HOTELSCHOOL THE HAGUE
Hospitality Business School

Company Project

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Johanna Lucas
701313

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Preface

I decided to take the opportunity to complete my final placement in the last block of Launching your career (Lycar) in a hospitality-related sector, which I had grown more and more fond of over the past years. It was my idea to explore the world of winemaking and find out if I can picture myself pursuing a career in this field. When the application process turned out to be successful, the following months started taking shape with the outlook to be starting the internship at Domaine Agnès Paquet in burgundy in August. The internship itself, as well as the Research Proposal and Company Project were a fulfilling experience, as I was actively working on pursuing my dreams.

The project interlinks perfectly with my own values of taking responsibility of the own actions regarding the environment as well as my passion for wine and curiosity for correlations in the world.

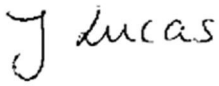
I would like to thank Agnès Paquet for the incredible learning experience at her company, the continuous support and interest in the project and the trust with all the sensitive data. Furthermore, I would like to thank the entire staff at the winery for supporting me and making this new place my home.

Furthermore, I would like to thank my coach Mr Heijblom for the support during the entire process and the regular coach meetings, as well as my peer group with Jip Monninkhof and Maaike Hiddema. Also, I would like to especially thank Jonas Jost and my parents for critically questioning my work and therefore helping me improve.

And lastly, I would like to thank Heinrich Färber, Bettina Sans, and Pierre Enjalbert, without who I would not have found the placement at this winery.

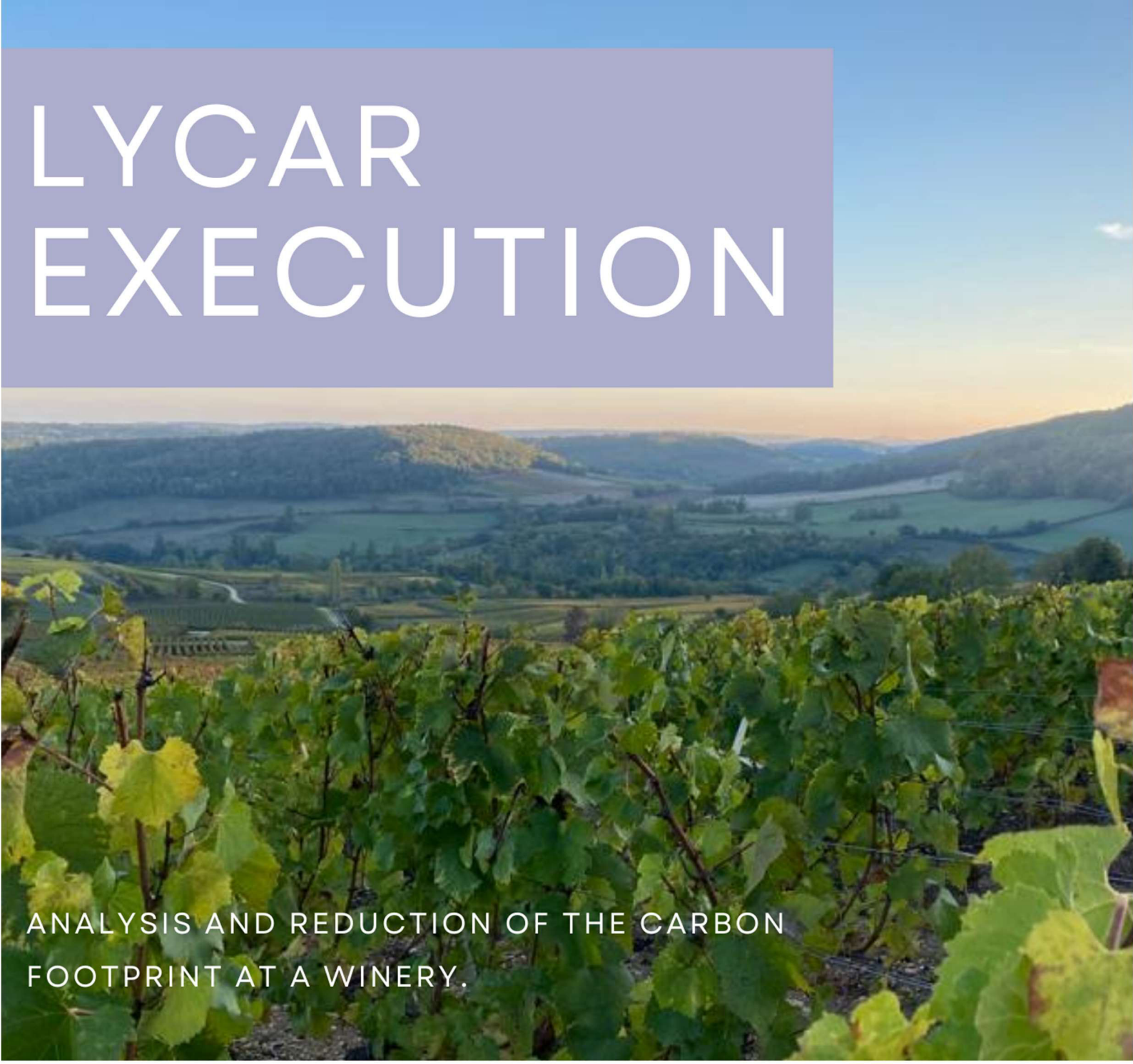
I am looking forward to seeing how future research and reporting will build up on my project and am looking forward to returning to the winery after graduation and studying oenology and viticulture.

I hope you enjoy the read.



Johanna Lucas

LYCAR EXECUTION



ANALYSIS AND REDUCTION OF THE CARBON FOOTPRINT AT A WINERY.

HOTELSCHOOL THE HAGUE

EXECUTION REPORT

JOHANNA LUCAS
701313
19.12.2022

Agnès Paquet
VITICULTRICE EN BOURGOGNE

Executive summary

Within the context of the last block at Hotelschool The Hague (HTH), the management internship was completed at the medium-sized, organic winery Domaine Agnès Paquet in burgundy. The goal of the project was to establish the carbon footprint of the winery in order to identify the most influential emitters of greenhouse gases (GHG) and finally reduce their impact. The research question to be answered was:

How can Domaine Agnès Paquet reduce their greenhouse gas emissions during the cultivation of grapes and winemaking process in order to combat climate change and contribute to a more sustainable wine industry?

First, extensive desk research, which was compiled in a research proposal, laid the foundation for the project. After approval, an elaborate literature review as well as a certified course on carbon footprint balancing expanded this foundation. After a preliminary interview with the owner of the company and commissioner Agnès Paquet, primary data from the company was collected and evaluated according to the reporting standards of the Greenhouse Gas Protocol. In line with international standards, this carbon balancing tool divides the GHG emissions based on their sources into three scopes. The scopes are defined as follows:

Scope 1 **Direct emissions:** GHG emitted directly at the company **Carbon sequestration:** Carbon retrieved from the atmosphere and stored by farmland
Scope 2 **Indirect emissions:** GHG emitted by electricity provider to produce and supply the company with power
Scope 3 **Indirect emissions upstream and downstream:** GHG emitted from all other sources in order to manufacture the finished product

Following the recommendation of the GHG Protocol, the emissions of scope 1 and scope 2 were calculated entirely, scope 3 emissions only selectively. The calculated scope 3 factors were selected based on their estimated influence shown by scientific literature and their reliability and validity in data collection. The final carbon footprint of the winery was determined to be 36.32 tCO_2eq in the time period of 1 August 2021 - 31 July 2022. The carbon footprint of one bottle of 0.75 l was 0.4 kg of CO_2eq, as 90,000 bottles were sold in the reporting year. This value is slightly below the values from literature, this is due to the selective calculation of scope 3 emissions.

The results were in line with the findings from the related studies regarding the share of the final footprint of each emission source. The largest share of emissions was caused by the glass bottle with 58.09 %, followed by diesel (14.23 %) and tractor diesel (9.62 %). The final emissions After conduction of a Pareto analysis and a presentation of the findings to the staff, three focus points were determined in co-creation with the commissioner. The research question was answered with three actionable solutions. The first solution tackles the emissions from the bottles, the second one the emissions from energy production and the last one the water consumption. As a reduction in weight decreases the GHG emissions of the bottles, the developed solution was to substitute the

current bottles with lightweight ones. The solution tackling the emissions from energy production is the implementation of solar panels on the roof of the winery. Lastly, the solution to minimize the emissions from water purchases is the construction of a rainwater tank, collecting and filtering the water for usage. The solutions are estimated to be implemented within different timeframes; however they are all in the process of being realized. Their success will be evaluated based on key performance indicators (KPIs) regarding their absolute reduction in GHG emission, their reduction of the carbon footprint compared to the preceding reporting year, and their financial performance.

Finally, the findings were disseminated, with the commissioner, the staff, the Lycar assessors, the Future of Food minor's core team, on the Instagram page of HTH, and with a fellow Lycar student for her Research Proposal.

List of abbreviations

ADEME	Agence de la transition Ecologique (French Agency for the Environment and Energy Conservation)
CO_2	Carbon dioxide
FQ	Fieldwork question
GHG	Greenhouse gas
GNR	Gas non routier (diesel for tractors)
HTH	Hotelschool the Hague
ID	Identification
Lycar	Launching your career
UNSDG	United Nations Sustainability Development Goal

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1 Background

1.1 Context of the project

In the context of the Lycar placement, this company project report addresses the topic of carbon footprint in wine production. The commissioner for this paper is Agnès Paquet, the owner of the internship company Domaine Agnès Paquet. The Domaine is a medium-sized vineyard in Meloisey, Burgundy producing high-quality, organic red, white, and sparkling wines. Taking place in France, the internship offers an intercultural experience by opening the doors to a new country, new language, and new culture. Furthermore, by creating a product to fulfil customers' demands and desires, the art of winemaking finds itself right at the heart of hospitality. Also, wines are a vital part in most restaurants, bars, and hotels. Working closely together with Ms Paquet and the entire team, the position as management intern will provide insights into all departments and components of the company's operations. This allows to critically assess their effectiveness, efficiency with regards to the greenhouse gas (GHG) production, also linking back to the topic of sustainability as discussed extensively in the minor Future of Food. In addition to including large parts of the minor's curriculum, the topic aligns with the researchers own ambitions and sense of responsibility to contribute to the reduction of GHG. But most importantly, as the commissioner proposed the topic, the project adds value to the internship company, continuously improving their operations and contributing to a greener future with her company. This research and the thereof resulting solutions contribute directly to the UNSDG 12, Responsible Production and Consumption, as well as UNSDG 13, Climate Action (United Nations, 2022d). Ultimately, this research thesis allows to identify unsustainable practices within the company, for them to be tackled effectively by creating and implementing a solution as a final project.

Domaine Agnès Paquet

Picture 1 - The winery

Picture 2 - Agnès Paquet (Domaine Agnès Paquet, 2022)

1.2 Glossary

Carbon footprint
The carbon footprint is defined as the total of greenhouse gases emitted into and/or captivated from the atmosphere by an organisation, region or person within one year (Ademe, 2022a).

Carbon neutral
A business or region can be declared carbon neutral, if their operations are net zero, meaning they absorb as much carbon as they emit greenhouse gases (European Parliament, 2019).

Carbon sink
A removal of carbon from the atmosphere through photosynthesis by forests, farmland, and other ecosystem (European Environment Agency, 2022).

Cradle to gate
Partial life-cycle-assessment of a product, from the production of the raw materials to the point of leaving the manufacturer. Downstream activities such as distribution, usage and end-of-life are not considered (European Commission, 2018b).

Cradle to grave
Full life-cycle-assessment of a product from the production of the raw materials to the manufacturing, storage, distribution, usage, disposal, and recycling. (European Commission, 2018c)

Global warming potential
The global warming potential indicates amount of energy absorbed by 1 t of a greenhouse gas over a period of time, compared to the absorption of energy by 1 t of carbon dioxide over the same period of time (US EPA, 2016). Each greenhouse gas has a different impact on the warming of the atmosphere based on its their potential to absorb energy and their lifetime in the atmosphere (Barrow et al., 2013). To determine a carbon footprint, the emissions of each gas must be multiplied with their respective factors to determine their final impact and allowing a comparison between gases (ibid).

Greenhouse Gas Protocol
The Greenhouse Gas Protocol is a the most widely used, standardized greenhouse gas accounting standard (Greenhouse Gas Protocol, 2022). It is developed by the World Resources Institute and the World Business Council (ibid)

Kyoto Protocol
A document established in 1997 and signed by 192 countries, binding the developed countries listed in its Annex B to reduce their greenhouse gas emissions to individual targets, based on the United Nations Framework Convention on Climate Change (UNFCC) (Ranganathan et al., 2004)

tCO_2 Equivalent
The unit carbon dioxide equivalent in tonnes is standardized unit to express the carbon footprint (Barrow et al., 2013). It includes the emissions of all greenhouse gases multiplied with their respective global warming potential, which allows the expression of one number and reliable comparison of carbon footprints (ibid).

Energy payback time
The amount of time required by a photovoltaic system to produce the energy required to build, install, and dispose of the system (Asdrubali, 2019)

2 Problem definition

Climate change and agriculture

Climate change is progressing with severe consequences such as heat, forest fires, water scarcity, catastrophic storms, and a decline in biodiversity (United Nations, 2022a). These implications can affect humankind in various ways, for instance their health and safety, their ability to cultivate crops or their access to housing (ibid). Emissions of GHGs such as carbon dioxide (CO_2), methane and other gases are the main cause for this development (ibid). All GHGs are defined in the Kyoto Protocol.(Ranganathan et al., 2004). Those GHGs are emitted into the atmosphere, covering the globe, causing the planet's temperature to increase through this so-called greenhouse effect (United Nations, 2022a). Agriculture is one of the largest emitters of GHG and hence an influential contributor to climate change (Arias et al., 2022). The amount of methane emissions in agriculture is clearly dominated by livestock production, the CO_2 emissions however, are vastly produced from fruit and vegetable growers (ibid). Those in particular, deeply rely on stable weather conditions, increasing the urgency of reducing the emitted gases even further and in their own interest (Chiriacò et al., 2019).

Vineyards

Depending on the country, the means of production, and additional factors to be elaborated later on in the report, the estimated amount of emitted GHGs per produced 0.75 l bottle of wine lies between 0.9 kg and 2.0 kg (D'Ammaro et al., 2021; Scrucca et al., 2018). Hence, a vineyard with the production as the commissioner's company of about 90,000 bottles a year, emits between 81 and 180 tCO_2eq annually (Döllerer, 2022). In comparison, a conventional diesel vehicle emits roughly 34 tCO_2eq over the entire span of its useful life (Böhmeke and Koch, 2021). This significant of amount of emissions can be decreased by identifying their main sources and implementing measures to reduce them (D'Ammaro et al., 2021).

Demographics

Furthermore, the world's population is estimated to continue growing from the current 7.7 billion to reach 9.7 billion by 2050 (United Nations, 2022b). In 2100 the world is expected to be home to 11 billion inhabitants (ibid). This this steady increase must be met with a higher production in agricultural products and hence an expansion of agriculture (FAO et al., 2022). This, however, might again increase the GHG emissions and speed up climate change, if agricultural businesses are not capable of lowering their production thereof.

Law

Worldwide politics furthermore acknowledge the danger and consequences of climate change and regularly meet to agree on international and national goals. One of the largest treaties to fight global warming in the Paris Agreement, signed by 196 parties in December 2015 (UNFCCC, 2022b). The goal of this treaty is to limit the global warming to well below 2° C, preferably to 1.5° C compared to pre-industrial levels, in order to avoid more severe catastrophes (ibid). In December 2021, the participating nations of the global climate summit COP26 have agreed on the Glasgow Climate Pact to lower GHG emissions, build climate change resilience and provide necessary funding for both (UNFCCC, 2022a). Such legally binding documents hence influences the national laws and policies which companies are going to be obliged to follow, reducing their output od GHG. Thus far, the lack of international political collaboration makes it unlikely to achieve all goals in the determined time frame (Oberthür and Dupont, 2021). Hence, the economy is partly forced to take over responsibility and action themselves (ibid).

Consumer behaviour

Having started out as a niche market, the demand on sustainably produced and organic products has been increasing steadily over the past twenty years (Mendon et al., 2019; Shahbandeh, 2022). The worldwide annual sales are estimated at around $ 18 billion in 2000 and have risen to around $ 120.65 billion in 2020 (Shahbandeh, 2022). The most popular reasons for choosing the more expensive, organic products over the cheaper alternatives include health benefits, environmental consequences, and higher quality and taste (Trenda, 2021). This continuing trend in the popularity of sustainable and organic products therefore also opens a financially strong market for producers.

Conclusion

To sum up, the fight against climate change is as urgent as ever and its success or lack thereof is predicted to influence agricultural businesses such as wine producers immensely. On the other hand, these businesses contribute vitally to the GHG emissions and have the means and leverage to help reduce them. Furthermore, the changing demographics, new laws as well as customer demands urge this sector to reduce their GHG emissions. Hence, the overall question guiding the research will be how to reduce the carbon footprint in agriculture, specifically wine cultivation and production. To specify the field of research and add even more value for the commissioner the following main research question was formulated:

How can Domaine Agnès Paquet reduce their greenhouse gas emissions during the cultivation of grapes and winemaking process in order to combat climate change and contribute to a more sustainable wine industry?

In the following, the sources of GHG in the winemaking process were thoroughly analysed, taking all stakeholders of the winery into consideration. The complete stakeholder analysis of Domaine Agnès Paquet can be found in appendix 8.5.

3 Analysis and diagnosis

As stated by Tseng et al. (2020), sustainable production consists of not only the environmental and operational components, but also must consider the societal, economical, and technological factors of its operations. These different aspects oftentimes interlink and influence each other (ibid). However, to lead to a measurable and specific solution within the scope of this thesis, the environmental and operational factors were selected for this project. A specific focus was set on the emissions of GHGs.

3.1 Related studies: literature review

In order to identify the most influential parameters of GHG emissions in wine cultivation and production, scientific literature was consulted. To further specify the particular sources of the case company, organizational data and knowledge from practitioners was collected and analysed. From the gained knowledge, fieldwork questions were derived to guide the research and develop to a solution tailored to the commissioner's needs. Thereupon and in agreement with the commissioner, potential starting points to reduce the emissions where assessed. Main topics of the research are the different sources of GHG emissions in the winemaking process and their impact on the total carbon footprint. Furthermore, the storage of carbon in the vines and soil as well as specific ways to reduce the emissions were analysed.

Generally, scientific literature agrees to divide the numerous sources of GHG emission into three different scopes, according to their source of origin (D'Ammaro et al., 2021; Gueddari-Aourir et al., 2022; Ponstein, 2022). This division is based on the GHG Protocol released by the World Resources Institute and World Business Council for Sustainable Development, the scopes are categorized as follows (Barrow et al., 2013):

Scope 1 **Direct emissions:** GHG emitted directly at the company through the combustion of fossil fuels at the property, gas leakages and gas production through nitrogen fertilizers **Carbon sequestration:** Carbon retrieved from the atmosphere and stored by farmland during operations of the company
Scope 2 **Indirect emissions:** GHG emitted by electricity provider to produce and supply the company with power
Scope 3 **Indirect emissions upstream and downstream:** GHG emitted from all other sources in order to manufacture the finished product, e.g. glass bottles, labels, packaging, distribution with external vehicles, staff commute

Figure 3 - GHG scope

Figure 3 visualises the three scopes including their sources of emissions and produced GHG. It does not include the specific case of carbon sequestration as it is a general depiction of the emissions, fit to represent the majority of organizations (United Nations, 2022c).

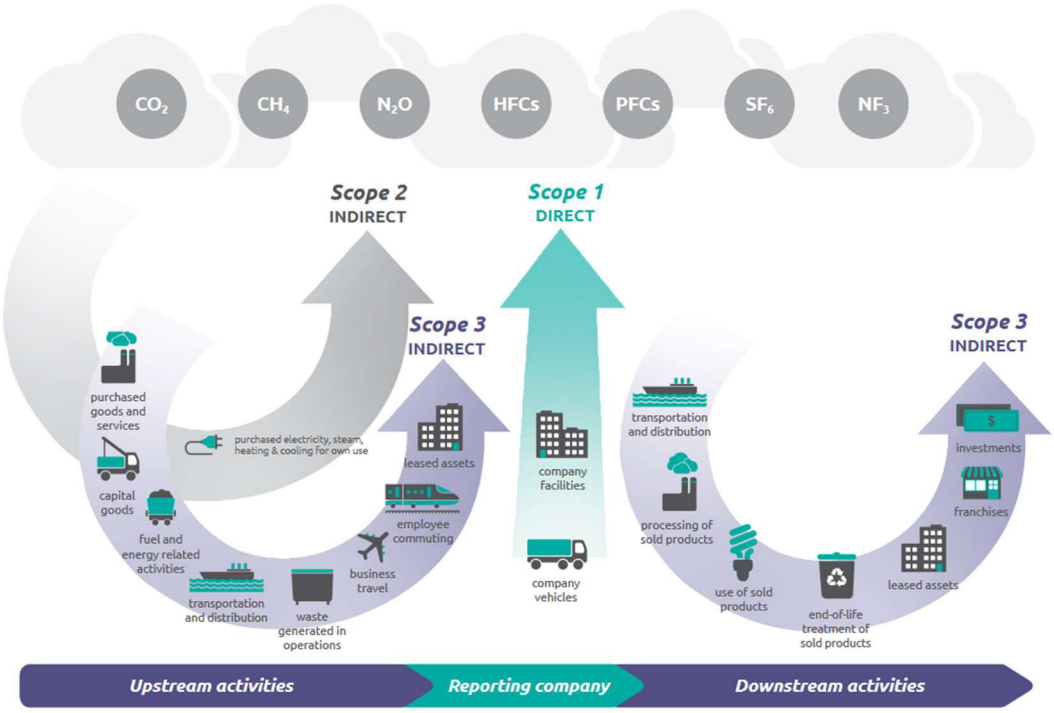


Figure 4 - Scopes (Barrow et al., 2013) (81)

Scope 1

Ascribed to scope 1 is any combustion of fuel, for example for the commute from the winery to the vine area or usage of company-owned vehicles on site (Barrow et al., 2013). In an agricultural business this generally makes up for the largest share of scope 1 emissions, as the main building and the farmland are highly likely to be spread out (United Nations, 2022c) Furthermore, literature shows that the use of nitrogen fertilizer in the vineyards is detrimental to GHG emissions (Ponstein, 2022; D'Ammaro et al., 2021). The nitrous oxide which is emitted when applying the fertilizers have an extremely high global warming potential and hence already small amounts of it increase the carbon footprint immensely (D'Ammaro et al., 2021). However, this emission can be disregarded, as the case company's organic certification Agriculture Biologique prohibits their use (Ecocert, 2022).

Furthermore, a winery-specific emission source is the CO_2 emitted during the alcoholic fermentation of the must or mash (Gueddari-Aourir et al., 2022). Studies and pioneering practitioners suggest lowering a winery's carbon by capturing and utilizing these emissions (Gueddari-Aourir et al., 2022; Torres, 2021; Romano, 2021). In this process, the produced CO_2 is collected and converted into sodium carbonate, a highly demanded chemical which is among other things a component of baking powder (ibid). The whole circular process can be found in appendix 8.6, however its implementation at the commissioners company might go beyond the scope of this research as it requires specific equipment and profound knowledge of chemical reactions.

On the other hand, all agricultural businesses which include land and crops in their operations, have the potential to mitigate climate change as the crops retrieve and store carbon from the atmosphere, creating a carbon sink (Wu et al., 2022). Additionally, previous research by Chiriacò et al. (2019) has found that vineyards have an advantage over e.g. wheat farms to become carbon neutral or even mitigate climate change, as the vines are perennial crops which allows them to continuously store and sequester more carbon. Hence, if the vineyard's operations produce less GHG than the plants can store, the business can be declared carbon neutral or even climate positive, as the total output of GHG is equal to zero or below (ibid).

Scope 2

Furthermore, the emissions in scope 2 increase the if the company's operations require large amounts of purchased energy and if this energy is gained from non-renewable sources (Barrow et al., 2013). In France, the carbon emissions from electricity production are on average lower than in other European countries due to their high production of energy from nuclear power plants rather than coal-fired power plants (Treyer and Bauer, 2019). The amount of emitted CO_2eq per produced kWh in Germany is more than six times and, in the Netherlands, more than five times higher than in France (ibid). Consequently, the amount of produced radioactive waste is drastically higher in France than in the other mentioned countries, however this does impact the carbon footprint crucially (ibid). Despite electricity not being the most influential parameter for a winery, switching to energy produced from renewable sources can reduce the GHG emissions of a business, also in France (Krug, 2022).

