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Chapter 2
Undoing Atmospheric Harm: Civil Action to Shrink the Carbon Footprint

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Global climate change represents the major environmental challenge of the modern era. An imposing body of scientific evidence links climate change to anthropogenic greenhouse gas (GHG) emissions (IPCC 2007; The Royal Society 2005; AMS 2003; NRC 2001). Carbon dioxide (CO_2) contributes more than three quarters of GHG emissions from human activity. In turn, more than 95% of global CO_2 emissions are due to fossil fuel burning and land use change (WRI 2006). Historical data show that carbon concentrations have increased 35% from pre-industrial levels of 280 parts per million (ppm), to reach the current 380 ppm (CDIAC 2006). This change in atmospheric chemistry coincides with a temperature increase of 0.6 ± 0.2°C in the twentieth century (IPCC 2007, 2001).

The Intergovernmental Panel on Climate Change (IPCC) projects that, due to cumulative GHG emissions from human activity (especially over the past century), average global temperatures are likely to increase between 2 and 4.5°C by the year 2100 compared to 1990 (IPCC 2007; 2001), unless major efforts are made quickly to reduce them. Such temperature increases correspond to carbon concentration levels of 541 to 963 ppm, respectively.[1] Warming at the high end of this range could have widespread catastrophic consequences (Schneider and Lane, 2006). The widely proposed protective threshold is carbon concentrations of no more than 450 ppm (Oppenheimer and Petsonk, 2005; Hansen, 2004; Parry *et al.* 2001).

With the international scientific community – led by the IPCC – largely in agreement regarding the role of anthropogenic behaviour in forcing a new climate, calls for immediate and sizeable policy action to arrest the problem are mounting. Recently, the Stern Review on the Economics of Climate Change, prepared for the Office of the Prime Minister and the Chancellor of the Exchequer of the United Kingdom, has announced the need for cuts of 80% or more in anthropocentric emissions involving all nations (Stern 2006). In June 2005, the national science academies of the G8 nations[2] (including the US) and those

[1] These values are mid-points for IPCC scenarios, and reported ranges for concentration and temperature are higher (1.4 to 5.8 °C for temperature and 490 to 1260 ppm for CO_2 concentration).
[2] The G8 nations include the United Kingdom, France, Russia, Germany, the US, Japan, Italy, and Canada.

of India, Brazil and China released a joint statement citing the urgency for significant and immediate responses to the emerging climate crisis (The Royal Society 2005). These proposals share a common perspective: namely, the need *now* for global policy innovation in changing the direction of present development paths which are wedded to conventional energy systems.

The political challenge of responding to climate change is daunting. Liberal democracies have shown particular difficulty in abandoning their commitment to a cornucopian politics of ceaseless economic growth in order to launch the transformative social changes needed to avert a significantly warmer world (Byrne and Yun 1999). The problem is especially evident in the case of the US, whose national government has refused to accept even modest reductions in its GHG emissions.

This chapter explores the politics of transformation needed to end the dangerous experiment in climate change now under way due to the failure of industrialized societies to limit their GHG footprint. First, international political negotiations are analysed and the need for an explicit commitment to carbon equity is shown as essential to the realization of climate sustainability. The Gini coefficient, a traditional economic measure of income distribution equity, is employed to explore how unequal carbon distributions – now and in the future – can prevent the achievement of climate mitigation, even if many nations act responsibly and ambitiously to alter their present energy pathways.

The chapter then examines political strategy in the face of US national governmental intransigence. Through an inventory of American civil society initiatives, a case is built for understanding the grassroots revolt under way in the US to challenge its national political posture. An alliance with this locality-focused revolt is recommended strategically as a means to undermine the American national government's support for climate inaction. But it is further recommended on the ground that eventually the politics of climate *action* must extend beyond the rhetorical level, where nations establish and enforce GHG reduction targets, to the level of practice, wherein social transformation is actually undertaken. An era of sustainability and equity in practice is ultimately the province of civil society and, specifically, its urban industrial communities in this instance because of their dominant role in GHG emissions. Urban action and innovation is essential if climate sustainability and carbon equity (defined below) are to be realized.[3]

2.1 Changing the Sky

Certainly for children, and for many (perhaps most) in their adulthood, the notion of human alteration of the atmosphere is baffling. The blue canopy is rarely conceived in human scale. Rather, it most often inspires the poesy of the human mind and spirit, in which we celebrate and bow in deference to the heavens and their celestial rulers. A distinct trait of modernity is that we now engage the heavens as a project of science and economics. We may have little choice, as we have changed its chemistry and the mechanics

[3] Data from UN and US sources indicate that urban communities account for more than three quarters of global CO_2 emissions, despite containing less than one half of the human population. The wealthy urban communities of North America, Europe, Japan, Australia and New Zealand release over 40% of the world's annual CO_2 emissions, although they are home to only 13% of the human community. By contrast, most of rural life is sustenance based and releases carbon at very modest rates – its population share of 54% accounts for less than 30% of yearly anthropocentric emissions (UN 2004; EIA 2004).

Table 2.1. Summary of IPCC scenarios.

Family	A1			A2	B1	B2
Scenario group	A1B	A1T	A1FI	A2	B1	B2
Population in 2050 and 2100 (Billion)	8.7	8.7	8.7	11.3	8.7	9.3
	7.1	7.0	7.1	15.1	7.0	10.4
World GDP in 2050 and 2100 (Trillion 1990 US$)	181	187	164	82	136	110
	529	550	525	243	328	235
Share of zero carbon in primary energy in 2100 (%)	65	85	31	28	52	49
Cumulative carbon emissions from fossil fuels (1990–2100, GtC)	1437	1038	2128	1773	989	1160
Cumulative carbon emissions from land use change (1990–2100, GtC)	62	31	61	89	−6	4
Carbon concentration in 2100 (ppm)	710	580	960	850	540	620
Mean temperature increase in 2100 compared to 1990 level (°C)	3.0	2.5	4.5	3.8	2	2.7

Source: IPCC 2001.

of climate associated with the molecular composition of the sky (for a discussion of this paradox, see Byrne and Glover 2005).

Future CO_2 concentrations in the atmosphere are partly a function of the amount of CO_2 released from fossil fuels and land use change over time. The US Energy Information Administration (EIA 2006, 2007) provides projections of world, regional and national CO_2 emissions from the use of fossil fuels for the next 25 years (2006–2030). The IPCC has produced 40 pathways, grouped within four sets of scenarios referred to as 'families', to capture the range of physical impacts associated with alternative assumptions about global social and economic trends. These families in turn have been grouped under the headings A1, A2, B1 and B2 (see Table 2.1).

The A1 scenario family describes a future with rapid economic growth and global population that peaks in mid-century and declines thereafter. Its subgroups map changes in the world energy system – a fossil intensive path (A1FI), a path with increasing reliance on non-fossil energy sources (A1T), or a path with a mix of fossil and non-fossil sources (A1B). Under the A2 scenario family, economic growth is regionally concentrated among Southern[4] nations and population is continuously increasing. The B1 scenario family describes a world with rapid change in economic structures, toward a service and information economy and with the same population trends as in the A1 scenario. The B2 scenario family emphasizes local solutions for economic, social and environmental sustainability, where global population continually increases but at a rate lower than trends in A2. In B2, intermediate levels of economic development coincide with less rapid and more diverse technological change than in the A1 and B1 storylines (IPCC 2001).

[4] 'South' and 'Southern' are used here to refer to the countries of Latin America, Africa, and Asia (excepting Japan, Australia and New Zealand), which are characterized by comparatively low annual CO_2 emissions per capita.

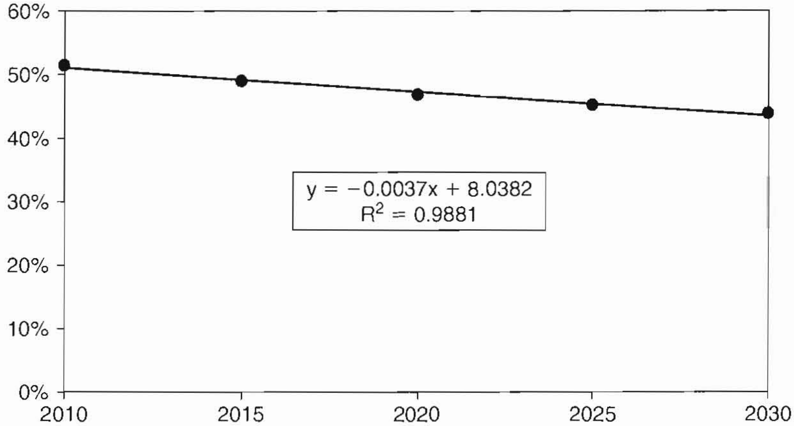

Fig. 2.1. Projected global share of industrialized countries' CO_2 emissions from fossil fuel burning under a BAU scenario (%).

