



Carbon Footprints and Transportation

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Objectives

- Provide an overview of carbon footprint measurement and management
 - What is a carbon footprint?
 - Why would you want to estimate one?
 - What are some of the issues involved in estimation?
- Offer some *general* guidance on how to estimate and reduce a carbon footprint

What is a carbon footprint?

- A measure of the impact your organization has on the climate by releasing carbon dioxide (and 5 other greenhouse gases) into the atmosphere
- All of your organization's activities contribute to the size of its footprint
 - Energy used to run the organization, including business and freight travel
 - Energy used to produce and ship what you buy and sell, including employee commuting
 - Emissions from production processes

Emissions from transportation

- Carbon dioxide (CO_2)
 - Primary byproduct of fuel consumption
- Methane (CH_4)
 - Trace gas from vehicle operations
 - Leakage from CNG fuel systems
- Nitrous oxide (N_2O)
 - Trace gas from vehicle operations
- Hydrofluorocarbons (HFCs)
 - Leakage from vehicle air-conditioning (A/C) or refrigeration systems

Not all gases are equal

- One pound of methane contributes as much to warming as \cong 21 pounds CO_2
- One pound of nitrous oxide \cong 310 pounds CO_2
- One pound of HFCs \cong 1,300 pounds CO_2
- These are called warming potentials
- Use warming potentials to convert all emissions to CO_2
- This yields “ CO_2 equivalent” or $\text{CO}_2(\text{e})$

- Example: 14,000 lbs CO_2 + 2 lbs HFCs = 16,600 lbs $\text{CO}_2(\text{e})$

Why would your organization want to estimate its carbon footprint?

- You want to manage emissions and reduce them
- You want or need to report emissions accurately to a third party

Reasons to manage and reduce emissions

- Reduce costs
- Reduce risk (energy prices, availability, government policy)
- Develop business opportunities (help your customers reduce *their* emissions)
- Comply with business customer expectations for “green” suppliers (here now, and increasing)
- Comply with government policy (future possibility, not yet)
 - Documenting reductions made now may earn credit under future policy (no guarantees)
- Recognition for environmental leadership
- Good stewardship/citizenship

Reasons to report emissions to a third party

- Organization policy
- Public or employee relations
 - Educate your stakeholders
- Grant applications
- Emission trading
- Government policy
- Policies or international standards applied by your business customers
 - ISO 14044, ISO 14064, ISO 14065

Business customer expectations are changing

- “All IKEA transport service providers must set their carbon dioxide emissions targets and set a three-year emission goal. They must also measure their carbon dioxide emissions and fill in an ‘Environmental Performance Survey’. In addition, transport service providers must use modern vehicles that are less than 10 years old.”—*IKEA Social & Environmental Responsibility Report 2007*



Financial risk

- If serious government policy is implemented to reduce carbon dioxide emissions
 - How vulnerable is your organization? Or your customers?
 - What are the financial risks and opportunities?
 - What are you doing now to manage them?
- Similar questions to
 - “If the price of gasoline increases to \$4 per gallon . . .”
 - “If there are shortages of petroleum . . .”
 - “If a competing product with better efficiency captures a big share of our market . .

Carbon Disclosure Project

- Backed by 475 major institutional investors controlling \$55 trillion in assets
- Seeks information and data on emissions, risks, opportunities
 - Not just from regulating emissions, but from changing climate
- Major companies have responded to the request
 - UPS
 - Coca-Cola
 - Carnival Cruise Lines
 - FPL
 - Office Depot
 - TECO Energy
- Climate change is becoming important to investors

OK, your organization wants to calculate its carbon footprint

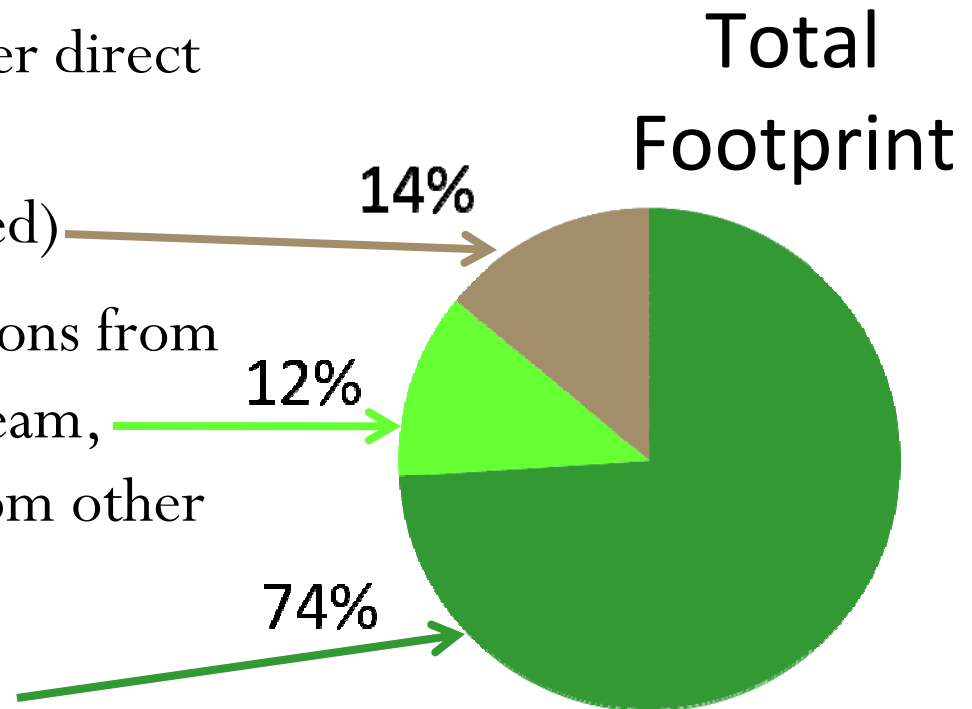
- What do you include?
- How do you go about organizing the process?

