

Ohio

Summary and Analysis

If the U.S. is destined to undergo a green industrial revolution, few states are better positioned than Ohio to take advantage of the opportunities it will bring. The state has historically been a manufacturing hub, and it clearly wishes to remain so. But its leaders have no illusions about the return of low-skill, high-wage jobs in “dirty” industries. Instead, they are employing a mix of tax incentives, research support, and supply-chain organizing to aggressively pursue manufacturers in alternative-energy sectors—or “advanced energy,” as state politicians like to say, leaving room for clean coal and related technologies. Backed by supportive policies at the state and local levels, Ohio has emerged as a national leader in the development and production of wind, solar, and fuel-cell technologies, with active business clusters in each area. The state’s fifteen public universities have joined together to promote investment in clean energy. Research, technology transfer and skills training aimed at growing green businesses and employment are widespread throughout Ohio universities and community colleges.

The prevailing worry in Ohio is whether the state can muster the resources needed to sustain its current momentum. The governor has been a tireless advocate for green development, but if his reelection bid fails this fall, at least some of the state’s plans for growing clean industries could be in jeopardy. The legislature faces a \$7-\$8 billion budget deficit for FY 2012-2013, and while it is unlikely that economic development dollars will be significantly cut, the future availability of discretionary funds for new investments is a huge unknown. The passage of federal climate change legislation could be a major boon to Ohio. The state has proven adept at procuring federal stimulus funds for green projects, and new revenue streams will have to materialize if many of the programs launched under ARRA are to continue. On the list of Ohio’s more progressive initiatives:

- Ohio Third Frontier will have spent \$1.6 billion of taxpayer dollars by 2012 to encourage high-tech business growth, and it was recently reauthorized for another four years and \$700 million by voter referendum. In its more recent funding cycles, the program has placed increased emphasis on advanced energy and materials, fuel cells, and photovoltaics that build on its success in creating a solar and fuel-cell industry.
- The state has conducted analyses of the supply-chain of the fuel-cell and wind industries.
- Ohio’s leaders have excelled at bridging the gaps among government, business and research institutions. Ohio Green Pathways and the University Clean Energy Alliance provide two examples of programs that link disparate constituencies.
- The world’s first freshwater wind farm is poised to begin construction off the shores of Lake Erie in 2011, thanks to a partnership between a Cleveland group and General Electric.
- Evergreen Cooperatives is simultaneously encouraging green development, local buying, and urban renewal by opening a network of worker-owned cooperative businesses in some of Cleveland’s most distressed neighborhoods.
- In Cleveland there is a unique building deconstruction program.
- The City of Cleveland hosts a sustainability summit that brings together stakeholders to develop plans and initiatives.

General Background Policy

Energy Goals. In 2007 Ohio joined the Midwestern Greenhouse Gas Reduction Accord, which committed the state to a minimum of 10 percent renewable energy by 2015. A year later the state legislature raised the stakes with the approval of an Advanced Energy Portfolio Standard of 25 percent by 2025 (SB 221). That benchmark can be achieved through increases in nuclear energy, fuel cells, and clean coal, but a minimum of 12.5 percent of the goal must come from renewable sources — giving Ohio the third most aggressive renewables standard in the nation. The legislation included an energy-efficiency goal of 22 percent reduction in demand by 2025, with targets of 1 percent per year starting in 2014. With Ohio's large population and high energy use from its manufacturing base, the targets demand a more significant commitment to greenhouse gas reduction than similar goals would in a smaller state.

Public Benefits Fund. Ohio's public benefits fund was inaugurated in 1999 for an amount of about \$15 million per year, then reduced to \$5 million per year after 2005. Known today as the Advanced Energy Fund, it draws revenues from ratepayer charges to support a wide range of grants in energy efficiency and clean energy, including low-income energy projects and incentives for installing wind or solar generation on residential properties (DSIRE 2010). The fund is set to expire at the end of 2010, which exposes its renewal to the vagaries of gubernatorial campaign politics, but policy insiders are confident that the program will be reauthorized as a rider on some other piece of legislation before the clock runs out. It is unlikely, however, that the fund will be expanded anytime soon.

Green-Buildings Policy. In 2007 government legislation (HB 251) required a life-cycle analysis of buildings above a designated size, and it also set up energy consumption reduction goals for state university buildings. The same year Governor Strickland issued an executive order (2007-02S) that required the state government to conduct an energy audit of buildings and to reduce energy consumption by 15 percent within four years (EPA 2008, DSIRE 2010). Form-based zoning codes, which allow planning administrators greater control over the types of building projects approved for an area, are already in use in Columbus and are being considered in Cincinnati.