Among these scenarios, A1B represents a mid-range path which can be considered a 'business as usual' (BAU) scenario for future CO_2 emissions.[5] After combining the EIA's reference case projections of fossil fuel-based CO_2 emissions for 2006–2030 and the IPCC's A1B projections for 2031–2100, BAU projections are made for future world CO_2 emissions from fossil fuels. These results were then combined with the IPCC's projections for emissions related to land use change for 2006–2100, under the A1B scenario.

An important aspect of future CO_2 emissions involves the location of these emissions. Currently, most fossil fuel-based CO_2 emissions originate in industrialized countries. However, rapid economic development and high population growth are expected to significantly increase the share of such emissions attributed to Southern countries. Nevertheless, on a per capita basis, emissions from industrialized countries are likely to remain higher for some time. Projections by the EIA provide the total fossil fuel-based CO_2 emissions of the industrialized (Annex 1) and industrializing (non-Annex 1) countries for 2006–2030 (EIA, 2006). A statistical curve fitting of EIA projections for the two groups indicates industrialized countries will account for a slowly declining global share of fossil fuel emissions (see Fig. 2.1). For the period 2031–2100, CO_2 emissions among industrialized and industrializing countries are derived by assuming the same trend for change in the national shares of emissions as we found during 2006–2030. This assumption means that the projected share of fossil fuel-based CO_2 emissions from Annex 1 will decrease from 51% in 2010 to 17% in 2100. The resulting BAU emission scenario (expressed in total CO_2 emissions and per capita emissions) is presented in Figs. 2.2 and 2.3, respectively.

Researchers at the Center for Energy and Environmental Policy (CEEP) have investigated scenarios for large CO_2 emission reductions since the early 1990s. A 1998 publication sought to fix scenario parameters in a manner that would satisfy: (1) a *sustainability* condition based on IPCC assessments of needed global CO_2 emission cuts to halt warming risk at

[5] For example, if we average carbon concentration levels and mean temperature increases under the scenarios in Table 2.1, the average value will be 710 ppm and the temperature increase will be 3°C, which are the concentration level and temperature increase for the A1B scenario.

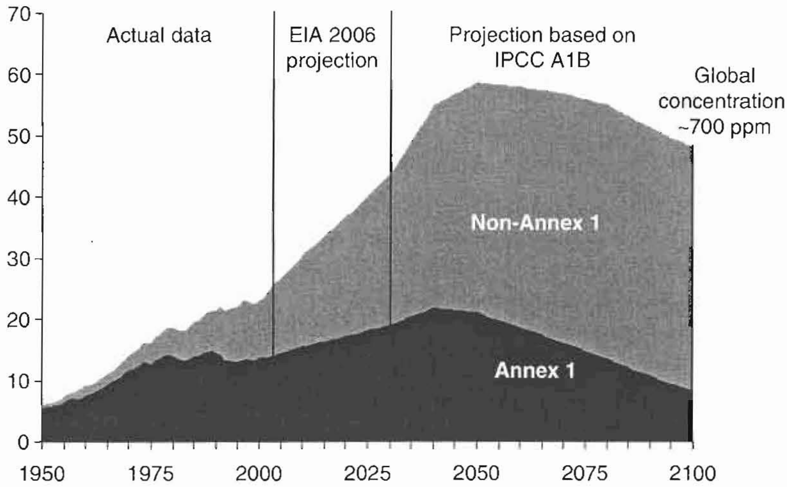

Fig. 2.2. CO_2 Emissions from fossil fuel burning under a BAU scenario (in $GtCO_2$).

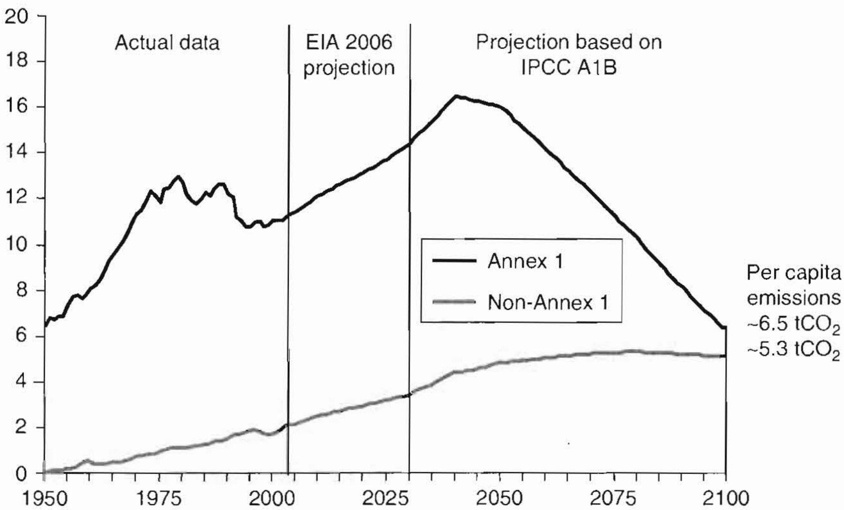

Fig. 2.3. Per capita CO_2 emissions from fossil fuel burning under a BAU scenario (tCO_2 per capita).

current levels; and (2) an *equity* principle in which the biospheric carbon store is equally shared (Byrne *et al.* 1998). The sustainability condition used in the modelling reported here is a level of emissions that will not increase carbon concentrations above 450 ppm by 2050.[6] This agrees with the most recent IPCC assessment (2007). To determine this pathway, the interrelation of carbon concentration levels and emissions are first established, and then a corresponding emissions path is derived. For this purpose, CEEP researchers relied upon

[6]The recent report of the UNDP (2007) on human development uses a 450 ppm concentration as well.

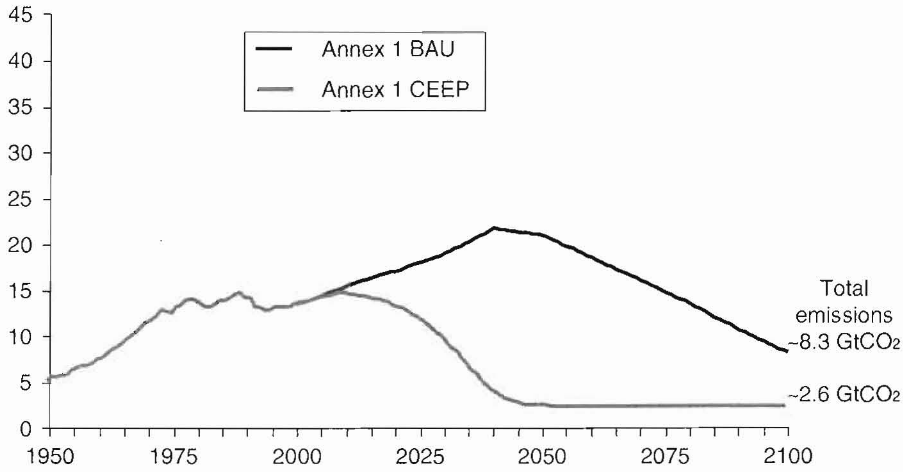

Fig. 2.4. CO_2 emissions from fossil fuel burning in Annex 1 countries under the BAU and CEEP scenarios (in $GtCO_2$).

a mixed-layer, pulse response function model (known as the Bern model).[7] In addition, assumptions were made regarding carbon uptake from the land biosphere and GHG emissions due to land use change based on IPCC (2001) and Joos *et al.* (2001).[8]

To satisfy the model's equity principle, a projection of future population growth is built on United Nations population projections through 2050 (UN, 2005); afterward, it is assumed that human population would stabilize at the 2050 level. Finally, an emissions path must stipulate reductions in carbon emissions by industrialized and industrializing countries. Starting in 2010, Annex 1 emissions are modelled to decline rapidly in order to reach a 2050 rate consistent with the specified sustainability and equity requirements. For Southern countries, carbon emissions are modelled to increase through 2040 and then decline, but at rates which are always slower than those for Annex 1.

Specifically, for Annex 1 countries, emissions would follow the BAU scenario until 2010 and subsequently decline to a level of 2 tCO_2 per person by 2050 (see Fig. 2.4). Total emissions from Annex 1 countries in 2100 would equal 2.6 $GtCO_2$. For non-Annex 1 countries, emissions would follow the BAU scenario until 2025, after which they grow slower than the BAU case. After 2040, non-Annex 1 emissions begin to decline, reaching the level of 2 tCO_2 per person in 2060 (see Fig. 2.5).[9] This scenario (hereinafter called the CEEP scenario)

[7]The model was developed by the Climate and Environmental Physics Institute at the University of Bern, Switzerland. Detailed discussion of this model, due to its technical complexity, is beyond the scope of this chapter. Readers can consult the IPCC's discussion of the model (1997); see also Joos and Bruno (1996) and Joos *et al.* (1996).

