality, ratings of poor environmental conditions, and perceptions of worsening environmental conditions (see Eqs. (6) to (8) in the Supplementary Material). This analysis helps test the materialist hypothesis that environmental concern stems from direct experience of poor environmental conditions. Through this comprehensive approach, we can evaluate which

theoretical framework best explains the relationships between income, environmental concern, and environmental degradation.

4. Results: GDP per capita growth is related to high levels of environmental concern but also more environmental degradation

First, we explore if economic growth has any impact on environmental concern. We also explore views about the trade-offs between economic growth and protecting the environment. Second, we look to see if there is any association between economic growth and facts of environmental change as seen in environmental indicators. Finally, we examine if there is any relationship between economic growth, facts of environmental change and the preference for protecting the environment over economic growth.

4.1. Survey results show concern for the environment grows with economies

Different surveys have shown that concern about the environment in the United States is an issue that is widespread and has not changed much during last fifteen years (Fig. 1). Only a small percentage of people (around 30 %) say they are not worried about the quality of the environment. In the same way we observe that more that 60 % agree on the idea that we (as a society) should spend more money on improving and protecting environment (the green line).

A common way of conceptualizing concern for the environment is to ask about the relative priorities for economic growth versus environmental protection (Inglehart, 1995; Brechin and Kempton, 1994; Gugushvili, 2021) a question that also serves to gauge public opinion regarding support for degrowth (Gugushvili, 2021). We draw upon the Gallup Survey question which asked respondents whether they would choose environmental protection over economic growth.

The results of this question during economic crises (Early 1990s recession, Early 2000s recession, The Financial Crisis of 2008 and The Pandemic crises) reveal how the original thesis of post-material values postulated by Inglehart (1977) still holds sway. In the U.S. context, environmental quality represents a higher-order, quality-of-life value that society deprioritizes when facing economic uncertainty. As Fig. 2 illustrates, societal support for environmental protection fluctuates with lagged GDP per capita growth, rising with economic expansion and declining during contractions - a pattern that aligns with Inglehart's original thesis.

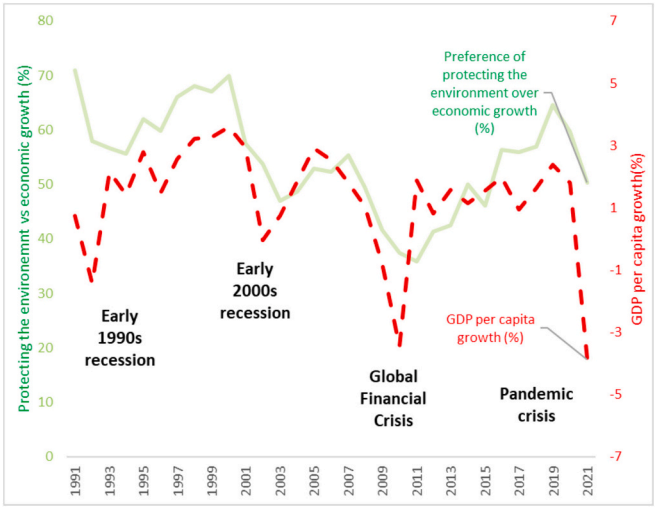


Fig. 2. Relations between GDP per capita growth $_{t-1}$ and the preference of protecting the environment 1991–2021.
Source: Own elaboration based on Gallup Survey and FRED.

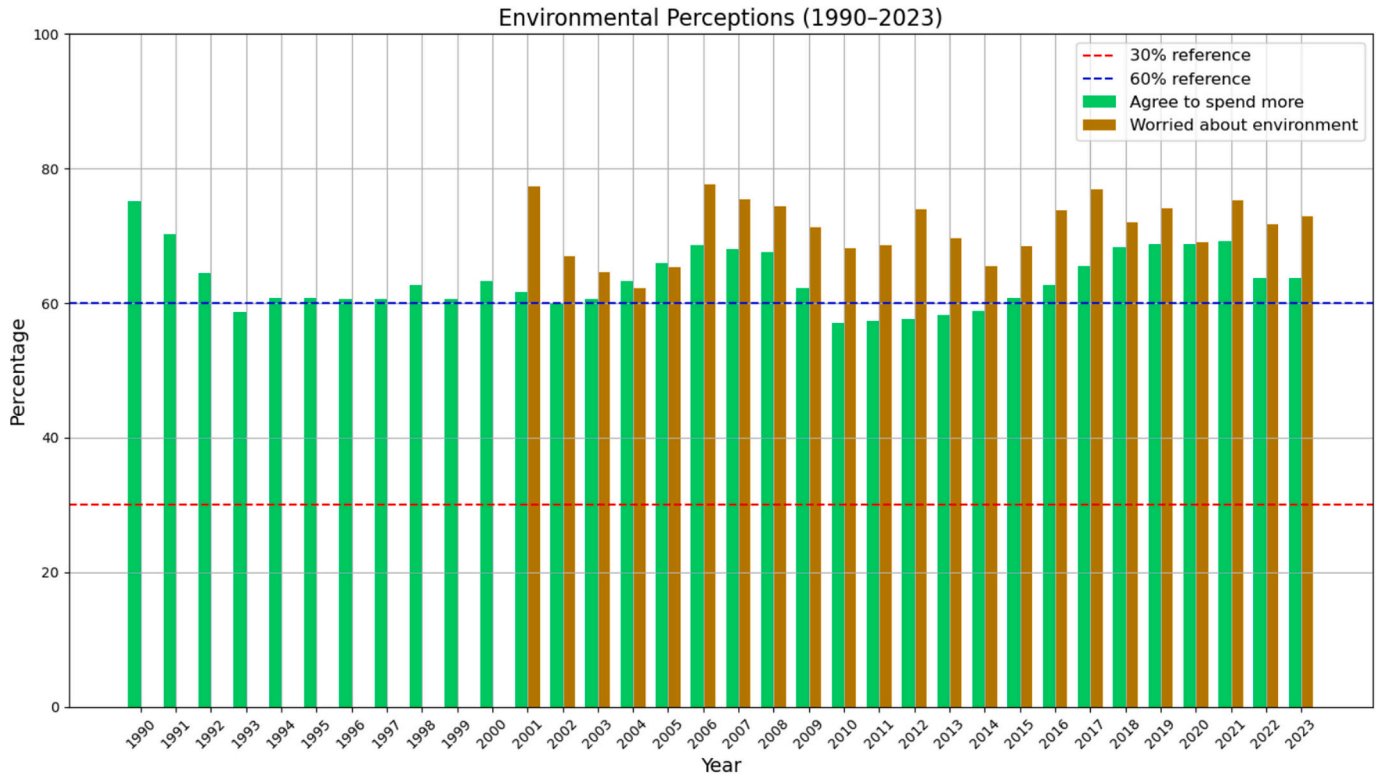


Fig. 1. Concerns about the quality of the environment (Gallup Survey 2001–2023) and too little money is spent on protecting the environment (General Social Survey survey 1990–2021).
Source: GSS survey and Gallup Survey Interactive figure: https://datawrapper.dwcdn.net/RYsNG/4/

