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CHANGING THE CLIMATE FOR PROSPERITY

DAVID FOSTER*

INTRODUCTION

My first job was on Wally Anderson's farm on the far side of the Red Jacket Bridge, detasseling corn on his river bottom field near the confluence of the Cobb and LeSeuer rivers in Southern Minnesota. I call it my first job for two important reasons. Wally Anderson was not a family member, and I was paid with a check at the end of the week. It was hot, hard, and buggy work, pulling the tassels out of the seed corn, every sixth row, to make sure that the pollination happened correctly. I was barely five feet tall and the corn was six; I had to stand on my toes and pull out the tassel at the very top without breaking the stalk.

I remember that job paid eighty-five cents an hour, less than the minimum wage,[1] because agricultural workers were not covered by the Fair Labor Standards Act.[2] Nor did the ban on child labor cover work in the fields.[3] And yet I remember it to this day as the hardest physical work I ever did—outpacing both the years I spent on road construction gangs and laying brick in a steel mill. But it was rewarding, nonetheless.

I remember that first job the way most Americans do because work is the defining experience in our social and cultural lives. Theodore Roosevelt summed up the American ethos about work when he said, "[f]ar and away the best prize that life has to offer is the chance to work hard at work worth doing."[4] In our history the defining work of an era similarly becomes the definition of a generation. Phrases such as "Winning the War" and "Rosie the Riveter"[5] described the collective work of the nation around which our identity has been shaped.

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* Executive Director, BlueGreen Alliance.

1. *History of Federal Minimum Wage Rates Under the Fair Labor Standards Act, 1938–2009*, U.S. DEP'T OF LABOR WAGE & HOUR DIV., http://www.dol.gov/whd/minwage/chart.htm (last visited Jan. 4, 2013).

2. 29 U.S.C. § 213(a)(6)(A) (2011).

3. 29 U.S.C. § 213(c).

4. *Congressional Intern Handbook: Introduction*, CONG. MGMT. FOUND., http://www.congressfoundation.org/publications/intern-handbook/introduction (last visited Jan. 4, 2013).

5. *Rosie the Riveter: Women Working During World War II*, NAT'L PARK SERV., http://www.nps.gov/pwro/collection/website/home.htm (last visited Jan. 4, 2013).

However, in the latter part of the twentieth century and increasingly in the twenty-first, something else besides the character of work has started to define who we are as a nation or culture. More often it is simply having the access to work at all. While we have had periods of high and prolonged unemployment before,[6] and endemic unemployment has impacted certain demographic groups,[7] until recently Americans have not thought about our country as infected with persistent, structural unemployment. But we are on the cusp of doing so today.[8] If we fail to take on this challenge and accept it as inevitable—in a sense, personalizing the responsibility for unemployment—we will weaken our capacity for collective accomplishments and cripple the forward march of American society.

We are also on the cusp of the climate crisis. That summer on Wally Anderson's farm was incredibly hot. But not nearly as hot as the summer of 2012 when 3840 all-time temperature records were set in the first week of July in the U.S.[9] Public awareness and concern about climate change—and its economic consequences—have again made the evening news, and a majority of Americans again believe global warming is real.

There is an alternative to both the unemployment and climate crises. But like most big alternatives it will require a massive shift of public priorities, not unlike the shift that mobilized the nation to win the Second World War.[10] In crises, Americans have demonstrated a collective willingness to sacrifice and work together. However, the twin crises of unemployment[11] and cli-

6. U.S. BUREAU OF LABOR STATISTICS, SEASONAL UNEMPLOYMENT RATE 1950–2012 (2013) (noting that unemployment reached over seven percent in 1958, 1961, 1975–77, 1980–86, 1991–93).

7. SYLVIA ALLEGRETTO & DEVON LYNCH, U.S. BUREAU OF LABOR STATISTICS MONTHLY LABOR REVIEW, THE COMPOSITION OF THE UNEMPLOYED AND LONG-TERM UNEMPLOYED IN TOUCH LABOR MARKETS 3, 10–11 (2010), *available at* http://www.bls.gov/opub/mlr/2010/10/art1full.pdf.

8. Palash R. Ghosh, *Persistent High Unemployment Among U.S. Teens Creating 'Lost Generation'*, INT'L BUS. TIMES (Aug. 30, 2011, 4:05 PM), http://www.ibtimes.com/articles/206115/20110830/teen-unemployment-retail-jobs-washington-minimum-wage.htm.

9. Meghan Evans, *Extreme Heat Wave Comes to End for Midwest, Mid-Atlantic*, ACCUWEATHER.COM (July 10, 2012, 9:01 AM), http://www.accuweather.com/en/weather-news/more-than-3000-temperature-rec/67593.

10. *America Goes to War: Mobilizing the Economy*, THE NAT'L WWII MUSEUM, http://www.nationalww2museum.org/learn/education/for-students/ww2-history/america-goes-to-war.html (last visited Jan. 4, 2013).

11. Charles Riley, *Long-Term Unemployment Crisis Rolls On*, CNN MONEY (June 11, 2012, 11:29 AM), http://money.cnn.com/2012/06/11/news/economy/long-term-unemployment/index.htm.

mate change[12] that we are facing today have a unique character that makes each difficult to mobilize the public for their respective and interrelated solutions. Rather than an external enemy, in each case we are facing a crisis, in part of our own making, that is unfolding slowly, and unfortunately corrodes our capacity for collective action at the very time it is needed most. Unfortunately, the escalating costs are almost impossible to quantify within the narrow constraints of annual budget cycles or political terms of office.

There is a case to be made that maybe in the era of small-bore government programs, simply pruning the status quo will get the current economic model headed in the right direction. We could concentrate, for instance, as former President Clinton advocates, on reducing the length of time it takes for employers to fill job vacancies from the current six months to three months[13] or attack the skills gap by better aligning existing job training programs with the three million existing job vacancies.[14] But I doubt that such narrow approaches will result in jobs miraculously reappearing in the country's deindustrialized heartland in the magnitude needed, or that these strategies can reduce unemployment to a tolerable five percent.[15] Maybe there is a case for drastically cutting taxes and slashing public spending as proposed by the Republican Congress to spark business investment.[16] But the failure of this approach to create jobs in the preceding decade or in Europe today leaves me dubious.[17]

Nor do slow, but sensible, reforms in the field of energy appear to point a path forward to curbing greenhouse gas emissions rapidly enough to avert the worst effects of climate

12. GLOBAL HUMANITARIAN FORUM, THE ANATOMY OF A SILENT CRISIS (2009), *available at* http://www.ghf-ge.org/human-impact-report.pdf (last visited Jan. 4, 2013).

13. Bill Clinton, Founder, Clinton Foundation, Remarks at the CGI America Meeting, in Chicago, Illinois (June 29, 2011).

14. Bill Clinton, *It's Still the Economy, Stupid*, THE DAILY BEAST (June 19, 2011, 10:00 AM), http://www.thedailybeast.com/newsweek/2011/06/19/it-s-still-the-economy-stupid.html.

15. *Unemployment*, QUICKMBA ECONOMICS, http://www.quickmba.com/econ/macro/unemployment/ (last visited Jan. 4, 2013) (discussing how some mainstream economists have placed the natural rate of unemployment in the U.S. in the 5% to 6% range).

16. Naftali Bendavid, *GOP Aim: Cut $4 Trillion*, WALL ST. J., Apr. 4, 2011, http://online.wsj.com/article/SB10001424052748703806304576240751124518520.html.

17. Paul Krugman, *The Austerity Agenda,* N. Y. TIMES, June 1, 2012, http://www.nytimes.com/2012/06/01/opinion/krugman-the-austerity-agenda.html.

change.[18] Today, I expect a more ominous future unless we welcome, indeed push for, disruptive change in our current economic and environmental policy directions.

I. The Crisis in Unemployment

One of the hallmarks of advanced industrial and post-industrial societies is the arrival of some level of permanent unemployment. Karl Marx called this class of unemployed workers, the "reserve army" of the proletariat.[19] Gunnar Myrdal called it the new "underclass."[20] Michael Harrington, famously, referred to it as "the other America."[21] Ronald Reagan disparaged it with the label "welfare queens."[22] Bill Clinton attempted to sweep them under the rug by "ending welfare as we know it"[23] while exploding the roles of permanently disabled workers on social security disability and supplemental security income (SSI).[24] Mitt Romney derides them as "the entitlement society."[25] He memorably risked his campaign by writing off the 47% of Americans who receive some form of government assistance—social security, food stamps, veterans' benefits, etc.—while currently paying no federal income tax even if their previous tax payments directly funded these programs.

But regardless of the label, a permanent feature of free market capitalism has been its inability to provide a job for everyone

18. Danielle Torrent, *Climate Change May Happen More Quickly Than Expected*, Science Daily (Nov. 30, 2011), http://www.sciencedaily.com/releases/2011/11/111130215740.htm.

19. Karl Marx, Capital, Vol. 1, Ch. 25, Sec. 3 (Samuel Moore & Edward Aveling trans., 1906), *available at* http://www.marxists.org/archive/marx/works/1867-c1/ch25.htm.

20. Gail Kligman et al., *A Note on the Meaning of "Underclass"*, European Roma Rights Ctr. (July 10, 2002), http://www.errc.org/article/a-note-on-the-meaning-of-quot%3Bunderclassquot%3B/900.

21. Scott Martelle, *'The Other America' Takes the Veil off American Poverty*, L.A. Times, May 27, 2012, http://articles.latimes.com/2012/may/27/entertainment/la-ca-michael-harrington-20120527.

22. John Blake, *Return of the 'Welfare Queen'*, CNN Politics (Jan. 23, 2012, 5:32 PM), http://www.cnn.com/2012/01/23/politics/weflare-queen/index.html.

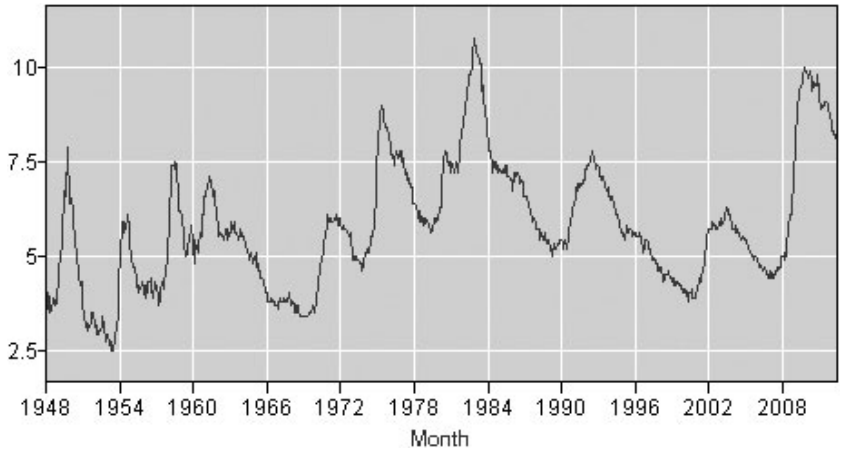
23. Barbara Vobejda, *Clinton Signs Welfare Bill Amid Division*, Wash. Post, Aug. 23, 1996, http://www.washingtonpost.com/wp-srv/politics/special/welfare/stories/wf082396.htm.

