King County Government: A Greenhouse Gas Inventory as an Indicator of Corporate Efficiency

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Air and Waste Management Association
Pacific Northwest International Section
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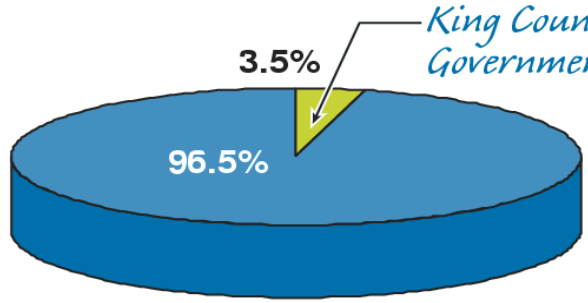
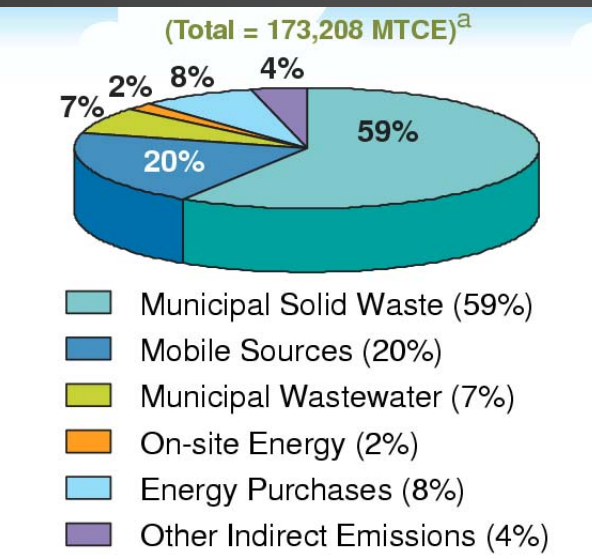
Inventory Overview

http://dnr.metrokc.gov/dnrp/air-quality/inventory.htm

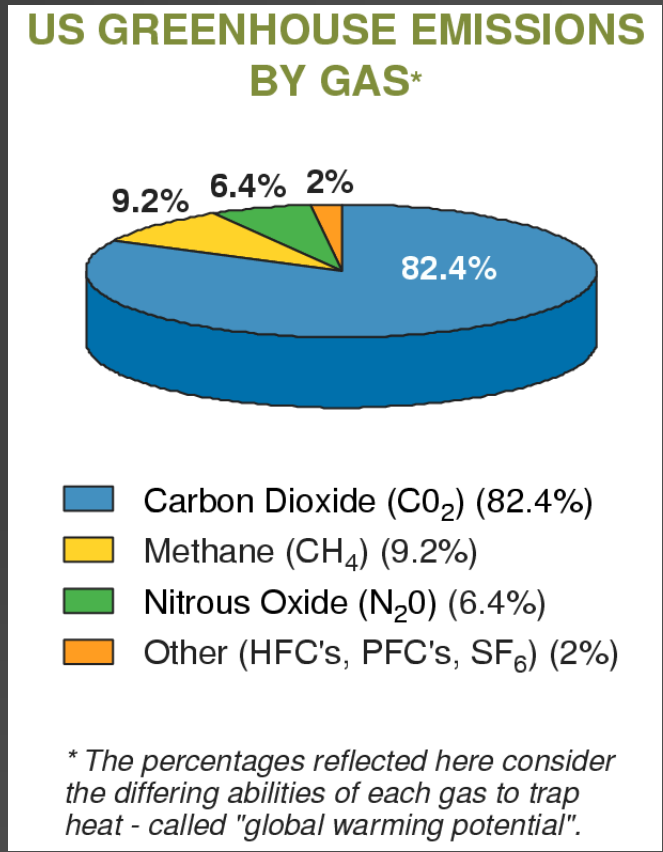
		Greenhouse Gases (MTCE)[a]	Traditional Pollutants (tons)			
			NOx	VOC	PM	SOx
DIRECT EMISSIONS	Municipal Solid Waste[b]					
	Cedar Hills Landfill	88,821	83.4	4.7	0.0	16.4
	Closed Landfills	13,371	1.2	0.0	0.0	0.2
	Mobile Sources					
	Metro Buses	28,310	802.1	55.0	31.0	20.4
	County Fleet - (gas and diesel)	7,560	107.4	49.7	3.3	4.0
	Lawn and Garden	included in misc. fuel	0.7	282.1	2.5	0.0
	Miscellaneous Fuel Use	625	13.3	6.2	0.4	0.5
	Employee auto use for County Business	236	2.5	3.3	0.1	0.2
	Municipal Wastewater Treatment					
	South Treatment Plant (Renton)[c]	3,624	0.9	43.9	4.1	0.1
	Westpoint Treatment Plant	7,885	115.1	10.0	1.2	4.8
	Vashon Treatment Plant	52	0.0	0.5	0.0	0.0
	Biosolids[d]	872	0.0	0.0	0.0	0.0
	Area Sources (Evaporative Emissions)					
	Paint (Interior/Exterior)	0	0.0	48.1	0.0	0.0
	Traffic Paint	0	0.0	33.9	0.0	0.0
	Cleaners	0	0.0	11.9	0.0	0.0
	Auto Products and Misc. Solvents	0	0.0	2.0	0.0	0.0
	Road Paving/Repair materials	0	0.0	20.1	0.0	0.0
	Pesticides	0	0.0	0.3	0.0	0.0
	On-site Energy[e]					
	Propane	179	0.9	0.0	0.0	0.0
	Natural Gas	3,579	11.4	0.7	0.9	0.1
	TOTAL - DIRECT EMISSIONS	153,111	1138.2	552.2	43.5	46.7
INDIRECT EMISSIONS	Energy Purchases					
	Electricity (Seattle City Light)	1,753	33.3	0.3	1.8	36.2
	Electricity (Puget Sound Energy)	10,685	74.1	1.7	5.7	93.8
	Steam (Seattle Steam)	945	3.0	0.2	0.2	0.0
	TOTAL - ENERGY PURCHASES	13,383	110.4	2.2	7.5	130.0
	Mobile Sources					
	Employee Commute	6,164	105.1	105.2	2.8	5.8
	Lawn and Garden	n/a	0.4	14.0	0.1	0.0
	Heavy Equipment	396	16.9	1.5	0.6	0.4
	Municipal Solid Waste					
	Employee Office Waste[f]	153	0.2	0.0	0.0	0.0
	Area Sources					
	Road Paving/Repair materials	0	0.0	117.4	0.0	0.0
	Pesticides	0	0.0	0.1	0.0	0.0
	Cleaners	0	0.0	3.4	0.0	0.0
	Paint	0	included in direct sources, listed above			
	TOTAL - OTHER INDIRECT EMISSIONS	6,713	122.6	241.5	3.3	6.1





