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Chapter · May 2022

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Inequality, Emissions, and Human Well-Being

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For
Handbook of Inequality and the Environment
Edward Elgar Publishing

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Abstract

Development strategies generally align with the assumption that economic growth and the use of fossil fuels, despite the resulting emissions, lead to improvements in human well-being. This logic suggests that reductions in emissions could harm human well-being. In addition to raising sustainability concerns, one component left out of such approaches is the role of inequality. This chapter highlights the importance of incorporating inequality into studies of emissions and human well-being. We review the relevant sociological literature and demonstrate how well-being, emissions, and the relationship between the two are shaped by inequality. We also summarize how the nature of these relationships vary by context and scale. We briefly outline two approaches to addressing climate change to protect the planet and promote human well-being: global climate negotiations and social movements for climate justice. We conclude by discussing directions forward for research and policy.

Inequality, Emissions, and Human Well-Being

"The alarm bells are deafening, and the evidence is irrefutable: greenhouse-gas emissions from fossil-fuel burning and deforestation are choking our planet and putting billions of people at immediate risk."
- Anthony Gutierrez United Nations Secretary-General, August 2021

The scale and magnitude of the climate crisis have intensified in recent decades. In August 2021, the United Nations Secretary-General described the findings for the 6th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which collates the latest scientific evidence on the climate crisis, as a "code red for humanity" (United Nations, 2021). This latest authoritative assessment on the planet's future confirms emphatically that human-induced warming is driven primarily by the burning of fossil fuels and greenhouse gas emissions and affects every region on earth, with many of the changes becoming irreversible (Masson-Delmotte et al., 2021). The urgency to address the climate crisis is growing. The problem is already compromising human well-being (Masson-Delmotte et al., 2021), risks undermining broader societal functioning (Department of Defense, 2021), and threatens the long-term survival of our species.

Addressing global climate change requires substantially reducing greenhouse gas (GHG) emissions, especially carbon dioxide (CO_2) emissions. This is challenging partly because development strategies tend to follow the assumption that economic growth and the use of natural resources, despite the resultant emissions and other waste products, will lead to improvements in human well-being. This logic suggests that GHG emissions, including CO_2 emissions, are a necessary byproduct of improvements in human well-being and overall development, and that reductions in emissions could reverse these benefits. This logic has set humanity on a dangerously unsustainable trajectory.

A major component left out of such development assumptions is the role of inequality. Our social world is characterized by inequality, and social science research demonstrates that patterns of climate change-causing greenhouse gas emissions and many human well-being outcomes reflect this inequality. For example, wealthier countries and individuals tend to generate higher emissions and have

longer life expectancies. There are, however, exceptions to these broad patterns at individual, nation-state, and international scales. There are also situations when inequalities exacerbate outcomes. Incorporating considerations of inequality—both between and within countries—illuminates how the development relationship between emissions and well-being varies by context and scale. It also makes clear that while climate change puts billions of people at risk and affects every region on earth, the responsibility for causing climate change and the human impacts are highly unequal. While reducing emissions is a global priority, focusing on improving well-being remains a priority in other contexts, and any strategy to address climate change needs to take inequalities and context into account.

The research summarized in this chapter demonstrates the need to more adequately consider various forms of inequality in the relationship between emissions and well-being, because we know prior emissions-based strategies for improving human well-being are unsustainable and inequitable. Research shows inequality can act as a driver of emissions and shape unequal well-being outcomes, and it can also moderate the relationship between emissions and human well-being. This chapter also reviews empirical evidence that suggests more sustainable possibilities moving forward, such as reducing inequality as a sustainability strategy, or focusing on factors that directly improve human well-being, rather than focusing solely on economic growth.

Foundational Work on Sustainable Development and the Relationship between Human Well-being and the Environment

Governments at all levels, in conjunction with other entities, are tasked with creating a good quality of life for their people. Sustainable development strategies involve reducing the environmental impacts of creating human well-being (Dietz & Jorgenson, 2014). Globally, the United Nations sustainable development goals (SDGs) capture this relationship between human well-being and the environment, with ten of the SDGs focusing on human well-being (goals 1-5, 8-10, and 16), three focusing on the environment (13-15), and three focusing on their intersection (goals 6, 7, and 12).