Scope 3

To reliably compare the carbon footprint of a winery, the majority of authors have recognized a 0.75 l wine bottle as a standardized unit (D'Ammaro et al., 2021; Gueddari-Aourir et al., 2022). A recent study by D'Ammaro et al. (2021), analyzing the carbon footprint of wine from 33 different Italian wineries found that the GHG emissions per 0.75 l wine bottle were between 0.9 kg and 1.88 kg. Despite Italy being a different geographical location, Scrucca et al. (2018) support this finding, reporting a span of 0.9 kg to 2.0 kg of CO_2eq per unit, most of which is ascribed to packaging and distribution. In the region of Burgundy, about 30 % to 40 % of the total carbon footprint of a winery is caused by the packaging (Reux, 2022). Generally, prior studies agree that the bottles, the secondary packaging such as carton and foil, and distribution of the final product are the most influential parameters on the carbon footprint (D'Ammaro et al., 2021; Scrucca et al., 2018; Becker et al., 2020). All of which are emissions calculated within scope 3. (Barrow et al., 2013). Especially the production of glass bottles requires substantial amounts of electricity as the melting ovens are kept on a high temperature and never turned off, but also the transport causes emissions through combustion of fuel (Becker et al., 2020). These emissions can be tackled by reducing the weight of the bottle (ibid). For instance, reducing the weight of the glass bottles from 710 g to 640 g can cut the footprint of one bottle by about 10% through its more efficient manufacturing process, the use of less material and its lower weight in transportation (ibid). Further emission sources within scope 3 of a winery are the water purchases, the staff commute to and from the workplace, and the distribution of products (Barrow et al., 2013). Next to the glass bottles and scope 1 emissions, the distribution can also be one of the more influential parameters, depending on the winery's distribution radius (Reux, 2022)

Conclusion

The literature agrees on the glass bottles being the most influential emitter of GHG in the carbon footprint of a bottle of wine. In second place, the collective of scope 1 emissions play an influential role, and afterwards the distribution of the products. The studies within CO_2 balancing in wine production are currently still based on divergent basic conditions with a determined footprint per 0.75 l bottle ranging from 0.9kg up to more than twice this amount. This vagueness and in some cases low ecological validity excludes the comparison and reliable conclusions on the ascertained data of the case company based on the existing literature. Furthermore, not all data considered in the studies was available during the research process. Hence, the total emissions of the winery were determined, and the footprint of a 0.75 l bottle was compared to the span of 0.9 kg to 2.0 kg as an approximate benchmark.

3.2 Methodology

Procedure
The carbon footprint of the winery was established according to the reporting standards and principles of the GHG Protocol (appendix 8.7). The framework used was The Greenhouse Gas Protocol - A Corporate Accounting and Reporting Standard and the calculations were conducted in the corresponding GHG Emissions Calculation Tool (Ranganathan et al., 2004; Greenhouse Gas Protocol et al., 2021). This standardized form mainly focuses on the emissions ascribed to scope 1 and 2. Hence, for more detailed information on the correct calculation of scope 3 emissions the GHG Protocol Technical Guidance for Calculating Scope 3 Emissions was consulted (Barrow et al., 2013). Furthermore, to include agricultural-specific data such as carbon sequestration, the Land Sector and Removals Guidance document was the main source of expertise (Downing et al., 2022). These four documents are all made available by the World Resources Institute and the World Business Council for Sustainable Development. Lastly, the information gained from a certified training on the calculation of a company's carbon footprint by the German Technical Inspection Agency served as further framework of comparison (appendix 8.8).

Building up upon the desk research, a semi-structured preliminary interview with the commissioner was conducted to confirm the findings and determine which emission sources to focus on (appendix 8.9). The transcript was colour coded based on the information answering the different fieldwork questions (FQs). Afterwards, quantitative, organizational data was collected through access to purchase records, and electricity and fuel bills. Information on the GHG emissions caused through purchased electricity were acquired from the electricity company directly (EDF Group, 2022). As each GHG has a different global warming potential and each emission source produces a different mix of GHG, the respective multiplication factors were sourced the GHG Protocol calculation tool, which are contributed by the United States Environmental Protection Agency (2018). All relevant data was compiled in the GHG calculation tool and the scope 1 and scope 2 emissions were determined. The global warming potential of scop-e 3 emissions was determined consulting the French Agency for the Environment and Energy Conservation (ADEME) (2022a) and the hence the custom emission factors were established. To calculate the impact of the carbon sink, the Farm Carbon Calculator (2022) tool by Wines Great Britain was utilized as a resource, as it provides thorough and recent research on the topic. Once the tCO_2eq of all emission sources as well as the impact of carbon sequestration was determined, the final carbon footprint of the winery was established. Dividing this result by the number of sold bottles in the reporting year, gives the standardized carbon footprint per 0.75 l bottle.

Subsequently, the quality management tool of a Pareto analysis was conducted to identify the most influential parameters, determining the priority of reduction of each emission source (von Rosing et al., 2015). After assessment of the results and in consultation with the commissioner (appendix 8.10), the glass bottles, the electricity, and the water usage were identified as a point of focus. Further research was conducted on these sources and the feasibility and effectiveness of tackling them was assessed. Factors taken into consideration are the impact on the overall carbon footprint, the financial effort, required time, and necessary qualifications to reduce them.

Project Boundaries
Following the recommendation of the GHG Protocol, the research focuses on the emissions of scope 1 and scope 2, as these are the most influenceable by the company and most reliable to calculate (Ranganathan et al., 2004). Hence, only selected emissions of scope 3 such as the bottle material and weight were considered as previous research

evidenced their substantial impact (Becker et al., 2020). In the solution development, the previously mentioned capture and utilization of CO_2 during the fermentation was not investigated further as an option, due to its early development stage, required reconstruction measures and in-depth chemical knowledge (Gueddari-Aourir et al., 2022). A cradle-to-grave reporting approach was chosen over the less detailed cradle-to-gate approach. However, as the scope 3 emissions are only selectively reported on, this will mainly show an impact in future research. The reporting period of the emissions is the business year from 1 August 2021 - 31 July 2022.

Ethical data management
As the research is conducted in close cooperation with the commissioner and is based on sensitive data from the company, the data is being managed confidentially. All gathered information was only shared with the commissioner herself and the two assessors. Furthermore, stakeholder such as employees were only involved after approval of the commissioner. After consultation with the commissioner, the research results and implications will be presented at the final event to both assessors and further stakeholders. The commissioner will be advised of the other parties and only data which may be used under these circumstances will be shared.

Limitations
This project is the first report of the company, accumulating all relevant data and calculating the carbon footprint. Hence, no standardized reporting system for emitters was in place. Therefore, a restraining factor during the data collection process was that various data had to be based on estimates. For example, the exact emissions of tCO_2eq per combusted litre of fuel depend on several factors such as the make and age of the vehicle (Fontaras et al., 2017). Furthermore, even the emissions per litre can vary for the same vehicle, depending on the weight of its cargo, the driven speed and gear as well as the external circumstances such as inclines (ibid). As the company does not keep logbooks on the vehicle's mileage per litre of fuel, the average numbers published by the Helmholtz Collective of German Research Centres were applied, delivering results as exact as possible (August, 2022). Also, the data required to determine the exact carbon sequestration is outside the scope of the project. To calculate the carbon sequestered per year, each vine would have to be considered individually based on size and age. Furthermore, the composition of the soil of each plot would need to be analysed. As this required further scientific equipment, an average value on carbon sequestration by vines was utilized from the Farm Carbon Calculator (2022).

Another limitation of the research is the reporting size of scope 3. As the GHG emissions within scope three rely heavily on the availability of data of all stakeholders upstream and downstream. To maintain reliability the scope of the project had to be limited to relevant sources, as recommended by the GHG Protocol (Barrow et al., 2013).

Furthermore, despite the solution being based on detailed research of scientific literature, due to time restraints of the project, no measurements after the implementation of a solution can be made. All solutions will only show a measurable effect in the upcoming reporting year when the new carbon footprint is calculated.

Biases
As the researcher's French language skills only developed during the research process, relevant literature in French as well as interviews with stakeholders might have been missed out in the beginning (Brassey et al., 2017). This language bias was mitigated though the active studying of the language.

The open-minded and supportive climate created by the commissioner helps to avoid only the sharing favourable findings and outcomes. This is despite her position and high

involvement in the project, minimizing the occurrence of positive results bias (Plüddemann et al., 2017).

As the research is conducted by only one person, the perception might be biased and relevant information or angles might be left out (Spencer and Brassey, 2017). To avoid distortion, coach meetings, co-creation with the commissioner and critical discussions of the topic with other stakeholders were held.

3.3 Fieldwork

In order to address the main research question to its full extend, the winery's carbon footprint of scope 1 and 2 as well as selected factors of scope 3 was established according to the reporting standards and principles of the GHG Protocol.

Therefor primary data of the vineyard was collected and analysed. With the calculated result, the most influential parameters were defined. It furthermore serves as a value of comparison after implementation of the solution. Following fieldwork questions (FQ) guided this process:

FQ	Question	Method of data collection	Data type	Source
1	Which GHG emitters of scope 1 and 2 are contributing to the winery's carbon footprint?	Interview, desk research	Qualitative	Organizational data, scientific literature
2	Which of the selected emitters of scope 3 contribute to the winery's carbon footprint?	Interview, desk research	Qualitative	Organizational data, scientific literature
3	To what extend does each source have an impact on the winery's carbon footprint?	Interview, desk research	Quantitative	Organizational data, scientific literature, experts
4	What has been done to reduce the GHG emissions from each source?	Interview, observation	Qualitative	Organizational data
5	What are the best practices to reduce GHG emissions from each source?	Desk research, interview	Qualitative, quantitative	Organizational data, comparable vineyards, other industries scientific literature, experts
6	How feasible are the best practices for Domaine Agnès Paquet?	Desk research, interview, experiment observation	Qualitative, quantitative	Organizational data, scientific literature, comparable vineyards
7	How could best practices be developed newly, innovated, or optimized?	Desk research, interview,	Qualitative, quantitative	Organizational data, comparable vineyards,

		co-creation, observation		scientific literature, experts

3.4 Results

3.4.1 Interview Agnes Paquet

Scope 1

In the preliminary Interview Agnès Paquet stated that "organic does not equal ecologic", implying that crops which are cultivated organically require more supervision than crops protected by stronger, synthetic pesticides and insecticides (Paquet, 2022b). This additional supervision sometimes requires daily visits to the spread-out 13.35 ha of vine areas, to decide on the following steps, depending on crop and weather conditions (ibid). Furthermore, also the harvest by hand requires more time than machine harvest and hence more days of commuting to each vine area (ibid). Depending on the appellation the vine areas are up to 21 km from the winery (ibid). As this frequent commute is done with vehicles from the vinery's own fleet it comes within the ambit of scope 1 (Barrow et al., 2013). Ms Paquet (2022b) confirmed that all used fertilizer is natural, and hence not on a nitrogen basis.

Scope 2

The interview showed that the purchased electricity was used for lighting, heating, and the use of electric appliances (Paquet, 2022b).

Scope 3

Only two staff members commute to work on a daily basis, during the reporting period it were only one (Paquet, 2022b). The wine is finally shipped all over Europe and worldwide, including countries as far away as China, Russia, and the USA (ibid). The number of final destinations as well as varying modes of transportation did not allow a reliable calculation of these emission within the scope of the project. This source was hence not further investigated.

Furthermore, all data gathered from meter readings, invoices and observations can be found in appendix 8.11.

3.4.2 GHG Protocol calculating tool

To define the emissions ascribed to scope 1 and 2, the official calculation tool of the GHG Protocol was used. The full document with all calculations can be found in appendix 8.12. In the following, each tab of the document is explained, and its result are presented.

Parameters

Inventory data

The inventory year from 1 August 2021 – 31 July 2022 was chosen as it is the most recent completed business year.

Facility information

The business consists of several buildings in different locations. In the electricity bill it is differentiated between the two positions 'Winery Meloisey' and 'Storage Beaune'. 'Storage Beaune' lists exclusively the energy used there, whereas 'Winery Meloisey' includes all other buildings as well. All other emission sources are hence be allocated to Facility ID 1 except for the electricity usage of the storage, this is allocated to Facility ID 2. The two positions for electricity use were analysed separately to identify the most influential GHG emission sources as detailed as possible.

Custom Emission Factors
For all Scope 1 emissions the emission factors provided in the excel worksheet where utilized. This data was provided by the Environmental Protection Agency in their Emission Factors for Greenhouse Gas Inventories report (2018). For Scope 2 a custom emission factor was researched, as the electricity was reported in the location-based approach. The 0.048 kg per kWh of fossil CO_2 was derived from the electricity provider's annual report on their environmental, social, and governance matters (EDF Group, 2022).

Emission Factors
Extensive list on all emission factors and their GHG emissions, provided by the GHG Protocol (Greenhouse Gas Protocol et al., 2021).

Scope 1 – Stationary Combustion
Propane gas is used for combustion to operate the forklifts (Paquet, 2022b). The 4654 kWh were established by multiplying the annually used 26 bottles of gas with their energy capacity of 179 kWh per bottle (Antargaz Energies, 2022). The GHG emissions were then calculated by applying the company's use of gas to the previously determined values in the tab Emission Factors.

Scope 1 – Mobile combustion
For the combustion of diesel, gasoline and gas non routier (GNR) the activity amount shows the annual total amount of each fuel in litres. The GHG emissions were then again calculated by applying the company's use of the oil to the previously determined values in the tab Emission Factors. The last position of mobile combustion will be ascribed to scope 3, as it is the staff commute. However the tools resources were used to calculate the final results. It was also subtracted from scope 1 in the final overview and added to scope 3.

Scope 1 – Refrigerants
Not applicable, as the company's operations do not include refrigerants other than based on electricity use (Paquet, 2022b).

Scope 2 – Purchased Electricity
The first position described as Facility ID 1 includes the total annual purchased energy for all buildings except the storage in Beaune. The 49,961 kWh were determined by adding the monthly kWh used, provided on the energy company's invoices (EDF, 2022a; EDF, 2022b). The second position Facility ID 2 shows the total annual purchased energy for the storage in Beaune. Also the 10,430 kWh were determined by adding up the monthly purchased electricity. Afterwards the GHG emissions were calculated by multiplying the total consumptions with the electricity company's kg of CO_2eq per kWh as determined in the Parameters tab under Custom Emission Factors.

Scope 3 – Transportation
As the GHG Protocol only requires the calculation of Scope 1 and Scope 2 emissions, Scope 3 was here not considered. Furthermore, the required data collection and the calculation of numerous estimations would have gone beyond the scope of the project regarding time and extent.

Results Summary
The summary shows a total of 24.68 tCO_2eq for the inventory period of the 1 August 2021 - 31 July 2022 of Scope 1. This number consists of 0.98 tCO_2eq from stationary combustion and 20.80 tCO_2eq from mobile combustion. The location-based approach of purchased electricity resulted in 2.90 tCO_2eq in the reporting period for Scope 2.

The disaggregation of Scope 1 & 2 shows all tCO_2eq for the winery and other buildings, pointing out only the little use of purchased electricity at the storage in Beaune of 0.5 tCO_2eq.

3.4.3 Winery-specific data

As the GHG Protocol is a document to be used universally and by all varieties of companies, it does not consider the following winery-specific elements when establishing a carbon footprint.

Emissions during fermentation

In scope 1, the GHG Protocol only focuses on emissions caused through combustion of fuel, refrigeration, heating, or use of nitrogen fertilisers. However, it disregards the specific case of CO_2 emitted in the winemaking process through fermentation. During the fermentation process which converts the most into wine, an average of 90g of CO_2 per litre of wine are emitted as a by-product of the chemical reaction (D'alberti et al., 2019). Therefore, in a representative business year with 675 hl of wine produced, 6.08 tons of CO_2 are emitted during the fermentation process (Paquet, 2022b).

Carbon sink

Furthermore, the GHG strongly focuses on generally present emissions in the majority of companies. Hence, the tool disregards the crucial, agricultural-specific factor of the carbon sinks (United Nations, 2022c). The vine area contributes positively to the carbon footprint, as agricultural land has the ability to sequester carbon from the atmosphere (ibid). On average, one hectare or vine area absorbs 2.84 tons of carbon per year (Wine GB, 2022). Domaine Agnès Paquet owns 13.35 hectares of vineyards (Paquet, 2022b). Therefore, the total carbon sequestered annually and thus with a reversed impact on the company's carbon footprint is 37.91 tCO_2eq. The complete calculation can be found in appendix 8.11.

3.4.4 Total carbon footprint

Considering all emissions from scope 1 and scope 2, as well as relevant data from scope 3, the carbon footprint of the winery was determined.

	Source of emissions	**tCO_2eq**
	Scope 1	**-10.05**
1.1	Combustion propane	0.98
1.2	Combustion diesel	10.56
1.3	Combustion gasoline	3.1
1.4	Combustion GNR extra	7.14
1.5	Emissions fermentation	6.08
1.6	Carbon sequestration	-37.91
	Scope 2	**2.90**
2.1	Purchased electricity	2.90
	Scope 3	**43.47**
3.1	Purchased water	0.04
3.2	Bottles	43.12
3.3	Staff commute	0.31
	Total carbon footprint	**36.32**

Divided by 90,000 bottles produced annually, the carbon footprint per bottle 0.4 kg, which is below the values of comparison. However, the substantial amount of scope 3 emissions is not included in this calculation yet.

The share of the total carbon footprint per scope is as follows, the commas should be read as dots due to excel formatting:

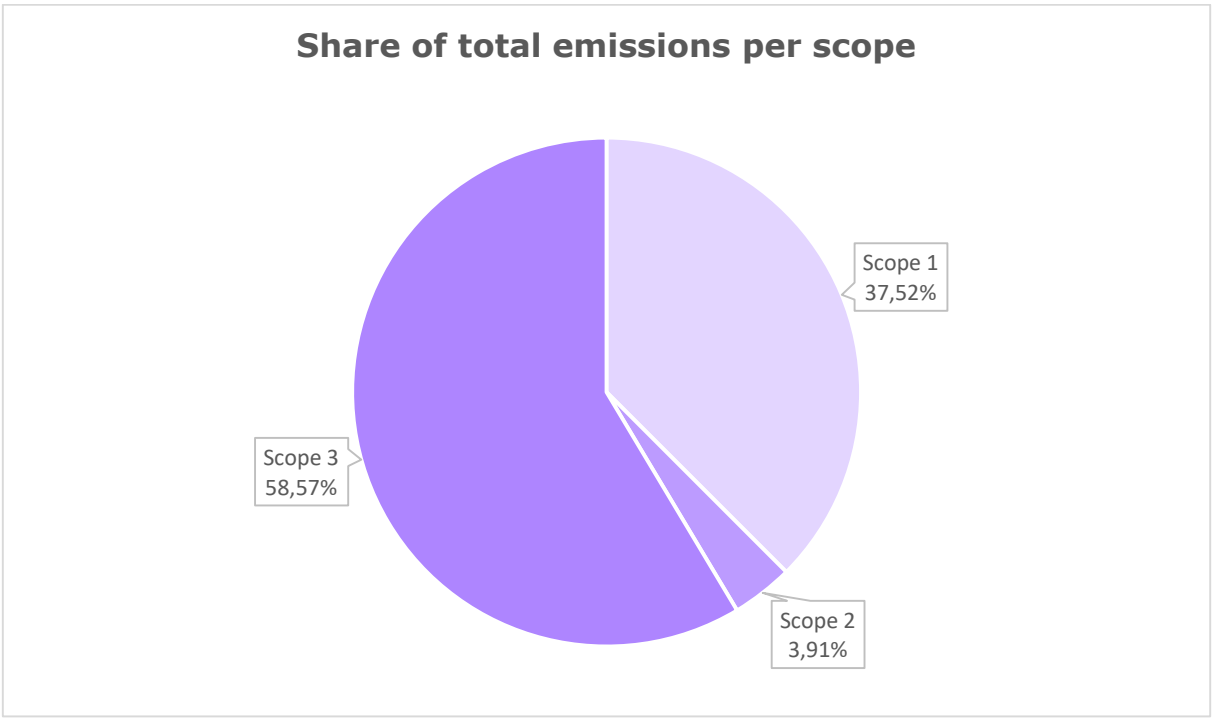


Figure 5 - Share per scope (15)

The share of each emission factor of the total carbon footprint is as follows, the commas should be read as dots due to excel formatting:

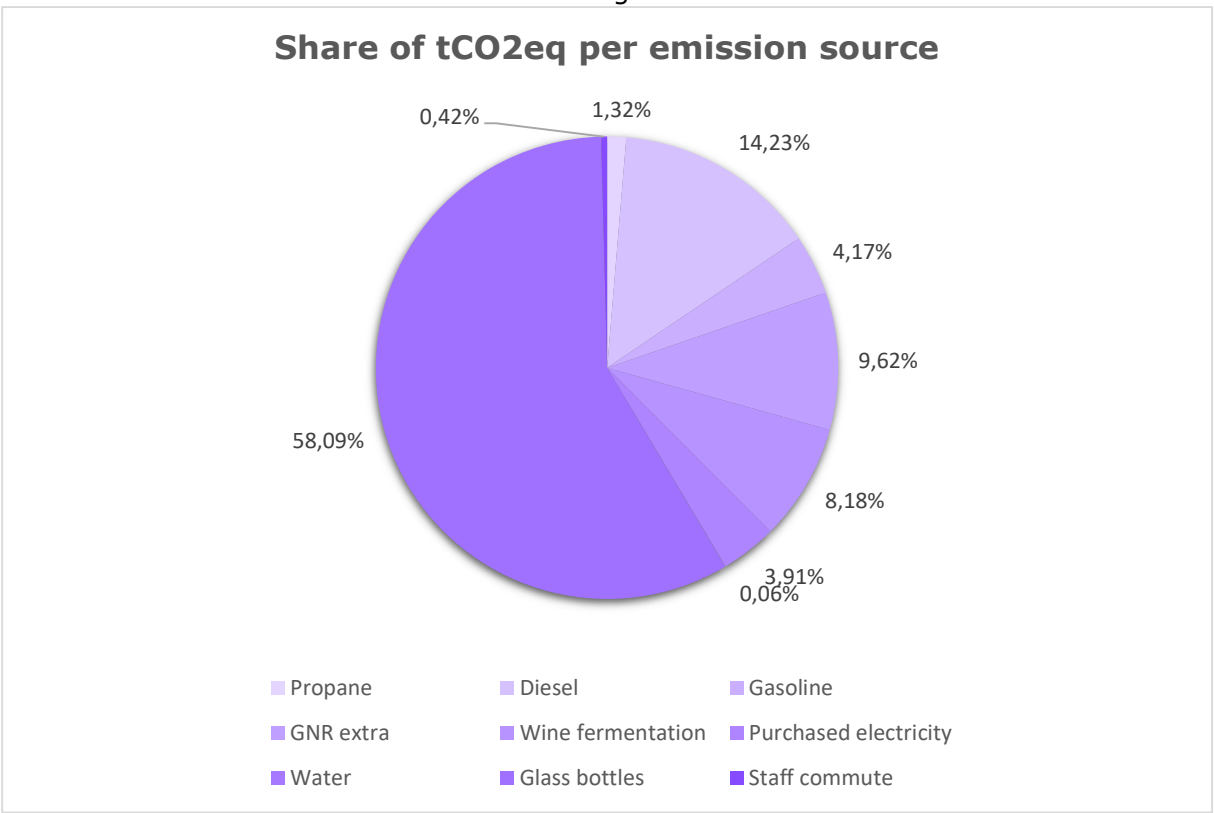
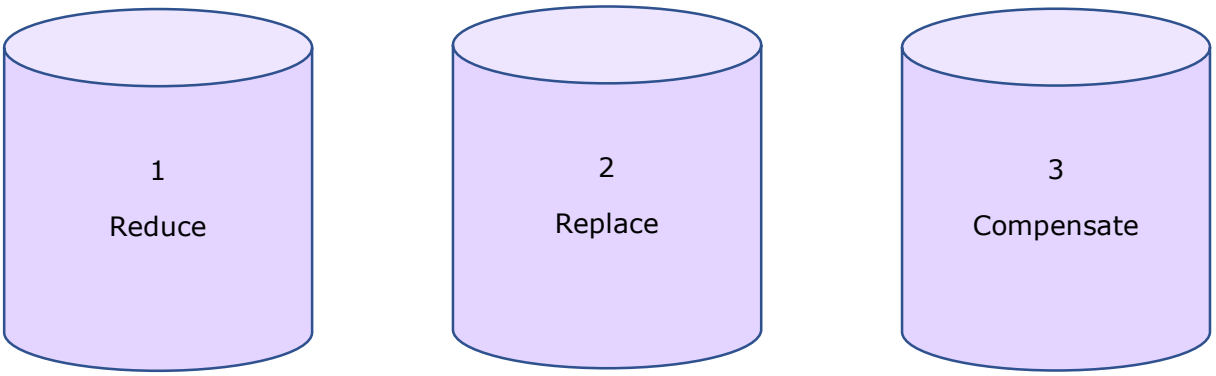


Figure 6 - Share per source (28)

4 The solution

To tackle the GHG emission of a company most effectively and on the long term, the following three-step-model should be applied (Krug, 2022).



Reduce
After identification of the most influential emitters, the first step is to merely reduce the emissions from these sources by less usage, more efficient usage, or a correction of usage (Krug, 2022). This could be a reduction in GHG emissions from combustion of fuel by carpooling or merely turning of the motor if not needed. Also the use of water could be reduced by cleaning the tanks with a brush and a little water, instead of large amounts of water and a high-pressure cleaner.

Replace
If the emissions cannot be reduced by a change in usage anymore, the emission sources can be replaced by more sustainable models (Krug, 2022). This could be by replacing a combustion vehicle by an electric vehicle, or the installation of solar panels instead of the purchase of energy from unrenewable sources (ibid).

