

Clean Air and Climate Protection Software

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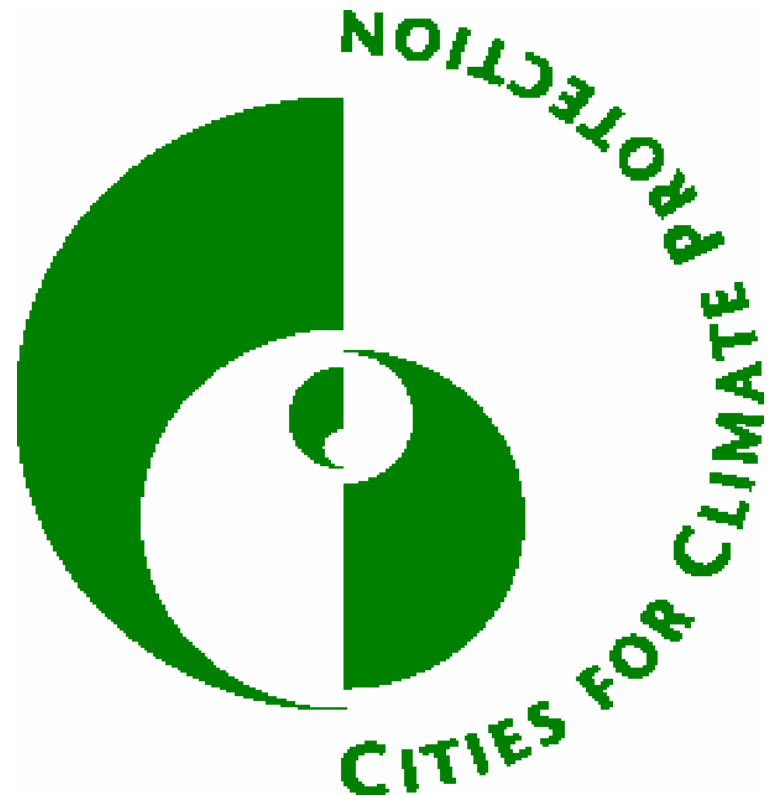
EPA Emission Inventory Conference
May 14th, 2007 Raleigh, NC

A bit about ICLEI

- An international association of local governments dedicated to a sustainable urban environment
- Organized in 1990 under the sponsorship of the UN Environment Program and the International Union of Local Authorities
- 600+ local government members from 6 continents and 50+ countries
 - 150 in the USA
- Governed by and for members

Cities for Climate Protection Campaign™

- **Mission:** To build a worldwide movement of local governments who achieve measurable reductions in local greenhouse gas emissions, improve air quality, and enhance urban livability.
- **Participation:** 500+ municipalities worldwide representing 10% world GHG emissions
- **Theme:** Climate action makes sense for cities

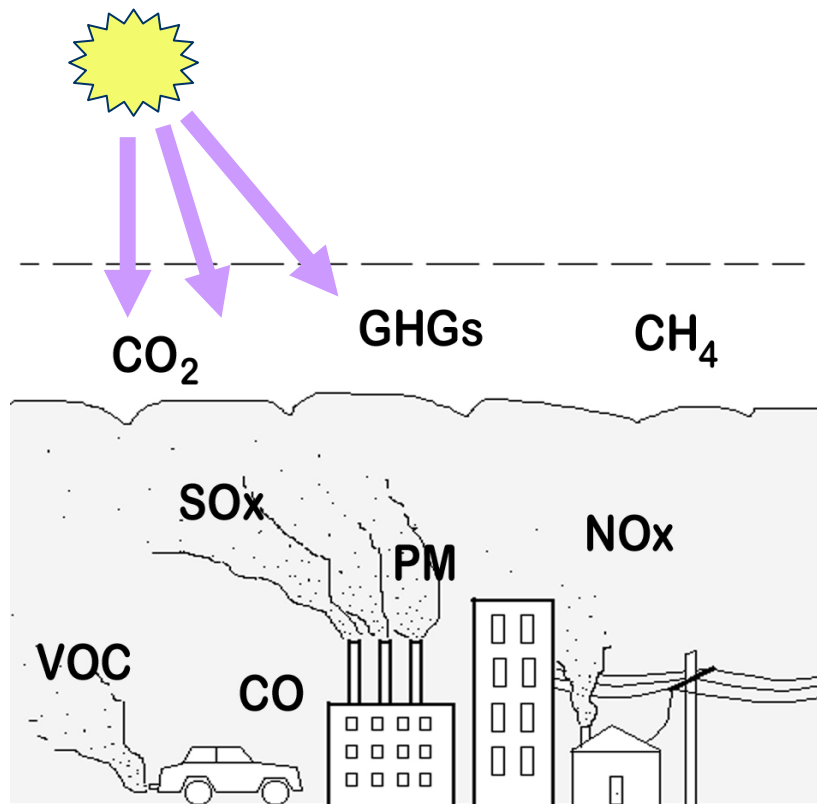


Evolution of ICLEI's Emissions Tools

- Spreadsheet based, 1995
- CCP Software for USA [GHG software], 1998
- CCP versions developed for the UK, Italy, Indonesia, India, South Africa, Thailand, Brazil, and Mexico.
- CACPS Software [adds air pollutants], 2003