Emissions Inventory: General Issues

- Boundaries
  - Direct emissions
    - Gases released on-site
  - Indirect emissions
    - Energy (electricity / steam purchases)
    - Other indirect emissions (purchases, employee commute…)
- Gases (2000 EPA report)
  - Carbon Dioxide (~82% U.S.)
  - Methane (~9% U.S.)
  - Nitrous Oxide (~6% U.S.)
  - Others (~2% U.S.)
  - Not a process-based organization?
    - → focus on CO_2



Tools and online resources (WRI)

- http://climate.wri.org/publications.cfm
  - Boundaries
    - Direct vs. indirect
    - Which gases / sources to consider
  - Online calculators (be careful with these!)
    - Fuel use for heat and transportation
    - Purchased electricity
    - Business travel
    - Employee commute
  - Other resources from WRI
    - Accounting for a renewable energy project
    - Renewable energy certificate purchases

Tools and online resources (EPA)

- http://www.epa.gov/ttn/chief/eiip/techreport/volume08/
  - Currently under review / update (contact them!)
  - Designed for state-level inventories
  - Good documentation of methods and protocols
  - Example sources:
    - Combustion of fossil fuels
      - Carbon dioxide, methane and nitrous oxide
    - Industrial processes
    - Municipal solid waste and wastewater disposal
- http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html
  - Calculators & software are linked under tools
  - Links to U.S. GHG inventory are also included

Example: electricity purchases (WRI)

- A building uses 6 million kilowatt hours during the year:

6,000,000 kWh * 0.25 lbs CO_2 / kWh = 1,500,000 lbs CO_2

  - 1,500,000 lbs CO_2 = 680 metric tonnes CO_2 (2,205 lbs / metric tonne)
  - 1,500,000 lbs CO2 = 186 metric tonnes C
    - C = 12, CO_2 = 44; 680 metric tonnes CO_2 * 12 / 44 = 186 tonnes C

- Issues:
  - WRI protocol wants to separate out office vs. “process” electricity
  - 0.25 lbs CO_2 / kWh is variable within Washington state
    - According to WRI (DOE), US ranges from 0.03 in VT, ID to 2.24 in ND
  - Comparison with other inventories—conversion to $MTCO_2$ or MTCE?
  - Be careful using online resources. Does the answer make sense?

King County: Efficiency Improvements

- Planned / existing investments:
  - Landfill gas to energy project (22-26 MW)
    - ~24,000 $MTCO_2$ offset per year
  - Hybrid public transit buses (~210 Metro / ~20 ST)
    - ~8000 $MTCO_2$ reduced emissions per year (expected)
    - Air quality and maintenance benefits
  - New cogeneration power plants / 1 MW fuel cell at wastewater treatment plants
    - Several thousand $MTCO_2$ offset per year
    - Reduced risk from high and variable energy prices
  - Energy efficiency in plants and buildings
    - Designed to reduce emissions / lower utility bills

Inventory: Conclusions

- Look at your organization
  - What level inventory do you want?
  - What sources / gases should you consider?
  - What is the best way to go about calculations?
- King County experience:
  - Inventories can be, but don't have to be, tedious
  - Thoughtful approach from outset WILL save time
  - WRI protocols help ensure apples = apples
  - #'s at the end are uncertain (source dependent)
    - but they give a pretty good idea of relative magnitude
  - Can help discover efficiencies and investments