

Potential Workforce Impacts of the Chicago Climate Action Plan: Quantitative and Qualitative Assessments

Research Report

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Greg Schrock
Research Associate
Center for Urban Economic Development
University of Illinois at Chicago
312.413.9412
gschro2@uic.edu

Eric Sundquist
Senior Associate
Center on Wisconsin Strategy (COWS)
University of Wisconsin-Madison
608.265.6155
erics@cows.org

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Executive Summary

Across the country and around the world, cities like Chicago are leading the charge to create more sustainable urban environments and a new, “green” economy. The Chicago Climate Action Plan (CCAP), a comprehensive strategy for greenhouse gas (GHG) mitigation and adaptation released in September 2008, presents such an opportunity to create green jobs, reducing poverty while revitalizing Chicago’s economy.

This report examines CCAP’s five strategy areas – Energy Efficiency, Clean and Renewable Energy, Transportation, Waste and Pollution Reduction, and Adaptation and Preparation – to assess their respective job and workforce impacts. The purpose of this report is not to develop an overall estimate of CCAP-related job creation, but rather to identify areas where an economic and workforce development strategy might be targeted to ensure a sufficient supply of skilled workers, and at the same time open up pathways to “green collar” jobs and careers for disadvantaged segments of the Chicago community.

Based on a labor demand model of building retrofit programs, and existing reports, studies and qualitative assessments of other CCAP-related strategies, we have assessed each of the five strategies in terms of:

- **New job creation:** Occupations where CCAP will result directly in new labor demand;
- **“Critical jobs”:** Occupations that are key to meeting CCAP’s mitigation goals; and
- **Opportunity areas:** Product and technology areas where, with the right economic development response, CCAP could generate new business and job creation opportunities.

Workforce Impacts by CCAP Strategy Area

1) Energy-Efficient Buildings	
<i>New Job Creation</i>	<ul style="list-style-type: none"> • Up to 2,500 weatherization jobs – energy auditing and efficiency measure installation • Hundreds of indirect jobs in program administration, warehousing and materials.
<i>“Critical jobs”</i>	<ul style="list-style-type: none"> • “Green” construction • Building maintenance and operations workers
<i>Opportunity areas</i>	<ul style="list-style-type: none"> • “Green” or environmentally-preferable building materials
2) Clean and Renewable Energy	
<i>New Job Creation</i>	<ul style="list-style-type: none"> • Hundreds of jobs in renewable energy installation, including solar, geothermal and “small wind.” • Renewable energy development
<i>“Critical jobs”</i>	<ul style="list-style-type: none"> • Energy engineers

	<ul style="list-style-type: none"> • “Smart grid” installation workers
<i>Opportunity areas</i>	<ul style="list-style-type: none"> • Renewable energy component manufacturing, especially wind • “Small wind” turbines
3) Transportation	
<i>New Job Creation</i>	<ul style="list-style-type: none"> • Transit construction • Transit operators and maintenance workers • Train conductors and yard workers.
<i>“Critical jobs”</i>	<ul style="list-style-type: none"> • Urban planners and designers
<i>Opportunity areas</i>	<ul style="list-style-type: none"> • Biofuel production from recycled sources
4) Waste and Pollution Reduction	
<i>New Job Creation</i>	<ul style="list-style-type: none"> • Processing, handling and resale/remanufacture of materials, such as <ul style="list-style-type: none"> ○ Municipal solid waste; ○ Appliances and electronics; ○ Organic and food waste; and ○ Building materials.
<i>“Critical jobs”</i>	<ul style="list-style-type: none"> • Industrial engineers
<i>Opportunity areas</i>	<ul style="list-style-type: none"> • Remanufactured products, such as engineered plastics.
5) Adaptation and Preparation	
<i>New Job Creation</i>	<ul style="list-style-type: none"> • Green infrastructure installation and maintenance • Green roof design and installation • Water infrastructure construction
<i>“Critical jobs”</i>	<ul style="list-style-type: none"> • Civil engineers and technicians • Landscape architects and designers
<i>Opportunity areas</i>	<ul style="list-style-type: none"> • Green infrastructure materials, such as porous paving materials.

Conclusions

CCAP, when fully implemented, will have diverse impacts on the Chicago labor market and economy. It will result directly in demand for several thousand jobs in building retrofits, renewable energy installation, green infrastructure, and other areas. It will also require the effort of others, from “green” construction trade workers to energy engineers, to achieve CCAP’s goals, and create a variety of new business and economic development opportunities in areas like wind turbine components.

Based on our analysis, we have identified three areas where CCAP-related workforce development efforts could be focused:

- Energy efficiency – auditors and measure installers;
- Landscape, horticulture and urban forestry; and
- Recycling and reuse occupations.

I. Introduction

Traditional concerns about tradeoffs between environmental and economic goals have given way to a growing consensus that efforts to address environmental challenges such as global climate change may, in fact, present significant economic benefits, both for particular cities and regions and for the economy overall. Throughout the world, cities like Chicago are leading the charge, exploring ways to use both “carrots” (e.g., incentives, public procurement) and “sticks” (e.g., regulations) to build the market for innovative, environmentally-preferable goods, services and technologies. And of particular interest is the potential to harness the growth of “green collar” jobs and target those opportunities toward disadvantaged populations as a pathway toward economic self-sufficiency¹.

In September 2008 the City of Chicago released the *Chicago Climate Action Plan* (CCAP), a comprehensive strategy for lowering the city’s greenhouse gas (GHG) emissions. Through a combination of programmatic and regulatory measures, CCAP implementation is projected to result in a 25 percent reduction in GHG emissions by 2020 and 80 percent by 2050, while at the same time helping the City to prepare for climatological changes likely to occur in the future, such as extreme heat and precipitation events. The Plan’s five strategy areas are: Buildings and Energy Efficiency; Clean and Renewable Energy; Transportation; Waste and Pollution Reduction; and Adaptation and Preparation².

Recent analyses point to the vast job creation potential of green investments. The Center on American Progress and Political Economic Research Institute estimate that a \$100 billion federal “green recovery” strategy would yield roughly two million new jobs nationally and 83,000 in the state of Illinois³. An analysis for the U.S. Conference of Mayors by the consulting group Global Insight suggests that as many as 4.2 million new “green jobs” are likely by the year 2038, nearly a sixfold increase from the current total⁴.

Locally, analyses for the Chicago Climate Action Task Force by the Regional Economics Applications Laboratory at the University of Illinois at Urbana-Champaign suggest that household savings from reduced energy consumption, when redirected to other types of

¹ Several recent publications address this idea, including: “Green-Collar Jobs in America’s Cities: Building Pathways Out of Poverty and Careers in the Clean Energy Economy” (Apollo Alliance and Green For All, March 2008) , and “Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy” (Center on Wisconsin Strategy with The Workforce Alliance and Apollo Alliance, March 2008); see also Van Jones, *The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems* (HarperOne, 2008).

² The Chicago Climate Action Plan final report is available online at: <http://www.chicagoclimataction.org/>

³ Robert Pollin, Heidi Garrett-Peltier, James Heintz, and Helen Sharber, “Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy” (Center on American Progress, Political Economic Research Institute/University of Massachusetts-Amherst, September 2008).

