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Abstract: Inequality has important consequences for the extent of pollution and natural resource depletion as well as for the distribution of the costs and benefits from environmental degradation. Inequalities in the distribution of purchasing power operate through the market, and inequalities in the distribution of political power operate through governance institutions, often with mutually reinforcing effects.

Keywords: *Environmental justice; environmental inequality; income distribution; political power; pollution*

Inequalities of wealth and power are implicated in both the distribution of environmental costs and their total magnitude. Activities that release pollutants and deplete natural resources result in winners as well as losers. Some benefit (or at least think they do) from these activities; otherwise, they would not occur. Others bear net costs, suffering environmental harms that outweigh whatever benefits, if any, they obtain. The ability of winners to reap benefits for themselves while imposing costs on others is a function of their relative economic and political power.

Purchasing power underpins effective demand in markets: willingness to pay exists if, and only if, preferences are backed by the ability to pay. Every dollar counts equally in the market, so those with more dollars wield more "votes." Willingness and ability to pay likewise underpin the techniques used in cost-benefit analysis to assign monetary values to non-market goods, such as clean air, clean water, and a stable climate. Insofar as environmental policy decisions are dictated by the efficiency criterion of neoclassical economics – weighing benefits against costs to determine the "optimal" levels of pollution and natural resource depletion – those with more purchasing power again wield more votes.

Political power reinforces and magnifies the effects of purchasing power. When those who are harmed by environmental degradation lack political influence – for example, when they are unable to vote or to lobby elected officials – the costs and benefits that accrue to them carry less weight in social decisions. In the extreme case where those who are harmed have no political power whatsoever, decision makers can simply ignore the costs imposed upon them. An example is the U.S. Environmental Protection Agency's 2017 decision, in analyzing the costs and benefits of curbing emissions from electric power plants, to assign zero value to climate damages incurred outside the United States, a stance that put an official imprimatur on the maxim "out of sight, out of mind."

Purchasing power and political power are mutually reinforcing: those with more wealth typically wield more political influence, and vice versa. The joint effect of these two dimensions of power can be characterized by a power-weighted social decision rule (PWSDR), in which environmental outcomes maximize net benefits weighted by the political influence of those to whom they accrue (Boyce 1994).

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Two predictions follow. The first is that the distribution of environmental costs will not be random. Instead, risks and harm are likely to be inflicted disproportionately on those with less wealth and power. The second is that wider inequalities of wealth and power will result in higher levels of environmental degradation overall. Both propositions have been supported in recent years by a growing body of empirical research.

Inequality and the distribution of environmental costs

The logic behind the first prediction is straightforward. Environmental quality generally is not a pure public good that when available to one is equally available to all. Rather it is an impure public good; in George Orwell's memorable phrase, "Some are more equal than others." Likewise, environmental degradation is an impure "public bad". Once we recognize that environmental costs are not impersonal misfortunes that fall indiscriminately across the population, we can expect to see them imposed disproportionately on individuals, communities, and nations that lack the economic and political power to fend them off.

Pollution has particularly adverse effects on children, leading to higher infant mortality, lower birthweights, a higher incidence of neurodevelopmental disabilities, more frequent and severe asthma, and lower school test scores (e.g., Currie 2011). Among adults, pollution exposure leads to higher morbidity and mortality and to more lost work-days due to illness and caring for sick children (Boyce *et al.* 2016). These impacts exacerbate the vulnerabilities that make some communities more susceptible to environmental harm in the first place.

In the United States, environmental justice researchers have documented systematic disparities in exposure to pollution and other hazards along the social fault lines of race, ethnicity, and income. A pioneering study by sociologist Robert Bullard (1983) showed that hazardous waste disposal sites in Houston, Texas, were sited primarily in African-American neighborhoods. Subsequent research identified similar patterns across the country. Race and ethnicity often are stronger than income as predictors of proximity to hazards and pollution exposure, testifying to their salience in the distribution of political power (Zwickl *et al.* 2014). Investigations of the causal linkages that underlie these spatial correlations have found clear evidence of disparities in the initial siting decisions, as well as some evidence of post-siting demographic shifts (Mohai and Saha 2015). In Delhi, India, where residents breathe some the world's dirtiest air, researchers similarly have found that the poor generally live in more polluted neighborhoods and spend more time working outdoors where pollution exposures are most intense (Garg 2011; Foster and Kumar 2011).

Inequalities based on gender often translate into disparate environmental harms inflicted on women. A prime example is the disproportionate exposure of women to indoor air pollution in south Asia and sub-Saharan Africa, where solid fuels such as wood, crop residues, and dung are widely used for cooking (Agarwal 2010; Okello *et al.* 2018). The World Health Organization estimates that this pollution is responsible for more 3.8 million deaths per year, mostly of women and children (WHO 2021).

Environmental inequalities also extend across national borders. In an infamous 1992 memorandum, the World Bank's chief economist argued that "the economic logic of dumping a load of toxic waste in the lowest-wage country is impeccable." The statement was said to have been meant provocatively, but real-world practice often follows this script. Each year millions of tons of toxic

waste are shipped from the industrialized nations of the global North to lower-income countries in Africa, Asia, and Latin America. The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, an international environmental accord that went into effect in the same year as the World Bank memo, has proven inadequate to prevent the large-scale shifting of environmental costs onto some of the world's poorest people.

