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ESSAY

CLIMATE CHANGE: THE EQUITY PROBLEM

*Michael P. Vandenbergh**
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Income disparity in America affects the potential for environmental reform. When environmental standards are imposed on industry, the cost of consumer goods tends to rise, and low-income consumers can be priced out of important goods and services. This anticipated burden makes regulators less eager to impose standards that they know will raise prices. Opponents of regulation frequently invoke this equity argument in aid of their opposition argument.[1] Environmental standards that make certain goods more energy efficient, for example, will be less effective if many consumers cannot purchase the more efficient goods. With individual behavior accounting for a large share of many pollutants and more than fifty million Americans (roughly eighteen percent of the

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1 For example, opponents of more stringent automobile tailpipe standards point to the costs imposed on consumers who cannot afford more expensive vehicles. *See, e.g.*, John H. Cushman, Jr., *California Lawmakers Vote to Lower Auto Emissions*, N.Y. TIMES, July 2, 2002, at A14 (noting that Dennis Hollingsworth, a state legislator from Murrieta and opponent of a California greenhouse gas tailpipe bill, said: "This will cost lives. The reason it will cost lives is that it will price people out of the market. So they will keep their older cars, which do not have the safety features of newer cars."). Similarly, opponents of stringent electric utility emissions standards point to the effects of higher electricity prices on the economically disadvantaged. BERNARD L. WEINSTEIN & TERRY L. CLOWER, CTR. FOR ECON. DEV. AND RESEARCH, ENVIRONMENTAL DEFENSE V. DUKE ENERGY: HOW A SUPREME COURT REVERSAL ON THE INTERPRETATION OF NEW SOURCE REVIEW COULD IMPERIL RURAL AMERICA (2006), http://www.unt.edu/cedr/NewSourceReviewUpdate.pdf.

population) living at or near the poverty line, this gap in regulatory effectiveness is significant.[2]

Climate change dramatically illustrates this problem. Over the last several years, many scientists and policymakers concluded that reducing the risk of catastrophic climate change will require prompt and substantial reductions in greenhouse gas (GHG) emissions. In the United States, individual behavior accounts for at least one-third of the emissions of carbon dioxide, the leading greenhouse gas, and reducing those emissions will require individuals as well as industries to change their behavior.[3] Many of the potential solutions will increase the prices of consumer goods, whether in the form of carbon taxes, efficiency standards for motor vehicles and appliances, more stringent building codes for single family homes and apartments, or carbon cap-and-trade requirements for electric utilities. Although some of these programs will save money for consumers over the long run, many will require upfront expenditures of funds that low-income individuals simply cannot afford to make. In the absence of measures to address how climate change policies intersect with pre-existing financial inequities, these policies will be less likely to be adopted, and they will not achieve their regulatory potential if they are adopted. As with other environmental regulations, objections to climate change measures will come from both sides of the political spectrum. Those on the right will contest the seriousness of the climate change threat or object to government intervention, and those on the left will raise the equity concern despite the risk of delaying reductions in GHG emissions.

This Essay examines the climate change equity problem and the legal options for addressing it. Recognizing the normative and political import of environmental justice concerns, we seek an approach to curbing individual carbon emissions that enhances the

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2 Activities under the direct control of individuals generate a large share of many pollutants in the United States. *See, e.g.*, Michael P. Vandenbergh, *From Smokestack to SUV: The Individual as Regulated Entity in the New Era of Environmental Law*, 57 VAND. L. REV. 515, 547 (2004) (concluding that thirty-one percent of ozone precursor emissions are attributable to individual behavior). Thirty-eight million Americans (13.3 percent of the United States population) were living in poverty in 2005 and another thirteen million (4.4 percent) were within twenty-five percent of the poverty line. *See* U.S. CENSUS BUREAU, INCOME, EARNINGS, AND POVERTY DATA FROM THE 2005 AMERICAN COMMUNITY SURVEY 19 (August 2006), *available at* http://www.census.gov/prod/2006pubs/acs-02.pdf. In this Essay, we refer to these fifty-one million individuals living at or near the poverty line as "low-income individuals."

3 Michael P. Vandenbergh & Anne K. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. REV. 1673, 1675 (2007).

ability of those with greater discretion in their consumption patterns to enable changes in consumption among those with less.[4] Although many options are available, the most promising in the near term is the extension of the growing retail carbon offset market to those offsets generated by individuals and households, and not industrial sources. We examine the viability of a family of options based on the creation of an equity offset market that would enable donors to subsidize the purchase of more efficient (and thus less carbon-emitting) goods by low-income individuals. We then draw on the growing private governance literature to examine the potential role of private standard-setting and certification schemes for this new carbon equity offset market, and we suggest that a private offset scheme ultimately might be incorporated into the proposed federal cap-and-trade schemes that now target industrial sources.

The conceptual value of approaching the equity issue in this way is significant. It encourages a sense of shared environmental responsibility, which in turn could have beneficial effects on polluting behaviors. At the same time, it removes the incentive to use "we-they" classifications that stymie legislative reforms while placing blame on sectors of the society that have the least ability to modify their behavior.

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4 The imposition of inequitable or unjust environmental burdens on particular individuals or groups is a common problem in environmental law. The most familiar example concerns disproportionate exposure to toxics in low-income or minority communities. Framed in this way, environmental justice concerns generate a robust literature that conceptualizes environmental-economic impacts as tradeoffs with winners and losers. *See, e.g.*, ROBERT D. BULLARD, THE QUEST FOR ENVIRONMENTAL JUSTICE: HUMAN RIGHTS AND THE POLITICS OF POLLUTION (2005); ROBERT D. BULLARD, ET AL., TOXIC WASTES AND RACE AT TWENTY: 1987-2007 (March 2007), *available at* http://www.ejrc.cau.edu/TWART-light.pdf (report prepared for the United Church of Christ, Justice and Witness Ministries); Richard J. Lazarus, *Pursuing 'Environmental Justice': The Distributional Effects of Environmental Protection*, 87 NW. U. L. REV. 787 (1993); Anne E. Lucas, *No Remedy for the Inuit: Accountability for Environmental Harms under U.S. and International Law*, *in* NEW PERSPECTIVES ON ENVIRONMENTAL JUSTICE: GENDER, SEXUALITY AND ACTIVISM (Rachel Stein ed., 2004); Mathew D. Adler, *Corrective Justice and Liability for Risk Equity: A New Proposal* 156, (Univ. of Pa. Law. Sch. Working Paper, Mar. 2007). In contrast, the approach followed here characterizes environmental equity as a collective action problem. For a recent examination of the distributive and corrective justice issues raised by climate change on an international level, see Eric A. Posner & Cass R. Sunstein, *Climate Change Justice* (Univ. of Chi. Law & Econ. Olin Working Paper, Paper No. 354, 2007) *available at* http://ssrn.com/abstract=1008958.

