COMMONWEALTH OF MASSACHUSETTS

Executive Office of Energy and Environmental Affairs
Leading by Example Program

Greenhouse Gas Inventory Guidance for MA Colleges and University Campuses

I. INTRODUCTION

This ***greenhouse gas inventory guidance*** is designed specifically for the Commonwealth's public colleges and university campuses as these institutions develop greenhouse gas (GHG) emissions inventories to meet the mandates set forth by the Executive Office of Energy and Environmental Affairs' (EEA) Leading by Example Program (LBE) and the American College and University Presidents' Climate Commitment (ACUPCC). This document is intended to guide colleges/universities through the inventory process, establish consistency across all campuses, and serve as an initial tool to help campuses identify priority areas for energy reductions.

This guidance describes the rationale for conducting an emissions inventory, outlines the types of energy sources that must be tracked to meet the LBE and ACUPCC requirements, and provides direction on how to gather energy consumption data and convert that data into a GHG emissions inventory.

This guidance provides information to assist campuses with navigating the GHG emissions inventory process including:

- **What energy consumption/activity data to collect**
  - **Scope 1 sources (*Direct Emissions* - fuel consumed on site)**
  - **Scope 2 sources (*Indirect Emissions* - purchased electricity/steam) and**
  - **Scope 3 sources (*Indirect Emissions* - from commuting and air travel)**
- **How to obtain energy consumption data for all Scopes**
- **How to calculate GHG emissions data using the LBE Program and Clean Air-Cool Planet Campus Carbon Calculator**

For more information on this guidance, climate programs and the LBE Program, contact: Eric Friedman, Director, 617-626-1034, eric.friedman@state.ma.us. This guide is also available at: www.mass.gov/envir/leadingbyexample.

II. GHG INVENTORY DESCRIPTION

Although inventories vary in scope and detail among institutions, the general definition of a GHG emissions inventory is ***an accounting of the sources and amounts of greenhouse gases that are produced over a specific period of time as a result of the operations and existence of an institution***. These emissions include direct (on-site) and indirect (off-site) sources. Once sources are accounted, the emissions factors can be calculated, tracked, and ideally reduced through targeted strategies and initiatives. Your inventory will establish a baseline for developing a campus climate action plan that targets emissions reductions and tracks progress. The process of completing the inventory can also be a significant educational opportunity for students and for other stakeholders, if you work to include them throughout the process. In addition, identify with whom you will share the results of your inventory and how you will share it with them: publishing inventory results in various publications allows you to tell stories about successes and challenges that your campus is facing as well as encourage buy-in and goodwill from important stakeholders.

This guidance was prepared by the Leading by Example Program at the Executive Office of Energy and Environmental Affairs
Deval L. Patrick, Governor, Timothy Murray, Lt. Governor, Ian A. Bowles, Secretary

III. GHG EMISSIONS SCOPES

Development of GHG inventories involves the collection of data that are normally categorized into Scope 1, Scope 2, and Scope 3 emissions. These scopes are described below.

Scope 1 refers to direct GHG emissions that are owned or controlled by the institution

- Heating oil, natural gas, biofuels/biomass, for heat, hot water, etc.
- Fuel for campus vehicles
- Fuel for on-site generation (e.g. co-generation)
- Animal agriculture
- Nitrogen fertilizers
- Refrigerants and chemicals

Scope 2 refers to indirect emissions generated in the off-site production of electricity consumed by the institution

- Grid electricity
- Off-site steam generation/power plant

Scope 3 refers to all other indirect emissions – those that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution

- Commuting by staff, faculty, and students
- Air travel by faculty and staff
- Solid waste generation and recycling
- Wastewater (if processed off-campus)

Many entities often calculate emissions from: agricultural activities, solid waste and recycling, wastewater, refrigerants, and other chemicals. For the purposes of the LBE and ACUPCC programs this data is not required, but campuses should be aware that many institutions do collect much of this data for their campus-wide inventories.

IV. DATA AND INVENTORY REQUIREMENTS

While the LBE and ACUPCC climate change efforts are similar in their short- and long-term objectives, there are some important distinctions in both the program goals and inventory requirements:

Executive Order 484 – *Leading by Example: Clean Energy and Efficient Buildings*
Governor Deval Patrick's Executive Order requires state government greenhouse gas emission reductions of 25% by Fiscal Year 2012, 40% by 2020, and 80% by 2050. The LBE Program has stipulated that agencies use Fiscal Year 2002 data as the baseline and emissions reductions shall be measured on an absolute basis and not adjusted for facility expansion, load growth, or weather. GHG emissions inventories are calculated for all campuses using Scope 1 and 2 emissions.