Categories of emissions

- Scope 1—Emissions under direct control of the organization (equipment owned or leased)

- Scope 2—Indirect emissions from direct use of electricity, steam, heat, cooling purchased from other organizations

- Scope 3—Other indirect emissions



Examples of Scope 1

- Direct fuel use (heating, cooling, motor fuel)
- Direct process
- Industrial/chemical
- Business travel or commuting in vehicles owned or controlled by the organization
 - Motor pool, delivery vehicles, shuttles, other vehicles owned or contracted for
 - Bus fleet, truck fleet, corporate aircraft, police helicopters
- Coolant emissions (leaks) from A/C and refrigeration
 - Vehicles
 - Buildings

Scope 2

- Scope 2 emissions are indirectly under your organization's control
 - It can control its use of electricity (or steam, cooling, etc.)
 - It has some options for controlling the emissions from generating electricity
 - It can generate some electricity (emissions become Scope 1)
- There are pretty good data on emissions from electricity purchased from utilities

Examples of Scope 3

- Production of fuels that you purchase
 - Your use of the fuel you purchase is your Scope 1
 - Production of the fuel you purchase is your Scope 3
 - (If you produce fuels, production of the fuel is your Scope 1, but may have some Scope 3)
- Commuting or business travel in vehicles not owned or controlled by your organization
- Travel by your customers
 - Significant for retail and hospitality businesses
- Purchase and delivery of goods and services
- Use of your products

Differences between Scopes

Control

Information

Boundary

Boundary

- Your organization's Scope 3 emissions are other organizations' Scope 1 and Scope 2 emissions
 - They should have much better information about their Scope 1 and Scope 2 emissions than you do
- Similarly, your organization's Scope 1 and Scope 2 emissions are other organizations' Scope 3 emissions
 - You should have better information about your Scope 1 and Scope 2 emissions than they do
- So, don't expect to report *your* Scope 3 emissions for trading
 - It would create double-counting

What do you include in your carbon footprint?

- Always Scope 1 and Scope 2, especially for trading
- Scope 3, it depends
 - Definitely not, if your purpose is trading
 - Probably not, if your purpose is to manage and reduce your organization's direct emissions (fuel bills)
 - Probably yes, if your purpose is
 - To report your carbon footprint to others (except for trading)
 - To manage risk
 - If the risk of not worrying about it is "large enough"
 - Especially if it is "large" relative to Scopes 1 and 2
 - Definitely yes, if your customers or investors require it

Ok, so how do we calculate our carbon footprint?

How do you estimate emissions?

1. Collect data on all fuel use, electricity use, vehicle use by the organization
2. If you have direct emissions of coolant from air conditioning, collect data on recharge volumes and coolant types
3. Multiply by emission and global warming equivalence factors
4. Document your data and analysis



Collecting and organizing data

- Generally, do Scope 1 and Scope 2 completely separately from Scope 3
- To *report* a carbon footprint, you need data on:
 - Total fuel use
 - Total electricity use
 - Use by some individual equipment (e.g. vehicles)
 - You calculate at this level but don't report at this level
- To *manage* a carbon footprint, you need detail describing how and why the fuel and electricity were used

What data do you need to collect?

