The Ecological Price of Inequality
How Wealth Disparities Shape Sustainable Development

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Abstract: *Environmental degradation and global income inequality are widely recognized as two of the defining crises of the 21st century. In political practice, they are usually treated as two separate challenges, requiring separate sets of interventions. Growing research, however, suggests that both are deeply interconnected and that economic inequality is not just a separate concern, but a core component of sustainable development. This chapter provides an overview of the literature investigating the effect of economic inequality on environmental degradation. Theory suggests that various channels drive this relationship via political, economic and social pathways. After discussing each of these pathways, the chapter reviews empirical findings on the inequality-environment link from a wide range of national contexts. Although studies report mixed findings, some patterns emerge with respect to national income levels and environmental indicators. By mapping the three underlying pathways and synthesizing results across countries, the chapter shows where equality can serve as a lever for environmental improvement and where trade-offs must be managed, pointing to integrated policy designs and priorities for future research.*

1. Inequality and environmental degradation—two separate crises?

Environmental degradation and increasing economic inequality are among the most pressing crises of current times.

Ecological crises, including climate change, biodiversity loss, pervasive pollution and growing freshwater scarcity, are tightly linked and accelerate rapidly. The IPCC's latest report shows warming of about 1.1 °C, already with escalating, widespread risks from extremes and slow-onset changes (Calvin et al., 2023). Global biodiversity is in steep decline, with IPBES estimating about 1 million species at risk of extinction due to land and sea-use change, overexploitation, pollution, invasive species and climate change (Watson et al., 2019). Pollution remains the largest environmental risk to health, causing about 9 million premature deaths annually (Fuller et al., 2022). Synthesizing these trends, the updated planetary boundaries assessment concludes that six of nine Earth-system limits are already transgressed (Richardson et al., 2023). Overall, the continuous increase in global economic activity poses a serious threat to the planet.

Despite the associated growth in global wealth, not everyone benefits equally from it—in most countries, economic inequality continues to intensify (Milanovic, 2024), leading to numerous adverse social and economic outcomes. The persistence of absolute poverty, inadequate access to basic needs, and lack of social inclusion remain a fundamental problem, especially in low-income countries. Studies demonstrate that both absolute and relative poverty seriously undermine physical and mental health (Pickett & Wilkinson, 2015), making it even more difficult for individuals to escape persistent poverty.

Beyond its impact on individual well-being, inequality is linked to a variety of macroeconomic and societal challenges. For instance, it is associated with weakened resilience against recessions and economic crises (Kumhof et al., 2015). On a societal level, socioeconomic inequality has been shown to contribute to the destabilization of systems by deepening social fragmentation and polarization, leaving room for populism (Engler & Weisstanner, 2021) and fostering violent crime rates (Fajnzylber et al., 2002).

In sum, both individual well-being and systemic stability are significantly impacted by strong degrees of inequality.

Moreover, solving these two crises is severely complicated by the fact that both are deeply interconnected. As research on the issue of carbon inequality shows, both the responsibility for and the burden of environmental degradation are distributed highly unequally: Globally, the richest 10 percent are responsible for nearly half of consumption-based CO2 emissions, while the bottom 50 percent emit only a tenth of global CO2 (Bruckner et al., 2022). Historically, the countries that are now among the richest in the world have contributed most to the current carbon budget: The USA, UK and today's EU countries have emitted nearly half of global cumulative emissions since 1751 (Ritchie, 2019), a share that increases even more when colonial rule is taken into account (Evans & Viisainen, 2023). At the same time, the consequences of climate change and environmental degradation have a disproportionate impact on the poorest households, as people in low-income countries are exposed more frequently to climate disasters, have fewer resources to protect themselves against them, and rely more heavily on natural resources and ecosystem services for their everyday living (Adger et al., 2003; Barbier & Hochard, 2018).

In the context of environmental protection, inequality further intensifies the trade-offs between economic interests and mitigation efforts: When sustainability requires changes in lifestyles and investments in cleaner technology and infrastructure, negotiations about who carries which share of the burden are often unavoidable. Consequently, issues of social fairness and acceptability have become a crucial component of (and obstacle to) environmental policies (Maestre-Andrés et al., 2019).

In addition to the questions of climate justice and the feasibility of environmental policies, a growing strand of literature has emerged over the last 30 years studying the direct linkages between economic inequality and ecological degradation. The overarching goal of this line of research is to understand whether income inequality, on an aggregate level, is conducive or obstructive to sustainability—or, as a result, whether policymakers can either utilize a win-win relationship to achieve both higher levels of equality and sustainability or whether they have to carefully manage a trade-off between both goals.

This strand of literature focuses on two questions: *1) What are the underlying pathways through which inequality affects the environment? and 2) What is the empirical evidence of the inequality-environment relationship across countries and time?*

The first question has been discussed extensively on a theoretical basis. While various mechanisms have been proposed, the literature focuses on three pathways, two of which act through households' consumption patterns and one through the distribution of political power. Since these pathways suggest contradictory effects, however, they alone cannot provide a definite answer.

As a result, more attention is being paid to the empirical evidence. Despite a growing number of studies, the results do not provide a clear picture, either. In addition to mixed findings, estimates have been found to be sensitive to country-specific contexts, use of indicators for inequality and environmental impacts, as well as choices of data and methodology.

The aim of this chapter is to review this literature addressing the effect of economic inequality on environmental degradation. While neither theoretical considerations nor empirical evidence provide a definitive answer, the chapter attempts to provide a structured overview of the current state of research. Section 2 discusses possible political, economic and social pathways underlying the inequality-environment link. In section 3, I summarize the empirical evidence on the relationship, highlighting some patterns that emerge despite the overall mixed findings. Section 4 concludes with a summary of policy implications and open points for future research.

