



Greenhouse Gas Inventory Overview

Carbon Neutral Challenge Initiative
Oregon Wineries

Ecos

309 SW 6th Avenue #1000

Portland OR 97204

503 525-2700

February 8, 2008



Introduction

The purpose of this document is to describe the greenhouse gas (GHG) inventory process for the Carbon Neutral Challenge Initiative. The Initiative will employ the recently developed GHG Accounting Protocol for the International Wine Industry to ensure consistency across the industry.

Climate Background

As the effects of climate change become more evident, the list of at-risk industries continues to grow. As stated in a study published in the Proceedings of the National Academy of the Sciences, the U.S. wine industry is among the industries that are most vulnerable to global warming. The report asserts that by 2099, there will be between a 50 percent and 81 percent decline in the areas suitable for growing premium wine grapes; this degeneration is attributed to an increased annual number of days forecasted to have temperatures above 95 degrees.

Issues surrounding water demand and availability are also exacerbated by global warming, and are an increasing problem for the industry. Moreover, vineyards and wineries are both energy-intensive operations. Because crush tends to coincide with peak energy periods, overall energy supply is further strained, causing extremely high energy costs in winegrowing regions. Energy efficiency and distributed generation are therefore important considerations for stakeholders throughout the industry.

Carbon Neutral Challenge Initiative Overview

Governor Kulongoski's office, the Oregon Environmental Council and the Oregon Wine Board have joined together to develop an initiative for Oregon wineries and vineyards to assess and reduce their carbon footprint, with the ultimate goal of becoming carbon neutral. Globally, only a handful of wineries and vineyards have become carbon neutral.

While the wine industry is not a major emitter of greenhouse gas emissions in the state, it is directly impacted by climate change. Oregon's wineries and vineyards – many of which have already adopted sustainable agricultural practices into their operations – recognize that climate change will have a significant impact on their ability to grow grapes and produce quality wines.

By participating in this initiative, these wineries and vineyards are demonstrating their leadership in addressing climate change, reducing greenhouse gas emissions and producing a product that helps protect the climate. Further, their participation demonstrates the important role businesses play in reducing carbon emissions.

International Carbon Accounting Protocol

The significant impact of climate change on the wine industry's long-term viability and the increased focus on environmental accountability throughout business sectors necessitate the creation of adequate environmental accounting tools for the International Wine Industry to use. Provisor Pty Ltd was contracted by several national agencies – the Wine Institute of California, New Zealand Winegrowers, Integrated Production of Wines in South Africa and the Winemakers Federation of Australia – to develop a greenhouse gas accounting protocol and calculator that could be utilized by the international wine industry to standardize reporting and allow for greater communication throughout the industry. The company completed version 1.1 in January 2008.

The protocol and calculator are designed primarily as enterprise- and/or facility-level calculating tools for the International Wine Industry and are in compliance with current international standards and practices for greenhouse gas accounting. Use of this Protocol is expected to define a company's carbon emissions

to a level of detail that, when combined with accounting practices and allocation rules, also supports the apportioning of greenhouse gas emissions to individual products as required by international standards.