⁴ Global Insight, “U.S. Metro Economies: Current and Potential Green Jobs in the U.S. Economy” (Report to the U.S. Conference of Mayors, October 2008).

consumptive activities, could produce 5,000 to 10,000 jobs in Chicago⁵. Similar analyses for Chicago Metropolis 2020 of reduced congestion from investments in public transit, especially when linked to planning for “smart growth” and transit-oriented development, imply gains of up to 25,000 jobs throughout the Chicago metro region⁶.

As suggestive as these analyses are, they are of limited value for decision makers in Chicago with respect to where CCAP’s implementation is likely to *directly* impact the local labor market, either by creating demand for new jobs or by significantly affecting the skill requirements for existing jobs. This information is potentially valuable on two fronts. With respect to CCAP’s environmental goals, information about where increased occupational demand is likely to occur can inform efforts to ensure, through local education and training providers, an adequately trained workforce to do the work – from planting trees to installing solar panels to upgrading HVAC systems – that will help Chicago achieve its GHG reduction goals. But from a social equity standpoint, information about CCAP’s labor market impacts can be useful for identifying “green collar” occupations that could lead toward economic self-sufficiency for disadvantaged segments of the population.

Purpose

In this paper we review the Chicago Climate Action Plan’s five strategy areas and, drawing on available evidence, assess the potential labor market impact of each. However, the purpose of this analysis is *not to develop an aggregate estimate of direct and indirect job creation* related to CCAP. Rather, it is intended to inform the efforts of the City of Chicago and its partners to develop an economic and workforce development strategy that will help Chicago ensure that:

- CCAP’s GHG mitigation and adaptation goals are achieved;
- “Green-collar” jobs and career opportunities for disadvantaged populations are maximized, and;
- Chicago’s long-term economic vitality is enhanced by businesses developing and producing “green” goods and services related to CCAP.

Methodology

To assess the workforce impacts of the CCAP, we began by gathering information from Chicago Department of Environment (CDOE) staff and consultants regarding the detailed strategies and implementation status of the Plan’s five strategy areas, including memoranda and other working documents.

For the Energy Efficiency Building Retrofit component of the strategy, we rely on a model developed by the Center on Wisconsin Strategy (COWS) and the Powell Center for Building

⁵ “Chicago Climate Change: Economic Impact Analyses,” unpublished memorandum, Regional Economics Application Laboratory, University of Illinois, n.d.

⁶ Chicago Metropolis 2020, “Time is Money: The Economic Benefits of Transit Investment” (September 2007).

and the Environment at the University of Florida, which projects the labor requirements for such programs based on construction estimation techniques.

For other parts of the Plan, however, such quantitative estimates were not feasible, both because models for deriving employment impacts are not readily available, and often because detailed implementation strategies (i.e., with projected levels of investment or activity) have not been put in place. Instead, we reviewed existing reports, studies and articles where available, and draw on key informant interviews, to derive qualitative assessments of potential workforce impacts.

Based on that information we draw the following assessments about each of the CCAP strategy areas, in terms of three categories:

- *New Job Creation*: Industries and occupations where CCAP is likely to result in new, direct job creation;
- *“Critical jobs”*: Industries and occupations that are instrumental to achieving CCAP’s goals, and/or are likely to face changing skill requirements as a result of CCAP;
- *Opportunity areas*: Product and technology areas where, with the right economic development response, CCAP could generate new business and job creation opportunities.

We conclude by identifying the occupational areas where CCAP’s impact on the local labor market is likely to be the most acute relative to the existing labor supply and proposed implementation schedule, and/or where it is likely to generate the most significant opportunities for targeting jobs and career pathways to disadvantaged populations.

Notes

- In this report we do not attempt to define “green(-collar) jobs,” but rather focus on industries and occupations that are likely to be impacted by CCAP implementation. A number of recent studies have attempted to do so, and while there is no broadly accepted working definition, the most commonly cited areas relate to “clean energy,” e.g., wind, solar, biofuels and geothermal installation and component production, and energy efficiency activities such as building retrofits⁷.
- We do not directly account for the impact of the current economic recession on the scale, scope and pace of likely workforce impacts. However, for each strategy, we identify policy and economic variables that are likely to affect job creation outcomes.

⁷ For further discussion of green job definitions, see Greg Schrock and John West, “Review of Recent ‘Green Job’ Studies and Reports” (CUED memo, August 2008).

II. Potential Job and Workforce Impacts by CCAP Strategy Area

In this section we review each of the five components of the Chicago Climate Action Plan and assess the likely impacts in terms of new job creation, jobs that are “critical” to achieving the Plan’s goals, and opportunity areas where CCAP-related economic development efforts could leverage additional job growth.

1) Energy Efficient Buildings

a) *What is the CCAP calling for?*

The first mitigation component of the Chicago Climate Action Plan is *buildings and energy efficiency*. Improving the energy performance of the city’s commercial, industrial, residential and institutional building stock is a prime target of CCAP because of its potential to affect significant, near-term reductions in GHG emissions while at the same time creating new jobs. The specific implementation items under the energy efficiency component of CCAP are:

- Massive investments in *energy efficiency retrofits* for residential, commercial and industrial buildings;
- Expansion of *appliance trade-in programs* currently operated through ComEd;
- Update the *City’s Energy Conservation Code* to latest international standards;
- Establish *green standards and guidelines* for building renovations; and
- Expand the number of *rooftop gardens and trees*, to help cool buildings.

b) *What are the likely workforce impacts?*

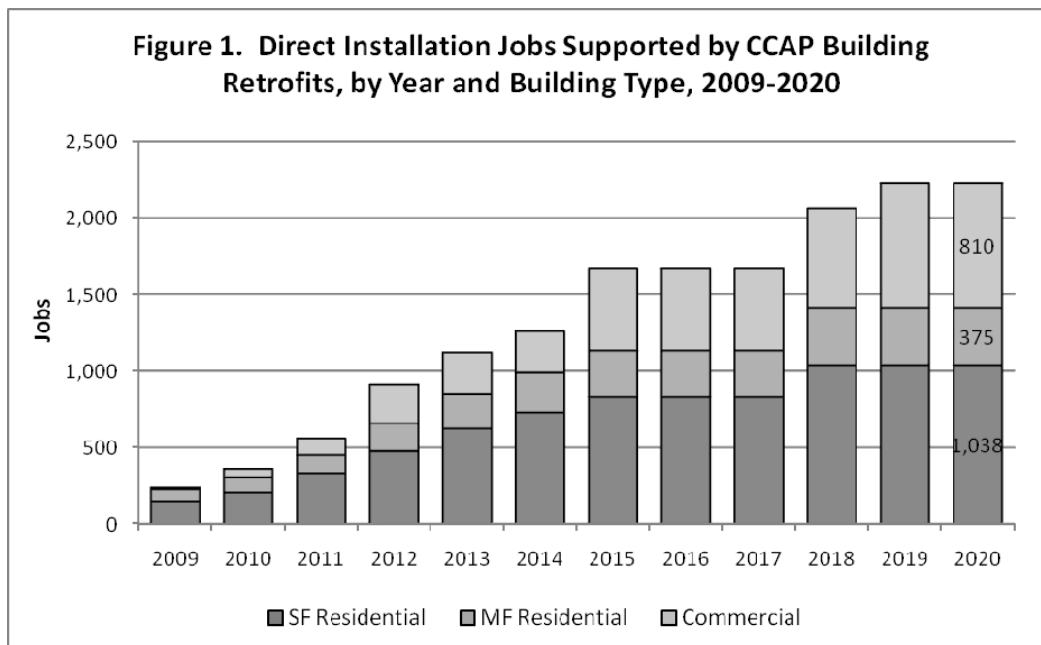
Of all the components of the CCAP, the energy efficiency strategy presents the most significant, direct opportunities for creation of new jobs, and impacts on existing ones. Our models suggest that the residential and commercial energy efficiency retrofit programs alone could generate demand for roughly 2,000 to 2,500 energy efficiency auditing and installation jobs on an annual basis. While these figures may seem modest, it is worth keeping in mind that this represents *direct* job creation (not indirect or induced figures based on predicted “multiplier” effects), and that these figures compare quite favorably with any economic development program, at the city or state level.