American College and University Presidents' Climate Commitment
As signatories to the American College and University Presidents' Climate Commitment, Massachusetts public colleges and universities are required to undertake greenhouse gas emissions inventories to establish baseline data, measure progress, and develop strategies to reduce emissions. Signatories are also expected to meet at least two short-term goals, develop a climate action plan, and ultimately achieve long-term carbon neutrality. For further information on the ACUPCC: http://www.presidentsclimatecommitment.org. The ACUPCC requires campuses to calculate emissions that come from Scope 1, 2, and certain 3 emission sources.

INVENTORIES: Leading by Example and ACU-Presidents' Climate Commitment					
	Campus Fuels and Electric *Scopes 1 & 2*	**Commuting** (Faculty, Staff, and Students) *Scope 3*	**Air Travel** (Faculty and Staff) *Scope 3*	**Gases Tracked**	**Emissions Calculation**
LBE	**Yes, annually**	**No**	**No**	**CO_2**	**Yes – as determined by LBE program**
ACUPCC	**Yes, annually**	**Yes**	**Yes***	**CO_2, CH_4, N_2O, HFCs, PFCs, SF_6****	**Up to Campus**

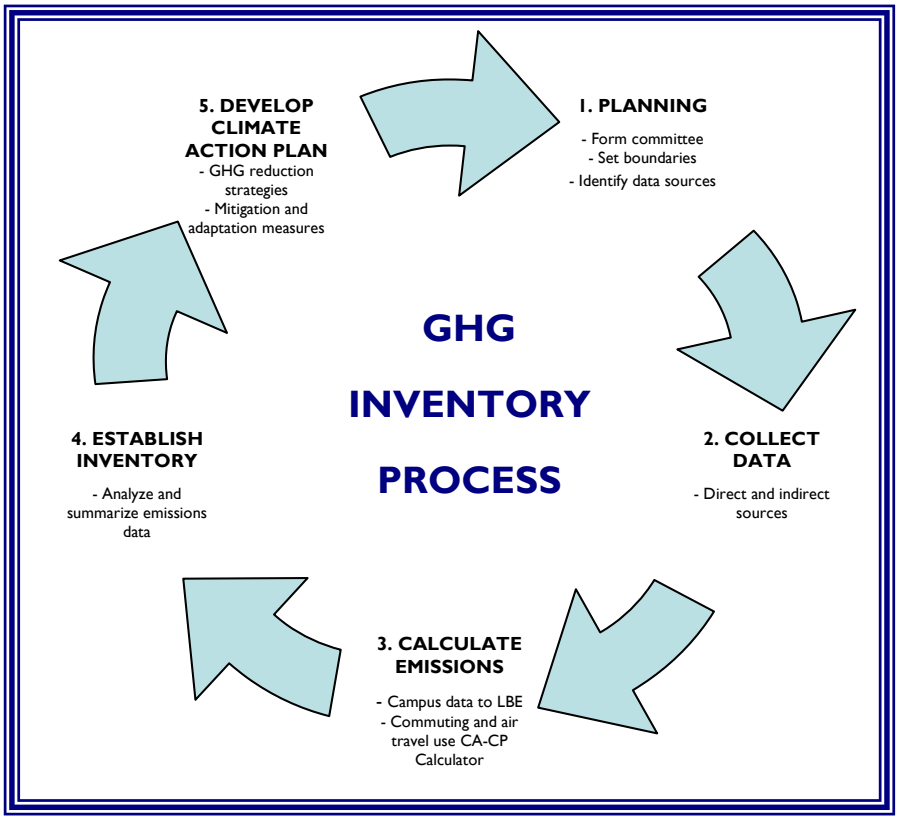
** The Clean Air-Cool Planet Carbon Calculator, recommended by the ACUPCC, also requests data from athletic and extracurricular transportation (including air travel for conferences, sports teams, and other student programs)*

*** carbon dioxide, methane, nitrious oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride*

V. CONDUCTING AN EMISSIONS INVENTORY

There are several key stages in the GHG inventory process:

1. Planning: set boundaries and identify qualified data.
2. Collect activity (energy consumption) data from all appropriate sources (e.g. fuels burned on campus and in fleet vehicles, electricity purchased, etc.)
3. Once data is collected, it should be input into the recommended calculator tools to identify GHG emissions.
4. Next, analysis of calculated data is necessary to summarize inventory results.
5. Inventory data can then be used to analyze campus trends and primary sources of emissions to help inform a Campus Climate Action Plan that will ultimately lead to emissions reductions campus-wide.