I. CLIMATE CHANGE AND INDIVIDUAL BEHAVIOR

A. *Individual Behavior*

This Essay makes several core assumptions about the climate change problem: (1) carbon dioxide and other GHGs are driving a substantial portion of the observed and expected climate change (carbon dioxide accounts for roughly eighty-five percent of the climate-forcing effects of the leading GHGs, and we refer only to carbon dioxide emissions in the rest of this Essay)[5]; (2) humans are the principal source of recent increases in carbon dioxide emissions;[6] and (3) there is a non-trivial risk of substantial catastrophic effects from climate change, including large increases in sea level over the long term.[7] We also assume that substantial reductions in anthropogenic carbon dioxide emissions will be required to reduce the risks of catastrophic climate change, including a leveling off in roughly the next decade followed by reductions of as much as sixty to eighty percent over the next fifty years.[8] Achieving reductions of this magnitude in these short time frames will require substantial emissions reductions from all major source types.

To date, the regulatory measures and proposals generated by policymakers focus in large part on large industrial sources, the traditional targets of environmental law. Several federal legislative proposals, for example, would establish cap-and-trade programs for such sources.[9] Industrial sources are often large emitters, and industry fits easily into common perceptions about the sources of pollution.[10] Agencies perpetuate these perceptions regarding climate change through their methods of data collection and dissemi-

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[5] *See* James Hansen & Makiko Sato, *Greenhouse Gas Growth Rates*, 46 PROC. NAT'L. ACAD. SCI. 16,109, 16,113 (2004).

[6] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], *Climate Change 2007: The Physical Science Basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers (Feb. 2, 2007, with corrections made as of Feb. 5, 2007) (*prepared by* Richard Alley, et al.) [hereinafter IPCC, Working Group I Report], *available at* http://www.ipcc.ch/SPM2feb07.pdf.

[7] *See generally* Vandenbergh & Steinemann, *supra* note 3, at 1683.

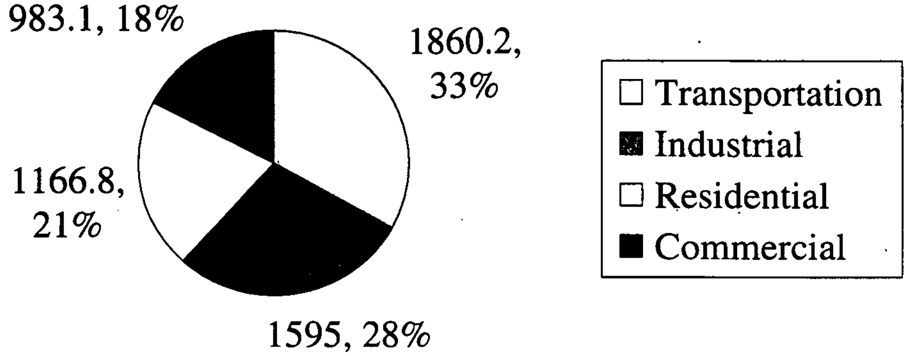
[8] *See id.* at 1687.

[9] *See generally* LARRY PARKER, CONGRESSIONAL RESEARCH SERVICE, CLIMATE CHANGE: GREENHOUSE GAS REDUCTION BILLS IN THE 110TH CONGRESS (Jan. 31, 2007) (summarizing legislation). Although these measures would have indirect effects on emissions from individual behavior by increasing the cost of electricity and reducing the emissions per unit of electricity used (or by requiring more efficient and thus less carbon dioxide-emitting cars), they can be expected to have limited effects on the emissions from many types of individual behavior. *See* Vandenbergh & Steinemann, *supra* note 3, at 1666-67.

[10] *See* Vandenbergh, *supra* note 2, at 591.

nation. For example, as demonstrated in Figure 1, the Energy Information Administration (EIA) of the Department of Energy disseminates data on overall national carbon dioxide emissions in four categories:

FIGURE 1[11]



Although the four EIA categories (transportation, industrial, residential, and commercial) include a discrete category for industry, they do not include a discrete category for individual behavior. Instead, the EIA frames the data in a way that distributes the emissions from individual behavior across both the residential and transportation sectors. This framing leaves the reader with the impression that individual behavior contributes an unrealistically small share of the total U.S. carbon dioxide emissions.

In another recent article, we assess the contributions of individual behavior to carbon dioxide emissions by estimating the aggregate and mean carbon dioxide emissions from individual behavior in the United States in 2000.[12] The estimate includes only those behaviors that are under the substantial and direct control of individuals, such as personal transportation (personal motor vehicle use, air travel, and mass transportation use) and household energy use (electricity use and direct household energy use, such as the gas burned for hot water heaters). Even using this restrictive defini-

[11] ENERGY INFO. ADMIN., DEP'T OF ENERGY, ANNUAL ENERGY REVIEW 2004, at 3 (2005), *available at* http://tonto.eia.doe.gov/FTPROOT/multifuel/038404.pdf; U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990-2004, at 2-10 (2006), *available at* http://yosemite.epa.gov/oar/globalwarming.nsf/content/ResourceCenterPublicationsGHGEmissionsUSEmissionsInventory2006.html (data presented by spreadsheet is converted to pie chart format).

[12] For a discussion of the model methodology and results, see Vandenbergh & Steinemann, *supra* note 3.

tion, individual behavior in the United States generated 4.1 trillion pounds of carbon dioxide in 2000, an average of over 14,000 pounds per person, which accounts for thirty-two percent of the U.S. total.[13] Although the emissions arise from seemingly innocuous activities such as individual motor vehicle use and home appliance use, the 4.1 trillion pound total is larger than the 3.9 trillion pound total for all of industry, and it represents eight percent of the world total.[14]

B. Equity

Despite the large contribution of individual behavior to carbon dioxide emissions in the United States, policymakers direct surprisingly little attention toward changing individual behavior. The framing discussed above may explain the lack of focus on individual emissions, and the inefficiencies and intrusiveness associated with regulating individual behavior certainly play a role. Equity issues also may be surprisingly important. To date, the expert reports that address climate change equity issues direct much of their attention toward the inequitable share of the environmental and human health burdens that low-income and minority communities bear.[15] A lack of resources for adaptation, for example, may cause droughts to pose far greater problems in the developing world than in the developed world.[16] Environmental justice groups also argue that carbon cap-and-trade schemes will create air toxics "hot spots" that disproportionately affect minority and low-income

13 *Id.* at 1677.

14 *Id.* Others have generated comparable estimates. *See, e.g.*, GERALD T. GARDNER & PAUL C. STERN, ENVIRONMENTAL PROBLEMS AND HUMAN BEHAVIOR 258, Table 10-1 (2d. ed. 2002) (1996) (estimating that households account for 32.4 percent of direct U.S. energy use).