2. The pathways from inequality to sustainability

While many studies try to establish a general link between inequality and environmental degradation, this aggregate relationship seems to emerge from an interaction between various underlying mechanisms. Several approaches have been used to study these mechanisms, e.g. by investigating the role of different societal actors and decision instances (Islam, 2015), using a scale-composition-technique approach (Berthe & Elie, 2015; Clement & Meunie, 2010) or taking a complex adaptive systems perspective (Leach et al., 2018). Most papers, however, explain the inequality-environment link by distinguishing between *economic* and *political* pathways.

From this analytical perspective, the economic pathways operate via the consumption and investment decisions of households, whereas the political pathways investigate the role of power, voter interests and political priorities in the determination of environmental policies. In more recent papers, the social dimension is discussed as well, showing how social and cultural consequences of inequality shape environmental attitudes.

As not only the theoretical, but also most empirical papers are guided by this classification, I will discuss the three pathways in more detail in the following sections.

2.1 Political pathways

Among the first authors to link environmental degradation and economic inequality was Boyce (1994). Using a political economy framework, he demonstrated how inequality can exacerbate environmental harm through power dynamics favoring the wealthy.

He adopts the standard welfare-economic model of externalities as his point of departure. In this framework, polluting activities yield short-term economic gains but also impose costs on the general public. When these gains and costs are unevenly distributed across the population, certain actors derive net benefits from such activities, while others bear net costs. In equilibrium, the level of pollution should be set to maximize overall welfare. Given diminishing marginal benefits from the pollution-generating activity and increasing marginal costs from pollution, the socially optimal level of activity is determined by the standard condition in which marginal benefit equals marginal cost.

Boyce contends that this optimal outcome can only be achieved if no power asymmetries exist between net beneficiaries and net cost bearers. Where such asymmetries do exist, the level of pollution is no longer determined by the optimal benefit-cost criterion, but instead by the so-called '*power-weighted social decision rule*' (PWSDR) whereby more powerful actors have greater influence over public decision-making. Depending on whether power is concentrated among the winners or losers of polluting activities, the resulting pollution level will deviate upward or downward from the social optimum. Consequently, greater power inequality leads to larger deviations from the socially optimal level.

Building on this formal model, Boyce argues that a) political power is usually correlated with income and b) income correlates with being a net beneficiary of polluting activities. As a result, powerful actors who benefit from pollution are able to assert their interests via the PWSDR, resulting in higher pollution levels.

Boyce justifies the assumption that wealthy individuals have a stronger preference for pollution on two grounds (Torras & Boyce, 1998). First, he argues that the wealthy benefit disproportionately from polluting activities because they are more likely to own polluting firms, hold greater asset portfolios and maintain higher levels of consumption. As a result, they generate greater producer and consumer surplus, which they have an interest in protecting. Second, wealthy individuals are more likely able to protect themselves from the consequences of pollution, for example by relocating to less polluted areas or by using their financial resources to secure priority access to otherwise scarce goods and services.

Accordingly, strong inequality creates conditions in which high levels of pollution persist, with the associated costs disproportionately borne by low-income groups that lack the political influence to prevent them. In the context of political decision-making, this dynamic manifests as insufficient environmental protection and inadequate climate mitigation policies.

Boyce's line of argument, also known as the *equality hypothesis*, is prominently challenged by Scruggs (1998), who argues that the link between inequality and environmental quality is more complex and mediated by institutional structures and the distribution of preferences.

Scruggs mainly challenges Boyce's claim that the wealthy systematically prefer environmental degradation. He argues that, if the environment is considered a normal or superior good, higher-income individuals may instead demand more protection, meaning inequality could under some conditions improve environmental outcomes. He also questions the assumption that the wealthy can fully shield themselves from pollution, noting that global problems like climate change are public, not private, bads.

Empirically, Scruggs points to evidence that environmental concern is often stronger among higher-income groups, drawing on Inglehart's theory of culture shift according to which post-materialist values can only emerge once a minimum level of prosperity and material security is acquired. He concludes that environmental preferences cannot be reduced to income alone but result from a complex interplay of economic, cultural, and individual factors.

Finally, Scruggs disputes Boyce's notion that political outcomes simply reflect power-weighted preferences. Instead, institutional rules, advocacy dynamics and voting behavior shape the outcome of democratic processes. Thus, even if higher equality strengthened pro-environmental interests, the resulting collective choices might not automatically lead to more environmental protection.

Considering both positions, the political economy arguments can thus lead to inequality being either conducive or obstructive to environmental quality, depending on which assumptions about environmental interests and the mechanisms of political influence are true in a given empirical context. Berthe and Elie (2015) summarize this point by identifying three questions that need to be asked in order to test the suitability of the different arguments:

1. What are different social groups' overall interests in terms of protecting the environment?
2. How have these interests been transformed into political positions?
3. Are these positions reflected in political decisions?

While these two theoretical positions dominate the inequality-environment literature, other political pathways may play a role as well.

First, both positions investigate how political interests directly translate into public decision-making. However, political decisions are not only influenced by contemporary interests and institutional structures, but also by general beliefs about welfare, economic dynamics and the role of the government. In the short term, public opinion has been shown to be significantly affected by the media (DellaVigna & Kaplan, 2007), which can be biased towards the interests of the wealthy if media ownership is concentrated in these groups. Indeed, studies confirm this influence of elite and business interests in various contexts (e.g. Gilens & Page, 2014; Popiel, 2018).

