FIVS International

Wine Greenhouse Gas Protocol

Version 2.0

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1. Introduction & Overview

The FIVS International Wine Greenhouse Gas Protocol (*Protocol*) is designed to be an international wine industry specific supplement to the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) Greenhouse Gas Protocol Corporate Accounting and Reporting Standards.[1] Using these globally-accepted quantification standards as its foundation, the Protocol will be robust and flexible in its application over several years. References to current best practice in methodological guidance and a repository of regularly updated greenhouse gas emission factor tables also support the Protocol's design and intent. As such, this Protocol should be used in conjunction with the Greenhouse Gas Protocol Corporate Accounting standards. This Protocol supports a consistent quantification approach across the international wine industry when corporate carbon footprinting activities are undertaken.

This Protocol is fully relevant and tailored for use by the wine industry internationally, while providing the necessary guidance to report domestic emissions at the corporate level. It is intended that this Protocol be accepted by the wine production industry as a whole and has therefore been developed to be suitable for growers, wineries, and contract bottlers. The Protocol has been designed to accommodate a company whose operations consist of any combination of these growing and processing operations.

The Protocol is intended to be used from a whole company or corporate perspective. It can be used equally effectively to gain an understanding of the carbon footprint of a company or of a facility. It is not intended to be used as guidance for product footprinting, however many of the overall principles apply to both corporate and product standards and an effort has been made to provide consistency with both corporate and product footprint best practices. It is not expected that the use of this Protocol will define product-level carbon emissions to the extent necessary to satisfy the expected international standards (ISO 14040/44) for Life Cycle Assessment. However, it will provide general guidance on the significance of emissions associated with individual products.

The Protocol attempts to include emission sources that ensure the corporate carbon footprint is relevant and representative of improvement areas for the industry, while at the same time ensuring that compliance with the standard is not unrealistic from a business perspective by being too difficult or burdensome. As corporate carbon footprinting matures within the industry, the protocol may be revised to be more comprehensive in its inclusions, and as a result increase the level of sophistication required to comply with the Protocol.

[1] Note, this document was not developed in collaboration with WRI/WBSCD and has not been endorsed as an official supplement to the Greenhouse Gas Protocol standards.

1.1. Definitions

Anthropogenic emissions: Emissions of greenhouse gases, greenhouse gas precursors, and aerosols associated with human activities. These activities include the burning of fossil fuels, deforestation, land use changes, livestock, fertilisation, etc., that result in the net increase in emissions. [WRI/WBCSD 2011]

Baseline: The baseline is a level or year against which subsequent greenhouse gas emissions are measured. For example, the results from a business's first carbon footprint audit will serve as a baseline against which subsequent carbon audits will be compared. [WRI/WBCSD 2011]

Biogenic carbon emissions: CO_2 emissions from the combustion or biodegradation of biomass. [WRI/WBCSD 2011]

Carbon dioxide (CO_2): A naturally occurring gas fixed by photosynthesis into organic matter. A by-product of fossil fuel combustion and biomass burning, it is also emitted from land use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured. [WRI/WBCSD 2011]

Carbon dioxide equivalent (CO_2e): The universal unit of measurement to indicate the global warming potential (GWP) of each greenhouse gas, expressed in terms of the GWP of one unit of carbon dioxide. It is used to evaluate releasing (or avoiding releasing) different greenhouse gases against a common base. [WRI/WBCSD 2011]

Carbon stock: The total amount of carbon stored on a plot of land at any given time in one or more of the following carbon pools: biomass (above and below ground), dead organic matter (dead wood and litter), and soil organic matter. A change in carbon stock can refer to additional carbon storage within a pool, the removal of CO_2 from the atmosphere, or the emission of CO_2 to the atmosphere. [Confronting Climate Change 2014]

Carbon pool: A carbon pool is a component of the air, land or sea that has the capability to store or accumulate greenhouse gases that are removed or captured from the atmosphere. For example, the 'biomass carbon pool' on a farm would be the cumulative carbon stored in biomass (trees and crops) on the farm over a certain time period. [Confronting Climate Change 2014]

Emission factor: A factor that converts activity data into greenhouse gas emissions data (e.g., kg CO_2e emitted per litre of fuel consumed, kg CO_2e emitted per kilometre travelled, etc.). [WRI/WBCSD 2011]

Global warming potential (GWP): A factor describing the radiative forcing impact of one unit of a given greenhouse gas relative to one unit of CO_2. [WRI/WBCSD 2011]

Greenhouse Gases (GHG): Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, which absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, by the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine containing substances, dealt with under the Montreal Protocol. In addition to CO_2, N_2O, and CH_4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). [WRI/WBCSD 2011]

Intergovernmental Panel on Climate Change (IPCC): The Intergovernmental Panel on Climate Change (IPCC) is an international body of climate change scientists. The role of the IPCC is to assess the scientific, technical and socio-economic information relevant to the understanding of the risk of human-induced climate change. The IPCC releases periodic assessment reports that are a synthesis of peer reviewed papers and studies of relevance and generally include potential impacts of climate change and options for mitigation and adaptation. (www.ipcc.ch)

Offset: A monetary investment in a project or activity elsewhere that abates greenhouse gas emissions or sequesters carbon from the atmosphere that is used to compensate for greenhouse gas emissions from the company activities or from the production of a product. Offsets can be bought by a business or individual in the voluntary market (or within a trading scheme). A carbon offset usually represents one metric ton of CO_2e. [OIV 2011]