Dynamic time series regressions revealed that lagged GDP per capita growth (t-1) significantly and positively affects environmental preferences, measured as the percentage of respondents prioritizing environmental protection over economic growth (see Table 1). This temporal relationship, where prior year economic growth influences current year environmental preferences, supports a core tenet of the post-materialism thesis: environmental concern increases systematically with economic growth.

4.2. Environmental impact increases with GDP and environmental concern

Our analysis shows that while environmental concern rises with economic growth, environmental improvements do not. Both material and carbon footprints exhibit strong positive correlations with GDP growth, as illustrated in Fig. 3. Our regression results (Table 1) confirm that annual GDP growth rates are significantly and positively associated with contemporaneous increases in both material and carbon footprints (1.31 and 1.14, respectively). The coefficients show that for every 1 % increase in GDP growth, there's a 1.31 % increase in material footprint and a 1.14 % increase in carbon footprint.

Our analysis reveals that societal preferences for environmental protection grow with lagged increases in both material and carbon footprints per capita (Fig. 4, Table 1). Specifically, the coefficients for material and carbon footprints at t-1 and t-2 are positive and significant, indicating that environmental preferences in a given year are influenced by environmental impacts from the previous two years (Table 1). This shows that US society expresses stronger pro-environmental preferences precisely when its environmental impact is highest and sustained. During economic recessions, when material footprints decline, environmental concern also wanes - as evident in Fig. 4, showing that periods of reduced environmental degradation coincide with diminished societal preference for environmental protection.

This pattern extends beyond the United States, as demonstrated by our cross-country analysis in Supplementary Section S_5, which examines data from Argentina, Chile, China, India, Japan, Spain, and the United States. World Value Survey data (1994–2022) shows that increasing GDP strengthens environmental values, supporting post-materialist theory that economic security elevates environmental concerns. However, analysis of material footprint per capita growth (1970–2022) reveals that economic growth simultaneously accelerates environmental degradation. This demonstrates capitalism's environmental paradox: rising environmental consciousness does not translate into better environmental outcomes, as growth imperatives prevent the alignment of values with environmental improvements. Full statistical analysis is available in Section S_5.

Additionally, we looked to see if there was any correlation between the desire to protect the environment and any of the more easily perceptible environmental indicators—air quality and annual temperature anomalies, but we found no evidence of this (see the Supplementary Materialt, S_3). We neither found evidence of economic growth nor economic growth lags directly affecting these indicators.

Table 1
Results of the distributed lag models.

	Protecting		Material Footprint		*Protecting*
Constant	11.17** (4.5)	**Constant**	−2.24** (0.97)	**Constant**	22.6** (5.7)
GDP_t	0.65 (0.42)	GDP_t	1.31*** (0.31)	MF_t	0.22 (0.23)
GDP_{t-1}	1.90*** (0.45)	**…**	…	MF_{t-1}	0.60** (0.24)
…	….	**…**	…	MF_{t-2}	0.45* (0.25)
$Protecting_{t-1}$	0.72*** (0.08)	MF_{t-1}	0.122 (0.20)	$Protecting_{t-1}$	0.56*** (0.10)
Prob > F	0.000	**Prob > F**	0.000	**Prob > F**	0.000
Adj.R^2	0.79	**Adj.R^2**	0.43	**Adj.R^2**	0.76
N°obs	31	**N°obs**	31	**N°obs**	30

	Carbon Footprint		*Protecting*
Constant	−2.60**(0.64)	**Constant**	21.71** (5.62)
GDP_t	1.14***(0.27)	CF_t	0.23 (0.28)
…	…	CF_{t-1}	0.58*(0.29)
…	…	CF_{t-2}	0.65*(0.28)
CF_{t-1}	−0.70(0.13)	$Protecting_{t-1}$	0.61***(0.99)
Prob > F	0.000	**Prob > F**	0.000
Adj.R^2	0.41	**Adj.R^2**	0.72
N°obs	32	**N°obs**	31

…' indicates no significant lags; Standard errors are shown in parentheses; Stars correspond to the *p*-value: *for $p < 0.10$.**for $p < 0.05$. and***for $p < 0.01$.
Source: Own elaboration based on Gallup Survey and FRED.

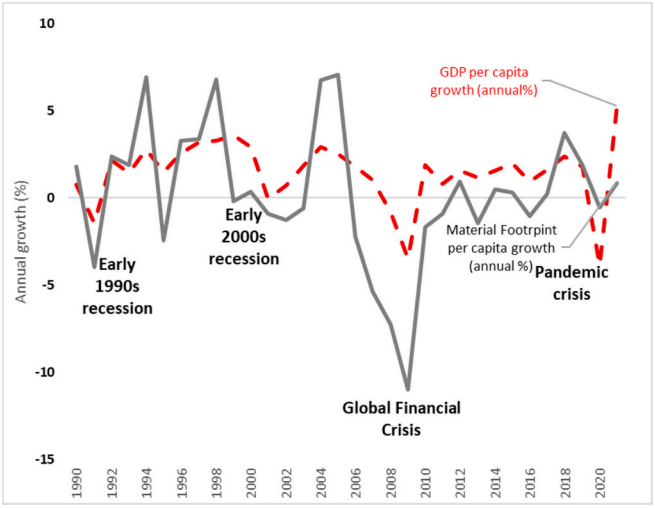


Fig. 3. Relations between GDP per capita growth and material footprint per capita growth 1991–2021.
Source: Own elaboration based on Lenzen et al. (2021) and FRED.