Compensate
And lastly, the calculated carbon footprint of a company can be reduced on paper through the trade of emission certificates (Krug, 2022). The regional Emissions Trading System, such as the European Union's determines a monetary value of the tCO_2eq emitted into or retrieved from the atmosphere (European Commission, 2022). Based on this value, companies can trade these emission certificates and financially compensate their CO_2 emissions (ibid). This monetary value can incentivise large corporations to reduce their emissions (ibid). However, this option applies rather to businesses causing substantial emissions of GHG which are a crucial part of their operations, such as in the oil, the steel, or the car industry (Krug, 2022).

Hence, to optimize the solution for the commissioner's company, the focus was put on step 1 and step 2. The third step was not taken into consideration.

In order to determine how to reduce the carbon footprint of the company as efficient and effective as possible, a the pareto principle was applied. This quality management tool divides the so-called significant few from the insignificant many, by showing that 80% of the effects are caused by only 20 % of the factors (Jana and Tiwari, 2021). It hence aides with prioritizing the causes in order to achieve the most pivotal results (ibid). The following pareto diagram shows that the purchased bottles and combusted diesel make up for 72.32 % of all GHG emissions. Adding the tCO_2eq emitted through combustion of GNR extra, the 80% mark is exceeded by 1.94%. Therefore, the main focus was set on the reduction of emissions caused by the use of the bottles. Due to interest of the company, two further focus points which were agreed on with the commissioner are the

purchased electricity and the water usage (Paquet, 2022a).

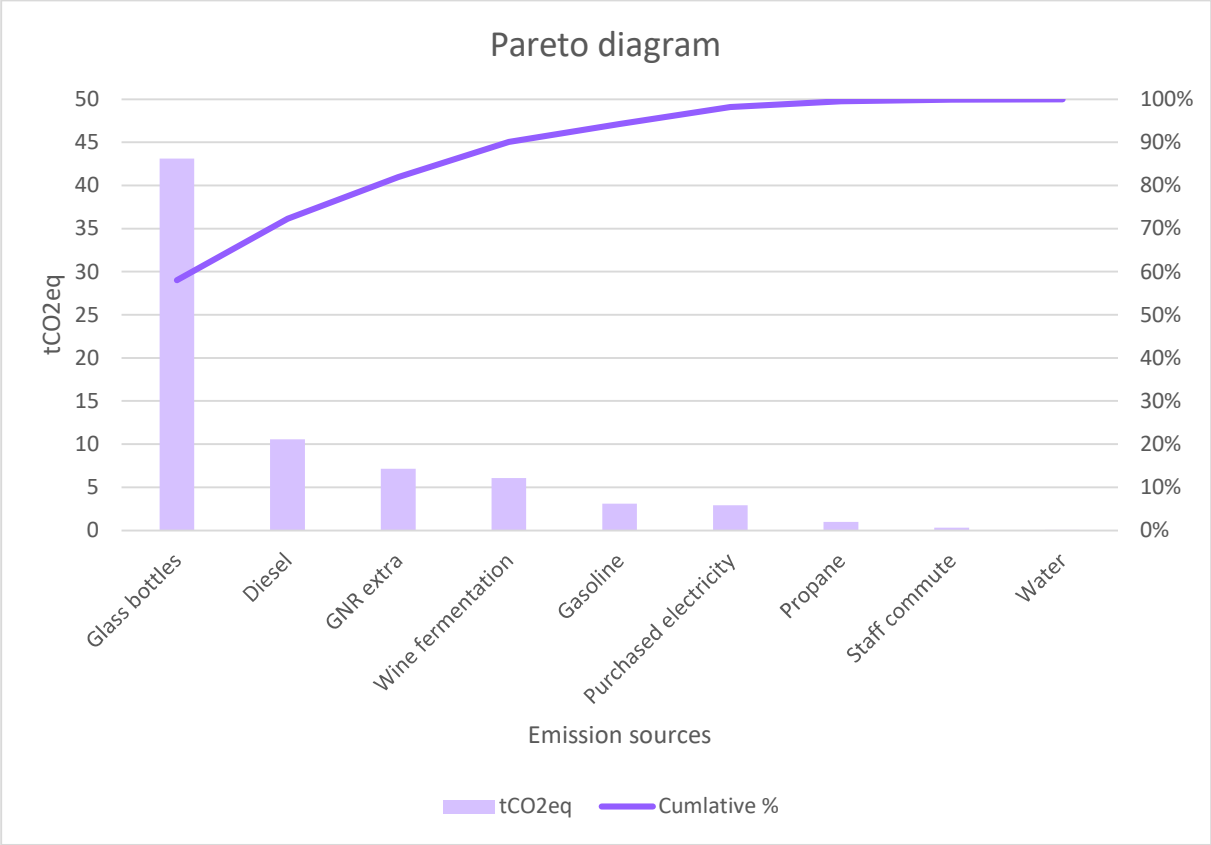


Figure 7 - Pareto analysis (41)

4.1 Design

4.1.1 Reduction of weight of the bottles

Established by scientific literature and confirmed with the company's own data, the glass bottles are the emission source with the most impact. Hence, tackling this emitter with the highest priority also aligns with the commissioner's interest (Paquet, 2022a). As the sale of the filled wine bottles is source of income of the company, the number of bottles cannot be reduced. However, they can be replaced with a lighter product. An alternative packaging through Frugalbottle was taken into consideration, which would have reduced the carbon footprint immensely (Frugalpac, 2022). Frugalbottles are a newly developed type of lightweight bottle, consisting of 94% recycled carton and lined with a synthetic bag (ibid). Depending on the glass bottle of comparison, the implementation of this alternative can reduce the bottle's share of the carbon footprint by more than 80% (ibid). However, in co-creation with the commissioner it was determined, that the cardboard bottles are no suitable alternative for the customer clientele (Paquet, 2022a). The attempt of selling a wine in a carton bottle is highly likely to diminish the associated value and quality thereof (ibid). Furthermore, the shape of the Frugalbottle is a classic Bordeaux shape, and hence not suitable for the Burgundy region (ibid). The following graphics x shows a current bottle from Domaine Agnès Paquet and an example of three designs of Frugalbottle.

Figure 9 - Bottle Domaine Agnès Paquet (Potzinger, 2022)

Figure 8 - Examples Frugalbottle (Frugalpac,

To align with the company's requirement, the alternative product was decided to be a lighter glass bottle of the same make. This implementation causes a decrease of the GHG emissions during the bottle production and transport, and hence of the company's scope 3 emission (Becker et al., 2020). However, the glass bottle is more than just a packaging, it also serves as a marketing tool, as customers perceive heavier bottles to carry wine of a higher quality (Paquet, 2022a). Nevertheless, as stated by Becker et al. (2020), reducing the weight of a glass bottle by 10% is very likely to go unnoticed by the customers and contributes to a reduction of about 10% of GHG emissions per bottle. The following table shows the total of purchased bottles and their GHG emissions. To determine the emissions of a bottle, the weight of the bottle in kg was multiplied with the factor 0,81, which are the kg of CO_2eq emitted through production and transport (Ademe, 2022b).

Bottle purchases and GHG emissions

Bottle type	Half bottle	Bottle	Magnum	Jeroboam	
Capacity in l	0,375	0,75	1,5	3	
Total units sold	2325	83315	3087	200	
CO2eq per bottle in g	0,30	0,48	0,65	1,41	
tCO2eq total	0,69	40,15	2,00	0,28	**43,12**

The standard 0.75 l bottle is the most sold model by the winery and has the largest impact on the CO_2 footprint. Therefore, a lighter alternative with the same characteristics such as fill level, shape, and colour were investigated. As a reduction of weight by 10 % decreases the CO_2 footprint but is also highly likely to go unnoticed by the customers the new bottle should weigh around 535.50 g (Becker et al., 2020).

Resolved issue	**Economic impact**	**Technical feasibility**
Stark reduction of GHG emissions through	To be determined, currently waiting for	Standardized size of bottles compatible with all

replacement of heavy bottles by lighter bottles.	pricelist of supplier, possibly lucrative immediately due to less use of material	machines in processes such as bottling, corking, and labelling. The product is in line with the standard filling level, shape, and measurements of the winery.

4.1.2 Installation of solar panels

A second approach to reduce the emissions is to tackle the 2.90 tCO_2eq of scope 2, caused by the electricity purchases. The emissions were determined to by far the highest in the colder and darker months of December to February with a strong peak in February. The main cause of this strong increase it the heating, rather than the lighting. This is due to the necessity of keeping the wine cellars at the temperature of 12 - 14 °C, also in winter. As the quality of the final product requires this consumption, it is also not reducible. Hence, in order to decrease the scope 2 emissions, energy from renewable sources will be utilized. To do so, solar panels for self-supply will be installed on the roof of the winery. In order to capture as much solar power as possible with a lesser visible installation of solar panels, the three roofs of the winery complex were an option. The following graphic shows the complex of the winery within the orange lines and the area for potential installation of solar panels in square meters.

Figure 10 - Winery complex and potential solar panels (Géoportail, 2022)

Various providers were contacted for an estimation of investment and potential production of kWh. Furthermore, to support the installation official government institutions were contacted for financial subventions.

Resolved issue	Economic impact	Technical feasibility
Reduction of GHG emitted through purchased electricity by decreased use of electricity from non-renewable sources.	Long term positive (Sunconnect, 2021)	To be determined by company, waiting on quotation.

4.1.3 Capture of rainwater

Despite the water usage having a comparatively small impact on the carbon footprint, it was decided to install a water tank to capture and utilize rainwater instead. This decision was made firstly, because the water is a scarce resource, tendency declining (United

Nations, 2022a). Secondly, the water usage has increased in the reporting year from a usage of 269 m³ to 335 m³ (Saur, 2022). Hence, the usage of the free resource promised to be sustainable and on the long term, after an initial investment, financially rewarding.

The winery complex includes one old and unusable two-story building, which is going to be demolished. The large tank for collection of rainwater will be installed in this newly to be gained area. Picture xx shows the complex of the winery marked with orange lines, and the area for the future water tank in green.

Figure 11 - Winery complex and area for rainwater tank (Géoportail, 2022)

First, the maximum amount of the last year's water usage per months was determined, to install a tank of sufficient capacity throughout the year. Afterwards, different water tanks for underground or overground and filtration systems were evaluated.

Resolved issue	Economic impact	Technical feasibility
Reduction of GHG emitted through purchased water by capture, filtration, and use of rainwater.	Long term positive, no more water purchases.	To be determined based on planned utilization of the area.

4.2 Implementation

All three of the developed solutions are a change in the origin of the used resources, rather than a change in the working processes of staff. The implementation can be used for marketing purposes, differentiating the winery from others through more sustainable practices. The changes might bring a competitive advantage and also serve as an industry example, driving a change in the wine sector.

4.2.1 Bottles

To decide on a new, lighter model of the bottles, further research on potential new suppliers was conducted. As the desk research showed that the current suppliers Verreries de Bourgogne and Bourgogne Viti Services are the largest ones in the area, they were contacted for an offer of lighter bottles. Finally, in consultation with Agnès Paquet (2022a), Verreries de Bourgogne was chosen as the supplier, the e-mail exchange can be found in appendix 8.13. Out of the three models proposed by supplier, the model Bourgogne Exclusive met all the company's requirements such as filling level, shape, and colour. A sample was requested to finally evaluate the haptic and optic of the product and decide on whether this model should be the new packaging for the 0.75 l

bottles. If the model is finally not decided on, the process restarts with the research of suppliers to find a perfect fit. However, it is more likely that the model will be chosen, as it fulfils all technical requirements of the winery (Paquet, 2022a). The main reason for it to be eliminated is if the bottle gives the impression of a lower quality due to its reduced weight. Nevertheless, the reduction in weight from 595 g to 511 g is a decrease of 14.12 %, which is close to the 10 % that are likely to go unnoticed according to Becker et al. (2020).

The implementation process stretches into the following year, as the bottling of the new vintage takes place in the summer and fall after one year of aging. Once the decision on the new model of bottles is made, the change and its reasons will be communicated to customers to demonstrate the values and ambitions of the winery. It will also be communicated within the intranet of the burgundy winemakers to set an inspire fellow winemakers and drive sustainable change in the industry. Four months after the new vintage has entered the market, first KPIs will be analysed to determine a change in sales. Another month later, first customers will be reached sent a brief survey to monitor their experience on the change in bottles. This only applies to retailers or regular customers who know the heavier bottles as a value for comparison. The following is a visualization of the implementation plan.

What	Stakeholders	Who	When	Done
Research potential suppliers	Suppliers	Johanna	28.11.2022	x
Contact suppliers	Suppliers	Johanna	28.11.2022	x
Demand samples	Suppliers	Johanna	29.11.2022	x
Evaluate samples and decide on purchase	Suppliers	Agnès	As soon as sample is sent	
Share implementation of lighter bottles in social media with customers as differentiation	Suppliers, retailers, customers	Agnès, Johanna	As soon as purchase is decided on	
Share implementation of lighter bottles in Burgundy winemaker intranet to inspire other winemakers	Suppliers, retailers, competitors	Agnès, Johanna	As soon as purchase is decided on	
Purchase lighter bottles for next bottling	Suppliers, staff	Astrid	07.2023	
Bottle wine in lighter bottles	Staff, bottling company	Whole team	07.2023	
Distribute bottle wine to customers	Logistic company, retailers, customers, staff	Astrid, Julien	Starting 07.2023	
Send out customer survey on experience with lighter bottles	Retailers, customers	Johanna	11.2023	
Evaluate success of implementation based on KPIs of purchases	Retailers, customers	Johanna	12.2023	

4.2.2 Solar Panels

The solar panels require a high initial investment, as a former quotation for a roof of the winery show (Sunconnect, 2021). The former estimate concerns 57.6m² of roof surface, offering room for 24 solar panels (ibid). Here, the initial investment would have been € 16,668 and the payback period of this investment would have been 10 years (ibid). As the newly requested quotation concerns only smaller roofs the initial investment will lower. Depending on the initial investment and amount of solar panels, the payback period however might be similar, as less panels produce less energy.

What	Stakeholders	Who	When	Done
Research companies	Domaine Agnès Paquet	Johanna, Eugénie	24.11.2022	x
Research financial subventions	Domaine Agnès Paquet	Johanna, Eugénie	24.11.2022	x
Contact companies for quotation	Domaine Agnès Paquet	Johanna, Eugénie	24.11.2022	x
Meet with representative of the company	Domaine Agnès Paquet, external company	Agnès, Johanna, Eugénie	19.12.2022	
Decide on offer and panel area	Agnès Paquet	Agnès	2023	
Award contract to company	Agnès Paquet, external company	Agnès	2023	
Installation of solar panels	Agnès Paquet, external company	Agnès	2023	
Evaluation of success based on KPIs	Domaine Agnès Paquet	Johanna	Quarterly after implementation	

The KPIs for assessment of the solar panels are elaborated on further in the evaluation of the solution.

4.2.3 Rainwater tank

Due to its long-term implementation, the implementation plan of this solution can be found in appendix 8.14.

4.3 Evaluation

In order to assess the success of the solutions, a comparison of the KPIs of status quo and after implementation of the solutions will be made. The main KPI of all solutions is the tCO_2eq caused and saved through the implementation. All three solutions, however, will only show comparable values in the months or years after implementation. Hence, no primary data could be derived yet. The success of each solution will be assessed according to quantitative data as follows.

4.3.1 Bottles

Due to the number of upstream and downstream factors adding to the final GHG emissions of the glass bottles, a reliable measurement was beyond the scope of the project. Hence, the factor of 0.81 kg of CO_2eq per kg of glass bottle determined by the ADEME (2022a) was used to calculate the emissions of the winery. An estimate of the tCO_2eq saved after substitution of the heavy bottles can be made with the same calculation:

	Capacity in l	Weight in g	CO_2eq per bottle in g
Current bottle	0.75	595	0.48
New bottle	0.75	511	0.41

Bottles sold in reporting year 2021/22	83,315
tCO_2eq caused by old bottles	40.15
tCO_2eq caused if new bottles were used	34.48

It comes to show, that if the lighter bottles are implemented and the same number of bottles would be sold, 5.67 tCO_2eq less would be emitted annually. The actual decrease of GHG emissions based on the next year's sale can only be determined after the next reporting period.

4.3.2 Solar panels

The first results on the effect of the solar panels can be expected one month after commissioning, as the electricity is billed on a monthly basis (EDF, 2022a; EDF, 2022b). To assess the development of the solution, following four KPIs will be measured through meter readings and electricity invoices:

1. Monthly total consumption of energy in kWh
2. Monthly production of energy in kWh
3. Monthly energy purchases in kWh
4. Monthly energy purchases in Euro

With the carbon footprint of the reporting year 2021/22 and those four KPIs, the following three KPIs will be determined.

1. Difference monthly energy consumption in kWh compared to reporting year 2021/22
2. Difference monthly energy purchases in kWh compared to reporting year 2021/22
3. Difference monthly energy purchases in Euro compared to reporting year 2021/22

And finally, to establish a comparison to the carbon footprint of reporting year 2021/22, the following three KPIs will be determined:

1. Current scope 2 emissions in tCO_2eq
2. Current total carbon footprint
3. Reduction of scope 2 emissions in tCO_2eq compared to reporting year 2021/22

A reduction in scope 2 emissions with unvarying energy consumption indicates a success of the solution regarding the scope 2 emissions. The emissions caused by the production of the solar panels of 42.26 g of CO_2eq per produced kWh has to be taken into account in scope 3 and hence influence the total carbon footprint (Sunconnect, 2021). The estimated energy payback is about 1.65 years (ibid). Regarding the financial profitability the monthly amount of Euros saved through self-production of energy will be added up until it reaches the amount of the initial investment and possible repair work.

The consumption and production however, are both susceptible to seasonal fluctuation (EDF, 2022a; EDF, 2022b; Sunconnect, 2021). The energy consumption of the winery is generally the highest in the winter months due to an increase in required heating of the wine cellars and an more frequent use of artificial light (EDF, 2022a; EDF, 2022b). The production of energy however, is countercyclical to the consumption and peaks in the summer, due to a high number of sunshine hours (Sunconnect, 2021). This discrepancy in supply and demand is predicted to lead to an increase in energy purchases in the winter months, despite the installation of solar panels. Based on the previously requested quotation on solar panels, an overproduction in summer and a need for storage capacity is highly unlikely (Sunconnect, 2021). This is due to the fact that the energy gained from the solar panels will cover just slightly less than half of the consumption, even in the summer months (ibid). Furthermore, quotation is issued for a roof area of 83.04m², while the current potential roof areas collectively add up to an area of 139m² (Géoportail, 2022).

4.3.3 Rainwater tank

Due to its implementation in the further future, the evaluation of the rainwater tank can be found in appendix 8.14.

5 Conclusion

To conclude, due to their large areas of agricultural land wineries have a great potential to become carbon neutral and even help mitigate climate change. The nature of their perennial crops which in some cases age over 90 years, even give them an advantage over other agricultural businesses, due to the higher carbon sequestration rates. Also the operations offer multiple starting points to reduce emissions of GHG. Emissions directly at the company can be reduced by a decrease in used resources or substitution of high-emitting devices through more environmentally friendly ones. The largest share of the carbon footprint of most wineries lies within the scope 3 emissions, caused by the production and distribution of the glass bottles.

How can Domaine Agnès Paquet reduce their greenhouse gas emissions during the cultivation of grapes and winemaking process in order to combat climate change and contribute to a more sustainable wine industry?

To reduce the carbon footprint of the winery Domaine Agnès Paquet, the approach to decrease GHG emissions was chosen rather than the increase of carbon sequestration or compensation through the purchase of carbon certificates. As research shows, even a decrease of merely 10% of the weight of the glass bottle can lead to a similar decrease in GHG emissions, without being registered as a loss in quality of the product by the customer. By implementing bottles of reduced weight, the share of GHG emissions of the bottles is estimated to be reduced by about 5.67% in a comparable business year. Furthermore, the emissions caused by the energy provider will be tackled by installing solar panels to generate electricity from renewable sources. And lastly, the water purchases are aimed to be eliminated by capturing rainwater for the own use. The conducted research and data acquisition give an actionable answer to the research question in these three solutions. The implementation thereof would influence the people in vicinity of the winery by saving resources, is financially rewarding on the long term and greatly beneficial to the environment.

6 Stakeholders and dissemination

To share the expertise gained through the research and working experience at the company, acts of dissemination were performed for different stakeholders. The following stakeholder map according to Johnson et al. (2017) provides an overview of all stakeholders involved in the project.

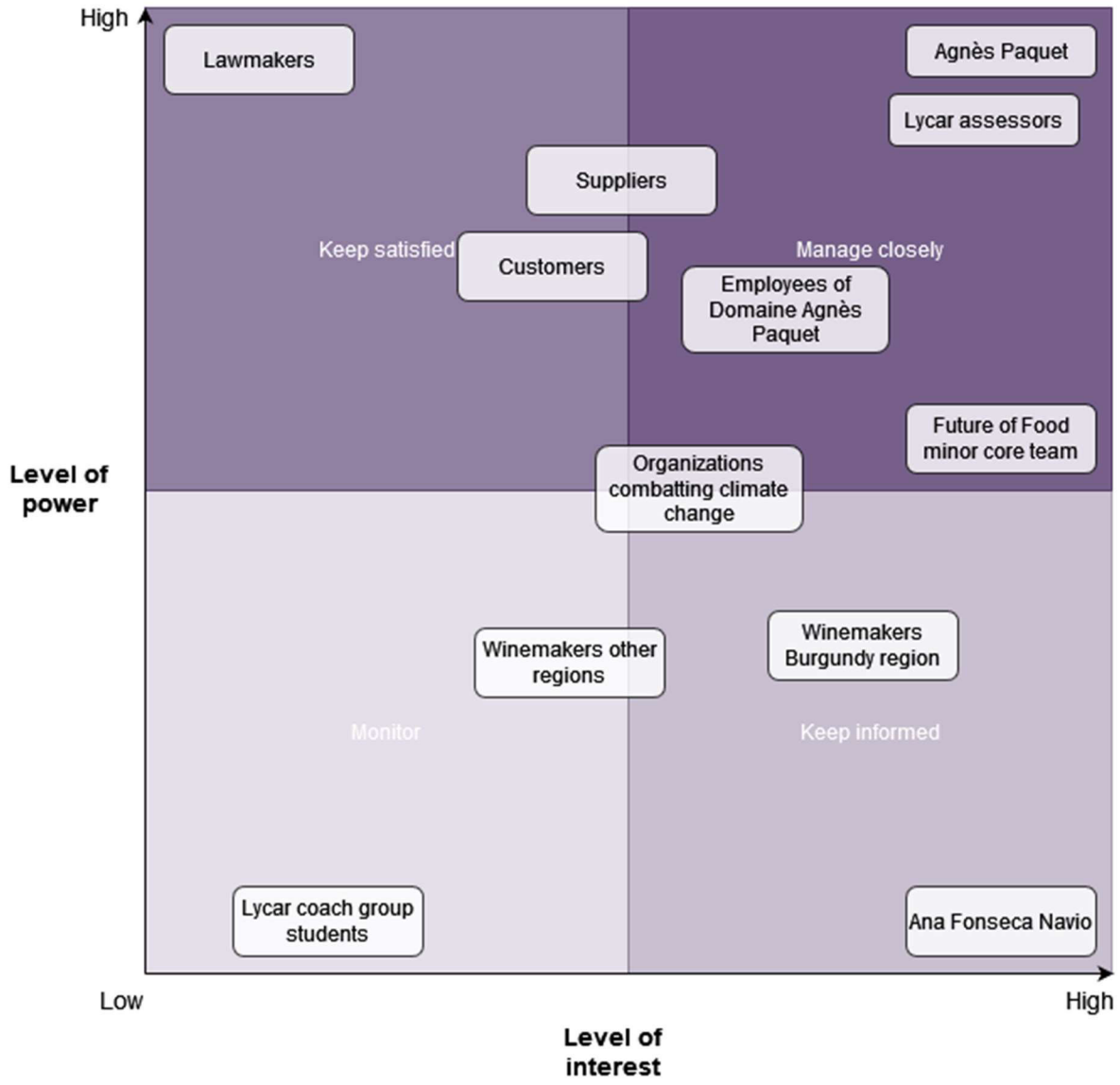


Figure 12 - Stakeholder map company project (51)

Agnès Paquet

The stakeholder with the most interest and the most power and hence the most important stakeholder is the owner of the company and commissioner Agnès Paquet. Ms Paquet was involved throughout the complete duration of the project, starting by deciding on the topic, through two interviews, as well as update and feedback sessions. During a presentation, given to the commissioner and the employees on 24 November 2022, the results of the research were shared and the direction for the solutions was decided on. The solutions were then co-created with the commissioner and tailored to her expectations and requirements. Naturally, the final decision on changes and investments was hers to make. Finally, the finished report, including all collected data and calculations was handed to and discussed with Ms Paquet. The tools were explained and made

accessible in a matter which allows their use in the future, building up upon the conducted research and findings. Furthermore, Ms Paquet was invited to the final oral dissemination of the project, which she happily confirmed to attend in person.