Soil carbon: Soil carbon is the carbon content that is stored in all organic soil matter. [Confronting Climate Change 2014]

Source: Source is any process or activity that releases greenhouse gases into the atmosphere. A carbon pool can be a source of carbon to the atmosphere if less carbon is flowing into it than is flowing out of it. [Confronting Climate Change 2014]

Sink: Any process, activity, or mechanism that removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas or aerosol from the atmosphere. [WRI/WBCSD 2011]

1.2. Acknowledgements

FIVS[2] embarked on an update of the FIVS International Wine Greenhouse Gas Protocol (GHG) to achieve the following goals:

- Help winegrowers and vintners account for, improve, and communicate the corporate carbon emissions of their business by providing an industry standard,
- Provide a consistent framework and ensure the Wine GHG Protocol aligns with current best practices,
- Integrate measures that ensure the longevity of the standard.

The project was made possible by a dedicated team and generous contributions from sponsoring organisations, and we thank them for their time, resources and expertise.

First, we wish to acknowledge the Steering Committee:

Allison Jordan, Wine Institute, California, United States,

Philip Manson, New Zealand Winegrowers, New Zealand,

Chris Savage, E. & J. Gallo Winery, California, United States.

The stakeholder group, that provided valuable input throughout the course of the project, drew from FIVS wineries, industry associations and other groups from the 20 member markets.

Thanks to financial contributions from the following sponsors, FIVS was able to retain the consulting services of thinkstep, a consulting firm that helps companies create business value through sustainability, and we are grateful for their support. We were in the able hands of Laura Morrison,

[2] Founded in 1951 and headquartered in Paris, France, FIVS is a trade association for all sectors of the alcohol beverage industry, whose membership includes producers, distributors, importers, exporters, and trade associations. (www.fivs.org)

Senior Consultant for thinkstep, who shared her experience, knowledge, and practical approach to guide the revision of the Protocol to meet FIVS members' goals.

2. Corporate GHG Accounting Principles

Section 2 of this report provides background information regarding greenhouse gas accounting principles. Although some wine industry examples are used, it is not intended to be specific to the wine industry. Table 1 summarizes the overall approach and where additional guidance on accounting principles can be found.

Table 1: Summary of Approach

Topic	Context	Approach	Justification	Guidance
Setting Organisational Boundaries	An organisational boundary defines what operations are included in various scopes of your footprint and ensures consistent accounting of GHG emissions.	Control Approach - companies account for GHG emissions from operations over which it has control (operational or financial).	Ensures reporting company has position of power to improve footprint.	WRI/WBCSD 2004: Chapter 3
Setting Operational Boundaries	Operational boundaries enable you to define direct and indirect emissions for your operations without double counting.	Calculation and separate reporting of scope 1, 2, and 3 emissions.	Consistent with best practice.	WRI/WBCSD 2004: Chapter 4
Scope 1: Direct GHG emissions	Emissions that occur from sources controlled by the organisation.	Mandatory for corporate GHG footprint.	Consistent with best practice.	WRI/WBCSD 2011: Chapter 4
Scope 2: Electricity indirect GHG emissions	Emissions from generation of electricity purchased or otherwise brought into the organisational boundary.	Mandatory for corporate GHG footprint.	Consistent with best practice.	WRI/WBCSD 2004: Chapter 4
Scope 3: Other indirect GHG emissions	Emissions resulting as a consequence of the organisations' activities.	Optional reporting following guidance in Section 3: Wine Specific Guidance.	Consistent with best practice and wine industry hot spots.	WRI/WBCSD 2013; GHG Protocol Scope 3 Guidance Documents; Section 3 of this document

2.1. Setting Organisational Boundaries

It is intended that this Protocol be accepted by the wine industry as a whole and as such has been developed to be suitable for growers, wineries and contract bottlers. The Protocol has been designed to accommodate a company whose operations consist of any combination of these growing and processing operations. When calculating the carbon footprint of a wine industry company, a common accounting formula can be applied to any combination of processing options; however, care needs to be taken in selecting the process boundaries as this will be different in each case. Examples of possible process boundaries within the wine industry are illustrated in **Erreur ! Source du renvoi introuvable.**.

This protocol recommends the use of the control approach for setting organisational boundaries. For the wine industry it has been assumed that "control" refers to operational control and ensures that the reporting company is in a position of power to alter its operations towards emission reductions. A company with full operational control has the sole authority to introduce policy, technology or operational changes with the potential to reduce overall emissions.

Most wine industry companies will have control over equipment such as tractors, forklifts and boilers. At a plant level, items under control are likely to include owned and leased cars[3], tank farms, fermenters, vineyards and bottling halls. Wine companies are not likely to own helicopters, rail and shipping systems, and large power generation facilities. Any emissions generated via these larger types of equipment, if not owned by the winery, are classified as scope 2 and scope 3 emissions.

For additional information about setting organisational boundaries, refer to Section 3 of the Greenhouse Gas Protocol Corporate Accounting & Reporting Standard.

2.2. Setting Operational Boundaries

Within greenhouse gas accounting, the concept of an operational boundary is used to help companies better manage the full spectrum of risks and opportunities that exist along its value chain. The operational boundary is also used to distinguish between direct and indirect emissions.