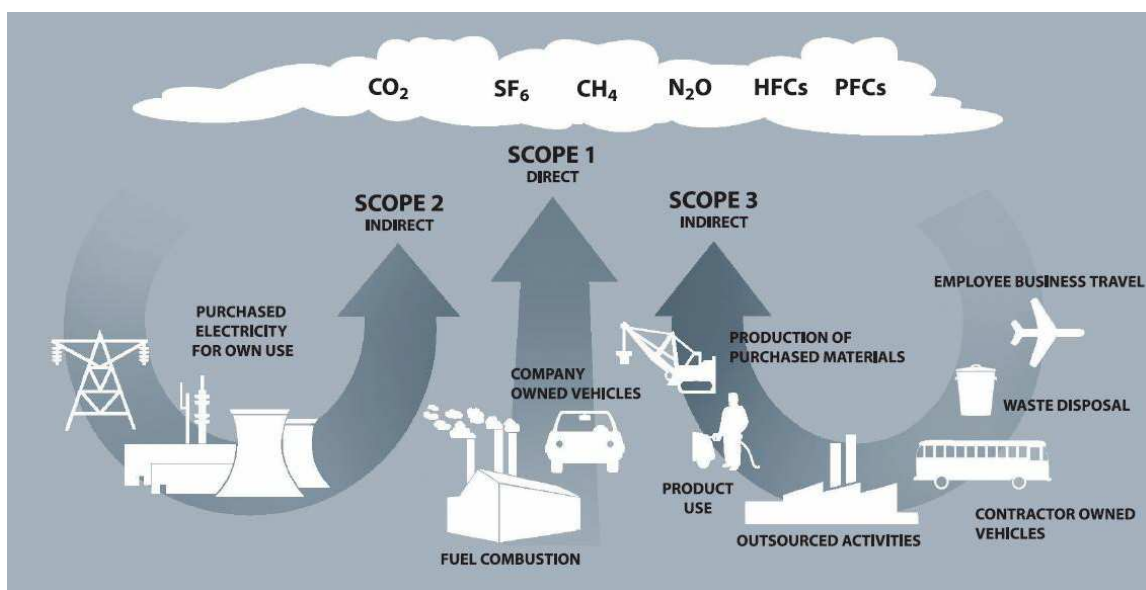
The development of the Carbon Accounting Protocol for the International Wine Industry is based on the methodology outlined by the World Resources Institute (WRI) and the World Business Council for Sustainable Development's greenhouse gas protocol. Other reference material has been extensively consulted including the International Standard, ISO 14064 1-3: 2006, for greenhouse gas accounting. It is anticipated that this protocol will undergo review hurdles and will be updated as appropriate in coming years.

GHG Emissions and Organizational Boundaries

GHG emissions are broken into three categories for accounting purposes. This separation of Scope categories is critical to manage mandatory reporting and the calculation of carbon footprint. Each Scope is described below and represented in Figure 1.

- ▶ Scope 1 emissions are those over which a company has direct control via ownership of activities;
- ▶ Scope 2 is purchased electricity, heat or steam; and
- ▶ Scope 3 includes the emissions from all activities that are purchased from other companies.

Figure 1: GHG Emissions Sources



Scope 1 and Scope 2 are included in almost all mandatory and voluntary reporting schemes, and are required by the *California Climate Action Registry*, *The Climate Registry*, and *EPA Climate Leaders*. The separation of Scopes ensures that no double accounting occurs at the regional level when greenhouse gas emissions are aggregated from many companies. Scope 1 and Scope 2 are typically the emissions categories companies use when calculating a carbon footprint and developing plans to minimize their carbon impact.

Alternatively, Scope 3 emissions can be included in reporting and may be included in carbon footprint processes, but are not necessary and must remain separated. While not required components for voluntary reporting schemes, Scope 3 emissions are part of the product lifecycle and are therefore critical for calculating and managing lifecycle and value-chain emissions. In the wine industry, where transport

and packaging are large components of the carbon footprint, a carbon calculator will not be complete without accounting for these.

International Protocol Boundary

The International Wine Industry Protocol has excluded the following Scope 3 emissions: all elements of the short-term carbon cycle; infrastructure items such as tanks and machinery, including posts and wire; business travel of employees; and the majority of chemicals used in winemaking and viticulture. The International Protocol includes, at this stage, bentonite, tartaric acid and barrel products as it is unknown whether these products are significant. A sensitivity analysis will be used to determine if they should be included in the long-term. The exclusion of elements of the short-term carbon cycle results in the exclusion of carbon dioxide emissions from winemaking, sequestration into grapes, carbon dioxide from the breakdown of vine prunings, carbon dioxide (but not methane) from waste degradation and wastewater treatment. Carbon dioxide from winemaking and carbon sequestration in grapes are calculated, but not included in Scope 1, 2 or 3 reporting.