Lycar assessors
Furthermore, the very high level of interest and the power over the final evaluation of the research and findings, make the Lycar coach and the second assessor crucial stakeholders. Through guidance by the Lycar coach, the research proposal was formed, and the structure of the project was shaped. The hand-in of the research proposal to the Lycar coach was a key act of dissemination, paving the way for the final project. Through further meetings during the internship, the focus of the research was critically re-evaluated and adjusted. The hand-in of the report was one of the most crucial acts of dissemination of the research, as the critical assessment of the two assessors examines the validity and importance of the research. In the final oral event, the relevance and impact of the main contributions will be disseminated and evaluated by the assessors. This marks another crucial, and the last point of the project.

Employees of Domaine Agnès Paquet
Another vital act of dissemination was the presentation of the research and the findings to all employees of Domaine Agnès Paquet. During the presentation on 24 November 2022, the context of the research was explained, the findings presented and a discussion on solutions was initiated. This moment of sharing the expertise with the people whose work would be influenced by the solutions, was a crucial and effective discussion. As stated by Kotter (1996), for the successful implementation of change it is key to involve those affected by it, and encourage them to take on an active role in the process. The results of the discussion confirmed the importance of the dissemination. The team took ownership of the combustions of fuel and produced ways to reduce it by breaking personal habits. Also, the capture of the CO_2 emitted during the fermentation was brought up as an idea. After the presentation, the determination to reduce the GHG emissions individually and collectively was firm and purposeful due to the factual input of the presentation. The presentation was prepared and given in French, all of its slides can be found in appendix 8.15.

Future of Food minor
As the sustainable production of food and beverages was a substantial part of the Future of Food minor's curriculum, the contact with the lecturers of the core team was kept also throughout the project. As the research links to the topics and issues discussed in the minor, a dissemination of knowledge was offered at one of the following Minor groups. The core team requested a brief abstract of the project, which was then provided. Depending on the final design and timing of the new Minor block, the findings are likely to be presented and discussed with the next group of Future of Food students on 2 March and 3 March 2023. The abstract and a tentative confirmation can be found in appendix 8.17. To potentially be part of the next Minor and giving back to the community would be a great honour. The lecturers would witness how their teaching and topics have influenced and shaped one of their students. Furthermore, the students could benefit from a first-hand presentation on how their chosen specialisation can pave their way into the industry.

HTH Instagram channel
On account of the interest and support of the Future of Food core team member Simone Williams, the internship and research project were forwarded to the HTH marketing department. The post includes a brief description of the internship, the research project, and links to the development as an intercultural hospitality leader, it can be found in appendix 8.18. Effective the 15 December 2022 the account has 10,000 followers, the post has been liked by 421 people and commented by five, the vast majority of which

were not initially reached with any other acts of dissemination (Hotelschool The Hague, 2022).

Ana Fonseca Navio
Due to the post on the HTH Instagram channel, a current Lycar student reached out to acquire expertise on the topic. After an initial meeting, aligning expectations and fields of interest, the research was summarized in an infographic for her to build up on in her final research proposal. This valuable exchange demonstrated the strengths and interest of the HTH community in a powerful way and teaches how all members continuously learns from one another. The infographic as well as proof for presentation thereof can be found in appendix 8.19.

7 Academic reflection

The calculation of the carbon footprint as a topic itself is as current as ever, and it is predicted to continue gaining importance. The research was based on an extensive literature review, which was enabled only by the numerous recent studies within the field. Furthermore, the in-depth examination of CO_2 balancing within the wine industry, proved the internship company and hence its owner Agnès Paquet to be one of the pioneers. The research project lays a foundation for the company to not only operate organically but also climate positive and develop into a role model in the region and furthermore the industry. For more detailed insights especially into the carbon sequestration and the capture of emissions during the fermentation, a more profound knowledge in chemistry and botany would have been necessary. Therefore, the results on the carbon sink are not as differentiated as they could be. Moreover, refraining from including all scope 3 emissions into the calculations due to time and reporting boundaries, distorts the actual share of the other emissions. As the mere transport of burgundy wines is averagely estimated to make up for 19% of the total carbon footprint, the relation of the calculated results are within a logical scope, despite the incompleteness of the scope 3 emissions (Reux, 2022).

Implications for future research

As the basis of a reporting system is now existent, further research at the company could optimize it and include other scope 3 emissions as well as a more detailed reporting of the carbon sink. Also, the possibilities of capture and utilization of carbon during the fermenting process could be explore more in-depth.

Additionally, analyzing the product with a cradle-to-cradle approach would be a promising step with growing importance in the future. This is an advanced full life-cycle-assessment of a product in regard to a circular economy (European Commission, 2018a). Considered are the stages from the production of the raw materials to the manufacturing, storage, distribution, usage, and the designed purpose after the product's initial life such as reusage or recycling (ibid). This next big step into a circular economy, however, is a challenge if only started by one business due to logistical and financial reasons. On the other hand, if a strong coalition could be formed, research and a projects into the field might revolutionize the wine industry.

Outlook for the company and the researcher

To build upon the project, the developed system should continuously be updated to see potential changes and evaluate the success of solutions. The researcher is going to return to work for the company in May 2023 and is happy to keep track of the carbon reporting so that maybe in the future the winery can be certified as carbon neutral, or even climate positive.

8 Appendices

8.1 Feedback Research Proposal

DD1: The student has demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that is supported by advanced textbooks

	Excellent	Pass	No Go
1.1 Use of literature and knowledge of the field	Student uses in-depth literature and knowledge of the field throughout the report. The report contains no mistakes and factual incorrectness.	Student uses in most cases literature and knowledge of the field in the report. The report contains some mistakes and factual incorrectness in a limited part of the report.	No sufficient or correct use of literature and knowledge of the field in the report. The report contains mistakes and factual incorrectness.
1.2 Intellectual depth and abstract thinking	Student takes all significant factors into account and looks from different perspectives, sees patterns, relates situations to concepts in order to solve larger problems. The reports show excellent thinking capacity of the student. New unique insights presented in the topic and depth of understanding displayed. Excellent linking between the elements and the underlying issues within the case situation.	Student takes different perspectives into account. The report shows intellectual depth (taking into account all significant factors and looking from different perspectives) in most parts of the report. Some patterns are clear. Some links have been made.	The report lacks intellectual depth (superficial and merely descriptive) in some parts of the report. Patterns are not sufficiently made clear.

Student Feedback:	Pass ☑ Not Yet ☐	A broad variety of relevant, current scientific literature was consulted, analysed and synthesized. The differences of the studies were taking into consideration and applicability is guaranteed through cross-referencing and complementing. The case was viewed and analysed from various angles.
Assessor Feedback:	Pass ☑ Not Yet ☐	Enough and interesting use of literature from the field of this project

DD2: The student can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and has competences typically demonstrated through devising and sustaining feedback and solving problems within their field of study

	Excellent	Pass	No Go
2.1 Application of theories/models to situations at hand	Student uses a range of theories/models appropriate to the problems in the case skilfully and able to add their own unique perspective and insight. They own the model(s).	Student mentions a range of theories/models appropriate to the problems in the case and applying some of them in the correct way.	Mentioning models and theories but not using them in a correct way.
2.2 Possible impact and meaning of own work - dissemination of research	Student plans evaluation of impact and meaning of own work in relation to business and industry with sound underpinning. Identification of all stakeholders and acts of dissemination. Plan on how to effectively disseminate knowledge through different channels fitted for a variety of audiences is also presented.	Student formulates criteria for evaluation. Student describes possible impact and meaning of own work. Identification of stakeholders and planning of dissemination through at least one valuable channel with an audience is presented.	Student fails to describe criteria how to evaluate impact. No identification of stakeholders or realistic plan on dissemination of knowledge through at least one valuable channel with an audience.

Student Feedback:	Pass ☑ Not Yet ☐	For the implementation of change, the stakeholder analysis and the methodology, a range of models and theories were applied. That way the determined issues were tackled best and a personalised solution can be derived. The dissemination is planned thoroughly, taken a broad variety of stakeholders into consideration and creating a large impact.
Assessor Feedback:	Pass ☑ Not Yet ☐	A current and actual research project, not only usefull for client but maybe for whole industry. Case study.

DD3: the student has the ability to devise data gathering events, gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues

	Excellent	Pass	No Go
3.1 The Design Based Research Process	Student sets the research process up in a systematic and well organised way. Student makes sense of a problem mess, analyses a (complex) problem and formulates feasible solutions by using a design-based research approach. Logical flow from Problem definition to Analysis to Solutions Design/methods are well chosen and motivated,	Student analyses the problem, and formulates possible solutions underpinned by literature using a design-based research approach. Methods motivated and mostly logically chosen	Insufficient problem analysis and methodology, research cycle not used.
3.2 Analysis and evaluation of data	Student plans analysis and evaluation of data/information well using appropriate (digital) tools and makes data-driven decisions. All statements are underpinned with facts and figures and/or referencing. The appropriate tools are used in all steps. Analysis is sufficiently complex with use of information from more than 2 different dimensions (practioners, scientific literature, the organization and stakeholders).	Student plans analysis and evaluation of solutions clearly, with some flaws or unclarities. Some statements are underpinned with facts and figures and/or referencing, some lacking underpinning. Analysis is sufficiently complex using data from at least one dimension and sufficiently backed up with literature.	Plan of analysis and evaluation of solutions is not clear. Statements are mostly not underpinned with facts and figures and/or referencing; some are contradicting. No tools are used. Lacking or no analysis and not backed up with literature.

Student Feedback:	Pass ☑ Not Yet ☐	The structure is logical and build on theory applied in the context. However, as currently the data is not yet collected, the practical analysis was not possible. Possible examples were provided, however in the final report more data and discussion and evaluation of it is required.
Assessor Feedback:	Pass ☑ Not Yet ☐	Use of several research methods, interviews, observations, survey and desk research, specify sampling methos

DD4: the student can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences

	Excellent	Pass	No Go
4.1 Communication to audience making use of professional (business) English	Student divides information effectively in paragraphs/chapters. No noticeable errors in English usage and mechanics. Use of language enhances the argument and avoids abbreviations. Sentence structures are well varied, and voice and tone are highly suitable for the specific audience/s. Style and content complement each other into an appealing, high quality story. Highly skilful organisational strategy. The logical sequence of ideas increases the effectiveness of the argument and transitions between paragraphs strengthen the relationship between ideas. Sub-headings are employed effectively and the links between different sections are reinforced through linking expressions. Shows attention to detail in all parts of the report.	Student divides information in paragraphs/chapters. Errors in English usage and mechanics are present, but they rarely impede understanding. Use of language supports the argument. Sentence structures are varied, and voice and tone are generally appropriate for the intended audience/s. Generally, a clear organisational strategy. The sequence of ideas in most cases supports the argument and transitions between paragraphs clarify the relationship between ideas. The report is mainly comprehensively written and lacks some attention to detail in some parts of the report.	Distracting errors in English usage are present and they impede understanding. Use of language is basic, only somewhat clear and does not support the argument. Word choice is general and imprecise. Voice and tone are not always appropriate for the intended audience/s. Basic organisational strategy, with most ideas logically grouped. Transitions between paragraphs sometimes clarify the relationship among ideas. The report is not comprehensively written and lacks attention to detail in most parts of the report.

Student Feedback:	Pass ☑ Not Yet ☐	Clearly written and in mostly professional language, suitable for the target audience. Complicated, scientific issues are researched in-dephts and well explained to a not-scientific audience. No apparent errors in grammar or spelling. Abbreviations are only used for reuccuring words. The stucture is guiding the reader through the problem mess to the final solution with ease.
Assessor Feedback:	Pass ☑ Not Yet ☐	Well written, AVOID or ELIMITATE as much as possible the use of ABBREVIATION, = not reader friendly and not necessary!

DD5: the student has developed those learning skills necessary to continue to undertake further study with a high degree of autonomy

	Excellent	Pass	No Go
5.1 Plan on IQ development in PLO: Reflection on product(s)	Student has clear plans on what will be delivered and uses different relevant theory to underpin own work and reflect on it.	Student has a plan on what will be delivered and uses theory to underpin planned own work and reflect on it.	No clear deliverables mentioned and almost no theory to underpin own work and reflection.
5.2 Plan on AQ & EQ Self development	Student devises excellent ability to critically reflect on own developmental goals and demonstrates real growth mindset for life-long learning. Student proposes a demonstration of being able to self-direct, taking initiative in unpredictable situations. Student shows different metrics that can demonstrate development in terms of their EQ/AQ.	Student shows developmental goals and demonstrates growth mindset. There is a plan on how to reflect on values, attitudes and behaviour. Starting levels and desired end levels are described and measurements are provided.	Developmental goals are not concrete, there is no demonstration of growth mindset. Plan on how to reflect is vague and does not give enough substantiation to show growth.
5.3 Plan on EQ Social development	Student provides a plan on how to construct a multitude of proof that shows development as an Intercultural Hospitality Leader. Excellent ability to contribute to the global society/local community as a responsible citizen. Excellent analysis of diversity of people the student will deal with. Possible effective collaboration with all stakeholders in different cultural settings. Hospitality is key to the project or work the student does.	Student provides a plan on how to prove development as an Intercultural Hospitality Leader. Plan on how to contribute to the global society/local community as a responsible citizen. Proposing ideas on how to collaborate with different stakeholders in different cultural settings. Hospitality is a differentiator in the students' project or work.	No clear plan on development as an Intercultural Hospitality Leader. Plan on how to contribute to global society/local community is missing. Ideas proposed on collaboration or hospitality are not sufficient.

Student Feedback:

Pass ☑
Not Yet ☐

The clearly stated main goal for the IQ development is the language proficieny. The delivered products however, could be elaborated more on.
Own strengths and weaknesses are analysed for action to be taken during the internship. The student can evidence growth in AQ, IQ, EQ, however one or two additional parameters should be taken into consideration to have a more reliable measurement. It is clear, how the development plays into the intercultural hospitality leadership, however the other people could have been analysed more in-depth.

Assessor Feedback:

Excellent ☐
Pass ☑
Not Yet ☐

Well aware, better evaluated on end of placement

Overall Assessor Feedback

Interesting project, current and definitely usefull for client

LYCar Proposal Outcome

Pass	☑	All qualitative criteria awarded a “Pass”. “P” registered in Osiris. Student can continue with LYCar execution.
No Go	☐	One or more qualitative criteria graded as “Not Yet”. “F” registered in Osiris. Student re-writes LYCar Proposal with incorporated feedback.
Pre-Condition NY	☐	Pre-conditions not met. Student resubmits LYCar Proposal. No grade or feedback provided to the student.

LYCar Proposal Grading Rubric

v.1.1 *(Version LYCar 2020; 16 February, 2021)*

Student Name:	Johanna Lucas	LYCar Coach:	Mr Heijblom
Student Number:	701313	Primary PLO:	5
Date Submitted:	29.08.2022	Secondary PLO(s):	9

Note: All boxes with red border to be filled by student

Preconditions (required for assessment)	***Yes***	***No***	***Comments***
Checks content and completeness			
Executive Summary is present, concise, can be read independently, contains information about process and content, focuses on results and outcomes	✔	☐	
LYCar Proposal meets formal reporting criteria (according to e.g., LYCar Reading & Writing Guide)			
LYCar Proposal is written in English and is professional, including common basic components such as Intro, ToC, Conclusion etc.- see Reading & Writing Guide	✔	☐	
LYCar Proposal is max. **5.000 words** (counting after Table of Content, incl. text in tables) **-** visual proof of wordcount is included in Appendices.	✔	☐	
Harvard Referencing Style is used consistently, referencing to primary sources only, List of References is well presented	✔	☐	
Check (technical) formalities and submissions			
Ephorus upload	✔	☐	
LYCar Proposal incl. Appendices are uploaded in Osiris	✔	☐	
Ethics and data management			
Ethical, integrity and data management requirements	✔	☐	
Entitled to assessment? (All yes above required):	✔		

8.2 Proof of data upload

File Upload Notification

noreply <noreply@hotelschool.nl>
An Johanna Lucas

Antworten | Allen antworten | Weiterleiten

So 18.12.2022 10:32

Dear Johanna Lucas,

This is an automatic delivery message to notify you that a new file has been uploaded.

Name : Johanna Lucas
Student Number : 701313
Email : 701313@hotelschool.nl
LYCar Coach : Mr Heijblom
Research Number : 2022-719

We kindly request you to forward this email to your LYCar coach as evidence that your data files have been uploaded securely.
Thank You.

File Upload Notification

noreply <noreply@hotelschool.nl>
An Johanna Lucas

Antworten | Allen antworten | Weiterleiten

So 18.12.2022 10:32

Dear Johanna Lucas,

This is an automatic delivery message to notify you that a new file has been uploaded.

Name : Johanna Lucas
Student Number : 701313
Email : 701313@hotelschool.nl
LYCar Coach : Mr Heijblom
Research Number : 2022-719

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Thank You.

File Upload Notification

noreply <noreply@hotelschool.nl>
An Johanna Lucas

Antworten | Allen antworten | Weiterleiten

So 18.12.2022 10:32

Dear Johanna Lucas,

This is an automatic delivery message to notify you that a new file has been uploaded.

Name : Johanna Lucas
Student Number : 701313
Email : 701313@hotelschool.nl
LYCar Coach : Mr Heijblom
Research Number : 2022-719

We kindly request you to forward this email to your LYCar coach as evidence that your data files have been uploaded securely.
Thank You.

File Upload Notification

noreply <noreply@hotelschool.nl>
An Johanna Lucas

Antworten | Allen antworten | Weiterleiten

So 18.12.2022 10:32

Dear Johanna Lucas,

This is an automatic delivery message to notify you that a new file has been uploaded.

Name : Johanna Lucas
Student Number : 701313
Email : 701313@hotelschool.nl
LYCar Coach : Mr Heijblom
Research Number : 2022-719

We kindly request you to forward this email to your LYCar coach as evidence that your data files have been uploaded securely.
Thank You.

8.3 Client appraisal of internship

Final appraisal

APPRAISAL FORM

(EVALUATION FROM ALL CLIENTS IS COMPULSORY, FORMAT IS NOT)

HOTELSCHOOL THE HAGUE
Hospitality Business School

Name of student:	**Johanna Lucas**	**Student number:**	**701313**
Name of company:	**Domaine Agnès Paquet**	**Department:**	**Winery**
Name of company tutor:	**Agnès Paquet**	**Position of company tutor:**	**Owner**
Assessment no:	**2 (final)**	**Date:**	**18/12/2022**

CATEGORY 1: EXPERTISE / JOB KNOWLEDGE & UNDERSTANDING

1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Has an exceptional level of job knowledge, experience and insight and applies this in practice. Works independently; can train others.	Has a very good level of job knowledge, experience and insight and applies this in practice. Can work independently.	Has sufficient job knowledge and applies this in practice. Requires minimum supervision.	Has some job knowledge but often needs help to apply it.	Below standards. Has insufficient job knowledge and technical skills to perform job responsibilities. Requires frequent supervision	.

Comments:	Clear development to be seen compared to the start of the internship, understands coherences of different steps in operations

CATEGORY 2: QUALITY OF DAILY WORK & PROFESSIONAL PRODUCTS (PLEASE SPECIFY PER PRODUCT, IF POSSIBLE)

1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, hardly ever makes mistakes, quality of work is superb	Very good, rarely makes mistakes, performs well and sometimes exceeds standard	Sufficient, in general makes few errors, level of deliverables is good	Standards are met, but work and deliverables are often lacking precision and consistency	Below standards, makes errors and does not perform according to the standards	

PRODUCT 1 (specify)	Again, strong development in daily work in all parts of the operations and in the language skills compared to the start of the internship, reliable staff member and always shows interest in the work.
PRODUCT 2 (specify)	Presentation of the research findings to the whole team with following discussion on solutions, presentation prepared and given in French.
PRODUCT 3 (specify)	In depth research on the impact of the glass bottles, solution in planning to be implemented in the company.

Page **1** of **4**

CATEGORY 3: MAKING JUDGEMENTS & PROBLEM-SOLVING					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, always solves problems independently, does not require any guidance.	Very good, solves most problems independently.	Sufficient, generally can solve problems independently.	Occasionally solves problems but this could be better.	Below standards, only solves problems with guidance.	
Comments:	Very patient and wants to learn, very smart.				

CATEGORY 4: LEARNING SKILLS					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, consistently learning, understanding and applying new knowledge and information.	Very good, understand and applies information easily.	Sufficient, generally understands and is able to apply new information.	Able to learn but this could be better.	Below standards, often forgets information.	
Comments:	Continuously shows interest in all operations of the company, understands instructions and applies knowledge also to unknown situations. Self-corrects and asks for help if she cannot figure out the solution, for example when pruning the vines.				

CATEGORY 5: COMMUNICATION SKILLS TOWARDS OTHERS (Guests, Employees, Suppliers, etc.)					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, consistently shares information openly.	Very good, shares information openly.	Sufficient, generally shares information.	Communicates in a sufficient manner but this could be better.	Below standards, often forgets or does not share information.	
Comments:	Johanna improves her French very quickly because she works a lot.				

CATEGORY 6: INTERACTION AND CO-OPERATION WITH COLLEAGUES AND OTHER DEPARTMENTS					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, is extremely dedicated, always knows what's going on; seeks out new information Is always very interested and social to other departments. Shows great flexibility in assisting	Clearly shows interest in other departments, is very social while interacting. Enjoys daily tasks and keep well informed of what is happening within the company	Shows interest in daily tasks, Is interested and involved with other departments, co-operates sufficiently and knows what's going on within the company.	Show occasional interest but this could be better.	Below standards, is not involved in daily tasks, at work, shows limited interest in other department and the company in general	
Comments:	Johanna is very pleasant, wants to share, easy to live with.				

CATEGORY 7: READINESS FOR THE INTERNATIONAL HOSPITALITY INDUSTRY					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent readiness to start a career in the hospitality industry.	Definitely ready for a career in the hospitality industry	Acceptable readiness for a career in the Hospitality industry	Sometimes shows not to be ready for a career in the hospitality industry	Below standards, is not ready for a career in the international hospitality industry.	
Comments:	Johanna is very mature and ready to start her career.				

REVIEW OF LAST OBJECTIVES AND ANY ADDITIONAL ACHIEVEMENTS:

All the objectives are achive. This is great!

TRAINEE'S STRENGTHS:

Interested, determined, joyful

TRAINEE'S DEVELOPMENT NEEDS:

The language skills can still be improved, also the knowledge in die wine production

TUTOR: ADDITIONAL COMMENTS (OPTIONAL):

It was a real pleasure to work with Johanna during those 4 months. She is very pleasant,,hard worker, always in a good mood. Her work is very efficient.

TRAINEE'S COMMENTS:

Comments on appraisal:	

DATE FOR FOLLOW-UP MEETING AND / OR NEXT EVALUATION:

DATE TRAINEE'S SIGNATURE:	COMPANY TUTOR'S SIGNATURE:
18.12.2022 J Lucas	18/12/2022 Agnès PAQUET

Midterm appraisal

APPRAISAL FORM

(EVALUATION FROM ALL CLIENTS IS COMPULSORY, FORMAT IS NOT)

HOTELSCHOOL THE HAGUE
Hospitality Business School

Name of student:	**Johanna Lucas**	**Student number:**	**701313**
Name of company:	**Domaine Agnès Paquet**	**Department:**	**Winery**
Name of company tutor:	**Agnès Paquet**	**Position of company tutor:**	**Owner**
Assessment no:	**1 (mid term)**	**Date:**	**18.10.2022**

CATEGORY 1: EXPERTISE / JOB KNOWLEDGE & UNDERSTANDING

1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Has an exceptional level of job knowledge, experience and insight and applies this in practice. Works independently; can train others.	Has a very good level of job knowledge, experience and insight and applies this in practice. Can work independently.	Has sufficient job knowledge and applies this in practice. Requires minimum supervision.	Has some job knowledge but often needs help to apply it.	Below standards. Has insufficient job knowledge and technical skills to perform job responsibilities. Requires frequent supervision	

Comments:	First time to be working in wine production, most procedures are new to her however she is always interested and eager to learn.

CATEGORY 2: QUALITY OF DAILY WORK & PROFESSIONAL PRODUCTS (PLEASE SPECIFY PER PRODUCT, IF POSSIBLE)

1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, hardly ever makes mistakes, quality of work is superb.	Very good, rarely makes mistakes, performs well and sometimes exceeds standard.	Sufficient, in general makes few errors, level of deliverables is good.	Standards are met, but work and deliverables are often lacking precision and consistency.	Below standards, makes errors and does not perform according to the standards.	

PRODUCT 1 (specify)	Daily work is good, however Johanna still needs help and supervision, as the job and language is new to her. She is self-critical and strives to improve every day.
PRODUCT 2 (specify)	
PRODUCT 3 (specify)	

CATEGORY 3: MAKING JUDGEMENTS & PROBLEM-SOLVING					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, always solves problems independently, does not require any guidance.	Very good, solves most problems independently.	Sufficient, generally can solve problems independently.	Occasionally solves problems but this could be better.	Below standards, only solves problems with guidance.	
Comments:	When she has encountered a similar problem before, Johanna is able to make judgements. However, some situations in the different parts of the business are still new to her.				

CATEGORY 4: LEARNING SKILLS					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, consistently learning, understanding and applying new knowledge and information.	Very good, understand and applies information easily.	Sufficient, generally understands and is able to apply new information.	Able to learn but this could be better.	Below standards, often forgets information.	
Comments:	Johanna is always interested and asks if she does not understand something. Things once learned, are applied. Sometimes still a language barrier.				