15 *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [IPCC], *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability*, Working Group II Contribution Intergovernmental Panel on Climate Change Fourth Assessment Report 8 (Apr. 13, 2007) (*prepared by* Neil Adger, et al.) [hereinafter IPCC, Working Group II Report] (concluding that Africa is "one of the most vulnerable" to climate change effects because of "low adaptive capacity").

16 *See, e.g.*, Andrew Revkin, *The Climate Divide: Wealth and Poverty, Drought and Flood: Reports from 4 Fronts in the War on Warming*, N.Y. TIMES, Apr. 3, 2007, at D4 (comparing drought responses in Malawi and Australia and concluding that the "most vulnerable countries also tend to be the poorest"). *See also* CHRISTIAN AID, THE CLIMATE OF POVERTY: FACTS, FEARS AND HOPE 28-38 (2006), *available at* http://www.christianaid.org.uk/Images/climate_of_poverty_tcm15-21613.pdf; YIANNA LAMBROU & GRAZIA PIANA, GENDER: THE MISSING COMPONENT OF THE RESPONSE TO CLIMATE CHANGE 20-21 (2006).

communities.[17] Some poor communities in the United States also extend the global "ecological debt" argument to their local communities, arguing that because the rich occupy a larger environmental space, the poor should have the right to consume more today.[18]

Rather than extending the environmental justice analysis in this direction, this Essay focuses on the opportunities arising from the norms of individuals who accumulate ecological debt through energy-intensive consumption patterns. We extend the environmental justice analysis to two additional equity concerns: the impact of income disparities on the adoption of regulatory measures and on the efficacy of the measures adopted. In both cases, the equity concerns arise from a conception of individuals not only as risk receptors, but also as risk creators.

1. Adoption

The concerns about adoption or political viability stem from the resistance to climate change regulatory measures that can be expected to arise from the inequitable burdens posed by complying with these measures.[19] Many of the regulatory measures that will reduce emissions from individual behavior (e.g., efficiency standards for motor vehicles or appliances, stringent building codes, carbon taxes, and cap-and-trade schemes for electric utilities) will increase the costs of electricity and other consumer goods.[20]

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[17] *See, e.g., Environmental Justice Groups Seek Greater Role in Climate Debate*, INSIDE EPA, Mar. 30, 2007, at 20 [hereinafter *Greater Role*] (noting that cap-and-trade programs "may create pollution 'hot spots,' because industrial sources that pay for allowances to continue emitting greenhouse gases would not automatically reduce other emissions"). *See also* ROBERT D. BULLARD, ET AL., *supra* note 4,at 155.

[18] *See* Duncan McLaren, *Environmental Space, Equity and the Ecological Debt*, *in* JUST SUSTAINABILITIES: DEVELOPMENT IN AN UNEQUAL WORLD 30 (Julian Agyeman et al. eds., 2003).

[19] *See, e.g., Greater Role, supra* note 17, at 20 (noting that "[e]nvironmental justice (EJ) advocates are seeking a greater role in the debate over possible climate change legislation, charging that even Democratic lawmakers and traditional environmental groups are devoting little attention to how a future greenhouse gas emissions regime could impact low-income and minority communities").

[20] *See* CONG. BUDGET OFFICE, TRADE-OFFS IN ALLOCATING ALLOWANCES FOR CO2 EMISSIONS 3 (Apr. 2007). Proposed federal legislation reflects the concerns about the higher costs of energy that a cap-and-trade program may have for lower-income individuals, but it often takes the form of a mandate to research the impact on poorer individuals. *See, e.g.,* Climate Stewardship and Innovation Act, S. 280, 110th Cong. § 402 (2007) (introduced by Senators McCain and Lieberman, et al.) [hereinafter CSIA]. Questions of inequitable distribution of exposure to toxics based on race or ethnicity dominate much of the environmental equity or justice debate. *See, e.g.,* Lazarus, *supra* note 4 (examining status of environmental justice debate). The additional form of inequity discussed in this Essay

Although some of these measures will save money for consumers over the long run, many will require up-front expenditures of funds that low-income individuals do not possess and cannot borrow.[21] Low-income individuals thus will be less able to reduce their emissions and will suffer economically over the long run because they will be unable to afford more efficient cars, appliances, and other goods. Studies suggest that low-income individuals will be more likely to pay for higher energy costs through economic sacrifices than those with more resources.[22]

In response to the inequitable burdens imposed on low-income individuals, opponents of climate change regulatory measures will frame their objections to appeal not only to those on the right, who contest the seriousness of the climate change threat or object to the costs or intrusiveness of government intervention, but also to those on the left, who may be as concerned about equity as environmental protection. This is more than a hypothetical concern. As mentioned at the outset, opponents of more stringent automobile emissions standards frame these concerns in terms of the costs both to automobile manufacturers and to those who cannot afford more expensive vehicles.[23] Others raise similar objections to the higher electricity prices that may result from utility emissions standards.[24] In addition, environmental justice groups raise concerns about the increased energy prices and economic dislocations that may arise from climate change regulations.[25]

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exerts a strong, if less visible, influence. In some ways this issue is the obverse of the standard environmental justice problem: Individuals are concerned about the costs they will bear from the individual behavior changes necessary to achieve environmental goals, as opposed to the costs they will bear if industry fails to achieve those goals.

[21] *See* NAT'L RESEARCH COUNCIL, ENERGY USE: THE HUMAN DIMENSION 25 (Paul C. Stern & Elliott Aronson eds., 1984).

[22] *See id.*; CONG. BUDGET OFFICE, *supra* note 20, at 3.

[23] *See, e.g.,* Cushman, *supra* note 1, at A14 (noting that California emissions standards opponents raised safety concerns regarding low-income individuals). For a review of the effort to adopt motor vehicle greenhouse gas emissions standards in California, see Karen D. Bettencourt, *California's Attempt to Remain the Leader in Environmental Policy: Regulating Carbon Dioxide Emissions from Vehicles Sold in the Golden State*, 34 MCGEORGE L. REV. 465, 473-74 (2003).

[24] *See, e.g.,* WEINSTEIN & CLOWER, *supra* note 1 (noting concerns arising from pollution control efforts for electric utilities).

[25] *See, e.g.,* Letter from Gary Cook, Dir., U.S. Climate Action Network, to John D. Dingell Chairman, House Energy and Commerce Comm., and Rick Boucher, Chairman, Subcommittee on Energy and Air Quality, House Energy and Commerce Comm. (Mar. 19, 2007) (on file with author) (asserting that "[g]lobal warming legislation must mitigate against any disproportionate impacts on low-income and vulnerable communities. The transition to a clean, low-carbon energy future will create economic opportunities and jobs in numerous sectors while requiring shifts in the economy. The distribution of total benefits

Furthermore, in many parts of the country, race, ethnicity, and class are so highly correlated—in fact[26] and in the political imagination of citizens[27]—that certain minority groups may even be blamed for the continued climate threats. This could exacerbate existing socio-economic tensions. In addition, it could reduce the political will to address not only the climate change threat, but also the environmental burdens experienced by these groups (such as the exposure to air toxics mentioned at the outset).