- Number, ages, and types, and fuel types of vehicles used
- Use of each vehicle
 - Miles driven or flown
 - Purpose
 - Not needed for estimating your carbon footprint
 - Essential for managing it
- Fuel use by type
 - Include alternate fuels (such as biodiesel, ethanol, CNG)
 - Include electricity if you plug in a vehicle to charge it (Scope 2)
 - Ignore electricity if it is generated by the vehicle (e.g., hybrids such as the Toyota Prius), because it is Scope 1
- Amount of coolant added to replace losses from vehicle A/C and refrigeration

Document your data and process

- Required if reporting for trading
 - Some standards require third-party verification of reports
- Facilitates updating the estimates in future years
- Increases likelihood that future estimates will be consistent and comparable
- Easier to hand off the process to someone else
- Easier to answer questions
 - If your purpose is to report to others, you may get questions
 - If your purpose is to manage your carbon footprint, documentation helps identify weaknesses in the estimate, and needs for management support for improved data collection

Contractor records

- Remember the IKEA example?
- Your organization can do this when it contracts for service
- At a minimum, your contract can require the contractor to report its Scope 1 emissions attributable to serving your organization
- This is part of the ISO standards mentioned earlier
- Walmart imposes reporting requirements on its suppliers
- Consumer products companies are looking at how customers use their products

You also need emission factors



- Some are per mile of use by different vehicle types or fuel types or ages
- Some are per gallon of fuel, kwh of electricity, or pound of coolant
- If you are reporting emissions to register them for trading, use the factors prescribed by the registering agency
- Otherwise, use factors from a reputable source
- You also need global warming potential factors to convert CH_4 , N_2O , and HFC to $\text{CO}_2(\text{e})$

Sources for emission and warming factors

- The Climate Registry
 - They are the *de facto* standard for reporting for trading within North America
 - They have most of the factors you need for Scopes 1 and 2, plus detailed guidance and suggestions beyond what we present here
 - They don't have everything you need for estimating Scope 3 emissions
- Main protocol document at <http://theclimateretry.org/downloads/GRP.pdf>
- EPA will probably specify sources for its required reports

Other possible sources

- Greenhouse Gas Protocol Initiative/World Resources Institute (has factors from indirect emissions from commercial aviation, and from average car/light truck fleets)
- Intergovernmental Panel on Climate Change
 - Guidelines for National Greenhouse Gas Inventories, Vol. 2
- US Environmental Protection Agency (especially Report AP-42)
- US Department of Energy
- California Air Resources Board
- Your state's climate change program (most states don't have these on their websites yet)

Ok, so how do we manage
our carbon footprint?

Managing your carbon footprint

- Consider
 - Vehicle technology
 - Fuel type
 - Vehicle use
- For Scope 3, work with suppliers and customers
- Focus on outcomes, not means
- Technology may require good behavior to yield results
- Plan on measuring activity and results

If your organization owns vehicles

- Replace with more efficient ones at next replacement cycle
- Don't accelerate purchases of NEW vehicles just to get modest reductions in emissions
 - It may take many years for fuel savings to offset the emissions needed to make the vehicle
- Consider efficient USED vehicles
- If the old ones are REALLY inefficient, consider scrapping (and crushing/shredding) rather than reselling
 - Otherwise, your old vehicle will be used elsewhere
 - *Your* emissions will go down but *total* emissions go up

Fuel technology

- The jury is still out on alternative fuels and CO₂(e)
- Much of the uncertainty is over the indirect (Scope 3) emissions from producing the fuels
 - You don't have to calculate or report these
 - So it is possible to reduce reported emissions while actually increasing total emissions
 - You do have to report the carbon content of the fuels
 - You do have to report the percentage of carbon from fossil vs. renewable sources
- Some is over operating practice
- Some is because the processes or vehicles don't exist yet

Vehicle use

- Activities for which the vehicle is used
- How the activities are conducted, scheduled, and routed
 - Efficiently vs. haphazardly
 - UPS plans routes to avoid left turns
- How the vehicle fleet is dispatched
 - Schedule the vehicles with the lowest emission rates for the most frequent/longest trips
- How much the vehicles are used
- How the vehicles are operated

One model for managing travel emissions

- Set a carbon budget
- Allocate it to administrative or operational units and quarterly or monthly periods
 - Short periods reduce wiggle room, allow correction if things are off track
- Provide a standard calculator to enable managers to compare trips and alternatives consistently
- Allow trading between business units
- Encourage substitution of modes, sharing rides, or video conferencing
- Hold managers accountable
 - Breaking the budget one month requires reductions in later months somewhere
- Where travel is truly essential, seek emission reductions elsewhere in the organization
 - But if you are using a carbon footprint to manage risks, keep risk in mind

Little things add up

- Tire pressure
- Vehicle maintenance
- Junk in trunks
- Plan ahead to combine trips, reduce stops and cold starts
- Schedule to avoid congestion
- Aggressive driving
- Speed
- Drive-through service windows



But also, think “big”

- Avoid the tendency to think in terms of small reductions, “paring down”, “across-the-board” cuts of 10-20%
- Consider a carbon budget
- If you could emit only 80% of what you do now
 - What would you keep doing, no matter what?
 - Are there ways to do these things more efficiently?
 - What might you quit doing altogether?
 - Are there things you could do in some completely different way that accomplishes what you need but with a smaller footprint?

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