Research in the sociology of sustainable development has explored this relationship for years. A foundational paper, published close to fifty years ago, showed that in the context of wealthy nations, energy use had decoupled from quality of life (Mazur & Rosa, 1974) sparking ongoing research that examines relationships between economic growth, energy use, emissions, and population well-being. More recent research conceptualizes this relationship as the ecological intensity of well-being (EIWB) (Dietz et al., 2009, 2012; Jorgenson & Dietz, 2015; Knight & Rosa, 2011). Others look at the decoupling of improvements in human well-being from energy use and emissions (Lamb et al., 2014; Roberts et al., 2020; Steinberger & Roberts, 2010; Steinberger et al., 2012).

Specifically in the case of emissions, research on the carbon intensity of well-being (CIWB), a measure initially used by Jorgenson (2014) that builds on the EIWB concept, focuses on the relationship between carbon emissions and well-being. Operationalized as a ratio variable with CO_2 emissions per capita divided by average life expectancy, variations on these measures can be used, such as production or consumption-based carbon emissions or other measures of well-being. A strength of this measure is its applicability across scales and comparability over time. The CIWB is used in prior analyses at the global scale, with countries as units of analysis, or at smaller scales such as analyses of U.S. states. We discuss work on the CIWB in more detail below.

Trends in Economic Inequality

Income inequality within and between nations is a persistent feature of the world economy. Over the last two centuries, the top 10 percent of earners have consistently accrued 50-60 percent of the worldwide income generated annually (Chancel & Piketty, 2021). In the more recent period, the share of global income going to the very wealthiest in the world has increased. For example, globally, approximately 20 percent of the pre-tax national income share went to the 1 percent of earners in 2019, up from 17 percent in 1980. Conversely, the pre-tax national income share accrued by the bottom 50 percent of the global income distribution was just 8.5 percent in 2019, up from 6 percent in 1980

(Chancel & Piketty, 2021). In other words, there has been a slight decrease in poverty rates globally in recent decades while the share of the real income of the top earners has also increased.

If we focus on wealth instead of income as a measure of economic inequality, the scale of the issue becomes even starker. The poorest half of the global population owns just 2 percent of the total wealth in the world. By contrast, the richest 10% of the global population own 76% of all wealth (Chancel et al., 2022). The rise in income shares of the top 1 percent of earners is also reflected in the increase of within-country inequality for many high-income nations—where many of the world's wealthiest individuals currently reside. For example, in the United States, the share of income going to the top 1 percent of earners almost doubled between 1980 and 2019 (Fisher-Post, 2020).

Inequality between Nations and Human Well-being

As a result of this uneven distribution of income and wealth, there are substantial differences in living standards and well-being across and within nations. Vast swathes of the world's population do not have adequate access to basic sanitation, nutrition, water or health care, despite several decades of national and international efforts to address extreme poverty. The scale of this inequality in living standards is captured by the range in the projected life expectancy at birth between nations. The average life expectancy for high-income countries is 81 years, versus 64 years for those living in low-income nations (World Bank, 2022). It is important to note that global inequality in health and other well-being outcomes that contribute to life expectancy is perpetuated, in part, by exploitative economic trade relations that suppress resource consumption among lower income nations (e.g., Jorgenson & Clark, 2009, 2011; Rice, 2007, 2008; for a review see Givens et al., 2019 or Givens & Huang, 2021).

Inequality within Nations and Human Well-being

Interdisciplinary research demonstrates that inequality within nation-states also directly undermines human well-being in several ways. Further, the recent increase in inequality is identified as posing a threat to societal functioning in many national contexts (Piketty, 2014a, 2014b). Research

reveals a link between higher rates of inequality and worsened population health outcomes (e.g., Anderson et al., 2019; Pickett & Wilkinson, 2015), including reduced life expectancy (e.g., Chetty et al., 2016; Hill & Jorgenson, 2018; Kelly et al., 2021; Thombs et al., 2020).