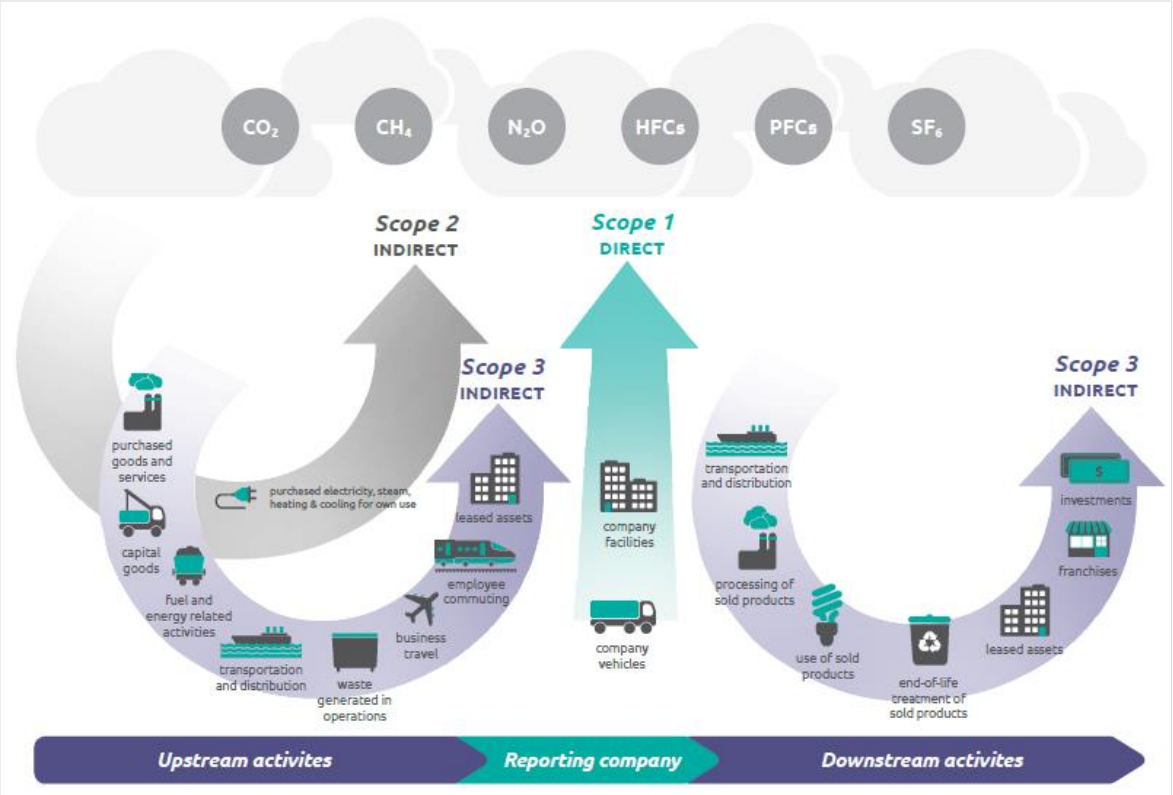
Direct GHG emissions are from sources that are owned or controlled by the company. Indirect GHG emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company.

In order to delineate between direct and indirect GHG emission sources, and to help in the development of emission policies and business goals, the WRI has defined three GHG Scopes, namely scope 1, scope 2 and scope 3 (refer to Figure 1, WRI/WBCSD 2004). These GHG scopes, particularly scope 1 and 2, have been clearly defined to ensure that double counting is never a possibility at the national, state, or industry level.

An operational boundary defines the scope of direct and indirect emissions for operations that fall within the company's established organisational boundary. Based on the organisational boundary, the operational boundary (scope 1, scope 2, and scope 3) is used to categorise direct and indirect emissions. The established organisational and operational boundaries together constitute a company's inventory boundary.

[3] When adopting the 'control' approach, leased items, although not owned by the company, may be completely controlled by the company and should therefore be included within Scope 1 emissions. An example is a company leased car. The company can choose what type of car to lease, pay for the fuel, and control how often that car is used. The company is in a position of control to alter those emissions.

Figure 1: Overview of scopes and emissions across a value chain (WRI/WBCSD 2011)



When calculating the carbon footprint of a wine industry company, care needs to be taken in selecting the operational boundaries as this will be different for each reporting entity. For example, a company that owns a vineyard and winery and makes wine from its own grapes, will include the production of grapes within its organisational boundary. Any emission generated in the production of those grapes will be included within scope 1. A winery that does not own the vineyard will need to purchase grapes from a grower. As this winery does not own the vineyard, any emissions generated in growing these grapes will be classified as Scope 3 for the winery. In both cases the actual emission value generated will be the same, but it is classified as belonging to a different entity.

For additional information about setting operational boundaries, refer to Section 4 of the Greenhouse Gas Protocol Corporate Accounting & Reporting Standard.

2.2.1. Scope 1: Direct Greenhouse Gas Emissions

Direct greenhouse gas emissions, or scope 1 emissions, are generated from items controlled by and owned by the company. For the wine industry, typical examples of scope 1 emissions will occur from tractors within company controlled vineyards, forklifts within company controlled wineries, water heaters within the winery or bottling halls, and emissions from onsite electricity generation.

Scope 1 emissions generally occur from one of the following types of activities:

- Emissions produced through the generation of heat, steam or electricity via the combustion of fuels in stationary equipment, such as boilers or water heaters;

- Emission produced from burning fuel in mobile operating equipment, such as cars, forklifts and tractors. To be classified as a scope 1 emission, the mobile equipment must be owned or leased by the company; and
- Unintentional emissions of greenhouse gases from within a company through leaks and spills. These emissions are known as fugitive emissions. Within the wine industry fugitive emissions are most likely to be limited to leaks from HFC-based refrigeration systems.