24. David C. Stapleton et al., Transitions from AFDC to SSI Before Welfare Reform, 64 Soc. Sec. Bull. 84 (2002).

25. Philip Rucker, *Romney Sees Choice Between 'Entitlement Society' and 'Opportunity Society'*, Wash. Post, Dec. 20, 2011, http://www.washingtonpost.com/politics/romney-sees-choice-between-entitlement-society-and-opportunity-society/2011/12/20/gIQAjXH57O_story.html.

who wants to work. As industrial societies mature, increasing unemployment has become a more difficult problem for social management, especially in a globalized labor market with its increasingly diverse populations and rising immigration across all continents.[26]

The Great Recession in the U.S. has accelerated this new and more dangerous trend. While it is somewhat difficult to track unemployment in the U.S. over time because of the shifting definitions of unemployment, the upward direction is unmistakable. The same is true of other advanced industrial economies.[27]



SEASONAL UNEMPLOYMENT RATE, 1948-2010[28]

There are other important statistics to note that are not included in official unemployment statistics, such as the increasing number of underemployed individuals, usually those who are working part-time but want full-time work. This number has only been measured in the U.S. since 1994.[29] Second is the trend

26. Landon Thomas, Jr., *London Riots Put Spotlight on Troubled, Unemployed Youths in Britain*, N.Y. TIMES, Aug. 9, 2011, http://www.nytimes.com/2011/08/10/world/europe/10youth.html?pagewanted=all.

27. *Jobless Rate in Rich Nations Edges Higher, Says OECD*, GULF TIMES (Sept. 11, 2012, 1:50 AM), http://www.gulf-times.com/site/topics/article.asp?cu_no=2&item_no=530588&version=1&template_id=48&parent_id=28.

28. *Seasonal Unemployment Rate: 1948–2012*, U. S. BUREAU OF LABOR STATISTICS, http://data.bls.gov/cgi-bin/surveymost?bls (last visited Jan. 4, 2013) (choose "Unemployment Rate, Seasonally Adjusted." Once generated, choose relevant years from the drop-down boxes at the top.).

29. ANDREW SUM & ISHWAR KHATIWADA, U.S. BUREAU OF LABOR STATISTICS MONTHLY LABOR REV., THE NATION'S UNDEREMPLOYED IN THE 'GREAT RECESSION' OF 2007–09 (2010), *available at* http://www.bls.gov/opub/mlr/2010/11/art1full.pdf.

toward declining participation in the workforce, particularly by men, which has dropped from near 80% in 1970 to 73% in 2005.[30] Third is the restrictive definition of unemployment, which does not count the large number of "discouraged workers," who have not actively looked for work in the preceding four weeks.[31] If the underemployed and discouraged workers were added to the current official unemployment rate, that number would almost triple.[32]

In 1948, the year I was born, Hubert Humphrey was elected the Senator from my state.[33] Thirty years later, in the year of his death, Congress passed and President Carter signed the Humphrey-Hawkins Act, committing our country to full employment, defined as 3% unemployment by 1983 for persons over the age of twenty.[34] Its underlying premise was simple. As another U.S. Senator from Minnesota, Paul Wellstone, used to say, there is no social problem in America that cannot be solved by a "good education, good healthcare, and a good job."[35] Where did we go so wrong, that the full employment commitments of the America of 1978, became the America with no jobs plan whatsoever in 2012?

The social consequences of a permanent global underclass of unemployed workers, disproportionately immigrant, casting from one diaspora to another in a global labor market which cannot employ them or train them and increasingly refuses to support them except in refugee camps in every country and on every continent, are enormous. Add to this problem the disruptive effects of climate change, and we have a true disaster on the horizon.

II. The Climate Crisis

In 2006, the Intergovernmental Panel on Climate Change, the preeminent international scientific organization established by the United Nations in 1992 to study global warming, issued its

30. *Changes in Men's and Women's Labor Force Participation Rates*, U.S. Bureau of Labor Statistics (Jan. 10, 2007), http://www.bls.gov/opub/ted/2007/jan/wk2/art03.htm.

31. Andrew S. Ross, *Many Unemployed Also Uncounted*, S.F. Chron., July 21, 2012, http://www.sfgate.com/business/bottomline/article/Many-unemployed-also-uncounted-3725038.php.

32. *See supra* notes 28–30 and accompanying text.

33. *Hubert H. Humphrey*, Minn. Historical Soc'y, http://www.mnhs.org/library/tips/history_topics/42humphrey.html (last visited Jan. 4, 2013).

34. Full Employment and Balanced Growth Act, 15 U.S.C. § 3101 (1978).

35. Paul Wellstone, Sheet Metal Workers Speech (Sept. 1999), http://www.wellstone.org/legacy/speeches/sheet-metal-workers-speech.

fourth assessment on the risks of climate change.[36] This landmark document was accepted by the National Academies of Science of every major industrialized country and became the platform from which governments and NGOs alike rallied to take decisive action. And while international momentum to do so grew steadily during the 2006 to 2008 period, launched by the Bali Roadmap in December 2006,[37] by 2009, that momentum had dissipated in the aftermath of an inconclusive Copenhagen United Nations Framework Convention on Climate Change (UNFCCC) conference.[38]

Since that time, the United Nations process has struggled under the weight of the global economic downturn, particularly in the industrialized western countries where rising unemployment in Europe and an agonizingly slow recovery in the U.S. have frustrated efforts to focus on climate change solutions.[39] While the political paralysis has grown more acute, the climate crisis has worsened. First, the level of global emissions has sharply accelerated after a one year decline in 2009 and is on a much higher trajectory than anticipated by the IPCC in its 2006 report. Second, the economic impacts of climate change appear to be far worse and taking place more quickly than originally anticipated. Extreme weather events, desertification, wild fires, heat waves, sea level rise, ocean temperature increases, and glacial and polar ice melt are all worse than expected.

While the obvious weather impacts of climate change are resulting in a resurgence of public awareness of the problem, the politicization of the issue in the U.S. and the single-minded focus in Europe on austerity solutions to the Eurozone's debt crisis have stymied dramatic action. An especially troubling development is that emissions in non-OECD countries, particularly China and India, have increased far more quickly than expected.[40] The charts below spell out this dangerous develop-

36. INTERGOVERMENTAL PANEL ON CLIMATE CHANGE, IPCC FOURTH ASSESSMENT REPORT: CLIMATE CHANGE 2007 (2007).

37. *Bali Road Map,* UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/key_documents/bali_road_map/items/6447.php (last visited Jan. 4, 2013).

38. John Vidal et al., *Low Targets, Goals Dropped: Copenhagen Ends in Failure,* THE GUARDIAN (Dec. 18, 2009, 7:47 PM), http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-deal.

39. Mustafa Babiker & Richard S. Eckaus, *Unemployment Effects of Climate Policy,* MIT JOINT PROGRAM ON THE SCI. & POLICY OF GLOBAL CHANGE (July 2006), http://economics.mit.edu/files/2438.

40. Wynne Parry, *Greenhouse Gas Emissions Continue to Climb in 2011*, LIVESCIENCE .COM (July 20, 2012, 2:30 PM), http://www.cbsnews.com/8301-205_162-57476887/greenhouse-gas-emissions-continue-to-climb-in-2011/.

ment. Chart 1 shows the unanticipated, rapid emissions increase in the developing world. Chart 2 indicates the degree to which overall emissions are now on a trajectory to exceed the original IPCC worse-case scenario.

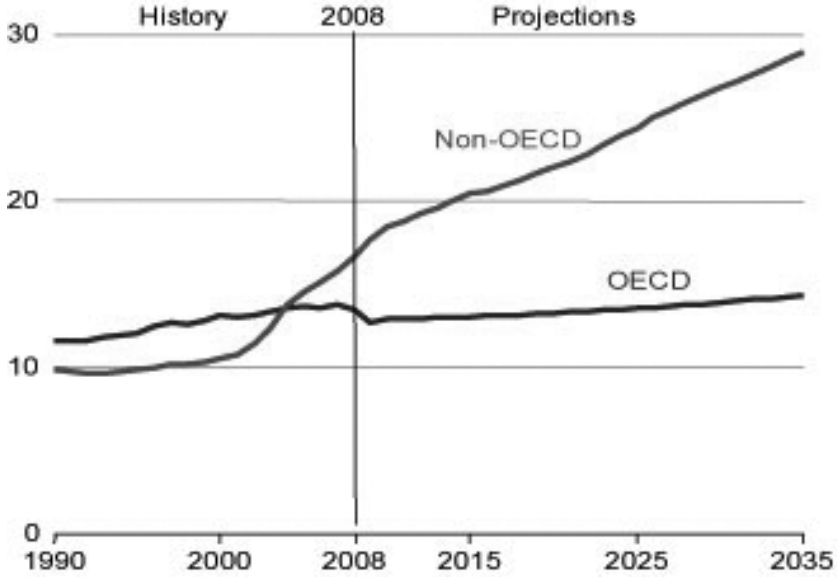


CHART 1[41]

41. *World Energy-Related Carbon Dioxide Emissions, 1990–2035*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/forecasts/ieo/images/figure_110-lg.jpg.

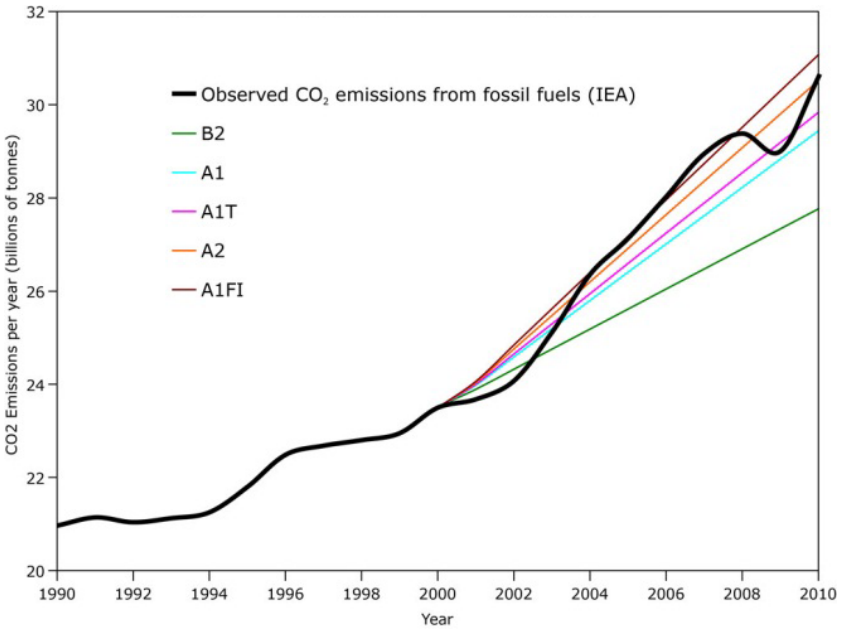


CHART 2[42]

In spite of this generally bad news, the raw data from the U.S. Environmental Protection Agency (EPA) emissions reporting documents, in Chart 3 below, contains some promising news. Absolute emissions in the U.S. declined by more than 5% between 2008 and 2009 and in 2010, despite an increase, total emissions still remained more than 6% below the high point in 2007. With a range of new regulations scheduled to kick-in on fuel efficiency in autos and trucks,[43] the declining use of the most inefficient coal-fired generating plants,[44] increasing renewable deployment,[45] and significant improvements in building[46]

42. John Abraham, *IEA CO2 Emissions Update 2010 – Bad News*, SKEPTICAL SCI., Figure 1 (June 3, 2011), http://www.skepticalscience.com/news.php?n=779.

43. *See* Press Release, White House Office of the Press Secretary, Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards (Aug. 28, 2012), *available at* http://www.whitehouse.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard.

44. *Why Are Old Coal Plants Retiring? It's Just Business (Not the EPA)*, ENVTL. DEF. FUND, http://www.edf.org/sites/default/files/fact-sheet-why-are-old-coal-plants-retiring.pdf (last visited Jan. 4, 2013).

45. *G20 Investments in Clean Energy*, SUSTAINABLE ENERGY FOR ALL, http://www.sustainableenergyforall.org/actions-commitments/country-level-actions/item/37-investments-in-clean-energy (last visited Jan. 4, 2013).