Inequality and the magnitude of environmental degradation

The second prediction following from the PWSDR is that wider inequalities in the distribution of wealth and power will tend to result in more environmental degradation overall. The concentration of environmental harms at the lower end of wealth-and-power spectrum implies that with wider inequality, such costs carry less weight on both the economic scales of markets and the political scales of policy makers. Moreover, the benefits from environmentally degrading activities tend to be concentrated at the upper end of the wealth-and-power spectrum. Externalization of environmental costs yields higher profits for shareholders, higher compensation for the firm's executives, and sometimes lower prices for its consumers. Shareholders and executives typically occupy high rungs on the spectrum, and benefits passed through to consumers accrue disproportionately to those with the most purchasing power. With wider inequality, all these benefits carry greater weight both in markets and in the eyes of policy makers. In other words, both the cost side and the benefit side of the scales are tipped in favor of more pollution and resource depletion.

From the perspective of methodological individualism – the foundational perspective of neoclassical economics – in which social outcomes are reduced to the sum of individual preferences weighted by ability to pay, wider income inequality might be expected to lead to less environmental degradation rather than more, insofar as the share of household expenditure devoted to energy and other resource-intensive goods tends to decline as incomes rise (Boyce 2007). From the perspective of political economy, however, interrelationships among people matter as well as individual preferences. Economies, like ecosystems, are not merely the sum of their individual parts: they are societal webs of interactions and interdependence.

Many affluent people prefer to live in a clean and safe environment. But because environmental quality is an impure public good – neither entirely private nor equally available or unavailable to all – they can reside in less contaminated locations. They also can afford to shield themselves from the impacts of pollution by buying air purifiers and drinking bottled water. In the event of pollution-related illness they can obtain better medical care. And they can deploy their political leverage to oppose the siting of environmental hazards in their neighborhoods, and to demand more stringent regulation of hazards they cannot avoid. The wealthy and powerful cannot escape the consequences of environmental degradation altogether, but in their private calculations they weigh a relatively small share of the costs against a relatively large share of the benefits.

A number of empirical investigations have supported the prediction that wider inequality will result in more environmental degradation. When cross-national data on environmental variables first became available in the 1990s, early studies on how pollution varies with per capita income found that in many cases there was evidence of an inverted U-shaped relationship that came to be known as the environmental Kuznets curve (Grossman and Krueger 1995). When measures of economic and political inequality were added to the analysis, it was found that higher levels or inequality are associated with more pollution, and that the apparent relationship between pollution and per capita income often weakens or disappears once the impact of inequality is taken into account (Torras and

Boyce 1998; Farzin and Bond 2006). Similarly, researchers have found that biodiversity losses are more severe in countries where income is more unequally distributed (Mikkelson *et al.* 2007; Holland *et al.* 2010).

In general, evidence for the adverse environmental effects of inequality is strongest for harms with immediate and visible impacts on human health, as one might expect (Cushing *et al.* 2015). For impacts such as climate destabilization that are more widely dispersed across time and space, the evidence is less conclusive. Nevertheless, several recent studies have found an inverse relationship between inequality and carbon dioxide emissions (Knight *et al.* 2017; McGee and Greiner 2018). One explanation may be that fossil fuel combustion releases hazardous "co-pollutants" with immediate and localized effects, alongside carbon dioxide, and that this helps to spur public demand for emissions reductions.

Within the United States, researchers have found evidence that states with higher levels of inequality tend to have more severe environmental degradation. More unequal distribution of power at the state level is associated with weaker environmental policies, more environmental stress, and worse public health outcomes (Boyce *et al.* 1999). Inter-state differences in inequality have also been found to be correlated with carbon dioxide emissions (Jorgenson *et al.* 2017). Within China, cross-sectional analysis similarly has found that regions with higher income inequality tend to suffer worse air pollution (Wang *et al.* 2021).

Inequality can also foster environmental degradation by eroding concern for the well-being of future generations. For the rulers in highly unequal societies, the risk that their political power one day come to an end encourages a cut-and-run approach to natural resource extraction, as exemplified in the rapacious deforestation experienced in Southeast Asia under the dictatorships of Ferdinand Marcos in the Philippines and Suharto in Indonesia. At the same time, for the poorest people the demands of day-to-day survival may override worries about tomorrow. The latter effect can also be seen in settings with less extreme inequality. After the French government's 2018 announcement of a fuel tax increase to combat climate change, Yellow Vest protestors took to the streets, explaining that while President Macron worried about the end of the world, "we worry about the end of the month" (Mehleb *et al.* 2021).

Combining these two environmental predictions, the first on the distribution of environmental costs and the second on their magnitude, we can expect that locations with wider environmental disparities will tend to have more environmental degradation overall. In line with this, researchers in the United States have found that all population groups suffer more severe air pollution and higher cancer risks in metropolitan areas that have a higher degree of residential segregation and wider racial and ethnic disparities in pollution exposure (Morello-Frosch and Jesdale 2006; Ash *et al.* 2013).

In sum, then, our relationships with the environment are closely intertwined with our relationships with each other. Environmental degradation is not simply a matter of humans harming other species and ecosystems; it is also a matter of some people harming other people. To rebalance our relationships with nature, it will be necessary to rebalance our relationships among ourselves.

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