2.2.2. Scope 2: Purchased Electricity indirect GHG emissions

The emissions that occur from the production of electricity in facilities not owned by the company are categorised as scope 2 emissions. They are regarded as indirect emissions because they occur in equipment owned by another company, generally a power station. Scope 2 also includes emissions generated from purchased steam or heat, but this has not been considered as important for the wine industry.

Purchased electricity is separated from other indirect greenhouse gas emissions as electricity generation is considered to significantly contribute to global warming. For many organisations, purchased electricity is the largest component of greenhouse gas emissions and a necessary component of greenhouse gas management strategies.

Reductions in electricity consumption will result in less emissions of greenhouse gases. Reductions can take the form of utilising more energy-efficient equipment or alternatively switching to electricity providers that are less carbon intensive.

2.2.3. Scope 3: Indirect GHG Emissions

Scope 3 emissions are emissions that occur as a consequence of producing a finished saleable product, emitted from equipment or plants owned by another company. By definition the classification of scope 3 is dependent upon the operational boundary. For example, if a vineyard owns a harvester and uses it to harvest grapes, then the emissions generated from the harvester engine will be classified as scope 1. If the vineyard does not own a harvester and instead utilises a harvesting contractor then the emissions from the contract harvester will be classified as scope 3.

2.3. Reporting

Best practice dictates that at a minimum scope 1 and 2 are reported as part of your corporate inventory. Because of their environmental significance to the wine industry, this Protocol outlines the inclusion of several scope 3 items in your corporate carbon footprint as discussed in Section 3.1: Inclusions & Exclusions. If reporting scope 3 in accordance with this protocol, the mandatory scope 3 elements should be included.

Reporting of GHG emissions should be based on the principles of accuracy, transparency and consistency. When reporting greenhouse gas emissions within the facility or corporation, each scope should always be reported separately. Assumptions, exclusions and inclusions should be clearly stated.

Reporting is usually based on an organisation's strategy and often defined by the company's management priorities and decision-making timelines. External reporting is also largely driven by

market and stakeholder requirements for transparency. If external reporting is done via the Carbon Disclosure Project (CDP), there are annually specific deadlines. This is also true for other external programmes. If the reporting is being provided via the company's website or corporate sustainability report then these are typically annual (as defined by the company).

For additional information about corporate reporting, refer to "Common guidance on reporting to corporate level" provided in Chapter 6: Identifying and Calculating GHG Emissions and Chapter 9: Reporting GHG Emissions of the *Greenhouse Gas Protocol Corporate Accounting & Reporting Standard.*

3. Wine Specific Guidance

The following section summarizes the wine supply chain with a focus on the items relevant to conducting a corporate GHG footprint.

3.1. Inclusions & Exclusions

In developing the Protocol for the wine industry, care has been taken to ensure that items thought to be significant in their greenhouse gas emissions have been included within the Protocol. Although WRI considers the inclusion of scope 3 into carbon accounting as optional, published wine industry product and carbon footprints indicate that emission sources categorised as part of scope 3 contribute significantly to the total product greenhouse gas footprint in the wine industry. Scope 3 emissions related to glass packaging and the distribution of packaged wine are particularly significant. As such, inclusion of these items are important for the industry to understand, and influence the indirect emissions involved in producing wine.

The inclusions/exclusions based on the scope definitions will vary by reporting entity. As such, this section summarizes the overall inclusions/exclusions recommended by the Protocol regardless of your organisational boundaries. These recommendations are based on:

- Alignment with existing corporate carbon accounting and wine-specific standards;
- Understanding of the supply chain (scope 3) hot spots based on product standards and existing life cycle assessments of wine (e.g., significance relative to scope 1 and 2 emissions);
- Availability and quality of data available to reporting entities;
- Contribution to the reporting entity's risk exposure;
- Ability of reporting entity to reduce emissions; and
- Importance to stakeholders.

Table 2: Summary of Inclusions and Exclusions

Inclusions
Scope 1 and 2 GHG emissions
Vineyard field emissions
Vineyard GHG emissions from fuel combustion
Winery electricity consumption (GHG emissions from electricity production and distribution)
Winery GHG emissions from fuel combustion
Glass packaging (GHG emissions from production of glass packaging)
Fibre packaging (GHG emissions from production of glass packaging)
Product distribution (emissions related to combustion of fuels to transport finished packaged wine)
Emissions due to land use change (e.g., deforestation)
Optional
Non-glass packaging materials
Annual soil organic carbon fluxes
Sequestration from land use change (20-years)
Emissions related to business travel by airplane
Excluded
Infrastructure and capital equipment (metal tanks, tractors, forklifts, pipes, vineyard posts, wires, bottling lines, oak barrels other equipment)
Repair and maintenance of capital equipment
Biogenic carbon emissions that are part of the short-term carbon cycle (Table 3)
Purchased goods not specified above (e.g., chemicals used in viticulture and winemaking)
Product end-of-life and waste not included in scope 1 and 2
The following scope 3 aspects: Retail, Consumer Transport, and Consumption
Emissions related to non-air business travel in private vehicles
Emissions related to employee commuting
Emissions related to all other upstream and downstream operational GHG emissions that are not product specific (e.g., office paper purchase, organisational waste)

3.2. Vineyard

The primary contributors to a vineyard's carbon footprint include:

- Emissions that result from the combustion of fossil fuels onsite for use in operational equipment such as tractors and forklifts; and
- Field emissions, particularly nitrous oxide (N_2O), related to application of synthetic fertilizers and vineyard management practices.