46. *See What is LEED?*, U.S. GREEN BLDG. COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988.

and appliance efficiency,[47] the rate of emissions increase in the U.S. is now projected to slow even under the base case scenario.[48]

This good news gives weight to the claim of leading energy efficiency businesspeople such as David Cote, Honeywell CEO, who recently remarked that if the U.S. and Europe were to universally adopt Honeywell's existing technology we could cut current energy consumption by 20% to 25%.[49]

Chapter/IPCC Sector	1990	2005	2006	2007	2008	2009	2010
Energy	5,287.7	6,282.4	6,214.4	6,294.3	6,125.4	5,752.7	5,933.5
Industrial Processes	313.9	330.1	335.5	347.3	319.1	268.2	303.4
Solvent and Other Product Use	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Agriculture	387.8	424.6	425.4	432.6	433.8	426.4	428.4
Land-Use Change and Forestry	13.8	25.6	43.2	37.6	27.4	20.6	19.6
Waste	167.7	137.2	136.5	136.7	138.2	136.0	132.5
Total Emissions	**6,175.2**	**7,204.2**	**7,159.3**	**7,252.8**	**7,048.3**	**6,608.3**	**6,821.8**
Land-Use Change and Forestry (Sinks)	(881.8)	(1,085.9)	(1,110.4)	(1,108.2)	(1,087.5)	(1,062.6)	(1,074.7)
Net Emissions (Emissions and Sinks)	**5,293.4**	**6,118.3**	**6,048.9**	**6,144.5**	**5,960.9**	**5,545.7**	**5,747.1**

* The net CO_2 flux total includes both emissions and sequestration, and constitutes a sink in the United States. Sinks are only included in net emissions total.
Note: Totals may not sum due to independent rounding. Parentheses indicate negative values or sequestration.

CHART 3[50]

But unless the U.S. takes decisive action to deploy our existing technologies and set long-term, mandatory targets that spur the innovation of greater efficiency and lower the cost of renewable energy sources, neither our own emissions curve, nor that of the non-OECD countries, will decline rapidly enough to avoid the worst impacts of climate change.[51]

While some environmentalists in the early years of climate policy debate in the U.S. chose to couch the dangers of global warming largely in terms of habitat endangerment and species extinction, policy makers in the last decade have increasingly focused on the serious dangers to human society. One of the most important studies in this regard was completed at the

47. *Appliance and Equipment Standards Result in Large Energy, Economic, and Environmental Benefits*, U.S. DEP'T OF ENERGY, https://www1.eere.energy.gov/buildings/appliance_standards/ (last updated Mar. 19, 2013).

48. John M. Broder, *U.S. Greenhouse Gas Emissions Projected to Grow Slowly*, N.Y. TIMES GREEN BLOG (Apr. 28, 2011, 10:05 AM), http://green.blogs.nytimes.com/2011/04/28/u-s-greenhouse-gas-emissions-projected-to-grow-slowly/.

49. *Profile of David Cote, CEO Honeywell*, PwC, http://www.pwc.com/gx/en/ceo-survey/ceo-profiles/david-cote.jhtml (click on "Read Interview Transcript" hyperlink for text of interview).

50. INVENTORY OF U.S. GREENHOUSE GASES AND SINKS: 1990–2012, EPA 11 (2012), *available at* http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-ES.pdf (last visited Jan. 4, 2013) [hereinafter *Inventory*].

51. *See* Michael Marshall, *Lowest US Carbon Emissions Won't Slow Climate Change*, NEWSCIENTIST (Aug. 20, 2012, 5:30 PM), http://www.newscientist.com/article/dn22196-lowest-us-carbon-emissions-wont-slow-climate-change.html.

request of the British government in October 2006, when Sir Nicholas Stern published his *Review on the Economics of Climate Change*.[52] Stern's work, discussed in a later section of this paper, unequivocally demonstrates that the costs of doing nothing to prevent climate change would be devastating to the global economy, while the costs of reasonable intervention would simply slow the rate of growth of global gross domestic product.

In the aftermath of the Great Recession, when the global economy stopped contracting and started a slow recovery, a number of NGOs and political parties around the world called for a "green recovery" or a "Green New Deal" in the words of the United Nations Environment Program (UNEP),[53] the German Green Party, the International Labor Organization,[54] and the BlueGreen Alliance, among others.[55] Our concept was simple. Recovery from the recession offered an opportunity to introduce a sustainable growth model to the existing global economy, a model which responded to the dual threats of climate change and unemployment by jumpstarting the deployment of clean energy generation and infrastructure.

In February 2009, at the biennial UNEP conference of environmental ministers in Nairobi, Kenya, Achim Steiner, UNEP Executive Director, called on environment ministers of the world's governments to interject themselves into the recovery debate in their respective countries:

> The $2.5 to $3 trillion to be mobilized over the next 24 months to tackle the economic crisis are sums almost unthinkable just 12 months ago.
>
> Spent wisely and creatively they offer the chance to deal with today's immediate crises and begin focusing and framing a response to those on the horizon from future food

52. *Stern Review on the Economics of Climate Change*, The Nat'l Archives, http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/sternreview_index.htm (last visited Jan. 4, 2013) [hereinafter *Stern Review*].

53. *Global Green New Deal*, United Nations Env't Programme (Oct. 22, 2008), http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=548&ArticleID=5957&l=en.

54. Int'l Labour Org., Global Jobs Pact Policy Brief: Promoting Green Jobs for Recovery and Sustainable Development, Brief No. 9 (2010), *available at* http://www.ilo.org/jobspact/policy/policy-briefs/WCMS_146807/lang—en/index.htm.

55. *See* John Podesta, *Green Recovery: A New Program to Create Good Jobs and Start Building a Low-Carbon Economy*, Ctr. for Am. Progress (Sept. 9, 2008), http://www.americanprogress.org/issues/green/report/2008/09/09/4929/green-recovery/.

> shortages, natural resource scarcity, energy security and climate change . . . .[56]

And to some extent the world responded. Virtually every stimulus package, from the U.S. American Reinvestment and Recovery Act to South Korea's and China's stimulus plans, included large "green economy" investments.[57]

But as the recovery stalled, there has been less certainty on the part of policy makers that green initiatives are the key to the success of recovery as opposed to an incidental opportunity. Indeed, in some parts of Europe the observation "[b]etter a brown recovery, than a green recession" has become gospel.[58] And in the U.S., conservatives have similarly attempted to discredit green initiatives and blamed them for misallocating capital investment in the economy and hampering recovery.[59]

In fact, nothing could be more wrong. Our global economy has reached the breaking point for a model reliant on increasingly rare and costly fossil fuels. It was not a coincidence that, in the summer of 2008, the economic crisis was precipitated by a combination of resource scarcity and climate-driven events—the skyrocketing oil prices of $140 a barrel,[60] food riots across the globe sparked by the cost increases of oil-based fertilizers and food scarcity from growing droughts,[61] and a sharp decline in manufacturing output, particularly in energy intensive industries.[62]

The increased costs of fossil fuels, both direct and indirect in the form of climate-related disasters, undermined economic

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56. *Realizing a "Green New Deal"*, UNITED NATIONS ENV'T PROGRAMME (Feb. 16, 2009), http://www.unep.org/Documents.Multilingual/Default.Print.asp?DocumentID=562&ArticleID=6079&l=en.

57. *See* Nick Robins et al., *Building a Green Recovery,* HSBC GLOBAL RES., 1 (May 22, 2009), http://www.hsbc.com/1/PA_esf-ca-app-content/content/assets/sustainability/090522_green_recovery.pdf.

58. Heinrich Böll Foundation Conference, Prague, Czech Republic, October 2010.

59. *See* Adam James, *Darrell Issa Again Shows Deep Disdain for Green Jobs, Even With 338,000 of Them in His State,* CLIMATEPROGRESS (June 7, 2012, 4:44 PM), http://thinkprogress.org/climate/2012/06/07/496362/darrell-issa-again-shows-deep-disdain-for-green-jobs-even-with-338000-of-them-in-his-state/?mobile=nc.

60. Kenneth Musante, *Oil Hits $140 for the First Time,* CNN MONEY (June 26, 2008, 3:41 PM), http://money.cnn.com/2008/06/26/markets/oil/index.htm.

61. *Riots, Instability Spread as Food Prices Skyrocket,* CNN WORLD (Apr. 14, 2008), http://articles.cnn.com/2008-04-14/world/world.food.crisis_1_food-aid-food-prices-rice-prices?_s=PM:WORLD.

62. *Manufacturing Index Shows Sharp Decline,* N.Y. TIMES, Oct. 1, 2008, http://www.nytimes.com/2008/10/02/business/economy/02econ.html?_r=0.

growth. And since that time, each economic recovery has sputtered to a halt, in part because rising oil prices acted as a direct tax on the economy. In the U.S., a ten dollar increase in the cost of a barrel of oil shaves one-tenth of a percent off U.S. GDP, as billions of dollars flow out of the U.S. and into foreign government treasuries in the Persian Gulf.[63]

We are at the point where long-term economic recovery depends on a strategic decision to convert the global economy from its reliance on a dwindling supply of fossil fuels. We must transition to clean energy sources with a stated goal of reducing carbon emissions by at least 80% below 1990 levels by 2050. Such clear policy signals to global markets would unleash a wave of investment unparalleled in the last fifty years. And such signals would stabilize energy prices, prevent the worst effects of climate change, and solve a ravaging unemployment problem that is threatening to ruin a generation of Americans.

The balance of this paper will examine the underlying demand for green investments in the U.S. and the success of existing efforts to create a road map to full employment.

III. JOBS21!

In the spring of 2011, after the failure of the U.S. Senate to pass comprehensive climate and clean energy jobs legislation and the change of control in the U.S. House of Representatives in 2010, the BlueGreen Alliance launched its Jobs21! Initiative.[64] Jobs21! aggregated a host of regulatory actions, tax incentives, loan guarantee programs, infrastructure initiatives, job training measures, and other market-building steps that the federal and state governments had pursued over the last decade to promote the clean economy and converted them into a comprehensive plan to create seven million jobs to replace those lost in the Great Recession.[65]

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63. John Podesta et al., *Cleaner Cars, Less Foreign Oil: A Path to Economic Prosperity and Oil Security*, CTR. FOR AM. PROGRESS, 3 (Mar. 30, 2011), http://www.americanprogress.org/wp-content/uploads/issues/2011/03/pdf/oilsavingsagenda.pdf.

64. *Schauer, Clark to Spearhead "Jobs21!" Campaign to Create Good Jobs in 21st Century Economy*, BLUEGREEN ALLIANCE (Mar. 1, 2011), http://www.bluegreenalliance.org/news/latest/schauer-clark-to-spearhead-jobs21-campaign-to-create-good-jobs-in-21st-century-economy.

65. *See generally A BlueGreen Alliance Blueprint to Solve the Jobs Crisis*, BLUEGREEN ALLIANCE, http://www.bluegreenalliance.org/news/publications/image/Platform-vFINAL.pdf (last visited Jan. 4, 2013) (detailing the launch of the Jobs21! campaign in 2011).

Jobs21! was also a public education effort to underscore the importance of environmental regulation to solving climate change and creating jobs.[66]

IV. Where the Jobs Are

The quickest way from my home to downtown Minneapolis is to cross the Franklin Avenue Bridge and turn north on West River Road which follows the Mississippi River from the northern to the southern city limits. I usually take that route once or twice a week, as I did on July 31, 2007, passing under the I-35 Bridge, just before reaching downtown. That bridge collapsed the next day, killing thirteen people and injuring 145, including several who were crushed while driving on West River Road.[67]

According to the American Society of Civil Engineers (ASCE), which performed a comprehensive review of American infrastructure, U.S. bridges rated a C, while our energy systems received a D+, our levees, dams, hazardous waste, and school systems received a D, and our roads and drinking and waste water systems received a D-.[68] This level of disinvestment in the foundation of a twenty-first century economy is far more detrimental to future economic growth than is the level of government debt.

Without the capacity to service an advanced industrial and information society, economic growth will inevitably atrophy and/or shift to more hospitable locations. The great irony, of course, is that in 2012 the borrowing costs for social spending on infrastructure projects have never been lower.[69]

V. A Twenty-First Century Infrastructure

One of the important challenges to building a twenty-first century infrastructure is designing it correctly. In the first half of the twentieth century, many American cities, including Minneapolis and St. Paul, enjoyed a greater population density. Jobs were closer to working class neighborhoods and employees relied on public transportation to commute to work. At its height in the

66. *See Inventory*, *supra* note 50.