[8]Specifically, we used the assumption in the A1B scenario of emissions from land use change equal to 0.4 PgC per year, which implies that excess carbon released from the land biosphere is 2.7 PgC (based on Joos *et al.* 2001).

[9]The level of 2 tCO_2 per person in 2100 is based on the sustainable and equity rate of 3.3 tCO_2 per person at the 1990 world population level developed by Byrne *et al.* (1998). However, the 1998 Byrne *et al.* paper included all greenhouse gases that are not available for many countries, the analysis reported here addresses only CO_2. As a result, estimates of atmospheric stability (i.e. 450 ppm of CO_2) under the different scenarios presented in this chapter may understate the needed level of reductions.

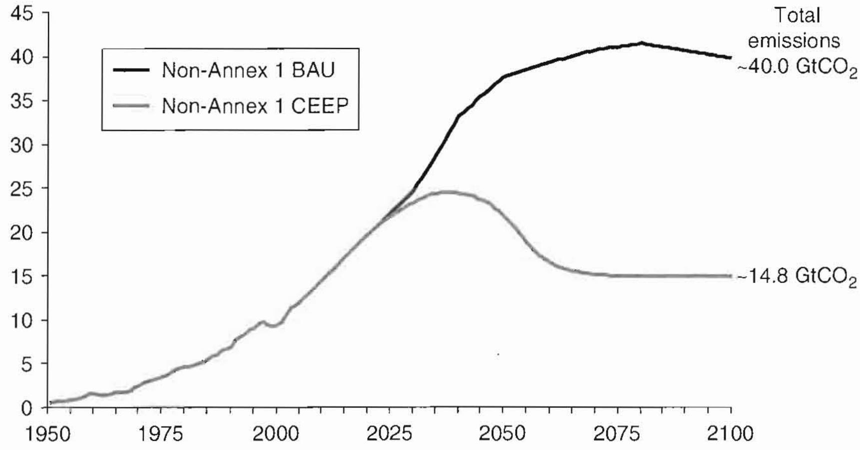

Fig. 2.5. CO_2 emissions from fossil fuel burning in non-Annex 1 countries under the BAU and CEEP scenarios (in $GtCO_2$).

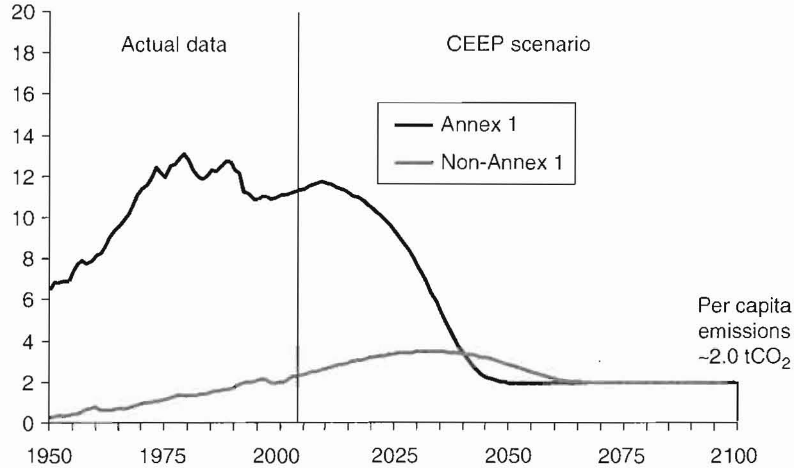

Fig. 2.6. CO_2 emissions from fossil fuel burning under the CEEP scenario (in $GtCO_2$).

expects Southern nations will take some time to adjust emission trends, while industrialized nations are subjected to an obligation of rapid emission reductions in order for the human community to meet the sustainability target.

In Figs. 2.6 and 2.7, resulting projections under the CEEP scenario are presented. Figure 2.6 shows that, for Annex 1 countries, per capita emissions should rapidly decline after 2010 to 2 tCO_2 per person in 2050. For the non-Annex 1 countries, per capita emissions can grow until 2040, reaching 3.5 tCO_2 per person and then declining to a global average of 2 tCO_2 per person after 2060. Figure 2.7 indicates that, under the CEEP scenario, the achievement of a sustainable level of carbon concentration (i.e. 450 ppm by 2050) requires emissions to be nearly one third of those forecasted in the BAU scenario.

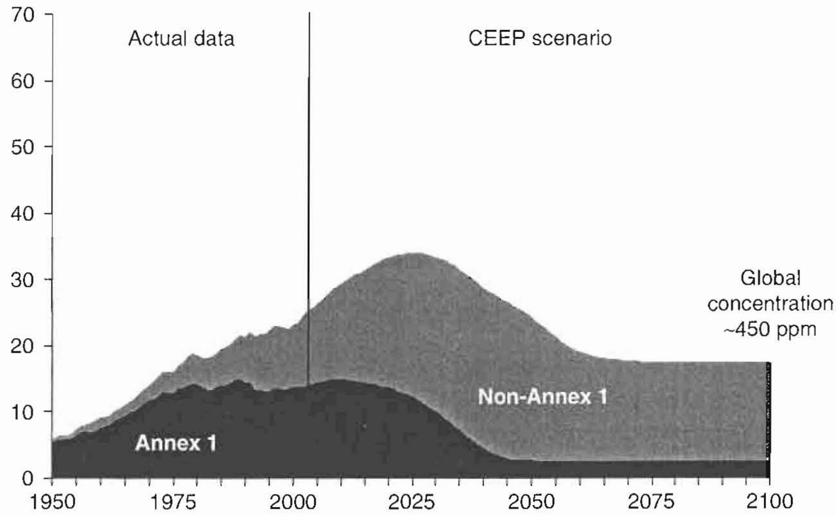

Fig. 2.7. Total CO_2 emissions from fossil fuel burning under the CEEP scenario (in $GtCO_2$).

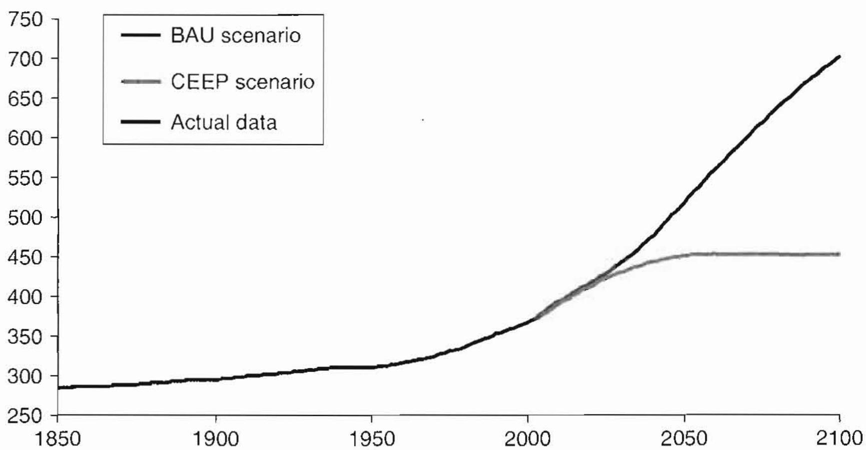

Fig. 2.8. Projections of atmospheric carbon concentration under the BAU and CEEP scenarios (in ppm).

For comparison, the carbon concentration paths for the BAU and CEEP scenarios are presented in Fig. 2.8. Under the BAU scenario, carbon concentrations will gradually increase and reach approximately 520 ppm in 2050 and 700 ppm in 2100. By contrast, under the CEEP scenario, concentrations stabilize around 450 ppm by 2050. Obviously, the BAU scenario violates the specified sustainability condition and equity principle.