For additional guidance on calculating agriculture-based emissions, refer to the GHG Protocol Agricultural Supplement (WRI/WBCSD 2014).

3.2.1. Field emissions – nitrous oxide

Of particular importance within the vineyard are the emissions of nitrous oxide (N_2O), which is a greenhouse gas with 265 times the 100-year global warming potential of carbon dioxide (IPCC 2013). N_2O is produced within soils naturally through the process of nitrification and denitrification. One of the factors that influences the N_2O release is the human induced nitrogen additions to soil in the form of fertilizers, both organic and synthetic. The use of synthetic fertilizers in agriculture is one of the largest sources of anthropogenic N_2O production (IPCC 2007). Emissions also occur from the mineralisation of nitrogen in soil organic matter following soil cultivation and other land management practices. These emissions could potentially contribute as much as 50% of the total greenhouse gas emissions within the vineyard (Wine Institute, 2014).

While several vineyard conditions such as soil composition, land cover, climate, and management practices affect the vineyard's N_2O emissions, these relationships are complex and there is not adequate data to easily calculate a site-specific N_2O emission factor. However, because of their significance to the vineyard carbon footprint, the field emissions should be estimated.

3.2.2. Field emissions – carbon dioxide

The CO_2 fluxes related to the short-term carbon cycle (see Section 4.1) are excluded from this Protocol because it is difficult to measure and assumed to be net zero, thus not adding material value to the corporate carbon footprint.

Annual vineyard fluxes (removals and emissions) of soil organic carbon can result in net carbon sinks. Field management practices such as cover cropping and application of vine clippings and other organic material can lead to the long-term increase in soil organic matter. As such, soil carbon storage in the vineyard may be optionally included in the Protocol. Note, transparency around data availability and quality of the carbon sink calculations should be included and reported separately. If available, industry tools should be used to ensure consistent regional calculation of annual soil carbon storage.

3.3. Winery

The primary contributors to a winery's carbon footprint include:

- Consumption of electricity;
- Combustion of fossil fuels for heating and cooling; and
- Combustion of fossil fuels for operations.

Additional emissions associated with winery operations include:

- Onsite waste disposal (anaerobic digestion or incineration);
- Gas recharge of cooling systems (refrigeration, air conditioners, etc.); and
- CO_2 used in the winemaking process (dry ice, blanket tanks, pipe flushings, etc.).

3.3.1. Fermentation

Fermentation (primarily malo-lactic fermentation) is the chemical process of converting sugar to ethanol that results in the release of direct carbon dioxide emissions. Although fermentation is a direct

emission source, CO_2 generated as a result of fermentation is not reported as it is included in the short-term carbon cycle (refer to Section 4.1).

3.4. Packaging

Packaging, in particular, the use of glass, is a significant contributor to the overall wine industry carbon footprint. Because of its significance to the industry overall, packaging is included in this Protocol.

3.4.1. Glass packaging

Emissions resulting from the production of container glass are included. The carbon footprint of glass packaging varies with the location of production, the furnace design and firing technology, the cullet percentage, the furnace age, the glass colour, and the electro-boost to top fire mix ratio. In lieu of better emission factor data, best available data should be used and documented.

3.4.2. Fibre packaging

Fibre packaging is used to describe the cartons and dividers used for packaging the finished wine product. Due to the large quantity of fibre-based packaging such as corrugated card and box material required to package and ship wine, fibre packaging is included in the Protocol.

3.4.3. Alternative packaging

If alternative packaging (PET bottles, TetraPak, wine bags, etc.) makes up a large majority of your production volume, attempts should be made to estimate the carbon footprint of the alternative packaging and include this within the scope 3 carbon footprint.

3.4.4. Closures

Closures (aluminium screw caps, natural cork, agglomerate cork, synthetic cork, glass stoppers, etc.) are excluded from the Protocol because of their relatively small contribution in the wine supply chain. An analysis of empty packaging weight shows that closures generally comprise less than 1% of the total packaging product mass. Further analysis shows that closures are responsible for about 1% of the greenhouse gas emissions from packaging and are expected to be an insignificant contributor across the reporting entity's wine supply chain (FIVS 2008).

3.4.5. Pallets

Wooden packaging products include both returnable and non-returnable pallets. They are excluded from the Protocol because they are not expected to contribute significantly to the company's corporate footprint.

3.5. Distribution

Distribution or transport of finished packaged wine products to the first point of sale (e.g., distributer, retailer), is included within the Protocol because of its significance to the industry's overall carbon footprint.

For additional information about calculating the carbon footprint associated with distribution, refer to the GHG Protocol supplement: Calculating CO2 Emissions from Mobile Sources.

3.6. Consumer Use

Two main emission sources associated with the use phase of a wine product include the biological consumption of wine and the potential energy requirement associated with refrigeration. The use phase emissions have been excluded from the Protocol due to the complexities of how consumer use changes depending on the distribution channel (e.g., retail vs. direct to consumer), the variability in use phase emissions based on location of use, and the lack of consistent consumer use data on refrigeration habits. Additionally, consumer use is a difficult portion of the supply chain for the wine industry to influence.

