

Harmonized Air Emissions Analysis Tool (HEAT) Development Project

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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:** 600+ municipalities worldwide representing 10% world GHG emissions
- **Theme:** Climate action makes sense for cities



450+ users internationally

CCP Software

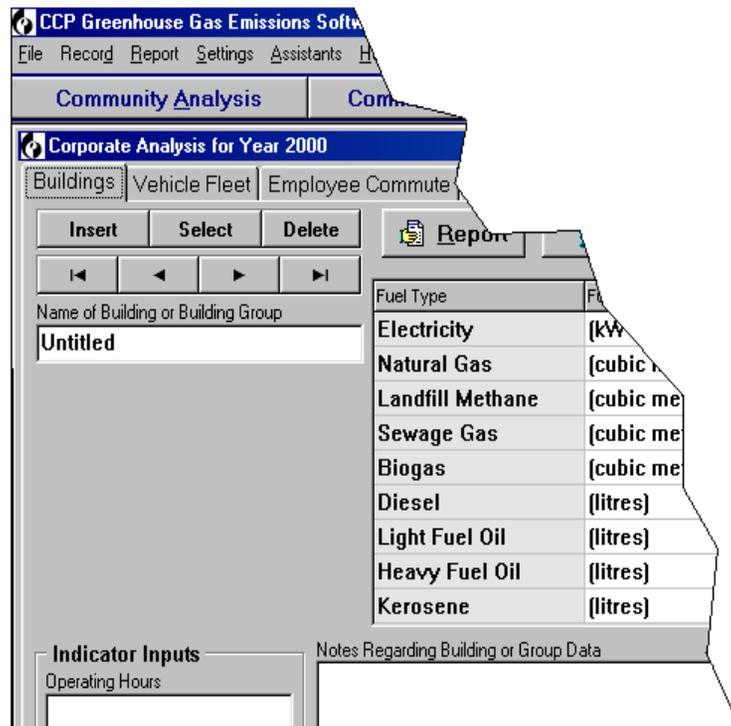
5 - Milestone Process

- ✓ Emission inventory and forecast
- ✓ Set reduction target
- ✓ Develop a quantified action plan
- ✓ Implement action plan
- ✓ Monitor and verify results