2.2 Carbon Emission Allocations Under an Equity Consideration

Equity has both theoretical and practical groundings in concerns for sustainability. As previously explored in the literature, equity can be used to consider how different populations,

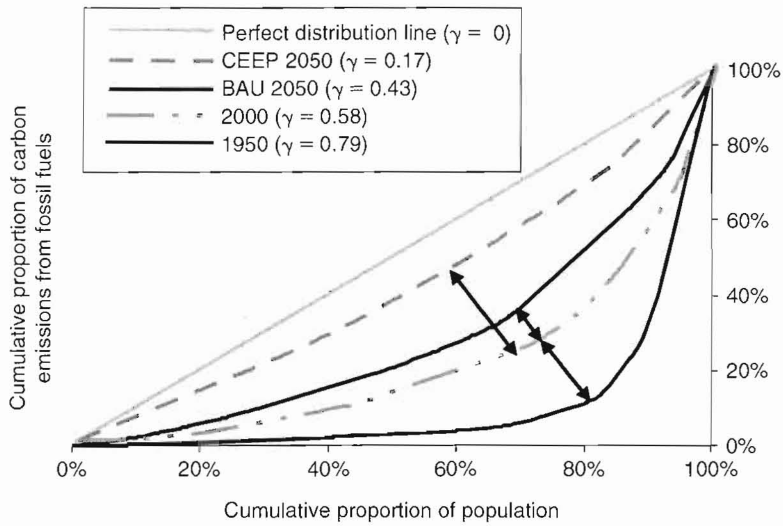

Fig. 2.9. Lorenz curves for global carbon emissions.

regions, and life forms – now and across generations – will be impacted by various environmental harms (Haughton 1999). Applied to the challenge of climate change, equity has been defined in terms of per capita GHG emissions that may safely and fairly be released by the global human population. To derive this amount, CEEP researchers first looked to the GHG emissions levels for 2050 identified in the 1990s by the IPCC as compatible with scenarios for a stabilized climate based on global carbon sink capacity (Byrne *et al.* 1998, p. 337). Then, this target volume for GHG emissions was divided by global population, approximately 5.2 billion people, in 1989. This calculation produced a yearly target of some 3.3 tonnes CO_2 equivalent released per person (Byrne *et al.* 1998, p. 337), apportioned equally among the residents of all nations regardless of their economic or political power. The per person target upholds a 'democratic principle that no human being is entitled to greater access to our atmospheric commons' (Byrne *et al.* 2001, p. 451). However, one should note here that increases in world population since 1989 have necessitated a further reduction in the allowable amount of GHG emissions per person, causing the original target of 3.3 tonnes CO_2 equivalent to fall to 2.0 tonnes by 2050.

With an equitable and sustainable emission rate in hand, the next challenge is to compare national and regional efforts to meet this rate over time. One notable method for measuring equity is the Gini coefficient (Stiglitz 1993), which is from Lorenz curves developed more than 100 years ago (Lorenz 1905) for the purpose of characterizing the extent of inequality in a community's income distribution. While the Gini coefficient has largely been used to gauge income inequality, it can be applied to measuring the inequality of carbon emissions among different nations or regions.

To plot a Lorenz curve for carbon emissions, per capita emissions were at first sorted from low to high values. Then, the percentage of total cumulative carbon emissions corresponding to the cumulative percentage of population is plotted. The derived Lorenz curves for the actual years of 1950 and 2000, as well as projected emissions under the BAU and CEEP scenarios for the year 2050, are presented in Fig. 2.9. As can be seen from this analysis, historical inequality decreased from 1950 to 2000, because non-Annex 1 emissions increased. If carbon emissions continue under the BAU scenario, inequality will continue to decline but will nonetheless be extensive in 2050 (see the discussion of Gini coefficients below). By contrast, under the CEEP scenario significant improvement will occur in the equitable distribution of carbon emissions.

After plotting the Lorenz curves, corresponding Gini (γ) coefficients are derived.[10] In 1950, γ was 0.79, which indicates that vast inequality in per capita carbon emissions existed at a global scale. In 2000, γ was reduced to 0.58, still indicating significant inequality. Under the BAU scenario, the Gini coefficient by 2050 will reach 0.43, indicating some improvement yet still failing to reach a more equitable allocation of emissions among nations. If the CEEP scenario is followed, by 2050 γ will have significantly decreased, reaching 0.17.

Thus, three distinct pathways exist toward equity, albeit 'equity' of very different types. The shift in the Lorenz curve from 1950 to 2000 depicts an increase in equity resulting from higher overall GHG emissions throughout the world, where developing nations have begun to increase their emissions toward the significant scale of releases demonstrated by industrialized countries. The Lorenz curve shift from 2000 to the BAU 2050 scenario portrays a world where equity increases because of higher non-Annex 1 emissions, while world emissions overall reach a plateau. In both instances, equity improvement occurs *without* corresponding progress in sustainability. In fact, both the historical and BAU cases increase warming risk, with the BAU path doing so at alarming levels (leading to CO_2 concentrations of more than 710 ppm by 2100). By contrast, the shift from 2000 to the CEEP 2050 scenario represents a type of equity under which non-Annex 1 nations at first emit increasing amounts of GHGs, while Annex 1 countries simultaneously achieve significant cuts. Importantly, aggregated global emissions – to include non-Annex 1 actors – fall to sustainable levels by 2050 and avert warming risk by the end of the century.

In this regard, the CEEP scenario achieves equity of national effort to realize climate sustainability, while the BAU case achieves neither. This underscores a key finding: it is not possible to avert warming risk if unequal efforts to reduce CO_2 emissions are maintained. The implication of this finding is next explored for the case of the largest CO_2 emitter in the world – the US – and the decision to date of its national government to refuse participation in global accord to cut emissions.

2.3 Impact of US (In)Action on Climate Sustainability and Carbon Equity

On sustainability and equity grounds, the CEEP scenario is far superior to the BAU path. Implementing the CEEP scenario requires both groups of nations (i.e. Annex 1 and non-Annex 1) to make commitments for reducing and curbing their emissions. This is particularly urgent in the case of the US, which accounts for more than 40% of emissions by Annex 1 countries (CDIAC 2006).

To reach sustainable emission levels not exceeding 450 ppm in 2050, all industrialized nations need to begin reducing their emissions no later than 2010. To demonstrate this point, an analysis is presented in which US CO_2 emissions are initially projected to climb according to the EIA (2006) forecast, and later emissions are reduced to the 2 tonnes CO_2 per capita level. Figure 2.10 displays the path of emissions projections for this scenario. The rest of the world is assumed to follow the CEEP scenario. The derived results show that even if other industrialized and non-Annex 1 nations meet their proportionate obligations under a 450 ppm policy regime, global concentrations increase to a probable 480 ppm by the conclusion of the century. Even an extreme case in which both the EU and Japan lower their emissions by 2030 to zero will result in a probable global concentration of 465 ppm (see Fig. 2.11).

[10] For a mathematically evolved discussion of the Gini coefficient and Lorenz curve, see Gastwirth (1972).

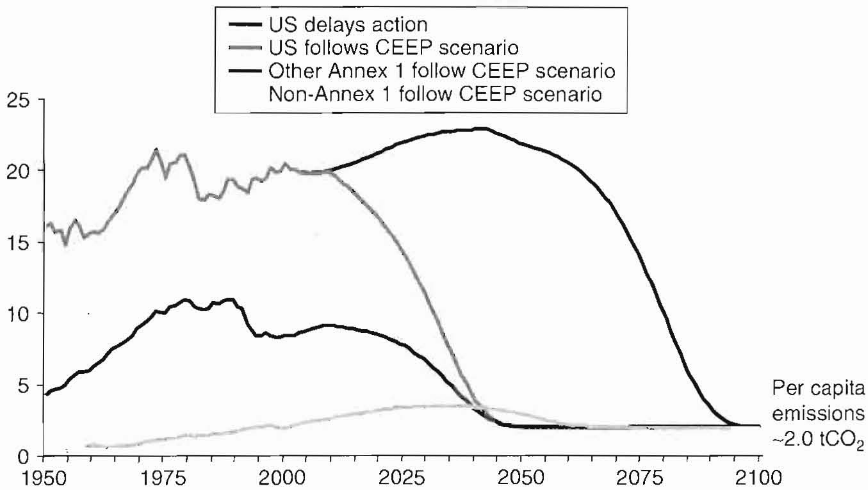

Fig. 2.10. Per capita CO_2 emissions from fossil fuel burning, in the US and other countries under different scenarios (tCO_2 per person).

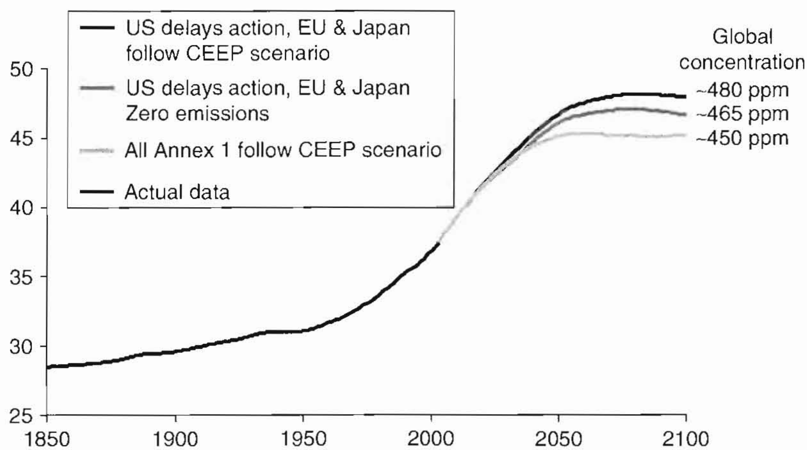

Fig. 2.11. CO_2 concentrations under different scenarios (ppm).