5A. SETTING BOUNDARIES

A. Temporal boundaries:

The first step in planning is to determine what years your inventory will cover. As noted previously, EEA established Fiscal Year 2002 as the baseline year for all state agencies (including colleges/universities) and has collected Scope 1 & 2 data for all campuses. For the ACPUCC, you should use the full year preceding the development of your Scopes 1, 2, & 3 inventories as your initial base year.

B. Organizational boundaries:

You also need to identify for which facilities you will collect data. Campuses should, where possible, include all space utilized by campus personnel or for campus activities, including leased space.

C. Operational boundaries: GHG Emissions Scopes

Most GHG inventory protocols call for institutions to track and report activities and/or sources that produce emissions of the six greenhouse gases covered under the Kyoto Protocol: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The LBE Program focuses on CO_2 since emissions of PFCs or SF_6 are unlikely to originate on campuses, and emissions of CH_4, N_2O, and HFCs often represent only a small percentage of an institution's total emissions. Tracking CO_2 means focusing on activities related to energy, electricity, and fuel use. However, because of the diversity in Massachusetts college campuses, some institutions should consider accounting for HFCs produced from refrigerants and CH_4 produced from animal waste (cow poop!) or composting, for example. *It should be noted that the LBE Program will be tracking additional gases associated with electricity production in FY08.*

5B. COLLECTING DATA

Data collection can be the most difficult aspect of the inventory process. To be sure, achieving accuracy is challenging—EEA recognizes this challenge so please, don't be intimidated by the process! The goal is to get the best data possible while recognizing that there will be gaps.

Scope 1 Recommended Process

Collecting data for on-site fuel consumption can usually be accomplished through fuel use records from the physical plant, campus planning, your procurement office, fleet managers, energy managers, purchasing records, the budget office and/or vendor reporting. It is useful to collect cost data as well as consumption data to track impacts on expenditures as well as emissions.

Campuses should make sure to collect all appropriate fuel data (natural gas, Type #2, #4, & #6 fuel oil, propane, motor gasoline, and diesel fuel) as well as renewable sources, such as biomass and bio-diesel, from all campus buildings, including, where available, leased space.

Scope 2 Recommended Process

Electricity consumption data can best be collected through utility bills or through invoices from a competitive supplier. Off-site steam records should be collected from your steam provider. EEA is in the process of establishing an on-line energy tracking system that will automatically collect electricity consumption and cost data by account directly from your utility. This data should also be collected, wherever possible, from leased space used for campus needs or activities.

Scope 3 Recommended Process

Data collection for commuting and air travel may require more "sleuthing" to identify miles traveled by automobile and by airplane. To help you determine total commuting miles traveled, options include:

- Conducting surveys among student commuters and staff and faculty for average trips and miles to and from campus (some colleges offer incentives or prizes to encourage students to respond).

- Obtaining information on student commuters (% of students living off campus) from offices of residence life or the registrar's office.
- Analyzing payroll/personnel/campus records for faculty and student home locations (utilizing zip codes) and then calculating average miles traveled using on-line mapping tools.
- Assessing the number of parking permits issued by the institution and using an estimate average trip distance.

To identify air miles traveled, campuses may want to:

- Consult a campus/institutional travel office or procurement office for the previous year's travel authorizations (which may have actual destinations), then use on-line tools to calculate mileage flown.
- Utilize travel cost data to estimate travel distances (this option is much less accurate).

To collect these data, institutions may want to consider working with individual students, class projects, or student environmental groups. Students can play a key role in conducting research and developing campus inventories. Establishing a task force or Climate Action Committee comprised of students, faculty, and staff is one way that many institutions have approached the inventory process. Campuses should also consider consulting with Clean Air-Cool Planet, a nonprofit organization that works directly with campuses on climate issues, including GHG inventories. For more information, please go to www.cleanair-coolplanet.org. Contact: Jennifer Andrews, Campus Program Manager, at 603-422-6464 x103.

EEA also recommends establishing long-term formal systems to collect and track the necessary data so that emissions calculations grow more accurate over time.