CCP software supports the first three milestones

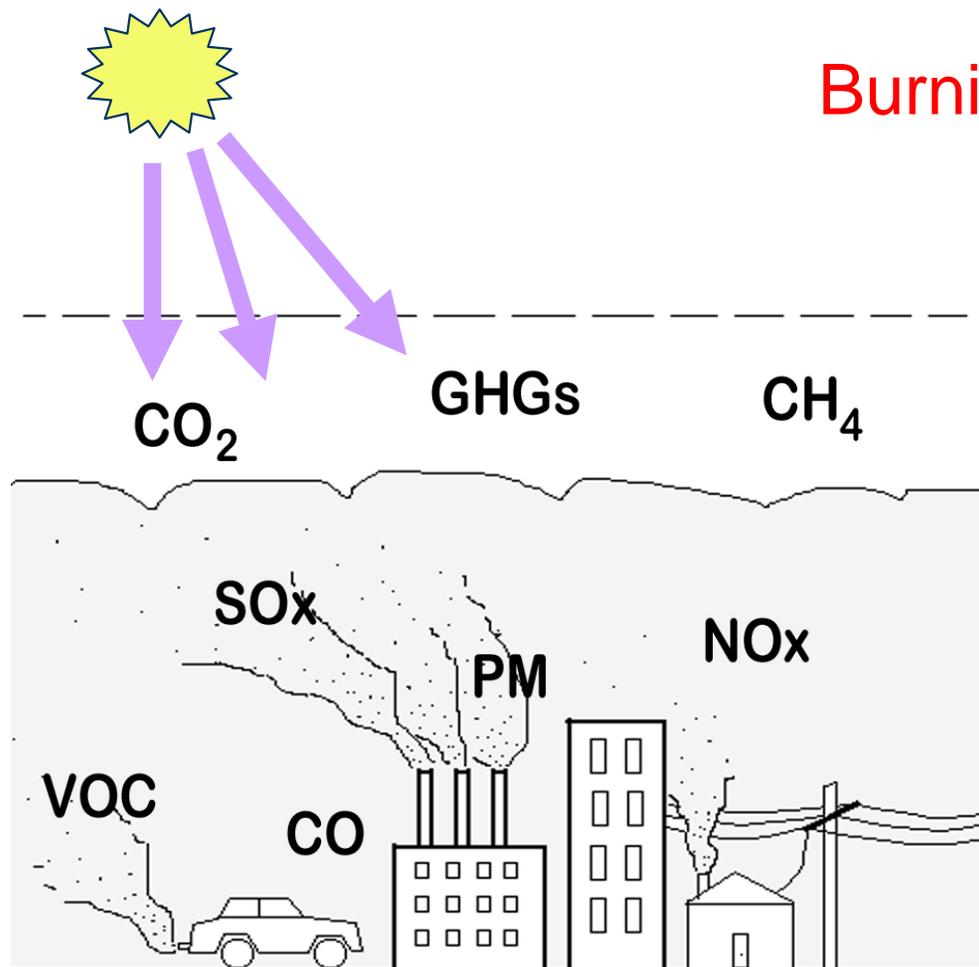
Existing International Software

CCP Software



- Has been evolving since 1993
- Analyzes greenhouse gas emission and reductions
- Separate versions for each country
- Independently installed on local computers

Demand for Combined Analysis of Global Warming and Air Pollution



Burning fossil fuels release both
GHGs and CAPs

- 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

Introducing HEAT

The Harmonized Emissions Analysis Tool

HEAT Harmonized Emissions Analysis Tool

HEAT APPLICATION HEAT ADMINISTRATION MESSAGE BOARD DOWNLOADS

Community Analysis
Residential
Commercial
Industrial
Transportation
Waste
Other

Community Measures
Government Analysis
Government Measures

RESIDENTIAL

← INSERT SELECT DELETE →

Name: (name of the Residential Building or Group)

Note: (note regarding Residential Building or Group Data)

Emission Entries:

Fuel Type	Unit	Energy Use
Electricity (Grid Average)	(ekWh)	12
Coal	(ekWh)	1
Light Fuel Oil	(barrels)	1
Natural Gas	(billion cu ft)	1
Propane	(barrels)	1
Biomethane	(billion cu ft)	1
Fuelwood (Air Dry)	(barrels)	1
Solar	(barrels)	1
Green Electricity	(ekWh)	1

SAVE REFRESH

Output

Energy Consumption	12	(ekWh)	Equivalent CO2 Production	12	(grams)
NOx Production	12	(grams)	SOx Production	12	(grams)
CO Production	12	(grams)	VOC Production	12	(grams)
PM10 Production	12	(grams)			

“Towards harmonized air emissions and climate action planning”

What is HEAT?

- HEAT will be a...
 - Multi-national, Internet-based database for storing, tracking, and reporting GHGs emissions and CAPs.
- Heat will provide...
 - Tools for calculating and reporting emissions and reductions of GHGs and CAPs
- Heat will...
 - Create a standardized, flexible, integrated framework for emissions analyses

Input Energy / Fuel Use, Waste, Vehicle Travel Information to Calculate and Track....

- Greenhouse Gases
 - Carbon Dioxide (CO₂)
 - Methane (CH₄)
 - Nitrous Oxide (N₂O)
 - Criteria Air Pollutants
 - NO_x
 - SO_x
 - CO
 - Volatile Organic Compounds (VOC)
 - Particulate Matter (PM10)
- “Indicators” standardize results for ease of comparisons

Other emissions can be manually entered

HEAT Will Have Modules For...