The zero emissions case is not only unlikely but will also increase the inequity of carbon emissions among nations, as demonstrated in Fig. 2.12. Under Scenario 1, where all Annex 1 countries follow the CEEP scenario, the Gini coefficient falls to 0.17. For Scenario 2 in which the US delays action, γ almost doubles to 0.33. If the EU and Japan try to compensate for US inaction, γ rises to 0.39 because inequality persists between Annex 1 and non-Annex 1 countries *and* inequality within the Annex 1 group is exacerbated by delayed US action (see Scenario 3 in Fig. 2.12).

2.4 American Civil Society in Revolt: Breaking Ranks with the National Government

As illustrated above, climate sustainability *cannot* succeed without robust participation by the US. Yet, US national policy is built on inaction and delay of the type modelled above.

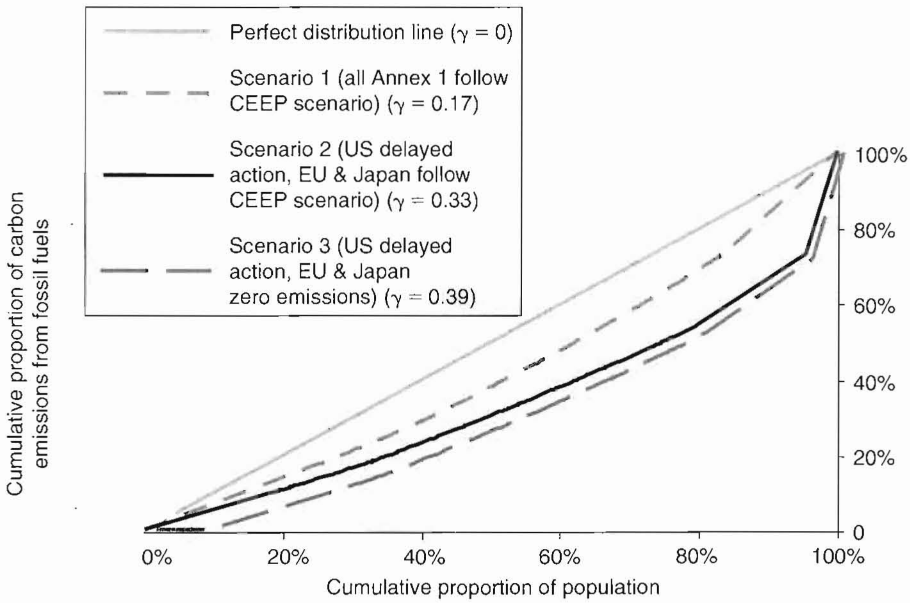

Fig. 2.12. Lorenz curves under different emission scenarios in 2050.

This raises a fundamental political problem: how shall the world community interact with American society to address the need for significant and rapid action.

Understandably, attention has been focused on US intransigence in UNFCCC treaty negotiations. Our argument here should not be construed as, in any sense, a call for diminished pressure on US national policy and its leadership. As we discuss below, however, there is evidence of a sizeable and growing divide between American national policy and civil society. This divide offers a second response to the political problem: engagement of American communities prepared to participate in the repair of the atmospheric commons. The politics of this strategy are merited not only by the possibility of overcoming US national governmental inaction, but it may also more properly locate the ground and momentum of the social change needed to halt the warming risk. As evident in the discussion below, major reductions in CO_2 emissions require *community transformation.*

National and international reduction targets and corresponding commitments of funds to support social action are essential components of greenhouse politics, but these agendas can neither embody the diversity of strategic actions needed, nor can they stand for community will and action – the crucible of transformative change. Indeed, what we describe here as a civil revolt against national policy underscores the incompleteness of nationally and internationally organized politics, even when the challenge is surely global in character.

An extraordinarily diverse collection of American states and cities are now working to fill the void left by the US national government in taking real action to sustain life in the greenhouse (Byrne *et al.* 2007, 2006a). Through their efforts, a politics of climate protection is forming which is intimately linked with goals of greater economic security, better public health, and improved quality of life. In this vein, ecological and community political agendas are merging while recognizing the differences of locale as a source of political innovation in responding to warming risk.

Municipal governments in the US represent an increasingly influential force for climate protection. Despite their increasing location as the headquarters of global economic activity amid a more general urbanizing trend, cities in many cases are simultaneously displaying an interest in addressing a global ecological agenda. The phenomenon of cities acting as forces for climate protection can be seen in the proliferation of individual policies alongside wider American city participation in climate-conscious policy networks. For example, the Cities for Climate Protection (CCP) campaign, established by ICLEI (International Council for Local Environmental Initiatives (ICLEI), 2007) has linked 650 local governments throughout the globe to cut CO_2 emissions 20% from 2000 levels by 2010. One hundred and seventy one US cities have adopted the CCP target, complemented by local action plans and programs which monitor and report progress (ICLEI 2007). At present, these US municipalities represent nearly one fifth of the country's population.

The US Mayors Climate Protection Agreement was adopted in February 2005. Its 435 participating cities have pledged to meet or go beyond targets originally established for the US under the Kyoto Protocol and also to push officials at state and federal levels to act accordingly. Yet another framework, the International Solar Cities Initiative (ISCI), calls on cities throughout the world – to include those in the US – to act more aggressively to reduce carbon emissions to levels consistent with that necessary to achieve climate stabilization by 2050. Its target is 2.0–3.3 tonnes CO_2-equivalent released per person annually, apportioned equally among the nations (and cities) of the world (Byrne *et al.* 2006a).

For cities that have undertaken aggressive efforts to control their greenhouse gas emissions, chosen pathways vary widely, reflecting the goals and needs of diverse communities. In Austin, Texas, a city of 650000 residents, local leaders have linked greenhouse gas reduction to two major platforms pursued via the city's municipal utility, Austin Energy (AE). The utility is working to source some 20% and 15% of energy demand in 2020 from renewable energy and energy efficiency, respectively (City of Austin 2003). The renewable energy goal includes a 100 MW solar commitment. These efforts aim to meet 'realistically achievable' goals set in 1997 for lowering CO_2 emissions by 4.5 million tonnes, a 25% cut compared to business-as-usual projections of 16.7 million tonnes in 2010 (City of Austin 1997, 2001).

Austin and its municipal utility have sought these measures for a number of reasons. First, should the city ever be forced to open its service area to competition, AE's provision of green power products was deemed capable of helping the utility retain its popularity among customers (Sustainable Energy Task Force 1998). This is an important consideration, as AE traditionally has provided a major source of revenue for the city of Austin. Second, as a municipal utility, AE has long encouraged conservation and energy efficiency in the community as a means of avoiding expensive additions to its generation capacity and grid infrastructure. Third, as the city over time has grown more reliant on natural gas for electricity generation, this fuel has become more expensive and its price trends are punctuated by volatile swings in amount. The city therefore seeks to proactively manage its vulnerability to reliance on spiking fossil fuel costs by utilizing wind and increasingly solar energy to meet local energy demand. Additionally, by carefully cultivating its reliance on alternative energy, Austin aims to stake a lucrative claim within the growing international market for advanced energy and related technology.

While all these factors have proven significant in helping the community to devise its ambitious programs for a more sustainable energy future, a major push for such initiatives can also be linked to the conscious efforts of local citizens and community groups who have worked since the 1970s to keep environmental issues on the energy agenda in Austin. In turn, the community has benefited from their foresight. Under AE's GreenChoice program to buy electricity from renewable sources, households and businesses pay an alternative fuel charge, which is currently higher than conventional charges, but it remains fixed throughout the term of the agreement, so that participants are protected from volatile conventional fuel prices. The use of solar PV and solar thermal installations in this program is supported by city-funded rebates, indicative of a community politics of sustainability (City of Austin 2003; Austin Energy 2004a).