67. Megan Chuchmach, *Minnesota I-35 Bridge Collapse Anniversary: How Safe Are Drivers Now?*, ABC: The Blotter (Aug. 2, 2007, 8:24 AM), http://abcnews.go.com/Blotter/bridge-collapse-anniversary-safe-drivers-now/story?id=16907710#.ULVuAobLnbg.

68. *2009 Report Card for America's Infrastructure*, Am. Soc'y of Civil Eng'rs, 2 (Mar. 25, 2009), *available at* http://www.infrastructurereportcard.org/sites/default/files/RC2009_full_report.pdf [hereinafter *Report Card*].

69. Simone Foxman, *US Government Borrowing Costs Hit New All-Time Lows*, Bus. Insider (July 24, 2012, 1:43 PM), http://www.businessinsider.com/treasury-yields-hit-new-all-time-lows-2012-7.

1920s, the Twin Cities had nearly 530 miles of light rail transit lines.[70] By the mid-1950s virtually all of that rail had been torn up, streets were widened, and the metropolitan area was redefined around the use of personal vehicles (e.g., road and bridge infrastructures). The early twentieth century transportation infrastructure no longer matched the one needed for the last half of the century.

In much the same way, an early twentieth century electrical grid will not be appropriate for the twenty-first century. For instance, we already cannot deliver the full potential of renewable electricity produced in the Great Plains wind corridor to where it is needed in American cities.[71] Substantial new transmission infrastructure will need to be built similar to the Montana project discussed below.

Similarly, in order to realize the environmental benefits of increased natural gas usage we must correct the leakage from decaying pipelines in our 6000 mile delivery system. Currently, the methane leaking from this system undermines the environmental benefit of converting industrial and utility boilers from coal and oil since methane is a far more intense greenhouse gas than the CO2 created by burning traditional fossil fuels.[72]

These examples of deficiencies in transmission and pipeline infrastructure underscore the need to integrate economic development, urban planning, and environmental policy. Failing to do so will result in spending today's resources on repairing or expanding yesterday's infrastructure.

Improvements in our road systems contribute to both fuel efficiency in vehicles and reduced congestion. These, in turn, lessen greenhouse gases. The jobs created by investments in America's highway system have been well-documented over the decades by the successive passage of the Surface Transportation Act.[73] Funded by a federal gas tax, levied at the pump, and deposited in the Highway Trust Fund,[74] the passage of the most

70. RICHARD S. PROSSER, RAILS TO THE NORTH STAR 95–106 (Univ. of Minn. Press ed., 2007).

71. *See* Rob Gramlich et al., *Green Power Superhighways: Building a Path to America's Clean Energy Future*, AM. WIND ENERGY ASS'N & SOLAR ENERGY INDUS. ASS'N (2009), http://www.awea.org/documents/issues/upload/GreenPower Superhighways.pdf.

72. *Natural Gas*, ENVTL. DEF. FUND, http://www.edf.org/energy/getting-natural-gas-right (last visited Jan. 4, 2013).

73. Surface Transportation Extension Act, 23 U.S.C. § 101 (2012).

74. *Id.*

recent two year version of the Surface Transportation Act is computed to have saved 500,000 construction jobs.[75]

However, funding has not been increased since 2005 though there are more than nine million more cars and two million more trucks on the road.[76] Is it any wonder that our roads and bridges have deteriorated to the extent that ASCE has graded these systems at D- and C?[77] More than 72,868 bridges have been deemed "deficient" with another 89,024 as "functionally obsolete."[78] The ASCE estimates that $2.2 trillion is required to update and repair our infrastructure[79]—and an increase in the gas tax could contribute to funding this deficit. The efficiency benefits of transportation expenditures are in addition to the exceptionally low borrowing costs currently facing state and local governments.

VI. Energy Systems

America's energy infrastructure is antiquated, carbon intensive, and reliant on transmission systems that lose seven percent of electricity between the generating units and consumers.[80] In the great race for the clean energy of the future, energy infrastructure will be critical for the delivery of the right amount of electricity at the right time. Especially in a world in which personal transportation vehicles may be increasingly powered by electric or plug-in hybrid engines, a modern energy infrastructure that can deliver renewable electricity to the right place at the right time will be critical.

Building such a system will also create hundreds of thousands of new jobs; manufacturing its components will create thousands more. Take, for example, one small project funded by the American Recovery and Reinvestment Act (ARRA). Renewable electricity was being generated on the Rim Rock wind farm in Montana, but the logical market for this power was in Alberta,

75. *Driving the Low Road in the Construction Industry: New Research on the Associated Builders and Contractors (ABC)*, Am. Bldg. Trades Unions, 8 (Nov. 1, 2012), http://www.bctd.org/Legislative-Conference.aspx.

76. *The 2012 Statistical Abstract: Transportation*, U.S. Census Bureau, http://www.census.gov/compendia/statab/cats/transportation.html (last visited Jan. 4, 2013).

77. *Report Card*, *supra* note 68.

78. *Id.* at 76.

79. *President Continues Push for Infrastructure Investment*, Am. Soc'y of Civil Eng'rs (Nov. 7, 2011, 1:10 PM), http://blogs.asce.org/govrel/2011/11/07/president-continues-push-for-infrastructure-investment/.

80. *Frequently Asked Questions: How Much Electricity Is Lost in Transmission and Distribution in the United States?*, U.S. Energy Info. Admin., http://www.eia.gov/tools/faqs/faq.cfm?id=105&t=3 (last updated July 9, 2012).

Canada which had no direct tie-in to the Montana electrical grid. Using funds from the ARRA, new transmission lines were constructed, employing 160 construction workers and design engineers on the project. Now the Rim Rock wind farm employs approximately seventy-five full-time employees who service the facility's Acciona wind turbines.[81] The turbines incidentally were manufactured in West Branch, Iowa, a factory that employs another 150 Americans.[82]

Since many of the U.S.'s most productive renewable energy resources are in sparsely populated parts of the country with low levels of energy consumption, building a new energy transmission infrastructure to move that electricity is estimated to create thousands of jobs.[83]

Redesigning that transmission infrastructure to create a "smart grid" will create thousands more. Designing the systems, software, and delivery products to make energy usage efficient will reduce greenhouse gas emissions, create an entire industry of jobs along the energy consumption value chain, and reduce costs to consumers. This kind of virtuous cycle not only pays for itself, it promotes the recirculation of dollars throughout the domestic economy. Instead of pulling those dollars out of the U.S. and using them for foreign oil purchases, they are plowed back into the goods and services that middle-class families need. Every dollar saved through energy efficiency results in decreased spending on energy imports and increased domestic spending that contributes to putting additional Americans back to work.

VII. SCHOOLS

A recent assessment of New Jersey's public school system revealed that over 700 building repair projects were issued as "emergent," meaning if the problems were not fixed immediately they would cause "an imminent peril to the health and safety of

81. Jason Walsh et al., *Rebuilding Green: The American Recovery and Reinvestment Act and the Green Economy*, BLUEGREEN ALLIANCE, 25 (Feb. 17, 2011), http://www.bluegreenalliance.org/news/publications/rebuilding-green-the-american-recovery-and-reinvestment-act-and-the-green-economy.

82. *ACCIONA Windpower—Wind Turbine Generator Assembly Plant: Economic Development*, ACCIONA N. AM. (2012), http://www.acciona-na.com/AccionaWindpower.

83. Richard W. Caperton, *Re-energize Regional Economies with New Electric Transmission Lines*, AMS. FOR A CLEAN ENERGY GRID (Dec. 15, 2011), http://cleanenergytransmission.org/re-energize-regional-economies-with-new-electric-transmission-lines/.

students or staff."[84] And yet New Jersey school children continued to attend classrooms in these buildings. In the case of New Jersey, it was particularly shameful that the state already had $3.9 billion in bonding authority but only allocated $100 million for emergent repair projects.[85]

In state after state and community after community the physical deterioration of our educational institutions has reached the point that it is impairing the learning experience of children and the teaching capability of educators.[86] Neither is acceptable.

Making the necessary repairs to America's basic K-12 schools to alleviate the ASCE D-rating would cost $112 billion[87] and, in turn, create over one million jobs in the construction industry.[88] Attacking this problem does not even begin to address the issue of greening our schools, e.g. improving energy performance, reducing water consumption and waste, and eliminating toxic exposures. As will be discussed, a massive green schools investment will result in benefits to public health, learning environments, and job creation.[89]

VIII. Drinking and Waste Water

In many American cities our drinking and waste water systems were designed and built in the nineteenth century. And in most cases they served us well as systems upon which a century of growth and prosperity were founded. Now, however, they are seriously degraded, given a D- by the ASCE. This is not only a serious public health issue; it is also a question of economic growth and competitiveness in a world that is becoming water constrained. The UNEP estimates that today 8% of the world's population faces chronic water shortages and that as much as

84. N.J. Work Env't Council, Our Children, Teachers, and Other School Staff Are at Risk (2012).

85. N.J. Work Env't Council, Health and Safety Hazards in Schools (2012).

86. Gregory Kats, *Greening America's Schools: Costs and Benefits*, U.S. Green Bldg. Council, 10 (Oct. 2006), http://www.usgbc.org/ShowFile.aspx?DocumentID=2908.

87. *Report Card*, *supra* note 68, at 126.

88. Mary Filardo et al., *Creating Jobs Through FAST!, A Proposed New Infrastructure Program to Repair America's Public Schools*, Econ. Policy Inst. (Aug. 11, 2011), http://web.epi-data.org/temp727/Fix%20America%27s%20Schools_Today_FINAL.pdf.

89. *See infra* Part XIV.

40% of humanity may be living in water stressed habitats by 2050.[90]

Climate change is leading to rapid desertification in Africa and, as recent summers have shown, creating significant uncertainty about agricultural production in traditional grain areas of the U.S.[91] Water access and usage is a critical issue for the twenty-first century and rebuilding America's water infrastructure in a way that is consistent with these new realities is critical. Inefficient use of water resources, leakage, contamination, and other challenges must be met.

With the arrival of more frequent climate-induced extreme weather events, a redesign of entire water systems is becoming necessary. For instance, in Duluth, Minnesota, in one forty-eight hour period a ten inch rainfall destroyed $190 million of infrastructure, washing out drainage systems, roadways, bridges, and culverts. The growing frequency of these "once every hundred to two hundred year" events to once a decade means that the systems of the nineteenth century cannot simply be repaired, they need to be redesigned and replaced.[92]

The growing deficiency of our water infrastructure means that there is no economic benefit to relying on the depreciated investments of the nineteenth century. We must create a new infrastructure that simultaneously helps us adapt to the changes of the climate that are already upon us while limiting additional carbon emissions and avoiding the even worse effects that are on the horizon. For example, both New York City and San Francisco are already redesigning their water discharge systems to avoid the back flows and salt water contamination caused by the current two-inch sea level rise attributed to climate change. Updates to New York City's water distribution and sewage systems to address climate related issues will cost $17 billion over the next decade,[93] while San Francisco is incurring costs of $20 to

90. *Increased Global Water Stress*, UNITED NATIONS ENVTL. PROGRAMME, http://www.unep.org/dewa/vitalwater/article141.html (last visited Jan. 4, 2013).

91. *See UN Issues Desertification Warning*, BBC NEWS (June 28, 2007, 10:49 AM), http://news.bbc.co.uk/2/hi/africa/6247802.stm; BERT BOLIN ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, IPCC SECOND ASSESSMENT: CLIMATE CHANGE 1995 (1995), *available at* http://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf.

92. Jim Ragsdale, *Flood Relief Tally Hits $190M*, MINN. STAR TRIB. (Aug. 7, 2012, 11:18 PM), http://www.startribune.com/politics/statelocal/165371246.html?refer=y.