- Emissions Analysis
 - Develop annual emission inventories
 - Project-based Reductions
 - Enter existing actions to measure their impacts
 - Calculate the potential impact of proposed actions
 - Community-wide
 - Residential
 - Commercial
 - Industrial
 - Transportation
 - Waste
 - Other
 - Government operations
 - Buildings
 - Streetlights
 - Waste
 - Vehicle Fleet
 - Water/Sewage
 - Other
- ❖ Efficiency
 - ❖ Technology shift
 - ❖ VMT Reduction
 - ❖ New Fuels
 - ❖ Green Power
 - ❖ Waste Reduction

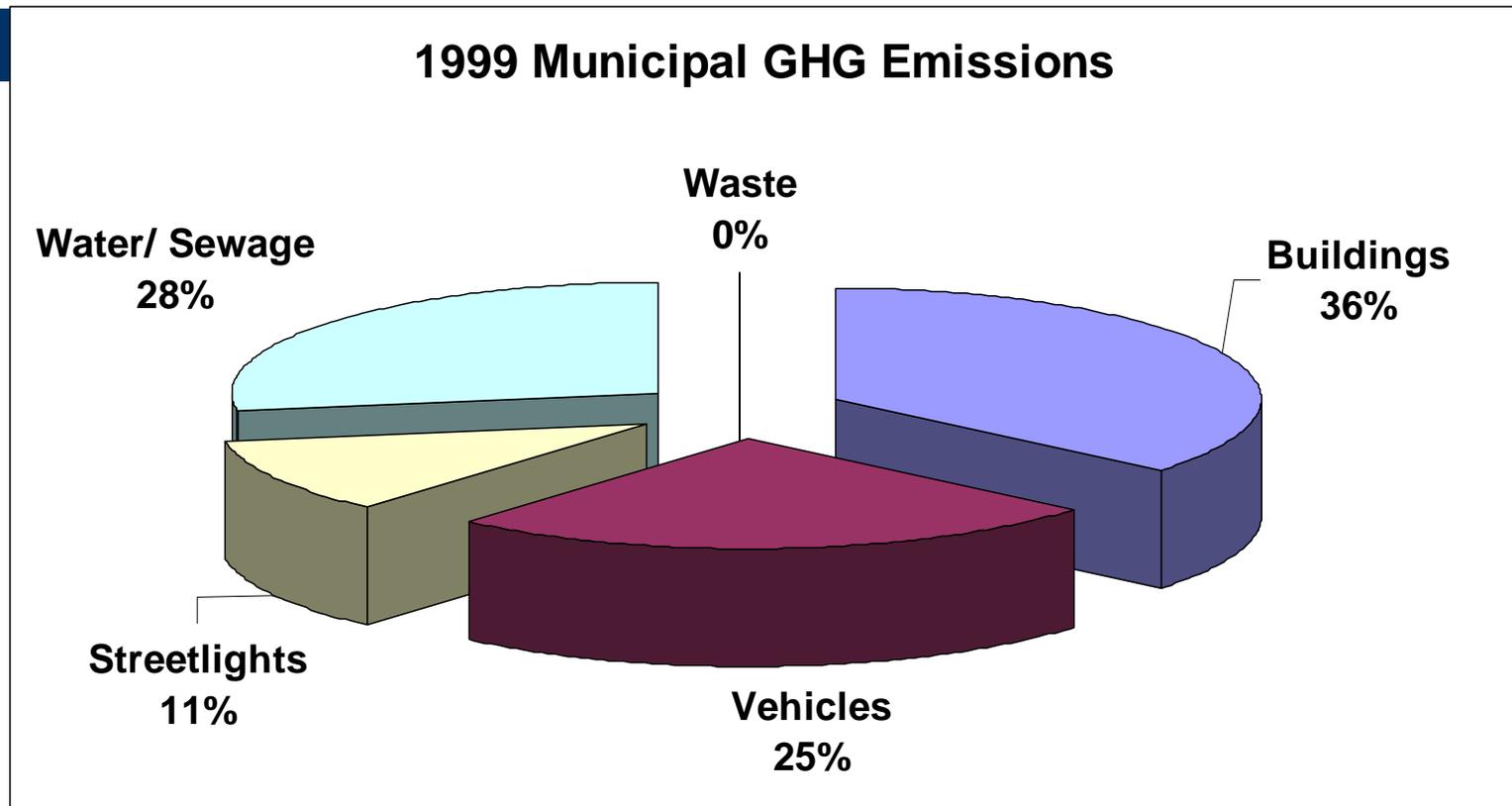
Local Governments Use HEAT To...