For energy efficiency and conservation, AE is distinguished as a global leader in green building. Utility representatives work with the construction industry and end users to market innovative technologies and processes, offering training in related fields and rating both new and refurbished structures according to their energy needs. Rebates are provided to customers for the purchase of energy efficient products and appliances, alongside free or for-payment audits to help customers identify cost-effective improvements. Renters and homeowners are eligible for free services such as caulking, weather stripping, solar screen shading, ductwork sealing, and attic insulation (Austin Energy 2004b). To address transport, utility and city officials have pushed for a national commitment among automakers for the development and dissemination of the 'Plug-In Hybrid Vehicle' (Austin Energy 2005), which could be charged from the grid on electricity generated at night from wind farms. If wind were to play a substantial role in such electric generation, the relative cost of each 'electric' gallon of fuel to power the vehicles could prove vastly cheaper compared to current prices of gasoline – even as the cars themselves generate substantially less greenhouse gases (Austin Energy 2005).

While various AE programs are funded by customer rates and city grants and low and zero interest loans, the utility has simultaneously succeeded in achieving lower rates through avoiding construction of new electric plants (Regelson 2005). Aided by approximately $5 million in rebates for 40000 area apartment units, utility expenses have decreased up to 40% for some Austin residents. Approximately 1100 homes recently achieved a 'star' rating or better under AE's Green Building programs, and 19 commercial buildings have received LEED (US Green Building Council's Leadership in Energy and Efficiency Design) silver certification (Magnusson 2005). Additionally, GreenChoice has achieved the greatest US sales of utility-sponsored green power (NREL 2004), generating 340 GWh of electricity from renewable sources and lowering CO_2 emissions by nearly 255000 tons (ICLEI, n.d.). Collectively, Austin's efforts have allowed the utility to forego electricity generation equivalent to that of a 500 MW electric plant (Austin Energy 2003). In light of the city's successes to date in transforming its energy system, the Austin city council in February 2007 approved an advanced Climate Protection Plan. Looking ahead to 2020, targets entail increasing the role of renewable energy to meet 30% of overall energy demand, while offsetting demand for an additional 700 MW by enhanced energy efficiency and conservation. By 2015, new single-family homes should be 'zero net-energy capable', with other new buildings achieving at least a 75% increase in their energy efficiency (City of Austin 2007, p. 2).

The city of Chicago (population 2.8 million) has similarly acted to achieve a more sustainable future as 'the most environmentally friendly city in America', a goal extensively promoted by Chicago's mayor. Its efforts have centred, primarily, on lowering local energy demand and increasing the energy efficiency of both public and private sectors. Chicago has taken such action in part as a means to improve regional air quality, which has negatively affected human health and increased costs for industrial and other economic actors seeking to meet federal environmental standards (City of Chicago 2001, 2004). Moreover, heatwaves in 1995 and 1999 placed serious strains on the local electric grid in Chicago, leading to power outages and contributing to the deaths of hundreds of area residents (Regelson 2005). The city has subsequently sought to apply funds from a $100 million settlement negotiated with the local private energy utility, Commonwealth Edison (ComEd), to help mitigate energy demand and improve electric reliability within Chicago.

To reach these goals, the city has put forward a number of initiatives. Under its Rebuild Chicago program, the municipal government has supported partnerships by which zero or low interest loans are offered to manufacturers and other firms in helping them lower the energy intensity of their industrial processes. Meanwhile, private buildings meeting green standards benefit from an expedited process in receiving needed permits (City of Chicago Department of Environment 2006). As a result of improvements being made at present in Chicago's public buildings – representing approximately 15 million ft^2 – the city should avoid energy and related expenses of some $6 million each year. Further economic and environmental gains are expected as new municipal buildings in Chicago are now required to achieve at least LEED silver certification (Widholm 2006).

Chicago also has sought to dramatically enhance the natural beauty and greenery of the local environment. Particular efforts here have involved support for green roofs, which can now be spotted growing on 2.5 million ft^2 of both commercial and residential buildings, as well as City Hall (McCarthy 2006). Some 30 000 trees are planted annually (Schneider 2006; Johnston 2006). These efforts simultaneously aim to improve air quality within Chicago while also helping to lower the urban heat island effect.

Finally, in addition to the city's targeted push for greater energy efficiency, the municipal government of Chicago set a goal in 2001 for 20% of its electricity to come from renewable resources by 2006 (City of Chicago 2001). Although the goal was later pushed back to 2010, the city is working with public and private partners, including ComEd, in placing solar energy installations throughout Chicago. Noteworthy examples of solar power can now be found atop the Chicago Center for Green Technology, as well as local schools and museums (Chicago Solar Partnership 2006). The emphasis on distributed clean electricity generation serves not only to enhance the reliability of electric service, but also helps reduce pollution and encourages local consumer interest and awareness regarding solar energy and alternative resources.

Through these initiatives, Chicago aims to improve environmental conditions in the city, lower energy costs for industrial, commercial, and residential energy users, and facilitate the emergence of a new industrial sector – one specifically linked to clean energy technology and services. More broadly, the city can lower its greenhouse gas emissions some 7% beneath its 1990 levels by 2012, a policy target established as part of Chicago's participation in the US Mayors Climate Protection Agreement (City of Chicago Department of Environment 2006; City of Seattle Mayor's Office 2006). Environmental *and* economic sustainability thus figure prominently in Chicago's political agenda for the twenty-first century.

As with Chicago, the city of San Francisco is taking major steps to alter its energy future by promoting energy efficiency and utilizing the savings to invest in renewable energy development. San Francisco's effort in this regard has been motivated by several factors. First, the community – like much of California – was subjected to the 2000–2001 energy crisis in the state, following the implementation of electricity sector restructuring (Beck 2002). At that time, service interruptions and escalating electric prices had major impacts on the residents and economy of the city. In more technical realms, San Francisco's location on a peninsula means that the city must rely significantly on electric imports into the community. With mounting demands on its limited energy infrastructure due to population and economic growth, local officials have expressed concern that existing transmission capacity may not prove sufficient to area needs, with the potential for both reliability and price impacts (Smeloff *et al.* 2002). Moreover, as a means to take pressure off of existing transmission lines serving San Francisco, older power stations reliant on fossil fuels have long been required to operate within the city. Within the neighbourhoods where these plants have been located, local residents have experienced pollution and high rates of breast cancer and asthma (Greenaction 2007). Furthermore, San Francisco's bay location means that the city is vulnerable to rising sea levels, which could threaten much of its existing urban infrastructure (SFE and SFPUC 2004).

To lessen its reliance on fossil fuel electric plants and regional transmission systems, while improving local environmental health, San Francisco has adopted a multi-pronged approach. San Francisco voters passed a $100 million bond initiative as the funding mechanism for sustainability investments. San Francisco (which is both a city and a county) is seeking to alter the method by which it receives electric service in the community. At present, the city receives electric service from a private utility – Pacific Gas & Electric (PG&E). However, through a new plan for community choice aggregation, the local government of San Francisco is seeking to devise a framework by which it may offer blocs of residents and businesses alternative service bids from entities other than PG&E. Within the terms of service, the alternative electric service provider would be compelled to meet targets set by San Francisco for renewable energy, energy efficiency, conservation, distributed generation, and related measures to meet 360 MW of community energy demand, compared to typical daytime demand of 850 MW (SFE 2004). The new energy target could assist the city in meeting its goal to reduce community greenhouse gas emissions by 2012 from a business as usual projection of 10.8 million tonnes released annually, down to 7.2 million tonnes by that year – representing a 20% decrease (SFE and SFPUC 2004).

San Francisco promotes the installation of solar photovoltaic technologies in both public and private structures, to include the largest municipal solar installation in the US (atop the Moscone Convention Center). Together with energy efficiency measures, Moscone's PV installation is offsetting the demand for approximately 4 million kWh each year and avoiding the release of 35 000 tonnes of CO_2 that would otherwise be emitted from the use of fossil fuels (Moscone Center 2005). Efforts for alternative energy development are complemented by a number of initiatives to promote more sustainable construction. To lessen energy demand in buildings, San Francisco has passed a Green Building Ordinance under which new and renovated municipal structures larger than 5000 square feet are required to achieve LEED silver standards (SFE 2006). Through programs such as the Mayor's Energy Conservation Account, the Energy Watch Program, the Power Savers Program, and the Peak Energy Program, the city is working to reduce local energy demand by some 55 MW by 2008 and 107 MW by 2012 (SFE 2007; Smeloff *et al.* 2002).

US states are also taking sizable steps to reduce their impacts on the world's climate. Some 28 US states and Puerto Rico have adopted Climate Action Plans (CAPs) establishing goals for lowering greenhouse gas emissions through a number of diverse activities (EPA 2007). The range of such activities span energy efficiency, renewable energy, waste management and recycling, public transportation, the use of alternative fuels in fleets, and land use. Specific types of policies, and examples of state action in such areas, are briefly reviewed below.