Specifically, evidence suggests that the relative deprivation in living standards associated with domestic inequality is associated with lower social-emotional outcomes, maladaptive coping mechanisms, and lower subjective well-being, thereby undermining population health outcomes (Oishi et al., 2011; Payne et al., 2017; Pickett and Wilkinson, 2010a). In the Western context, these social dynamics have contributed to the rise of a phenomenon known as "deaths of despair," resulting from alcohol abuse, suicide, drug use, and other risky behaviors (Case & Deaton 2020). Income inequality is also associated with lower social trust and cohesion (Truesdale & Jencks, 2016) particularly among disadvantaged communities (Pickett & Wilkinson, 2010b; Rözer & Volker, 2016). This trend contributes to community dysfunction (Daly et al., 2001) and inhibits communities' propensity for collective action for social and environmental reform (Cushing et al., 2015; Ostrom, 2008).

Inequality as a Driver of Emissions

In addition to undermining human well-being, social science research identifies income inequality as a driver of environmental stress (e.g., Boyce, 1994; Jorgenson, 2015; Jorgenson et al., 2017, 2019; Piketty, 2014a, 2014b; Rosa & Dietz, 2012). Income inequality is associated with higher production-based and consumption-based carbon emissions among high-income nations (Jorgenson et al., 2017; Knight et al., 2017) and in lower income nations (Hubacek et al., 2017). Similarly, but at the subnational scale, Jorgenson et al. (2015) find a positive association between residential carbon emissions and income inequality at the U.S. state level.

Political economy scholarship provides insights into the ways that income inequality may increase emissions. For example, research demonstrates that those with economic power, such as a high concentration of income, often use their influence in the political sphere to protect their interests

(Boyce, 1994; Dietz et al., 2020; Mann, 2012) which often includes lobbying against environmental regulations including emissions reductions (Brulle, 2021; Farrell, 2016). On a more systemic scale, Piketty (2014a, 2014b) delineates the capitalist dynamics driving the global economic system toward more extreme inequality and wealth concentration, while Foster, Clark, and York (2010, 2011; see also Foster, 1999) identify these capitalist dynamics, i.e., the treadmill of capitalist accumulation, as the driver of the ecological crisis.

Those studying patterns of consumption provide further insight into the nature of the association between inequality and emissions. The lifestyles of the rich are highly resource-intensive (Davison, 2016) as the wealthy tend to compete for status through overconsumption (Ehrhardt-Martinez et al., 2015; Frank, 2020; Schor, 1998). Furthermore, larger segments of the population consume mass-produced, nondurable, and highly polluting goods (Pickett & Wilkinson 2010a) to emulate the lifestyles of the wealthy on smaller budgets.

Beginning to Consider Inequalities and the Relationship between Emissions and Well-being

The vast disparities in access to resources and living standards are reflected in global greenhouse gas emissions. Higher-income and wealth generally leads to higher energy consumption and carbon emissions. A small number of high-income nations are responsible for most cumulative greenhouse gas emissions (United Nations Environment Programme, 2020). For example, despite making up less than 5 percent of the world's population, the United States has contributed more to the global burden of emissions than any other nation over the past century (Kelly et al., 2021).

Similarly, analyses of energy use by income group at the global level illustrate that current levels of resource extraction and associated pollution are driven by a relatively small proportion of the global population. Notably, the top 10 percent of earners in the world are responsible for about 34 percent of household-related direct and indirect (i.e., supply chain-related) carbon emissions (Hubacek et al., 2017). In an analysis of energy embodied in goods and services across income classes in 86 countries,

Oswald et al. (2020) find that the consumption share of the bottom half of the population is less than what the top 5 percent consume. Meeting global emissions targets will require massively curbing the emissions associated with the world's richest. Addressing this issue remains a considerable but critical challenge. The top 1 percent of earners are projected to have per capita consumption emissions in 2030 that are 30 times higher than levels that would be compatible with the 1.5^{o}C goal of the Paris Agreement (Gore et al., 2021). Meanwhile, many people on the planet do not contribute to the production of the disproportionate amount of emissions, nor do they have their basic needs met.

