

Confronting Climate Change in the Great Lakes Region

Technical Appendix Climate Change Solutions

REDUCING EMISSIONS OF HEAT-TRAPPING GREENHOUSE GASES

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Reducing emissions can avoid many of the worst of potential impacts from climate change. It is the first of three complementary and necessary strategies to comprehensively deal with climate change. While emission reduction measures will have some cost, many of them are also cost-saving measures; many others will stimulate new technological development, economic growth, jobs and opportunities.

Tackling the problem at the source requires that we first need to know where our emissions come from (see [Greenhouse Gas Inventories](#) below). Nationally and in most states, power plants (see [Opportunities in the Energy sector](#)) and motor vehicles (see [Opportunities in the Transportation sector](#)) are the biggest sources of emissions, but emissions from industry, businesses, and homes and other locally important sources such as landfills (see [Opportunities in the Waste sector](#)) will also need to be reduced. In addition, improvements in forestry and agricultural practices offer potential for reducing emissions and for storing carbon (see [Opportunities in Forestry and Agriculture](#)). Approaches that integrate several of these strategies are also described (see [Cross-Sectoral Approaches](#)).

Examples of activities underway at present in the Great Lakes region are provided below (note this list aims not to be comprehensive, but illustrative).

Greenhouse Gas Inventories

None of the Great Lakes states currently have mandatory greenhouse gas registries (although Wisconsin is developing such a system). All states and the province of Ontario do, however, have an inventory of their greenhouse gases (GHG) emissions for 1990.

For state greenhouse gas inventories, see:

<http://yosemite.epa.gov/oar/globalwarming.nsf/content/EmissionsStateGHGInventories.html?OpenDocument>

For Wisconsin's mandatory reporting system for large emitters, see:

<http://www.pewclimate.org/states/stateprogram.cfm>

For the Ontario greenhouse gas inventory see:

<http://nrcan.gc.ca/es/ceo/update.htm>

Opportunities for emission reductions in the energy sector:

(1) Energy Efficiency and Conservation

Significant amounts of heat-trapping greenhouse gas emissions can be reduced by using less energy, and using it more efficiently.

- Illinois** The state employs system benefits charges to collect revenue from utility customers to fund efficiency efforts and projects.
See: <http://www.aceee.org/briefs/mktabl.htm>
- Indiana** The Industrial Energy Efficiency Fund (IEEF) works directly with Indiana manufacturers to increase the energy efficiency of their manufacturing processes by providing zero-interest loans for replacement or conversion of existing equipment, or purchase of new equipment.
See: <http://www.pewclimate.org/states/index1.cfm>.

Indiana also has a Public Facility Energy Efficiency Program – loans to schools, political subdivisions, and public libraries to identify and implement efficiency projects.
See: <http://www.pewclimate.org/states/index1.cfm>.
- New York** The state is the first in the nation to offer a Green Building Tax Credit
See: <http://www.dec.state.ny.us/website/ppu/grnbldg/index.html>

The Keep Cool Air Conditioner Bounty Program reduces peak demand for electricity by encouraging customers to purchase Energy Star®-certified air conditioners and to recycle old units.
See: <http://www.pewclimate.org/states/index1.cfm>
- Wisconsin** Wisconsin is making efforts to reduce energy use in buildings by partnering with the federal Energy Star® program to implement energy efficiency, water conservation, and emission reduction measures in both existing and new state buildings.
See: <http://www.pewclimate.org/states/index1.cfm>.

(2) Renewable Power Sources

Most Great Lakes states, especially Minnesota, but also Illinois, Wisconsin, and New York, have commercially viable wind energy resources. With improving technology, wind energy in most states in the region can become commercially viable. Biomass—solar energy stored in crops, agricultural and animal wastes—is available in most of the states in the region, and can be co-fired in coal power plants. Solar energy is still expensive today, but gaining an increasing foothold in the region as a clean, widely distributed resource that can avoid electricity transmission and distribution, as well as generation, costs.

This large potential for renewables is not realized at present, but several states and Ontario promote the production of energy from renewable sources through renewable portfolio standards and through public benefit funds or in the course of utility restructuring.

- Illinois** Illinois has the technical potential to produce 83 percent of its 2000 electricity use from its wind resources, or 35 percent from its bioenergy resources.
See: <http://www.ucsusa.org/publication.cfm?publicationID=467>

The state also provides grants to help the development of renewables through public benefits funds. New wind projects are being built at present.