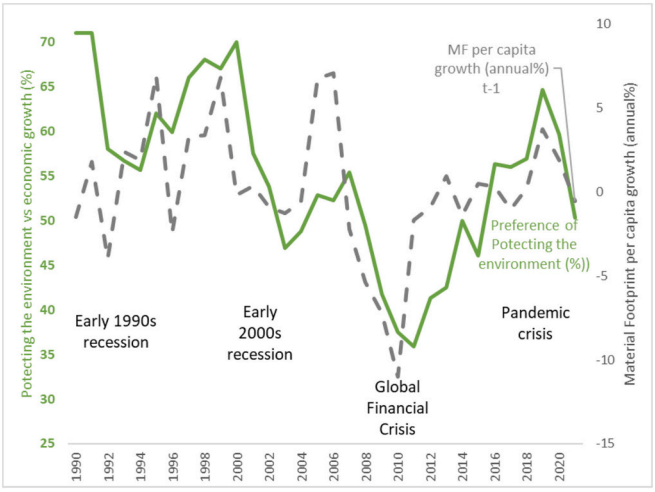


Fig. 4. Relations between material footprints per capita growth $_{t-1}$ and the preference of protecting the environment over economic growth (%) 1991–2021.
Source: Own elaboration based on Lenzen et al., 2021and Gallup Survey.

4.3. The material base of GDP growth enables the demand for environmental protection

What are the likely causal relationships between these variables? Are past values of GDP per capita growth driving the preference for the environment and the growth of the material or Carbon footprint? Or are the past values of material or carbon footprint per capita growth anticipating GDP per capita growth? To answer these questions, we used a VAR model. Additionally the results of an impulse-response function, and the variance decomposition are included in the Supplementary Material, S_6 and S_7 respectively. Both analyses demonstrate that environmental footprints – either carbon or material – significantly lead to subsequent GDP growth ($p = 0.046$ for material and $p = 0.01$ for carbon), with material footprint growth having a coefficient of 0.25 and carbon footprint growth having a coefficient of 0.3 on subsequent GDP growth. These relationships suggest that changes in resource use and emissions happen before and contribute to changes in economic performance. Notably, GDP growth emerges as a significant driver of environmental protection preferences in both models, with tests showing that GDP growth occurs prior to and influences environmental preferences ($p = 0.054$ for material and $p < 0.01$ for carbon). The preference for environmental protection shows strong persistence (coefficient = 0.69 for material and 0.7 for carbon, both $p < 0.001$) and is well-explained by the models ($R^2 = 80.75$ % for material and 80 % for carbon), yet it does not lead to changes in GDP growth or environmental footprints. These findings suggest a one-way relationship where economic growth shapes environmental preferences, while changes in resource use and emissions drive subsequent economic growth (see Fig. 5 and Table 2)

Table 2
VAR results.

VAR Material Footrpint GDP Protecting					
Equation	Variable	Coef.	Std. Err.	t	P > t
Material Footprint	Material Footprint t-1	0.43	0.26	1.68	0.11
	GDP t-1	−0.1	0.6	−0.16	0.87
	Protecting t-1	0	0.08	−0.04	0.97
	_cons	0.4	4.28	0.09	0.93
GDP	Material Footprint t-1	0.25	0.12	2.09	0.05
	GDP t-1	−0.39	0.28	−1.4	0.17
	Protecting t-1	−0.01	0.04	−0.18	0.86
	_cons	2.31	2	1.16	0.26
Protecting	Material Footprint t-1	0.41	0.28	1.44	0.16
	GDP t-1	1.34	0.67	2.02	0.05
	Protecting t-1	0.69	0.08	8.26	0
	_cons	14.41	4.76	3.03	0.01

VAR Carbon Footrpint GDP Protecting					
Equation	Variable	Coef.	Std. Err.	t	P > |t|
Carbon Footprint	Carbon Footprint t-1	0.2	0.2	1.2	0.3
	GDP t-1	−0.2	0.4	−0.6	0.5
	Protecting t-1	0.1	0.1	1.0	0.4
	_Cons	−3.3	3.3	−1.0	0.3
GDP	Carbon Footprint t-1	0.3	0.1	2.8	0.0
	GDP t-1	−0.3	0.2	−1.5	0.1
	Protecting t-1	0.0	0.0	0.2	0.8
	_Cons	1.9	1.8	1.1	0.3
Protecting	Carbon Footprint t-1	−0.2	0.3	−0.9	0.4
	GDP t-1	2.0	0.6	3.6	0.0
	Protecting t-1	0.7	0.1	8.7	0.0
	_cons	10.9	4.7	2.3	0.0

Source: Own elaboration based on Lenzen et al. (2021), FRED and Gallup Survey. For a detailed explanation of the VAR conditions, refer to Section S_2 in the Supplementary Material. For a comprehensive discussion of the VAR results, see Section S_4 in the Supplementary Material.

Examining these results through theoretical lenses, the strong positive effect of GDP growth on environmental preferences (coefficient = 1.34, $p = 0.05$ for material and coefficient = 2.0, $p < 0.01$ for carbon) aligns with the post-materialism thesis, suggesting that economic prosperity indeed leads to increased environmental concern. However, the simultaneous positive effect of both material footprint (0.249, $p = 0.046$) and carbon footprint (0.3, $p = 0.01$) on subsequent GDP growth, lends support to the disconnection hypothesis. This pattern suggests that while economic growth enhances pro-environmental preferences, it remains coupled with increasing resource use and emissions, creating a paradoxical relationship where growing environmental concern fails to translate into reduced environmental impact. The materialist hypothesis receives mixed support: while we find limited evidence for environmental degradation directly driving environmental preferences ($p = 0.969$ for material and $p = 0.4$ for carbon), the significant positive effects of both material and carbon footprints on GDP growth suggest that economic growth fundamentally depends on increasing material and energy throughput in the economy.

4.4. High-income individuals contribute more to environmental degradation and prioritize economic growth over environmental protection

It is also crucial to note that not everyone in the USA is increasing their material or carbon footprint in the same way. Indicators of material footprint inequality are not available for the USA. However, numerous studies have revealed that the material footprint is not spread uniformly across income groups, with richer groups having far larger footprints (see for instance Buhl et al., 2019; López et al., 2017; Lettenmeier et al., 2012).