Job Creation

- *Energy efficiency measure installers*. In nominal terms, the largest workforce impact of CCAP is going to be for workers who install energy efficiency measures in residential and commercial buildings. Occupationally, these jobs are broadly within the construction trades, but vary greatly from carpenters and insulation blowers to HVAC (heating, ventilation and air conditioning) technicians and electricians to general laborers. And they vary from entry- or apprentice-level to skilled/journeyman and managers. Furthermore, they vary with respect to wage levels and union status, which track closely to the sector of the construction market in which they work. Construction trades workers in the

commercial and larger (multi-family) residential segments are mostly unionized, while residential construction and remodeling firms (which tend to be smaller) utilize mostly non-union labor at significantly lower pay scales. However, it should be noted that union status does not directly relate to skill level; for any given skill level of a particular trade, there are often union and non-union installation workers available⁸.

Based on a model developed by COWS and the Powell Center for Building and the Environment at the University of Florida, we project that CCAP's commercial and residential retrofit initiative could eventually support over 2,200 measure installation jobs. This model, which is based on construction estimation techniques⁹, assumes a steady increase in retrofit activity to 2020, reaching its peak in the final two years of the effort (Figure 1)¹⁰. Just under half (47%) of the jobs – eventually over 1,000 jobs – would be attributable to single-family residential retrofits, 36 percent to commercial retrofits, and 17 percent to multi-family residential buildings¹¹.



⁸ However, this may be limited to the different market segments, e.g., a skilled, non-union electrician in the residential segment of the market may not easily transfer to the commercial segment, because his or her company may not have experience in that market.

⁹ The model takes out contractor's profit and overhead, cost for materials, and then allocating the labor portion of the investment based on loaded labor rates and typical crew makeup. See Appendix for a full description of the model and the assumptions used.

¹⁰ The growth in retrofit employment is based on projections for yearly retrofit activity developed for CDOE by Katzenbach Partners.

¹¹ CCAP also calls for energy efficiency retrofits of industrial buildings, however, good data on labor requirements for such retrofits does not exist and is therefore not included in the COWS/Powell Center model.

The COWS retrofit model projects that each \$1 million in investment would yield approximately 8.3 job-years (i.e., full-time equivalent for one year) for single-family residential retrofits; 6.0 jobs per million for multi-family residential retrofits; and 5.4 jobs for commercial retrofits. These figures are somewhat lower than estimates derived based on similar models for other cities and nationally; the differences relate, among other things, to higher wage levels for construction trades occupations in the Chicago area.

The *types of occupations* required will vary across the three building types, since different energy efficiency measures are often installed between single- and multi-family residential and commercial buildings (Table 1). Based on a typical mix of measures installed in programs elsewhere, the model projects that single-family residential retrofits will create jobs in blowing and rolling insulation, sealing and installing windows, which require individuals with carpentry skills. By contrast, multi-family residential retrofits will require a broader array of occupations, including HVAC/sheet metal workers, electricians and plumbers and pipefitters, while commercial retrofits will rely heavily on HVAC technicians and electricians.

Table 1
EE Measure Installation Jobs by Trade

Level	Single-Family Residential	Multi-Family Residential	Commercial
Insulation/Infiltration/Building Envelope	77%	24%	16%
HVAC/Sheet Metal Workers	8%	41%	50%
Electricians	*	12%	34%
Plumbers & pipefitters	5%	12%	*
Appliances & laborers	10%	11%	*
Total	100%	100%	100%

* Occupational group not included in model.

The model also projects the approximate distribution of energy efficiency installation jobs *by level* (Table 2). According to the model, roughly three in 10 jobs are considered entry-level, suggesting significant numbers of opportunities for new workers.

Table 2
EE Measure Installation Jobs by Level

Level	Share of Jobs
Supervisory/Managerial	7%
Skilled/Journeyman	27%
Semi-skilled/Apprentice	36%
Entry-level/Pre-apprentice	30%
Total	100%

- *Energy auditors and consultants.* Most energy efficiency retrofit programs utilize specialized, third-party energy auditors or consultants who go out to a particular residential and

commercial building, analyze its current energy performance, and prescribe customized energy efficiency measures that maximize energy savings while minimizing cost to the building owner. For residential applications, these jobs are often called “HERS raters” because most auditors utilize the Home Energy Rating System (HERS), an industry standard for building energy efficiency rating. In commercial settings, energy auditors working for environmental service companies (ESCOs) and consulting firms generally have more specialized training as mechanical, electrical or operating engineers.

Based on rough calculations for assessment and auditing costs included in programmatic cost projections developed in September 2007 by the Center for Neighborhood Technology, and staffing for existing energy efficiency programs like CNT Energy Savers and CEDA Weatherization, we estimate that CCAP-related energy efficiency programs will eventually generate annual demand for approximately 400 to 500 energy auditors, split almost evenly between commercial and residential applications. Although this figure is smaller in nominal terms than for measure installers, *in relative terms the impact of CCAP on this occupation will be much greater* because there are currently very few certified HERS raters in the greater Chicago area.

- *Building materials wholesalers and distributors.* Evidence from energy efficiency retrofit programs elsewhere suggests that roughly half of total implementation cost is dedicated to building materials and/or appliances, such as insulation, HVAC equipment, windows, lighting and electrical equipment. Our labor demand model does not account for these “indirect” demands for materials wholesaling and distribution, but they could entail several hundred jobs as material handlers, drivers, stock clerks and laborers depending on how retrofit activities are organized. Centralized procurement and distribution of retrofit materials used by weatherization contractors could generate significant economies of scale – which would reduce per-unit installation costs for any given measure – but would also likely require fewer distribution workers overall than if purchases were spread across a larger number of existing wholesale establishments.
- *Appliance recycling workers.* Expanded appliance trade-in programs will create a small number of jobs for pick-up and disassembly of the appliances. According to JACO Environmental, a Washington-based appliance recycling company, their refrigerator trade-in program with ComEd will eventually employ approximately 25 to 30 workers in the Chicago region – roughly half on pick-up and the rest in disassembly. Other large appliance retailers and wholesalers – especially companies like Sears who have adopted the U.S. Environmental Protection Agency’s Responsible Appliance Disposal (RAD) guidelines – are also likely to experience increased demand for these jobs. RAD guidelines necessitate a more labor-intensive process of disassembly (manual removal of rigid foam with very high GHG impacts) than standard appliance recycling, which involves simply draining hazardous fluids required by federal law.
- *Green roof design and installation.* See section 5, “Adaptation and Preparation,” for further discussion of labor demand impacts of expanded green roof installation.