3.7. Waste Disposal

Waste disposal should be included in the corporate carbon footprint if it is part of the reporting entity's scope 1 emissions (i.e., they occur within the operational boundaries and are under the direct control of the company). If the waste processing is done offsite, at a premise controlled by another company, any emissions occurring will be categorised as scope 3 emissions and are excluded from the Protocol.

The disposal of the product (wine and wine packaging) at the point of consumption is excluded from the Protocol. While disposal and landfill avoidance is an important issue to many consumers, the impact of waste disposal of wine and wine packaging is insignificant to the overall carbon footprint of wine.

3.8. Business Travel

Emissions from business travel are associated with employee travel for business-related activities in vehicles owned or operated by third parties (e.g., aircraft, trains, busses, passenger cars); it is therefore considered scope 3 (WRI/WBCSD 2013).

Business air travel is included in this Protocol as an optional inclusion. Some reporting companies may choose to include this because they are already tracking business travel and feel as though they have influence over their business air travel footprint. Further, companies may consider emissions related to business travel material to their business and their footprint. Business travel in other privately owned vehicles is excluded from this Protocol.

Note, "emissions from transportation in vehicles owned or controlled by the reporting company are accounted for in either scope 1 (for fuel use), or in the case of electric vehicles, scope 2 (for electricity use). Emissions from leased vehicles operated by the reporting company not included in scope 1 or scope 2 are accounted for in scope 3, category 8 (Upstream leased assets). Emissions from

transportation of employees to and from work are accounted for in scope 3, category 7 (Employee commuting)" (WRI/WBCSD 2013). Employee commuting is excluded from this Protocol.

For additional guidance on calculating GHG emissions associated with business travel, refer to Scope 3 Calculation Guidance: Category 6: Business Travel.

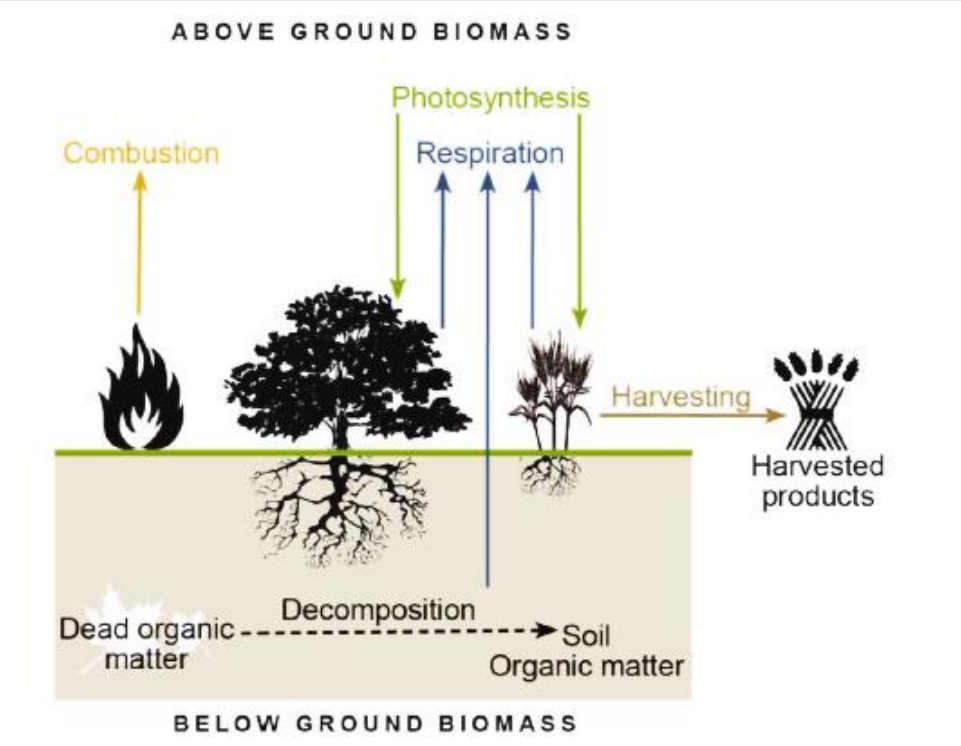
4. Methodological Approaches

The following methodological explanations help companies set the boundaries for inclusions/exclusions in their corporate carbon footprint.

4.1. Biogenic carbon dioxide

Biogenic carbon and the short-term carbon cycle warrant special attention anytime the carbon footprint of a bio-based material is calculated. Figure 2 illustrates the primary biogenic carbon pools and fluxes in agriculture. When discussing biogenic carbon, specifically, the carbon emissions from biomass combustion or oxidation, it is important to remember that the net GWP of biogenic CO_2 is assumed to be neutral or zero. During growth, plants convert the carbon contained in atmospheric CO_2 into biomass as part of the photosynthesis and respiration process. Whenever the stored carbon is then emitted as CO_2 from oxidation of the biogenic material, the two effects cancel each other out. Since wine is a fast moving consumer good, the biogenic carbon that is contained in the wine itself will quickly be re-released during consumption and end-of-life.

Figure 2. Carbon pools and fluxes in Agriculture (WRI/WBCSD 2014)



This short-term carbon cycle extends into the wine industry (Table 3) to include certain fluxes (emissions and sinks) from the vineyard, fermentation, and disposal of biodegradable waste (e.g., carbon dioxide emissions related to wastewater treatment, landfilling, or combustion for energy). The

CO_2 fluxes related to the short-term carbon cycle are excluded from this Protocol because it is difficult to measure and assumed to be net zero, thus not affecting the corporate carbon footprint.