The U.S. Department of Energy provided another windfall for Ohio in the form of \$266 million in ARRA funds to weatherize homes for low-income residents. No other state received nearly as much support. The Ohio Office of Community Services is using the first \$106 million, awarded in June 2009, to weatherize 32,000 homes all over the state. Ohio also offers residents a variety of other incentives to improve their energy efficiency or switch to clean energy, including rebates for purchasing efficient appliances and rate reductions on loans for home upgrades. A diversity of similar programs exists at the municipal and county levels throughout the state.

Green Jobs Training. The state government received \$6 million in ARRA funds in 2010 for green jobs training. It also launched Ohio Green Pathways (2009), a partnership between the Ohio Board of Regents and the Ohio Environmental Council. The program produces a web tool and a catalog of green jobs training programs at community colleges and adult career centers. It has an advisory panel of twenty-five people from industry, academia, government, and labor. They provide advice on industry needs, new opportunities, and strategies for placing students.

The program provides a model of how to connect industry needs with higher education training programs for greater coordination and information sharing.

About half of Ohio's twenty-three community colleges currently offer some sort of green jobs training program. Degree programs that prepare students for careers in green industries are being created at institutions of higher learning throughout the state, including an associate's degree in advanced energy and fuels cells at Hocking College, and M.S. programs in renewable and clean energy sponsored by the engineering schools at both the University of Dayton and Wright State University. Some apprenticeship and pre-apprenticeship programs, such as the Orientation to Trade and Apprenticeship Program at Columbus State Community College, are also beginning to target green collar skills such as weatherizing homes (Van Lier et al. 2010). The state's Constructing Futures Initiative is dedicating \$4 million in ARRA funds to providing training in building trades to underrepresented groups, such as women and minorities.

Clean-Energy Industries

General Background. Ohio is the seventh most populous state in the country, and its central location and access to rivers and lakes has made it a hub for the country's industry. The state retains a strong manufacturing base, with estimates of about 45 percent of the economy in heavy industry. However, much of the manufacturing is tied to older industries, and as a result the state government has actively developed programs to help transition its Fordist industrial base to high-technology, including clean-energy industries. The potential for growth in green sectors is encouraging; a recent study by Pew Charitable Trusts found that clean-energy jobs in Ohio grew more than seven percent over the last decade, even while overall employment was shrinking (Pew 2009).

In 2002, the state government established Ohio Third Frontier to spur the state's high-tech sector and stimulate cluster developments by assisting with the commercialization of new technologies. The program was established within the state's Department of Development and has a budget of \$1.6 billion over ten years that includes support for clean-tech industries. Ohio Third Frontier offers funding opportunities through numerous programs, including the Innovation Ohio Loan Fund and the Ohio Research Commercialization Grant Program. In 2010, voters approved reauthorization of the program for an additional \$700 million through 2016. Some observers have expressed concern that since the program is debt-financed, the state has not yet faced its true cost.

In June, the governor signed legislation (SB 232) eliminating property taxes on renewable energy operations that come online by 2013 and replacing them with a flat tax of \$6,000-\$8,000 per megawatt of generation capacity. Wind and solar groups cheered the new law, which they believe will create significant cost savings for renewable-energy producers and will make Ohio more competitive in attracting renewable energy investment (Cartledge 2010). The law also makes facilities producing electricity from advanced nuclear, cogeneration, and "clean" coal technologies eligible for the tax exemptions. The state has long exempted facilities used for "energy conversion" — which has typically been taken to mean replacing fossil fuels with alternatives — from sales, use, and property taxes. The recently-signed law also expanded PACE

financing in Ohio by authorizing municipalities to create Special Improvement Districts where homeowners can borrow state funds for a wide range of renewable-energy and energy-efficiency projects. Previously, PACE financing had been restricted to photovoltaic and solar thermal installations. In June, the city of Cleveland and sixteen suburbs joined forces to create a first-of-its-kind renewable energy SID with \$100,000 in seed money from a regional economic development fund (Wendel 2010).

The Ohio Department of Development (ODOD) promotes economic growth in renewable energy industries through its Ohio Energy Resources Division, which uses federal stimulus dollars to fund a wide range of clean-energy and energy-efficiency projects. ODOD has identified advanced energy technologies as a target area for investment, giving such projects priority in the distribution of tax incentives and other funding opportunities.