Critical Jobs

- *“Green construction.”* Achieving CCAP’s ambitious goals for GHG reduction will also require that new and rehabbed buildings are as energy efficient as possible. This will push the demand on the part of thousands of existing workers involved in designing, managing and building new homes and commercial structures to adopt “green” construction practices. The Chicago chapter of the U.S. Green Building Council (USGBC) is already among the most active nationally with nearly 1,300 members, and local construction contractor associations and building trade unions have taken the lead in integrating green principles into existing apprenticeship programs and new educational offerings for incumbent workers and contractors. For example, in September 2008 the Mechanical Contractors Association of Chicago established the Green Construction Institute, which will provide training and technical assistance to its member contractors, apprentices and journeymen of its partner union (United Association Pipe Fitters Local 597), and others. Such partnerships between construction management and labor, as well as government, will be essential for ensuring that green construction techniques are widely adopted within the building industry.
- *Building operations and maintenance workers.* An occupation that is very likely to be impacted by CCAP’s energy efficiency efforts is building operations and maintenance workers, particularly in multi-family residential and commercial buildings. Even after energy efficiency measures are installed, they will require ongoing monitoring to ensure that the building is achieving the maximum energy performance. This may not entail new job creation, but rather up-skilling of existing workers through short courses and certification programs, such as those offered by the Midwest Energy Efficiency Alliance (MEEA) or Wilbur Wright College’s Environmental Technology Program.

Opportunity Areas

- *Green building materials manufacturing, wholesaling and retailing.* Large-scale building retrofit efforts undertaken as part of CCAP, as well as related policies such as “green” standards for retrofits and an updated municipal energy code, could create an opportunity to attract existing manufacturers of green building materials to Chicago, or help existing local producers develop green product lines. The existing LEED certification system offers builders some incentives for local and recycled content, but could be augmented by local procurement incentives or requirements for the building retrofit initiative. Efforts like the Green Building Products Initiative in western Pennsylvania are attempting to strengthen the local market for green building products, with the goal of helping local producers tap into this growth market beyond the region. In addition to creating jobs in the manufacturing of building materials, an initiative to build the market for green building materials could support the growth of local businesses specializing in wholesaling and retailing of green building products, such as Greenmaker Supply.

c) *Factors affecting job impacts*

- *Overall growth of Energy Efficiency “market.”* The figures for building retrofit-related jobs are based on the assumption that the Plan’s overall goal of retrofitting 400,000 residential units and thousands of commercial and industrial buildings by 2020 will be accomplished. Because many of these building owners, e.g., middle- and upper-income households, would receive only marginal incentives or subsidies to undertake retrofits, the “market” for energy efficiency must be in place. This will likely depend on:
 - *Energy costs.* Prevailing energy costs, translated into utility rates, will shape the overall incentives facing building owners to invest in energy efficiency. As energy costs increase, the cost-effectiveness of more intensive energy efficiency measures increases along with the likelihood of achieving the projected job creation levels.
 - *Market transformation.* Other institutional factors will also be necessary to support the transformation of the energy efficiency marketplace on a broader scale. These include mortgage lending practices that appropriately value the benefits of energy efficiency.
- *Retrofit program design.* Several elements of how a CCAP-related building retrofit initiative would be organized would impact its overall job creation potential. These factors include:
 - *Economies of scale, e.g., block-by-block models.* The labor demand model presented here is based on the prevailing model for energy efficiency retrofit programs, in which auditors and contractors engage building owners on a one-by-one basis to identify and install efficiency measures. However, the program scale envisioned by CCAP could allow for alternative models, such as a block-by-block approach that has been used in Houston, Texas, which could potentially lower the labor requirements for any particular installation measure by reducing the amount of time in transit between houses, and more streamlined distribution of materials to worksites. To the extent, however, that this would permit more efficiency measures to be installed for a given budget, the net effect could be minimal. Other efforts to achieve scale economies, such as reduced or streamlined auditing functions, could lessen the demand for third-party energy auditors.
 - *Labor rates for energy efficiency measure installers.* Job impact estimates for the energy efficiency retrofit programs are based on a model that projects, for a given installation budget, how much of the budget will be allocated to materials and how much to labor. The higher the “loaded” labor rate (i.e., with benefits, overhead, liability insurance), the fewer jobs that are likely to be created, both because the installation budget would be exhausted more quickly but also because fewer installation measures would be deemed cost-effective. Thus there is a direct trade-off between the *quantity* and the *quality* of jobs created through energy efficiency retrofit programs.

- *Actual efficiency measures installed.* The job creation estimates are based on typical energy efficiency measures installed as part of programs in place currently. The total, and occupational mix of, jobs created will ultimately depend on the particular efficiency measures that the programs support and are adopted by building operators. For example, an increased focus on water efficiency as part of retrofit activities could spur additional demand for plumbers.
- *Program design elements, such as “first source” or local hire requirements.* In addition to how many jobs are created, there are factors that may affect who get those jobs. Requirements for energy efficiency installation contractors to utilize publicly-funded workforce development organizations as a “first source” for new hires, or hire a minimum share of workers from the communities in which they are working, could ensure that local residents get ample opportunity to take advantage of new job creation and at the same time, increase the neighborhood “multiplier effect” of their employment through their increased earnings and job vacancies created. However, such requirements would need to be balanced against employers’ need for experienced and adequately trained workers; otherwise fewer contractors would be attracted to the program.

2) Clean and Renewable Energy

a) *What is the CCAP calling for?*

The second component of the Chicago Climate Action Plan calls for “cleaning” traditional energy sources, and increasing the use of renewable sources such as biofuels, wind, solar and geothermal. The specific action items under this strategy include:

- Upgrading and improving the efficiency and environmental performance of the traditional (i.e., coal-fired) power plants operating within the city;
- Expanding the share of utility-sourced electricity generated from renewable sources, and increasing the renewables share of power used by the City; and
- Expanding distributed power utilization, including Distributed Generation (DG) and Combined Heat & Power (CHP) technologies, as well as household-level solar, geothermal and “small wind.”

b) *What are the likely workforce impacts?*

Expanded development and utilization of clean and renewable energy sources has significant job creation potential within and around Chicago. However, the implementation steps for the renewable energy component of the CCAP are less likely to have a direct job creation impact than the building energy efficiency initiative. For example, even if the City and State require utilities (through a Renewable Portfolio Standard, or RPS) to provide electrical power from renewable sources like wind, there is no guarantee that the companies generating and providing the power will utilize components made in or around Chicago. To a greater extent,

significant job impacts will result from economic development efforts to leverage overall growth in the renewables market, both resulting from CCAP and other drivers.