2. *Efficacy*

Even if climate change regulatory measures are adopted, the limited financial resources available to roughly eighteen percent of the population will mute the effects of those standards. Low-income individuals have limited capacity to respond to increased energy prices and the increased availability of energy efficient goods. This limited capacity will decrease the emissions reductions that will result from carbon taxes or cap-and-trade schemes that raise the price of energy. It will also decrease the emissions reductions that will result from inducing manufacturers to produce more efficient consumer goods, or from informing individuals of the personal and social benefits of switching to the more efficient goods. These lost emissions reductions may be quite important given the magnitude of the emissions attributable to individual behavior, as well as the speed and magnitude of the reductions necessary to reduce the risk of catastrophic climate change. Every one percent reduction in the overall carbon dioxide emissions from individual behavior represents roughly forty-one billion pounds of carbon dioxide, an amount larger than entire industrial sectors.[28]

Although low-income individuals may be able to undertake relatively minor curtailment activities, such as turning off lights and turning down thermostats,[29] the largest carbon dioxide emissions

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and costs among people and communities should be fair and just. Revenue from the auction of allowances should fund programs that provide displaced workers with both transitional income, benefits for their families, and tuition for training in alternative fields. Revenue from the auction of pollution allowances should also help cushion any energy price increases for low income Americans.").

26 *See* ROBERT D. BULLARD, DUMPING IN DIXIE: RACE, CLASS, AND ENVIRONMENTAL QUALITY 6 (2000).

27 *See* MARTIN GILENS, WHY AMERICANS HATE WELFARE: RACE, MEDIA, AND THE POLITICS OF ANTIPOVERTY POLICY (1999); PAUL M. Kellstedt, The Mass Media and the Dynamics of American Racial Attitudes (2003).

28 *See* Vandenbergh & Steinemann, *supra* note 3, at 1695.

29 Many low-income individuals may take these steps already for economic reasons. For a discussion of curtailment and efficiency-enhancing behaviors, see Paul Stern & Gerald

reductions often involve efficiency-enhancing activities, not curtailment activities. Examples of efficiency-enhancing activities include the purchase of more fuel-efficient cars, home appliances, and heating and air conditioning units, all of which can entail substantial costs. Low-income individuals may be unable to take many of these steps, even though the steps will generate substantial emissions reductions and save money over the long run.[30] In short, equity issues may reduce not only the likelihood that regulatory measures will be adopted, but also the emissions reductions achieved from those measures that are adopted.

II. A Remedy for the Equity Problem

A host of public and private legal measures could be taken to address the climate change equity issue. For other social problems, policymakers offer public subsidies in the form of direct payments or tax incentives, and some subsidies are currently in place to promote the purchase of efficient cars and other consumer goods.[31] These subsidies are difficult to administer efficiently, however, and enormous public support would be needed to offer them on a scale necessary to make a meaningful dent in emissions from individual behavior.[32]

Gardner, *Psychological Research and Energy Policy*, 36 Am. Psychologist 329, 334-39 (1981).

30 *See id.* For example, energy efficiency measures such as insulation can reduce household energy use for space heat by thirty to fifty percent without requiring reductions in winter temperatures. *See id.* In addition, in areas that lack mass transportation, low-income individuals may be unable to reduce gasoline use even when prices surge. The large number of individuals with financial constraints may be a contributing factor to the limited price elasticity of gasoline usage that has been observed in recent studies. For example, although gas prices doubled between 2001 and 2006, consumption decreased by only four percent. *See* J.E. Hughes, C.R. Knittel & D. Sperling, *Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand* 9 (U. Cal. Davis Inst. of Transp. Studies, Working Paper No. UCD-ITS-RR-06-16, 2006), *available at* http://pubs.its.ucdavis.edu/publication_detail.php?id=1050.

31 *See, e.g.*, Vandenbergh & Steinemann, *supra* note 3, at 1727-28 (discussing motor vehicle efficiency standards).

32 For a discussion of the use of subsidies to reduce GHG emissions, see Richard A. Posner, Catastrophe: Risk and Response 155 (2004). Subsidies have been used to reduce the contributions of individual behavior to other air emissions, such as in "cash-for-clunkers" programs directed at reducing emissions of ozone precursors. *See, e.g.*, City of Kelowana, Cash for Clunkers, http://www.city.kelowna.bc.ca/CM/Page464.aspx (last visited Dec. 27, 2007). This website outlines a California program offering cash in exchange for the return of a 1993 or earlier year model vehicle. The individuals wishing to participate have to apply for one of several incentives that will offer a specified amount of money for a specified purpose. For example, an individual can turn in a qualifying vehicle to receive 750 dollars toward the purchase of a 2004 or later model automobile that meets certain fuel efficiency standards.

Over the last decade, a growing number of scholars pointed to the important role that public-private and private-private interactions play in performing traditionally governmental functions,[33] and a private-private approach may provide the most viable near-term option. In particular, it may be possible to broaden the retail carbon offset market through a family of options that generate offsets by subsidizing emissions reductions from individuals. This private response may prompt near-term emissions reductions, enhance the efficacy of and the prospects for adoption of public regulatory measures, and ultimately become an integral part of a national or international cap-and-trade program. In addition to achieving the desired behavior change, the proposed private-private transactions, because they are individual-to-individual, may strengthen a sense of collaboration across socio-economic groups that does not generally arise from schemes that rely only on individualized action for collective outcomes. The discussion below details how a private scheme might be developed and ultimately integrated into a public cap-and-trade scheme.