Regarding the carbon ootprint, Chancel (2021) reports that the top 1 %/bottom 50 % ratio of carbon inequality has been scaling since 1990, as it is shown in Figs. 6. In 2019, the bottom 50 % only consumed 10.5tCO2eq/cap, compared to the top 1 %'s average consumption of 250.2 tCO2eq/cap.

When analyzing the preference for environmental protection by income group in the USA, we observe a significant positive association between low-income groups and the preference for protecting the environment, particularly around 2005 and 2017 (see Figure S_9 in the Supplementary Material and the first plot of Figs. 9). This positive and significant association remains robust even after controlling for ideology, sex, age, race, gender interactions, and education level. These findings highlight that individuals with lower incomes are consistently more likely to prioritize environmental protection compared to those with higher incomes (Fig. 7). For a comprehensive overview, we report results by income group here, while the full regression model including all variables is provided in the Supplementary Material, S_8.

Throughout most of the 23-year analysis period, individuals with lower incomes were more likely to prefer environmental protection over economic growth, as indicated by the coefficient being above 1. This suggests a higher relative likelihood or preference for environmental protection compared to higher income individuals. However, on only a few occasions—in just three out of the 23 years (2000, 2001, and 2013)—the coefficient falls below 1, indicating that during these specific years, individuals with lower incomes were less likely than those with higher incomes to prioritize environmental protection over economic growth.

When analyzing middle income versus upper income (Fig. 8), we observe that for the majority of the analyzed years, coefficients are not significant, although they are larger than 1. This indicates that while middle income individuals tend to prefer environmental protection over economic growth more than upper income individuals, these differences are not statistically significant in most years.

One possible explanation of why low-income individuals in the US consistently prefer protecting the environment is their systematic perception of worsening environmental conditions, as shown in Figs. 9 and S_10 in the Supplementary Material. Low-income individuals stand

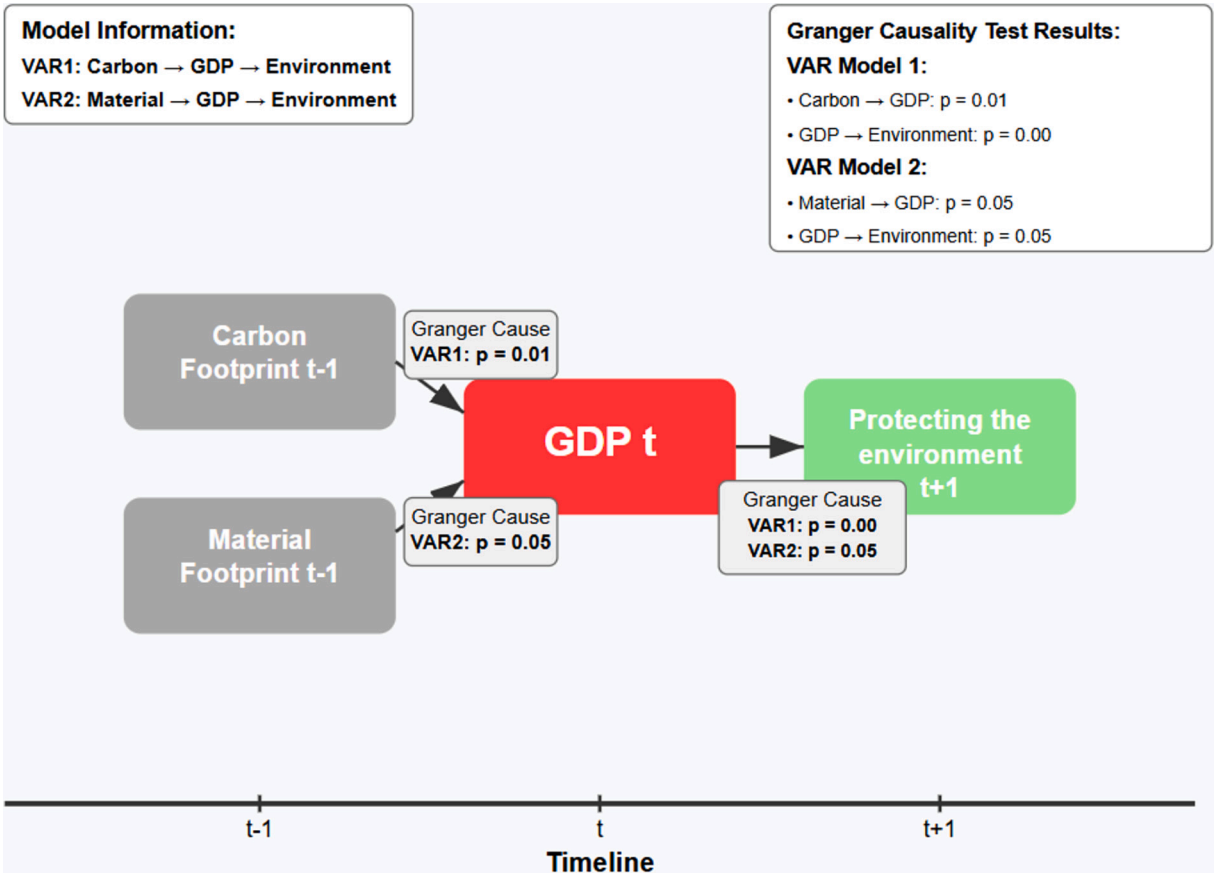


Fig. 5. Granger causality between the main variables.
**Granger causality in a VAR model implies a correlation between current values of one variable and the past values of other variables.
Source: Own elaboration based on Lenzen et al. (2021), FRED and Gallup Survey.