Indiana	The state provides grants to help the development of renewables.
Michigan	Through benefit funds or in the course of utility restructuring the state promotes the production of renewable energy.
Minnesota	MN is 3 rd in the nation in wind production; it established a policy preference for facilities using renewables; the state also requires a specific amount of renewables generating capacity. New wind projects are being built at present.
New York	New wind projects are being built at present.
Ohio	Through benefit funds or in the course of utility restructuring the state promotes the production of renewable energy.
Ontario	Ontario launched its tax-incentive-based 100,000 solar roofs program in October 2002. See http://www.renewables.ca
Wisconsin	The state has a Renewable Portfolio Standard, requiring a specified amount of new energy sources to come from renewables.

For additional information on these projects and the most recent state programs see:

- Database of State Incentives for Renewable Energy at <http://www.dsireusa.org/dsire/index.htm>
- American Wind Energy Association (AWEA) at <http://www.awea.org/projects/index.html>
- American Council for an Energy-Efficient Economy (ACEEE) at <http://www.aceee.org/briefs/mktabl.htm>
- Center for Renewable Energy and Sustainable Technology <http://solstice.crest.org/efficiency/ghgcasestudies/>

(3) Fuel Switching

By switching from fuels with high carbon content (e.g., coal) to others with lower carbon content (e.g., natural gas, biomass), energy can be produced with fewer emissions.

Michigan	The state has a Biomass Energy Program that encourages increased production and/or use of energy derived from herbaceous (mostly soybeans and perennial grasses) and woody (e.g., poplar, cottonwood, silver maple) biomass resources through program policies, information dissemination, and state and regionally funded research and demonstration projects. The environmental benefits from the use of such energy crops include water quality improvements, emission decreases at generation facilities, and wildlife habitat improvements. See: http://michiganbioenergy.org/areas/ec.htm
Wisconsin	The state has a pilot manure-to-energy recovery project provides an alternative energy source and reduces manure waste disposal. See: http://www.pewclimate.org/states/stateprogram.cfm

(4) Efficient Fossil Fuel Generation

In the course of energy production – not just during end use (see [1] above), significant amounts of energy and emissions could also be saved through more efficient technologies.

Opportunities for emission reductions in the transportation sector:

(1) Fuel Efficiency

A recent National Research Council study found that “[t]echnologies exist that, if applied to passenger cars and light-duty trucks [e.g., mini-vans, SUVs, and pick-ups], would significantly reduce fuel consumption within 15 years.” Fuel economy (CAFE) standards can only be set at the federal level, and studies show that raising the CAFE standard over the next 20 years to 55 mpg for new cars and light-trucks, the US and Canada could save billions of dollars of savings at the fuel pump while reducing millions of tons of heat-trapping gas emissions, smog-forming pollutants and other toxic emissions without sacrificing vehicle safety. However, state programs and auto manufacturers themselves can play a significant role in the development and promotion of more fuel efficient, advanced technology vehicles.

Minnesota State government fleets are already required – under the federal Energy Policy Act of 1992 – to purchase alternative fuel vehicles, but few state governments actually fulfill this requirement. Minnesota, however, has developed state vehicle fleet efficiency standards.
See: Pew Center for Global Climate Change (2002). Climate Change activities in the United States.

Additional opportunities exist for automakers in Michigan, Ohio and Ontario to make their manufacturing plants more efficient. Toyota has taken such steps in its California facilities, where it bought Green Power to meet some of its energy needs.

(2) Advanced Vehicles

Advanced vehicles use modern technologies, or a combination of modern and traditional internal-combustion technologies to propel motor vehicles.

Indiana The state encourages the building of alternative fueling sites through its Alternative Fuel Vehicle Infrastructure Program
See: Pew Center for Global Climate Change (2002). Climate Change activities in the United States.

Michigan Michigan launched an advanced vehicle development program in 2000 through tax incentives.
See: http://www.michigan.gov/treasury/0,1607,7-121-1751_2228-7807--,00.html

New York New York’s Clean-Fueled Bus Program, which provides funding for the incremental cost of a clean-fueled bus over a diesel bus to transit authorities, state agencies, universities, municipalities, and school bus fleets
See: <http://www.pewclimate.org/states/index1.cfm>.

(3) *Low-Carbon Fuels*

By switching from vehicle fuels with high carbon content (e.g., gasoline) to others with lower carbon content (e.g., ethanol), vehicles produce with fewer emissions.

Minnesota Minnesota requires that almost all fuel sold in the state contain 2.7 percent oxygen by weight, and gasoline makers in the state have chosen to use ethanol to meet this requirement.
See: <http://www.pewclimate.org/states/stateprogram.cfm>

(4) *Reducing Vehicle Miles Driven*

Driving less – whenever possible – is an effective option of reducing emissions. This involves personal choices such as walking or biking, but also planning decisions that affect the layout of our cities and transportation corridors.