CATEGORY 5: COMMUNICATION SKILLS TOWARDS OTHERS (Guests, Employees, Suppliers, etc.]					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, consistently shares information openly.	Very good, shares information openly.	Sufficient, generally shares information.	Communicates in a sufficient manner but this could be better.	Below standards, often forgets or does not share information.	
Comments:	Always open minded and interested, however room for improvement on French speaking skills.				

CATEGORY 6: INTERACTION AND CO-OPERATION WITH COLLEAGUES AND OTHER DEPARTMENTS					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent, is extremely dedicated, always knows what's going on; seeks out new information Is always very interested and social to other departments. Shows great flexibility in assisting	Clearly shows interest in other departments, is very social while interacting. Enjoys daily tasks and keep well informed of what is happening within the company	Shows interest in daily tasks, Is interested and involved with other departments, co-operates sufficiently and knows what's going on within the company.	Show occasional interest but this could be better.	Below standards, is not involved in daily tasks, at work, shows limited interest in other department and the company in general	
Comments:	Joyful and open-minded, fits great into the team				

CATEGORY 7: READINESS FOR THE INTERNATIONAL HOSPITALITY INDUSTRY					
1: Excellent	2: Very good	3: Sufficient	4: Room for improvement	5: Insufficient	Rating:
Excellent readiness to start a career in the hospitality industry.	Definitely ready for a career in the hospitality industry	Acceptable readiness for a career in the Hospitality industry	Sometimes shows not to be ready for a career in the hospitality industry	Below standards, is not ready for a career in the international hospitality industry.	
Comments:	Determined, mature, and ready for a career. Room for improvement in the specific knowledge of winemaking.				

REVIEW OF LAST OBJECTIVES AND ANY ADDITIONAL ACHIEVEMENTS:
TRAINEE'S STRENGTHS:
TRAINEE'S DEVELOPMENT NEEDS:
TUTOR: ADDITIONAL COMMENTS (OPTIONAL):
TRAINEE'S COMMENTS:

Comments on appraisal:	

DATE FOR FOLLOW-UP MEETING AND / OR NEXT EVALUATION:	
DATE TRAINEE'S SIGNATURE:	**COMPANY TUTOR'S SIGNATURE:**
18.12.2022 J Lucas	18/12/2022 Agnès PAQUET

8.4 Client evaluations of deliverables

Evaluation Research Proposal

HOTELSCHOOL THE HAGUE
Hospitality Business School

Evaluation Form Company Project/Research
(EVALUATION FORM OF ALL CLIENTS AND ON ALL DELIVERABLES IS COMPULSORY, FORMAT IS NOT)

Name of student:	**Johanna Lucas**	**Student number:**	**701313**
Name of company/organisation:	**Domaine Agnès Paquet**	**Department:**	**Winery**
Name of company tutor/research commissioner:	**Agnès Paquet**	**Position of company tutor/commissioner (if applicable):**	**Owner**
Project and/or Deliverable: (please specify)	**Research proposal report on the reduction of the CO2 footprint of the company, basis for final company project report.**		
For this final evaluation the project has been delivered by the student and is thus evaluated. This is taken into consideration for the final assessment of the student.			

Page **1** of **3**

CATEGORY 3: INFORMED JUDGEMENTS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The research process is done and explained in an excellent way. All statements, conclusions and recommendations are underpinned with the data collected by the students and/or referencing. The analysis is very substantial.	The research process is done and explained well. Most statements, conclusions and recommendations are underpinned with the data collected by the student and/or referencing. The analysis is substantial.	Weak problem analysis, research question not clear enough. Data collection and/or methodology is insufficient. Weak analysis, use of data from one dimension and not backed up.	Clear reasoning and plan for further research, well-funded.
CATEGORY 4: COMMUNICATION AND SHARING KNOWLEDGE				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Excellent ability to communicate information, ideas, problems and solutions to all stakeholders involved. The deliverable adds great value to the main stakeholders. Initial and creative channels have been actively used to share outputs and knowledge.	Good ability to communicate information, ideas, problems and solutions to stakeholders. The deliverable adds value to the company. Existing channels have been used to share knowledge	The deliverable could have been better delivered to the stakeholders. The deliverable could have added more value, if better delivered. No active communication of outputs and knowledge.	Clear final report, follows a logical structure and discussed possible outcomes. Tailored to the company.

CATEGORY 5: INTERCULTURAL HOSPITALITY LEADERSHIP				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Student can lead the project by themselves. Student is self-critical towards improvement and takes feedback to heart. Student deals with a diversity of stakeholders in an intercultural competent way. Hospitality mindset is seen in project or work in a very distinct way.	Student can lead the project with little help. Student is critical towards improvement and listens to feedback. Student deals with different stakeholders. Hospitality mindset can be seen.	Tasks performed are described and not critically analyzed. Student is not too critical towards own learning and can listen better to feedback. Student does not know how to deal with differences in stakeholders. Hospitality can be improved.	Took the lead on the carbon footprint project.

OVERALL COMMENTS:

The research work was very extensive. It allowed us to understand the changes necessary to improve our carbon footprint. Their implementation is starting as soon as possible.

STUDENTS' COMMENTS:

Comments on evaluation:	

DATE & STUDENT'S SIGNATURE:	**COMPANY SUPERVISOR'S/RESEARCH COMMISSIONER'S SIGNATURE:**
18.12.2022 J Lucas	18/12/2022 Agnès PAQUET

THE COMPLETED FORMS (ON ALL DELIVERABLES AND PERFORMANCE) NEED TO BE EMAILED TO THE LYCAR COACH AND PUT IN THE APPENDICES OF THE CAREER PORTFOLIO

CATEGORY 1: EXPERTISE/KNOWLEDGE OF THE FIELD				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	In-depth use of relevant literature and knowledge of the field. The deliverable shows excellent thinking capacity of the student (considering all significant factors and looking from all different perspectives).	Use of relevant literature and knowledge of the field. The deliverable shows mostly intellectual depth (considering significant factors and looking from different perspectives).	No or incorrect use of literature and knowledge of the field. The deliverable lacks intellectual depth.	Extensive research on the carbon footprint and its impact. Clear and logical structure, great basis for a final project. Excellent analysis of literature.

CATEGORY 2: KNOWLEDGE APPLICATION/SOLVING PROBLEMS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The theories and models are skillfully applied and the student can translate this in a unique solution and implementation. The student can relate situations to concepts that results into a solution that adds great value to the company's overall strategy. The creative solution is/can be implemented and evaluated and is solving the problem.	The student uses theory, models, and shows understanding of the issues at hand. The solution is realistic and implementable for the company. The solution is/can be implemented and evaluated.	Mentioning theory and models, but not using them in the correct way. The student cannot convince of the possibilities to implement and evaluate. It is not solving the problem.	Correlations are understood and pointed out, the knowledge is applied to the company.

Evaluation staff presentation

HOTELSCHOOL THE HAGUE
Hospitality Business School

Evaluation Form Company Project/Research
(EVALUATION FORM OF ALL CLIENTS AND ON ALL DELIVERABLES IS COMPULSORY, FORMAT IS NOT)

Name of student:	**Johanna Lucas**	**Student number:**	**701313**
Name of company/organisation:	**Domaine Agnès Paquet**	**Department:**	**Winery**
Name of company tutor/research commissioner:	**Agnès Paquet**	**Position of company tutor/commissioner (if applicable):**	**Owner**
Project and/or Deliverable: (please specify)	**Presentation of the research to entire staff with afterwards initiated discussion and brainstorming session on potential solutions**		
For this final evaluation the project has been delivered by the student and is thus evaluated. This is taken into consideration for the final assessment of the student.			

Page **1** of **3**

CATEGORY 1: EXPERTISE/KNOWLEDGE OF THE FIELD				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	In-depth use of relevant literature and knowledge of the field. The deliverable shows excellent thinking capacity of the student (considering all significant factors and looking from all different perspectives).	Use of relevant literature and knowledge of the field. The deliverable shows mostly intellectual depth (considering significant factors and looking from different perspectives).	No or incorrect use of literature and knowledge of the field. The deliverable lacks intellectual depth.	Very well-funded and in-depth research in scientific literature and other reliable sources lead to a round and well presented result.

CATEGORY 2: KNOWLEDGE APPLICATION/SOLVING PROBLEMS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The theories and models are skillfully applied and the student can translate this in a unique solution and implementation. The student can relate situations to concepts that results into a solution that adds great value to the company's overall strategy. The creative solution is/can be implemented and evaluated and is solving the problem.	The student uses theory, models, and shows understanding of the issues at hand. The solution is realistic and implementable for the company. The solution is/can be implemented and evaluated.	Mentioning theory and models, but not using them in the correct way. The student cannot convince of the possibilities to implement and evaluate. It is not solving the problem.	Understood the problem at hand and analyzed it from all relevant angles. The presentation was beneficial for all the staff.

CATEGORY 3: INFORMED JUDGEMENTS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The research process is done and explained in an excellent way. All statements, conclusions and recommendations are underpinned with the data collected by the students and/or referencing. The analysis is very substantial.	The research process is done and explained well. Most statements, conclusions and recommendations are underpinned with the data collected by the student and/or referencing. The analysis is substantial.	Weak problem analysis, research question not clear enough. Data collection and/or methodology is insufficient. Weak analysis, use of data from one dimension and not backed up.	Use of a substantial amount of academic and other reliable sources, solution based on clear and logical reasoning. Reliable and extensive collection of primary data.
CATEGORY 4: COMMUNICATION AND SHARING KNOWLEDGE				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Excellent ability to communicate information, ideas, problems and solutions to all stakeholders involved. The deliverable adds great value to the main stakeholders. Initial and creative channels have been actively used to share outputs and knowledge.	Good ability to communicate information, ideas, problems and solutions to stakeholders. The deliverable adds value to the company. Existing channels have been used to share knowledge	The deliverable could have been better delivered to the stakeholders. The deliverable could have added more value, if better delivered. No active communication of outputs and knowledge.	Well structured presentation, clear to all staff members.

CATEGORY 5: INTERCULTURAL HOSPITALITY LEADERSHIP				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Student can lead the project by themselves. Student is self-critical towards improvement and takes feedback to heart. Student deals with a diversity of stakeholders in an intercultural competent way. Hospitality mindset is seen in project or work in a very distinct way.	Student can lead the project with little help. Student is critical towards improvement and listens to feedback. Student deals with different stakeholders. Hospitality mindset can be seen.	Tasks performed are described and not critically analyzed. Student is not too critical towards own learning and can listen better to feedback. Student does not know how to deal with differences in stakeholders. Hospitality can be improved.	Took the lead on the carbon footprint project.

OVERALL COMMENTS:

The presentation was very interesting. It permitted a real analysis of the company and a reflexion on the changes that can be made to improve the company's carbon footprint . After a brainstorming, 3 amelioration axes have been chosen. The idea is to reevaluate the situation one year after the beginning of those changes.

STUDENTS' COMMENTS:

Comments on evaluation:	

DATE & STUDENT'S SIGNATURE:	**COMPANY SUPERVISOR'S/RESEARCH COMMISSIONER'S SIGNATURE:**
18.12.2022 J Lucas	18/12/2022 Agnès PAQUET

THE COMPLETED FORMS (ON ALL DELIVERABLES AND PERFORMANCE) NEED TO BE EMAILED TO THE LYCAR COACH AND PUT IN THE APPENDICES OF THE CAREER PORTFOLIO

Evaluation lighter bottles

HOTELSCHOOL THE HAGUE
Hospitality Business School

Evaluation Form Company Project/Research
(EVALUATION FORM OF ALL CLIENTS AND ON ALL DELIVERABLES IS COMPULSORY, FORMAT IS NOT)

Name of student:	Johanna Lucas	**Student number:**	701313
Name of company/organisation:	Domaine Agnès Paquet	**Department:**	Winery
Name of company tutor/research commissioner:	Agnès Paquet	**Position of company tutor/commissioner (if applicable):**	Owner
Project and/or Deliverable: (please specify)	Implementation of lighter bottles (511g vs. 595g)		

For this final evaluation the project has been delivered by the student and is thus evaluated. This is taken into consideration for the final assessment of the student.

Page **1** of **3**

CATEGORY 1: EXPERTISE/KNOWLEDGE OF THE FIELD				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	In-depth use of relevant literature and knowledge of the field. The deliverable shows excellent thinking capacity of the student (considering all significant factors and looking from all different perspectives).	Use of relevant literature and knowledge of the field. The deliverable shows mostly intellectual depth (considering significant factors and looking from different perspectives).	No or incorrect use of literature and knowledge of the field. The deliverable lacks intellectual depth.	Very well-funded and in-depth research and analyses lead to the solution of reducing the weight of the bottles.

CATEGORY 2: KNOWLEDGE APPLICATION/SOLVING PROBLEMS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The theories and models are skillfully applied and the student can translate this in a unique solution and implementation. The student can relate situations to concepts that results into a solution that adds great value to the company's overall strategy. The creative solution is/can be implemented and evaluated and is solving the problem.	The student uses theory, models, and shows understanding of the issues at hand. The solution is realistic and implementable for the company. The solution is/can be implemented and evaluated.	Mentioning theory and models, but not using them in the correct way. The student cannot convince of the possibilities to implement and evaluate. It is not solving the problem.	Understood the problem at hand and analyzed it from all relevant angles. The solution is in the progress of being implemented at the company.

CATEGORY 3: INFORMED JUDGEMENTS				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	The research process is done and explained in an excellent way. All statements, conclusions and recommendations are underpinned with the data collected by the students and/or referencing. The analysis is very substantial.	The research process is done and explained well. Most statements, conclusions and recommendations are underpinned with the data collected by the student and/or referencing. The analysis is substantial.	Weak problem analysis, research question not clear enough. Data collection and/or methodology is insufficient. Weak analysis, use of data from one dimension and not backed up.	Use of a substantial amount of academic and other reliable sources, solution based on clear and logical reasoning. Reliable and extensive collection of primary data.
CATEGORY 4: COMMUNICATION AND SHARING KNOWLEDGE				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Excellent ability to communicate information, ideas, problems and solutions to all stakeholders involved. The deliverable adds great value to the main stakeholders. Initial and creative channels have been actively used to share outputs and knowledge.	Good ability to communicate information, ideas, problems and solutions to stakeholders. The deliverable adds value to the company. Existing channels have been used to share knowledge	The deliverable could have been better delivered to the stakeholders. The deliverable could have added more value, if better delivered. No active communication of outputs and knowledge.	Clear and logical reasoning.

CATEGORY 5: INTERCULTURAL HOSPITALITY LEADERSHIP				
Rating	**Excellent**	**Good**	**Room for improvement**	**Comments**
	Student can lead the project by themselves. Student is self-critical towards improvement and takes feedback to heart. Student deals with a diversity of stakeholders in an intercultural competent way. Hospitality mindset is seen in project or work in a very distinct way.	Student can lead the project with little help. Student is critical towards improvement and listens to feedback. Student deals with different stakeholders. Hospitality mindset can be seen.	Tasks performed are described and not critically analyzed. Student is not too critical towards own learning and can listen better to feedback. Student does not know how to deal with differences in stakeholders. Hospitality can be improved.	Listens attentively to feedback and implements it right away. Took the lead on the carbon emission project.

OVERALL COMMENTS:
Johanna's work on the research bottle was well constructed. She approached a lot of different suppliers in find the best bottle at the end.

STUDENTS' COMMENTS:	
Comments on evaluation:	

DATE & STUDENT'S SIGNATURE:	**COMPANY SUPERVISOR'S/RESEARCH COMMISSIONER'S SIGNATURE:**
18.12.2022 J Lucas	18/12/2022 Agnès PAQUET

THE COMPLETED FORMS (ON ALL DELIVERABLES AND PERFORMANCE) NEED TO BE EMAILED TO THE LYCAR COACH AND PUT IN THE APPENDICES OF THE CAREER PORTFOLIO

8.5 Stakeholder analysis Agnès Paquet

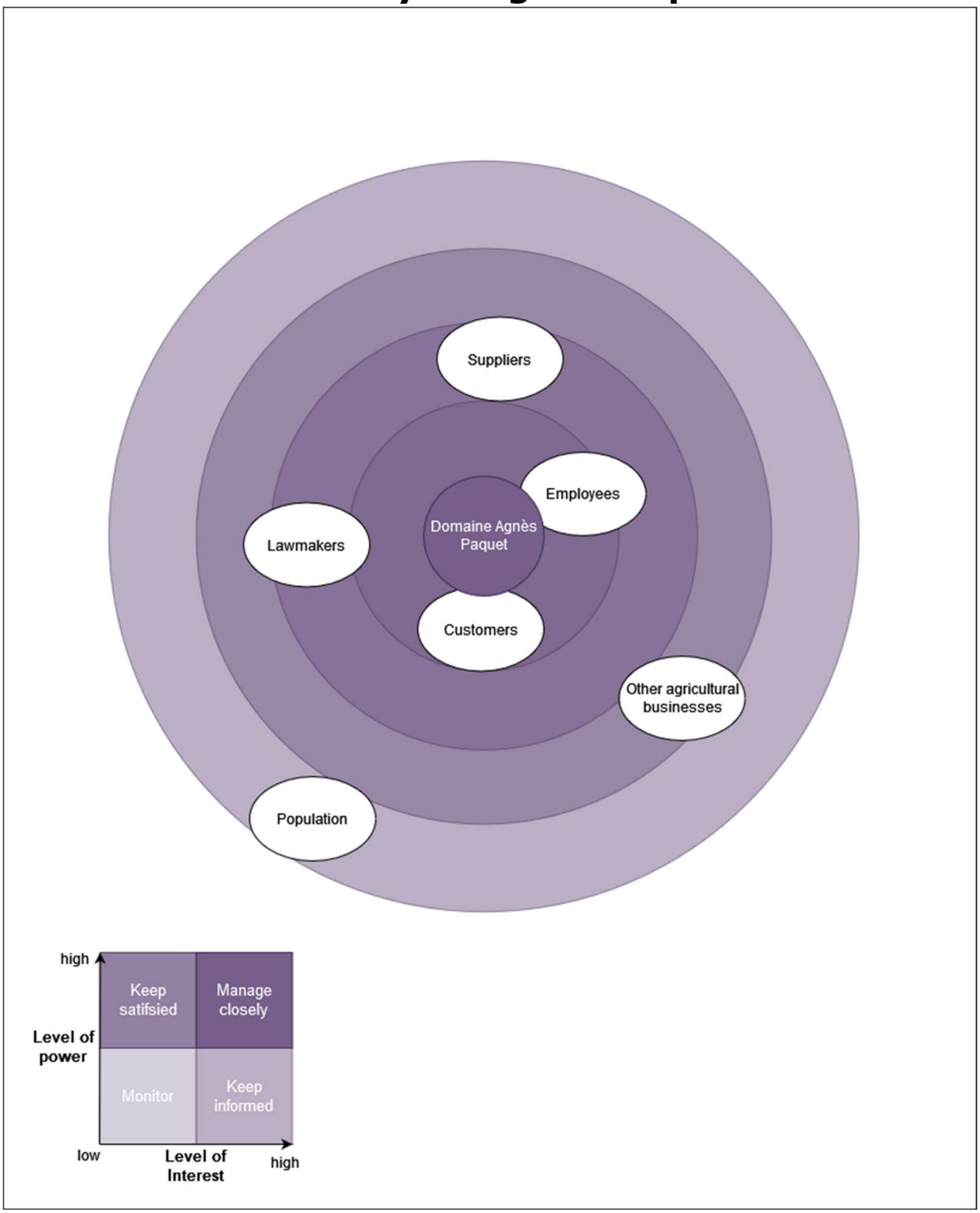


Figure 13 - Stakeholder map Agnès Paquet

8.6 Capture and utilization of CO_2

To reduce a winery's carbon footprint, the CO_2 emitted during the alcoholic fermentation of the wine can be utilized and turned into the demanded chemical sodium carbonate (Na_2CO_3). This can be done by reacting sodium hydroxide (NaOH) with the CO_2 and filtering the desired product out (ibid). To increase sustainability, the waste from the reaction is utilized in the fermentation again, creating circularity (ibid).

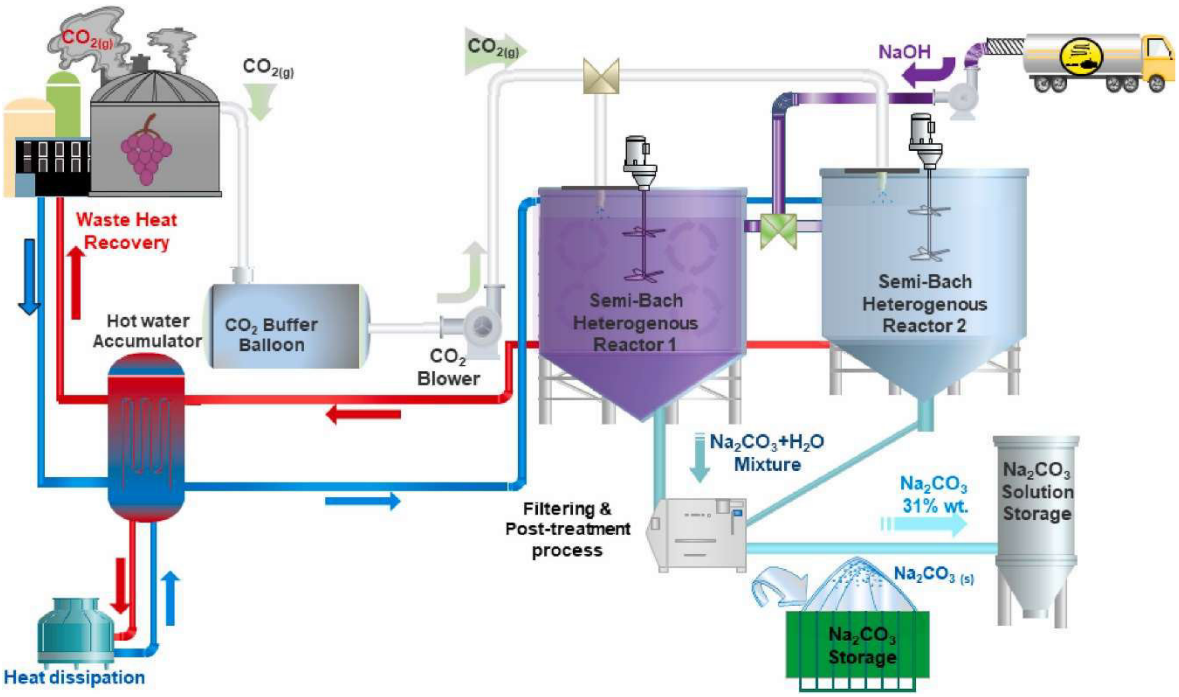


Figure 14 - Sodium carbonate production through CO_2 utilization (Gueddari-Aourir et al., 2022)

8.7 GHG Protocol reporting principles

Principle	Definition
Relevance	Ensure the GHG inventory appropriately reflects the GHG emissions (and removals, if applicable) of the company and serves the decision-making needs of users – both internal and external to the company.
Completeness	Account for and report on all GHG emissions (and removals, if applicable) from sources, sinks, and activities within the inventory boundary. Disclose and justify any specific exclusions.
Consistency	Use consistent methodologies to allow for meaningful performance tracking of emissions (and removals, if applicable) over time and between companies. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
Transparency	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
Accuracy	Ensure that the quantification of GHG emissions (and removals, if applicable) is systematically neither over nor under actual emissions (and removals, if applicable), and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.
Conservativeness	Use conservative assumptions, values, and procedures when uncertainty is high. Conservative values and assumptions are those that are more likely to overestimate GHG emissions and underestimate removals, rather than underestimate emissions and overestimate removals.
Permanence	Ensure mechanisms are in place to monitor the continued storage of reported removals, account for reversals, and report emissions from associated carbon pools.

Figure 15 - GHG Protocol Reporting Principles (Downing et al., 2022)

8.8 Training on calculating CO_2 emissions

Certificate of attendance by TÜV Nord

Frau Johanna Lucas

hat am Webinar

Klimaschutz in Unternehmen

Maßnahmenplanung für den CO_2-neutralen Betrieb

am 04.10.2022 teilgenommen
(Schulungsdauer 8 Unterrichtseinheiten).

Es wurden folgende Themen behandelt:

- Grundlagen klimaneutrales Unternehmen
  - Notwendigkeit, weniger CO_2 auszustoßen
  - Unterschiede Klimaneutralität im Unternehmen, einer Produktion, eines Projektes oder eines Produktes
  - Zusammensetzung des Carbon Footprints
  - Weitere klimaschädliche Gase/Bewertung der Klimaschädlichkeit (GWP-Werte)
  - Bilanzkreis Scope 1–3
  - Emissionshandel nach TEHG/aktueller Preis für CO_2
  - Politische Rahmenbedingungen Einschätzung der zukünftigen Gesetze/Klimaschutzkonzept und CO_2-Preis

- Der Weg zur CO_2-neutralen Produktion in drei Phasen
  - Bilanzkreis festlegen Scope 1–3
  - Ist-Stand des Carbon Footprints feststellen: Berechnung des individuellen CO_2-Ausstoßes
  - Kompensationsmöglichkeiten bewerten
  - Gesamtkonzept und Soll-Bilanz

- Wichtige Tools zum dauerhaft CO_2-neutralen Unternehmen
  - Nachhaltigkeitsmanagementsystem ISO 26000
  - Energiemanagementsystem ISO 50001
  - Umweltmanagementsystem EMAS
  - Energie-Daten-Monitoring

Hamburg, 04.10.2022

TÜV NORD Akademie
OnlineCampus
Der Leiter

Roland Katholing

8.9 Preliminary interview Agnès Paquet

Colour-coded preliminary interview from 22 September 2022 with Agnès Paquet. The colour-coding is assigned as follows:

Colour	Finding related to
	Scope 1
	Scope 2
	Scope 3
	Other

Greeting, expression of gratitude, explanation of the goal of the interview, and introduction into the topic.