A. Carbon Equity Offsets

1. The Retail Carbon Offset Market

Carbon dioxide and other GHGs are emitted into and removed from the atmosphere by human and natural processes, and the climate-forcing effect of carbon emissions ultimately arises from their ambient concentrations. As a result, an emissions source can reduce its "carbon footprint" by controlling emissions, offsetting emissions, or some combination of the two. Offsetting can involve preventing emissions that would otherwise occur (e.g., capturing methane emissions from landfills) or taking steps that result in carbon dioxide being removed from the atmosphere (e.g., planting trees in tropical areas). Industrial sources that face legal incentives or social incentives to reduce their carbon footprint can acquire carbon offsets from a variety of sources. The sources of carbon offsets include a wide range of activities and entities, but they typically involve large corporate, government, or non-governmental organization (NGO) projects such as landfill methane capture,

[33] *See, e.g.*, Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1, 21-32 (1997) (identifying collaborative governance arrangements); Jody Freeman, *The Private Role in Public Governance*, 75 N.Y.U. L. REV. 543, 592-672 (2000) (identifying the governance functions performed by public-private hybrids); Michael P. Vandenbergh, *The Private Life of Public Law*, 105 COLUM. L. REV. 2029, 2043-67 (2005) (identifying the governance functions performed by private-private contracting).

installation of renewable energy sources, and tropical reforestation efforts.[34] The term "offset" is used here in a generic sense, recognizing that a variety of more precise terms, such as allowances and renewable energy certificates, are applicable depending on the type of unit that is traded.[35]

International agreements regarding climate change explicitly contemplate that countries and firms will purchase and generate various types of carbon offsets.[36] In addition, the European Union's cap-and-trade program caps carbon emissions on a per-country basis and allows the major sources of carbon emissions in each country to achieve their caps by reducing emissions or purchasing offsets.[37] Several states and regions in the United States have taken steps to create similar trading schemes, and many of the current legislative proposals in Congress would create cap-and-trade schemes.[38] The details of the offset markets are complex, but they are not central to the analysis here. The important points are that (1) a growing private market in carbon offsets now exists in the United States and around the world, (2) the sources of offsets tend to be large projects rather than subsidies to individuals, and (3) cap-and-trade schemes are on the horizon in the United States.[39]

Industrial cap-and-trade schemes for various forms of pollution are the subject of an enormous literature in the academy,[40] but scholars direct less attention to the application of emissions trading

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[34] *See, e.g.*, TerraPass, http://www.terrapass.com (last visited Dec. 27. 2007) (listing three sources of offsets: wind power, biomass, and industrial efficiency). Carbon offsets and carbon trading raise important environmental and social justice issues. *See, e.g.*, Larry Lohmann, *Carbon Trading: A Critical Conversation on Climate Change, Privatisation, and Power*, 48 DEV. DIALOGUE 1 (2006) (identifying offset projects that did not generate environmental gains or raised social justice concerns).

[35] *See, e.g.*, David J. Hayes, Voluntary Reduction Commitments and the World of Offsets, presented at Am. Law Inst./Am. Bar Ass'n and Envtl. Law Inst., Global Warming: Climate Change and the Law, Washington, D.C., 4-6 (Mar. 22, 2007) (discussing offsets, renewable energy certificates, and allowances) (copy on file with the author).

[36] *See, e.g.*, Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 12, Dec. 10, 1997, 37 I.L.M. 22 (authorizing Clean Development Mechanism).

[37] *See* Lohmann, *supra* note 34, at 1.

[38] *See* Parker, *supra* note 9.

[39] *See, e.g.*, Robert R. Nordhaus & Kyle W. Danish, *Assessing the Options for Designing a Mandatory U.S. Greenhouse Gas Reduction Program*, 32 B.C. ENVTL. AFF. L. REV. 97 (2005) (discussing greenhouse gas cap-and-trade proposals).

[40] *See, e.g.*, Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1341 (1985) (proposing domestic emissions trading scheme); Jonathan Baert Wiener, *Global Environmental Regulation: Instrument Choice in Legal Context*, 108 YALE L.J. 677, 763 (1999) (examining emissions trading and other options for addressing global environmental concerns).

to individuals.[41] The voluntary carbon offset market has nevertheless grown dramatically in recent years, increasing from six million dollars in 2004 to more than 110 million dollars in 2006.[42] Retail carbon offsets are sold by for-profit firms and NGOs.[43] For the most part, the offsets are generated by the same types of large projects that generate offsets for the industrial market.[44]

Two aspects of retail carbon offsets are particularly important for the efficacy of the equity offset concept. The first is that individuals must have an incentive to purchase offsets. Although the concept of personal carbon accounts has been floated in the United Kingdom, the consumer demand for retail carbon offsets is not driven by legal requirements or economic incentives in the United Kingdom, the United States, or elsewhere.[45] Instead, the growth of the retail offset market is a result of social incentives: individuals gain personal and social norm-generated benefits by reducing their carbon footprints through a combination of emissions reductions and emissions offsets. The personal norm benefits may include an enhanced sense of self-esteem and guilt expiation, and the social norm benefits may include an enhanced reputation in some com-

[41] *See, e.g.*, Nordhaus & Danish, *supra* note 39, at 125 (concluding that "[i]ncluding any but the very largest domestic landowners in a cap-and-trade program does not appear to be feasible currently; land ownership is too diffuse, measuring emission impacts of LULUCF [Land-Use, Land-Use Change, and Forestry] and activities is too resource-intensive, and the relation between practices and emissions varies widely depending on a multiplicity of local conditions").

[42] *See* James Kanter, *Guilt-Free Pollution. Or Is It?*, N.Y. TIMES, Feb. 20, 2007, at C1.

[43] There are multiple non-profit organizations that sell carbon offsets. *See* Carbonfund.org, http://carbonfund.org (last visited Dec. 27, 2007); Climate Trust, http://www.climatetrust.org (last visited Dec. 27, 2007). A wide range of for-profit retail offset firms also exist. For example, Native Energy is a privately held renewable energy company that offers donors the choice between offsetting with wind power or farm methane. *See* Native Energy, http://www.nativeenergy.com (last visited Dec. 27, 2007). Natsource is a corporate partnership between DuPont and Blue Source that provides carbon offset credits from "select DuPont and Blue Source carbon-reducing projects." Natsource LLC, http://www.natsource.com/buycredits (last visited Dec. 27, 2007).

[44] The Bonneville Environmental Foundation offers offsets derived from replacing traditional power sources with renewable energy, and donors can choose between offsets that are ninety-nine percent wind and one percent solar, or ninety percent wind and ten percent solar. *See* Bonneville Environmental Foundation, http://www.b-e-f.org (last visited Dec. 27, 2007). Similarly, e-Blue Horizons provides offsets derived from sequestration of landfill methane. *See* e-Blue Horizons, http://e-bluehorizons.net (last visited Dec. 27, 2007). Several possible exceptions exist, although they are typically directed at large-scale projects. For example, The Solar Electric Light Fund generates offsets from installing photovoltaics in low-cost housing. *See* The Solar Electric Light Fund, http://self.org (last visited Dec. 27, 2007). In addition, The Climate Trust purchases offsets generated by making multi-unit housing more efficient. *See* Climate Trust, *supra* note 43.

[45] *See* Lucy Sherriff, *UK Ponders Personal Carbon Allowances*, THE REGISTER, July 19, 2006, *available at* http://www.theregister.co.uk/2006/07/19/carbon_allowances/print.html.

munities.[46] Although each transaction typically takes place individually and online, participants may garner additional benefits by forwarding information about their purchase of retail offsets to others in their social network. In this way, each transaction may generate norm-based benefits for the individual, further the spread of information about retail offsets, and contribute to the formation of networks of individuals who reduce their carbon footprints.