Distribution: 450+ communities internationally

Global Warming and Air Pollution: Linked Issues



- Burning fossil fuels releases GHGs
- GHGs trap additional heat causing global warming
- Air pollutants generate smog, cause health problems, reduce visibility, and diminish the overall quality of life of urban residents

Development Partnership

- Partners
 - US EPA, NACAA (formerly STAPPA/ALAPCO), ICLEI, and Torrie-Smith Associates
- Goals
 - Bring a climate planning tool to states and local governments
 - Expand the climate tool to include criteria air pollution emissions estimates action planning

CACPS Software



“Towards harmonized air emissions and climate action planning”

Overview

- Climate Planning Tool
 - Baseline inventory, forecasting, measures tracking
- Powered by Emission Factors
- Applicable for energy, waste, and transport sector
- Planning tool, not a compliance tool

GHG inventory support

- Supports emissions inventory development for GHGs
- Estimates of NO_x, SO_x, PM₁₀, CO, SO_x, and VOCs



	eCO ₂ (tons)	NO _x (kg)	SO _x (kg)	VOC (kg)
Residential	43,875	38,618	24,255	2,600
Commercial	15,442	52,732	261,431	1,509
Industrial	30,884	63,077	136,902	1,285
Transportation	9,652	53,797	2,407	6,136
Total	99,852	208,224	424,996	11,530

The software contains thousands of emission coefficients for all of the major GHGs and air pollutants for a range of technologies, regional electricity mixes, and fuel types.

Measures Evaluation

- Quantifies emission reductions from measures
 - Energy Efficiency measures
 - Vehicle and TDM measures
 - Waste measures, like recycling and landfill capping
- Produces reports detailing emission reductions, measures, cost savings

Organization of the Software (Main Divisions)



–**Community:** The emission and reduction from the jurisdiction as a whole.

–**Government:** The emissions and reductions associated with the government's own operations.

–**Analysis:** Creates an inventory of all emission sources.

–**Measures:** Allows you to quantify all existing or proposed emission reduction activities.

Organization of the Software (Sectors)

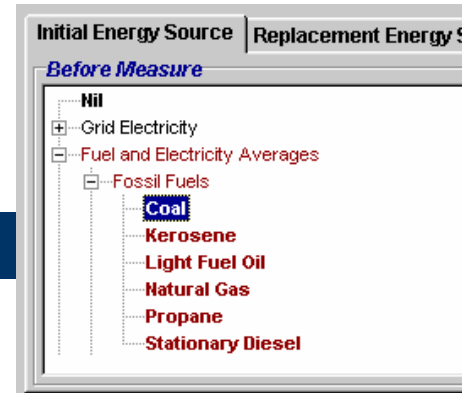
- Community
 - Residential
 - Commercial
 - Industrial
 - Transportation
 - Waste
 - Other
- Government
 - Buildings
 - Vehicle Fleet
 - Employee Commute
 - Water / Sewage
 - Waste
 - Streetlights
 - Other

Organization of the Software (Individual Records)

- Within each sector data is entered into individual records
 - There is no limit to the number of records created
 - Data can be as aggregated as you would like
- Using this sectoral approach to emissions quantification can reveal the structure of emissions with sufficient detail to inform action

Stationary Source EFs

- National Average Set
 - Most common fuels, available by sector
 - Based on EPA National Emission Inventory
 - Total Emissions / Total consumption
 - Commonly used by local governments to estimate emissions baselines for GHGs.
- AP-42 based detailed Emission Factors
 - 1200 combinations of fuels and technologies
 - Provided when detailed activity data is available



Mobile EFs

- National Average Set
 - 10 basic vehicle classes, common fuels and alternative fuels (like BD, Ethanol, CNG, etc.)
 - Year dependent
 - National emission inventory and DOT data
 - Appropriate for basic inventory estimate
- Fuel Standards Set
 - Emission factors for by vehicle type and emission standard
 - Appropriate for quantifying measures