General Questions

Johanna Lucas: How many hectares of vines do you currently cultivate?

Agnès Paquet: Altogether 13.35 hectares from the appellations Auxey-Duresses, Hautes-Côtes de Beaune, Bourgogne Aligoté and Pommard.

JL: And how much wine you produce in one year?

AP: Let me check, a representative year are 675 hectolitres.

JL: What is the carbon footprint of one 0,75l bottle of wine?

AP: We have never determined it before.

JL: What other measurable indicators do you use to track you GHG emissions or other sustainable practices?

AP: Not for GHG emissions, but we are certified by Ecocert as Agriculture Biologique, so organic farming, from the vintage 2021 onwards, the wines carry the certification AB. But you know, organic does not equal ecologic. Because we do not use synthetic fertilizers or pesticides, we have to go to the vine areas more often to decide which next steps to take. It really depends on the weather and on the state of the plants, sometimes we have to go there and check daily. Then of course, we use more fuel. Also, we harvest everything by hand which takes more time.

Scope 1

JL: How many and which vehicles running on fossil fuels do you currently use at the Domaine?

AP: Three tractors, one Peugeot Partner, one Renault Master, two pickup trucks and three forklifts, so ten in total. And during the harvest we use two extra pickup trucks, one minibus, one Renault Trafic and a large 20m³ trailer.

JL: To what extend are they used regarding fuel combustion?

AP: The tractors have a special fuel, the forklift use propane. I can give you all the fuel invoices.

JL: To what extend is nitrogen fertilizer used at the Domaine?

AP: It is not used at all; we only use natural fertilizer.

JL: Do you use any refrigerators that are not based on electricity but on gas?

AP: No, they are all powered by electricity.

JL: Are there any other gases or other materials combusted to generate heat?

AP: No

JL: Are there any gas leakages?

AP: No, neither.

Scope 2

JL: How much electricity does the Domaine need to run their operations?

AP: You can get all the electricity bills.

JL: Which electricity provider do you have?

AP: EDF, it is the biggest one in France.

JL: How much of the used electricity is self-produced?

AP: None, it is all purchased.

Scope 3

JL: Who is the bottle supplier?

AP: Verreries de Bourgogne and BVS.

JL: Where are the bottles finally distributed to?

AP: Worldwide, in Europe but also to Russia, Hong Kong and the USA.

JL: How many to which country/region/store?

AP: You can have a look at the logistics companies invoices.

JL: How are the bottles transported?

AP: In Europe by car, across the ocean by ship.

JL: To what extend does staff commute to and from work?

AP: Julien and Eugénie. Julien every day from Chagny to Meloisey since May, that are 20km per route, so 40km per day. And Eugénie since August every two weeks for two weeks 11km per route, so 22km per day.

JL: What are the modes of transportation?

AP: Both by car.

Closing

JL: What else would you like to add?

AP: I would like to know the carbon footprint of the Domaine. Could you calculate it?

Explanation of further process with the new information and the project, expression of gratitude

8.10 Follow-up interview Agnès Paquet

Colour-coded follow-up interview from 24 November 2022 with Agnès Paquet. The colour coding is assigned as follows:

Colour	Finding related to
	Bottles
	Solar panels
	Water tank
	Other

Johanna Lucas (JL): Thank you very much for your time. So, the results show that the glass bottles make up by far the largest percentage of the total carbon footprint. In our case even the majority, that however is because I have not included all of the emissions. The distribution would also take a bigger part, and hence reduce the share of the bottles. So it would make most sense to tackle the bottles, to find a lighter bottle. Also, the fuel would be something to look at. And otherwise we could think about the solar panels again or the capture of rainwater.

Agnès Paquet (AP): The bottles are good as the first one to focus on, I will give you the contacts to our bottle suppliers. The fuel is a bit difficult; we cannot drive less often to the vines. We can reduce small, unnecessary trips but most of the fuel is used for the vines or in the vines by the tractors. When we have the new building in Meloisey, we do not have to drive to Beaune that often. That will already decrease the fuel use. We had thought about solar panels once before on the large roof, but that would have very prominent and disturbed the look of the Domaine. I can give you the quotation though. You can think about the roof in between the big roof and the office, the labelling room, or your apartment.

JL: Okay great, thank you. And the rainwater you said you thought about before as well?

AP: Yes, we had the idea. You can also look into it; we are planning on tearing down the old house next to your apartment. That is cheaper than restoring it. And there we can put a rainwater tank afterwards. However, we do not know yet, how we are going to use the space. Either another cellar for the wine, then we could put the tank on top, or an additional parking space, then the tank would need to be underground. But the teardown is also still going to take some time.

JL: Okay, to I will look into that as well. However, we only have the water usage data on a quarterly basis, so we do not know the maximum water usage per month. And therefore, also not the required capacity for the water tank.

AP: The month in which we use the most water is clearly always the month of the harvest. We clean all the machines several times a day, the buckets, everything. Then we will just have to track our monthly water usage next year, especially in the month of the harvest.

JL: That sounds good. The I will look into those three, the bottles, the solar panels, and the water tank. But with the bottles being the earliest possible to be implemented.

AP: Yes, great.

JL: The cardboard bottles from Frugalbottle you sent me are great, but I do not know if they fit the winery and the customers.

AP: No, that was also just an idea. The cardboard does not fit to Burgundy, they will be perceived as lower value and probably not get sold to the clients. Even with the glass bottles you have to be careful that they are not too light. A heavier bottle is always

perceived as a higher quality of wine. For our Patience cuvee we also use different bottles. You need to check that they also fit our technical requirements. The filling level is the most important. Verreries de Bourgogne has all of our data, they know what we need. I will give you the contacts.

JL: Great, thank you very much. I will reach out to them. Have a great day.

AP: Thank you, you too.

8.11 Data collection and calculations

The following is the extract of the data collection and calculation of the GHG emissions

Carbon footprint analysis Domaine Agnès Paquet

Reporting Period
01 August 2021 to 31 July 2022

Scope 1
Direct emissions
Business travel with company's vehicle
Transport with company's vehicle
Burning of fossil fuels for internal combustion
Technical gases
Other

Scope 2
Indirect emissions
Energy from external sources
Other

Scope 3
Indirect emissions upstream
Purchased goods and services
Capital goods
Chemical base material
Wood, paper, cardboard
Plastic
Metal
Minerals and building material
Water
Fuel and energy related emissions
Transport with external vehicles
Waste
Business travel with external vehicles
Employee commute
Rented properties
Foods
Other
Indirect emissions downstream
Transport and distribution
Processing of sold products
Usage of sold products
Disposal of sold products
Rented out properties
Franchising
Investments
Other

Scope 1

Fuel combustion

Monthly fuel usage

Month	Type of fuel	Total amount in litres	Litres									
Aug 21	Diesel	41,91	41,91									
	Gasoline	10,44	10,44									
	GNR extra	0,00										
Sep 21	Diesel	488,97	65,84	88,56	46,21	75,75	60,94	46,31	42,20	25,84	37,32	
	Gasoline	160,70	31,47	12,46	18,67	40,12	57,98					
	GNR extra	788,00	788,00									
Okt 21	Diesel	116,36	39,26	52,65	24,45							
	Gasoline	114,82	46,23	29,67	38,92							
	GNR extra	0,00										
Nov 21	Diesel	404,78	82,93	49,75	75,65	71,14	45,24	50,92	29,15			
	Gasoline	89,54	28,98	21,75	38,81							
	GNR extra	0,00										
Dez 21	Diesel	93,80	61,49	32,31								
	Gasoline	153,06	35,99	40,67	33,74	42,66						
	GNR extra	0,00										
Jan 22	Diesel	373,50	22,59	69,80	38,45	42,38	49,32	73,40	44,74	32,82		
	Gasoline	95,55	41,62	53,93								
	GNR extra	0,00										
Feb 22	Diesel	384,15	81,20	29,93	44,47	69,14	87,59	49,76	22,06			
	Gasoline	86,63	32,90	53,73								
	GNR extra	0,00										
Mrz 22	Diesel	396,13	0,05	37,69	49,95	23,64	49,20	74,79	85,30	75,51		
	Gasoline	44,84	16,64	28,20								
	GNR extra	573,00	573,00									
Apr 22	Diesel	378,29	44,35	23,05	39,97	49,73	64,04	64,04	52,55	40,56		
	Gasoline	240,75	51,64	52,87	53,32	30,55	17,48	34,89				
	GNR extra	0,00										
Mai 22	Diesel	215,38	49,29	52,96	46,12	20,77	21,35	24,89				
	Gasoline	134,50	48,64	85,86								
	GNR extra	0,00										
Jun 22	Diesel	501,74	28,44	64,13	24,94	56,91	56,91	56,39	49,06	73,72	39,63	51,61
	Gasoline	94,99	55,27	15,00	10,00	14,72						
	GNR extra	1264,00	666,00	598,00								
Jul 22	Diesel	518,54	60,61	54,21	49,38	86,58	45,39	43,97	58,28	56,67	63,45	
	Gasoline	105,03	26,00	20,20	4,98	53,85						
	GNR extra	0,00										

Monthly propane usage

Month	Number of units (13kg)	Total
Aug 21	3	
Sep 21	3	
Okt 21	6	
Nov 21	1	
Dez 21		
Jan 22	2	
Feb 22	2	
Mrz 22	5	
Apr 22		
Mai 22	4	
Jun 22		
Jul 22		26

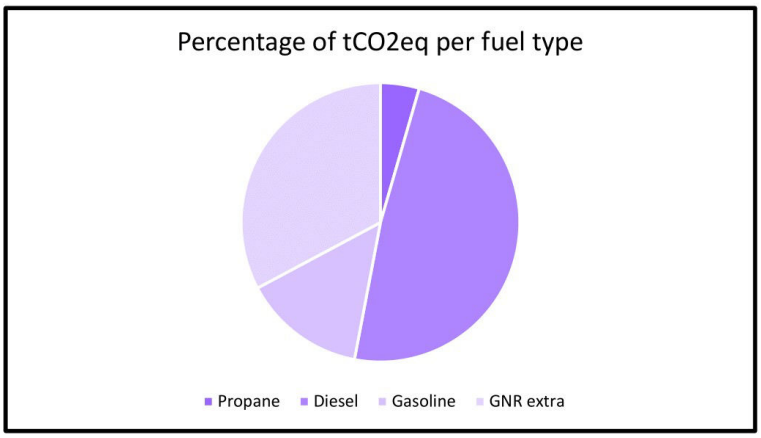
Glossary
GNR Gazole non routier

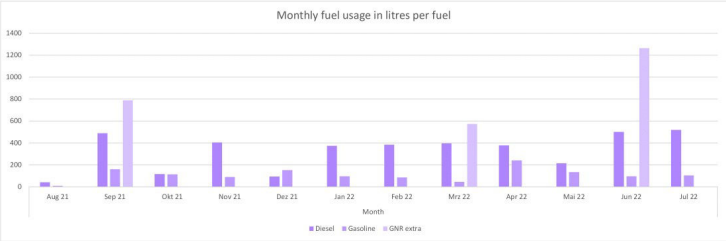
Dashboard

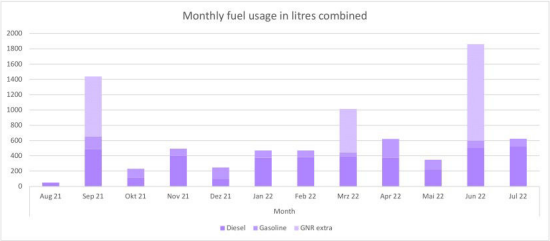
KWh per unit propane:	179
Total kWH produced	4654

	Litres	Gallons
Diesel total:	3913,55	1033,96
Gasoline total:	1330,85	351,61
GNR Extra total:	2625,00	693,53

Fuel type	Total tCO2eq	Percent
Propane	0,98	4,50%
Diesel	10,56	48,50%
Gasoline	3,10	14,23%
GNR extra	7,14	32,78%
Total	21,78	100,00%

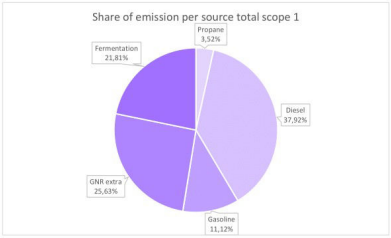






Emissions through fermentation

Emissions through fermentation			
		Unit	Source
Total wine produced	67500,00	l	Interview Agnès Paquet, 2022
Average of CO2 emitted during fermentation	90	g/l	D'alberti et al., 2019
Total of CO2 emitted during fermentation	6075000,00	g	
Total of CO2 emitted during fermentation	**6,08**	t	



Scope 2

Purchased electricity

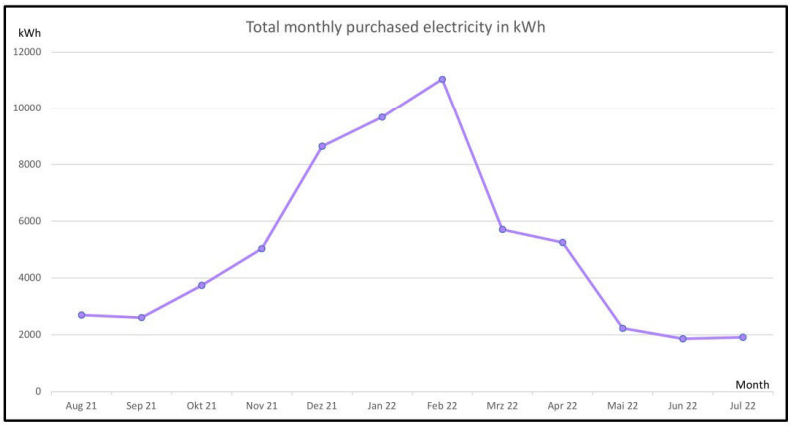
Location	Monthly KWh												Total KWh
	Aug 21	Sep 21	Okt 21	Nov 21	Dez 21	Jan 22	Feb 22	Mrz 22	Apr 22	Mai 22	Jun 22	Jul 22	
Winery Meloisey	2629	2537	3658	4212	6379	7595	8496	4420	4420	2003	1768	1844	49961
Storage Beaune	67	69	83	819	2264	2079	2544	1291	831	225	93	65	10430
Total	2696	2606	3741	5031	8643	9674	11040	5711	5251	2228	1861	1909	60391

Location	Monthly kg CO2eq market based												Total kg CO2eq
	Aug 21	Sep 21	Okt 21	Nov 21	Dez 21	Jan 22	Feb 22	Mrz 22	Apr 22	Mai 22	Jun 22	Jul 22	
Winery Meloisey	139,86	134,97	194,61	224,08	339,36	404,05	451,99	235,14	235,14	106,56	94,06	98,10	2657,93
Storage Beaune	3,56	3,67	4,42	43,57	120,44	110,60	135,34	68,68	44,21	11,97	4,95	3,46	554,88
Total	143,43	138,64	199,02	267,65	459,81	514,66	587,33	303,83	279,35	118,53	99,01	101,56	3212,80

CO2 Factor kg/KWh electricity mix France	0,0532	Source GHG Protocol

Location	Monthly kg CO2eq location based												Total kg CO2eq
	Aug 21	Sep 21	Okt 21	Nov 21	Dez 21	Jan 22	Feb 22	Mrz 22	Apr 22	Mai 22	Jun 22	Jul 22	
Winery Meloisey	126,19	121,78	175,58	202,18	306,19	364,56	407,81	212,16	212,16	96,14	84,86	88,51	2398,13
Storage Beaune	3,22	3,31	3,98	39,31	108,67	99,79	122,11	61,97	39,89	10,80	4,46	3,12	500,64
Total	129,41	125,09	179,57	241,49	414,86	464,35	529,92	274,13	252,05	106,94	89,33	91,63	2898,77

CO2 Factor kg/KWh electricity mix EDF	0,048	Source EDF Group Pack ESG 2022	Total tCO2eq	2,90



Scope 3

Carbon sequestration 2021 2022

Vine area

Cultivated white

Location	Hectares	Planted in	Age (years)
Auxey-Duresses	2,5	1930	92
	1	2016	6
Hautes-Côtes de Beaune			
Baubigny	0,6	1970	52
	0,15	2017	5
La lié	0,4	2015	7
Aligoté			
Topo	0,4	2017	5
Plumes	0,9	1970	52
Total	**5,95**		

Cultivated red

Location	Hectares	Planted in	Age (years)
Auxey-Duresses	0,6	2000	22
	0,6	1970	52
Hautes-Côtes de Beaune			
Melin	0,4	2016	6
Red	2	1980	42
Pommard	0,35	1934	88
	0,35	2013	9
Croquomots	0,8	1980	42
Total	**5,1**		

Not cultivated

Hectares	Total
0,5	
0,5	
0,5	
0,8	**2,3**

Average sequestration of carbon per hectare per year in tCOeq	2,84
Source	(Wines GB, 2022)

Total hectares	**13,35**
Total sequestration tCO2eq	**37,91**

Bottles

Purchased bottles per size

Bottle type	Half bottle	Bottle	Magnum	Jeroboam
Capacity in litres	0,375	0,75	1,5	3
Purchases	1109	2115	99	80
	1216	7810	999	80
		6566	989	40
		3345	54	
		10637	870	
		7948	76	
		3277		
		18182		
		11450		
		2474		
		3578		
		4378		
		1555		
Total purchases	**2325**	**83315**	**3087**	**200**
CO2eq per bottle in g	0,30	0,48	0,65	1,41
tCO2eq total	**0,69**	**40,15**	**2,00**	**0,28**
			Total	**43,12**

CO2eq in kg per kg glass bottle	0,81
Source: (ademe.fr, 2022)	

Weight per glass bottle size in g			
Fillette	Bottle	Magnum	Jeroboam
365	595	800	1740
Source: (verreriesdebourgogne.fr, 2022)			

90% of 0,75l bottle weight in g	535,5

Calculation solution

	Capacity in l	Weight in g	CO2eq per bottle in g
Current bottle	0,75	595	0,48
New bottle	0,75	511	0,41

Units sold in reporting year	83315
tCO2eq caused by old bottles	40,15
tCO2eq caused if new bottles were used	34,48

Decrease tCO2eq	5,67
%	85,89
Decrease %	14,11

Bottle type	Half bottle	Bottle	Magnum	Jeroboam
Capacity in litres	0,375	0,75	1,5	3
Total	2325	83315	3087	200
CO2eq per bottle in g	0,30	0,48	0,65	1,41
tCO2eq total	0,69	40,15	2,00	0,28
			Total	**43,12**

Water consumption

Water consumption

Month	Purchased water in m³
Total	**335**

CO2eq in tons per 100 m³ water	0,013
Source: (Ademe.fr, 2022)	

Total CO2eq per year in tons	**0,04**

Staff commute

	Employee 1
Distance per two way commute in km	38
Number of two way commutes	65
Distance driven in km	2470
Fuel type	Gasoline
Fuel usage l/100km	5,4
Total fuel used in l	**133,38**
Total tCO2eq emitted	**0,31**

Month	Mai 22	Jun 22	Jul 22	Note: the employee started
Number of commutes two way	22	22	21	working at the winery on 2
Source: Interview (Paquet, 2022)		**Total**	**65**	May 2022. Hence,

Calculation on emissions caused by staff commute extracted from the GHG Protocol calculation tool

									GHG Emissions (tonnes CO2e)					Emission Factor	
Year	Description	Facility ID	Activity Type	Fuel Source	Vehicle Type	Activity Amount	Final Activity	Unit of Fuel Amount	CO_2 (tonnes)	CH_4 (tonnes)	N_2O (tonnes)	**CO_2e (tonnes)**	Biofuel CO_2 (tonnes)	EF ($kgCO_2e$/unit)	Source
2021/2022	Combustion Gasoline	1	Fuel Use	Motor Gasoline	Gasoline Passenger	133,38	133,38	L	0,309	0,000014	0,000003	**0,311**	0,000000	8,812	EPA, "Emission Factors for Greenhouse Gas Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission Factors from Cross-Sector Tools, April 2014

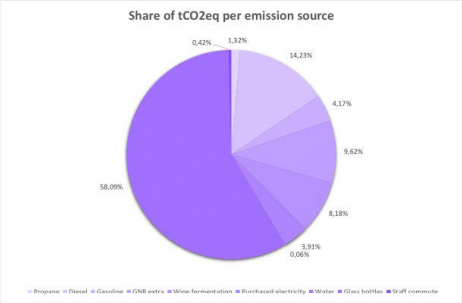
Summary results

Total carbon footprint

Total emissions Domaine Agnès Paquet

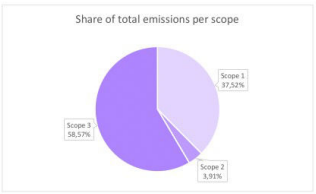
	Emission Source	tCO2eq	Percent
Scope 1	Propane	0,98	1,32%
	Diesel	10,56	14,23%
	Gasoline	3,10	4,17%
	GNR extra	7,14	9,62%
	Wine fermentation	6,08	8,18%
Scope 2	Purchased electricity	2,90	3,91%
Scope 3	Water	0,04	0,06%
	Glass bottles	43,12	58,09%
	Staff commute	0,31	0,42%
Total		**74,23**	**100,00%**
Scope 3	Carbon sequestration	37,91	51,07%
Total calculated carbon footprint		**36,32**	**48,93%**
Carbon footprint per 0,75l bottle		**0,0004**	
Carbon footprint per 0,75l bottle in kg		**0,40**	

Total wine produced in l	67500
Total wine sold, calculated in standadized unit 0,75l	**90000**



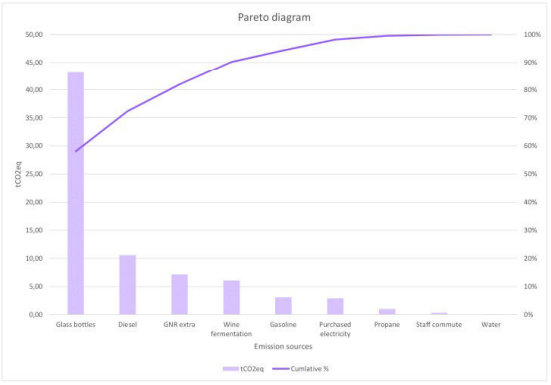
Share of total emissions per scope

	tCO2eq	Percent
Scope 1	27,85	37,52%
Scope 2	2,90	3,91%
Scope 3	43,48	58,57%
Total	**74,23**	**100,00%**



Pareto Analysis of GHG emissions

Emission Sou	tCO2eq	% of total	Cumlative %
Glass bottles	43,12	58,09%	58,09%
Diesel	10,56	14,23%	72,32%
GNR extra	7,14	9,62%	81,94%
Wine fermen	6,08	8,18%	90,12%
Gasoline	3,10	4,17%	94,30%
Purchased el	2,90	3,91%	98,20%
Propane	0,98	1,32%	99,52%
Staff commu	0,31	0,42%	99,94%
Water	0,04	0,06%	100,00%
Total	**74,23**	100,00%	



8.12 GHG Protocol calculation tool

The following are extracts oof all the described tabs of the GHG Protocol calculation tool.

GREENHOUSE GAS PROTOCOL

Name of Business	Domaine Agnès Paquet	
Prepared By	Johanna Lucas	
GWP dataset (IPCC assessment)	2014 IPCC Fifth Assessment	• **Use of the latest GWP values is recommended. Link to the GHGP accounting note on the use of alternative factor sets:** https://ghgprotocol.org/sites/default/files/standards_supporting/Required%20gases%20and%20GWP%20values_0.pdf
Uplift to Business Air Travel emissions using RF factors?	Yes	• Radiative forcing (RF) is a measure of the additional environmental impact of aviation. These include emissions of nitrous oxides and water vapour when emitted at high altitude. • Organisations should include the influence of radiative forcing RF in air travel emissions to capture the maximum climate impact of their travel habits. However, it should be noted that there is very significant scientific uncertainty around the magnitude of the additional environmental impacts of aviation. Further • Organisations should produce comparable reporting. Therefore, they should avoid reporting with uplifted air travel conversion factors in one year and without in another year as this may skew the interpretation of their reporting.

ventory Data

Inventory Year	Start Date	End Date	Exclusions
2021/2022	01.08.2021	31.07.2022	

cility Information

Facility info	Location (City)	Location (Country)	Facility ID	Grid Region
Winery	Meloisey	France	1	France
Storage	Beaune	France	2	France

• **To locate the grid region for a facility in the US: US EPA, Power Profiler ZIP Code Tool with eGRID2016 Data. Version 9.0, March 9, 2020. File name:** power_profiler_zipcode_tool_2018_3_09_20_v9.xlsx https://epa.gov/sites/production/files/2020-03/power_profiler_zipcode_tool_2018_3_09_20_v9.xlsx

• **For countries other than the United States, Canada or Australia, enter the country name under the Grid Region Column**

• **Default grid Region is EU. To select others, enter "USA" or "Canada" or "Australia". For all other regions, use custom emission factors.**

• **This tool allows for a maximum of 10 facilities. Facility ID can be changed based on the company's actual facility IDs**

Custom Emission Factors

The tool uses default emission factors, which vary by country. These are free to use and publicly available, and the tool includes links of where to obtain them. Currently, separate sets of emission factors are available for the UK and US. Location-based Scope 2 emission factors are also available for the US, Canada and Australia, while market-based residual mix emission factors are available for the US, Canada and all European counties. For all other emission factors, links are provided from where they can be purchased from and then put in the table below.