While inequality often refers to income inequality, there are other types of inequality to consider. For example, research that uses the CIWB concept tends to look at various types of inequalities at various scales as drivers. By comparing the CIWB across political entities, research shows how different types of inequalities related to national levels of economic development (Jorgenson, 2014; Jorgenson & Givens, 2015; Greiner & McGee, 2020), domestic income inequality (Jorgenson, 2015), urbanization (Givens, 2015; Greiner et al., 2020; McGee et al., 2017), technology (Feng & Yuan, 2016), global trade (Givens, 2018), world society integration (Givens, 2017), economic performance within a region (Sweidan, 2018), gender (Ergas et al., 2021; Jorgenson et al., 2018) and race (Briscoe et al., 2021) matter in different contexts for the relationship between emissions and population well-being.

Key findings from Recent Global Research

Research highlights global inequality in terms of the relationship between emissions and well-being. Although longer life expectancies tend to be associated with higher emissions, some countries achieve high levels of well-being for their populations while placing comparatively less stress on the environment than other countries with similar levels of well-being but much higher levels of emissions (Lamb et al., 2014). Steinberger and Roberts (2010) build on the foundational work of Mazur and Rosa (1974) with a longitudinal analysis of decoupling between emissions and several indicators of human development; they find greater decoupling over time in more developed countries. They explain their

findings indicate that if resources were distributed more equitably, higher levels of development could be achieved for more people without increasing overall emissions. In another set of analyses, Steinberger et al. (2012, p. 3) explore the importance of trade and the development paths that nations choose by examining both production and consumption-based emissions; in addition to these forms of global inequality, i.e., trade and consumption, they find higher per capita incomes "make lower carbon profiles difficult." This also points to the need to address the emissions of high income countries, which may be facilitated by the finding that the relationship between emissions and well-being can change, or decouple, over time (Steinberger et al., 2020). It also suggests that addressing disproportionality in emissions may be a sustainability strategy moving forward (Grant et al., 2020). In middle-income countries, Lamb (2016) finds that providing infrastructure and addressing health outcomes can be achieved with low emissions costs, and there is a potential for countries that do not have high incomes or emissions, but do have comparatively high well-being, the so-called "Goldemberg's Corner" countries (Steinberger & Roberts, 2010), to not follow a path of carbon intensive development, instead pursuing low-emissions pathways, while still providing high levels of well-being to their populations.

In addition to examining global income inequalities between countries, research demonstrates that countries' levels of domestic income inequality also matter for the relationship between emissions and population well-being. One specific emissions related issue is air pollution in the form of fine particulate matter ($PM_{2.5}$), which largely comes from the burning of fossil fuels. $PM_{2.5}$ also poses serious health risks and thus directly impacts well-being (Brunekreef & Holgate, 2002; Franklin et al., 2007; Fuller et al., 2022). In a cross-national longitudinal analysis, Jorgenson et al. (2021) find that domestic income inequality *amplifies* the relationship between this form of emissions and well-being. The negative effect of $PM_{2.5}$ on life expectancy is worse in countries with higher income inequality. The authors draw upon theoretical principles of power, proximity, and physiology to help explain this finding (Jorgenson et al., 2020b, 2021). In terms of power, inequality is associated with political power

concentration for the wealthy, which can lead to lack of enforcement of environmental and health regulations and deregulation and reductions in funding of social services. Proximity draws attention to how more affluent groups can insulate themselves from environmental and health harms while poorer people face increased exposure. Physiology draws attention to the increased stress experienced by those facing relative deprivation and how structural disadvantage negatively affects people's physiological conditions (Jorgenson et al., 2020b, 2021).

Between-country and within-country economic inequalities are key to consider. If some countries are able to decouple well-being from emissions, then research should explore the various contexts and other circumstances that inhibit this, such as high incomes or high levels of domestic income inequality (Jorgenson and Clark, 2012; Jorgenson et al., 2015, 2016, 2021; Steinberger & Roberts, 2010). Along these lines, McGee and Greiner (2018) examine decoupling between economic growth and carbon emissions and find rising income inequality over time and specifically a larger share of income going to the top 20% increases the correlation between economic growth and emissions in Global North nations. Thombs (2021) also examines the relationship between nations' growth and emissions and finds greater political equality moderates this relationship.