In 2008, the state approved a \$1.5 billion job stimulus program (HB 554), which included \$150 million in funding for the Advanced Energy Job Stimulus Fund that is administered by the Ohio Air Quality Development Authority. The fund included \$66 million for clean-coal technology and \$84 million for non-clean-coal projects. The funding was available over a three-year period as loans especially to businesses that attracted new investment or involved technology commercialization (State of Ohio 2010). \$40 million from the jobs stimulus and ARRA was used to establish the Ohio Energy Gateway Fund, which will pair state dollars with private investment to accelerate growth in advanced energy sectors. Another large chunk of the jobs stimulus package went to the Clean Ohio Fund, reauthorized for \$400 million after the program spent an equal amount between 2000-2008 on brownfield redevelopment, farmland preservation, and green space conservation. Half of the total \$800 million either has been or will be spent to restore brownfield sites.

In late 2009, Governor Strickland announced \$14 million in grants to bankroll fifteen solar, eight wind, and two solar thermal projects. These awards marked the first phase of the \$96 million State Energy Program, paid for with ARRA funds from the U.S. Department of Energy. More recent funding opportunities have included \$18 million for energy efficiency and \$10 million for waste-to-fuel projects. Federal funds, state matching dollars and private donations will also create a more than \$80 million revolving loan fund for energy-efficiency and renewables ventures.

Ohio has a strong public and private research university system, with research strengths in the materials science fields. In 2007 the leaders of the state's fifteen large research universities formed the University Clean Energy Alliance of Ohio. The partnership organizes conversations and conferences on energy, and facilitates university-industry collaboration. It will also make it easier for university researchers and administrators to share information and resources among themselves. The state's public universities have numerous research centers dedicated to developing clean-energy technologies, among them the Great Lakes Energy Institute at Case Western Reserve University, the Dayton University Research Institute, and the Institute for Energy and the Environment at Ohio State University. Ohio Third Frontier also funds university research through its Wright Projects Program. In 2009, Governor Strickland named nine "Centers of Excellence" in advanced energy at eight state universities, and in 2010 the program allocated \$20 million to seven different research programs. The purpose of the designations was

to allow each university to focus on its specific strengths in advanced energy research. The University of Toledo's new Scott Park Campus of Energy and Innovation, opened in late 2009, will be used as a "hands-on alternative energy laboratory" (Lockwood 2009). The campus will produce its own energy from two solar arrays and a wind turbine, and beginning next year it will be home to a half-acre of algae ponds for biofuels research. The state also funds seven Edison Technology Centers around Ohio to foster technology transfer and business development. The Edison Materials Technology Center in Dayton has provided expertise in fuel cells and hydrogen technology to private companies for decades, and in the last two years expanded its efforts to include all major categories of renewable energy.

Biofuels. In 2006 Governor Robert Taft issued an "Energy Action Plan" that included \$80 million in investments in ethanol production. The plan called for the state to double its use of E85 in fleet vehicles, required all new vehicles purchased to be flex-fuel models, and tripled the number of E85 pumps available to consumers (NASDA 2006). In 2007 an executive order (2007-O2S) called on state agencies to install E85 pumps "where such pumps are not otherwise available," ensuring that the state fleet had access to alternative fuels, and to develop plans for 25 percent of diesel fuel used by state vehicles to come from biodiesel by the beginning of 2008. Currently, all four of Ohio's large electric utilities are developing methods to replace a portion of the coal they burn with solid biomass fuels. (Arnold 2010). Ohio's biomass industry has grown to more than sixty businesses and research institutions (Kruse and Gomberg 2009). The company SuGanit, out of Toledo, produces cellulosic ethanol from biomass waste. Quasar Energy Group, based in Cleveland, broke ground earlier this year on an anaerobic digester plant in Columbus with the capacity to turn 40,000 tons of municipal waste into one megawatt of electricity each year (Hallett and Gearino 2010).

Solar. Ohio has one of the fastest growing solar power industries in the nation, and much of the excitement is emanating from the northwestern part of the state, where Toledo is reinventing itself as a solar research and manufacturing mecca. The city was historically known as a glass manufacturing center, an industrial strength that was aided by its proximity to the Michigan automotive industry. As glassmaking declined along with much of the rest of the Midwestern auto industry, Toledo researchers and companies leveraged their expertise in glass to shift into thin-film solar panel manufacturing. As of 2008, Ohio Third Frontier had invested \$33 million in the northwestern Ohio solar energy cluster, and at least 6,000 people are now employed by the region's solar industry (Keen 2010, Ohio Third Frontier 2008).

This fledgling manufacturing renaissance has been built from a strong knowledge base. The region's most successful solar companies are spin-offs founded by University of Toledo professors. The university is home to the School of Solar and Advanced Renewable Energy, and in 2007 it received the largest chunk of an \$18.6 million award from Ohio Third Frontier to form the Wright Center for Photovoltaics Innovation and Commercialization, connecting researchers at the University of Toledo, Ohio State University, and Bowling Green State University. An additional \$8.9 million grant in 2009 went to the University of Toledo and nearby Bowling Green State University (Ramsey 2009). In an effort to build on the region's growing expertise in photovoltaics, the state's Ohio Research Scholars Program dedicated \$8 million to attract scientists to the University of Toledo.