The second aspect of particular importance to the equity offset concept is that offsets must generate the promised emissions reductions. Commentators question whether retail offsets generate genuine emissions reductions and whether individuals who purchase them avoid taking emissions reduction steps they would otherwise take.[47] Because only informal incentives exist to purchase carbon offsets, the retail carbon offset market is heavily dependent on public perceptions that the offsets are legitimate. Only time will tell whether retail offsets generate genuine reductions, but there is no reason why private or public enforcement mechanisms cannot force a reasonably high degree of quality control on offset providers. A growing literature explores the use of private monitoring and verification schemes for the regulation of corporate environmental behavior on a domestic and global level.[48] Not surprisingly, legitimacy concerns also lead to the development of private standards for carbon offset providers and to the emergence of private offset verification firms.[49] Although private monitoring and verification certainly are not foolproof, if well designed they can offer a

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[46] *See* Vandenbergh & Steinemann, *supra* note 3, at 1706.

[47] *See* Andrew C. Revkin, *Carbon-Neutral is Hip, But Is It Green?*, N.Y. TIMES, Apr. 29, 2007, at A1. *See also* CLEAN AIR-COOL PLANET, A CONSUMER'S GUIDE TO RETAIL CARBON OFFSET PROVIDERS (Dec. 2006) (evaluating retail carbon offset providers), *available at* http://www.cleanair-coolplanet.org/ConsumersGuidetoCarbonOffsets.pdf.

[48] *See, e.g.*, BEN CASHORE, GRAEME AULD & DEANNA NEWSOM, GOVERNING THROUGH MARKETS: FOREST CERTIFICATION AND THE EMERGENCE OF NON-STATE AUTHORITY 88-126 (2005) (examining Forestry Stewardship Council standards); Errol Meidinger, *The Administrative Law of Global Private-Public Regulation: The Case of Forestry*, 17 EUR. J. INT'L. L. 47, 48-57 (2006) (same).

[49] Green-e is a certification organization for renewable energy that works with offset organizations to certify their offset amounts. *See* Green-e Verification Process, http://www.green-e.org/getcert_re_veri.shtml (last visited Dec. 27, 2007). Another potential way in which offsets might not generate overall emissions reductions is if individuals who purchase offsets avoid taking other steps that they would have taken in the absence of offsets because of a feeling that they have satisfied their normative obligations. *See* Revkin, *supra* note 47, at 4-1. It is at least equally likely, however, that they will take additional steps because they have expressed a commitment to reduce their carbon footprint and will expect others to do so as well. *See* Vandenbergh & Steinemann, *supra* note 3, at 1721.

quick and reasonably effective alternative or complement to government regulation.[50]

2. Equity Offsets

A variety of approaches could be taken to expand the retail offset market to include equity offsets. Successful private equity offset schemes will need to generate substantial emissions reductions in the aggregate, minimize transaction costs, and provide adequate incentives to induce large numbers of individuals to purchase the offsets. To draw on social justice norms, the equity offset schemes also will need to provide information that enables individuals to understand how the emissions reductions are achieved. In addition, in the long run private schemes may have far more reach if they are integrated into a public cap-and-trade program. The first three criteria necessary for a successful private equity offset scheme are examined here, and the cap-and-trade integration is discussed in Part II.B.

a. Potential Emissions Reductions

The potential emissions reductions that could be achieved from equity offsets are a function of the number of individuals whose emissions will not be addressed by other programs, the emissions per individual, and the extent to which the equity offsets reduce those emissions. As noted above, the potential market includes more than fifty million individuals who have a limited ability to change consumer behavior in response to increases in energy prices or to the availability of more efficient consumer goods. Offsets for more fuel-efficient private motor vehicles and residential heating and air conditioning systems provide two important examples of the emissions reductions potential for equity offsets. Private motor vehicle use makes up roughly half of the carbon dioxide emissions from individual behavior, and private motor vehicle use in the United States constitutes a substantial share of all U.S. carbon dioxide emissions.[51] As a result, small improvements in motor vehicle emissions could generate carbon dioxide emissions reductions equal to entire industry sectors. Hybrids and other fuel efficient vehicles are available, but they are expensive. Offsets could subsidize the purchase of hybrids and other efficient vehicles if a

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[50] *See, e.g.*, Michael P. Vandenbergh, *The New Wal-Mart Effect: The Role of Private Contracting in Global Governance*, 54 UCLA L. Rev. 913, 944-56 (2007) (examining efficacy of supply-chain contracting and private environmental certification schemes).

[51] *See* Vandenbergh & Steinemann, *supra* note 3, at 1698.

means could be found to direct the funds generated from offset purchases to low-income individuals who seek to replace high-emitting vehicles with more efficient ones. Similarly, home heating and air conditioning comprise roughly ten percent of the potential energy savings (and thus carbon dioxide emissions reductions) from individual behavior change, and home appliance use comprises a smaller but significant share.[52] Although many low-income individuals live in rental units and do not control purchasing decisions for various types of residential heating and air conditioning equipment and appliances, many others have some degree of control over these decisions. Accordingly, offsets have the potential to subsidize the purchase of many types of efficient equipment for low-income individuals.

b. Transaction Costs

Transaction costs are a substantial barrier, ranging from the costs of ensuring that buyers' funds are used for their intended purposes to the costs of soliciting and transferring the funds. One means of reducing transaction costs is for retail offset sellers to sell generic offsets and to use NGOs or retailers (e.g., automobile companies or dealers) as intermediaries in the creation of the offsets. A national or local NGO, for example, could maintain an account comprised of offset funds. The NGO could identify, screen, and certify individuals who meet eligibility criteria, and could provide a direct payment to an automobile dealer when the dealer certifies that the eligible individual will purchase the vehicle upon receipt of the funds.

For-profit firms could also serve as intermediaries. For instance, an automobile dealer could maintain an equity offset account and conduct the screening and certification in connection with the credit check that is often done in any event. Automobile dealers located in low-income neighborhoods, in particular, may have incentives to advertise the equity offset scheme to potential car buyers and offset buyers. Although the market for the Prius and other hybrids now consists largely of upper-middle income buyers who benefit from the social meaning attached to the vehicles and can afford the sticker price, markets for used hybrids and other fuel-efficient vehicles may become more robust over time.

A similar approach could be used for the purchase of a wide range of energy-consuming household equipment: large sellers

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52 GARDNER & STERN, *supra* note 14, at 259, Table 10-3.

such as Home Depot and Lowes have the capacity to reach many consumers on both sides of the transaction. A large retailer, such as Wal-Mart (which is promoting a campaign to sell more efficient products based on the concept of "democratizing sustainability") may have an incentive to maintain a fund devoted to equity offsets for consumer appliances.[53] Retailers also may be able to provide low-cost promotion of equity offsets by marketing the availability of the offset vouchers at check-out lines. The involvement of large retailers may add economies of scale that would further reduce transaction costs.[54] Whether the intermediary is an NGO, an automobile dealer, or a retailer, a private third-party validator or certifier may be necessary to ensure that the program is operating as intended.

