Complete Scope 3 Progress, Including Upstream Emissions from Energy

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

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Outline

What is complete scope 3?

• *What aspects of scope 3 are already in SIMAP?*
• *Benefits to accounting for complete scope 3*

Progress on fuel and energy-related activities

• *Solar, fuel oil, and natural gas*

Managing changing system boundaries
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GHG Protocol for Scope 3

- Standards developed by the World Resources Institute for reporting scope 3 at the corporate level
- For SIMAP, we are adapting these guidelines for higher ed
What are Scope 3 Emissions?
Which scope 3 categories are in SIMAP now?

**Scope 3 category**

1. Purchased goods and services  
   - Partial: Food, Paper
2. Capital goods
3. Fuel- and energy-related activities (not included in scope 1 or scope 2)  
   - Partial: Electricity T&D losses
4. Upstream transportation and distribution  
   - Partial: Food
5. Waste generated in operations
6. Business travel  
   - Second Nature
7. Employee commuting  
   - Second Nature
8. Upstream leased assets

**Upstream scope 3 emissions**

**Downstream scope 3 emissions**

9. Downstream transportation and distribution
10. Processing of sold products
11. Use of sold products
12. End-of-life treatment of sold products
13. Downstream leased assets
14. Franchises
15. Investments

Reference: Figure [5.3] Time boundary of scope 3 categories, Corporate Value Chain (Scope 3) Accounting and Reporting Standard
Scope 3 categories already in SIMAP

**Total footprint by scope**

- Scope 3: 80,000 MT eCO2
- Scope 2: 20,000 MT eCO2
- Scope 1: 0 MT eCO2

**Scope 3 by category**

- T&D Losses: 25,000 MT eCO2
- Food: 20,000 MT eCO2
- Paper Purchasing: 15,000 MT eCO2
- Wastewater: 10,000 MT eCO2
- Solid Waste: 5,000 MT eCO2
- Student Travel to/from Home: 2,500 MT eCO2
- Study Abroad Air Travel: 2,000 MT eCO2
- Other Directly Financed Travel: 1,500 MT eCO2
- Directly Financed Air Travel: 1,000 MT eCO2
- Student Commuting: 0.5 MT eCO2
- Staff Commuting: 0.25 MT eCO2
- Faculty Commuting: 0.125 MT eCO2

**GHG Protocol Categories**

- FERA: Purchased goods
- Waste
- Business travel
- Commuting
Complete scope 3: Potential magnitude

University of Cambridge
GHG Inventory 2011-2012 AY

Scope 1 + 2 = 30%
Scope 3 = 70%
Scope 3 could be a significant proportion of total campus footprints

Value proposition in scope 3 accounting

1. Informs decision-making
   • “Can’t manage what you don’t measure”

2. Quantitative data supports other initiatives

3. Campus as a ‘living lab’
   • Student research, high-impact learning

4. Leadership opportunity
   • For campus and vendor partners
Progress on Fuel- and Energy-Related Activities
What is included in category 3 of scope 3 emissions?

Emissions related to the production of fuels and energy purchased and consumed by the reporting company that are not included in scope 1 or scope 2

This category includes emissions from four activities

A) Upstream emissions of purchased fuels
B) Upstream emissions of purchased electricity
C) Transmission and distribution (T&D) losses
D) Generation of purchased electricity that is sold to end users
Activities included in each type of emission factors

Figure [7.2] Activities included in each type of electricity emission factor

- Fuel extraction, production & transport
- Power generation
- T&D losses

Activity included in...
- Combustion EF (for scope 1 and 2)
- Life cycle EF (for scope 3, except category 3)

EF = emission factor

In Progress
In SIMAP!
Calculation of category 3 (FERA) emissions in scope 3

Methods

- Average-data method / Default EF
- Supplier-specific method / Custom EF

Activity data

Already there
- Fuel consumption data from scope 1
- Electricity, steam, heat and cooling consumption data from scope 2

Upstream Emission factors

What we are working on
- Solar
- Fuel Oil
- Natural Gas
- More...

Upstream Emissions
Solar Energy Technologies

- Photovoltaic (PV) Solar Energy:
  - Crystalline silicon
  - Thin film

- Thermal Solar Energy:
  - Solar thermal collectors
  - Concentrating solar power (CSP)
Factors affecting life cycle emissions of solar energy

- **Solar irradiation (DNI)** – amount of sunshine they absorb – *changes by location*
- **Operating lifetime** – 30 years
- **Module efficiency** - *varies by technology*
- **Performance ratio** – *varies by type of installation*
Upstream Emissions of Solar Energy Technologies

Emission Intensities (gCO2e/kWh)

- **Crystalline Silicon**
  - With Scope 3 - Lower Irradiation: 29.3 gCO2e/kWh
  - With Scope 3 - Higher Irradiation: 20.8 gCO2e/kWh

- **Thin Film**
  - With Scope 3 - Lower Irradiation: 13.4 gCO2e/kWh
  - With Scope 3 - Higher Irradiation: 9.4 gCO2e/kWh

- **Solar Thermal/CSP**
  - With Scope 3 - Lower Irradiation: 19.4 gCO2e/kWh
  - With Scope 3 - Higher Irradiation: 13.7 gCO2e/kWh

Without scope 3, no emissions from solar technologies
Future Steps for Solar Scope 3 Emissions

Add emission factors for each life cycle stage instead of using average proportions

Add emission factors for each GHG type separately in order to account for future GWP changes in SIMAP
Questions we have for the user community about solar

Do your institutions own solar PV panels, thermal collectors or RECs?