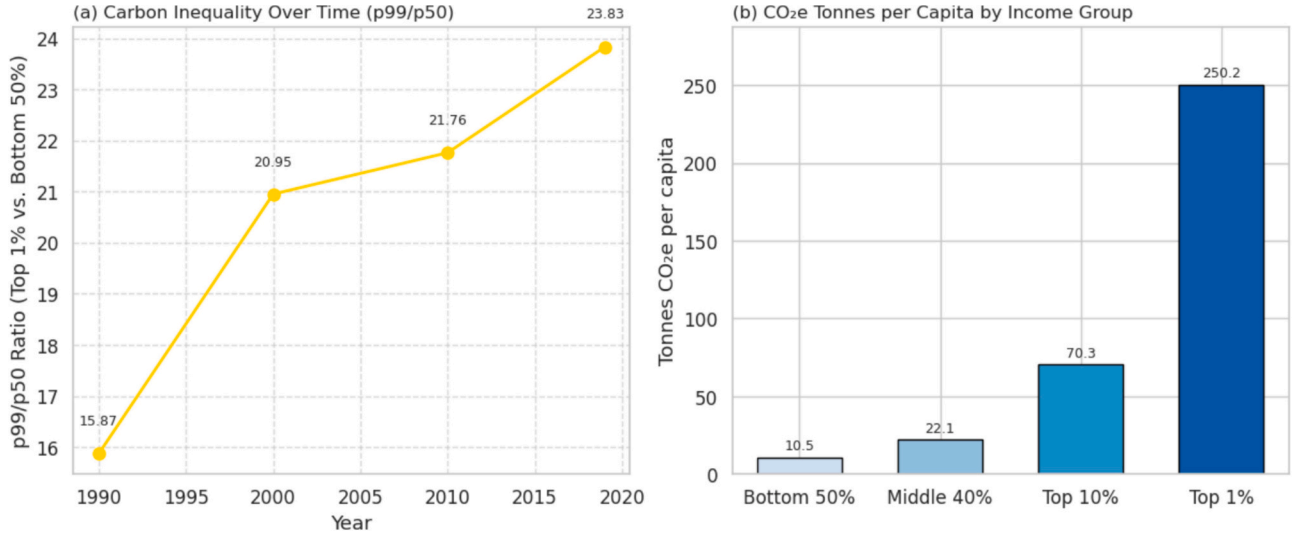


Fig. 6. (a) Carbon footprint inequality by income group in the USA 1990–2019 and (b) Carbon footprint per capita by income group in 2019 USA.
Source: Own Figures based on data from Chancel (2021).

out with consistently significant positive relationships, highlighting their heightened concern for environmental quality. They not only express greater worry about environmental degradation but also consistently rate the country's environmental conditions as poor and perceive them as worsening. This aligns with arguments from environmental justice advocates, who have long maintained that low-income and minority communities suffer disproportionately higher levels of pollution and generally worse environmental conditions. Middle-income individuals demonstrate more neutral perceptions, with relationships closer to a balanced midpoint, while upper-income groups tend to exhibit negative relationships, reflecting more favorable evaluations of environmental conditions. This may reflect the more favorable

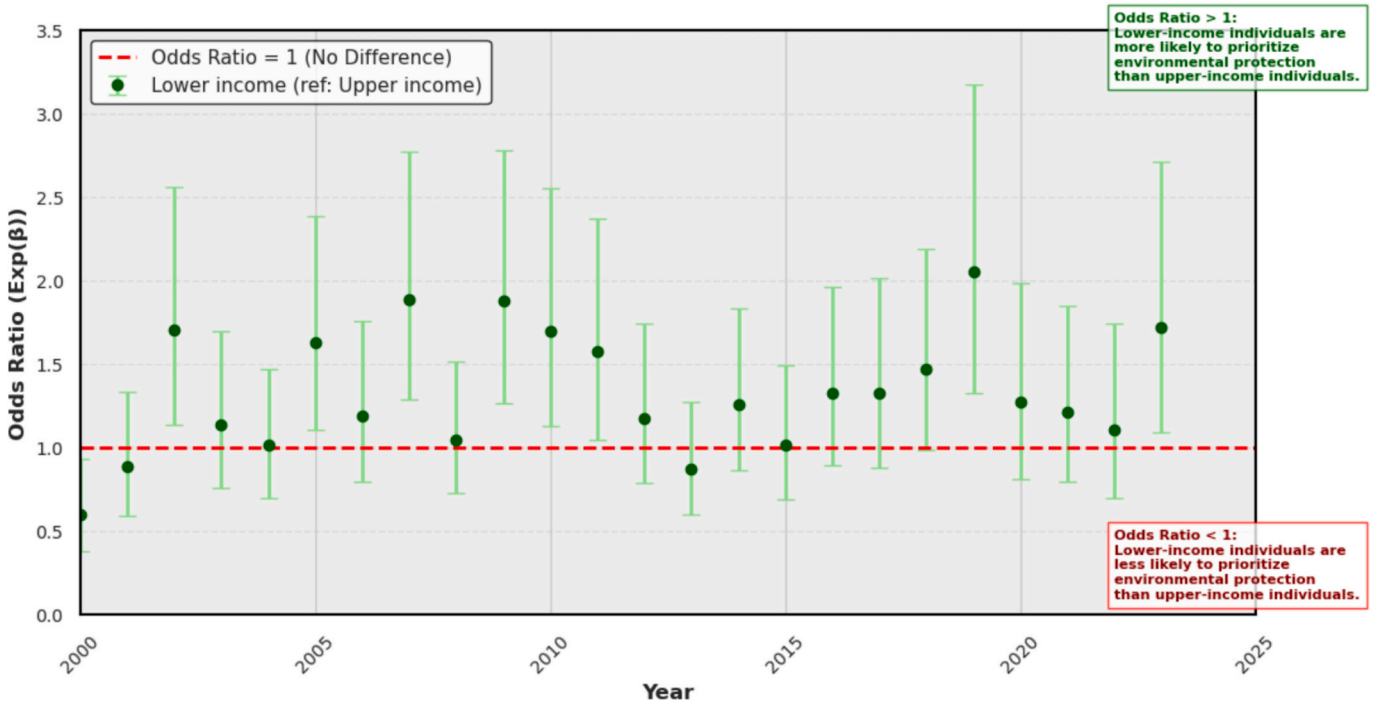


Fig. 7. Binary logistic regressions the preference for protectingthe environment over economic growth and income level 2000–2023. Lower income vs Upper income. Results when controlling by age, race and sex, educations and Politcial ideology, results including the rest of variables can be found at S7 in the supplementary document.
95 % confidence interval.
Source: Own elaboration based on Gallup Poll.