In situations where the transaction costs of connecting offset buyers to specific sellers are high, or where individuals do not have control over important energy uses (e.g., heating and cooling units, home appliances, or insulation), offset-generating subsidies may be more effective and efficient if they are directed at projects that are conducted on a larger scale, such as low-income housing rehabilitation projects.[55] A non-profit organization, for example, could disseminate information about these large-scale projects through the internet. Project descriptions could list the amount needed and the progress made toward the goal. Donors could access information about whether they are funding all or part of a new project, keeping the ball rolling on a project that is underway, or providing the last bit of funding to complete a project. As with the more direct approaches, private standards, monitoring, and verification may be necessary in the short term, although government involvement may be necessary in the long term.

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[53] *See* Vandenbergh, *supra* note 50, at 943, n.135.

[54] These approaches need to be attentive to their impact on local small businesses, which may not be able to secure a piece of the offset-funded purchases.

[55] For example, GlobalGiving funds a climate change project involving the installation of solar panels on ten low-income houses. GlobalGiving, Solar Electric Systems for 10 Low-Income Families, http://www.globalgiving.com/pr/1300/proj1263a.html (last visited Dec. 27, 2007). At least one organization now offers offsets generated from subsidies for energy efficiency measures used in low-income housing, but direct offset-generated subsidies for individuals are not available. *See e.g.*, Press Release, Grosolar.com, Global Resource Options Provides Solar Power to Habitat for Humanity House (April 20, 2006), *available at* http://www.renewableenergyaccess.com/rea/partner/story?id=44679 (noting that Habitat for Humanity partnered with some organizations to install solar panels on new homes built for low-income individuals).

c. Incentives

The explosive growth of the retail offset market occurred in the absence of legal and economic incentives, suggesting that the personal and social norm-based benefits of reducing one's carbon footprint are sufficient to induce a large number of individuals to purchase offsets.[56] These benefits arise at least in part from the belief of carbon offset purchasers that a small reduction in any one individual's carbon footprint, when combined with reductions from others, will have a meaningful impact on global climate change.[57] The climate change problem appears to be distant in time and geography to many individuals, and it is unclear whether the retail carbon offset market will plateau after the supply of the most committed individuals is exhausted.[58]

The equity offset concept may address this problem by offering two normative incentives over and above those arising from the environmental benefits of carbon offsets. First, the offset scheme may allow a person interested in decreasing her environmental impact to do so in a way that also reinforces her altruism toward low-income individuals. Second, the offset scheme may enable environmental politics to be understood less as a zero-sum game and more as a collective action problem. The individual-to-individual offset scheme may enable individuals who are aware of their disproportionately high consumption patterns to act in a way that is consistent with their concern for the socioeconomic inequality that enables them to have a disproportionate impact on the environment in the first place. Both the more conservative norm of altruism for the poor and the more liberal norm of concern about the injustice of socioeconomic differences may be activated by these offset schemes.

One way to increase the altruistic aspect of the normative benefits to offset purchasers is to use the internet to link purchasers

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56 *See* Vandenbergh & Steinemann, *supra* note 3, at 1720-21.

57 *See* DAVID A. CROCKER & TOBY LINDEN, ETHICS OF CONSUMPTION: THE GOOD LIFE, JUSTICE, AND GLOBAL STEWARDSHIP (1998); NORA HAENN & RICHARD R. WILK, THE ENVIRONMENT IN ANTHROPOLOGY: A READER IN ECOLOGY, CULTURE, AND SUSTAINABLE LIVING (2006); JUST SUSTAINABILITIES: DEVELOPMENT IN AN UNEQUAL WORLD (Julian Agyeman et al. eds., 2003). While environmentalists raise concerns that individuals purchase carbon offsets to distance themselves from responsibility for their behavior (*see* Vandenbergh & Steinemann, *supra* note 3, at 148-49), the equity offset scheme discussed here may reinforce not only the individual's responsibility to take steps to address climate change, but also to take steps to address economic inequities.

58 *See, e.g.*, Deborah L. Rhode & Lee Ross, *Environmental Values and Behaviors: Strategies to Encourage Public Support for Initiatives to Combat Global Warming*, 26 VA. ENVTL. L.J. 155 (2007) (examining public beliefs and values regarding climate change).

directly with individuals who are willing to use the subsidy for the intended purpose.[59] This approach would require that an organization provide a forum for individuals to post information about specific subsidy requests. The organization would also screen individuals for eligibility so that the posting would be accurate and would avoid disclosure of specific personal financial information. Another way to increase the economic justice aspect of the normative benefits to offset purchasers would be to link those purchasers with individuals in communities with particular demographic characteristics. In a hybrid model, communities (for example a church community) might adopt another (church) community for an offset program.

Although a variety of approaches are possible, all will require an understanding of the social context and norms of the individuals who could benefit from the offsets as well as the norms of those who purchase them. For some this will mean overcoming cultural assumptions about who cares about the environment.[60] Sensitivity to localized social contexts will be necessary to avoid a wide range of potential barriers to the use of equity offset-based subsidies.

B. Integration into a National Cap-and-Trade Scheme

In addition to its other benefits, a private equity offset scheme ultimately may demonstrate the feasibility of folding individual behavior into a national cap-and-trade program. Numerous federal legislative proposals include GHG cap-and-trade programs that focus on large industrial sources, and there is a growing consensus that Congress will enact some form of cap-and-trade program in the next several years.[61] These proposals include

[59] An example of an organization that does this regarding international charitable giving is GlobalGiving. GlobalGiving claims to have overhead of about ten percent of their total donations. GlobalGiving, GlobalGiving Corporate Fact Sheet, http://www.globalgiving.com/aboutus/media/backgrounder.html (last visited Sept. 20, 2007). Another example of an organization that uses the internet to connect donors and recipients is Locks of Love. *See* Locks of Love, http://www.locksoflove.org (last visited Sept. 20, 2007). In many cases, these organizations not only enable the donor to make a prompt gift with low transaction costs but also convey information to potential donors. *See, e.g.*, Breast Cancer 3-Day, http://www.the3day.org/site/pp.asp?c=pmL6JnO8KzE&b=2182537 (last visited Sept. 20, 2007) (providing information about breast cancer).

[60] *See, e.g.*, Carolyn Finney, Black Faces, White Spaces: African Americans and the Great Outdoors (2006) (Ph.D Dissertation, Clark University) (on file with author) *available at* http://www.cnr.berkeley.edu/community_forestry/People/Final%20Reports/Finney%20Final%20Report.pdf (examining conceptions of race and the environment).