In 2009, Ohio was home to 118 businesses and research institutions in the solar supply chain (Kruse and Gomberg 2009). Venture capital has flowed into the companies that are emerging in the area, including \$40 million into Xunlight (Ohio Third Frontier 2008). The company, which manufactures next-generation flexible solar films, put most of that startup capital into its production facility, which now employs more than 100 people and can produce enough photovoltaic film annually to power 25,000 homes. Xunlight has become a media darling; it hosted Sarah Palin for an energy policy speech during the 2008 presidential campaign and has been featured in the pages of *The New York Times* and *The Economist*. Toledo's other, larger thin-film solar manufacturer is First Solar, which today employs more than 1,000 people. The company expects to have 1.3 gigawatts of production capacity online by the end of the year, and has the lowest production costs in the industry, at around \$1 a watt. First Solar's stock is now trading for well over \$100 a share.

The state also supports the industry with a solar energy carve-out for its renewable portfolio standard (Calzonetti 2008, Fitzgerald 2010). Ohio has set a benchmark of developing 60 megawatts of solar capacity by 2012, about 30 times the amount currently installed (Schwartz 2009). The goal of generating 0.5 percent of the state's energy from solar by 2025 translates to 450-800 megawatts.

Transportation and Energy Storage. Ohio has developed a strong fuel-cell industry, which as of 2009 numbered 115 businesses and research centers (Kruse and Gomberg 2009). The state's Department of Development began a mapping process in 2004 for fuel-cell investment, and during the following four years it invested over \$73 million into the industry, of which about \$40 million came from the Ohio Third Frontier Fuel Cell Program. A cluster of firms is located in northeastern Ohio, but the state has also identified a fuel-cell "corridor" that includes Columbus and southwestern Ohio, but not northwestern Ohio, where the solar industry cluster is located. By 2008 the Ohio Department of Development reported the successful recruitment of several fuel-cell companies to the state and significant growth in the cluster. The state also has a fuel-cell supply-chain database developed by the Edison Materials Technology Center (Curtin et al. 2010). Fuel-cell research is conducted in many of the states universities, with over eighty-seven research projects underway in 2008 and significant research groups at Case Western Reserve University, Ohio State University, and Stark State College of Technology. Research is also conducted at the Wright Patterson Air Force Base and NASA Glenn Research Center. However, commercialization has been slow, and most jobs remained in the research and development segment of the industry (State of Ohio 2009). Rolls Royce chose Canton for the North American headquarters of its fuel-cell research division, citing the area's large base of potential suppliers as a reason for picking that location (Patton 2010). Nextech Materials in Lewis Center, Ohio has grown to thirty-five employees with the help of \$5.7 million in state funding. Owner Bill Dawson wants to someday open a manufacturing plant in Ohio (Hallett and Gearino 2010).

Lack of investment in rail and other forms of public transit remains a major sticking point in Ohio politics. Historically a major supplier to the automobile industry, the car culture is firmly embedded in Ohio. No passenger rail service has connected the state's major cities since the early 1970s. Plans to establish a "3C" corridor linking Cleveland, Columbus, Cincinnati and Dayton appear to be at a crucial stage. In early 2010, Governor Strickland announced that the

state had received \$400 million in ARRA funds to establish the corridor, enough to complete the entire project. For the moment, though, it remains unclear whether the state will even accept the federal stimulus money, despite Strickland's enthusiastic support. At least some Republicans in the state legislature are unconvinced the project can stay on budget, and a political fight appears imminent over the \$17 million in annual operating costs the state would have to provide. It is worth noting that those operating costs would represent only about one-half of one percent of the state's annual transportation budget (Freemark 2010).

Each of the last two years, only \$10 million has been set aside from the state's transportation budget for public transit, a 70 percent decrease from 2002 funding levels (Woodrum 2010). In a small gesture toward sustainability concerns, the Ohio Department of Transportation recently added an environmental category (evaluating the impacts that a project will have on air quality) to the scorecard it uses to determine funding priorities. A coalition of twenty citizen's groups and local transit authorities has formed under the banner "Save Transit Now, Move Ohio Forward!" to lobby for increased spending on public transit projects.

Wind. Ohio has become a hotbed of activity in the wind-energy sector, and in recent years has made significant strides toward become a national leader in wind technology manufacturing. The state's 2008 goal of obtaining 25 percent of its energy from advanced and renewable energy by 2025 requires that at least half of that total come from renewables like wind and solar (SB 221). The law set the stage for growth in the state's wind industry, and wind energy developers have shown considerable interest in the "wind belt" located in the state's northwestern region. Three large wind farms were recently approved for construction there. When completed, the combined capacity of those farms will top 400 megawatts (Sautter 2010).