- Conduct an emissions inventory
- Set a emissions reduction targets
- Forecast predicted emissions in future years under a “business-as-usual” scenario (i.e. the target year)
- Quantify the impact of reduction measures on emissions, energy use and cost
- Track changes over time and progress towards meeting targets

Stand-alone calculator or use modules together to create a complete emissions reduction plan

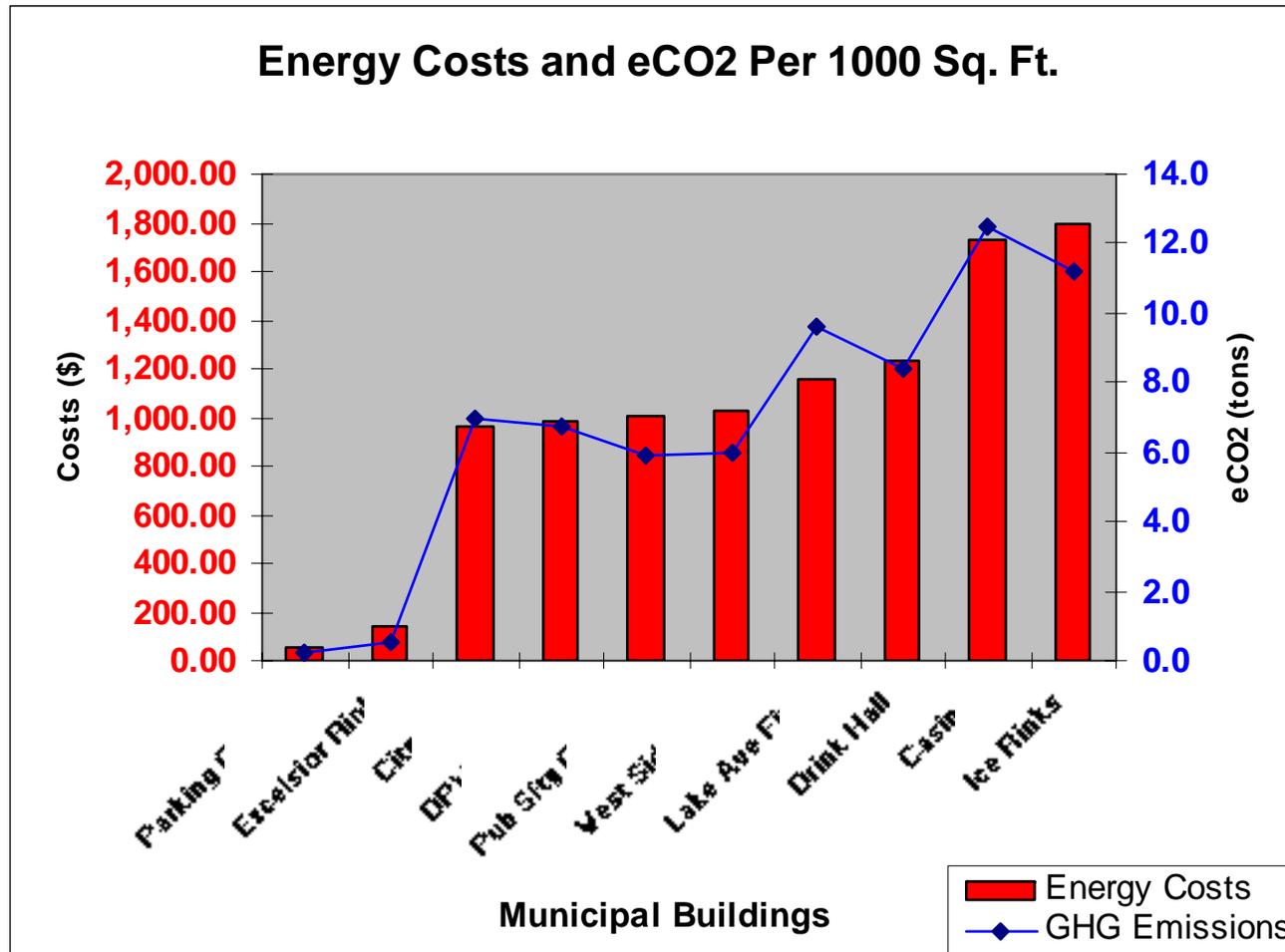
Sample HEAT output...