Table 3. Categorisation of the wine industry short-term carbon cycle

Short-term carbon cycle
Non-permanent vineyard growth
Grape growth
Burning of wood or biomass as fuel
Fermentation
Aerobic waste treatment both solid and liquid
Human digestion of wine

Please note that methane (CH_4) emissions associated with decomposition or combustion of biodegradable wastes associated with vineyards, winery processing, combustion of biomass or disposal of wastes are not part of the short-term carbon cycle and are included as emissions sources. Where the methane from anaerobic waste or wastewater treatment is captured and flared or combusted, the resulting CO_2 does not have to be reported.

Additionally, while the short-term carbon cycle is excluded, some vineyard management scenarios can lead to net sequestration (refer to Section 3.2.2: Field emissions – carbon dioxide).

4.2. Land use change

Direct Land Use Change (dLUC) refers to direct human-induced changes to the land that result in GHG emissions. Land use change is most environmentally relevant in the forestry sector, but can be evaluated for the wine industry when land is converted from an alternate use into a vineyard or when there is active land management of non-vineyard owned land. If land use change is included within the boundaries of the study, IPCC guidance on LUC should be followed.

In alignment with the GHG Protocol Agricultural Supplement (WRI/WBCSD 2014), emissions due to land use change (e.g., deforestation) that took place within the past 20 years from the reported year should be reported and are considered mandatory for this protocol. Sequestration as a result of direct land use change that took place within the past 20 years from the reported year may optionally be included but reported separately. If reported, one-twentieth (5%) of the total emissions and removals should be included in the annual GHG reporting.

The carbon stocks before and after a change in land use (e.g., grassland to cropland) must be quantified to calculate the associated land use change. Figure 2 summarizes the carbon pools in agriculture that can be quantified for different land uses. IPCC provides guidance for calculating land use change based on the generic type of land use (e.g., forest land, cropland, grassland, wetland, etc.) before and after a change in management. However, if the wine industry has tools that enable the calculation of changing carbon stocks over time specific to transformation to/from a vineyard or long-term impacts of the vineyard (e.g., accumulation of carbon stock in the vine) they may be applied. The assumptions and approach should be documented.

For additional guidance on calculating GHG emissions associated with LUC, refer to IPCC's Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG-LULUCF).

Annex A: References

Confronting Climate Change 2014	Confronting Climate Change: A South African Fruit & Wine Initiative, 2014. *The South African Fruit and Wine Industry Carbon Calculator Protocol Version 3.2*.
FIVS 2008	FIVS, 2008. International Wine Carbon Calculator Protocol, version 1.2.
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Annex B: Examples of Organisational Boundaries

The diagrams in this Annex illustrate potential scope 1, 2 and 3 definitions based on the reporting entity's ownership structure. These are included to support the wine industry in establishing organisational boundaries as part of their assessment.

Standalone Vineyard

The following diagram describes the entity that owns a vineyard but no winery operations. Within their scope 1 is the vineyard operations.

Figure 3: Vineyard Operation Only Process Boundary

Scope 2 Indirect Emissions	**Scope 1** Direct Emissions	**Scope 3** Indirect Emissions
Purchased Electricity	**Stationary Fuel Use** • Water Heaters • Frost Fighting Equipment **Mobile Fuel Use** • Tractors • 4wd Motor Bikes • Trucks • Cars • Company Operated Harvesters **Tillage and Vineyard Practices** • Permanent Row Cropping† • Marc Incorporation† • N_2O Emissions (Fertiliser and Soil) • Soil Carbon Incorporation† **Vine Photosynthesis** • Sequestration into Fruit • Sequestration into current Growth • Sequestration in Woody Material† • Degradation and Compositing of Vines **Waste Disposal** • Vineyard Waste	**Extraction and Production of Purchased Materials** • Pesticides and Fertilisers **Transport Related Activities** • Hired Helicopters Fuel Use • Business Travel • Truck, Rail or Ship Transport of Grapes if Machinery not owned by the Vineyard or Winery • Contact Harvesters **Electrical** • Transmission and Distribution Losses **Waste Disposal** • If Waste is taken Off Site **Use of Sold product** • Conversion of Grapes into Wine

Standalone Winery

The following diagram describes the entity that owns only winery operations. In this example, vineyard operations (growing of the grapes) is considered scope 3.

Figure 4: Standalone Winery Process Boundaries

Scope 2 Indirect Emissions	**Scope 1** Direct Emissions	**Scope 3** Indirect Emissions
Purchased Electricity	**Stationary Fuel Use** • Water Heaters • Boilers • Electrical Power Generation • Heat Generation **Mobile Fuel Use** • Trucks • Cars • Forklifts • Transport to Bottling Hall if done in equipment owned by the company **Winery Processing Related** • Primary Fermentation • Direct CO2 use **Fugitive Emissions** • HFC Refrigeration • Methane from Stationary Combustion **Waste Disposal** • Vineyard Waste • Winery Waste - Solid - Liquid • Packaging Waste	**Extraction and Production of Purchased Materials** • Pesticides and Fertilisers • Wine Additives • Juice, Spirit, Concentrate • Grapes and Bulk Wine • Oak or oak related products **Transport Related Activities** • Business Travel • Truck Rail or Ship Transport of Grapes if Machinery not owned by the Vineyard or Winery • Transport of Wine to Bottling Location if moved in equipment not owned by the company • Transport to Distribution Centre **Electrical** • Transmission and Distribution Losses **Waste Disposal** • Solid Waste Disposal, if done Off Site • Waste Water Disposal, if done Off Site

Standalone Packaging Centre

The following diagram describes the entity that owns a standalone packaging centre. In this example, vineyard operations (growing of the grapes) and production of wine at the winery is considered scope 3.