In the long run, political and economic thinking is strongly influenced by academia, think tanks and policy networks, often reflecting the interests of privileged groups and contributing to the preservation of existing power balances (Campbell & Pedersen, 2014). Therefore, existing power asymmetries do not only influence which interests are prioritized in political decision-making, they can also influence the *formation* of interests in the first place.

Second, inequality can shape environmental policy by shifting political priorities from long-term concerns to short-term issues. The social consequences of inequality—lacking access to necessities in low-income groups, increased support needs in times of crises, unequal opportunities in education and employment, etc.—require political attention and resources that could be reduced in the long run if structural changes were implemented to permanently reduce inequality (O'Neill, 2020). Instead, policies prioritizing the preservation of the status quo tend to apply short-term 'damage control' measures to cushion the consequences of inequality (Stiglitz, 2015), forcing political attention away from other long-term concerns such as environmental protection.

In sum, most of these political pathways suggest that inequality acts as a barrier to sustainable development, making reductions in income and power disparities an important tool to combat environmental degradation. However, the role of environmental preferences across the income distribution plays in an important role in these dynamics—if high-income groups with significant political power care more about the environment than lower-income groups, inequality could actually lead to better environmental protection.

2.2 Economic pathways

The economic pathways underlying the inequality-environment link focus on how households' consumption patterns would be affected by income redistribution measures.

As discussed earlier, high-income groups are responsible for the majority of resource use and pollution, both within and across countries. For instance, Bruckner et al. (2022) find that carbon footprints of the top 10 percent incomes in the US are about 40 times higher than those of the top 10 percent in Nigeria, and over 500 times higher than the footprints of Nigeria's bottom 10 percent.

Globally, they report that the top 1 percent emit more CO_2 than the bottom 50 percent combined.

These extreme degrees of carbon inequality should undoubtedly serve as a warning to recognize the role and responsibility of high-income groups in the ongoing global environmental crisis. Nevertheless, they are more indicative of the impact of *extreme wealth* on the environment rather than the impact of *wealth inequality* per se. Wealthy households have a disproportionately higher ecological footprint than poorer households, but they also have disproportionately high incomes. Whether redistributing this income would mitigate or exacerbate the environmental footprint of consumption depends on the extent to which lower-income households spend the additional income on more or less resource-intensive goods. In other words, it depends on the resource intensity of the average dollar spent across the income distribution.

The inequality-environment literature addresses this problem using the *marginal propensity to emit (MPE)* framework (Holtz-Eakin & Selden, 1995), describing how emissions associated with each dollar earned change with increasing income. In the case of constant MPE, redistribution should not affect consumption-based emissions because each dollar 'contains' the same amount of emissions. If the MPE is increasing, redistribution would benefit the environment as a dollar used in lower income groups is associated with fewer emissions than one in higher income groups. If it is diminishing, redistribution would worsen environmental degradation as more money is spent on emission-intensive goods after redistributing it.

Studies investigating the environmental impact of consumption patterns in Western countries tend to support the *diminishing* marginal propensity to emit (DMPE) hypothesis, i.e. the average carbon intensity of consumption decreases with higher income (Grunewald et al., 2017; Wan et al., 2022). This observation is linked to two underlying effects:

First, the *marginal propensity to consume (MPC)* usually diminishes with increasing income (Drescher et al., 2020). Compared to lower-income households, higher incomes devote a smaller proportion of their income to consumption, directing more towards savings or investment instead. Wealthy households spending less income on consumption therefore have a lower ecological footprint of consumption *relative to their income* than households with higher MPC.

Second, the *composition* of consumption patterns also changes across the income distribution. Analyses of household expenditure data suggest that, at least in high- and middle-income countries, the average carbon and resource intensity (i.e. the impact per dollar) tends to diminish with increasing income as well (Ivanova et al., 2016). Lower-income households usually spend a larger share of their income on carbon-intensive necessities such as food and housing, while higher-income households tend to buy more services, higher-quality (i.e. more durable) goods, as well as high-efficiency appliances (Bjelle et al., 2021; Druckman & Jackson, 2016). Rich households also tend to have a higher willingness to pay for expensive products and brand mark-ups (Fassnacht & Dahm, 2021), which have a lower environmental impact per dollar compared to less expensive substitutes with comparable material and energy inputs.

While most studies support the evidence of diminishing MPC and MPE, estimates of exact elasticities vary considerably across countries (Berthe & Elie, 2015), indicating that other economic and socio-cultural factors might play a role in determining consumption patterns in a given context. Static analyses using data of historical consumption patterns to test the effect of redistribution may therefore fail to capture dynamic connections between inequality and consumption. Consequently, understanding how inequality itself shapes consumption patterns via economic and social mechanisms is crucial to assess the ecological effect of redistribution.

One of these dynamic effects is captured by the concepts of *conspicuous consumption* and *status competition*, representing the second economic pathway frequently discussed in the inequality-environment literature. Based on Veblen's *Theory of the Leisure Class* (1899), conspicuous consumption describes the purchase of expensive and highly visible goods that are not consumed for individual utility, but to signal wealth, status and social position to others. According to Veblen, wealthy individuals engage in conspicuous consumption to differentiate themselves from lower social classes. In doing so, they create status competition that lower-income groups respond to by trying to emulate the consumption patterns of the rich—'Keeping up with the Joneses'—resulting in a 'consumption arms race' across income groups.