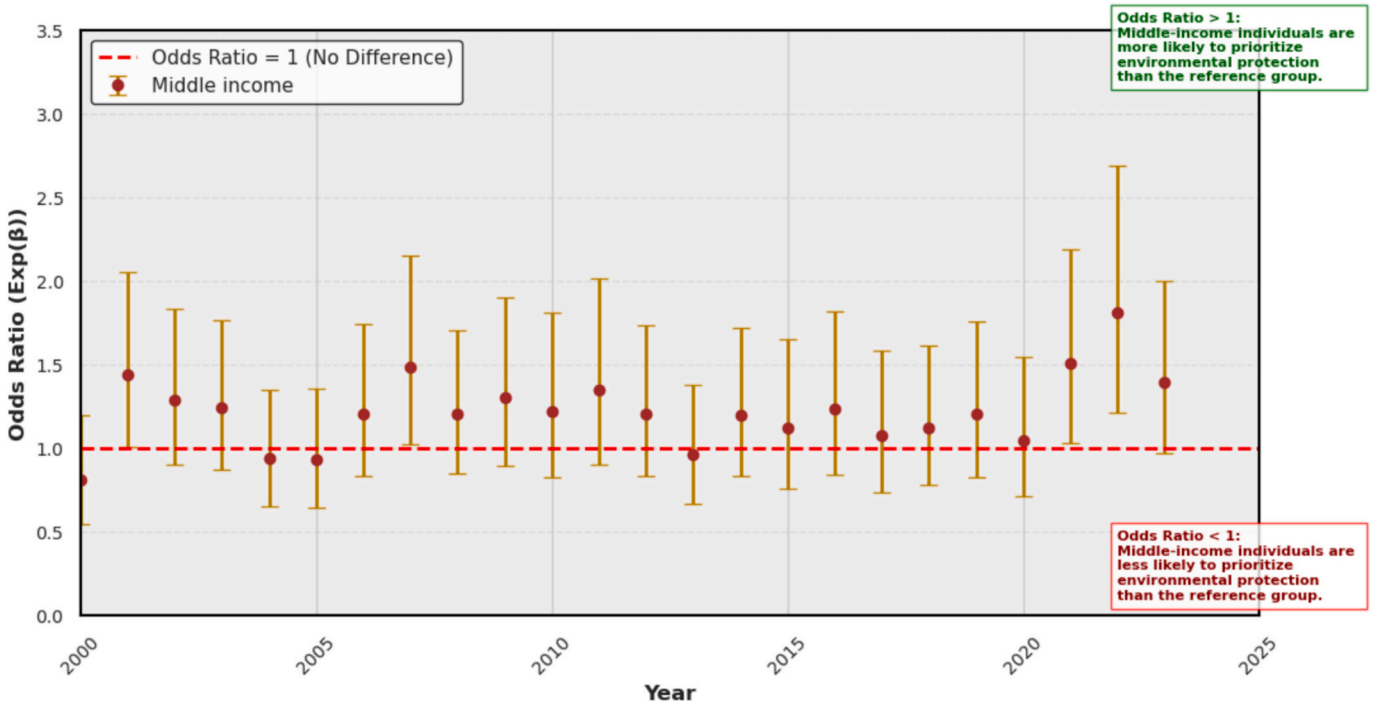
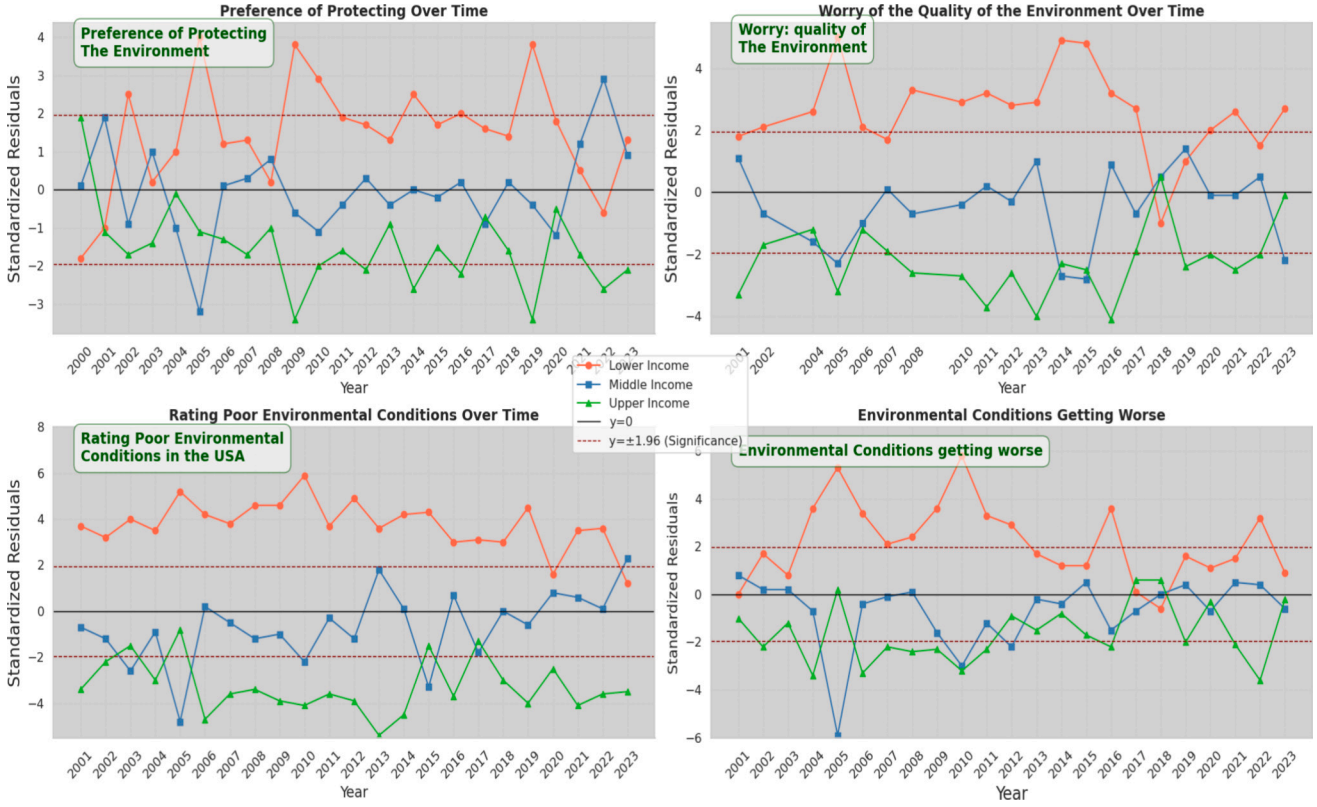


Fig. 8. Binary logistic regressions the preference for protecting the environment and income level 2000–2023. Middle income vs Upper income.
Results when controlling by age, race and sex, educations and Politcial ideology, results including the rest of variables can be found at S7 in the supplementary document.
95 % confidence interval.
Source: Own elaboration based on Gallup Poll.