Job Creation

- *Renewable energy development.* With the help of federal production tax credits and state (and anticipated federal) RPS initiatives, a robust marketplace for renewable energy (RE) development has emerged, to which CCAP will contribute. RE development jobs can be broken down into two broad categories: companies, such as locally-based Invenergy, involved in financing and managing renewable energy projects; and companies who produce and sell equipment, such as wind turbines and solar panels, for generating renewable energy. Chicago has witnessed significant growth in both areas in the last several years, such as the recent decision of German wind turbine maker Nordex to establish its U.S. headquarters in Chicago, and currently is the headquarters for seven wind energy-related companies. This is largely due to Chicago's favorable location at the intersection of global financial markets and rapidly growing Midwestern component production and energy generation capacity. These jobs are almost exclusively "white collar" in nature, in fields like sales, finance, operations and engineering requiring at least a four-year college degree, and are likely to grow in Chicago as long as the outlook for renewable energy development in the U.S. remains strong. Whether the presence of RE development activities in Chicago can be translated into manufacturing and production activities is an open question.
- *Renewable energy installation.* CCAP's goal to double household renewable energy capacity from solar photovoltaic (PV) and thermal, geothermal and "small wind" will require workers to design and install those systems. These jobs include electricians, operating engineers and laborers installing solar PV panels, solar thermal systems and geothermal energy systems. The scale of new demand for renewable energy installation workers is difficult to forecast, since there is no solid information on the present size of the Chicago-area RE installation workforce, or on the total new RE capacity that would be brought online as a result of CCAP. However, even if CCAP's goals for household RE generation are met, it is likely that the resulting job creation would be on the order of hundreds.

Critical Jobs

- *Energy engineers.* CCAP's goals for distributed generation, especially for larger commercial and industrial buildings, will require the work of highly skilled energy engineers to design and implement RE technologies like combined heat and power (CHP). Centers like the Energy Resources Center at the University of Illinois at Chicago play a critical role, both in conducting analyses and facilitating the installation and evaluation of distributed energy projects, but also in connecting to higher education programs training existing and future engineers for the field.
- *"Smart grid" installation workers.* Upgrading the nation's electricity infrastructure through "smart grid" and "smart meter" technology will be essential in facilitating the adoption of

renewable energy, by allowing users to sell surplus energy back onto the grid. This will require new and different skills on the part of electrical workers working for utilities and specialty contractors.

Opportunity Areas

- *Wind turbine component manufacturing.* Several recent studies, in particular those of the Renewable Energy Policy Project (REPP), have projected highly significant job creation potential for production related to wind energy components. A 2004 analysis by George Sterzinger and Matt Svrcek estimated that approximately 3,000 new production jobs are created for every 1,000 MW of new wind power capacity. Based on their analysis of the geographic distribution of technical production capacity, they projected that 8,530 of 150,000 (5.7%) new wind-related manufacturing jobs would be created in Illinois¹². However, this assumed that components would be produced in the locations where technical capacity existed as of 1997, and could not account for shifts based on new entrants into the U.S. market (e.g., Spanish company Gamesa locating production facilities in Pennsylvania), as well as the changing geography of wind farms, which effectively limits where certain assembly and sub-assembly processes can occur¹³. The nature of these production jobs varies somewhat, but many are highly-skilled jobs in metalworking (e.g., welders, machinists). According to Dylan Tuttle of the Jane Addams Resource Corporation, the wind component where Chicago-area manufacturers currently have the most significant presence is around gears and drive trains¹⁴. While there is the potential for wind-related component manufacturing to support thousands of jobs in the Chicago area, there is relatively little within the City's control to directly influence this outcome – except if it were to attract (with various types of economic development incentives) an existing producer to locate a production facility in or around Chicago.
- *"Small wind" turbines.* One renewable energy technology where CCAP could play a key role in building the market and generating job growth is for household- or building-scale wind turbines, often called "small wind." The technology for small wind is still nascent, but there is one Chicago-based company, Aerotecture, that is currently active in this market. Direct incentives to home and building owners to install small wind could help to nurture this market, which could result in the creation of a local cluster of manufacturers designing and producing the wind turbines.

c) *Factors affecting job impacts*

¹² George Sterzinger and Matt Svrcek, "Wind Turbine Development: Location of Manufacturing Activity," Renewable Energy Portfolio Project, Technical Report, September 2004. [online at: http://www.repp.org/wind_turbine_dev.htm] Their projection of 150,000 new jobs was based on the assumption of 5,000 MW of new wind capacity, which at the time they considered "aggressive," but according to the American Wind Energy Association is roughly equal to the amount added in 2007, and forecast for 2008.

¹³ For example, because of their weight, towers for wind turbines need to be produced in relatively close proximity to the wind farm.

¹⁴ Presentation to Chicagoland Green Collar Jobs Initiative, 6/30/08.

- *Overall growth of the renewables market.* Continued growth of the market for renewable energy is an essential factor, and hinges on at least two key variables. First is the relative price of conventional energy sources such as oil, natural gas and coal. Continued escalation of energy prices will progressively enhance the cost-effectiveness and hence the market viability of renewable sources. But even in this scenario, public policies at the state and federal level, including federal tax credits for solar installation and wind generation, and state (and potentially national) renewable energy portfolio standards, will be important in determining whether development, production and installation activities will continue to grow, in Chicago and elsewhere.
- *Ability of local manufacturers to capture the RE components market.* There is considerable potential for Chicago to experience significant growth in manufacturing jobs related to the production of renewable energy components, but it will depend on the capacity of local companies to capture that market. Local economic development efforts, such as those currently underway by the Chicago Manufacturing Center, Jane Addams Resource Corporation and the Chicago Manufacturing Renaissance Council to help local manufacturers connect with original equipment manufacturers (OEMs) of wind turbines, can play an important role in making this happen. At the same time, State business attraction efforts, through the Illinois Department of Commerce and Economic Opportunity, could help to identify companies whose presence in Illinois might positively benefit existing companies down the supply chain.
- *Future City renewable energy initiatives.* At present, the implementation of the Clean and Renewable Energy component of CCAP remains at an early stage, with specific strategies for promoting goals like distributed and household renewable power remaining undefined. The task force being led by the Environmental Law & Policy Center to develop an implementation strategy for this segment of CCAP will eventually allow a clearer assessment of workforce impacts, especially for areas like RE installation.

3) Transportation

a) *What is the CCAP calling for?*

The third component of the Chicago Climate Action Plan calls for enhancing the transportation options for residents and workers in the City, simultaneously reducing automobile dependence, greenhouse gas emissions, and traffic congestion. The specific action items for the transportation component of the plan include:

- *Improving and expanding public transportation* for residents, commuters and visitors, boosting ridership through incentives and enhanced system reliability and accessibility;
- *Promoting alternatives to traditional automobile usage* by encouraging transit-oriented development, making biking and walking easier and safer, and promoting car sharing and carpooling;

- *Improving the efficiency of City-owned vehicles and exploring the use of sustainable alternative fuels such as biodiesel; and*
- *Improving freight movement and intercity passenger rail.*

b) *What are the likely workforce impacts?*

The overall labor market impacts of CCAP's transportation component will depend in large part on the extent to which they include significant expansions of the city's public transportation network. Absent major capital investments, the job impacts are likely to be modest in scale.