93. EMILY LLOYD, N.Y.C. DEP'T OF ENVTL. PROT., ADAPTING NYC'S WATER SUPPLY AND WASTEWATER TREATMENT SYSTEMS TO CLIMATE CHANGE 3 (2005),

$40 million over the next five years.[94] However, these expenditures are dwarfed by the $28 trillion cost of a sea level rise of 0.5 meters to the world's largest coastal cities by the end of the century if nothing is done to halt climate change.[95]

IX. An Infrastructure Bank

One of the most important solutions to our infrastructure needs currently being discussed is the creation of a large, publicly guaranteed, privately funded infrastructure bank. A powerful argument for creating such an entity is the low cost of borrowing in today's stagnating economy. What better time to borrow money than when interest rates are below the rate of inflation? Banks are basically paying borrowers to use their money.

An infrastructure bank would solve two of the major dilemmas facing the American economy. First, it would provide a vehicle that would move private capital off the sidelines where U.S. companies currently have about $2 trillion sitting on their balance sheets and back into productive investment.[96] Second, it would address America's very significant infrastructure deficit, a shortcoming that will put a serious brake on organic growth once the economy starts expanding.

But there are two other important reasons why an infrastructure bank is key to American economic success. First, investments in infrastructure ripple throughout the American economy.[97] They create widespread demand for manufactured products and materials—everything from concrete and steel to bauxite and copper, sophisticated electronic control systems and new software. Second, infrastructure investments create demand for innovation throughout the economic value chain from edu-

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available at http://www.climatescience.gov/workshop2005/presentations/WA2.5_Lloyd.pdf.

94. Brett Walton, *Climate Change Alters the Calculus for Water Infrastructure Planning*, Circle of Blue (March 21, 2012, 10:23 AM), http://www.circleofblue.org/waternews/2012/world/climate-change-alters-the-calculus-for-water-infrastructure-planning/.

95. Peter Wilkinson, *Sea Level Rise Could Cost Port Cities $28 Trillion*, CNN Tech (Nov. 23, 2009), http://articles.cnn.com/2009-11-23/tech/climate.report.wwf.allianz_1_sea-level-rise-tipping-points-trillion?_s=PM:TECH.

96. Justin Lahart, *Companies Cling to Cash*, Wall St. J., Dec. 10, 2010, http://online.wsj.com/article/SB10001424052748703766704576009501161973480-search.html.

97. Isabelle Cohen et al., Associated Equip. Distribs., The Economic Impact and Financing of Infrastructure Spending 5 (2012), *available at* http://www.aednet.org/government/pdf-2012/infrastructure_report.pdf.

cational systems to logistics.[98] In the 1960s, building the infrastructure for space exploration created new technologies, production methods, and education investments throughout our economy.

One last point should be reiterated, however. All infrastructure projects are not equal. Investments that replicate the infrastructure of the twentieth century will be outmoded in the twenty-first. As demonstrated by the Duluth example, we need a twenty-first century infrastructure that helps us adapt to the current realities of climate change and that explicitly helps us avoid those impacts that are most serious, but still avoidable. In a word, we do not need to build more Hummers; we do need to build more Volts. And we need to build an infrastructure that is appropriate to the latter, not the former.

X. Renewable Energy Equipment

The last decade has seen remarkable growth in renewable energy, not only worldwide, but in the U.S. in particular. In fact, renewables account for 13% of all electricity generation in the U.S. Wind accounts for 23% of that, solar less than 1%, biomass 11%, and hydro 63%.[99] While the jobs related to installation of all this equipment—from mounting solar panels on residential roofs to the massive wind farms on the Texas prairies—are certainly the bulk of the jobs currently being created,[100] the renewable energy value chain continues to reinvigorate other sectors of our economy as well. The Brookings Institute's recent study, "Sizing the Green Economy," found that a disproportionate number of clean energy jobs are in manufacturing when compared to the economy as a whole.[101]

This is a particularly important finding, especially when we examine the role of manufacturing in reducing poverty and cre-

98. Katherine Bell, *Investing in Infrastructure Means Investing in Innovation*, Harvard Bus. Review Blog Network (Mar. 15, 2012, 9:54 AM), http://blogs.hbr.org/cs/2012/03/we_know_the_uss_infrastructure.html.

99. *How Much of Our Electricity Is Generated from Renewable Energy?*, U.S. Energy Info. Admin., http://www.eia.gov/energy_in_brief/renewable_electricity.cfm (last updated June 27, 2012).

100. In the solar industry, for example, over 57% of jobs created are related to installation. The Solar Found., National Solar Jobs Census 2011: A Review of the U.S. Solar Workforce 13 (2011), *available at* http://www.thesolarfoundation.org/sites/thesolarfoundation.org/files/TSF_JobsCensus2011_Final_Compressed.pdf.

101. Mark Muro et al., The Brookings Inst., Sizing the Clean Economy: A National and Regional Green Jobs Assessment 4 (2011), *available at* http://www.brookings.edu/~/media/Series/resources/0713_clean_economy.pdf.

ating a middle class in our country. Historically, America's greatest period of social mobility coincided with our country's zenith as the world's manufacturing leader. From 1950 to 1970, domestic manufacturing output rose from 65.0 to 104.5,[102] and still made up over 25% of the work force.[103] At the same time, median family income rose from $4,237[104] to $9,870,[105] while the number of families below the poverty level contracted from 22.4% in the late 50s to 11.1% in the early 70s.[106]

When the manufacturing sector started to decline in the U.S. as a result of the globalization of the supply chain and labor markets, poorly conceived trade agreements, and growing competition in the post-WWII economy, the traditional path upward for a high school educated work force rapidly narrowed. One of the most exciting features of the transition to a clean energy future is its capacity to revitalize manufacturing. In an early study done by the Renewable Energy Policy Project and the Blue-Green Alliance, a 25% federal Renewable Electricity Standard (RES) was demonstrated to have the potential to create 850,000 new manufacturing jobs throughout the supply chain. This study was based on a detailed application of the parts needed to manufacture all of America's renewable generation equipment at home.[107]

However, the study made clear that this was only the potential for job creation. In fact, unless appropriate safeguards were enacted in the renewable electricity standards that ensured a preference for domestically produced equipment, there was no certainty that U.S. regulations would create U.S. jobs. In this regard, the record has been mixed. For example, in the solar

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102. William H. Branson et al., *Trends in United States International Trade and Investment since World War II*, *in* THE AMERICAN ECONOMY IN TRANSITION 183, 190 (Martin Feldstein, ed., 1980), *available at* http://www.nber.org/chapters/c11297.pdf.

103. *Maybe It Isn't China*, ECONOMIST, Aug. 23, 2010, http://www.economist.com/blogs/freeexchange/2010/08/manufacturing.

104. U.S. BUREAU OF LABOR STATISTICS, 100 YEARS OF U.S. CONSUMER SPENDING: 1950 22 (2010), *available at* http://www.bls.gov/opub/uscs/1950.pdf.

105. BUREAU OF THE CENSUS, U.S. DEP'T OF COMMERCE, MEDIAN FAMILY INCOME UP IN 1970 1 (1971), *available at* http://www2.census.gov/prod2/popscan/p60-078.pdf.

106. *Poverty in the United States: Frequently Asked Questions*, NAT'L POVERTY CTR., http://www.npc.umich.edu/poverty/ (last visited Jan. 4, 2013).

107. GEORGE STERZINGER ET AL., BLUEGREEN ALLIANCE, BUILDING THE CLEAN ENERGY ASSEMBLY LINE: HOW RENEWABLE ENERGY CAN REVITALIZE U.S. MANUFACTURING AND THE AMERICAN MIDDLE CLASS 1 (2009), *available at* http://www.bluegreenalliance.org/news/publications/document/BGA-Phase-II-Report-PRINT.pdf.

photovoltaic (PV) panel industry, Chinese government subsidies for their manufacturers were combined with U.S. market installation subsidies to jump-start China's solar manufacturing industry. China went from a virtual non-player in the solar manufacturing industry to the global leader in five years with devastating consequences for U.S. and European manufacturers.[108] In a recent trade case filed by U.S. solar manufacturers, producers noted that 95% of solar panel manufacturing in China was done for the export market.[109] In the last year, several domestic PV manufacturers have gone into bankruptcy despite soaring installation rates.[110]

The wind energy industry's manufacturing has been governed by somewhat different economics. Both the size and complexity of turbine production has encouraged assembly close to the location of installation. However, the investment necessary for large industrial facilities requires longer term market certainty. Since financing for wind farms is dependent on multiple factors, i.e. steady electrical demand, adequate project financing, and competitive costs, advocates have attempted to create market certainty by passing state-based RESs, defining clear long-term goals for the amount of renewable energy required by specific dates. Currently, twenty-nine states have passed RESs ranging from 10% to 40%.[111] This market is roughly equivalent to about 13% of total domestic electricity consumption.[112] On the finance side, the Production Tax Credit ("PTC") and Investment Tax Credit provided a financial incentive for banks to lend money to developers. During a time of high banking industry profitability these credits were particularly valuable since they helped shield bank profits in other sectors of the economy.

However, although the PTC helped provide a financing mechanism for renewable projects, it was not able to provide

108. Keith Bradsher, *On Clean Energy, China Skirts Rules*, N.Y. TIMES, Sept. 9, 2010, http://www.nytimes.com/2010/09/09/business/global/09trade.html?ref=keith_bradsher&pagewanted=all.

109. Bruce Einhorn, *Firing Up China's Solar Market*, BLOOMBERG BUSINESSWEEK (Mar. 15, 2012), http://www.businessweek.com/articles/2012-03-15/firing-up-chinas-solar-market.

110. Matthew L. Wald, *A 2nd U.S.-Supported Maker of Solar Panels Will Close*, N.Y. TIMES, June 29, 2012, http://www.nytimes.com/2012/06/29/business/energy-environment/abound-solar-says-it-will-file-for-bankruptcy.html.

111. *Renewable Portfolio Standard Policies*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY (Sept. 2012), http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf.

112. *Sources of Electricity Generation, 2011*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/energy_in_brief/renewable_electricity.cfm (last updated June 27, 2012).

market certainty, and was therefore unable to attract the long-term investments necessary for major factories. As a result, renewable energy manufacturing stagnated in the early part of the last decade when compared to other countries.[113] U.S. developers relied on importing turbines, largely from European companies. As the aggregate demand from state RESs increased, however, both domestic assembly and manufacturing in the supply chain increased. According to the American Wind Energy Association (AWEA), the domestic content of U.S.-installed wind turbines has increased from less than 25% in 2005 to 60% today.[114] This amounts to at least 40,000 U.S. manufacturing jobs today. We say "at least" because it is somewhat difficult to measure the number of jobs in the wind energy supply chain. Over four hundred companies have self-reported their participation, although the exact number of jobs directly making one of the 8000 component parts of a wind turbine is uncertain.

XI. Energy Efficiency

One of the clearest paths forward to creating millions of jobs and avoiding the worst impacts of climate change is a significant initiative, both through regulation and public/private investment, in energy efficiency. American energy profligacy is well-documented. We use twice the energy per capita as our industrialized competitors in Europe or Japan.[115] And it is not that Americans cannot learn to conserve. Over the last two decades, California's energy consumption per capita has been flat while the rest of the country's usage has soared.[116] California's strict regulation and nation-leading efficiency standards have worked.[117]

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113. *Production Tax Credit for Renewable Energy*, Union of Concerned Scientists, http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/production-tax-credit-for.html (last updated Sept. 28, 2012).

114. *Wind Power: Economic Growth for Rural America*, Am. Wind Energy Ass'n, http://www.awea.org/learnabout/publications/factsheets/upload/Rural-Development_AWEAFactsheet_11-2011.pdf (last updated Mar. 2009).