Figs. 9. Trends in environmental perceptions by income group in the U.S. (2001–2023, standardized residuals).
Panel 1 (top-left): Preference for Protecting the Environment over economic growth (2001–2023, Standardized Residuals); Panel 2 (top-right):Worry About the Quality of the Environment (2001–2023, Standardized Residuals); Panel 3 (bottom-left):Rating Poor Environmental Conditions (2001–2023, Standardized Residuals); Panel 4 (bottom-right):Perception That Environmental Conditions Are Getting Worse (2001–2023, Standardized Residuals).
Source: Gallup Poll.

environmental conditions that their wealth can afford them.

5. Discussion: The disconnection hyphothesis and the environmentalisms of the poor

Inglehart and Welzel (2005) proposed that socio-economic modernization enables societies to prioritize higher-order values, such as environmental protection, as economic prosperity fosters autonomy and humanistic ideals. Our findings reveal a complex relationship between economic processes and environmental concern that manifests differently at societal and individual levels. Our findings support this notion at the societal level, showing that environmental concern increases with economic growth. However, they also expose a critical disconnection: the same economic processes driving environmental awareness also exacerbate ecological degradation. At the individual level, the relationship between economic prosperity and environmental concern follows a different pattern, where those with the highest environmental impact show less environmental concern, while those bearing the burdens of degradation demonstrate stronger environmental preferences. These multi-level findings challenge conventional understandings of the relationship between economic development and environmental values, suggesting the need for a more nuanced theoretical framework that can account for both societal-level disconnections and individual-level environmental justice dynamics.

5.1. Societal-level results: The disconnection hypothesis

At the societal level, the disconnection hypothesis brings into focus a paradox at the core of post-materialist environmentalism. In the U.S. context, periods of economic expansion—indicated by annual per capita increases—are associated with heightened environmental concern. However, this concern wanes during economic downturns, suggesting that short-term changes in economic conditions, rather than simply higher levels of wealth, shape public awareness. Although economic growth can stimulate environmental sensibilities, it concurrently intensifies the consumption of materials and energy, fueling ecological degradation. Societies experiencing economic booms express strong environmental awareness yet, in doing so, also bolster their material and carbon footprints, thereby intensifying global ecological strain. International panels analyzing cross-country data reinforce this paradox, showing that while economic growth fosters environmental preferences aligned with post-materialist values, it simultaneously drives higher resource use. This duality highlights a fundamental alienation between societal aspirations for sustainability and the material outcomes imposed by the structural demands of continuous economic expansion.

The very economic processes that enable societies to develop environmental consciousness simultaneously intensify their physical impact on ecosystems, creating a disconnect between stated environmental values and actual environmental outcomes.

The significant relationship between the material and carbon footprint and subsequent rises in environmental concern suggests a reactive dynamic, where ecological harm fosters economic growth and economic growth fosters awareness but often in a disconnected manner. As Marx (1990, p.163) observed, social relations—such as the interplay between economic growth and environmental degradation—often assume “the fantastic form” of abstract values detached from their material basis. Post-materialist environmentalism, in this sense, becomes a commodified narrative: it prioritizes symbolic actions and “green” consumption over reforms that would have a larger and more direct impact on the environment. This alienated environmentalism allows societies to

reconcile their concern with lifestyles that perpetuate ecological harm, reinforcing the structural entrenchment of growth-oriented economies.

Our findings complement this body of work, illustrating that the rise in environmental concern during periods of economic growth does not fundamentally alter underlying production and consumption regimes. Instead, following Uribe and Chapman-Ludwig (2023) individuals may become more environmentally "aware" without undertaking the large-scale changes required to curtail the relentless extraction, throughput, and waste that characterize modern economies.

5.2. Individual-level results: The environmentalisms of the poor

At the individual level, a different dynamic emerges. Despite their greater environmental impact, affluent groups exhibit less environmental concern and prioritize economic growth over ecological protection. This highlights the limitations of post-materialist narratives, which assume that affluence inherently fosters environmental responsibility. In contrast, lower-income individuals within the US—despite their smaller carbon footprints—consistently exhibit stronger pro-environmental attitudes.

This aligns with O'Connor, 1988, O'Connor, 1997 theory of the "second contradiction of capitalism," which posits that capitalism undermines its ecological and social foundations, creating material contradictions that intensify socio-environmental struggles. Marginalized groups, who bear the brunt of environmental degradation, are compelled to advocate for environmental protection as a matter of survival, not post-materialist ideals. Similarly, Martínez-Alier (2002) "environmentalisms of the poor" emphasizes that these groups, directly reliant on natural resources, exhibit stronger ecological awareness due to their lived experience of environmental harm. As Brechin and Kempton (1994) argue, the direct impacts of ecological degradation foster a deeper connection to environmental concerns, making economic hardship a paradoxically effective driver of environmental stewardship.

These findings highlight a critical disparity. While affluent groups sustain consumption-driven lifestyles marginalized groups—despite bearing the heaviest burdens of ecological damage—lack the socio-economic and political power to influence systemic change. This reinforces structural inequalities, undermining efforts to align environmental values with ecological outcomes.

Thus, even as post-materialist theories anticipate a wealth-driven shift toward environmental responsibility, the materialist hypotheses underscore the underlying structural inequalities. These results illustrate how the relentless pursuit of economic growth and high material consumption intensifies ecological pressures, disproportionately subjecting economically and politically marginalized groups to environmental harm. This dynamic aligns with materialist critiques of environmental injustice and helps explain why these marginalized communities often exhibit stronger environmental concern.