Cross-National Research on CIWB

Cross-national analyses of the CIWB draw attention to the importance of inequality, including global disparities in income and development (Jorgenson, 2014; Jorgenson & Givens, 2015), and national-level factors such as domestic income inequality (Jorgenson, 2015). In terms of global inequalities and change over time, economic growth decreases the CIWB in some groups of less-developed countries in Africa, but this relationship becomes less strong over time. In groups of countries in Asia and South and Central America, economic growth increases the CIWB, and this relationship has intensified over time. In North America, Europe, and Oceania economic growth has continued to increase the CIWB for decades at a steady rate (Jorgenson, 2014). Some of this research analyzes

production-based carbon emissions, where emissions are allocated to the country where they are produced, as opposed to consumption-based emissions that allocate emissions based on where the emissions, embodied in the international trade of products, are consumed. A CIWB study that examines consumption-based carbon emissions has relatively similar findings but also highlights that the analysis of consumption-based emissions demonstrates how the effect of economic development is much less sustainable in wealthier countries within the Global North (Jorgenson & Givens, 2015).

In terms of domestic income inequality, research finds that higher inequality is associated with higher CIWB, and the relationship increases through time for both Global North and Global South nations (Jorgenson, 2015). This finding points to the policy implication that reducing domestic income inequality globally could be a multi-dividend strategy for enhanced sustainability (Jorgenson, 2015). Urbanization, which is closely linked at the global scale with development, is associated with higher CIWB, yet when more and less developed countries are examined separately, along with urban slum prevalence, the findings are more nuanced. Urban slum prevalence is associated with lower CIWB, and the results are especially robust in lower-income countries, although greater population access to water and sanitation is also associated with lower CIWB (Givens, 2015; see also McGee et al., 2017).

Global integration and relationships of different groups of nations also matter. Building on research that compares production-based emissions to consumption-based emissions, an analysis of global trade demonstrates that while trade is associated with a decrease in the CIWB of lower income nations and a null relationship in higher-income nations, the relationship between trade and CIWB is becoming less sustainable over time for less developed countries, whereas more developed countries are increasingly able to use trade to decrease their CIWB (Givens, 2018). This research draws upon the theory of ecologically unequal exchange to emphasize how trade relationships allow countries in a more advantageous position to gain disproportionate access to resources in less developed countries, which in turn may experience greater environmental degradation and suppressed population well-being,

displacing the environmental costs of consumption in a globally unequal system (see also Givens et al., 2019).

Research also examines the role of civil society and governmental organizations, whose goals are often to improve human well-being and decrease environmental degradation. Additional research examines government policies. Drawing upon world polity and world society theories in global sociology, Givens (2017), in an analysis of both production and consumption-based CIWB, finds world polity and world society integration, operationalized with indicators of the presence of international governmental organizations (IGOs) and international non-governmental organizations (INGOs), including specifically environmentally focused non-governmental organizations (EINGOs), finds integration is only associated with a reduction in the CIWB in more developed countries in terms of production-based CIWB. These results suggest that IGOs, INGOs, and EINGOs are failing, at least to some extent, to effectively reduce global CIWB, and the results highlight the importance of taking a global perspective and considering global inequalities. A regional analysis examines countries in the Middle East and North Africa and finds that while economic growth increases the CIWB, public health expenditures reduce the CIWB, lending support to the idea that polices that focus directly on well-being may provide a more sustainable path forward (Sweidan, 2018).

Research in the U.S. and other Subnational Contexts

The relationship between inequality, emissions, and human well-being is important to analyze at different scales. In terms of the CIWB within the U.S., research has looked at the role of inequality in combination with gender (Jorgenson et al., 2018), race (Briscoe et al., 2021), and urbanization (Greiner et al., 2020). Jorgenson et al. (2018) find that inequality matters, specifically income concentration among the most affluent and the percent in poverty. These findings in conjunction with gender lend support for the important role power plays in the relationship between GHG emissions and well-being. Results also demonstrate that state environmentalism has a desirable mitigating effect on the forces

that increase CIWB (Jorgenson et al., 2018). Briscoe et al. (2021) perform an intersectional analysis that looks at income inequality, gender, and race and find that while inequality is associated with higher CIWB, the effect is greater for Blacks compared to Whites and males compared to females, suggesting that in addition to reducing income inequality and broader changes to economies, reducing other forms of inequalities may also be considered sustainability strategies, in addition to advancing equity. In a cross-sectional analysis that uses industrial-based emissions, Greiner et al. (2020) find landscapes with more impervious surfaces, characteristic of more urban areas, are associated with increased CIWB, although income attenuates the association. Finally, in a CIWB analysis within China, Feng and Yuan (2016) find evidence that technological advances can reduce CIWB.