Several of the items that have been included require additional research to address data quality issues addressed. In particular nitrous oxide generation, vineyard biomass photosynthesis, and vineyard soils sequestration have been identified as areas where research is needed to improve the quality of the model. . In the future, organic waste emissions, most packaging, pallets, bentonite, tartaric acid and barrels will also need improved data in order to fully analyze their environmental impacts.

The tool is structured so that it can be used by several types of wine production companies, including: grapegrowing only operations; winemaking only operations; bottling only operations; grapegrowing and winemaking; winemaking and bottling; and grapegrowing, winemaking and bottling operations.

Oregon Initiative

Oregon’s Carbon Neutral Challenge will follow the International Wine Industry Protocol as appropriate, but define a slightly different boundary. The current version of the International Protocol includes a subset of all GHG emissions related to the wine industry, as discussed above and expressed in Table 1. In similar fashion, the Carbon Neutral Challenge will include a subset of overall emissions that are most relevant for the Initiative and the wine industry in Oregon. In all cases where overlap exists, the Carbon Neutral Challenge will use the accounting protocols described by the International Protocol.

The table below describes GHG emissions sources for the wine industry. Items in italics are not included in the International Wine Industry Protocol. The asterisk denotes a partial inclusion of the category.

Table 1: Protocol Boundaries

Scope 2 Indirect energy	Scope 1 Direct	Scope 3 Indirect
Purchased power	<ul style="list-style-type: none"> ▶ Generation of heat, steam, or electricity ▶ Chemical or physical processing ▶ Vineyard (emissions and sinks) ▶ Winery (fermentation) ▶ Mobile combustion ▶ Fugitive emissions ▶ Waste disposal (on-site) 	<ul style="list-style-type: none"> ▶ <i>Infrastructure (embedded carbon)</i> ▶ Purchased products* ▶ <i>Contract machinery</i> ▶ Wine related products ▶ Transportation of goods* ▶ Transmission & distribution losses ▶ <i>Products in use phase</i> ▶ Waste disposal (off-site)

* Denotes partial inclusion

Transportation of goods in Scope 3 may include all items on the following list. Items in bold are to be included by the International Protocol. Items in italics may be included in the Oregon Carbon Neutral Challenge.

- ▶ **purchased products to the location**
- ▶ **intermediate products between value adding steps**
- ▶ **finished wine products to the point of sale**
- ▶ **waste to the point of disposal**
- ▶ *employee travel to work*
- ▶ consumer to the point of sale (outside the process boundary)
- ▶ *business travel of employees*

A more detailed discussion of emissions sources and the International Protocol can be found at the website listed below.

Oregon GHG Boundary

The greenhouse gas inventory for the Carbon Neutral Challenge Initiative will include the following:

- ▶ All of Scope 1 and Scope 2 emissions. The Data Requirements v1 spreadsheet pertains to this information.
- ▶ Two additional emissions sources from Scope 3, described below, will be part of the Oregon inventory and will be included in Data Requirements v2, to be distributed by March 1:
 - ▷ Transportation of finished wine products to point of sale
 - ▷ Employee business travel
- ▶ Additional emissions sources from Scope 3 may be included as part of the Initiative after further discussion with the winery initiative participants to confirm that they should be included in the carbon footprint analysis. These sources may include the following:
 - ▷ Employee commuting
 - ▷ Certain aspects of packaging

Data Collection Requirements

The following section provides descriptions of the data that is required to complete the GHG inventory. All data should be entered into the corresponding spreadsheet, 'OR Wine Data Requirements v1.xls.'