Job Creation

- *Transit construction.* Should expansion of the regional transit system occur, the most obvious labor market impact would be for construction workers, who would be employed to build the new or expanded lines. The scale of this impact could be quite dramatic, on the order of thousands of highly-paid jobs, especially if expansion comes in the form of new train lines.
- *Transit operators and maintenance workers.* Expanded transit ridership would, in theory, generate additional demand for train operators and bus drivers, as well as mechanics and maintenance workers to service transit equipment. Anecdotal evidence suggests that Chicago Transit Authority is seeking to accommodate increased ridership through more efficient deployment of existing resources, such as GPS technologies to reduce bunching of buses and alternative seat configurations to augment train car capacity, which would lessen the demand for additional operators. However, to the extent that increased ridership leads to increased utilization of the existing fleet of trains and buses, it could potentially result in greater demand for maintenance and repair to keep them operating smoothly.
- *Train conductors and yard workers.* Expansion of intercity and freight rail activity could generate demand for train conductors and entry-level "yardmen." According to Rob Hoffman, Transportation, Warehousing and Logistics (TWL) sector coordinator at the Chicago Workforce Board, the freight railroads maintain an aging workforce due to a lack of new hires in the last two decades, and so even under a slow growth scenario they are facing significant replacement needs over the coming years.

Critical jobs

- *Urban planners and designers.* Increased use of public transit and alternative transportation options like bicycles will depend greatly on a longer-term shift toward transit-oriented development (TOD) within Chicago. Urban planners and designers will need to provide for dense, multi-use, pedestrian- and bicycle-friendly environments, and consider incentives – such as increased street parking rates – that will encourage individuals to modify their behavior in ways that reduce their GHG footprint.

Opportunity areas

- *Alternative fuel (e.g., biodiesel) production.* One of the more interesting opportunity areas where CCAP could generate workforce impacts is around the production of alternative fuels like biodiesel, especially from recycled sources such as used vegetable oil (yellow grease). Rising oil and commodity prices have led to the emergence of a private market for companies specializing in grease recycling, such as Minnesota-based Restaurant Technologies Inc., which is the largest grease recycler for McDonald's¹⁵. The extent to which recycled grease is going into biodiesel production is unclear, but some cities are attempting to "close the loop." The City of San Francisco, through its Public Utilities Commission, operates the "SF Greasecycle" program, which was designed to help the City meet a 2006 mayoral directive to convert 100% of its fleet to B20 biodiesel by the end of 2007 (which it successfully accomplished). The program collects waste vegetable oil from local restaurants and residents and sells it to several biodiesel processors, which sell the processed fuel back to the City for use in its fleet. In May 2008, the City obtained funding to build a biodiesel processing plant so that it can process collected grease in house.

Factors affecting job impacts

- *Availability of capital funds for transit expansion.* The biggest factor shaping potential job impacts is whether there are funds available through the federal and state government to underwrite significant expansion of the public transit system in Chicago. Although shifting political priorities in favor of public transit will help, other factors – namely, Chicago's 2016 Olympic bid – will also play a key role. Should Chicago win its bid to host the 2016 Games, transit expansion will become a high priority.
- *Demand for public/alternative transportation.* To achieve increased transit ridership and utilization of alternative transportation modes, several factors will need to be present to sustain demand. Most obviously, the price of oil (and thus gasoline) will need to stay at a level where it will be attractive for individuals and businesses to reduce consumption and/or seek alternative transportation modes. But other factors such as increased density of new development around transit nodes, and limits on (and pricing of) parking could contribute to increased demand.

¹⁵ "Grease Sizzles as Fuel Source," *Chicago Tribune*, 5/22/08, B1.

4) Waste and Pollution Reduction

a) *What is the CCAP calling for?*

The fourth mitigation component of the Chicago Climate Action Plan relates to waste and pollution reduction, or “zero waste.” Through this component of the Plan, the City intends to reduce the amount of material sent to landfills by 90 percent by 2020, which would result in significant reductions in the amount of methane released into the atmosphere. The specific action items associated with the zero waste strategy include:

- *“Reduce, reuse, recycle”* – Expansion of municipal solid waste recycling programs (e.g. Blue Carts), exploration of waste-to-energy technologies, innovative models for reuse and recycling of organic waste, construction and demolition waste;
- *Expanded use of alternative refrigerants;* and
- *Capturing storm water on site through green infrastructure,* reducing energy needs and emissions from the City’s wastewater treatment facilities.

b) *What are the likely workforce impacts?*

Overall, the zero waste component of CCAP could generate hundreds of jobs in the processing, handling and resale or remanufacture of recovered materials. The process of recycling and reusing or reprocessing an item, by its very nature, creates jobs because it adds value to something that would have otherwise been discarded. According to data from the comprehensive 2001 Illinois Recycling Economic Information (REI) Study, the collection and processing of recyclable materials creates nearly three jobs directly for every job lost related to traditional waste disposal¹⁶. An analysis by the environmental consulting firm CDM for the Chicago Department of Environment estimated, based on the REI study, that increases in the City’s overall recycling rate by 5 and 10 percentage points would yield direct increments of approximately 230 and 460 jobs, respectively, and an almost equal number of jobs on an indirect basis¹⁷.

New Job Creation

Direct job creation is likely for a variety of occupations related to the processing, handling, and resale of recovered materials, such as:

- *Municipal solid waste recycling collection, sorting and processing.* These jobs are the most directly implicated in City efforts to boost recycling rates, e.g., through its Blue Cart (single-stream household recycling) initiative. Although the processing of recyclables

¹⁶ R.W. Beck Inc., “Illinois Recycling Economic Information Study,” Final Report to Illinois Department of Commerce and Community Affairs, December 2001. Based on employment impacts and offsets from 35% and 50% recycling rate scenarios, Tables 6-5 and 6-7.

¹⁷ Chicago Department of Environment, Zero Waste Strategy Report, Section 8, “Business Opportunities and Job Creation.”

has become increasingly automated within Material Recovery Facilities (MRFs), there remain considerable numbers of sorting and processing jobs within the companies who operate them.