Municipal Emissions Summary



Total Municipal GHG Emissions:
Base Year: 1999
Total Emissions: 6,070 tons eCO₂

Identify Energy/Emissions Intensity Various of Activities



Your Locale

Community Greenhouse Gas Emissions Reductions in 2010

Base Year Greenhouse Gas Emissions Summary

Measures Summary	Equiv CO ₂ (tons)	Equiv CO ₂ (%)	Energy (million Btu)	Energy Cost (\\$)
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Residential
Commercial
Industrial
Transportation
Total

22/07/02

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Your Locale

Community Greenhouse Gas Emissions Reductions in 2010

Base Year Criteria Air Pollutant Emissions Summary

Measures Summary	NOx (lbs)	SOx (lbs)	CO (lbs)	VOC (lbs)	PM10 (lbs)
Residential Sector	185,462	351,706	23,992	4,033	9,945
Commercial Sector	23,531	61,537	1,870	208	1,472
Industrial Sector	65,571	186,248	4,186	315	4,285
Transportation Sector	200,592	9,397	1,937,610	204,885	4,173
Total	475,155	608,889	1,967,659	209,441	19,875

Sample HEAT output...

Action Plan of Proposed Measures

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
Commerical/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

Analyzing Alternatives

	eCO ₂ (tons)	NO _x (lbs.)	SO _x (lbs.)	CO (lbs.)	VOC (lbs.)	PM ₁₀ (lbs.)
	Transportation Mode Shift					
Increased ridership on existing bus routes by 20%	131,115	131,115	7,859	1,438,174	149,553	2,837
	Fuel Switch					
Switch from traditional diesel to biodiesel in the bus fleet	56,591	-109,291	26,654	292,651	54,329	16,461
Switch from traditional to Ultra Low Sulfur diesel in the bus fleet	0	0	30,715	0	0	1,751

Scenario Building

	eCO ₂ (tons)	NO _x (tons)	SO _x (tons)	CO (tons)	VOC (tons)	PM ₁₀ (tons)
25% Renewable Standard	68,628,690	7,493	23,055	9,924	1,095	7,131
Energy Star Homes, Oil	4,441,344	5,826	3,250	1,181	199	695
Energy Star Lighting	3,173,581	3,465	10,661	4,589	506	3,297
TOTAL Reductions	15,477,794	16,785	36,966	15,694	1,800	11,123

Your Locale

Community Greenhouse Gas Emissions Reductions in 2010 Target Year Measures Listing

Residential Sector

Location of Measure:

Type of Measure: Energy Efficiency: Buildings

Measure Name

Energy Retrofit Program

Measure Details

Affected Energy Source 1
Electricity

Affected Energy Source 2
Natural Gas

Commercial

Energy Reduction	37,500,000	Energy Reduction	302,042
Unit	(kWh)	Unit	(thous cu ft)
Price per Unit	\$.10	Price per Unit	\$12.91
Ramp-In Factor	100%	Energy Reduction (million Btu)	436,102
Year Implemented	1999	Emission Reduction (tons eCO ₂)	60,270
Implementation Cost	\$50,000,000	Savings (\$/year)	\$7,650,000
		Payback Period (years)	6.5

The emission reduction from this measure as a percentage of total reductions: 51.1%