5C. CALCULATING EMISSIONS

After collecting energy use data, campuses will need to calculate actual greenhouse gas emissions. The LBE Program at EEA has been collecting Scope 1 and Scope 2 data since Fiscal Year 2002 and has, and will continue to, convert these data into an inventory for each campus. Massachusetts public campuses should continue to submit data to the LBE Program as part of their inventory process. The LBE program uses widely accepted emissions factors from the federal government and regional electricity grid to calculate actual CO_2 emissions.

For Scope 3 emissions, EEA strongly recommends that campuses use the Clean Air-Cool Planet Campus Carbon Calculator (a series of Microsoft Excel spreadsheets) to help you track and record data, and develop the final piece of your inventory. The Campus Carbon Calculator was designed specifically for university/college campuses and is currently the most commonly used tool for campus inventories. You can utilize the Campus Carbon Calculator specifically to input commuting and air travel data and calculate corresponding emissions. Download the CA-CP Calculator at: http://www.cleanair-coolplanet.org/toolkit/content/view/43/124/.

While not required, you may also want to consider inputting all campus energy data into the CA-CP Calculator to host your data in one location, and to enable you to automatically calculate and report emissions from GHGs other than CO2 (e.g. CH4, N2O) required by ACPUCC. However, please note that Scope 1 and 2 campus data must continue to be submitted to the Executive Office of Energy and Environmental Affairs' Leading by Example Program. Contact: Eric Friedman, LBE Director at eric.friedman@state.ma.us.

Note: To meet the ACU Presidents' Climate Commitment, signatories must report on the emissions calculator used as well as the source of the emissions coefficients used. The ACUPCC identifies CA-CP's Campus Carbon Calculator as the tool of choice.

5D. ESTABLISHING AN INVENTORY

After emissions data are calculated, organize, analyze, and summarize results to establish your comprehensive inventory for the campus; documentation should include excel data spreadsheets (CA-CP Carbon Calculator) with a supporting and explanatory narrative that can be shared with the campus community and broader public. This inventory will provide the baseline and framework for developing emissions reduction strategies and policies that will be outlined in your campus climate action plan.

5E. DEVELOPING A CLIMATE ACTION PLAN

In accordance with the American College and University Presidents' Climate Commitment (ACUPCC), within two years of the institution's implementation start date, signatories agree to develop a climate action plan that outlines strategies for emissions reductions, mitigation and adaptation measures, and establishes benchmarks toward achieving long-term "climate neutrality." Climate neutrality is defined by ACUPCC as "having no net greenhouse gas emissions." This is to be achieved through measures such as energy conservation, energy efficiency improvements, renewable energy (on-site installation and purchasing), carbon offsets, green buildings, alternative fuels, efficient vehicles, and other actions to mitigate the remaining emissions.

EEA plans to work closely with state colleges/universities in developing campus climate action plans. Institutions should also consider hiring consultants or student teams to develop their plans. Version 6 of CA-CP's Campus Carbon Calculator (to be released in the Fall '08) will include a new "planning" module that will help to facilitate the collection and analysis of data related to the costs and impacts of potential carbon reduction measures; this will be designed to aid students, faculty, staff and administrators in developing viable and cost-effective campus climate action plans.

VI. RESOURCES

American Association of Higher Education: http://www.aashe.org/
Examples of completed Campus GHG Inventories: http://www.aashe.org/resources/ghg_inventories.php

American College and University Presidents' Climate Commitment: http://www.presidentsclimatecommitment.org/

California Climate Action Registry: http://www.climateregistry.org/Default.aspx?refreshed=true

Clean Air-Cool Planet: http://www.cleanair-coolplanet.org/
Examples of completed Campus GHG Inventories: http://www.cleanair-coolplanet.org/toolkit/content/view/146/132/

EEA – Leading by Example Program: http://www.mass.gov/envir/Sustainable/

Environment Massachusetts – Campus Climate Challenge: http://www.environmentmassachusetts.org/

EPA – Climate Change: http://www.epa.gov/climatechange/

EPA – College and Universities in New England: http://www.epa.gov/region01/assistance/univ/

Harvard University Green Campus Initiative: http://www.greencampus.harvard.edu/

ICLEI USA – Local Governments for Sustainability: http://www.iclei.org/index.php?id=391

Massachusetts Department of Energy Resources: http://www.mass.gov/doer/

MassPIRG/Environment Massachusetts – Campus Climate Challenge: http://www.environmentmassachusetts.org/

NWF Campus Ecology Program: http://www.nwf.org/campusecology/

Tufts Climate Initiative: http://www.tufts.edu/tie/tci/index.htm

World Resources Institute: http://www.wri.org/project/ghg-protocol