6. Conclusion: Belief in post-materialism is part of the constitution of the present environmental crisis

This study investigates the complex relationships between economic growth, environmental concern, and environmental degradation. We tested the predictions of the post-materialist hypothesis, the materialist hypothesis, and the disconnection/alienation hypothesis using dynamic, and logistic regressions and a VAR model.

Our analysis reveals that GDP per capita growth is positively related to both heightened environmental concern and increased environmental degradation. The post-materialist hypothesis is supported, showing that environmental concern rises with economic prosperity. However, this concern does not necessarily mitigate environmental degradation; instead, economic growth often exacerbates it, as evidenced by the material and carbon footprint analysis. The structural imperatives of continuous economic growth undermine efforts to align environmental consciousness with tangible environmental improvements. Impulse-response function and variance decomposition analyses indicate that both GDP growth and resource use significantly impact environmental concern.

Additionally, the preference for environmental protection over economic growth is influenced not only by economic conditions but also by past environmental impacts. This is evident in the significant relationship between the material and carbon footprint and the subsequent rise in environmental concern. This supports the disconnection/alienation hypothesis, which suggests that while economic growth fosters environmental concern, it also leads to greater environmental degradation. Thus, environmental concern is often alienated from the actual environmental effects.

The analyses of the environmental concern 'brings out that it is a very strange thing, abounding in metaphysical subtleties and theological niceties' (Marx, 1990, p.163). The mysterious character of the environmental concern consists therefore in the fact that it is presented to us as a product of economic growth separated from the physical environmental impact that this economic growth is creating. What is, in fact, a social relation between economic growth and environmental impact instead assumes the fantastic form of a relation between a type of environmental concern separated from the effects that this concern is producing to the environment. The post-materialist environmental concern has little connection with much of the physical environment economic growth creates, and with the material relations arising therefrom. Post-materialist environmental concern is alienated from the effects that economic growth and modernization are causing to the environment (Requena-i-Mora and Moreno, 2019).

This alienation of environmental concern from material reality at the societal level poses fundamental challenges for degrowth transitions. Our findings show that environmental concern itself has become dependent on the very economic growth that drives environmental degradation. This creates a paradoxical situation where attempts to build environmental awareness through economic growth ultimately undermine environmental protection by increasing material and carbon footprints. The strong relationship we found between GDP growth and environmental preferences (coefficient = 1.34 and 2.0; $p < 0.05$) suggests that current forms of environmental consciousness are structurally tied to growth, making it difficult to imagine or implement degrowth alternatives within existing frameworks. This helps explain why periods of economic contraction, which actually reduce environmental impact, coincide with decreased environmental concern. Breaking this growth-dependency of environmental values becomes crucial for any meaningful degrowth transition. Rather than relying on growth-dependent environmental consciousness, we need to foster forms of environmental awareness that emerge from direct engagement with ecological limits and environmental justice concerns.

The analysis of microdata challenges Inglehart's post-materialist hypothesis, revealing a complex relationship between income and environmental attitudes. Contrary to expectations, higher income is associated with increased environmental degradation and lower environmental concern, while lower-income individuals tend to prioritize environmental protection over economic growth. These findings suggest that economic hardship may paradoxically be more effective than affluence in cultivating environmental stewardship and mitigating ecological damage.

This pattern of environmental preferences among lower-income groups suggests possibilities for what we might call "degrowth from below" – where communities most impacted by environmental harm are already showing alternatives to growth-centered development. Rather than environmental protection being a luxury that emerges with affluence, our findings indicate that those experiencing environmental degradation firsthand are already prioritizing ecological protection over economic growth, despite their economic challenges. This is particularly significant as these preferences emerge from communities that contribute least to environmental degradation while suffering its worst effects. These findings suggest that effective environmental policy

should not wait for economic growth to foster environmental concern, but rather should build on and support the existing environmental priorities of lower-income groups while ensuring their basic needs are met through non-growth-dependent mechanisms. This requires fundamentally rethinking both environmental protection and economic justice in ways that break from growth-centered development models and learn from communities already choosing ecological protection over economic expansion.

The present study has limitations that should be addressed in future research. First, the study should consider possible confounding factors, such as policy shifts, that may have influenced the results. The analysis of data across income groups and the comparison between attitudes (captured through surveys) and actual environmental impacts (measured through footprints) highlight key discrepancies. However, measuring attitudes solely through surveys rather than qualitative data limits the study, as expressed attitudes may not fully reflect the complexity of individual perceptions and behaviors. Additionally, while the study examines data at the individual level, the reliance on societal-level aggregations in some parts of the analysis may still oversimplify complex interactions and obscure nuanced patterns. While the focus on material and carbon footprints provides a robust measure of environmental impact, it does not capture the full spectrum of environmental degradation, such as biodiversity loss or water scarcity. Finally, although the study includes international panel data from seven countries, its reliance on aggregated data and the primary geographic and cultural focus on the US may limit the generalizability of the findings, particularly to the Global South.

Addressing these disparities and limitations requires systemic reforms that move beyond post-materialism, economic growth and income are the cause of environmental degradation. Achieving genuine environmental sustainability will necessitate confronting the structural drivers of ecological degradation—particularly the inequalities and material-driven dynamics of affluent societies and individuals. Bridging the disconnection between environmental concern and material realities is essential, as is amplifying the voices of those most affected by environmental harm, to create equitable and sustainable ecological outcomes. Future research should aim to address these limitations, exploring broader environmental dimensions, enhancing causal understanding, and incorporating diverse geographic and cultural contexts—both at aggregate but also among economic stratas— to provide a more nuanced understanding of these critical dynamics.

Overall, our results suggest that aa genuine environmental sustainability may necessitate transcending the current framework of consumer-driven environmentalism in favor of systemic reforms that address the fundamental drivers of environmental degradation, such as economic growth and high-income levels.

CRediT authorship contribution statement

Marina Requena-i-Mora: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Dan Brockington:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Conceptualization. **Forrest Fleischman:** Writing – review & editing, Writing – original draft, Supervision, Resources, Investigation, Conceptualization.

Declaration of competing interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ecolecon.2025.108648

Data availability

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