Ohio's large manufacturing base gives it a significant advantage in developing its wind industry. Like Michigan, the state is home to many small automotive suppliers that could easily make parts for wind turbines. A 2005 report by Policy Matters Ohio projected that the state has the potential to add as many as 13,000 jobs by investing in wind energy (Hanauer 2005). The Cleveland-based manufacturers' organization WIRE-Net was responsible for creating the Great Lakes WIND Network, which is dedicated to developing the wind-energy supply chain throughout Ohio and the nation (Fitzgerald 2010). The network has made progress in organizing Ohio's wind supply chain and connecting suppliers with turbine manufacturers. Ohio now claims to have a very high, if not the highest number of companies located in the wind energy supply chain (Ohio Wind Energy Working Group 2009), and some of those companies are already producing wind energy components (Sterzinger and Svrcek 2004). American Tower Company in Shelby is making towers for small turbines up to 10 kilowatts. Cardinal Fastener & Specialty Company makes oversized screws and bolts, in the past for companies like John Deere and Caterpillar, but has now moved aggressively into supplying turbine manufacturers. Owner John Grabner predicts turbine manufacturing could account for 90 percent of Cardinal's business in the years to come, and unlike many businesses in Bedford Heights, he is hiring (Chu 2009).

Ohio's industry leadership in promoting wind energy has been impressive, and state government is also working to attract investment through its Ohio Wind Working Group, administered by the Department of Development. There is also freshwater wind energy research conducted at the University of Toledo and Case Western Reserve University's Great Lakes

Energy Institute. In 2010 Ohio Senator Sherrod Brown (2010) introduced federal legislation, the Program for Offshore Wind Energy Research and Development (POWERED) Act of 2010, that would fund additional research and support wind-energy sites.

Cleveland

Twenty-first century Cleveland is typical of large rust belt cities. Like its neighbor to the north, Detroit, the city's economy and infrastructure have been ravaged by fifty years of disinvestment and decline. The middle classes have largely fled to the sprawling suburbs, and the city center is now a shell of what it once was, home to impoverished minority communities and tens of thousands of empty lots. One of the biggest dilemmas facing city leaders today is what to do with all of the vacant land. The population has evaporated from more than 900,000 in the city's heyday to less than 450,000 today. But unlike Detroit, efforts underway to green Cleveland are benefiting from strong government and community support. Cleveland is known for sustainability efforts directed at community gardens and urban farms — there are already twenty-five for-profit farms within the city limits — and it is also working to develop the nation's first utility-scale offshore, freshwater wind farm. City leaders appear to possess the political will to enact transformative changes, and Mayor Frank Jackson is convinced that charting a more sustainable path is Cleveland's best hope for an economic resurgence (Watterson 2010).

Sustainability Plans. Cleveland has adopted the statewide goal of obtaining 25 percent of its energy from “advanced” sources by 2025, but unlike the state does not count clean coal or nuclear as advanced energy sources. Although it was not yet available at the time of this publication, city officials should make public a strategic plan for sustainable growth sometime this August. The plan has emerged from a unique community dialogue that has been ongoing over the last year. In August 2009, about 700 people gathered at a downtown convention center for the Sustainable Cleveland 2019 summit. Everyone from corporate bosses to local high school students was included in the conversation. Participants split into twenty working groups and together produced a list of twenty-eight sustainability initiatives they would like to see the city pursue in the coming decade. Projects proposed included a “solarail” transit line, the establishment of an alternative energy business incubator called the Laboratories for Advanced Energy Commercialization, a \$100 million Regional Sustainability Fund, and a handful of local foods initiatives. Following that meeting, Mayor Frank Jackson appointed Andrew Watterson to head the city's Office of Sustainability, established in 2005, and he formed the Sustainable Cleveland Council to work the twenty-eight summit recommendations into a strategic vision for the city (City of Cleveland 2010). “It's truly an economic development plan that integrates sustainability,” Watterson said of the forthcoming plan (Watterson 2010).

Working groups formed at the 2009 summit continue to meet and advance various sustainability initiatives. According to Watterson, projects related to local foods and energy efficiency have been moving forward rapidly (Watterson 2010). A follow-up summit is scheduled for September.