Oregon mandates that new power plants offset 17% of their expected CO_2 emissions (Oregon Department of Energy 2004) through direct reductions or through contributions made to a fund managed by the state's Climate Trust. Similar power plant regulations have been adopted by Washington State (Washington Department of Ecology 2004). In California, Assembly Bill 32 mandates that the California Air Resource Board (CARB) put forward regulations by which to lower the state's greenhouse gas emissions by 2020 to 1990 baselines (CARB 2006). CARB is also to set GHG emissions standards for light trucks and cars by 2009. While the national government is challenging these standards, California's actions will and are already affecting the US, considering that states on both the east and west coasts have enacted compatible rules following California's example (Council of State Governments Eastern Regional Conference 2006; Freeman 2006).

The state of New York has established targets to lower its greenhouse gas emissions by 5% against 1990 levels in 2010, and 10% against 1990 levels by 2020 (New York State Energy Research and Development Authority (NYSERDA), 2002). Relevant strategies to pursuing such goals span energy efficiency and energy demand reduction, to greater reliance on renewable energy and the use of distributed generation (Center for Clean Air Policy 2003).

Delaware has set goals to lower its greenhouse gas emissions 30% below BAU by 2019, and has approved the formation of a 'sustainable energy utility' (SEU) to undertake energy policies supportive of climate protection (Delaware SEU (Sustainable Energy Utility) Task Force, 2007). The initiative is funded by a Sustainable Energy Bond and a charge on electricity sales which, together, will transform energy capital investment from its supply bias to a demand-side focus.

New Jersey's commitment to lower greenhouse emissions has grown considerably from its original target of 3.5% below 1990 levels by 2005 (New Jersey Climate Change Workgroup 1999). While modest by today's standards, this commitment included a signed Letter of Intent with the Netherlands for shared action in establishing a system for emissions banking. With private and public actors partnering under the program, New Jersey pursued 'covenants' for greater reliance on efficient technologies, reduction of waste, and conservation of both energy and open space (New Jersey Sustainable State Institute 2004). Success over the seven years of the initiative led to a dramatic step in 2007 – the governor of New Jersey issued an executive order under which the state must decrease its emissions 20% below 1990 levels by 2020, and by 80% by 2050 (nj.com, 2007). Representing the most aggressive climate planning commitment in the US, New Jersey – the country's most urbanized state – demonstrates how deeply climate action is embedded in the fabric of American civil society.

As well, states have joined together to pursue regional initiatives for climate protection. In the northeast states, the relative scarcity of native fossil energy supplies – resulting in often high energy prices – has contributed to an interest in alternative energy development *and* controlling carbon emissions (US Department of Energy (DOE) 2003). In 2003, 11 northeast states collectively established a regional cap-and-trade program to control carbon emissions from power plants (Union of Concerned Scientists 2003), known as the Regional Greenhouse Gas Initiative (RGGI). Under this framework, participating states have pledged to stabilize power plant emissions at 137 million metric tons from 2009 to 2015. Then, from 2015 to 2020, emissions must fall 10% beneath the cap (RGGI 2005). Present participation under RGGI includes ten states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) that have adopted a timeline for emissions reduction (RGGI 2007). Other states may join RGGI, whose partnership structure is open ended and welcomes additional participants.

State agencies in the northeast that seek to protect air quality are additionally working to devise cooperative actions for greenhouse gas reduction, as part of the Northeast States for Coordinated Air Use Management (NESCAUM). Beyond the northeast region, NESCAUM has worked 'to promote harmonized GHG accounting and reporting standards' with the California Climate Action Registry (California Climate Action Registry, 2005).

On the US west coast, the governors of Oregon, California, and Washington in 2003 established the West Coast Governor's Global Warming Initiative (WCGGWI (2004)) to examine the likely impacts of emerging climate and alternative energy policies. The WCGGWI (2004) additionally signalled its support for the creation of a regional system for emissions trading compatible with that enacted by RGGI, and the harmonization of GHG vehicle emissions standards. The governors of New York and California even put forward plans in October 2006 to link California's GHG reduction program with RGGI (Young 2006), allowing an opportunity for wider shared action among west and east coast states.

Together, the RGGI and WCGGWI states release approximately 1000 MMT CO_2 each year, some 20% of US CO_2 emissions (Fontaine 2005; EIA 2003). Representing approximately 30% of the US population, these states as members of a coordinated plan for greenhouse gas reduction should increase pressure on the national government to harmonize their efforts in ways compatible with the smooth operation of interstate commerce.

In assessing the impact of WCGGWI and RGGI efforts to lower emissions from power plants, such actions over the coming decade could result in an emissions decrease of 21% against present forecasts (based on data from the US Energy Information Administration (see Byrne *et al.* 2007).

Beyond dedicated policies to directly address climate protection, US states are also acting in diverse ways to support renewable energy and energy efficiency. Several policies are promoted not simply for their carbon impacts but, equally important, as tools to lower pollution, reinforce energy security, lessen volatility in energy prices, and create opportunities for new markets and jobs related to cleaner technologies. For example, the US is now home to the largest market in the world for customer-driven electricity from renewable sources (Bird *et al.* 2002). Its 'citizens' market is comprised of green pricing, competitive green power products, and 'green tags' markets in which individuals, communities and organizations can invest directly in renewable energy plant through the purchase of shares or 'tags'. In 36 states, approximately 600 utilities now offer green pricing options, helping to foster the development of 800 MW of renewable capacity (Bird and Swezey 2006). Commercial and industrial customers are also boosting demand for green power purchases as a means to improve their community standing, fulfil in-house environmental targets, and lower regulatory risks (Hanson and Van Son 2003; Holt *et al.* 2001). These initiatives have led to the development of 1710 MW of renewable capacity (Bird and Swezey 2006).

Many states have also required utilities to procure a minimum amount of their electricity from renewable sources, under Renewable Portfolio Standard (RPS) policies. By summer 2007, 24 states and the District of Columbia had passed RPS policies, with an additional 14 states examining such legislation. While RPS policies differ in scope and level of success (van der Linden *et al.* 2005), many states have appeared to support more far-reaching policies over time. Certain states have acted to reinforce existing laws, to enlarge targets, or to hasten compliance timelines, where their RPS policies have been active for at least three years (Rickerson 2005). Examples include New Jersey's enlarged target for 23% by 2021, with a 2% solar 'carveout' (DSIRE 2007), New York's enhanced target of 24% by 2013 (DSIRE 2007), and California's accelerated RPS schedule from 20% by 2017 to 20% by 2010 (Doughman *et al.* 2004; California Public Utilities Commission 2006). According to the Union of Concerned Scientists (2006), 44 900 MW of new renewable capacity will come online by 2020 due to current state RPS policies.

Markets for tradable renewable energy credits (RECs) have also begun to proliferate, as most US states with RPS programs allow utilities to obtain their mandated supply beyond state boundaries. Such markets are found in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, Texas and Washington, DC, and regional authorities have designed systems to track credit trades in Texas, the Northeast, and the Mid-Atlantic, with other efforts targeted for the West and the upper Midwest (Porter and Chen 2004; Wingate and Lehman 2003). The goal of such systems as part of RPS initiatives lies in cultivating wider cooperation among many states in meeting RPS targets and developing renewable energy markets.

By summer 2007, 21 state public benefit funds (PBFs) could be found in the US, with 15 dedicated to renewable energy development (DSIRE 2007). These PBFs are made possible by charges placed on electricity sales within individual states, usually at the level of \$0.001 to \$0.003 per kWh (Kushler *et al.* 2004). In turn, they generate yearly deposits into state renewable energy accounts approximating $500 million, so that by 2017 $4 billion will have been earmarked for renewable energy projects (Union of Concerned Scientists 2004). While wind projects in recent years have received the majority of these funds (Bolinger and Wiser 2006), PBFs are also strong forces for the installation of PV technology. For example, under the California Solar Initiative (CSI) of 2006, $2.35 billion in PBF funding will go toward the development of 3000 MW of solar electricity by 2017 (Go Solar California! 2006).

Accrued monies from PBFs may also be spent on energy efficiency, related research and development, and household weatherization for low and moderate income families, often in the form of rebates or production credits. Energy efficiency is the largest area of investment, where states often apply their PBFs in ways that enhance commitments made by utilities and other actors. An annual investment of $1.2 billion is expected from PBFs for energy efficiency in 21 US states until 2015 (DSIRE 2007; American Council for an Energy-Efficient Economy 2005). Even larger investments are likely, since the PBF monies do not include programs funded by cities, municipal utilities, rural electric cooperatives, and investor owned utilities, or state policies aiming to add to public spending with tax incentives for energy-efficiency investments and minimum efficiency standards for appliances (Alliance to Save Energy 2005).