Veblen's theory is applied to the inequality-environment relationship to describe how inequality affects consumption patterns via social norms. In highly unequal societies, differences in social status are more pronounced and visible, which intensifies status competition and therefore demand for status goods. This can lead to more resource-intensive consumption patterns via three direct effects: First, status competition can cause a scale effect by stimulating total demand—as demand for status goods rises across all income groups, overall consumption levels increase (Bertrand & Morse, 2016). Second, the environmental impact of consumption increases if status goods are more resource- or emission-intensive than the average non-status good. Evidence for this composition effect has been found in the context of SUV purchases (Grinblatt et al., 2008), travel (Josiassen & George Assaf, 2013) and housing (Fligstein et al., 2017). Third, there is some evidence that status competition can increase people's working hours, affecting both economic growth and individual consumption levels (Bowles & Park, 2005).

As before, the consumption pathways lead to conflicting implications: On the one hand, the DMPE findings suggest that reducing income disparities will harm the environment by allocating income towards households with more resource-intensive consumption patterns. On the other hand, the Veblen approach indicates that higher equality can mitigate status competition and overconsumption, leading to lower absolute and possibly less resource-intensive lifestyles. The total impact of redistribution would thus depend on the net effect between the two.

Finally, it should be noted that the arguments surrounding the economic pathway focus mostly on consumption, ignoring the role of *investments* in a household's environmental footprint. Although it is difficult to assign the environmental impact of production processes to investors rather than final consumers, the role of capital income cannot be ignored in a discussion on the effects of inequality. Compared to labor income, it is significantly more concentrated among the population, with the top 10 percent receiving a disproportionate share of dividends and profits (Bengtsson & Waldenström, 2018). Hence, lower marginal propensities to consume among the rich may be offset by higher investment shares. Indeed, Chancel (2022) finds that most emissions caused by the top 1 percent stem from investments rather than consumption.

The environmental effects of redistribution via changes in investment behavior are hard to predict, mainly because of the interaction of scale and technique effects: While investments contribute to expanding production levels, they can also promote efficient production processes via innovation and technology. Nonetheless, incorporating investment and capital income alongside consumption in the analysis may reveal an important piece in the inequality-environment puzzle.

2.3 Social pathways

Income inequality can affect environmental degradation through several social pathways, which explain how inequality influences environmental concern via social norms, societal cohesion, and environmental awareness. As before, several mechanisms stand out.

The first one directly builds on the conspicuous consumption pathway discussed above. In addition to the effects of status competition on demand, it has been argued that cultures expressing social hierarchies mainly though material goods foster materialism and consumerism (Kasser, 2003), influencing not only individual consumption choices but general attitudes on life and well-being. As such, they can also feed back into attitudes on sustainability. For instance, materialism has been shown to be related to lower environmental concern, possibly because people view sustainability and the necessary changes in lifestyles as a direct threat to their social status and identity (Kilbourne & Pickett, 2008).

Second, inequality has been found to reduce pro-environmental attitudes by weakening social cohesion and a sense of solidarity. Research suggests that societies with higher economic inequality and steeper social hierarchies show lower levels of trust in institutions and among citizens, strongly mediated by perceived societal (un)fairness (Rothstein & Uslaner, 2005). This can reduce people's desire to advocate for others and be concerned with the common good (Power et al., 2016).

There is strong evidence that this effect also feeds into environmental concern, behavior and policy support. Generalized trust, for example, is linked to general pro-environmental behavior (Zheng et al., 2025) and has been found to reduce the gap between environmental concern and action (Tam & Chan, 2018). Similarly, Harring & Jagers (2013) report that higher interpersonal trust increases support for carbon taxes. With respect to social norms, Vesely et al. (2020) find that pro-environmental acts are perceived as signals of cooperativeness that, in turn, elicit more cooperation from others. Overall, this evidence suggests that societies with strong social cohesion produce a sense of collective responsibility for current and future generations, which is an essential prerequisite for mobilizing collective efforts toward environmental sustainability (Wilkinson et al., 2010).

The third social pathway concerns the role of education. Economic inequality is typically associated with inequality in educational attainment (Gregorio & Lee, 2002). Education, in turn, is related to environmental awareness, attitudes and behaviors, (Meyer, 2015), including behaviors such as organic food choice (Dimitri & Dettmann, 2012), bicycle-use (Cole-Hunter et al., 2015) and green voting (Schumacher, 2014).

Table 1: Overview of theoretical pathways

Type of pathway	Mechanism	Hypothesized effect
Political	**Equality hypothesis and PWSDR** (Boyce, 1994)	+
	PWSDR with increasing environmental preferences over income (Scruggs, 1998)	–
	Influence of elites on political and economic beliefs	+
	Political priorities and short-termism	+
Economic	**Diminishing marginal propensity to emit (DMPE)**	–
	Veblen effect and status competition	+
Social	Materialism and consumerism	+
	Social cohesion and collective responsibility	+
	Education	+

Description: Overview of political, economic and social pathways. The three main mechanisms discussed in the literature are printed in bold. Positive effects of inequality on environmental degradation represent a 'win-win' relationship, negative ones a trade-off between improved equality and environmental quality.

How does education raise pro-environmental attitudes? While the role of environmental knowledge itself is smaller than commonly expected (Kollmuss & Agyeman, 2002), the process of engaging with environmental topics generally seems increase awareness (Zsóka et al., 2013). Furthermore, there is evidence that education can foster civic engagement and voter participation (Dee, 2004), which can increase environmental concern via the social cohesion pathway. Indeed, Meyer's (2015) observed positive effect of education on several pro-environmental behaviors suggest a higher concern with social welfare as one of the underlying mechanisms.

Summarizing the findings on the three types of pathways, this chapter illustrated the multidimensionality and context-dependency of the inequality-environment relationship. The social and most political pathways indicate that higher equality is beneficial for the environment, whereas the economic pathways suggest conflicting effects (see table 1 for an overview).