115. Vaclav Smil, *A Hummer in Every Driveway*, Foreign Policy (Nov. 2011), http://www.foreignpolicy.com/articles/2011/10/11/a_hummer_in_every_driveway.

116. Adrienne Kandel et al., Cal. Energy Comm'n, A Comparison of Per Capita Electricity Consumption in the United States and California 9 (2008), *available at* http://www.energy.ca.gov/2009publications/CEC-200-2009-015/CEC-200-2009-015.PDF.

117. *California Energy Efficiency Solutions*, Envtl. Def. Fund, http://www.edf.org/energy/california-energy-efficiency-solutions (last visited Jan. 4, 2013).

In a 2007 study produced for Solar 2007, Roger Bezdek, at Management Information Services, estimated that an aggressive suite of energy efficiency policies pursued at the federal level would increase the current eight million direct and indirect jobs in energy efficiency (overwhelmingly in the private sector)[118] to thirty-two million jobs by 2030.[119] Bezdek's research demonstrated that half of these jobs would be in manufacturing, with large gains in the recycling and construction industries as well. Under the base case scenario, i.e. no change in existing energy efficiency policies, the number of energy efficiency related jobs would grow from eight to fifteen million.[120]

At a time when twenty-three million Americans are out of work,[121] discouraged and no longer looking for work, or working part-time while looking for full-time work, the country needs an approach to economic development that focuses on those regulatory activities that simultaneously stimulate demand while producing cost-savings.

Another study that validated the importance of Bezdek's approach to joint solutions for unemployment and climate change was produced by the McKinsey Institute. According to the Natural Resources Defense Council, the McKinsey U.S. Greenhouse Gas ("GHG") Abatement curve "demonstrates that reducing U.S. emissions below current levels would yield cost savings from energy efficiency (below the horizontal line) that roughly match the investments needed for more expensive but essential clean supply options (above the line)."[122]

118. ROGER BEZDEK, AM. SOLAR ENERGY SOC'Y, RENEWABLE ENERGY AND ENERGY EFFICIENCY: ECONOMIC DRIVERS FOR THE 21ST CENTURY 30 (2007), *available at* http://www.cleantechsandiego.org/reports/ASES-JobsReport-Final.pdf.

119. *Id.* at 39.

120. *Id.*

121. *Flash Fact*, AFL-CIO (Dec. 2012), http://www.aflcio.org/Flash-Facts/Jobless-or-Unemployed.

122. RICK DUKE ET AL., NATURAL RES. DEF. COUNCIL, THE NEW ENERGY ECONOMY: PUTTING AMERICA ON THE PATH TO SOLVING GLOBAL WARMING 20 (2008), *available at* http://www.nrdc.org/globalwarming/energy/eeconomy.pdf.

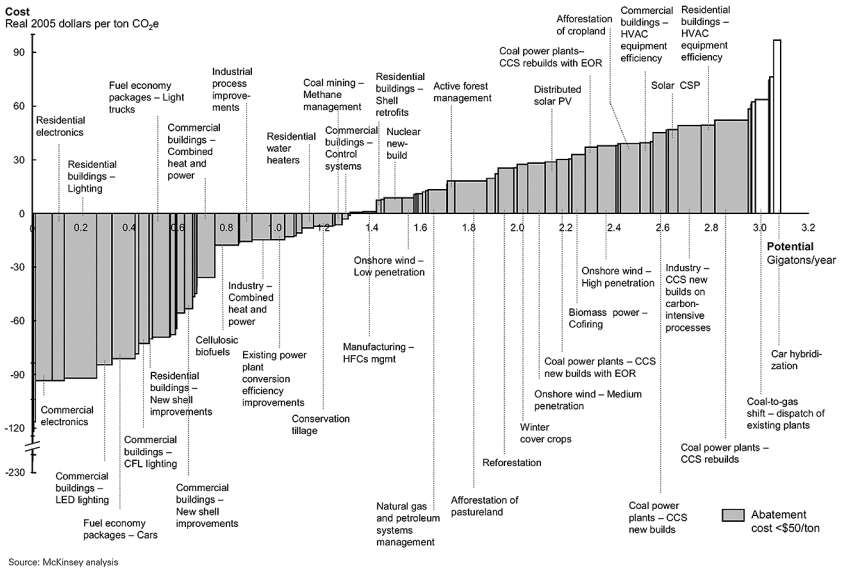

CHART #4

Energy efficiency measures have the unique capacity to pay for themselves while simultaneously creating jobs, unlike other investments that frequently rely on labor productivity improvements (and the elimination of jobs) to earn their internal rate of return.

XII. BUILDING RETROFITS

One example of the ability of energy efficiency to create jobs throughout a wide sector of the U.S. economy is through widespread energy retrofitting of the country's commercial and residential building stock. Architecture 2030, another advocacy organization that analyzed the McKinsey study reached the following conclusion:

> According to a recent McKinsey Global Institute report (February, 2008), the implementation of just straightforward, off-the-shelf, residential and commercial building efficiency measures would reduce energy consumption by 11.1 QBtu for an investment of $21.6 billion per QBtu.
>
> Investment in building energy efficiency is surprisingly effective. A single investment of $21.6 billion would replace 22.3 conventional 500 MW coal-fired power plants, reduce annual CO_2 emissions by 86.7 million metric tons, save 204 billion cu. ft. of natural gas and 10.7 million barrels of oil each year, save consumers $8.46 billion in energy

bills annually (less than a 3-year simple payback) and create 216,000 permanent new jobs.[123]

XIII. Transportation Efficiency

More efficient movement of goods and people throughout the economy provides another opportunity to make investments that pay for themselves with a net increase in jobs. These opportunities exist in the expansion and upgrade of existing freight rail systems, passenger rail, mass transit systems, more fuel efficient light duty and heavy duty vehicles, and improved roads and bridges.

In a recent report on the job creation and environmental benefits of freight rail, *Full Speed Ahead: Creating Green Jobs through Freight Rail Expansion*, the BlueGreen Alliance and the American Association of Railroads documented that each $1 billion worth of rail infrastructure investment would create or sustain up to 26,600 jobs.[124] In the manufacturing supply chain associated with freight rail, thousands of jobs are created in building and refurbishing rail cars, locomotives, tracks, switching equipment, and installation and repair equipment.

Since rail is by far the most efficient way to move goods—a gallon of fuel can move a ton of freight nearly 500 miles[125]—a 10% shift from truck to rail would reduce U.S. carbon emissions by twelve million tons.[126]

Similar efficiency opportunities exist for the transportation of people. The recent fuel efficiency rules implemented by the Obama administration are an example of how environmental rule-making can stabilize markets for consumer goods, spur innovation, and result in dramatic job growth.

In 2009, after thirty years of inaction on fuel efficiency rules, the Obama administration initiated a series of new rules affecting light duty and heavy duty vehicles.[127] The rules were accompanied by important additional policies, such as the Advanced

123. Edward Mazria, Architecture 2030, The 2030 Blueprint: Solving Climate Change Saves Billions 2 (2008), *available at* http://www.drexel.edu/~/media/Files/greatworks/pdf_fall09/2030Blueprint.ashx.

124. Ethan Pollack et al., BlueGreen Alliance, Full Speed Ahead: Creating Green Jobs Through Freight Rail Expansion 6 (2010), *available at* http://www.bluegreenalliance.org/news/publications/document/FullSpeedAhead.pdf.

125. *Fuel Efficiency*, CSX, http://www.csx.com/index.cfm/about-csx/projects-and-partnerships/fuel-efficiency/ (last visited Jan. 4, 2013).

126. *Environment*, Ass'n of Am. R.Rs., http://www.aar.org/Environment.aspx (last visited Jan. 4, 2013).

127. White House Office of the Press Secretary, *supra* note 43.

Technology Vehicles Manufacturing Loan Program, which encouraged innovation and investment in new technologies.[128] This program was so successful that the U.S. went from being a laggard in energy storage technology to the world leader in advanced automotive battery production.[129]

The net effects of the new Corporate Average Fuel Economy (CAFE) standards, loan programs, and technology supports were dramatic comebacks of the auto industry: they flattened U.S. oil consumption for the foreseeable future and directly created over 200,000 new jobs in auto manufacturing and assembly.[130] General Motors went from bankruptcy to a global leader in the industry.[131]

The consumer and environmental benefits were equally impressive. Consumer savings of $1.7 trillion are projected from efficiency savings.[132] The release of six billion metric tons of CO_2 will be avoided.[133] Since the voluntary GHG reduction commitments entered into by participants at the United Nations Framework Convention on Climate Change (UNFCCC) COP-17 in Copenhagen in 2009, the new U.S. fuel efficiency rules represent the largest single commitment by any country in the world.[134] The oil industry now projects U.S. oil consumption as flat for the foreseeable future.[135] Coupled with the recent expansion of the North Dakota Bakken Oil Fields, the new fuel efficiency rules

128. *ATVM*, U.S. DEP'T OF ENERGY LOAN PROGRAMS OFFICE, https://lpo.energy.gov/?page_id=43 (last visited Jan. 4, 2013).

129. Saqib Rahim, *The Cold, Hard Economics of Electric Cars Points to Making Them in the U.S.*, N.Y. TIMES, Sept. 27, 2010, http://www.nytimes.com/cwire/2010/09/27/27climatewire-the-cold-hard-economics-of-electric-cars-poin-7189.html?pagewanted=all.

130. Chris Isidore, *Auto Jobs Boom Coming to Midwest*, CNN MONEY (Dec. 6, 2011, 10:21 AM), http://money.cnn.com/2011/12/06/news/economy/auto_jobs_midwest/index.htm.

131. Micheline Maynard, *GM Is No. 1 in the World Again in Auto Sales*, FORBES (Jan. 19, 2012, 2:37 PM), http://www.forbes.com/sites/michelinemaynard/2012/01/19/gm-is-back-in-the-auto-sales-drivers-seat/.

132. Karen Rubin, *New Obama 54.5 Mpg Fuel Efficiency Standards to Save Consumers $1.7 Trillion*, EXAMINER.COM (Aug. 29, 2012), http://www.examiner.com/article/new-obama-54-5-mpg-fuel-efficiency-standards-to-save-consumers-1-7-trillion.

133. *Id.*

134. Nichole Allem, *U.S. Center at COP-17: Historic Progress in U.S. Fuel Efficiency Standards*, DIPNOTE: U.S. DEP'T OF STATE OFFICIAL BLOG (Dec. 7, 2011), http://blogs.state.gov/index.php/site/entry/cop17_fuel_efficiency.

135. BP, BP ENERGY OUTLOOK 2030 13 (Jan. 2012), *available at* www.bp.com/liveassets/bp_internet/globalbp/STAGING/global_assets/downloads/O/2012_2030_energy_outlook_booklet.pdf.

have resulted in U.S. domestic production at its highest since 2003, while oil imports are down.[136]

And while the consumer and environmental benefits of the new fuel efficiency rules are impressive, even more impressive are the long-term economic benefits. In a joint study released in July, 2012, the BlueGreen Alliance and the American Council for an Energy Efficient Economy found that the new rules will result in a net increase of 570,000 jobs in the U.S. over business as usual.[137] These jobs include an additional 5100 jobs in auto assembly and parts manufacturing, 35,000 additional manufacturing jobs, and 68,000 new jobs in vehicle sales and services.[138] In addition, the study explored the increased environmental and economic benefits of coupling the fuel efficiency rules with additional supportive policies, such as increasing domestic content provisions for the U.S. market from its current 58% in assembly and 60% in parts to 75% overall.[139] Such a step would add another 13,000 jobs by 2030 and thousands of additional indirect jobs.[140]

136. HEATHER ZICHAL ET AL., THE WHITE HOUSE, THE BLUEPRINT FOR A SECURE ENERGY FUTURE: PROGRESS REPORT 3 (2012), *available at* http://www.whitehouse.gov/sites/default/files/email-files/the_blueprint_for_a_secure_energy_future_oneyear_progress_report.pdf.