Cleveland's Office of Sustainability has become an active unit of city government, and is currently involved in dozens of initiatives, though many of those remain in exploratory phases. The city is investigating the feasibility of offshore wind and combined heat and power. Plans for a \$160 million waste-to-energy facility have moved into the design phase, and will include a new single-stream recycling and sorting center. The sorting process will remove hazardous waste, identify recyclable materials for resale, and create pellets of solid fuel for burning. Since Cleveland currently conducts its own recycling, water treatment and electricity production, city officials expect a strong return on investment through savings on landfill tipping fees, decreased costs for the public utility, and the sale of materials and fuels (Watterson 2010).

Some tangible strides have been taken to reduce energy consumption and waste. In 2007, the city nearly doubled its recycling rate, saving \$1 million. Traffic lights and crosswalk signals are being replaced with energy-saving LEDs. The long-term goal is to eventually transition all city lighting to LED. Officials are working to consolidate all of their lighting contracts to a single supplier, with the stipulation that that supplier locate in Cleveland. A number of companies have expressed interest in the proposal, and the city plans to initiate a competitive bidding process (Watterson 2010). City government is putting increased emphasis on local purchasing across the board. Earlier this year, the city council passed an ordinance giving an up to four percent preference to sustainable local businesses in competitive bids.

All improvement projects funded by the city are being required to divert half of the construction waste they produce from landfills. Pilot projects to install solar hot water heaters in government buildings and convert the city fleet to 20 percent biodiesel are underway. Sustainability goals have also been built into the Connecting Cleveland 2020 Citywide Plan, which proposes a wide range of "green" policies such as the creation of mixed-use districts, the rehabilitation of brownfields, the amendment of zoning codes to promote green building, and the development of pedestrian- and bike-friendly trails and roads. In 2008, Mayor Jackson required that all municipal buildings reduce their energy consumption by 10 percent within three years. The city is also using \$550,000 in federal grants to enhance its credit in order to attract a pool of investors for a revolving loan fund that would help local residents and property owners invest in renewable energy and efficiency retrofits.

Until recently, Cleveland Public Power lagged behind other publicly-owned utilities in terms of investments in efficiency and alternative energy sources. The utility is now making up for lost time, either leading or partnering in the proposed offshore wind, waste-to-energy and LED lighting projects. It has also invested in a 50-megawatt hydroelectric plant on the Ohio River (Watterson 2010).

Like the rest of the state, underinvestment in public transportation remains a struggle for Cleveland. Even as bus ridership has increased in the wake of the recession, funding has been slashed and services were reduced. As a major highway hub with little traffic congestion and cheap, readily available parking downtown, there are few incentives for the city to invest heavily in a public transit system. Cleveland has a small but growing bicycle movement, which the city is supporting through initiatives such as installing bike racks and increasing the number of bike lanes. A planned downtown bike station will provide showers and lockers for commuters. A \$450 million project to replace the Inner Belt Bridge spanning the Cuyahoga River was supposed

to include bike lanes and pedestrian walkways, but those plans will likely be scrapped after the Ohio Department of Transportation concluded they were not feasible. Under an alternative proposal, bike and pedestrian lanes will be added to adjacent bridges instead.

Green-Building Initiatives. Although a green building amendment to Cleveland's residential building code was considered in 2002, the proposal was not adopted. However, a number of significant green building projects have moved forward (LaRue 2008); for example, a \$10 million recreation center under construction will be built to LEED Gold standards. By law, the city cannot enforce any building codes more stringent than those specified by the state, but officials are using tax incentives to encourage green building. Starting in 2010, all new developments that hope to qualify for a tax-abatement have to meet either Energy Star, LEED, or Enterprise Green Community standards. Mayor Jackson has also made it his unofficial policy that all new city facilities must qualify for LEED certification, and any design team hired by the city is required to include LEED-accredited personnel (Watterson 2010). Municipal government is also trying to green city infrastructure and improve stormwater management. A large permeable concrete parking lot was recently completed at a city park.

For the moment, green building is less of an issue in Cleveland than sustainable demolition. There has been little investment capital available for large building projects, but the city has been tearing down about 2,000 abandoned structures each year. Demolition and construction waste are now the leading contributors to city landfills. In an effort to reduce waste from such activities, Cleveland launched its Deconstruction Initiative in 2007. The initiative aims to encourage the reuse of building materials from sites slated for demolition. In 2008, the U.S. Environmental Protection Agency funded a study of deconstruction practices in Cleveland as one of sixteen Brownfields Sustainability Pilots. The study identified five categories of lessons learned from previous deconstruction practices and recommended numerous strategies for improving future deconstruction projects and fostering the use of deconstruction methods on a broader scale.