To gain insights into the overall net effect of these pathways, the next section turns to studies investigating the relationship empirically across countries and for various measures of environmental degradation.

3. Evidence of the inequality-environment relationship

Empirical studies investigating the inequality-environment relationship have been growing steadily since the 1990s. Starting with the pioneering study by Torras and Boyce (1998), who aimed to test Boyce's (1994) equality hypothesis, many papers followed to empirically investigate the relationship in various national contexts.

3.1 Research designs and methods

Most of the empirical studies discussed below use panel data to test the relationship within or across countries.

To measure inequality, the majority of analyses apply the Gini coefficient. Theoretically, a coefficient of 0 reflects perfect equality, a value of 1 means all income would be concentrated in one person. Empirically, national Gini coefficients lie in a range from 0.2 to 0.8, with a global pre-tax average of 0.67 (Chancel, 2022; WID, 2025). Income redistribution can significantly lower this value—in OECD countries, for instance, the Gini coefficient changes from 0.46 to 0.32 after taxes and transfers (OECD, 2025).

Environmental impacts are measured with a variety of indicators. A small, early group of studies investigates the role of local pollutants such as water or air pollution, as well as deforestation and biodiversity loss. Over time, more analyses started focusing on per-capita CO_2 emissions or footprints, now making up the majority of papers in this branch of literature. Some more recent studies further apply the ecological footprint, which measures the amount of biologically productive land and water required to sustain a person's or population's consumption patterns (Wackernagel & Lin, 2023). I will discuss each group of studies in turn.

All models control for GDP or GDP per capita. Other common control variables include urbanization rates or population density, share of manufacturing as % of GDP, energy consumption, measures for political rights and trade openness.

3.2 Local pollutants and biodiversity loss

In order to test Boyce's (1994) equality hypothesis, Torras and Boyce (1998) are the first to empirically examine the relationship between inequality and pollution. They analyze the effect on seven indicators of water and air pollution, including sulfur dioxide (SO_2), smoke, heavy particles, dissolved oxygen (O_2) and fecal coliform, in an international sample of 58–82 countries. Apart from using the Gini coefficient as a measure of income inequality, they also include indicators for political rights, literacy and civil liberties to test for the role of inequality in political power.

Their results show a clear difference between low- and high-income countries. In low-income countries, income inequality has a significant positive effect on most pollution indicators, confirming Boyce's equality hypothesis. In high-income countries, however, effects are either non-significant or negative. With respect to political rights and literacy, results generally show positive significant effects on nearly all pollution indicators, although the relationship is stronger in low-income countries. The authors conclude that the hypothesized role of power inequalities in environmental protection is confirmed, though its channel through income inequality is weaker than the direct channel via political rights, especially in high-income countries.

Other studies build on this initial analysis to test the effect of inequality on pollution across a variety of contexts (see table 2 for an overview).

Some studies support the hypothesized positive relationship. In an investigation of 113 Chinese cities, Wang et al. (2021) find that inequality correlates with increased smog and pollution levels. Persson et al. (2023) report that smoke rises with higher inequality across countries, while SO_2 depends on country context: in rich democracies, inequality is associated with higher SO_2, but in poor non-democracies, the Gini index is non-significant, suggesting other factors are more relevant. Similarly, Clement and Meunie (2010) confirm a positive effect on water pollution in developing countries, but a negative one in transitioning countries.

However, other studies do not support the inequality-pollution link. Kasuga and Takaya (2017) test it in Japanese cities and find that inequality was associated with worse air quality in the 1990s, but the effect disappeared in the 2000s. They find no significant effect for water pollution. Clement and Meunie (2010) likewise report no significant effects for SO_2 across developing and transitioning countries. They do, however, find a positive effect for the interaction between income inequality and power inequality, suggesting that income inequality may indirectly increase pollution via power relations, as posited in Boyce's equality hypothesis.

Several studies further investigate inequality's effects on biodiversity loss. Mikkelson et al. (2007) show that higher inequality exacerbates biodiversity loss across countries and US states, a finding confirmed by Holland et al. (2009) in a larger cross-country sample. Heerink et al. (2001) also find a positive relationship for deforestation in a cross-country analysis. Similarly, Ceddia (2019) reports that income, land and wealth inequality significantly increases agricultural expansion in 10 Latin American countries.

In sum, the evidence linking inequality to water and air pollution is mixed, with most results indicating either positive or non-existing associations depending on the geographical context. All evidence on biodiversity loss and its proximate drivers, however, points towards positive connection, confirming the detrimental effect of inequality on the environment.

Table 2: Empirical studies (local pollution and biodiversity loss)

Study	**Environmental indicators**	**Sample**	**Time span**	**Effect**
Torras and Boyce (1998)	Water pollution	58 countries	1977–1991	+ (LIC) *ns* (HIC)
Heerink et al. (2001)	Water pollution	33–46 countries	1985	+
Clement and Meunié (2010)	Water pollution	83 developing and transition countries	1988–2003	+ (LIC) – (MIC)
Kasuga and Takaya (2017)	Water pollution	Japanese cities	1990–2009	*ns*, but indirect effect
Torras and Boyce (1998)	Air pollution	19–42 countries	1977–1991	+ (LIC) *ns* (HIC)
Heerink et al. (2001)	Air pollution	31–38 countries	1985	*ns*
Clement and Meunié (2010)	Air pollution	83 developing and transition countries	1988–2003	*ns*

Study	Environmental indicators	Sample	Time span	Effect
Kasuga and Takaya (2017)	Air pollution	Japanese cities	1990–2012	+ in 1990s *ns* in 2000s
Persson et al. (2023)	Air pollution	35 countries	1971–1992	*ns* (LIC) + (HIC)
Heerink et al. (2001)	Deforestation	52 countries	1961–1986	+
Ceddia (2019)	Agricultural expansion	10 Latin American countries	1990–2010	+
Mikkelson et al. (2007)	Biodiversity loss	US states; 45 countries	1969–2004 (time lag)	+
Holland et al. (2009)	Biodiversity loss	US states, 50 countries	1975–2007 (time lag)	+

Description: Overview of studies investigating the effect of inequality on local pollution or biodiversity loss. '+' = positive effect (win-win); '–' = negative effect (trade-off); 'ns' = non-significant; LIC, MIC, HIC = low-, middle- and high-income countries.