Scope 1

Mobile Equipment

Users should collect data on their mobile equipment in one of the following two ways:

- ▶ *Fuel Quantity Consumed*

Users will need to collect all fuel documents from within their company and categorize them by type. For example, if the only Gasoline use within your company is in fleet cars, and you have four of them that consume 3,500, 2,500, 6,000 and 9,000 Gal, then the total gasoline use is the sum of these four, 21,000. Users need to ensure that all mobile operating equipment has been accounted for. Where possible users are encouraged to enter their mobile equipment within the fuel quantity consumed section. However, if users do not have quantity-based records, an emission approximation can be made using the distance-based calculation.

- ▶ *Distance Traveled*

This might come in the form of odometer readings or log book records. It is critical to ensure that companies, who adopt this method and the quantity based method at the same time, do not double count emissions sources. There must be a clear accounting principle to differentiate between the quantity based method and the distance traveled method.

Stationary Combustion

Stationary combustion is all combustion-related activities that occur in fixed items. Examples include hot water heaters, boilers and generators. Users are encouraged to collect all fuel receipts and dockets that relate to stationary combustion equipment. The fuel use needs to be categorized and summed by type.

Fugitive Emissions

Fugitive Emissions are defined as emissions of greenhouse gases that arise from leaks or spills. In the case of the wine industry, sources such as refrigeration equipment and gas insulated electrical switchboards are included. Natural gas combustion devices are generally known to emit fugitive emissions from poor pipe work connections. Fugitive emissions from natural gas are calculated automatically based on the amount of natural gas consumed within stationary combustion devices. Two methods are available for users to calculate their fugitive emissions. In both cases, users will need to identify the type of gas used within their equipment.

Users should collect data on fugitive emissions in one of the following two ways:

- ▶ *Recharge Weight*

Emissions can be quantified by using the annual recharge weight (from service documents) of refrigeration gases. If annual service documents can be traced that show the recharge weight of gas, then users are encouraged to adopt this value rather than the default loss method.

- ▶ *Default Fugitive Losses*

If service documents are not available or do not include the annual recharge weight, then the default loss rate method should be adopted. Users will need to know the total gas weight within their device; this information should be available in the equipment specification documents.

Onsite Waste Disposal

Waste disposal is only categorized as part of Scope 1 if it is carried out within your operating boundary. The calculation page has been developed for both solid and liquid waste. Users need to understand the following factors involved in their waste water streams:

- ▶ Volume of waste water;
- ▶ Source of waste water;
- ▶ Chemical oxygen demand (COD) (mg/L) of their waste water; and
- ▶ How much, if any, methane is recovered within the treatment of that waste water (please note that if methane is flared within the waste treatment site, this is comparable with recovery from a greenhouse gas perspective).

Vineyard Practices

The vineyard practices page has three areas that require user information. The first section is concerned with fertilizer or nitrogen addition. The second section of the calculation page is concerned with emissions that result from soil cultivation. Users are requested to enter the vineyard area that is cultivated. The third section of the page is concerned with vineyard permanent row cropping; users are requested to enter the land area of their vineyard that is under permanent row cropping.

Winemaking Practices

Although part of the short-term carbon cycle, understanding the CO₂ produced in the winemaking process is an important part of this calculator.

Users are required to enter:

- ▶ Volume of fruit;
- ▶ Typical Press extraction;
- ▶ Extra juice added to the ferment;
- ▶ Average Baume;
- ▶ Residual sugar in the finished wine;
- ▶ Amount of Malic Acid converted to Lactic Acid; and
- ▶ Amount of Carbon Dioxide used in the winemaking process.

The process has been divided into white, red, sparkling and fortified product so that allocations can be made for each one.

Scope 2

Purchased Power

Scope 2 purchased power relates to all purchased electricity. Users should collect data on all

Reference

Much of the information included in this Overview is taken from the GHG Accounting Protocol for the International Wine Industry, developed by Provisor Pty Ltd and Yalumba Wines. Complete and current versions of The International Protocol, GHG Calculator, and Calculator Users Guide can be found at: <http://www.wfa.org.au/environment.htm>.