Deconstruction remains fraught with challenges — it is far cheaper to knock a building down and cart the waste to a landfill than it is to take it apart by hand and salvage the materials. The labor costs and time required for sustainable deconstruction practices remain obstacles to widespread adoption. But several small companies in Cleveland have ventured into the business and are having some success. Started in January 2008, A Piece of Cleveland has made a name for itself building high-end furniture from salvaged wood. Each piece they sell comes with a “rebirth certificate” describing the history of the materials. The company has been hired to decorate offices and restaurants around Cleveland, and it has spun off a second enterprise — Urban Lumberjacks of Cleveland — to procure the materials for their designs from demolition sites.

Green Jobs Training. The Pathways out of Poverty through Green, Sustainable Jobs program started in 2009 at Cuyahoga Community College provides training to individuals with significant barriers to employment, especially ex-offenders, though so far the program has only met with limited success. Almost thirty people had completed the training by August 2009, but only a little more than a third of them had been placed in green energy jobs (Van Lier et al.

2010). The community college has also begun offering Alternative Energy and Wind Turbine Technician certificate programs.

Green Business Initiatives. Cleveland provides a good example of second-generation sustainability initiatives that are very much focused on green job creation. Major investments in business development have come from northeastern Ohio's Fund for Our Economic Future, an organization of numerous philanthropies that has awarded more than \$40 million in grants since it was founded in 2004. Most of that money has gone to fund business accelerators like NorTech Energy Enterprise, which is working to promote the region's advanced energy cluster.

Recently, Nortech has placed a strong emphasis on the wind industry, and it is backing one of the most exciting projects under development in Cleveland — offshore wind. Community leaders have long discussed the possibility of placing wind turbines in the shallow Lake Erie, which has an average depth of only sixty feet. Those dreams are fast becoming a reality. In late May, the nonprofit Lake Erie Energy Development Corporation (LEEDco) announced a partnership with General Electric to build the nation's first freshwater wind farm off the shores of Lake Erie near Cleveland. GE has pledged to provide the turbines for the initial phase of the project. Although a specific site has yet to be announced, the turbines will likely be constructed about five miles offshore, and work should begin by the end of 2011. Lawyers are in the process of filing the necessary permits, and public hearings will probably be held later this year. So far, there has been little organized public opposition to the project. A 20-megawatt farm is scheduled for completion by 2012, and it may be expanded to as much as 1,000 megawatts by 2020 (Greene 2010).

An initiative now underway to build a network of cooperatives in impoverished Central Cleveland neighborhoods is garnering national attention. What numerous media and civil society organizations are referring to as the "Cleveland model" is in fact patterned after the famous worker-owned cooperatives of the Mondragon Corporation in Spain. The project, dubbed the Evergreen Cooperative Initiative and funded largely by the Cleveland Foundation, looks to provide good green jobs to residents of the slums surrounding the city's University Circle district, home to hospitals, museums and Case Western Reserve University. Employees of the cooperatives are also partial owners who build equity in the business over time. Initially, ten for-profit cooperatives were planned that would employ about fifty people each, and the project's leaders clearly envision a flowering of the model on a much larger scale over time. As of summer 2010, two cooperatives are in operation and a third is in development. The first to launch, Evergreen Cooperative Laundry, takes advantage of energy-efficient technologies to provide commercial laundering services in a LEED-certified facility. At present, the laundry's primary clients are local hospitals (The Economist 2010). Ohio Cooperative Solar provides weatherization services and solar panel installation. The company will soon be installing a 100-kilowatt photovoltaic system on the roof of the Cleveland Clinic (Schwartz 2009). A third cooperative, Green City Growers, is expected to open later this year in a building the size of a big-box store, to be constructed on fourteen acres of abandoned land. The business will grow hydroponic lettuce and herbs. Ten percent of the profits from the cooperative will go to a common fund that will provide the financing for additional cooperatives.

Cleveland start-up Tremont Electric has garnered significant interest in its first product offering, the \$150 nPower PEG. The baton-shaped device, meant to be placed in a backpack or purse, converts kinetic energy to electricity while the wearer walks. While the power output from the first-generation PEG is meager (ten minutes of walking will only store enough electricity to charge-up an iPhone for one minute of talk time), the patented technology is scalable, and the company is currently working with Ohio State University and Akron University on a large buoy that will harness wave power from Lake Erie. Tremont Electric founder Aaron LeMieux hopes to create 250 jobs in Cleveland within five years.