Figure 5: Standalone Packaging Centre Process Boundaries

Scope 2 Indirect Emissions	**Scope 1** Direct Emissions	**Scope 3** Indirect Emissions
Purchased Electricity	**Stationary Fuel Use** • Water Heaters • Boilers • Electrical Power Generation • Heat Generation **Fugitive Emissions** • HFC Refrigeration • Methane from Stationary Combustion **Waste Disposal** • Vineyard Waste • Winery Waste - Solid - Liquid • Packaging Waste	**Extraction and Production of Purchased Materials** • Wine Additives • Juice, Spirit, Concentrate • Grapes and Bulk Wine • Wine • Packaging Material - Glass - PET - Tetra Pack - Closures - Fibre Packaging - Wooden Packaging **Transport Related Activities** • Business Travel • Distribution of Wine to Sale **Electrical** • Transmission and Distribution Losses **Waste Disposal** • Solid Waste Disposal, if done Off Site • Waste Water Disposal, if done Off Site

Joint Ownership of Vineyard and Winery

The following diagram describes the entity that owns both vineyards and wineries. In this example, vineyard operations (growing of the grapes) is not considered scope 3. Note that the process boundary may not include the transport of grapes from the vineyard to the winery if the truck used to transport the fruit is not owned or operated by the company. In most cases external transport companies will be contracted for this particular job and for the job of transporting finished wine to a packaging centre, hence emissions from these transport sources will be classed as scope 3.

Figure 6: Vineyard and Winery Combined Process Boundary Excluding Bottling

Scope 2 Indirect Emissions	**Scope 1** Direct Emissions	**Scope 3** Indirect Emissions
Purchased Electricity	**Stationary Fuel Use** • Water Heaters • Frost Fighting Equipment • Boilers • Electrical Power Generation • Heat Generation **Mobile Fuel Use** • Tractors • 4wd Motor Bikes • Trucks • Forklifts • Cars • Harvesters **Tillage and Vineyard Practices** • Permanent Row Cropping† • Marc Incorporation† • N2O Emissions (Fertiliser and Soil) • Soil Carbon Incorporation† **Vine Photosynthesis** • Sequestration into current Growth • Sequestration into Fruit • Sequestration in Woody Material† • Degradation and Compositing of Vines **Winery Processing Related** • Primary Fermentation • Direct CO2 Use • Waste Water Practices • Solid Waste Practices **Fugitive Emissions** • HFC Refrigeration • Methane from Stationary Combustion **Waste Disposal** • Vineyard Waste • Winery Waste - Solid - Liquid	**Extraction and Production of Purchased Materials** • Fertilizers • Wine Additives • Juice, Spirit, Concentrate • Grapes and Bulk Wine • Oak or oak related products • Bentonite • Tartaric Acid **Transport Related Activities** • Hired Helicopters Fuel Use • Business Travel • Truck Rail or Ship Transport of Grapes if Machinery not owned by the Vineyard or Winery • Transport of Wine to Bottling Location if moved in equipment not owned by the company **Electrical** • Transmission and Distribution Losses **Waste Disposal** • Solid Waste Disposal, if done Off Site • Waste Water Disposal, if done Off Site

Joint Ownership of Vineyard, Winery and Bottling

The following diagram describes the entity that owns only vineyard, winery and bottling operations.

Figure 7: Vineyard, Winery and Bottling Centre Process Boundaries

Scope 2 Indirect Emissions	**Scope 1** Direct Emissions	**Scope 3** Indirect Emissions
Purchased Electricity	**Stationary Fuel Use** • Water Heaters • Frost Fighting Equipment • Boilers • Electrical Power Generation • Heat Generation **Mobile Fuel Use** • Tractors • 4wd Motor Bikes • Trucks • Forklifts • Cars • Harvesters **Tillage and Vineyard Practices** • Permanent Row Cropping† • Marc Incorporation† • N2O Emissions (Fertiliser and Soil) • Soil Carbon Incorporation† **Vine Photosynthesis** • Sequestration into Fruit • Sequestration into current Growth • Sequestration in Woody Material† • Degradation and Compositing of Vines **Winery Processing Related** • Primary Fermentation • Direct CO2 Use **Fugitive Emissions** • HFC Refrigeration • Methane from Stationary Combustion **Waste Disposal** • Vineyard Waste • Winery Waste - Solid - Liquid • Packaging Waste	**Extraction and Production of Purchased Materials** • Fertilizers • Wine Additives • Juice, Spirit, Concentrate • Grapes and Bulk Wine • Oak or oak related products • Bentonite • Tartaric Acid • Packaging Material - Glass - PET - Tetra Pack - Closures - Fibre Packaging - Wooden Packaging **Transport Related Activities** • Hired Helicopters Fuel Use • Business Travel • Truck Rail or Ship Transport of Grapes if Machinery not owned by the Vineyard or Winery • Transport of Wine to Bottling Location if moved in equipment not owned by the company • Transport of Wine to point of wholesale in market **Electrical** • Transmission and Distribution Losses **Waste Disposal** • Solid Waste Disposal, if done Off Site • Waste Water Disposal, if done Off Site