A large body of U.S. focused research analyzes relationships between various forms of inequality, emissions operationalized as different forms of air pollution, and well-being, especially in terms of health risks or outcomes. In a study that contradicts the assumption that emissions reductions will have detrimental effects on well-being, Kelly et al. (2021) analyze the relationship between inequality, emissions, and human well-being in the U.S. over time. They find that at varying time-scales, both emissions and income inequality have a negative effect on life expectancy.

Prior research shows that income inequality harms population heath and reduces life expectancy within and across U.S. states (Hill & Jorgenson, 2018). Newer research that combines this finding with air pollution data shows that not only do U.S. states with higher levels of $PM_{2.5}$, a particularly common and damaging type of air pollution from fossil fuel combustion among other things, have lower average life expectancy, but this relationship is worse in states with higher levels of income inequality (Hill et al., 2019). Going further, Jorgenson et al. (2020b), via a three way interaction in an analysis of U.S. states, find the harmful relationship between air pollution in the form of $PM_{2.5}$ and life expectancy is exacerbated not only states with high levels of income inequality but is further intensified within states with high levels of income inequality when the population is composed of higher

percentages of Black residents. In a related study, Jorgenson et al. (2020a) find inequality in the form of disparities in working hours exacerbates the effect $PM_{2.5}$ on life expectancy across U.S. states, pointing to the need for further research on the complex interactions between socioeconomic and environmental factors and impacts on population health and well-being. Research on working hours also demonstrates another potential strategy to address simultaneous emissions reductions and improvements in well-being. Fitzgerald (2022) analyzes working time, inequality, and carbon emissions in the U.S. and finds support for the moderating effect of inequality; the positive effect of working hours on emissions is greater in contexts of higher income inequality. Fitzgerald's (2022) findings suggest that policies aimed at reducing both inequality and working hours could have beneficial outcomes for both climate mitigation and well-being improvements (see also Fitzgerald et al., 2018).

Much of the research that looks at the relationship between emissions, well-being, and various types of inequalities draws upon and is in conversation with a rich tradition of literature in sociology on environmental justice that among other things documents, examines, and considers ways to move beyond the structures that maintain systemic inequalities in terms of exposures to environmental hazards (Agyeman et al., 2016; Bullard, 1990; Mohai et al., 2009; Pellow, 2007, 2017; Taylor, 2014). With roots in studies of environmental racism, environmental justice is increasingly critical, illuminating connections between social and environmental violence (Pellow, 2017) and intersectional, incorporating multiple and interwoven forms of inequity "related to race/ethnicity, indigeneity, class, gender, age, disability, spatial location" (Malin & Ryder, 2018, p. 2). For example, multiple studies document and examine several forms of inequality and exposure to toxic air pollution from industrial sites in the U.S. (Crowder and Downey, 2010: Downey, 2005, 2006). Other studies look at air pollution and bring in well-being related health effects. For example, Grineski (2007) and Grineski et al. (2007, 2013a, 2013b, and 2019) analyze inequalities, exposure to air pollution, and subsequent health effects, often at national or city scale (see also Mullen et al., 2021). Ard (2015), in a spatial and temporal analysis in the US,

examines how trends in exposure to industrial air toxins differ by racial and socioeconomic groups (see also Ard 2016). Importantly, Ard (2015) interrogates whether or not the downward trend in toxic emissions in the U.S. overall has mitigated disproportional exposure some groups face, or if the disproportionality by racial and socioeconomic status persists; Ard's results provide evidence of persistent inequalities. Quantitative environmental inequality research in the U.S. continues to find evidence of racial, spatial, and other forms of intersecting inequalities (e.g., Liévanos, 2019) including as related to the relationship between exposure to emissions related air pollution and COVID-19 outcomes (Benmarhnia, 2020; Petroni et al., 2020).