Illinois The Center for Neighborhood Technology in Chicago developed – through a series of community meetings (Connecting Communities Summits) – an alternative vision for a more energy efficient, convenient and functional regional transportation plan for Northeastern Illinois, including many strategies and approaches applicable throughout the Great Lakes region, especially highly urbanized areas.
See: <http://www.cnt.org/>

Michigan Grand Rapids is rapidly becoming the poster child of anti-sprawl planning in the region
See: Schneider, K. (1999). Acting as a region to tame sprawl: Grand Rapids leads the way in Michigan. *Great Lakes Bulletin* 4, 2: 7-12.

Ontario Even at very local scales, travel reduction strategies, including ride-share, teleworking, bicycle and pedestrian programs, transit promotions and parking management – as implemented, for example, in Richmond Hill, Ontario – can have multiple benefits such as emission reductions, healthier air and higher life quality.
See:
http://www.fcm.ca/scep/case_studies/air_quality/richmondhill_air_sum.htm.

Opportunities for emission reduction in waste sector:

(1) *Waste Avoidance*

As waste decays, heat-trapping gas – principally methane – gets emitted. The best way to reduce these emissions is by avoiding the generation of the waste source.

Wisconsin The state has a pilot manure-to-energy recovery project provides an alternative energy source and reduces manure waste disposal.
See: <http://www.pewclimate.org/states/stateprogram.cfm>

(2) *Waste Recovery and Recycling*

If waste generation can't be avoided, the next best strategy to reduce emissions from waste is to reuse and recycle discarded materials. Recycling also reduces emissions

indirectly in that less of the primary material has to be produced using high amounts of energy. A good example is aluminum.

Indiana Recycling Market Development Program (currently 38 projects) that aims to stimulate not just recycling rates but the purchase of recycled products.
See: <http://www.pewclimate.org/states/index1.cfm>

(3) Methane Emission Capture

Landfills are major stationary sources of methane emissions. They can be captured and used to generate electricity.

Ontario Methane capture from landfills is promoted and practiced through a number of projects. Toronto's City of Welland-Landfill Gas Recovery Program, for example, currently collects and destroys more than 100,000 t CH₄ per year - the equivalent of taking 560,000 cars off the road.
See: http://www.fcm.ca/scep/case_studies/waste_management/toronto_waste_sum.htm

Similarly, the waste and emission reduction efforts undertaken in London, Ontario since 1987 have reduced heat-trapping emissions by 20%.

See: http://www.fcm.ca/scep/case_studies/waste_management/london_waste_sum.htm

Opportunities for emission avoidance and carbon capture in forestry and agricultural land use:

These opportunities are particularly relevant in the northern parts of the region (Minnesota, Michigan and Ontario) but other areas can also benefit.

(1) Forest Protection, Reforestation, and Afforestation

- Illinois** Both to store carbon and to reduce the urban heat island effect, urban tree cover maintenance and new plantings are already and will become increasingly important in the future – as proven in a study for Chicago. The Chicago Urban Forest Climate Project reduced the city’s air pollutants by more than 6000 tons in 1991 and resulted in net savings of annual heating and cooling costs of \$200 per tree. See: http://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/scanned/qtr186a.pdf
- Indiana** Forest carbon sequestration projects are underway on land owned or managed by The Nature Conservancy with funding from utilities looking for opportunities to offset some of the heat-trapping gas emissions from energy production.
- A funeral home in the state initiated the Living Memorial Tree Planting Program as early as 1976. Since then, over 8 million trees have been planted, removing over 180,000 metric tons of CO₂ from the air each year.
See: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsStateCaseStudies.html?OpenDocument>
- Minnesota** The state’s Forest Legacy Program supports acquisition of private forests, which make up more than 50% of forestlands in Minnesota. In addition, the USDA’s Conservation Reserve Program provides financial resources to landowners to restore native tree cover to unproductive agricultural lands. The state’s ReLeaf Program, in place since 1991, promotes and funds the planting and maintenance of trees as a means to store carbon and save energy (but is currently limited for projects addressing oak wilt control). In its first 10 years in existence, the Program supported 361 individual projects despite increasing funding insecurity in recent years.
See: http://www.pewclimate.org/projects/states_greenhouse.cfm
- Ohio** Forest carbon sequestration projects are underway on land owned or managed by The Nature Conservancy with funding from utilities looking for opportunities to offset some of the heat-trapping gas emissions from energy production.
- Wisconsin** Forest carbon sequestration projects are underway on land owned or managed by The Nature Conservancy with funding from utilities looking for opportunities to offset some of the heat-trapping gas emissions from energy production.