Custom Emission Factors											
				Emission Factors							
Name of Custom EF	Scope	Activity Type	Source of Emission Factor	Fossil CO_2	CH_4	N_2O	Biofuel CO_2	CO_2e	Unit of Emission Factors (numerator unit)	Unit of Emission Factors (denominator unit)	Notes
Combustion Diesel	Scope 1	Mobile Combustion	Vehicle information	10,21	0,00001125	0,0000225	0	10,217	kg	gal (US)	
Combustion Gasoline	Scope 1	Mobile Combustion	Vehicle information	8,78	0,00038925	0,000081	0	8,814	kg	gal (US)	
Combustion GNR	Scope 1	Mobile Combustion	Vehicle information	10,21	0,00057	0,00026	0	10,302	kg	gal (US)	
Combustion Propane	Scope 1	Stationary Combustion	Company information	61,46	0,003	0,0006	0	61,714	kg	mmBtu	
Purchased Electricity	Scope 2	Purchased Electricity - Location Based	Utility provider	0,048				0,048	kg	kWh	EDF Group Pack ESG 2022

Figure 16 - Parameters

S1 - Mobile Combustion

Mobile Fuel	Column1	CO2 Factor (kg / unit)	CH4 Factor (kg / unit)	N2O Factor (kg / unit)	Biogenic CO2 (kg Biogenic CO2 per mmBtu)	AR4 (kgCO2e)	AR5 (kgCO2e)	Standardized unit	Source
Electricity - Mobile - Electric Vehicle		0	0	0		0	0	kWh	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Passenger Cars		8,78	0,00038925	0,000081		8,81386925	8,812364	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Light-duty Trucks (Vans, Pickup Trucks, SUVs)		8,78	0,00026406	0,00010692		8,81846366	8,81572748	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Heavy-duty Vehicles		8,78	0,00029304	0,00011792		8,82246616	8,81945392	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Diesel Passenger Cars		10,21	0,00001125	0,0000225		10,21698625	10,2162775	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Diesel Light-duty Trucks		10,21	0,0000162	0,0000243		10,2176464	10,2168931	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Diesel Medium- and Heavy-duty Vehicles		10,21	0,00004488	0,00004224		10,22370952	10,22245024	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Biodiesel (100%) - Biodiesel Passenger Cars			0,00001125	0,0000225	9,45	0,00698625	0,0062775	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Biodiesel (100%) - Biodiesel Light-duty Vehicles			0,0000081	0,0000162	9,45	0,0050301	0,0045198	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Biodiesel (100%) - Biodiesel Medium- and Heavy-duty Vehicles			0,000044	0,000044	9,45	0,014212	0,012892	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Compressed Natural Gas - CNG Light-duty Vehicles		0,40723948	0,089312914	0,006059221		4,44571013	4,513694587	scf	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Compressed Natural Gas - CNG Medium- and Heavy-duty Vehicles		0,40723948	0,129418971	0,01152		7,075673766	7,08377068	scf	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Ethanol (100%) - Ethanol Light-duty Vehicles			0,000891	0,0010854	5,75	0,3457242	0,312579	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Ethanol (100%) - Ethanol Medium- and Heavy-duty Vehicles			0,0017336	0,00154	5,75	0,50226	0,4566408	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Hybrid (Gasoline) Passenger Cars		8,78	0,000539061	0,000112175		8,826904547	8,82481997	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Agricultural Equipment		8,78	0,00126	0,00022		8,87706	8,87358	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Diesel Agricultural Equipment		10,21	0,00144	0,00026		10,32348	10,31922	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Ships and Boats		8,78	0,00064	0,00022		8,86156	8,85622	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Diesel Ships and Boats		10,21	0,00006	0,00045		10,3456	10,33093	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Jet Fuel - Jet Fuel Aircraft		9,75	0	0,0003		9,8394	9,8295	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Aviation Gasoline - Aviation Gasoline Aircraft		8,31	0,00706	0,00011		8,51928	8,53683	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Gasoline Motorcycles		8,78	0,00336	0,000345		8,96681	8,965505	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Motor Gasoline - Other Gasoline Non-Road Vehicles		8,78	0,0005	0,00022		8,85806	8,8523	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Diesel Fuel - Other Diesel Non-Road Vehicles		10,21	0,00057	0,00026		10,30173	10,29486	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F
Biodiesel (100%) - Biodiesel Medium- and Heavy-duty Vehicles		0	0,0000295	0,0000295	9,45	0,0095285	0,0086435	gal (US)	s Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission F

Figure 17 - Emission factors

Includes fuel consumption at a facility to produce electricity, steam, heat, or power. The combustion of fossil fuels by natural gas boilers, diesel generators and other equipment emits carbon dioxide, methane, and nitrous oxide into the atmosphere.

Data required:
1. Fuel type
2. Fuel Usage
3. Units for usage (volume or weight)

Emissions $_{GHG, fuel}$ = **Fuel Consumption** $_{fuel}$ * **Emission Factor** $_{GHG, fuel}$

User supplied data						GHG Emissions (tonnes CO_2e)					Emission Factor	
Facility ID	Year	Custom Emission Factors?	Fuel	Amount of fuel	Units (e.g., kg or kWh)	CO_2 (tonnes)	CH_4 (tonnes)	N_2O (tonnes)	CO_2e (tonnes)	Biofuel CO_2 (tonnes)	EF ($kgCO_2e$/unit)	Source
1	2021/2022	No	Propane Gas	4654	kWh	0,976	0,0000476	0,0000095	0,980	0,000	61,703	EPA, "Emission Factors for Greenhouse Gas Inventories," Table 1 Stationary Combustion Emission Factors, March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub).

Figure 18 -Stationary combustion

- Mobile Combustion

Includes fuel consumption by vehicles that are owned or leased by the company. Combustion of fossil fuels in vehicles (including cars, trucks, planes, and boats) emits carbon dioxide, methane, and nitrous oxide into the atmosphere.

Data required:
Two of the following:
1. Total fuel used by each vehicle
2. Total distance traveled by each vehicle
3. Fuel efficiency of each vehicle

Emissions $_{GHG, fuel}$ = **Fuel Consumption** $_{fuel}$ * **Emission Factor** $_{GHG, fuel}$

- This calculation uses EPA emission factors by default
- Activity type can either be in the form of fuel used, distance traveled, or custom emission factors

Year	Description	Facility ID	Activity Type	Fuel Source	Vehicle Type			GHG Emissions (tonnes CO2e)					Emission Factor	
						Activity Amount	Unit of Fuel Amount	CO_2 (tonnes)	CH_4 (tonnes)	N_2O (tonnes)	CO_2e (tonnes)	Biofuel CO_2 (tonnes)	EF ($kgCO_2e$/unit)	Source
2021/2022	Combustion Diesel	1	Fuel Use	Diesel Fuel	Diesel Passenger Cars	3913,55	L	10,556	0,000012	0,000023	10,562	0,000	10,216	EPA, "Emission Factors for Greenhouse Gas Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission Factors from Cross-Sector Tools, April 2014
2021/2022	Combustion Gasoline	1	Fuel Use	Motor Gasoline	Gasoline Passenger Cars	1330,85	L	3,087	0,000137	0,000028	3,098	0,000	8,812	EPA, "Emission Factors for Greenhouse Gas Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission Factors from Cross-Sector Tools, April 2014
2021/2022	Combustion GNR	1	Fuel Use	Diesel Fuel	Other Diesel Non-Road Vehicles	2625,00	L	7,080	0,000395	0,000180	7,139	0,000	10,295	EPA, "Emission Factors for Greenhouse Gas Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission Factors from Cross-Sector Tools, April 2014
2021/2022	Combustion Gasoline	1	Fuel Use	Motor Gasoline	Gasoline Passenger Cars	133,38	L	0,309	0,000014	0,000003	0,311	0,000	8,812	EPA, "Emission Factors for Greenhouse Gas Inventories", March 9, 2018 (https://www.epa.gov/climateleadership/center-corporate-climate-leadership-ghg-emission-factors-hub); WRI, GHG Protocol - Emission Factors from Cross-Sector Tools, April 2014

Figure 19 - Mobile combustion

S2 - Purchased Electricity

Electricity and other sources of energy purchased from your local utility (that is not combusted on-site). Examples include electricity, steam, and chilled or hot water. To generate this energy, utilities combust coal, natural gas, and other fossil fuels, emitting carbon dioxide, methane, and nitrous oxide in the process.

Data required:
1. Energy source
2. Energy usage
3. Units (kWh for electricity)

Emissions $_{GHG, fuel}$ = **Fuel Consumption** $_{fuel}$ * **Emission Factor** $_{GHG, fuel}$

- User has the option to choose between market-based or location-based emissions
- The tool includes data for grid average emission factors for the US, Canada, Australia and China; residual mix factors are provided for the US, Canada and EU countries
- Market-based emissions hierarchy: Custom emission factors, residual mix, location based/grid average

- Country-level location based emission factors are available for other countries from the IEA. These factors may be purchased from: http://data.iea.org/payment/products/122-emissions-factors-2017-edition.aspx

User supplied data							GHG Emissions (tonnes CO_2e)				Emission Factor	
Year	Facility ID	Amount of Electricity Consumption	Units	Calculation Approach	Type of Emission Factor	Custom Emission Factor	CO_2 (tonnes)	CH_4 (tonnes)	N_2O (tonnes)	CO_2e (tonnes)	EF ($kgCO_2e/kWh$)	Source
2021/2022	1	49961	kWh	Purchased Electricity - Location Based	Custom emission factor	Purchased Electricity	2,39813	0	0	2,398128	0,048	Utility provider
2021/2022	2	10430	kWh	Purchased Electricity - Location Based	Custom emission factor	Purchased Electricity	0,50064	0	0	0,50064	0,048	Utility provider

Figure 20 - Purchased electricity

GHG Emissions Summary

Name of Business Domaine Agnès Paquet
Prepared By Johanna Lucas

Boundary for results: **Company**
Year (optional): **2021/2022**

		Year					
Scope	Activity Type	2021/2022	0	0	0	0	0
Scope 1	Stationary combustion	0,98	0,00	0,00	0,00	0,00	0,00
	Mobile combustion	21,11	0,00	0,00	0,00	0,00	0,00
	Fugitive emissions from air-conditioning	0,00	0,00	0,00	0,00	0,00	0,00
	Other fugitive or process emissions						
	Scope 1 - Total	**22,09**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
Scope 2	Purchased electricity - location based	2,90	0,00	0,00	0,00	0,00	0,00
	Purchased electricity - market based	0,00	0,00	0,00	0,00	0,00	0,00
	Purchased heat and steam	0,00	0,00	0,00	0,00	0,00	0,00
	Scope 2 - Location based + heat and steam	**2,90**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
	Scope 2 - market based + heat and steam	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
Scope 3	Purchased goods and services						
	Capital goods						
	Fuel-and energy-related activities (not included in scope 1 or scope 2)						
	Upstream transportation and distribution	0,00	0,00	0,00	0,00	0,00	0,00
	Waste generated in operations						
	Business travel	0,00	0,00	0,00	0,00	0,00	0,00
	Employee commuting	0,00	0,00	0,00	0,00	0,00	0,00
	Upstream leased assets						
	Downstream transportation and distribution						
	Processing of sold products						
	Use of sold products						
	End-of-life treatment of sold products						
	Downstream leased assets						
	Franchises						
	Investments						
Scope 1 (Biogenic)		0,00	0,00	0,00	0,00	0,00	0,00
Scope 2 (Biogenic)							
Scope 3 (Biogenic)		0,00	0,00	0,00	0,00	0,00	0,00

Figure 21 - Summary

Disaggregation of Scope 1&2 emissions by facility or country

Boundary for results:	Facility							
			Year					
	Scope	Activity Type	2021/2022	0	0	0	0	0
1	Scope 1	Stationary Combustion	0,98	0,00	0,00	0,00	0,00	0,00
		Mobile Combustion	21,11	0,00	0,00	0,00	0,00	0,00
		Refrigerants/Fugitive Emissions	0,00	0,00	0,00	0,00	0,00	0,00
	Scope 2	Purchased Electricity - Location based	2,40	0,00	0,00	0,00	0,00	0,00
		Purchased Electricity - Market based	0,00	0,00	0,00	0,00	0,00	0,00
		Purchased Heat and Steam	0,00	0,00	0,00	0,00	0,00	0,00
	Scope 1 (Biogenic)		0,00	0,00	0,00	0,00	0,00	0,00
2	Scope 1	Stationary Combustion	0,00	0,00	0,00	0,00	0,00	0,00
		Mobile Combustion	0,00	0,00	0,00	0,00	0,00	0,00
		Refrigerants/Fugitive Emissions	0,00	0,00	0,00	0,00	0,00	0,00
	Scope 2	Purchased Electricity - Location based	0,50	0,00	0,00	0,00	0,00	0,00
		Purchased Electricity - Market based	0,00	0,00	0,00	0,00	0,00	0,00
		Purchased Heat and Steam	0,00	0,00	0,00	0,00	0,00	0,00
	Scope 1 (Biogenic)		0,00	0,00	0,00	0,00	0,00	0,00

Figure 22 - Disaggregation of emissions

8.13 Lighter bottles

Email exchange

Johanna Lucas

Von: Johanna Lucas
Gesendet: Dienstag, 29. November 2022 14:05
An: Eric VINCENT
Cc: Agnes PAQUET; Faty BRIFFAUT
Betreff: AW: Des bouteilles légères

Monsieur Vincent,

Merci beaucoup pour votre réponse détaillée.
Est-il possible d'obtenir un échantillon du modèle BOURGOGNE EXCLUSIVE?

Merci d'avance.

Cordialement,

Johanna Lucas

Von: Eric VINCENT <e.vincent@verreriesdebourgogne.fr>
Gesendet: Dienstag, 29. November 2022 11:49
An: Johanna Lucas <701313@hotelschool.nl>
Cc: Agnes PAQUET <agnes@vinpaquet.com>; Faty BRIFFAUT <f.briffaut@verreriesdebourgogne.fr>
Betreff: RE: Des bouteilles légères

Bonjour à tous,
Vous trouverez ci-dessous les bouteilles référencés par le domaine :

Ref.	Désignation
BOUCHEUSE	BOUCHEUSE (PRET)
OMATHUSALEM	MATHUSALEM 600 cl Champagne NU 150 E
OSALMANAZAR	SALMANAZAR 900 cl NU. 160 Champagne
S0718CH1CR	JEROBOAM 300 cl Champagne NU 115mm
S1746AN1CA_63	BOURGOGNE CLASSIQUE 75cl Antique B.(
S3219AN1CA	LA DIVINE 75 cl Antique NU 70 B.Carrée S3
S4408AN1CA	BOURGOGNE DUCASSE 75 cl NU63 Antiqu
SGSURCOUT	Surcharge temporaire 9% sur prix de vente
V4599AN1CA	BOURGOGNE CLASSIQUE 75 cl Antique NU
VID1164320M	CHAMPENOISE STD 75cl Antique B.Couron

Concernant les grands contenants et les bouteilles champenoises, il n'a que très peu d'alternative : la bouteille doit résister à la pression ou il n'y a qu'un seul fabricant.
Concernant les modèles avec bague carrée, il existe peu d'alternative non plus car cette bague est réservée à des bouteilles assez lourdes.
Votre demande entraîne donc une refonte complète des modèles choisis en s'orientant sur des modèles avec bague Cetie style NOVA ou avec bague Carrée EXCLUSIV.

En pj quelques plans avec les poids.

Figure 23 - E-mail exchange Verreries de Bourgogne 1

Cordialement.

Eric VINCENT
3 rue Jacques Germain / 21200 Beaune Tél 03 80 26 24 34 ou 06 85 03 36 83

Télécharger notre catalogue : http://www.verreriesdebourgogne.fr/catalogue/verrissimo/

Verrissimo LE VERRE ET LA DÉGUSTATION par Verreries de Bourgogne ecotree la nature a de la valeur

Adoptez l'éco-attitude
N'imprimez ce document que si c'est nécessaire

De : Johanna Lucas <701313@hotelschool.nl>
Envoyé : lundi 28 novembre 2022 09:34
À : Eric VINCENT <e.vincent@verreriesdebourgogne.fr>
Objet : Des bouteilles légères

Bonjour Monsieur,

Je travaille pour Domaine Agnès Paquet, et j'ai calculé le bilan carbone du domaine. Dans ce contexte, nous nous intéressons aux bouteilles un peu plus légères. J'ai vu vos produits en ligne, et je voulais vous demander s'il était possible de vous rencontrer et de voir vos bouteilles? Vous pouvez me joindre par e-mail ou au +49 163 92 34 902.

Je me réjouis de votre réponse.

Cordialement,

Johanna Lucas

Figure 24 - E-mail exchange Verreries de Bourgogne 2

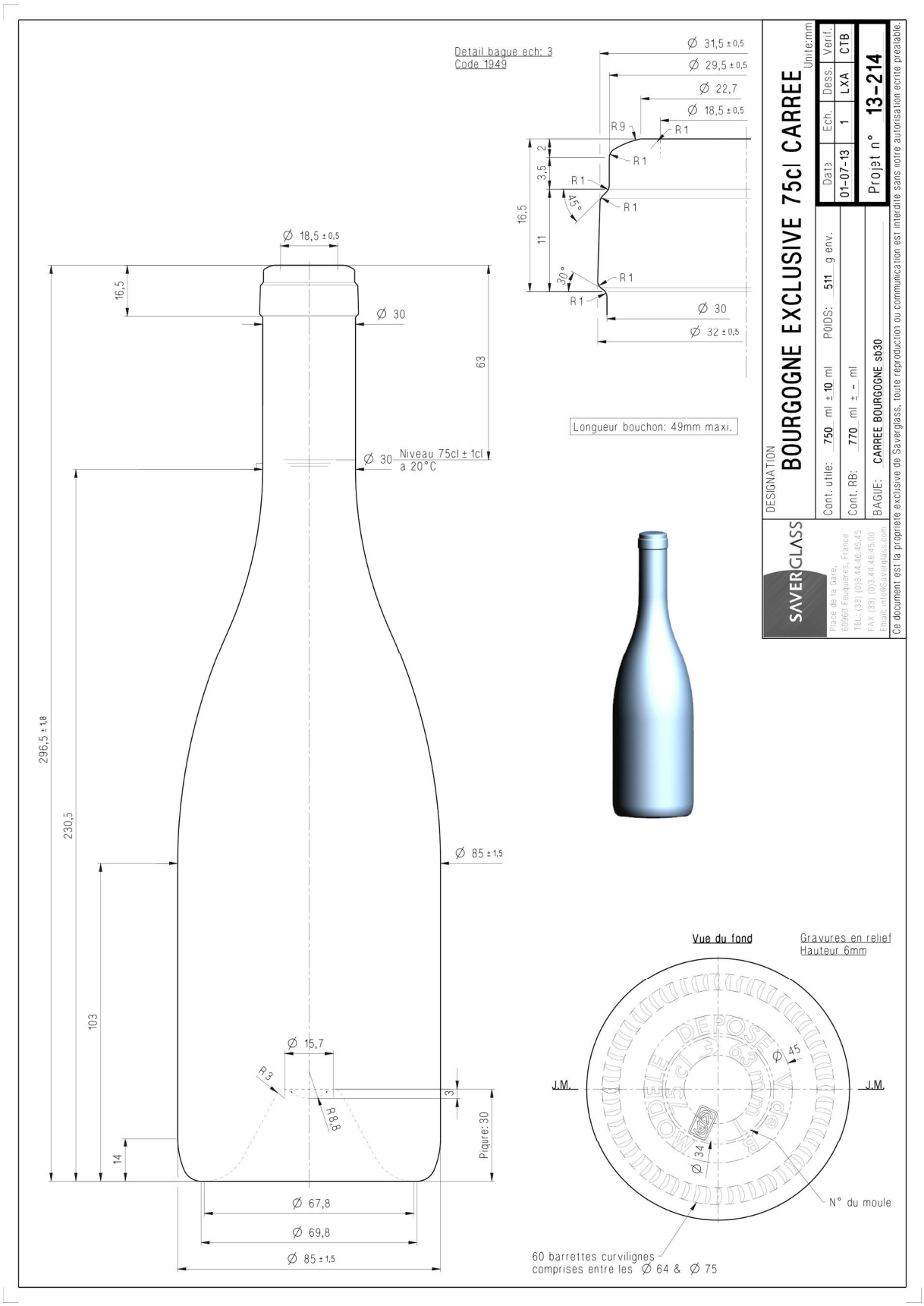


Figure 25 – Technical drawing lighter bottle

8.14. Rainwater tank

Implementation of rainwater tank

The third solution will be implemented on the long term due to practical feasibility. It requires a large investment as an external company is required to first tear down the old building and another company is required to install the water tank. This also requires a substantial amount of time more than the other two solutions. The goal however is also a long-term change, as the water consumption will be shifted to collected rainwater rather than purchased water.

What	Stakeholders	Who	When	Done
Research offers from companies	Domaine Agnès Paquet	Johanna, Eugénie	24.11.2022	x
Research financial subventions	Domaine Agnès Paquet	Johanna, Eugénie	24.11.2022	x
Decide on usage of are	Domaine Agnès Paquet, staff	Agnès	2023	
Further research on offers	Domaine Agnès Paquet	Johanna, Eugénie	2023	
Initiate tear down of building	External company	Agnès	2023	
Choose tank and initiate implementation	Domaine Agnès Paquet	Agnès	2023	

Evaluation of rainwater tank

The evaluation of the rainwater tank follows the same structure as the one of the solar panels, as it is also a substitution of the purchase of services by self-production. The following KPIs will be evaluated to determine the solution's effectiveness.

1. Monthly total consumption of water in m^3
2. Monthly amount of water captured in m^3
3. Monthly water purchases in m^3
4. Monthly water purchases in Euro

With the carbon footprint of the reporting year 2021/22 and those four KPIs, the following three KPIs will be determined.

1 Difference monthly water consumption in m^3 compared to reporting year 2021/22
2 Difference monthly water purchases in m^3 compared to reporting year 2021/22
3 Difference monthly water purchases in Euro compared to reporting year 2021/22

Again, to finally establish a comparison to the carbon footprint of reporting year 2021/22, the following three KPIs will be determined:

4. Current emissions in tCO_2eq through water consumption
5. Current total carbon footprint
6. Reduction of scope 3 emissions in tCO_2eq compared to reporting year 2021/22

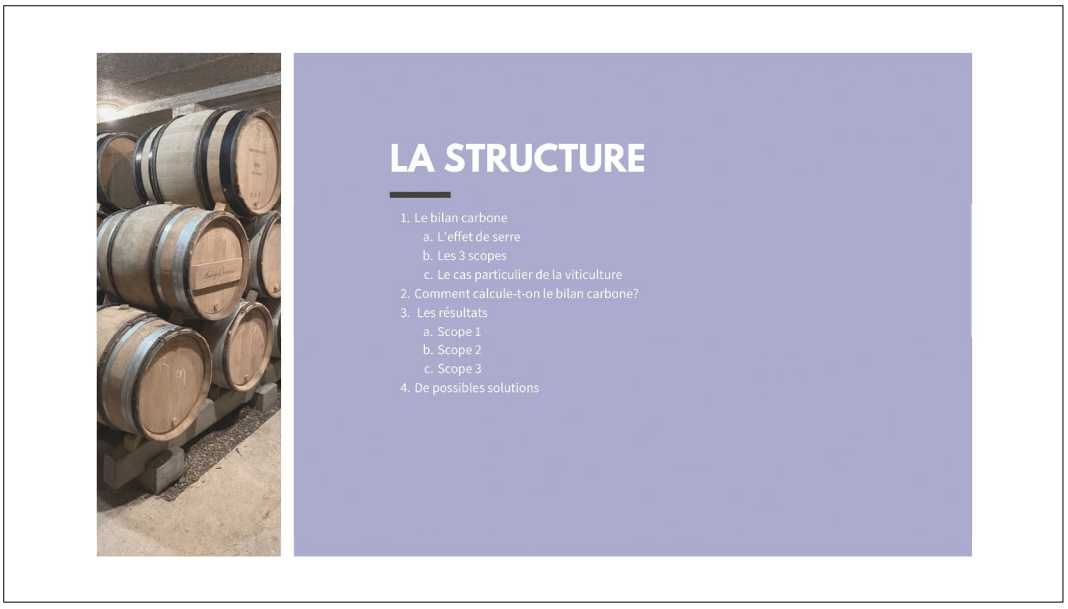
The time of installation of the rainwater tank is dependent on the teardown of the old building and the decision on the new utilization of the space. As the teardown is not a project of the nearest future, the plans on the design of the new space are not yet finalized. One option is a new building for a wine cellar, then the rainwater tank would be built above ground, on top of the building. However, if the new space would be converted into an additional parking space, the tank would need to be installed underground, and hence be of different material and nature. Another aggravating circumstance regarding the planning and estimations of the success of the solution is that the required size of the tank can only be determined in September 2023, after the next harvest. This is due to

the water supplier's accounting approach on a quarterly basis (Saur, 2022). To determine the maximum consumption per month, and hence install a tank of sufficient holding capacity, the monthly water consumption must be ascertained through manual meter readings. Based on over 20 years of experience, Ms Paquet (2022a) predicts the water consumption to be the highest in the month of the harvest, as all machinery is cleaned several times on a daily basis.