Scholars point out that attention to such inequalities and social justice concerns mean energy decisions moving forward must consider, along with overall emissions, social justice considerations that take into account inequalities in impacts on well-being. Sovacool et al. (2016, p. 1) propose an energy justice decision-making framework that takes into account "availability, affordability, due process, transparency and accountability, sustainability, equity, and responsibility" when making decisions about energy and the emissions that come from production and use. McGee and Greiner (2019) note the need to consider energy justice in the deployment of renewable energies and the need for policies to ensure equity and that renewable energy actually displaces non-renewable sources, as their findings indicate that societal inequality shapes the displacement process. Others seek to find the factors that can reduce environmental inequalities, such as by examining whether environmental justice action at the U.S. state state-level reduces unequal exposures (Bullock et al., 2018).

Global Climate Negotiations and Social Movements for Climate Justice

Here we very briefly touch upon two approaches to addressing climate change in order to protect the planet and human well-being. The first is global political cooperation and action to address climate change at various political scales. Second, we discuss social movements, which range from the

transnational to the local. Over time, these groups have addressed the issue of inequality in varying ways.

The United Nations Framework Convention on Climate Change (UNFCCC) went into effect in 1994. Today almost all countries, 197, have ratified the Convention, pledging a desire to prevent dangerous interference with the earth's climate (UNFCCC, 2022). A key step along the way in this attempt at global political cooperation was the adoption of The Kyoto Protocol in 1997, which because of a complex ratification process, went into effect in 2005 (UNFCCC, 2022). The Kyoto Protocol is significant in its recognition of global international inequality in terms of responsibility for climate change (Givens, 2014). This agreement placed binding emissions limits on only the group of countries deemed most responsible for contributing to global climate change. These tended to be the more affluent countries with longer histories of higher emissions. Unlike with The Kyoto Protocol, where only some countries were asked to make changes to address climate change, the next key global agreement, The Paris Agreement, which went into effect in 2016, asked all countries to submit plans to address climate change (UNFCCC, 2022). Here inequality was also recognized, albeit differently. The aim of the Paris Agreement is to have all countries participate in emissions reductions, however, countries are allowed to set their own emissions reductions goals in consideration of each country's particular contexts and needs related to the well-being of their populations and economies. These commitments are called nationally determined contributions (NDCs). Global climate negotiations are an important, if as-yet not successful approach to reducing emissions. Global political-economic inequality, inequalities in well-being, and specifically inequalities in contributions to and unequal impacts from climate change have factored in to and often been a stumbling block in these global negotiations (Roberts and Parks 2006). The conference of the parties to the UNFCCC, meaning all member states, usually meet every year. At COP26, held in Glasgow, Scotland in November 2021, countries continued to agree to try to reduce emissions further, although the pledges still do not go far enough to keep global temperatures

from rising more than 1.5 degrees Celsius (BBC, 2021). Some specific agreements from COP26 related to inequality included a pledge to reduce coal, which is used unevenly across countries, and pledges for wealthier countries to increase funds for poorer countries to transition to renewable energy, although previously pledged amounts have not been met, demonstrating the ongoing struggle to effectively address global inequalities.

Another approach to addressing climate change is collective action and the formation of social movements at various scales to advocate for political and societal change. Early environmental movements in the U.S. often neglected social justice issues and inequalities (Taylor, 2016). Increasing awareness of how environmental burdens are placed more heavily on disadvantaged populations has encouraged a trend in environmental movements toward environmental justice approaches that recognize inequalities and equity issues (Johnson & Burke, 2021; Pellow & Nyseth Brehm, 2013; Schlosberg & Collins, 2014). Environmental justice movements span from the local to the transnational (Agyeman et al., 2016; Pellow 2007). The movement to address climate change is also increasingly focused on climate justice (Agyeman et al. 2016; Della Porta & Parks 2014), intersectional (Dietz et al., 2020), and transnational and sustained (Almeida, 2019). Research shows that other justice movements such as peasant and indigenous movements are linking with the climate justice movement (Claeys & Delgado Pugley, 2017). The incorporation of a wider array of ways of knowing, such as increasingly respecting and learning from indigenous perspectives and voices while working to dismantle environmental and other inequities arising from settler colonialism (Norgaard, 2019; Norgaard & Fenelon, 2021) aligns with the justice approach. This approach recognizes various forms of inequalities in both causes and consequences of climate change and perceives such issues as inextricably linked to social issues such as inequalities in well-being across various groups in society.