137. CHRIS BUSCH ET AL., BLUEGREEN ALLIANCE, GEARING UP: SMART STANDARDS CREATE GOOD JOBS BUILDING CLEANER CARS 3 (2012), *available at* http://www.bluegreenalliance.org/news/publications/document/AutoReport_Final.pdf.

138. *Id.* at 15.

139. *Id.* at 16.

140. *Id.* at 17.

	2017	2020	2025	2030
Agriculture	320	1,400	5,500	8,200
Oil and Gas Production	14	-200	-1,300	-2,500
Mining	80	290	1,100	1,200
Transportation and Public Utilities	420	2,000	8,800	15,000
Construction	160	700	3,000	4,900
Manufacturing	1,800	7,100	27,000	35,000
Oil Refining	-1	-24	-120	-190
Iron and Steel Products	160	610	2,300	2,500
Light-Duty (LD) Vehicle Manufacturing	420	1,500	5,300	5,100
LD Vehicle Parts Manufacturing	4,200	14,000	49,000	45,000
Wholesale and Retail Trade	1,100	2,800	8,400	16,000
Vehicle Sales and Services	620	7,000	35,000	68,000
Business and Personal Services	4,900	30,000	140,000	310,000
Government	1,900	8,500	39,000	63,000
Total Jobs Impacts*	**16,000**	**76,000**	**320,000**	**570,000**

Note: Numbers may not appear to add up due to rounding.

CHART 5

Overall, the restructuring of the U.S. automotive industry has provided a clear case for how smart government rule-making coupled with supportive tax, investment, and research and development policies can jump-start job growth and environmental performance in mature industries. Among the key elements of success are: 1) the long-term nature of the rules, extending out to 2025, and thus providing clear market signals for the deployment of private capital; 2) supportive investment policies like the Advanced Vehicles Manufacturing Loan Program; and 3) the consensus-based model for reaching agreement between federal and state regulators, business, labor, and environmental advocates. A similar model could and should be successfully applied to other major sectors of the U.S. economy including its energy, commercial and residential construction, information technology, health care, and agriculture sectors.

XIV. GREEN SCHOOLS

As part of its recently proposed American Jobs Act, the Obama Administration paid special attention to investments in retrofitting public schools through a $25 billion program target-

ing 35,000 public schools.[141] In addition to improving the health of learning environments for children and teachers, the program could create over 250,000 jobs, particularly in the hard-hit construction industry.[142]

According to the U.S. Green Building Council, "[g]reen schools can save $100,000 per year [on operating costs] — enough to hire two new teachers, buy 150 new computers, or purchase 5,000 new textbooks."[143]

As with other investments in the clean economy, the direct savings in operating efficiency improvements would pay back the initial investments in less than a decade while the indirect savings in improved health, learning, and avoided climate-related costs significantly improve the return on the initial investments.

XV. Broadband Access

Information and communications' technologies are not always thought of as essential building blocks of the clean economy. However, on closer examination, both are essential for solving climate change and significantly benefitting the economy.

In the BlueGreen Alliance-Communication Workers of America report, "Networking the Green Economy," we wrote:

> Broadband policies, particularly those that support the expansion and implementation of smart grid technologies *have real potential to reduce rising electricity consumption and greenhouse gas emissions.* With coordinated research, support and action from consumers, environmental advocates, labor and federal and state policymakers, broadband and related communications technologies can pave the way for a greener and more robust economy. If implemented effectively, these tools can transform the way people and businesses use technology and, according to some experts, have the potential to reduce carbon dioxide emissions and energy costs in the electricity sector by up to 20 percent by 2020, and, through further investments in the

141. *Fact Sheet: The American Jobs Act*, The White House (Sept. 8, 2011), http://www.whitehouse.gov/the-press-office/2011/09/08/fact-sheet-american-jobs-act.

142. Mary Filardo et al., Econ. Policy Inst., Creating Jobs Through FAST!, a Proposed New Infrastructure Program to Repair America's Public Schools 1 (2011), *available at* http://web.epi-data.org/temp727/Fix%20America%27s%20Schools_Today_FINAL.pdf.

143. *Green Schools Facts: Benefits of Green Schools*, U.S. Green Bldg. Council, http://www.usgbc.org/ShowFile.aspx?DocumentID=5409.

> following decade, cut emissions in the electricity sector by 58 percent by 2030. This could also provide potential savings of up to $2 trillion in energy costs and reductions of as much as 53 quadrillion BTUs of energy use over the next two decades.[144]

However, to realize these savings, initial public and private investments must be made to provide high-speed wired and/or wireless access uniformly throughout the U.S. Our country already lags far behind our European and Asian competitors in providing both business and consumer access to broadband and the resultant savings that such access provides for energy and work management.[145] As we will explore in a later section, employing a coherent investment strategy for realizing the environmental and economic benefits of a clean economy is essential for solving our country's twin problems of unemployment and climate change.

XVI. Recycling

As the 2007 Bezdek study revealed, the recycling industry is one of the pillars of the current energy efficiency industry in the U.S., directly employing over 1.3 million employees. However, it is hardly a mature industry and in many areas recycling rates are far below their potential.[146]

In a 2011 report on the effects of increasing the overall U.S. recycling rate from 33% to 75% in municipal solid waste and construction and demolition debris, the BlueGreen Alliance, Tellus Institute and other partners released data showing that such an initiative would add over one million new jobs in recycling.

Achieving a 75% diversion rate for municipal solid waste (MSW) and construction and demolition debris (C&D) by 2030 will result in:

> A total of 2.3 million jobs: Almost twice as many jobs as the projected 2030 Base Case Scenario, and about 2.7 times as many jobs as exist in 2008. There would be a significant number of additional indirect jobs associated with

144. Nathan Newman et al., BlueGreen Alliance, Networking the Green Economy: How Broadband and Related Technologies Can Build a Green Economic Future (2011), *available at* http://www.bluegreenalliance.org/news/publications/document/NetworkingforaGreenEconomy.pdf (emphasis in original) (citations omitted).

145. Jeb Boone, *US Lags Behind in Broadband Access*, Global Post (Aug. 23, 2012, 11:10 AM), http://www.globalpost.com/dispatches/globalpost-blogs/the-grid/us-lags-behind-broadband-internet-access.

146. Bezdek, *supra* note 118, at 30.

> suppliers to this growing sector, and additional induced jobs from the increased spending by the new workers.
>
> Lower greenhouse gas emissions: The reduction of almost 515 million metric tons of carbon dioxide equivalent (eMTCO2) from diversion activities, an additional 276 million eMTCO2 than the Base Case, equivalent to shutting down about 72 coal power plants or taking 50 million cars off the road.[147]

Once again, the potential jobs and environmental benefits of a national program are clear. A long-term regulatory framework for recycling would attract private capital investment, promote internal investment, and result in rapid job creation.

At a 2012 Good Jobs, Green Jobs Conference in Philadelphia, North American SCA Tissue CEO, Don Lewis, described the role that private investment can play in driving up recycling rates. SCA is a global paper company, based in Sweden, that runs recycling paper mills in the U.S. Faced with a shortage of paper in its Alabama facility, SCA invested in two recycling collection centers supporting local businesses and job creation to increase the available raw material for its own facility. The 200 local recycling jobs that were created removed landfill waste, reduced the resultant GHGs from decomposition, and secured jobs in the SCA mill.[148]

Recycling is one area where the role of regulation is critical to driving investment and can have the added benefit of reducing the cost pressure on upstream manufacturers in traditional industries like paper, aluminum, and steel.

XVII. Green Chemistry

One of the least explored areas of the clean economy in the U.S. is the developing area of green chemistry, defined by the OECD as, "the design, manufacture, and use of environmentally benign chemical products and processes that prevent pollution, produce less hazardous waste and reduce environmental and

147. James Goldstein et al., More Jobs, Less Pollution: Growing the Recycling Economy in the U.S., BlueGreen Alliance 1 (2011), *available at* http://www.bluegreenalliance.org/news/publications/more-jobs-less-pollution (citations omitted).

148. *See* Don Lewis, CEO, Noth America SCA Tissue, Panel at Good Jobs, Green Jobs East: Sustainable Communities & Clean Energy Jobs, 15:30 (Apr. 10, 2012), *available at* http://www.youtube.com/watch?v=XOJrYYYq3fI (discussing the effects of sustainability on the job market).

human health risks."[149] The chemicals industry is traditionally seen as one of the most polluting industries, most of whose products remain untested and presumptively "safe" until proven otherwise. Nothing, of course, is further from the truth.

What is less commonly known in the U.S. is the growth of green chemistry in Europe as a direct result of extensive regulatory reform through REACH (Registration, Evaluation, Authorization and Restriction of Chemical Substances) implemented in 2007.[150] In much the same way that the U.S. auto industry wrote itself out of the global market by ignoring efforts to improve fuel efficiency standards in the rest of the world, the U.S. chemicals industry could become uncompetitive because of our outdated chemicals regulation scheme.

First passed in 1976, the Toxic Substances Control Act, or TSCA,[151] is in dire need of reform. Changes are certainly needed in the law in order to improve public and worker health. In BlueGreen Alliance's 2009 review of green chemistry for the cities of Minneapolis and St. Paul, we noted:

> There are over 80,000 chemicals in the U.S. Environmental Protection Agency's (EPA) chemicals database. Very little information exists about the effects and properties of the vast majority of these. Of the 3000 high production volume chemicals only 7% have a complete set of data about basic toxicity, and 43% have absolutely no publicly available data on possible acute and chronic health effects, reproductive effects, environmental fate, ecotoxicity or mutagenicity. Approximately 1000 chemicals are added each year, and global chemical production is expected to double every 25 years, further compounding the data gap.[152]

But increasingly, as in other sectors of the economy, reform is needed in order to protect the economic competitiveness of an important industry. In the BlueGreen Alliance study, *The Economic Benefits of a Green Chemistry Industry in the United States*, we noted that the industry had lost 300,000 jobs or 38% of total

149. ALLAN ASTRUP JENSEN, EUROPEAN ENV'T AGENCY, ESTABLISHMENT OF A EUROPEAN GREEN AND SUSTAINABLE CHEMISTRY AWARD 21 (2001), *available at* http://edz.bib.uni-mannheim.de/daten/edz-bn/eua/01/tech53.pdf.

150. *REACH*, EUROPEAN COMM'N, http://ec.europa.eu/environment/chemicals/reach/reach_intro.htm (last updated Sept. 14, 2012).

151. 15 U.S.C. §§ 2601–2697 (2011).

152. KATRINA MITCHELL, BLUEGREEN Alliance, The GREEN CHEMISTRY LANDSCAPE IN MINNEAPOLIS SAINT PAUL 6 (2009), *available at* http://www.bluegreenalliance.org/news/publications/document/Green-Chemistry-vfinal.pdf (citations omitted).

employment between 1992 and 2010. If these trends continue, the industry will lose another 230,000 U.S. jobs by 2030 even though global chemical production is predicted to increase by 4.5% per year.[153]

This loss is not inevitable, however. As we wrote in 2011:

> New market opportunities demonstrate how to reverse negative employment trends and put people to work in the chemical industry in the U.S. This report estimates that if, for example, 20% of current production were to shift from petrochemical-based plastics to bio-based plastics, 104,000 additional jobs would be created in the U.S. economy even if the output of the plastics sector remained unchanged.[154]

The impediment to the innovation necessary to reinvigorate this important industry is an antiquated regulatory framework that encourages the continued mass production of the same chemicals that were grandfathered in under TSCA in 1976. To stay profitable making the same buggy-whip chemicals that were produced thirty-six years ago, the chemical industry keeps cutting American jobs and cutting research and development costs.

In fact, research and development investment in the U.S. chemicals industry has dropped to 1.5% of sales, less than 45% of the average for the U.S. manufacturing sector.[155] The BlueGreen Alliance has made three key policy recommendations to reverse job loss in the chemicals industry: 1) pass TSCA reform modeled on the European REACH; 2) "[i]mplement complementary policies to promote innovation, commercialization, and the development of human resources to create a greener and safer chemical industry"; and 3) widely disseminate information on chemical products to the public.[156]

Enacting these three reforms would make the U.S. a leader in green chemistry.