3.3 CO_2 emissions

While earlier studies focus on local types of pollution, a larger body of literature investigating the link between inequality and CO_2 emissions has emerged from the 2010s on. Overall, the studies yield mixed findings, though some patterns can be observed—most noticeably with respect to countries' development level (table 3).

Among studies reporting exclusively positive associations between inequality and emissions, the majority analyze medium- or low-income contexts. Zhang and Zhao (2014) and Hao et al. (2016) confirm the positive relationship for China, noting substantial regional variation and particularly strong effects in the developed eastern provinces. Baloch et al. (2020) report that both poverty and income inequality increased CO_2 emissions in 40 African countries, a finding they further validate for consumption-based emissions in the BRICS countries (Baloch & Danish, 2022). Yang et al. (2022) corroborate this finding in a sample of 42 developing countries. In the US context, two studies lend support to the equality hypothesis, though with variation: Baek and Gweisah (2013) find positive effects in both the short and long run, while Liu et al. (2019) identify a reversal to negative effects in the long run.

Conversely, a few studies provide evidence for a negative association, indicating a trade-off relationship between climate change mitigation and inequality reduction. Heerink et al. (2001) and Wan et al. (2022) report this negative relationship using cross-sectional data of 64 and 217 countries, respectively. Ravallion et al. (2000) confirm this finding in 42 countries but note that the effect is weaker in high-income economies. They conclude that, in the long run, low inequality combined with high income growth may reduce emissions and eventually eliminate the inequality-emissions trade-off.

A third group of cross-country analyses provides evidence for different effect directions depending on the national income of the countries involved. Among these, Ehigiamusoe et al. (2022) examine the relationship in 70 countries, finding a positive effect of inequality in low-income countries, but a negative one in high-income countries. They also investigate the effect of poverty, which was related to higher CO_2 emissions in low-income countries. Chen et al. (2020) provide evidence for a positive inequality-emissions link in developing countries as well, but apart from a few negative effects in countries with very high per-capita emissions, inequality in most developed countries is found to be unrelated to emissions. Similarly, Wu and Xi (2020) observe that higher inequality reduces CO_2 emissions in high-income countries, but cannot confirm any significant association in low-income countries.

Interestingly, Grunewald et al. (2017) and Rojas-Vallejos and Lastuka (2020) come to the opposite conclusion; in a panel dataset of 158 and 68 countries, respectively, their findings indicate a trade-off between equality and emission reductions in low- and middle-income countries, and a win-win relationship in high-income countries.

Table 3: Empirical studies (CO2 emissions)

Study	**Environmental indicators**	**Sample**	**Time span**	**Effect**
Baek and Gweisah (2013)	CO_2 per capita	US states	1967–2008	+
Zhang and Zhao (2014)	CO_2	Chinese provinces	1995–2010	+

Study	Environmental indicators	Sample	Time span	Effect
Hao et al. (2016)	CO_2 per capita	Chinese provinces	1995–2012	+
Liu et al. (2019)	CO_2 per capita	US states	1997–2015	+(short term) – (long term)
Baloch et al. (2020)	CO_2 per capita	40 African countries	2010–2016	+
Khan and Yahong (2022)	CO_2 per capita	18 Asian developing countries	2006–2017	+
Baloch and Danish (2022)	Consumption-based CO_2	BRICS	1994–2018	+
Yang et al. (2022)	CO_2 per capita	42 developing countries	1984–2016	+
Grunewald et al. (2017)	CO_2 per capita	158 countries	1980–2007	– (LIC) + (HIC)
Rojas-Vallejos and Lastuka (2020)	CO_2 per capita	68 countries	1961–2010	– (LIC) + (HIC)
Chen et al. (2020)	CO_2 per capita	17 G20 countries	1988–2015	+ (LIC) – or *ns* (HIC)
Wu and Xi (2020)	CO_2 per capita	78 countries	1990–2017	*ns* (LIC) – (HIC)
Ehigiamusoe et al. (2022)	CO_2 per capita	70 countries	2000–2018	+ (MIC) – (HIC)
Hübler (2017)	CO_2 per capita	149 countries	1985–2012	*ns* or –
Jorgenson et al. (2017)	CO_2	US states	1997–2012	*ns* (Gini) + (income top 10%)
Kasuga and Takaya (2017)	CO_2	Japanese cities	1990–2012	*ns*
Wolde-Rufael and Idowu (2017)	CO_2 per capita	China, India	1971–2010	*ns*
Khan et al. (2018)	CO_2 per capita	Bangladesh, India, Pakistan	1980–2014	+ (Bangladesh) – (India / Pakistan)

Study	Environmental indicators	Sample	Time span	Effect
Mader (2018)	CO_2 per capita	28 countries, US states	2000–2014 1997–2014	*ns*
Baležentis et al. (2020)	Consumption-based GHG emissions p.c.	109 countries	1990–2014	Non-linear
Ravallion et al. (2000)	CO_2 per capita	42 countries	1975–1992	– (+ long term)
Heerink et al. (2001)	CO_2 per capita	64 countries	1985	–
Wan et al. (2022)	CO_2 per capita	217 countries	1960–2021	–

Description: Overview of studies investigating the effect of inequality on CO_2 emissions. '+' = positive effect (win-win); '–' = negative effect (trade-off); 'ns' = non-significant; LIC, MIC, HIC = low-, middle- and high-income countries, respectively.