(2) Agricultural Practices

Numerous studies have shown that certain best practices in soil management can enhance short-term soil carbon sequestration. In addition, the EPA supports several programs that can help methane emission reductions, e.g., the AgSTAR Program (see: <http://www.epa.gov/agstar/>), which encourages adoption of anaerobic digestion technologies in livestock operations to help the recovery and combustion of methane for odor control and as an on-farm energy resource; or the Ruminant Livestock

Efficiency Program for the reduction of livestock methane emissions (see: <http://www.epa.gov/rlep>).

Cross-sectoral approaches:

(1) State Climate Change Action Plans

Several states have climate change action plans, in which sectoral strategies and measures are combined, but these plans will require strong support for implementation. None currently have specified reduction targets by certain dates.

Illinois Available at: <http://dnr.state.il.us/orep/inrin/eq/iccp/toc.htm>

Wisconsin Available at: <http://dnr.state.wi.us/org/aw/air/global/>

Pennsylvania State has a plan; link not available.

Minnesota Plan under development

New York Plan under development

(2) Local Climate Change Action Plans

The following 14 US Great Lakes Basin communities are already partners of the International Council for Local Environmental Initiatives (ICLEI)'s "Cities for Climate Protection Campaign" (with many more in states like NY and PA, but outside the basin). For additional communities see <http://www3.iclei.org/us/participants.cfm>:

Illinois Chicago: <http://www.ci.chi.il.us/>

Michigan Ann Arbor: <http://www.ci.ann-arbor.mi.us/>

Washtenaw Co.: <http://www.washtenaw.org/>

Minnesota Duluth: <http://www.ci.duluth.mn.us/city/mainpage/>

Hennepin Co.: <http://www.co.hennepin.mn.us/>

Minneapolis: <http://www.ci.minneapolis.mn.us/>

Ramsey Co.: <http://www.co.ramsey.mn.us/>

St. Paul: <http://www.stpaul.gov/>

New York Ithaca: <http://www.ci.ithaca.ny.us/>

Tompkins Co.: <http://www.co.tompkins.ny.us/>

Ohio Toledo: <http://www.ci.toledo.oh.us/>

Wisconsin Dane Co.: <http://www.co.dane.wi.us/>

Madison: <http://www.ci.madison.wi.us/Environment/default.htm>

Milwaukee: <http://www.ci.mil.wi.us/>

In Canada, the International Council for Local Environmental Initiatives (ICLEI) and the "20% Club" of the Federation of Canadian Municipalities' (FCM) (<http://www.fcm.ca/>) have merged to form "Partners for Climate Protection: For a Better Quality of Life." The PCP program supports Canadian local governments in reducing greenhouse gas and air pollution emissions through development and

implementation of local climate action plans. (Twenty-five percent of national emissions come from Canada's four largest urban centers.) The municipalities involved in the Program represent 61 percent of the population of Canada. In total, 20 municipalities or counties in southern Ontario currently participate in the program (weblinks to some of these exist at the following website:

<http://www.fcm.ca/newfcm/Java/frame.htm>):

- Founding members: Ottawa and Toronto
- Selected other Ontario members in the Great Lakes Basin: Brantford, Collingwood, Dundas Co., Guelph, Kitchener, London, Mississauga, Perth, Peterborough, Port Hope, Regional Municipality of Hamilton-Wentworth, Scugog, South Frontenac, Sudbury (Region), Town of Richmond Hill, Toronto's City of Welland-Landfill Gas Recovery Program, Better Buildings Partnership Program; Regional Municipality of Ottawa-Carleton; and Thunder Bay

(3) Carbon Credits and Trading

Different parties, say, a utility or car factory, hold a fixed number of carbon permits, which allow them to emit a given amount of CO₂. If one party finds a way to reduce its emissions cheaply such that it has not used up its full emission allowance, it can sell its remaining permits to another party who cannot meet its emission reduction targets on its own in a cost effective manner. Under emission caps, this sort of trading thus can help achieve emission reductions in the most cost-effective manner, similar to what has been achieved through successful trading schemes in the context of air or water pollution. Timely research and development activities could position the Great Lakes region as a leader in the emerging carbon trading market.

Illinois

The U.S. leader in developing voluntary carbon-trading strategies is the Chicago Climate Exchange.

See: <http://www.chicagoclimatex.com/html/about.html>

Ontario

In Canada, the federal government's Tradable Permits Working Group has investigated different options, ran two pilot projects (one of which was based in Ontario), and has set up a prototype of a regulated trading system in Ontario, which could be adapted in the future to include heat-trapping gases .

See: http://www.nrtee-trnee.ca/EmissionsTrading/en/overview_countries_Canada.htm