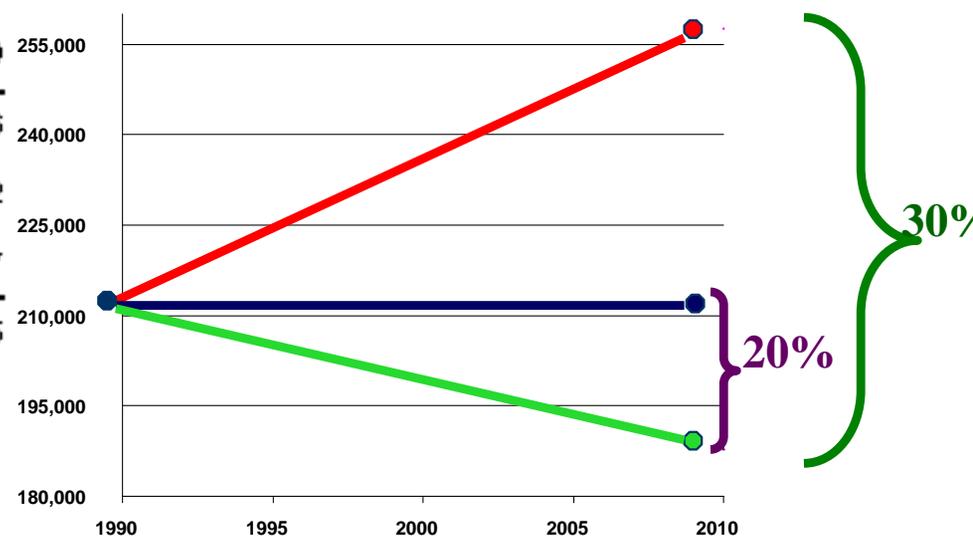
NO _x Reduction	SO _x Reduction	CO Reduction	VOC Reduction	PM10 Reduction
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
185,462	351,706	23,992	4,033	9,945

Anytown

Community Greenhouse Gas Emissions Reductions in 2010 Target Year Measures Summary Report

<i>Measures Summary</i>	Equiv CO ₂ (tonnes)	Equiv CO ₂ (%)	Energy (GJ)	Energy Cost Savings (\$)
Residential Sector	370,529	21.9	3,934,500	28,849,875
Commercial Sector	605,537	35.8	8,692,000	45,000,000
Industrial Sector	191,270	11.3	900,000	17,500,000
Transportation Sector	326,386	19.3	4,789,619	76,003,767
Waste Sector	198,000	11.7		3,000,000
Total	1,691,722	100.0	18,316,119	170,353,642

<i>Local Action Plan</i>	(tonnes)
Base Year Emissions	6,129,846
Target Year Emissions Forecast	7,279,122
Target Emissions Level	4,903,877
Emissions Reductions Required to Meet Target	2,375,245



HEAT As An International Tool

- Multilingual
 - Users can change the working languages or create multilingual reports “on-the-fly.”
- Available ***on-line*** or as a ***stand-alone*** version with synchronization capabilities
- HEAT contains thousands of default emission factors and each country will have unique...
 - Fuel types
 - Vehicle types
 - Emission factors
 - Emission control technologies

ICLEI Can add emission factors specific to partner organizations

Customizable Emission Factor Tree

✦ IPCC Tier 1

✦ IPCC Tier 2

UNFCCC/IPCC 1996 guidelines
Internationally accepted.

✦ USEPA AP42

Very detailed set from USEPA.

✦ Brazil Average

National average EF set
created in conjunction with
local development partners.
Based on secondary research.

✦ User-defined

Allocated for users to define own set when they have data they trust.

Emission Factors (EF)

- Calculators powered by Emission Factors
 - Emissions = EF x Activity level
 - where “Activity” is energy, waste, and transportation data supplied by user
- Emissions factor set forms a “tree”

The screenshot displays a software interface for managing emission factors. It features a tree view on the left and a data table on the right. The tree view is expanded to show 'Grid Electricity' and 'Fuel and Electricity Averages', with 'Specific Technologies' further expanded to 'Coal', 'Anthracite', and 'Hand-fired'. Under 'Hand-fired', there are two sub-items: 'UIICONTROLLED' and 'Baghouse'. The 'Baghouse' item is highlighted. The data table on the right shows the following values:

Energy Reduction	(tonnes)
	5,000.0
(R per tonne)	
	750

At the bottom of the interface, there are two summary fields:

Energy Reduction	(TJ)	Equivalent CO ₂ Reduction	(tonnes)
	132		12,987

Heat also acts as a Multi-National Data Repository

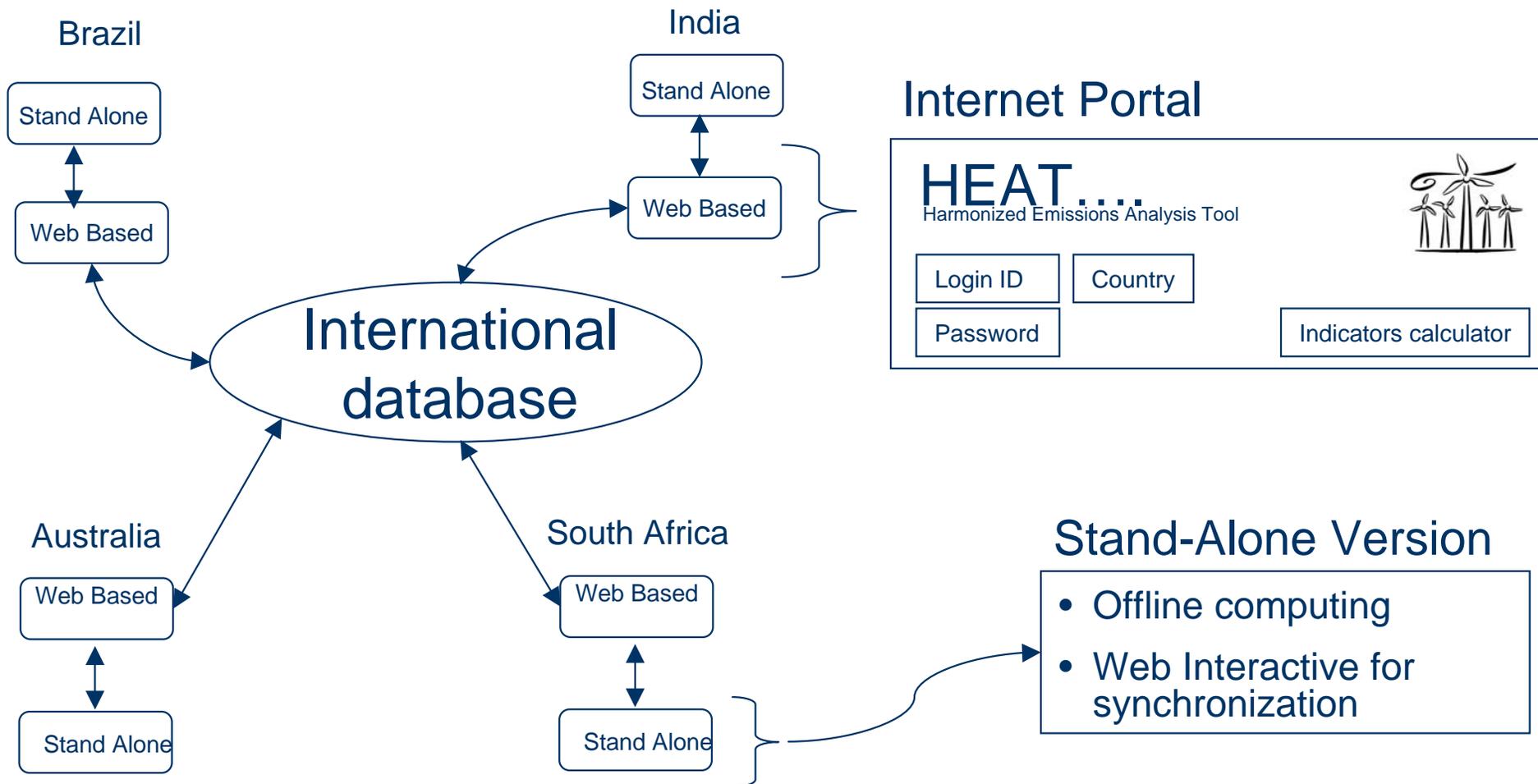
- Store and track data from a variety of sources
- Import results from other, external, analyses
- Incorporate emissions from other external tools

“HEAT will create an unprecedented data repository for local government energy use, with hundreds of inventories and action plans to be available.”