- *Appliance and electronics recycling.* A number of efforts are underway to provide for environmentally-responsible disposal of “e-waste” and appliances. As mentioned earlier, expansion of appliance trade-in programs and the EPA’s Responsible Appliance Disposal initiative are creating jobs in the disassembly of refrigerators, freezers and air conditioners. And jobs in electronics recycling are likely to grow as voluntary initiatives like the City’s Hazardous and Household Waste Recycling Facility at Goose Island potentially give way to mandatory bans on the disposal and export of electronic items like computers, cell phones and televisions.
- *Organic waste and composting.* Specific initiatives to capture a greater amount of organic waste such as landscaping and food waste could generate small numbers of jobs in collection and preparation of the materials for composting and re-use.
- *Waste oil collection and processing for biodiesel.* As mentioned earlier, the burgeoning market for biofuels like ethanol and biodiesel led to a spike in early 2008 in prices for commodities like corn, which enhanced the viability of business enterprises and social ventures engaged in the collection and re-processing of waste vegetable oil from restaurants and other food service establishments. In New York City, the RWA (Ready, Willing and Able) Resource Recovery program, operated by nonprofit The Doe Fund, currently employs 15 people in the collection of waste vegetable oil from local restaurants, which it sells to biodiesel processors in the region. They project that their enterprise could eventually grow to support over 30 full-time staff and 60 trainees, which it hires from Doe Fund’s transitional job/life skills training program targeted at formerly homeless, ex-offenders, and recovering substance-addicted individuals¹⁸.
- *Deconstruction/building materials resale.* There is growing interest in the economic and environmental potential for building “deconstruction,” i.e., systematic disassembly and salvaging of buildings as an alternative to demolition. Several cities have undertaken small-scale deconstruction initiatives, and nationally, organizations like California-based The ReUse People and The Green Institute in Minneapolis are developing social enterprise models linking building deconstruction with resale of salvaged materials, creating jobs along the way in both the construction and retail sides of the business. According to a recent analysis for the City of New Orleans, demolition of 1,000 average wood-framed houses would support 160 living-wage jobs on annual basis¹⁹.

¹⁸ <http://www.rwarr.org/news/detail.cfm?PressID=280>

¹⁹ Preston Browning, Brad Guy, and Chris Beck, “Deconstruction: A New Cottage Industry for New Orleans,” August 2006. Obviously, the demand for deconstruction in post-Katrina New Orleans is quite tremendous and would likely exceed even a large city like Chicago; the report profiles deconstruction/building material salvage and resale operations in Vermont and Oregon, which operate with staff of 40-50 employees covering deconstruction, retail and management staff.

Critical Jobs

- *Industrial engineers.* Although the choices of individuals and households to consume less and recycle and reuse more will be essential to achieving CCAP's waste reduction goal, industrial engineers will need to develop new processes for reducing waste and utilizing non-virgin materials as feedstock, which would help to stimulate the market for recycled goods. The Waste to Profit Network, funded through the City of Chicago and operated by the Chicago Manufacturing Center, is helping to connect producers of waste materials to potential users of those materials as inputs or feedstock.

Opportunity Areas

- *Remanufacturing of recycled goods.* Increased recycling and recovery of consumer and industrial waste is likely to generate downstream business opportunities and jobs in the remanufacturing of those materials. Both the Waste to Profit Network, and the Delta Institute's recent efforts to increase the supply of salvaged building materials available for remanufacture into value-added products like window frames, show great promise in this regard. Further efforts to use policy tools such as public procurement to help build the market for locally-remanufactured products could help Chicago capture the opportunity in this area.

c) *Factors affecting job impacts*

- *Commodity prices.* Before the current economic crisis, the price of many commodities, including metals, glass, lumber and petroleum, had increased significantly over the course of several years. This had the effect of greatly enhancing the viability of business enterprises engaged in recycling. At the same, increased fuel prices effectively increased the cost of traditional landfill disposal methods, making recycling more cost-effective as an option for consumers. If commodity prices return to levels near their 2008 highs, it will increase the likelihood that a sufficient "pull" will exist to sustain recycling activities.
- *Measures to increase/incent recycling.* At the same, ongoing efforts to improve public awareness about, and convenience of, recycling will be important in building the market for recycling-based enterprises. Policy measures, such as state bottle deposit laws, would also greatly affect the quantity and quality of certain recyclable materials collected.

5) Preparation and Adaptation

a) *What is the CCAP calling for?*

The fifth and final component of the Chicago Climate Action Plan relates to *preparation and adaption* to the effects of climate change on Chicago's weather patterns and infrastructural needs. In addition to a variety of planning and public engagement activities, implementation of the Preparation and Adaption strategy will involve:

- Preparation for extreme heat and precipitation events; and
- Expanded use of “Green Infrastructure” and “Green Urban Design” to mitigate impacts of increased heat and precipitation.

b) *What are the likely workforce impacts?*

Overall, the Preparation and Adaptation strategy is likely to result in moderate amount of new job creation in a variety of occupational areas, while altering the knowledge and skill requirements for others. Specific occupational areas likely to be impacted include:

Job Creation

- *“Green infrastructure” design and installation.* Expanded utilization of “Green Infrastructure” elements such as trees, bioswales, rain gardens, and green roofs will boost demand for workers in “green” occupations like landscape design, horticulture, and urban forestry occupations like arborists. These occupations have already experienced robust growth in Chicago as a result of City’s ambitious Landscape Ordinance passed in the 1990s. According to the Illinois Department of Employment Security, there were over 20,000 jobs in landscaping and groundskeeping occupations in Cook County as of 2004, with a projected growth rate of over 14 percent to 2014, nearly 50 percent higher than the growth rate for all occupations²⁰. The City’s Green Urban Design initiative will build on this by emphasizing the use of native vegetation and more intensive efforts to maintain and expand the tree cover on public and private lands within the city. For this reason, workers in the landscape field are likely to require additional knowledge and training about sustainable landscaping techniques and plant varieties.
- *Green roof design/installation.* CCAP’s goal of increasing the number of rooftop gardens to 6,000 will require more landscape designers and architects, and especially “green roofers” – who are often traditional roofing contractors who are experienced and familiar with green roof components and application techniques. The net impact of increased green roofs will depend somewhat on the mix of intensive versus extensive designs²¹, with the former requiring more specialized landscape architecture and structural engineering services than the latter, which are increasingly being done by traditional roofing contractors using prefabricated materials (e.g., pre-vegetative mats). A recent analysis by the District of Columbia Office of Planning estimated that each million square feet of green roof installation would support approximately 400 new, direct jobs – about 60 percent of which would be positions like roofers and landscapers, the rest in more highly-skilled design

²⁰ Illinois Department of Employment Security, Occupational Employment Projections, Cook County, 2004-2014.

²¹ Intensive green roofs, such as what is found on Chicago’s City Hall, require a minimum of one foot of soil, add 80-150 pounds per square foot of load to the building and can accommodate a wide range of plants and trees, while extensive green roofs require only 1 to 5 inches of soil, add 12-50 pounds per foot and use a more limited range of grasses and plants. (Source: <http://www.epa.gov/heatisland/strategies/greenroofs.html>).

positions²². Based on these estimates, Chicago's expansion of green roof installation – which would likely result in nearly 10 million square feet of new installation by 2020 – would directly support approximately 400 green roof design and installation jobs, plus additional indirect jobs in the production and distribution of materials.

- *Water infrastructure construction.* Capital investments in the City's aging water infrastructure will be necessary to ensure that it is prepared for the effects of climate change, and at the same time improve water conservation. Estimates by the Chicago Department of Water Management suggest that needed investments in aging water mains and pumping stations and new metering technologies could sustain as many as 2,000 high-paying construction jobs.