Lastly, some studies report mixed or non-significant results. Khan et al. (2018) find a positive association in Bangladesh, but negative ones in Pakistan and India. Baležentis et al. (2020) identify a non-linear relationship in a sample of 109 countries, where the effect depends on the level of inequality. Jorgenson et al. (2017) find no effect of the Gini coefficient on US state-level emissions, but using the top 10 percent income share shows a positive association with CO_2 emissions, leading the authors to assume that this indicator is more accurate to capture the underlying Veblen and political economy effects.

Generally non-significant results, however, have been found for China and India (Wolde-Rufael & Idowu, 2017) and Japanese cities (Kasuga & Takaya, 2017), as well as in two cross-country analyses (Hübler, 2017; Mader, 2018).

Overall, the inequality-emissions link remains unclear despite the growing body of empirical analyses. Some studies indicate that reducing inequality may lead to emission reductions, mainly in low- and middle-income countries, but this result is not universally supported. Likewise, the negative (trade-off) association found for some high-income countries cannot be supported by all studies, either. In the CO_2 context, therefore, there is no evidence for a universal or linear relationship, but likely a strong impact of context-dependent factors and dynamics.

3.4 Ecological footprints

The last group of studies focuses on the general environmental impact of economic activity. Interestingly, these studies paint a somewhat clearer picture than those covering only CO_2-Emissions, although some areas of uncertainty remain (table 4).

Again, Boyce and colleagues conduct the first analysis using a composite measure of environmental degradation, the environmental stress indicator, which includes water and air pollution, energy use, waste production, and others (Boyce et al., 1999). Instead of using a single-equation model, they apply a recursive model to test the multiple hypothesized stages from income inequality over political inequality to environmental stress. Their results support the equality hypothesis across US states in the early 1990s—higher income and racial inequality predict higher power inequality, which in turn predicts less environmental policy, resulting in higher environmental stress. Taken together, these effects match the political pathway proposed by Boyce (1994).

Table 4: Empirical studies (composite environmental indicators)

Study	Environmental indicators	Sample	Time span	Effect
Boyce et al. (1999)	Environmental stress index	US states	1990s	+
Ekeocha (2021)	Ecological footprint	46 African countries	1996–2014	+
Khan and Yahong (2022) / Khan et al. (2022)	Ecological footprint	18 Asian developing countries	2006–2017	+
Uzar and Eyuboglu (2023)	Ecological footprint	US states	1965–2017	*+ (via cropland component)*

Study	Environmental indicators	Sample	Time span	Effect
Kazemzadeh et al. (2021)	Ecological footprint	25 countries	1970–2016	+ (lower quantiles) *ns* (higher quantiles)
Ehigiamusoe et al. (2022)	Ecological footprint	70 countries	2000–2018	+ (MIC) – (HIC)

Description: Overview of studies investigating the effect of inequality on environmental stress and ecological footprints. '+' = positive effect (win-win); '–' = negative effect (trade-off); 'ns' = non-significant; MIC, HIC = middle- and high-income countries.

While no follow-up study applies a recursive model, some more recent papers test the inequality-environment relationship using the ecological footprint (EF) as another composite indicator of environmental degradation.

Uzar & Eyuboglu (2023) examine the impact of inequality on EF in the United States as well, finding a positive effect over the entire period of 1965–2017. However, an investigation of the components of the EF reveals that the positive association is mainly related to cropland use, not fishing grounds or the carbon footprint. In contrast, Khan and Yahong (2022) find that inequality increases both CO_2 emissions and EF among Asian developing countries. They also find the reverse effect of environmental degradation on increased income inequality, suggesting a reinforcing feedback loop between inequality and deteriorating environmental quality. Khan et al. (2022) extend the analysis by including the role of poverty, which is also found to increase ecological footprints. Likewise, the positive effect of inequality on EF and CO_2 emissions is confirmed by Ekeocha (2021) in a sample of 46 African countries.

Finally, two studies yield somewhat mixed results. Kazemzadeh et al. (2022) find that inequality results in higher EF across 25 countries, but the effect turns non-significant in higher quantiles. Similarly, Ehigiamusoe et al. (2022) investigate a sample of 70 countries, finding that inequality increases EF, but only in middle-income countries. In high-income countries, on the other hand, the effect turns negative.

Therefore, the evidence suggest that for environmental footprints, too, a country's national income level seems to be a relevant factor in the inequality-environment relationship.

3.5 Synthesizing the findings

As shown in this section, the link between inequality and various measures of environmental degradation is everything but clear, depending heavily on context, time, and type of environmental indicator. Despite the large number of contradictory findings and mixed results, though, some patterns can be observed across studies.

First, results are less diverse in the case of local pollutants, biodiversity loss and ecological footprints compared to CO_2 emissions. Apart from the negative effect in Ehigiamusoe et al. (2022) for high-income countries, all other studies in these groups find either positive or non-significant associations. These results suggest that in cases where the effect of environmental degradation is directly perceived, such as in the case of local pollution, inequality plays a larger role in preventing mitigation efforts. Several authors have linked this finding to a strong political pathway: Powerful individuals can shield themselves from the effects of local pollutants, leaving less powerful groups to bear the burden. By contrast, in more equal settings, where the interests of all are considered, general improvements in environmental quality are more easily achieved (Berthe & Elie, 2015; Clement & Meunie, 2010; Uzar & Eyuboglu, 2023).