In the transport sector, states are working innovatively to reduce greenhouse gas emissions from vehicles. California's zero emission vehicle standard has received much attention and is being imitated in New York and other states. Other state policies promote vehicle labels, tax incentives, and feebates as mechanisms to enhance the attractiveness of high efficiency and low emission vehicle models. Still other state initiatives advance the use of biofuels or the market competitiveness of hybrid-electric and fuel cell vehicles (Curtin and Gangi 2006). As well, 'smart growth' programs seek to foster urban land use planning where individuals can rely on walking, biking, or public transit rather than individual use of automobiles (Prindle *et al.* 2003).

A recently published estimate by this chapter's authors of the impacts of state and regional policies supporting energy efficiency, renewable energy development (including RGGI and WCGGWI) indicates that scale effects of grassroots action are substantial (Byrne *et al.* 2007). Transport policies were not included, as comprehensive figures on impacts from state policies are not yet available. A decrease in emissions totalling 1663 million tonnes CO_2 by 2020 is attributable to state energy efficiency policies. State RPS policies are forecasted to cause CO_2 emissions reductions of an additional 111 million tonnes by 2020. Projected decreases from the RGGI and WCGGWI programs by 2020 will provide an additional 48 million tonnes. Collectively, the three commitments represent an emissions reduction of 1,822 million tonnes of CO_2 by 2020, compared with the BAU case of 2812 million tons of CO_2 (US Energy Information Administration (EIA) 2007), or a *65% decrease in emissions* (see Byrne *et al.* 2007 for a detailed discussion of the methodology used in this assessment).

2.5 Toward a Grassroots Politics of Climate Sustainability

The political momentum built in US cities, states and regions to initiate climate mitigation and related efforts is to be contrasted with inaction by the US national government in addressing the climate challenge. Support for climate protection can be found in polling of Americans which points to 83% support among the country's citizens for greater national leadership in addressing climate change, and even deeper support for state and community action to address climate concerns (Opinion Research Corporation 2006). If the

American people appear to support such initiatives, the question becomes why are states, cities and regions leading the way, rather than the national government?

US national politics has for decades exhibited a troubling amenability to the interests of fossil fuel and automaker lobbies (Leggett 2001; Public Citizen 2005; NRDC 2001). A recent example of this influence can be found in the history of the National Energy Policy Development Group, which took input 'principally' from actors associated with such interests (US General Accounting Office (GAO) 2003). At the same time, the national administration has been noted for the presence of individuals with backgrounds in the auto, mining, natural gas, electric, and oil industries, in positions at the White House, the Environmental Protection Agency, and the Departments, respectively, of Energy, Commerce, and the Interior (Bogardus, 2004; Drew and Oppel Jr 2004; NRDC, 2001).

State-level politics may be able to obviate this influence through their efforts to allow a more direct citizen influence upon decision making. For example, 23 states permit citizens to petition for a direct vote (Initiative and Referendum Institute 2007), a strategy that has helped ensure the advancement of environmentally minded initiatives within states in recent years, such as the State of Washington's enactment by ballot of an RPS proposal in 2006 (Initiative and Referendum Institute 2007).

An additional reason for the ability of states and cities to push forward green-minded energy and climate policies may also be found in their traditional jurisdictional authority over many spheres of activity with links to such concerns. Examples here include the regulation of energy utilities, as well as states' and cities' responsibilities to address public health, local economic development, land use, and urban planning. A noteworthy rationale can also be found in the objective among many states and cities of avoiding the most damaging scenarios of climate change, which hold the potential to destroy local geography and natural resources and to threaten longstanding economic sectors. Rising oceans from melting ice caps portend saltwater contamination of drinking water as well as crop losses in Rhode Island (Rhode Island Greenhouse Gas Action Plan Stakeholder Process 2002). In New Jersey, hurricanes and droughts stand to have a larger impact on the state's many seashore developments (New Jersey Office of the Governor 2005; New Jersey Climate Change Workgroup 1999). Throughout the coming century, Connecticut's coastline could witness sea level rises of 56 cm, making necessary some $500 million to $3 billion in protective measures and negatively impacting forests and fisheries (Dutzik *et al.* 2004).

Another major driver of locale-based action for climate protection can be found in the relative diversity of the industrial makeup of many cities and states, where fossil fuel and automobile companies seldom dominate local economies. Moreover, policies to promote renewable energy and reduce overall energy demand can enhance demand for new technologies and industries that create local jobs (CEEP 2005; Hoerner and Barrett 2004; Union of Concerned Scientists 2005; Sterzinger and Svrcek 2004a, b). Also, community-based renewable energy initiatives can enhance landowner revenue and the municipal tax base, with such investments showing the potential for a greater multiplier effect on communities' economies than that associated with fossil fuels (CEEP 2005; Hopkins 2003).

The beneficial economic impacts of renewable energy development can be linked in part to its reliance on 'free' fuel inputs, particularly as greater reliance on natural gas-sourced electricity in the US has resulted in growing power price volatility (Henning *et al.* 2003; Klass 2003; Zarnikau 2005). Greater reliance on renewable sources of electricity, energy efficiency and conservation as tools to lessen energy demand can work as a hedge against over-reliance on natural gas (Delaware SEU (Sustainable Energy Utility) Task Force 2007; Rickerson *et al.* 2005; Biewald *et al.* 2003). For example, the Lawrence Berkeley National Laboratory has found that, for every 1% of demand replaced by green energy development, a price decline of as much as 2% takes place for boiler fuel natural gas (Wiser *et al.* 2005). This consideration has been cited in examinations of RPS proposals undertaken in Colorado, Delaware, Maryland, New York, Pennsylvania, and Texas, as a potential beneficial impact on electricity prices (CEEP 2005; Deyette and Clemmer 2005; Binz 2004; New York State Department of Public Service *et al.* 2004; Pletka *et al.* 2004; Chen *et al.* 2003).

In these and myriad other ways, grassroots politics in the US[11] is adopting a climate sustainability agenda in defiance of a national politics of inaction. The aphorism 'all politics are local' is mistaken if, at least in this case, it means that global scale problems command little local interest. Instead, it would appear more appropriate to interpret its meaning as a recognition that enduring political commitments, and especially those commitments seeking transformative change, are very often built from the bottom up, not the other way around.

2.6 Civil Strategy to Decarbonize the Human Footprint

The above analysis demonstrates the need to combine global agendas of carbon equity and climate sustainability if we are to successfully address the problem of climate change. Halting the current experiment in warming risk requires *all* industrialized societies to transform their social and economic structures in a manner that is consistent with the carbon cycle *and* social justice. Without transformation along both dimensions, it is unlikely that a global commitment to significantly and rapidly reduce greenhouse gas emissions can be mounted.

Additionally, it is now clear that irresponsible climate action by just one nation – the US – can result in the loss of sustainability for the entire world. If the US delays action, even a commitment by Europe and Japan to *zero* emissions cannot avert warming risk. This vital point cannot be stressed too strongly.

To resolve the current stalemate, the global political and scientific communities need to confront the necessity of an equitable foundation to strategies and policies for GHG reduction. This challenge involves recognizing equity not simply as a target for sustainable rates of energy use, but as a political basis for motivating all nations to adopt and act upon climate protective measures. In particular, if nations with burgeoning populations and economies such as China and India are to be expected to act in concert with international accords, the US – the world's largest violator of the atmospheric commons – must commit to a transformation of its social and economic structures. One political strategy is to sanction the US for its delayed action in the hope that compliance can be forced.

But another option – which does not preclude the sanction strategy – is to forge alliances with American civil society through, for example, locality focused partnerships with US states and cities. The methods to be pursued here remain subject to the democratic negotiations of the global political community, yet the need for such intervention cannot be forestalled. American civil society has undertaken precisely the changes in social and economic structure that its national leadership refuses to consider. Ultimately, compacts with civil society across the world will produce the transformation to renewable cities (Droege, 2007) and a global solar economy (Scheer 2004; see also Byrne *et al.* 2006b). International treaties among governments can call for action, but these agreements cannot produce results.[12] Our political challenge, therefore, is not only the creation of a rhetoric of climate justice, but its practice and this, after all, is the province of civil society.

[11] There is fast-growing literature of local policy leadership which includes initiatives in Europe and Asia that cannot be discussed here (please see, for example, Kim 2006).

[12] This fundamental point is sometimes overlooked. Recent interest in restoring US governmental leadership in the climate arena seems to make this mistake. See Claussen and Diringer (2007).

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