International Data Analysis and Reporting Capability

- How do emissions levels vary between jurisdictions with different...
 - Geographic regions
 - Demographics
 - Development types
 - Economic profiles
- What is the cumulative impact of emission reduction measures implemented by local governments?
- What are the most commonly implemented measures?
- How successful have various measures been in different communities?
 - What is the biggest “bang for the buck?”

HEAT – Multinational Database



Customize HEAT Quantification Tools

HEAT contains calculators to compute emissions impacts from future mitigation options,

- Energy efficiency
- Landfill gas use
- Fleet fuel switch
- Installing renewable energy
- Many others.....

Waste Calculator

Residential | Commercial | Industrial | Transportation | **Waste** | Other

Avoided Disposal Method: **Landfilling** | Target Disposal Method: **Composting**

Measure Name: **Compost Market waste rather than landfilling**

Measure Description, Notes and Assumptions: *Expand*

Waste Type Affected

Nil	Amount of Waste (tonnes)	
Waste		
Food Waste		10,000.0
Yard Waste	(R per tonne)	120

Location: Implementation Data | Coefficients

Location of Measure (type in or use list): **Hyderabad, India**

Equivalent CO₂ Reduction: **8,472** (tonnes) | Savings: **1,200,000** (R)

Residential | Commercial | Industrial | Transportation | **Waste**

Measure Type: **Change in Energy Source**

Measure Name: **Replace Commercial Coal boilers with Natural Gas**

Measure Description, Notes and Assumptions: *Expand*

Add your notes...

Initial Energy Source | **Replacement Energy Source**

After Measure

Nil	Usage After (GJ)	
Grid Electricity		500.0
Fuel and Electricity Averages		(R per GJ)
Fossil Fuels		
Coal		
Heavy Fuel Oil		
Kerosene		
Light Fuel Oil		
Natural Gas		
Propane		

Location: Implementation Data | Coefficients

Location of Measure (type in or use list): **Sao Paulo**

NOx Reduction: **29,836** (kg) | SOx Reduction: **72,368** (kg) | CO Reduction: **6,017** (kg)

Fuel Switch Calculator

Who will use HEAT?

- Local and State Governments
- Energy, transportation, land use, and waste planners
- Research community
- NGOs
- Anyone wishing to translate energy data into an emissions estimate

What can HEAT be used for?

- Policy planning and implementation
- Advocacy and outreach
- Supporting voluntary programs
- Supporting anyone wishing to report emission impacts of energy, transportation, and waste activities

HEAT will not be...

- Air quality/dispersion model
- An emissions factor model
- An air quality management (AQM) tool

HEAT could be used to identify actions that reduce emissions targeted in an AQM plan.

Over the next year ICLEI will be...

- Customizing HEAT for various countries
 - Convene local consultation group
- Producing and distributing local versions
- Providing local user training
- Tracking and verifying results
- Reporting on findings

Timeframe

- March 2005: Initial release and beta-testing
- Summer 2005: Rolling releases in...
 - Australia
 - Brazil
 - Indonesia
 - India
 - Indonesia
 - United States
- Fall 2005: Data transfer and compilation
- Winter 2005: Produce international report on municipal emissions and reductions.

Future for HEAT?

- Thousands of inventories and action plans
- 5-10 languages
- HEAT becomes premiere international repository for local energy and emissions data.
- Developing additional modules:
 - Carbon Asset Accounting
 - Land use/carbon stock
 - Sustainability indicators
 - Vulnerability/Adaptation tools

Thank You!

Please contact ICLEI if:

- You are interested in learning more about HEAT
- Have ideas for partnerships
- Have tools to integrate into this project
- Are interested in joining a country's consultative group

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