Are you aware of types of technologies used for your solar panels/RECs?

Who is responsible for operational processes/maintenance of your solar systems?
Fuel Oil is a petroleum product
• Derived from crude oil
• Used mainly in furnaces and boilers

Types of Fuel Oil considered in SIMAP:
• Distillate Oil (#1-4)
• Residual Oil (#5-6) (not common anymore)

The type is determined by how it is Refined
Scope 3 Emissions of Fuel Oil

System Boundaries

1. Oil Production & Upgrading
2. Oil Transport
3. Refining
4. Refined Product Transport
5. Combustion

Scope 3
To be added into SIMAP

Scope 1
Currently Included in SIMAP

Source: ARC Financial Corp.
Fuel Oil Scope 3 Emissions

• The addition of Scope 3 Emissions will add 25-34% to the life cycle emissions from fuel oil based on location.

• The average Scope 3 Emission Factor for Fuel Oil is 3.12 kg CO2e per US Gallon.

Addition of Scope 3 Emissions

- Scope 1
- Scope 1 + Scope 3

kg CO2e per US Gallon

0 2 4 6 8 10 12 14 16

Scope 1  Scope 1 + Scope 3
Fuel Oil Regional Districts (PADDs)

Regional differences in emissions are due to the regional differences in the type of crude oil being processed and refined.

SIMAP will be using the emission factors for the user’s specific region.

Regional Differences in Scope 3 Fuel Oil Emissions

- Production
- Transport
- Refining
- Product Transport
• Natural Gas is composed of mainly methane (CH4)
• It is commonly used for heating, cooking, and electricity generation

• There are several types of Natural Gas
  • Shale (75% of US Natural Gas Production)
  • Conventional
  • Tight
  • Associated

• The type is determined by how it is EXTRACTED
Scope 3 Emissions for Natural Gas

Supply Chain Boundaries

Production
Gathering and Boosting
Processing
Transmission, Storage, Pipelines
Distribution
Combustion

Scope 3
To be added into SIMAP

Scope 1
Currently Included in SIMAP
• The addition of Scope 3 Emissions will add 39% to the life cycle emissions from natural gas

• The scope 3 emission factor for natural gas is 21.01 kg CO2e per MMBtu

• This is a weighted average for the US
Natural Gas Scope 3 Methane Leaks

Further research is needed!

• Methane leakage rates range from 1% to 7% (per unit of natural gas delivered) depending on method and boundaries

• Shale Natural Gas extraction produces significantly higher amounts of CH\textsubscript{4} than Conventional Natural Gas

• Howarth et al. 2014 suggests that when using the 20-year GWP, Natural Gas has higher life cycle emissions than coal
Scope 1 and Scope 3 Emissions for Stationary Fuel and Energy Related Activities

Note: This graph does not include biofuels
Managing changing system boundaries
Challenges w/Expanding Boundaries

1) Social capital: maintaining "credibility" and buy-in

2) Capacity: balancing hours, energy and focus w/potential for impact

3) Communications: balancing clarity and context to motivate ACTION and CHANGE
So **Why** “Move the Goalposts”? 

*Because reality demands it*

- Every bit of warming matters
- Every year matters
- Every choice matters

From the IPCC slide deck. 
Wrestling with Changing Boundaries at UNH

**Original WildCAP goals and reporting**

1. Reporting and setting goals using Climate Commitment “combined” boundaries
   - 80% across-the-board reductions by 2050; 50% by 2020

2. 2001 baseline
   - “back-casted” for business air travel, still don’t have complete business travel or study abroad

**WildCAP 2020 – Plans for updated goals and reporting**

1. Reporting and setting goals separately
   - Scope 1+2: Net zero by 2030
   - Scope 3: category-specific, with categories added over time as available (purchasing, investments)

2. Varied baseline year
   - For S1+S2, adjusted to 2010 to be able to communicate how we are aligned with IPCC 1.5c report
   - For Scope 3 categories, first year for which there is complete data/analysis (e.g. food, 2014)
## Summary

### Scope 3 Accounting

- Challenging to do, but can be of strategic value, especially if coupled with related initiatives (e.g. student research, STARS)

- Need to move toward “dual reporting”

- SIMAP will help!

### FERA next steps

- Finalize emission factors for additional categories (e.g., biofuels, wind, coal)

- Finalize methods for upstream direct energy and purchased electricity

- Incorporate into SIMAP!

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