Electricity EFs

- Grid “Average” and “Marginal” sets
- NERC region-based
- Developed from DOE/NEMS model output
- End use based (Emissions / Sales)
- Updated to 2004, forecasted to 2020



Average Grid Electricity Coefficients

Region

01 - East Central Area Reliability Coordination Agreement
02 - Electric Reliability Council of Texas
03 - Mid-Atlantic Area Council
04 - Mid-America Interconnected Network

01 - East Central Area Reliability Coordination Agreement

Year	CO2	NO2	CH4	NOx	SOx	CO	VOC	PM10
1990	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1991	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1992	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1993	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1994	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1995	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1996	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1997	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1998	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
1999	1,102.9	0.017	0.013	3.193	8.206	0.126	0.014	0.119
2000	1,136.1	0.018	0.013	2.643	8.206	0.129	0.015	0.122

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Waste Sector EFs

- Emissions from landfills and dumps, methane only.
- Two options
 - “Waste in Place” (based on the LandGEM)
 - “Methane Commitment” (based on WARM model)
- Includes incinerator emissions factors

Emissions Analysis by Sector

Gleneagle Air Emissions Strategy Software®

File Year Record Report Settings Assistants Help

Community Analysis Community Measures Corporate Analysis Corporate Measures

Community Analysis for Year 1995

Residential Commercial **Industrial** Transportation Waste Other

Name of Industrial Building or Group
All Industry

Record Controls

Insert Select Delete

Report Help

Fuel Type	Units	Energy Use
Electricity (Grid Average)	(kWh)	15,000,000
Coal	(tons)	2,000
Heavy Fuel Oil	(US gal)	400,000
Light Fuel Oil	(US gal)	0
Natural Gas	(thous cu ft)	0
Propane	(US gal)	0
Fuelwood (Air Dry)	(cords)	0
Solar	(MMBtu)	0
Green Electricity	(kWh)	0

Assistants Categories Indicators Coefficients

Forecast Builder

Notes Regarding Industrial Building or Group

Energy Consumption (MMBtu) **149,911**

Equivalent CO₂ Production (tons) **14,898**

NO_x Production (kg) **41,730**

SO_x Production

GHG's and air pollutants by record

Measures Quantification by Sector

Gleneagle Air Emissions Strategy Software®

File Record Report Settings Assistants Help

Community Analysis Community Measures Corporate Analysis Corporate Measures

Corporate Measures [Target Year 2010]

Buildings Vehicle Fleet Employee Commute Streetlights Water/Sewage Waste Other

Measure Type
Change in Fuel Type

Measure Name
Changes Buses from Diesel to Natural Gas

Measure Description
Expand

Record Controls
Insert Select Delete

Report Help

Before Measure
Initial Fuel and Vehicle Type

- Transport Averages
 - CNG
 - Diesel
 - Auto - Full-Size
 - Auto - Mid-Size
 - Auto - Sub-Compact/Compact
 - HDV
 - LDT
 - Marine
 - Rail

Use Before (thousand vehicle-km)
50,000.0

Fuel Efficiency Occupancy Factor Unit Cost
(\$ per thousand vehicle-km)
0

After Measure
Replacement Fuel and Vehicle Type

- Transport Averages
 - CNG
 - Auto - Full-Size
 - Auto - Mid-Size
 - Auto - Sub-Compact/Compact
 - HDV1
 - HDV2
 - HDV3
 - LDT1
 - LDT2

Use After (thousand vehicle-km)
50,000.0

Fuel Efficiency Occupancy Factor Unit Cost
(\$ per thousand vehicle-km)
0

Location Implementation Data Coefficients

Location of Measure (type in or use list)
Berkeley, Ca

NOx Reduction (kg)
183,051

SOx Reduction (lbs)
28,529

CO Reduction (lbs)
-127,971

VOC Reduction

Example, Quantification of Proposed Measures

Clean Air and Climate Protection Software®

File Record Report Settings Assistants Help

Community Analysis | **Community Measures** | **Government Analysis** | **Government Measures**

Community Measures [Target Year 2010]

Residential | Commercial | Industrial | Transportation

Measure Type: **Change in Energy Source**

Measure Name: **Implement 10% Wind Power in New York**

Measure Description, Notes and Assumptions: **Expand**

Initial Energy Source | Replacement Energy Source

After Measure

- Nil
- Grid Electricity
- Fuel and Electricity Averages
 - Fossil Fuels
 - Other Electricity
 - Green Electricity**
 - Landfill Gas Electricity
- Other Fuels
- Specific Technologies