Climate justice focuses on inequitable vulnerabilities (Schlosberg & Collins, 2014) and “just sustainabilities” moving forward (Agyeman et al., 2016). For example, now globally well-known climate

activist Greta Thunberg was the founder of a youth strike for climate. Her original individual action of striking for the climate has grown into a global social movement, the demands of which include keeping the global temperature from rising more than 1.5 degrees Celsius compared to pre-industrial levels, ensuring climate justice and equity, and basing decision-making on the best available science (Fridays for Future, 2022). Research on this movement shows that being familiar with Greta Thunberg is associated with intentions to participate in climate activism in the U.S. and the authors write that, "her viral Fridays for Future campaign and demand for inter-generational justice have established her as an inspirational youth figure" (Sabherwal et al., 2021, p. 322).

Conclusion: Key Take Away Points and Directions Forward

Research in sociology draws attention to the importance of the role of inequality in the relationship between greenhouse gas emissions, other related forms of air pollution, and human health and well-being. Research looks at the effect of inequality as both a driver and as a moderator. Studies examine these relationships in different contexts, at different scales, and across time. Concepts and indicators such as the CIWB provide an example of one approach that helps capture these socio-environmental relationships and thus facilitates further analysis.

Research points to directions forward for policy, such as reducing inequality as a sustainability strategy, addressing disproportionality in emissions and well-being outcomes, and focusing on certain attributes linked to human well-being such as working hours, quality of infrastructure, and public health expenditures and outcomes, as ways to improve population well-being without increasing emissions. Research draws attention to low emissions pathways that countries at varying levels of development may be able to intentionally follow. Schor and Jorgenson (2019, p. 320) write that we need to move "from growth-centricity to needs- and people-centered policies." Climate justice movements and international cooperation to address emissions, inequalities, and human well-being also hold promise. Future research should continue to improve our understanding of equitable policies and strategies that

can be implemented in both more and less developed countries and in varying contexts around the world.

Specifically, future research should continue to investigate these relationships at various scales from the sub-national to the global and in various contexts. Research should investigate factors that may facilitate better well-being outcomes without increasing and while instead reducing both emissions and inequities, such as education (Kelly, 2020), public health and infrastructure investments, worktime reduction, and increased use of renewable energy coupled with policy implementation to ensure renewables displaces non-renewable energy sources especially in wealthier countries. Research should also examine individual, collective, and political action, including global agreements or social movement mobilization. It is also vital to continue to examine forces that may hinder progress such as prioritizing economic growth or militarization at the expense of sustainability.

Additional research is needed on specific barriers to more equitable outcomes such as vested interests, technological lock-in, culture, and political structures and policies, and there should be more research into strategies that focus directly on human well-being outcomes (Roberts et al., 2020). Case study analysis may further clarify the mechanisms that shape the relationships between nations' emissions levels and well-being outcomes, especially in those countries with relatively higher life expectancy but relatively lower emissions. Research should continue to examine how inequality drives or moderates these relationships. In light of recent events, research should continue to examine how inequality interacts with environmental exposures to affect public health outcomes (Brulle & Pellow, 2006). COVID-19 makes this suggestion especially pertinent. In addition, multiple measures of well-being, types of inequalities, and types of emissions should be examined moving forward. As biodiversity loss is a growing issue, we must also increasingly consider non-human animals' and other species' well-being. Finally, we can expand our thinking by including more diverse voices and ways of knowing in both research and action to address these issues.

An ongoing dilemma for sustainable development approaches is how to maintain or increase human well-being while decreasing environmental impacts, such as emissions, to a point where the relationship is sustainable and the outcomes are equitable (Dietz & Jorgenson, 2014). Sociological research has advanced this work by drawing attention to the importance of inequality, and the discipline is well positioned to continue to make valuable contributions moving forward.

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