Other Cities

Aside from California, Ohio is perhaps the only state able to boast that it is home to several major cities engaged in broad and aggressive efforts to green their local economies and become more sustainable. Columbus Mayor Michael Coleman started the Get Green Columbus initiative in 2005, and created a city Office of the Environmental Steward. Since then the city has notched significant gains in sustainability. In 2007, Mayor Coleman and twelve other elected officials from around the region signed the Central Ohio Green Pact, committing their municipalities to a wide range of goals, including greening city infrastructure, growing the regional green economy, and educating their communities about sustainability. Columbus increased its recycling rate 69 percent from 2000 to 2009, decreased its total fuel use 4.5 percent in 2009, and secured \$30 million in Clean Ohio funds for brownfield redevelopments. The city has also committed to reducing its carbon emissions 40 percent below 2005 levels by 2030, at a rate of 2 percent each year. Columbus' GreenSpot recognizes environmentally-friendly businesses, and green building is widespread throughout the city. Notable projects include the installation of a 5,000 square foot green roof on a municipal recreation center (City of Columbus 2009). The city's new biking initiative will install 1,000 bike racks and create 500 miles of bike paths and trails by 2028 (Sustain Lane 2008).

Cincinnati is also beginning to take sustainability seriously, following Columbus' lead in adopting the goal of reducing carbon emissions 40 percent by 2028 and a whopping 84 percent by 2050. That target is just one of 80 recommendations included in the Green Cincinnati Plan, approved by the city council in 2008 (City of Cincinnati 2008). The city's Office of Environmental Quality recently hired a sustainability coordinator to help implement those recommendations. The Office of Environmental Quality has also started a \$5 million fund to provide loans for the installation of green roofs on residential and commercial buildings. A pilot project launched in 2009 offers free parking for electric vehicles at three city garages. Cincinnati was also awarded \$3.5 million in federal energy-efficiency block grants in March of that year. Those funds were distributed to a variety of projects, including recycling programs, community sustainability initiatives and improvements at city facilities. The city has entered into contracts for a total of \$5.6 million in efficiency upgrades. Late in 2009, the city council passed the nation's first environmental justice ordinance, requiring new industrial facilities to show that their operations will not negatively impact the health of nearby communities. The Green Partnership for Greater Cincinnati allies the city, the county, the public school system, the local utility and the University of Cincinnati to work on a range of projects including mass transit, green building and green purchasing.

Civil Society Organizations and Policy

A large number of Ohio citizen's groups are active in promoting green jobs as a pathway to revitalizing the economy of a state that historically depended on heavy manufacturing. Organizations with active statewide include Ohio chapters of Repower America, the BlueGreen Alliance and the Apollo Alliance. The latter group is convened by Policy Matters Ohio, a nonpartisan think tank dedicated to economic development. The institute publishes regular reports on energy policy and has consistently promoted green energy initiatives. One recent report from Policy Matters Ohio proposes increasing energy efficiency by capturing heat lost during electricity generation (Woodrum 2009). Clean Fuels Ohio, Ohio Advanced Energy, and the Ohio Business Council for a Clean Economy, among others, lobby for policies that create a favorable climate for the development of green technologies and jobs within the state. Greater Ohio is an advocate of smart growth, and lobbies for causes such as the revitalization of urban centers and the development of alternative forms of transportation.

In Cleveland, grassroots groups and local nonprofits, working both independently and as partners with city government, have been major players in the push to put Cleveland on a more sustainable track. The GreenCityBlueLake Institute, now an arm of the Cleveland Museum of Natural History, has long history of driving green initiatives in northeastern Ohio. Its accomplishments include launching the Cleveland EcoVillage, a neighborhood redevelopment project on the city's west side, and successfully lobbying for bike lanes along local bus routes. GreenCityBlueLake was also instrumental in the formation of city's Office of Sustainability. The Cleveland Foundation has been one of the primary sources of funding for redevelopment in the city. Among its many projects, the foundation administers the Cleveland Carbon Fund, which claims on its web site to be "the first community-based, open-access carbon reduction fund in the United States." Individuals who want to ease their consciences by selling off a portion of their carbon footprints can donate to the fund, which was launched in 2009. The money raised is then distributed to groups in the Cleveland area for sustainability projects. The first project being undertaken with proceeds from the fund is the installation of 10,000 compact fluorescent light bulbs in two city neighborhoods.

For Additional Information

Green Energy Ohio provides helpful resources for state residents considering a personal investment in renewable or efficient energy technologies, and for those seeking jobs in green industries (www.greenenergyohio.org). The Ohio Department of Development's Energy Resources Division maintains a comprehensive list of clean-energy incentives available to businesses and state residents (www.development.ohio.gov/Energy). Policy Matters Ohio has archived a virtual library of studies on their web site, many pertaining directly to green jobs and technologies (www.policymattersohio.org). GreenCityBlueLake stays on top of green energy initiatives in the greater Cleveland area (www.gcbl.org). The Green Strategies Group runs an active blog, called *Ohio Green Strategies*, cataloging developments around the state (www.ohiogreenstrategies.com).

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