Usage After (tons): **17,300.0**

(\$ per ton): **0**

Location of Measure (type in or use list): **Berkeley, Ca**

CO Reduction (tons): **5,125**

VOC Reduction (tons): **567**

PM10 Reduction (tons): **3,761**

1/1

Shift by 10% electricity demand
In New York to Wind Energy

Enter in amount of demand to be
switched to wind electricity

Output is projected reductions of emissions
Of CO₂, CH₄, NO_x, SO_x, VOC, CO, and PM-10

Example: Durham, North Carolina

- Climate Action Plan
- 5% emissions reduction below 1998 baseline by 2025
- Total 1.8 million tons of GHGs emissions reductions required

Durham Climate Action Plan	
1998 Baseline Emissions	2.61 million tons eCO ₂
2025 Forecast Emissions	4.31 million tons eCO ₂
Reduction Target below baseline	5%
Emission reductions required	1.83 million tons eCO ₂

Climate Plan Measures

Durham Community Measures	DCAP
	eCO ₂
<i>Transportation Measures</i>	
Regional Rail System	85,000
Expand Mass Transit Bus System	68,000
Increased Use of Alternative Fuels in Motor Vehicles	39,000
Land Use Planning	320,000
Decrease motor vehicle traffic (walking and biking)	1,000
Decrease motor vehicle traffic (telecommuting)	6,000
Decrease motor vehicle traffic (car and vanpooling)	12,000
Decrease Idle time of Motor Vehicles	10,000
<i>Residential, Commercial, Industrial Measures</i>	
Residential Fuel Switching	36,000
Residential Energy Efficiency	341,000
Residential Renewable Energy	9,000
Commercial/Industrial Fuel Switching	173,000
Commercial/Industrial Energy Efficiency	495,000
Commercial/Industrial Renewable Energy	28,000
Reduce Heat Island Effect	18,000
Total	1,641,000

tons

Quantified using old CCP
GHG software

Climate Plan: with CAP co-benefits

Durham Community Measures	DCAP	CACP Reanalysis					
	eCO ₂	eCO ₂	NOx	SOx	VOC	CO	PM ₁₀
<i>Transportation Measures</i>							
Regional Rail System	85,000	69,270	-135,000	-96,837	453,000	5,018,000	-8,521
Expand Mass Transit Bus System	68,000	54,000	74,334	6,655	310,558	4,034,000	1,904
Increased Use of Alternative Fuels in Motor Vehicles	39,000	33,991	191,293	8,349	295,003	2,378,000	540
Land Use Planning	320,000	327,469	1,211,000	86,564	1,809,000	19,284,000	28,024
Decrease motor vehicle traffic (walking and biking)	1,000	1,166	4,314	308	6,443	68,680	100
Decrease motor vehicle traffic (telecommuting)	6,000	12,245	45,299	3,237	67,647	721,000	1,048
Decrease motor vehicle traffic (car and vanpooling)	12,000	11,692	70,158	5,026	132,516	1,316,000	1,433
Decrease Idle time of Motor Vehicles	10,000	10,014	6,921	0	13,983	208,000	13,801
<i>Residential, Commercial, Industrial Measures</i>							
Residential Fuel Switching	36,000	19,000	80,097	127,079	-204	9,204	23,835
Residential Energy Efficiency	341,000	514,000	1,479,000	3,624,000	28,000	196,000	99,000
Residential Renewable Energy	9,000	17,000	50,054	155,271	588	5,372	3,465
Commercial/Industrial Fuel Switching	173,000	125,038	582,267	4,907,205	-1,354	61,030	158,045
Commercial/Industrial Energy Efficiency	495,000	524,000	1,647,000	4,099,000	108,800	630,000	134,000
Commercial/Industrial Renewable Energy	28,000	52,888	152,703	473,699	1,794	16,389	10,570
Reduce Heat Island Effect	18,000	35,349	102,000	316,000	1,199	10,954	7,065
Total	1,641,000	1,807,122	5,561,440	13,715,556	3,226,973	33,956,629	474,309

tons

lbs

Example: US Cities Annual Report

- 150 reporting cities
- 23 million tons of annual eCO₂ reduced
- 43,000 lbs of annual criteria air pollutants reduced
- \$535 million saved after payback
- 75 million gallons of fuel reduced per year (diesel and gasoline)

Growing usage....

- Becoming the standard for climate planning
- ICLEI's CCP campaign members
- Supports signatories to the US Mayors Climate Protection Agreement, Sierra Club Cool Cities
- State and County Governments
- Growing number of consultants

Getting CACPS

- ICLEI and NACAA members, go to <http://cacpsoftware.org>
- Contact EPA, Denise Mulholland
 - Mulholland.denise@epa.gov

The End

Contact

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