[61] *See Despite Court Ruling, EPA Resists Calls for Mandatory GHG Program*, 28 INSIDE EPA 14, Apr. 6, 2007, at 2 (noting that one source believes that "[t]here is no longer a question there will be greenhouse gas regulation at the federal level, the question is which

downstream cap-and-trade approaches that focus on electric utilities and other large industrial carbon dioxide sources, as well as upstream approaches that focus on the producers of natural gas, petroleum, and coal.[62]

Whether taking the downstream or upstream approach, the cap-and-trade legislative proposals offered to date would reduce emissions from individual behavior only indirectly by increasing the price of various sources of energy and increasing energy efficiency incentives for utilities and other industrial sectors.[63] Downstream measures alone, however, could leave more than half of the current sources of emissions largely untouched.[64] In some cases, the proposals would set aside a portion of the allowance trading proceeds or initial allowance auctions to subsidize adaptation activities for low-income individuals, such as a provision in one bill that would mitigate the effects of high energy prices on low-income consumers.[65] These types of subsidies will address the equity problem that arises from the harm to low-income individuals caused by high energy prices, but they will do little or nothing to address the obverse problem of providing low-income individuals with the resources necessary to reduce their contribution to carbon dioxide emissions.

Although none of the leading legislative proposals would enable low-income individuals to generate tradable offsets from the

institution will be the first to do it."). For examples of recently introduced legislation, see CSIA, S. 280, 110th Cong. § 402 (2007) (proposing upstream and downstream trading programs); Clean Air Planning Act of 2006, S. 2724, 109th Cong. § 2 (2006) (introduced by Senator Carper et al., proposing a trading system for emissions from the electric generating sector).

62 For a discussion of upstream and downstream approaches, see Nordhaus & Danish, *supra* note 39, at 120.

63 For example, the CSIA incorporates individual automobile emissions into its statutory scheme indirectly by including an upstream program that would require petroleum refiners and importers to hold a tradable allowance for each ton of greenhouse gas emitted from the petroleum they sell. CSIA, S. 280, 110th Cong. § 121(a)(3) (2007).

64 Nordhaus & Danish, *supra* note 39, at 128 (concluding that a large-source downstream cap-and-trade program could reach, at most, "less than half of the nation's CO2 emissions").

65 The CSIA would establish a Climate Change Credit Corporation (CCCC). *See* CSIA § 201. The CCCC would be required to "use the tradable allowances to reduce costs borne by consumers as a result of the greenhouse gas reduction requirements of [the CSIA]. The reductions. . .may include arrangements for preferential treatment to consumers who can least afford any such increased costs." *Id.* § 202(b)(1). The CSIA also provides that "the [CCCC] shall allocate a portion of the proceeds derived from its trading activities to funding climate change adaptation and mitigation programs to assist low-income populations identified. . . as having particular needs in addressing the impact of climate change." *Id.* § 202(4).

purchase of energy-efficient consumer goods, integration of equity offsets into a larger cap-and-trade scheme is conceptually possible. Commentators who examine the inclusion of individuals in a cap-and-trade system assume that transaction costs present an overwhelming barrier.[66] Yet many of the transaction costs involved in industrial cap-and-trade programs arise from the allocation of emissions rights based on emissions baselines for those sources.[67] The number of individuals who might generate equity offsets exceeds fifty million, and individual baselines would be almost impossible to establish, but neither small numbers of sources nor verifiable baselines are essential if individuals are viewed as sources of emissions offsets, rather than as regulated entities. An equity offset program, for example, could generate tradable offsets from individuals without capping any one individual's emissions if the program is limited to those individuals who are highly unlikely to be able to take the steps that generate the offset (e.g., insulating a house or purchasing a more efficient vehicle or household equipment) in the absence of the subsidy from the purchaser of the offset. To reduce transaction costs, the emissions reductions could be quantified using standard assumptions regarding the characteristics and usage of the goods involved. For example, the emissions from replacing a mid-sized sedan with a hybrid, assuming average usage, might be presumed to reduce emissions by a fixed number of tons of carbon dioxide-equivalents per year.[68] Provided that the offsets eliminate emissions that would not otherwise be eliminated, problems arising from double-counting should be minimized.

To the extent transaction costs would arise from creating and documenting many small offsets, corporate or NGO intermediaries could bundle the offsets and sell them in sufficiently large units to create economies of scale. A mix of public and private monitoring and verification could reduce government administrative costs. Concerns arising from integrating equity offsets into a national or global cap-and-trade scheme could be vetted in advance via the

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[66] *See, e.g.*, Nordhaus & Danish, *supra* note 39, at 159 (concluding that "[a]n economy-wide downstream cap-and-trade program – because it implies the regulation of literally millions of individual GHG sources, including cars and homes – would be difficult and costly to administer, and therefore is not a viable prospect for a domestic GHG regulatory program").

[67] *See id.* at 120 (noting that "cap-and-trade programs are best suited to regulation of emission sources that can be readily measured and monitored").

[68] The retail offset firm TerraPass uses a similar tiered approach rather than attempting to calculate the specific emissions attributable to any one vehicle. *See* TerraPass, *supra* note 34.

new private equity offset market. To address any remaining concerns about the actual emissions reductions achieved, a cap could be imposed on the percentage that equity offsets could comprise of all tradable units. Several current bills take an analogous approach to other types of offsets.[69]

III. Conclusion

A successful response to climate change will require attending to the effects of socioeconomic inequality, including both the historical disproportionate burden of environmental harms on the poor and minorities, and the disproportionate financial capacity to reduce emissions. The family of options proposed here accounts for these concerns in the design of public and private responses to climate change. Instead of adversarial politics, the equity offset schemes proposed would re-characterize the political challenge of the climate change crisis as one that is beyond adversarial democracy.[70] Equity offsets would harness and extend the social influences that are driving the current retail carbon offset markets, enabling the individuals who purchase equity offsets to benefit from complying with emerging carbon emissions norms and norms regarding altruism or social justice. These schemes would not enable offset purchasers to evade personal responsibility (or to rename it as "charity"), but rather to share that responsibility with others. Although the design and implementation of equity offset schemes along these lines will face obstacles, these schemes may not only provide additional normative incentives for individuals to reduce their carbon footprints but also reduce resistance to the adoption of regulatory measures and enhance the efficacy of the measures that are adopted. In the long run, equity offset schemes may become an essential part of the current and proposed public cap-and-trade programs that currently focus largely on industrial sources. Equity offsets thus have the potential to become an integral part of the social response to climate change.

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69 *See, e.g.*, CSIA, S. 280, 110th Cong. §§ 144, 145 (2007).

70 *See* Jane J. Mansbridge, Beyond Adversary Democracy (1980).