XVIII. Financing the Clean Economy

One of the key arguments leveled against the economic recovery program of the Obama Administration (or against other Keynesian approaches to solving chronic unemployment) is that government spending simply replaces private spending in the

153. James Heintz & Robert Pollin, BlueGreen Alliance, The Economic Benefits of a Green Chemical Industry in the United States 3 (2011), *available at* http://www.bluegreenalliance.org/news/publications/document/Green-Chemistry-Report_FINAL.pdf.

154. *Id.*

155. *Id.*

156. *Id.* at 5.

marketplace. It does not create additional growth; it simply displaces private spending with public spending. If markets worked like mathematical models, there might be a persuasive logic to this argument. Unfortunately, as Sir Nicholas Stern reminded us in 2007, markets are "imperfect" and the failure to price the effects of carbon pollution on the global market is the biggest market failure of all.[157] This is an enormously important consideration in how we think about the role of government in managing a capitalist economy and whether or not public spending always displaces private spending.

Stern calculated the costs to the global economy of making the investments necessary to avoid the worst effects of climate change as a reduction of the annual growth rate of global domestic product by about .5% to 1%. By comparison, the cost of doing nothing and absorbing the ongoing costs of disruption to the global economy through severe weather incidents, drought, loss of water access by as many as 2 billion people, and catastrophic sea level rise was calculated by Stern as at least a 5% per year contraction of the global economy on an ongoing basis. To put this in perspective, during the 2009 global recession, the economy contracted by only 2.4% before starting to expand again in 2010.[158]

With such high stakes, one of the keys to unlocking both the economic growth potential of the clean economy and avoiding the economic costs of the worst effects of climate change is finding a mechanism(s) to finance the transition to clean energy.

The simplest mechanism is to devise an internationally consistent price on carbon and other greenhouse gases either through a global carbon tax or a cap-and-trade system of tradable allowances. Either mechanism would have raised revenues, the first through taxes and the second through the sale of allowances. Both would have provided 1) an incentive for private investment in new technologies to avoid the taxes or purchase of allowances and 2) a public revenue pool to spur research and development in new technologies, encourage rapid deployment, and finance the transition costs to communities and poor countries in a multiplicity of forms.

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157. *Stern Review, supra* note 52.

158. COUNTRY NOTES: UNITED STATES, ORG. FOR ECON. CO-OPERATION & DEV. 1 (2011), *available at* http://www.oecd.org/gov/budgetingandpublicexpenditures/47860866.pdf; *see also* Timothy R. Homan & Courtney Schlisserman, *Economy in U.S. Expands 2.6% in Quarter; Price Rise Is Slowest in 50 Years*, BLOOMBERG (Dec. 22, 2010, 12:48 PM), http://www.bloomberg.com/news/2010-12-22/u-s-economy-grew-2-6-in-third-quarter-final-revision-shows.html.

However, the failure of federal climate legislation in the U.S. in 2010 and the collapse of the Kyoto process in Copenhagen in December, 2009, have left a void in economy-wide financing of the transition to clean energy. As a result, U.S. policymakers are confronting the dilemma of trying to create an efficient national clean energy finance policy through a hodgepodge of individual local, state, and federal regulations, tax provisions, and financial incentives to encourage the production of carbon neutral energy and the implementation of energy efficiency measures.

In some ways, the fact that such a confusing tangle of policies and initiatives has actually worked to create jobs and reduce greenhouse gases is remarkable. The fact that very few Americans are actually aware of the dramatic job growth and impressive environmental benefits of these efforts is not in the least surprising. But it is an important accomplishment and one that should give Americans confidence that there is a tested and common sense path forward to avoiding the costs to our economy of structural unemployment and catastrophic climate change.

The good news is that the U.S. has dramatically reduced its emissions of greenhouse gases from the business-as-usual case and is on an entirely different trajectory than it was four years ago.[159] While this is partially a result of the economic slowdown of the Great Recession, it is also a result of a series of very important regulations issued by the EPA and states on fuel efficiency, GHG emissions reduction, wider deployment of renewables and natural gas electricity generation, and growing energy efficiency financing measures.

Secondly, the green economy regulatory and investment mechanisms adopted in the American Reinvestment and Recovery Act (approximately $90 billion) created over 997,000 jobs[160] and attracted private capital back into the market place at a rate of three dollars of private investment to every one dollar of public support (a combination of tax relief, direct grants, and loan guarantees).[161]

Among the financing mechanisms that have proven their effectiveness have been tax programs such as the Production Tax Credit for wind, the Investment Tax Credit for solar, the Advanced Energy Manufacturing Program, and the Advanced

159. *See supra* Chart 3.

160. JASON WALSH ET AL., BLUEGREEN ALLIANCE, REBUILDING GREEN: THE AMERICAN RECOVERY AND REINVESTMENT ACT AND THE GREEN ECONOMY 4 (2011), *available at* http://www.bluegreenalliance.org/news/publications/rebuilding-green-the-american-recovery-and-reinvestment-act-and-the-green-economy.

161. *See id.* at 20.

Vehicle Technology Loan Program, in addition to the use of traditional federal programs in transportation infrastructure.

The key takeaway from this experience is that, while it is far less efficient than a comprehensive, economy-wide approach, a coordinated set of individual regulations and incentive programs can lead to wide-spread economic growth and environmental benefits. The real question is not whether these programs work but how to expand them to the scale necessary to deal with the scope of the problems.

XIX. Why Regulation Does Not Hurt Job Creation

Another frequent argument against environmental regulatory action is that new rules act as a "tax" on the economy and are "job killers." In our June 25, 2012 comment to the EPA on its proposed GHG regulation for new power plants, the BlueGreen Alliance and the Economic Policy Institute (EPI) (a Washington, DC-based think tank) wrote:

> The generic argument that the proposed rule should not be finalized because environmental regulations are "job-killers" is flat wrong. When the economy is operating well below potential, as it is today, regulatory changes have the potential to actually accelerate movement towards economic potential. As a result, calls to delay the rule based on appeals to overall economic weakness are not justified. Previous research on regulatory efforts limiting emissions of harmful pollutants has found that the net employment impacts of previous rules in the near-term are actually positive, while long-term impacts are neutral at worst.[162]

In a study of the earlier EPA rules limiting the emissions of mercury and other toxins from existing power plants, EPI found that the net job creation effect of the rules would be an increase of 84,500 jobs.[163] These numbers included 8000 jobs in the utility industry, 80,500 jobs from pollution abatement and controls investments, and 28,000 jobs from re-spending effects.[164] From

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162. David Foster & Josh Bivens, BlueGreen Alliance, Comments on Proposed Rule, Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources 1 (2012), *available at* http://www.bluegreenalliance.org/news/publications/document/BGA-EPI-Carbon-Pollution-Standard-Comments.pdf.

163. Josh Bivens, Econ. Policy Inst., The 'Toxics Rule' and Jobs: The Job-creation Potential of the EPA's New Rule on Toxic Power-plant Emissions 2 (2012), *available at* http://www.epi.org/files/2012/ib325.pdf.

164. *Id.*

this would be deducted 32,000 jobs lost as a result of higher energy costs leading to reduced demand for affected products.[165]

This kind of dynamic interplay is typical of the effects of environmental regulation in a depressed economy. With thoughtful complementary policies the number of jobs lost as a result of higher costs can be substantially reduced. For instance, in this particular case, an effective industrial energy efficiency program that incentivized efficiency investments in affected industries in advance of the increased costs of energy resulting from pollution reduction costs would, in turn, reduce the loss of demand from higher energy prices.

In short, cleaning things up does not cost jobs, it creates jobs.

XX. The Role of Disruptive Technologies

When I started work in the steel industry in 1975 at a St. Paul, Minnesota steel mill, North Star Steel, so-called "mini-mills" were in their infancy in North America. Over 90% of American steel was manufactured in traditional open hearth and blast furnace facilities, converting iron ore into steel.[166] Typical man hours per ton of steel were in the ten through twelve hour range.[167] Mini-mills utilized electric arc furnace technology, melting recycled scrap steel that was quickly converted into slabs and billets with continuous casters. Finished steel products exited rolling mills with less than two man hours per ton of labor costs.[168] The new technologies disrupted the old economic models and within two decades almost half of the country's steel was produced in mini-mills. Dozens of antiquated steel mills were shuttered. Open hearth steelmaking was completely abandoned. Ingot casting has been completely replaced by continuous casting.

Today, some observers look at the climate crisis and would like to bet the earth's future on the development of new, disruptive energy technologies that will undercut the cost structure of our current fossil fuel economy. They look at examples such as in the steel industry and hope that innovation will eventually

165. *Id.*

166. Robert W. Crandall, The Brookings Inst., The U.S. Steel Industry in Recurrent Crisis: Policy Options in a Competitive World 6 (1981).

167. Michael A. Fletcher, *Steel, Forging a Comeback*, Wash. Post, May 28, 2008, www.washingtonpost.com/wp-dyn/content/article/2008/05/27/AR2008052703099.html.

168. Profile of the American Iron and Steel Institute 2010–2011, Am. Iron & Steel Inst. 4 (2011), *available at* http://www.steel.org/~/media/Files/AISI/About%20AISI/Profile%20Brochure%20F-singles_CX.pdf.

result in displacing increasingly costly oil, coal, and gas energies with clean renewable sources.

There are two problems with this approach. First, the nature of greenhouse gas pollution has a built-in time lag. Carbon lingers in the atmosphere for decades and even centuries before it dissipates.[169] Fuels being burned today will continue to disrupt our atmospheric weather norms for generations. We simply cannot wait for imperfect market forces to solve the problem.

The second issue is that capital intensive, disruptive technologies rarely, if ever, develop on their own. Such was the case with mini-mill steel technologies. The great leaps forward in melting and casting technologies took place in Europe and Japan in the wake of the WWII destruction of their industrial economies. Since the steel industry of the U.S. was not fully depreciated in the 1950s, there was little incentive on the part of U.S. steelmakers to invest in disruptive technologies that devalued their own assets. In fact, there was a powerful incentive to sit on such technologies. Only when foreign steel competitors started to penetrate U.S. markets, taking advantage of their lower labor and energy costs, did U.S. producers start to embrace new technologies. Simultaneously, investors realized that lower capital barriers to entry with the new technologies permitted a new generation of steel companies like North Star Steel, Nucor, and others to enter a traditional industry.

While the result may have been "creative destruction" at its capitalist best, the social cost to American industry was significant. Is this the way we want to manage our transition to a clean energy economy, i.e. allowing our economic competitors—Europe, China, and India—to own the technologies of the future while we are held hostage to the embedded technologies of our fossil fuel past? Should the economic interests of the oil industry hold sway over the politics of the country, setting both economic development and environmental policy for the next generation, until it collapses under the disruptive force of the renewable energy technologies of our competitors? Whose interests would be served by such an outcome?

XXI. Conclusion

I hope that I have made the case for an active government role in jointly solving our unemployment and climate crises. One of the real accomplishments of the Obama Administra-

169. Mason Inman, *Carbon Is Forever*, Nature Reports Climate Change (Nov. 20, 2008), http://www.nature.com/climate/2008/0812/full/climate.2008.122.html.

tion—and indeed one of its enduring gifts to early twenty-first century global society—is to have demonstrated through the ARRA that large government investments, combined with smart environmental regulations, can reopen the door to economic growth. In the twenty-first century, we must discard the notion that the earth's resources are inexhaustible or that growth must, by definition, happen without regard to our common, but unrecognized, environmental costs.

Reconfiguring the rules of capitalism so that it does charge those costs and insisting on a level playing field that rewards social responsibility and sustainability are the only ways to keep the free enterprise system from spinning into the vortex of the two worst crises facing America today—unemployment and climate change.