Critical Jobs

- *Civil engineers and technicians.* The City's recently-enacted Stormwater Management Ordinance, which is related to the Adaptation strategy, requires developers of certain types of properties to take steps to control the flow of stormwater leaving their developments into the City's combined sewer system. This has increased the demand for civil engineers and technicians to analyze properties and design drainage systems, often utilizing Green Infrastructure elements like permeable pavement, cisterns and rain barrels, water detention and retention culverts to capture more stormwater on site and divert it into the ground rather than the sewers.
- *Landscape architects and designers.* Similarly, recent City efforts to expand the Landscape Ordinance and promote Green Urban Design make the efforts of landscape architects and designers increasingly important. Over the coming years they will be called upon to utilize more porous hardscape materials (i.e., pavers, concrete), and design more sustainable greenspaces using more drought-resistant plants and requiring less pesticides.

Opportunity Areas

- *Green Infrastructure Materials, such as Porous Pavement.* City-led demand for "green infrastructure" materials has the potential to build the market for local companies producing items like porous pavers and concrete mixes. However, to the extent that demand for green infrastructure materials simply displace demand for other locally-produced items (e.g., concrete), the net impact may be relatively low.

²² Analysis based on labor demand calculations in "RE-GREENING WASHINGTON, DC: A Green Roof Vision Based on Quantifying Storm Water and Air Quality Benefits," Casey Trees Endowment Fund and Limno-Tech Inc., August 2005.

III. Conclusion

The Chicago Climate Action Plan, when fully implemented, will impact the local economy and labor market in diverse ways. It will directly generate demand for up to 2,500 energy efficiency-related jobs on an annual basis, plus hundreds of jobs in areas such as renewable energy installation, green roof design and installation, and collection, processing, resale and reuse of recycled materials. Capital investments in new and revitalized infrastructure, from new transit lines to water mains, could generate thousands of jobs on their own while helping Chicago mitigate and prepare for climate change.

In addition, CCAP will impact thousands of other workers, from building operators and landscape designers to electricians and industrial engineers, whose efforts will be critical to achieving the Plan's GHG reduction goals. And yet other jobs, from green building materials companies to wind turbine manufacturers, are possible if the right economic development strategy were put into place to support CCAP implementation.

However, CCAP's overall impact is difficult to quantify. Many of CCAP's implementation steps will hinge on a range of factors, including commodity market conditions (e.g., oil prices), state and federal expenditures and policy changes, and the effectiveness of local economic development strategies around green jobs. All of these factors – plus a simple lack of good data – make it practically impossible to forecast the total employment impact of the Chicago Climate Action Plan²³.

The purpose of this analysis was to identify where the City may be able to leverage its investment in the CCAP to develop workforce development initiatives that, on one hand, provide disadvantaged and/or low-income workers in Chicago access to career-path jobs in “green collar” fields, and at the same time ensure that an adequate supply of skilled workers is available to meet the demand on the part of employers to do the work of the CCAP and help Chicago achieve its greenhouse gas reduction goals.

Based on this analysis, we have identified three broad occupational impact areas where there is either an acute need, and/or significant job potential for disadvantaged populations:

- *Energy Efficiency.* Far and away, the biggest impact is going to be for workers to assess the energy performance of buildings and install various measures, from new lighting systems to appliances to insulation, to enhance their performance. Our estimates suggest that the building retrofit programs for residential and commercial buildings will eventually support up to 2,500 jobs for measure installation and auditing functions. Although these figures may seem small relative to the total number of construction-related jobs in Chicago, they are nonetheless significant and compare quite favorably

²³ Similar analyses for other cities, such as the one recently produced for PlaNYC by Louis Berger Group, focus almost exclusively on construction-related impacts for new infrastructure investments such as expanded public transit and water infrastructure.

with any existing economic development program. And because much of this work will be done in low-income neighborhoods in need of jobs, the significance of these jobs should not be understated, especially if effective mechanisms can be developed for training and preparing local residents for entry-level positions. At the same time, the occupation where the greatest gap between supply and demand is likely to exist is energy auditor, and so efforts to recruit and train individuals for these skilled jobs will be critical. And there may be a demand for training for building operators to help them learn how to maximize the energy efficiency of the buildings in which they work.

- *Landscaping and Urban Forestry.* Although the scale of CCAP-driven job growth for landscaping and urban forestry occupations is difficult to project, a number of CCAP-related goals and initiatives – more rooftop gardens, planting one million trees, utilizing Green Infrastructure and Green Urban Design – point in their direction as an area where workforce programming might be targeted. A number of programs like Greencorps, Chicago Christian Industrial League and Windy City Harvest are already targeting entry-level jobs in this area, but there may be a need for continuing education, credentialing and degree opportunities that will allow entry-level workers to advance their careers and earnings potential.
- *Recycling and Reuse Occupations.* Several parts of the Chicago Climate Action Plan suggest that small-scale pilot projects around recycling and reuse occupations might be feasible. These could include appliance recycling, waste vegetable oil pick-up and processing for biodiesel, building deconstruction and salvage, and a number of others. Although the job impacts are small, they may nonetheless lend themselves to social enterprise models that would be suited to targeted populations such as ex-offenders.

Subsequent analyses will examine these three occupational areas in greater depth, looking at the career ladders and education and training infrastructure around those occupations.

Appendix

Summary of COWS Building Retrofit Jobs Model

The Center on Wisconsin Strategy (COWS) has developed, along with the Powell Center for Building and the Environment at the University of Florida, a model for estimating labor demand requirements from energy efficiency building retrofit programs for single- and multi-family residential and commercial buildings. The model is based on construction estimation techniques that account for contractor profit and overhead and materials costs, and estimate the labor portion of installation costs based on loaded labor rates and typical crew makeup.

Model Assumptions

- Per-unit auditing and installation costs for single-family, multi-family and commercial retrofits based on September 2007 memorandum prepared by the Center for Neighborhood Technology.
- Occupational breakdown based on available data on energy efficiency measures in similar programs elsewhere, adjusted for Chicago building size.
- Model assumes that half of total installation budget is dedicated to materials costs, the remaining half to labor costs.
- Four wage rate scenarios were modeled:
 - 1) Full union-scale wages, provided by a prominent Chicago construction management firm;
 - 2) Reduced union-scale, based on some non-union and reduced contractor liability;
 - 3) Non-union wages from major Chicago-area weatherization contractor;
 - 4) Wages from national survey of small, generally non-union weatherization contractors conducted by Powell Center.
- Job estimates for the three retrofit program areas are based on assumptions about likely program design scenarios, with the commercial estimates based on the midpoint between scenarios (1) and (2), multi-family residential based on the midpoint between (2) and (3), and single-family residential between (3) and (4).
- Model projects total full-time equivalent (FTE) job-years and number of jobs created per million (JPM) dollars of investment; totals based on the application of the JPM figure to unit retrofit projects developed by Katzenbach Partners for CDOE.
- Totals are for direct labor requirements only, and do not include indirect jobs created through materials production, wholesaling and distribution functions.