Second, inequality is more frequently associated with increased environmental degradation in low- and middle-income countries, whereas the reverse pattern is more commonly observed in high-income countries. The underlying pathways therefore seem to hold different weight depending on the national income or development level of a country. Some authors attribute this finding to the influence of institutions and regulations, as well as the role of absolute poverty, which tends to exacerbate environmental pressures as low-income populations often rely on resource-intensive means of subsistence (Barrett et al., 2011). Indeed, three empirical studies in the current sample (Baloch et al., 2020; Ehigiamusoe et al., 2022; Khan et al., 2022) test the role of poverty as an underlying mechanism in the inequality-environment link, unanimously confirming the detrimental impact of poverty on CO_2 emissions and ecological footprints.

Third, in terms of study design and interpretation, surprisingly little attention has been paid to social and cultural factors. The majority of studies only discusses the three dominant pathways—the role of political power and influence, the marginal propensity to emit, and the Veblen effect – and use them to interpret their results. Understanding the social effects of inequality and how they lead to sustainable lifestyles or increased environmental protection might shed some light on the persistence of mixed findings in the empirical literature.

Fourth, very few studies in the current sample explicitly test the underlying pathways, focusing only on the significance and effect signs of the general inequality-environment link. Among those studies that do investigate underlying mechanisms, most focus on the political pathway. As discussed above, Torras and Boyce (1998) and Boyce et al. (1999) find support for Boyce's equality hypothesis in low-income countries and the US. Additional studies confirm the importance of political power and rights for local pollution (Clement & Meunie; Kasuga & Takaya, 2017; Persson et al., 2023) and ecological footprints (Ekeocha, 2021). In contrast, research explicitly testing mechanisms for CO_2 emissions remains more limited. Two studies (Baloch & Danish, 2022; Jorgenson et al., 2017) employ the income share of the top 10 percent as an alternative measure of inequality, arguing that it more accurately reflects political economy dynamics and Veblen effects. Both find this measure to be positively associated with CO_2 emissions. In addition, Yang et al. (2022) show that institutional quality moderates the positive link between inequality and emissions, thereby indirectly supporting Boyce's hypothesis that the limited political influence of poorer groups contributes to environmental degradation.

Beyond that, only one study in the current sample, Rojas-Vallejos and Lastuka (2020), tests the interaction between multiple pathways. They observe that the consumption effect dominates for most income levels, but its magnitude diminishes as income rises, with the political effect dominating at higher-income levels—explaining their somewhat divergent finding of a positive effect in high-income and a negative one in low-income countries.

All in all, this review emphasizes the importance of further empirical research into the mechanisms—particularly the economic and social pathways—underpinning the inequality-environment relationship, rather than focusing solely on the aggregate link.

4. The way forward

Overall, the empirical evidence confirms the complex and context-dependent nature of the inequality-environment relationship. Although a variety of underlying political, economic and social pathways has been proposed and investigated, they alone do not seem sufficient to explain the mixed findings. To further advance the understanding of this topic, future research is needed to

a) examine the dynamic interplay between the different pathways, b) understand which societal conditions activate individual pathways to different degrees, and c) investigate other mechanisms besides the three pathways dominating the literature.

The question of whether income redistribution measures lead to beneficial outcomes for the environment or whether they result in a trade-off with environmental protection cannot be answered with certainty. Still, the literature has provided some suggestions.

For lower-income economies, where inequality poses a serious humanitarian challenge due to its association with absolute poverty, evidence indicates that inequality reductions can directly or indirectly lead to better environmental quality. Consequently, policymakers can use a win-win strategy to achieve both social equity and environmental protection to a certain degree.

In higher-income countries, the opposite seems to be the case, suggesting that policymakers need to find strategies that specifically combat social inequality without exacerbating environmental destruction. Given that these countries are responsible for the majority of resource use and greenhouse gas emissions, it is crucial to consider the environmental consequences of inequality reductions.

When it comes to designing these policies, the literature discussed in this article can help identify important features, as well as measures to avoid. On the one hand, the findings regarding the diminishing marginal propensity to emit point towards the danger of using progressive taxation to exclusively boost households' disposable income in lower- and especially middle-income brackets. Instead, using a share of the revenues for environmental protection, sustainable infrastructure and clean technologies could contribute to weakening the trade-off between inequality and environmental degradation. In addition, a variety of public investments can increase well-being without relying on economic gains and resource use—education, healthcare, social protection and community services, accessibility, or culture and arts can significantly curb welfare for the entire population.

On the other hand, policymakers could aim to strengthen the pathways leading from higher equality to better environmental outcomes. By making use of the social pathway, for instance, investments in procedural fairness, public goods and civic infrastructure could be used to restore a sense of solidarity and trust, which can increase support for sustainable policies as well.

Taken together, this chapter has shown that global income disparities and environmental degradation are not separate crises, but that the path to sustainable development is shaped by political, economic and social consequences of inequality. Whether this path is enhanced or impeded by narrowing the income gap depends on a variety of factors. Some of these factors are known and explored, others are yet to be identified.

The chapter has presented a synthesis of existing research on the links between inequality and the environment. Although the literature on this topic is expanding, many of the underlying dynamics remain unclear. Further investigation is needed to develop more robust policy guidance on managing trade-offs and enhancing synergies between inequality reduction and environmental protection. Only by designing policies that deliberately align distributional fairness with environmental protection can we achieve equity, well-being, and a livable planet for all.

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