Due to the number of contingencies, a reliable example calculation cannot be made yet. However, the above mentioned KPIs provide a clear framework on how to evaluate the success of the solution once it is implemented.

8.15 Staff presentation

Presentation on the 24 November 2022 of the carbon footprint and the share of each emission source. Information for staff and brainstorming session on solutions for reduction of emissions.

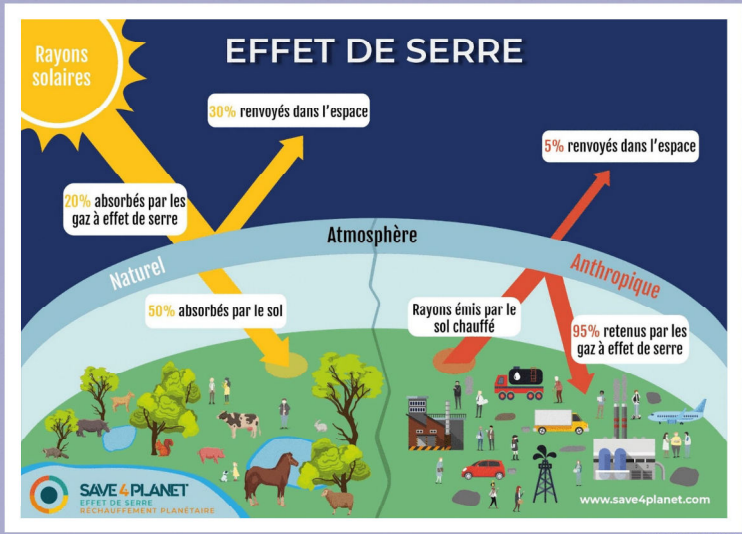


La définition

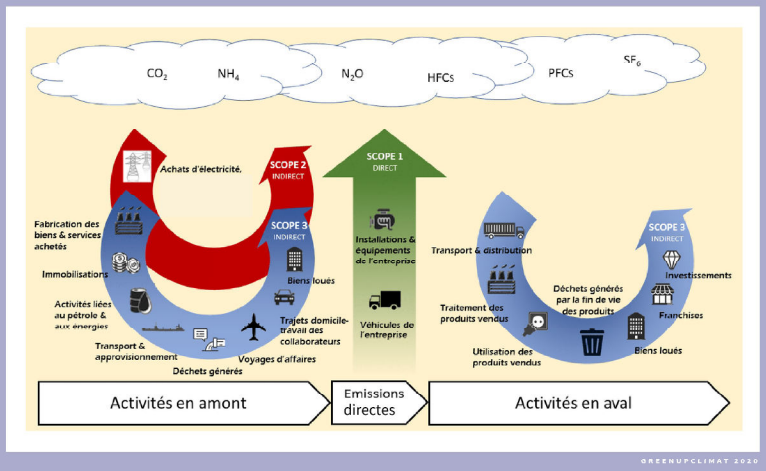
UN BILAN GES EST UNE ÉVALUATION DE LA QUANTITÉ DE GAZ À EFFET DE SERRE ÉMISE (OU CAPTÉE) DANS L'ATMOSPHÈRE SUR UNE ANNÉE PAR LES ACTIVITÉS D'UNE ORGANISATION OU D'UN TERRITOIRE.

ADEME 2022

L'effet de serre



Les 3 scopes



Le cas particulier de la VITICULTURE

La fermentation

Les émissions de CO2

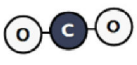
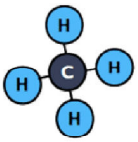
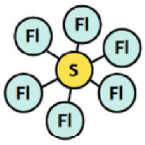
La séquestration du carbone

Le stockage du carbone

Comment calcule-t-on le bilan carbone?

Le facteur potentiel de réchauffement planétaire

Pouvoir réchauffant global (PRG) par rapport à 1 kg de CO2

1 (référence)	27,9	273	25200
			
CO_2	CH_4	N_2O	SF_6
Dioxyde de carbone	Méthane	Protoxyde d'azote	Hexafluorure de soufre

GREENUPCLIMAT 2020

Comment calcule-t-on le bilan carbone?

Collecter les données de l'entreprise

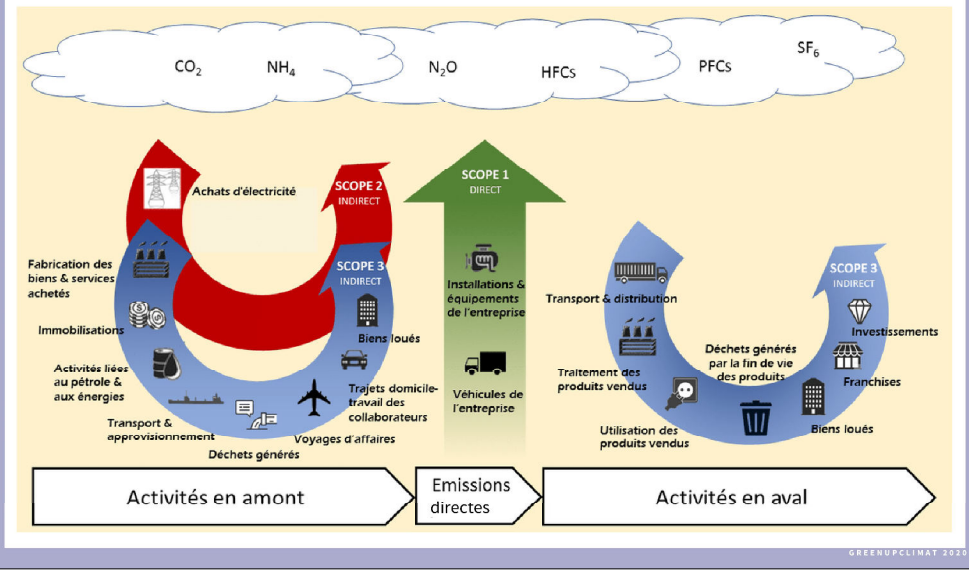
$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Multiplier les emissions par les facteurs potentiel de réchauffement planétaire

CO_2

L'équivalent dioxyde de carbone en tonnes

Les résultats



SCOPE 1

Les émissions directes

Les carburants

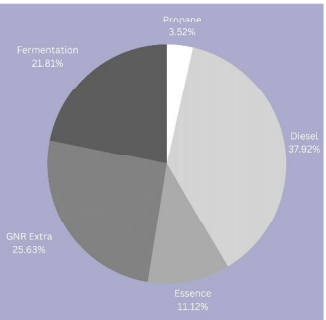
Propane 338 kg	0,98 tCO2eq
Diesel 3913,55 l	10,56 tCO2eq
Essence 1330,85 l	3,10 tCO2eq
GNR Extra 2625,00 l	7,14 tCO2eq

La fermentation

La totalité du vin produit: 675 hl

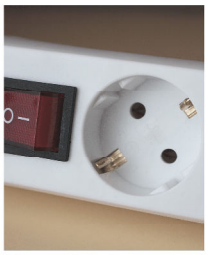
Emissions de CO2 pendant la fermentation: 90 g/l

Total d'emissions de la fermentation: 6,08 tCO2eq



Pourcentage de tCO2eq par type de source

=27,86 tCO2eq



SCOPE 2

Les émissions indirectes

Les achats d'électricité

Pour l'éclairage, le chauffage et la consommation d'électricité

EDF Tarif bleu:

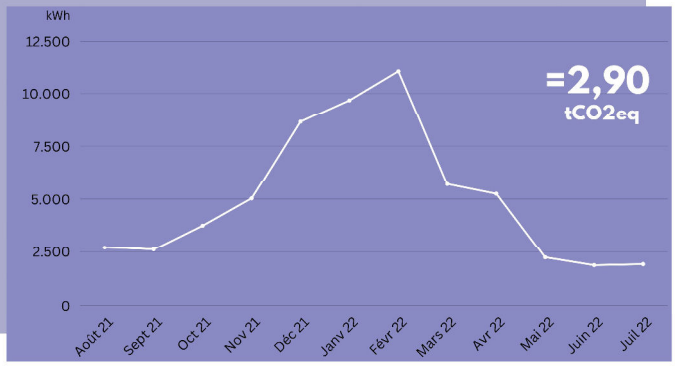
74,5% nucléaire

17,1% renouveables

7,7% gaz

0,4% petrole

0,3% charbon



=2,90 tCO2eq

SCOPE 3

Les émissions indirectes et le stockage du carbone

L'eau

503m³ émettent environ 0,07t equivalent du CO2 par an.

Les bouteilles

Taille	1/2 bouteille	Bouteille	Magnum	Jéroboam
Quantité	2325	83315	3087	200
tCO2eq	0,69	40,15	2,00	0,47

Le total: 43,31 tCO2eq

Le stockage du carbone

13,35 HA du vignes * 2.84 = 37,91 tCO2eq

0,07
43,31
- 37,91

=5,47 tCO2eq

Le bilan carbone

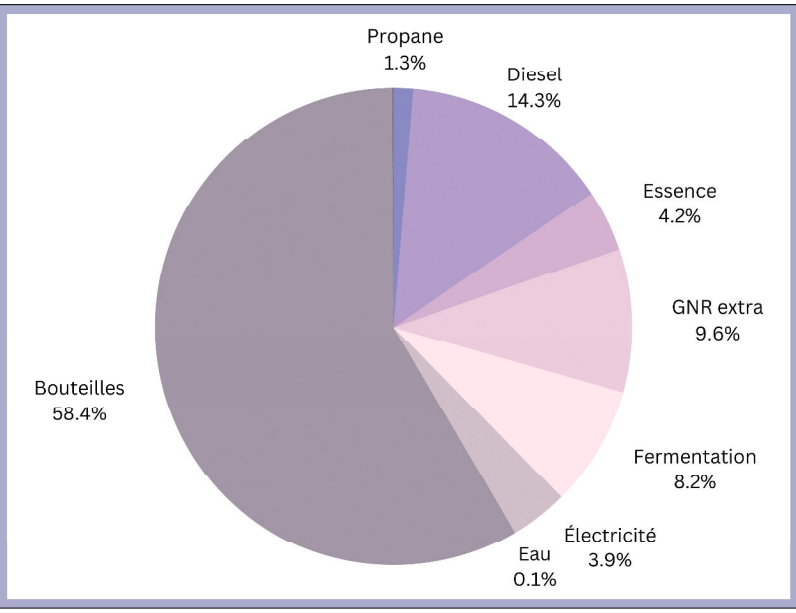
du domaine
août 2021 à juillet 2022

Scope 1
27,86
tCO2eq

Scope 2
2,90
tCO2eq

Scope 3
43,38
- 37,91
tCO2eq

Total
35,23
tCO2eq



73,14
tCO2eq

De possibles solutions

1

REDUIRE

Causer moins d'émissions par une reduction des ressources utilisés

2

REMPLACER

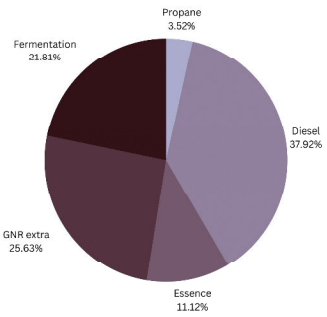
Privilégier des machines plus efficaces et moins polluantes

3

COMPENSER

Acheter des licences pour le stockage de carbone

Scope 1



Pourcentage de tCO2eq par type de source

Reduire

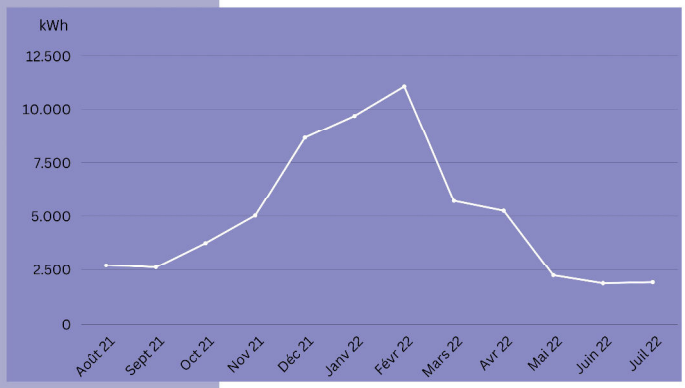
Réduction des émissions de gaz d'échappement:

- Réduction des trajets
- Arrêt du moteur lorsqu'il n'est pas nécessaire
- Utilisation réduite de la climatisation
- Covoiturage
- Captage et transformation des émissions de la fermentation

Remplacer

- Priviligiér des carburants plus durables comme E10, B7, B10 ou d'autres huiles
- Remplacement des véhicules à combustion par des véhicules électriques ou hybrides

Scope 2



Reduire

- Éteindre les lumières lorsque ce n'est pas nécessaire
- Accroître l'utilisation de l'éclairage naturel
- Ne chauffer les pièces que si nécessaire et seulement autant que nécessaire
- Éteindre/débrancher les appareils s'ils ne sont pas utilisés
- N'utilisez les appareils qu'en fonction des besoins
- Repérez (p. ex. avec un compteur intelligent) l'endroit où la plupart de l'énergie est utilisée et réduisez les consommations les plus importantes

Remplacer

- Ampoules économes en énergie
- Appareils économes en énergie
- Tarif vert
- Panneaux solaires

Scope 3

0,07 tCO2eq
Le consommation d'eau

Reduire

- Utilisation économe de l'eau lors du nettoyage par ex. utilisation d'une éponge, d'une brosse, du produit

Remplacer

- Utilisation de l'eau de pluie, par exemple pour la chasse des toilettes

43,31 tCO2eq
Les bouteilles

Reduire

- Système de réutilisation des bouteilles

Remplacer

- Bouteilles en verre plus légères
- Bouteilles alternatives comme Frugalbottle pour des éditions sélectionnées

- 37,91 t CO2eq
Le stockage du carbone

Accroitre

- Accumulation supplémentaire d'humus par labourage de la végétation d'accompagnement ou par semis permanent
- Composter les coupes de vigne

Merci beaucoup pour votre attention

8.16 Brainstorming staff

Visualization of brainstorming on solution after presentation to the staff.

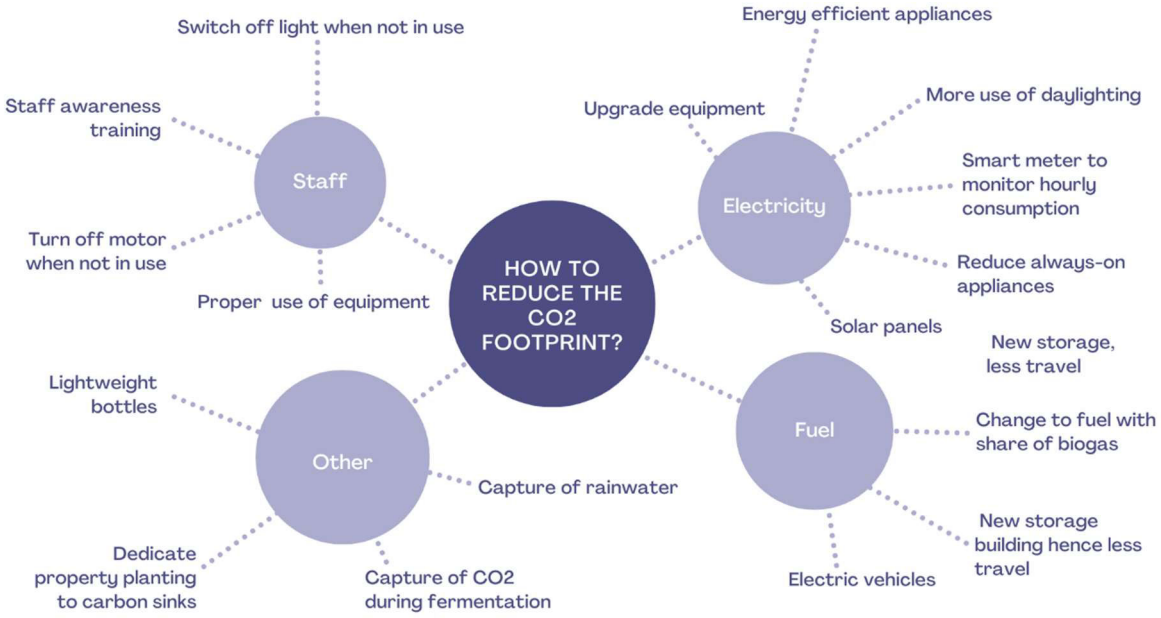
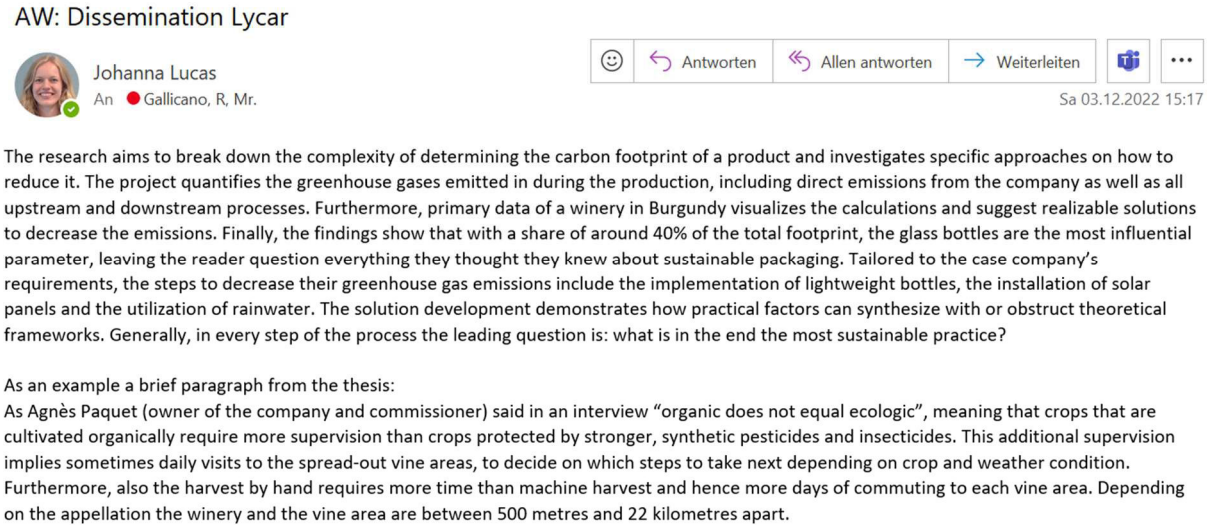


Figure 26 – Mindmap brainstorming session

8.17 Dissemination Minor Future of Food

An extract of the e-mail exchange with the Future of Food core team.



AW: Dissemination Lycar

Johanna Lucas
An Gallicano, R, Mr.

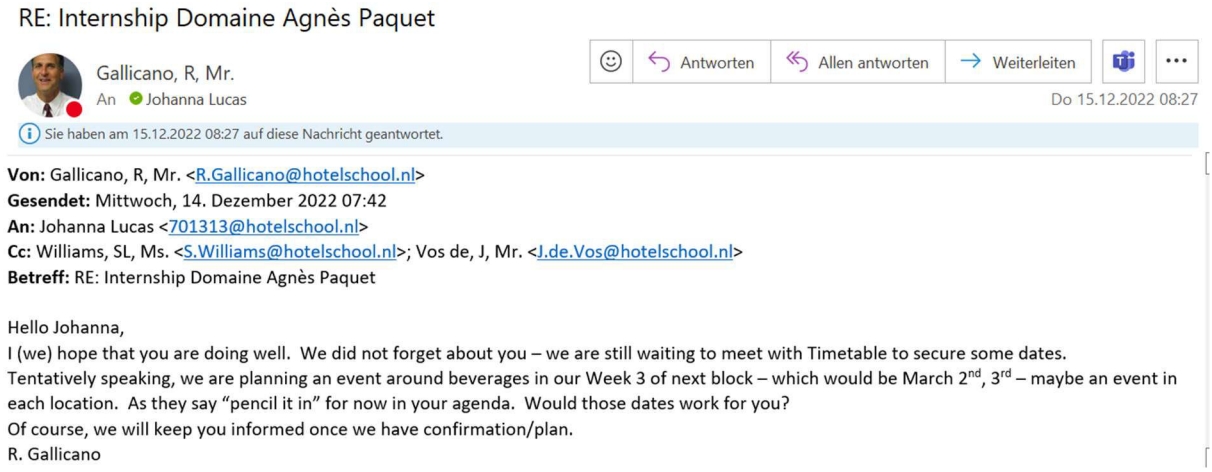
Antworten | Allen antworten | Weiterleiten

Sa 03.12.2022 15:17

The research aims to break down the complexity of determining the carbon footprint of a product and investigates specific approaches on how to reduce it. The project quantifies the greenhouse gases emitted in during the production, including direct emissions from the company as well as all upstream and downstream processes. Furthermore, primary data of a winery in Burgundy visualizes the calculations and suggest realizable solutions to decrease the emissions. Finally, the findings show that with a share of around 40% of the total footprint, the glass bottles are the most influential parameter, leaving the reader question everything they thought they knew about sustainable packaging. Tailored to the case company's requirements, the steps to decrease their greenhouse gas emissions include the implementation of lightweight bottles, the installation of solar panels and the utilization of rainwater. The solution development demonstrates how practical factors can synthesize with or obstruct theoretical frameworks. Generally, in every step of the process the leading question is: what is in the end the most sustainable practice?

As an example a brief paragraph from the thesis:
As Agnès Paquet (owner of the company and commissioner) said in an interview "organic does not equal ecologic", meaning that crops that are cultivated organically require more supervision than crops protected by stronger, synthetic pesticides and insecticides. This additional supervision implies sometimes daily visits to the spread-out vine areas, to decide on which steps to take next depending on crop and weather condition. Furthermore, also the harvest by hand requires more time than machine harvest and hence more days of commuting to each vine area. Depending on the appellation the winery and the vine area are between 500 metres and 22 kilometres apart.

Figure 27 - Brief abstract of research for core team



RE: Internship Domaine Agnès Paquet

Gallicano, R, Mr.
An Johanna Lucas

Antworten | Allen antworten | Weiterleiten

Do 15.12.2022 08:27

Sie haben am 15.12.2022 08:27 auf diese Nachricht geantwortet.

Von: Gallicano, R, Mr. <R.Gallicano@hotelschool.nl>
Gesendet: Mittwoch, 14. Dezember 2022 07:42
An: Johanna Lucas <701313@hotelschool.nl>
Cc: Williams, SL, Ms. <S.Williams@hotelschool.nl>; Vos de, J, Mr. <J.de.Vos@hotelschool.nl>
Betreff: RE: Internship Domaine Agnès Paquet

Hello Johanna,
I (we) hope that you are doing well. We did not forget about you – we are still waiting to meet with Timetable to secure some dates.
Tentatively speaking, we are planning an event around beverages in our Week 3 of next block – which would be March 2nd, 3rd – maybe an event in each location. As they say "pencil it in" for now in your agenda. Would those dates work for you?
Of course, we will keep you informed once we have confirmation/plan.
R. Gallicano

Figure 28 - Tentative confirmation of dissemination

8.18 HTH Instagram post

The Instagram post published on 23 November 2022 on the official Hotelschool The Hague Instagram channel @hotelschoolthehague.

Figure 29 - Instagram post picture HTH (Hotelschool The Hague, 2022)

hotelschoolthehague Hey everyone, I am Johanna @johanna_tabea_, coming from Germany 🇩🇪 following the Fast Track Programme of the BA in Hospitality Management at HTH.

As part of the last phase at HTH, I am currently on my Management Internship and writing my Bachelor's thesis. I am doing my internship at Domaine Agnès Paquet @agnes_paquet, a winery in the beautiful region of Burgundy, France 🇫🇷. Having started just before the harvest, I was able to dive right into the most intense time period of the winemaking process and have enjoyed every second of it. So much even, that after my graduation in February I will keep working at the winery and study Oenology here in France. 🍷🍇

The experience of living in yet another country and culture is enriching and changes the perception of the own habits. Even though working on my French language skills might be challenging at times, it is extremely rewarding. Especially, the open-minded and caring team makes my time here unique and unforgettable.

By the end of the year, I will also have finished my thesis which deals with the carbon footprint in winemaking and ways to reduce it. I love researching a topic that adds value to my internship company, links back to the inspiring lectures of my minor Future of Food, and aligns with my own values and visions. If you have any questions, feel free to reach out to me anytime!

#hth #placement #internship #hotelschoolthehague #creatinghospitablefuturestogether #france #thenetherlands

Figure 30 - Instagram post text HTH (Hotelschool The Hague, 2022)

8.19 Research Proposal Ana Fonseca Navio

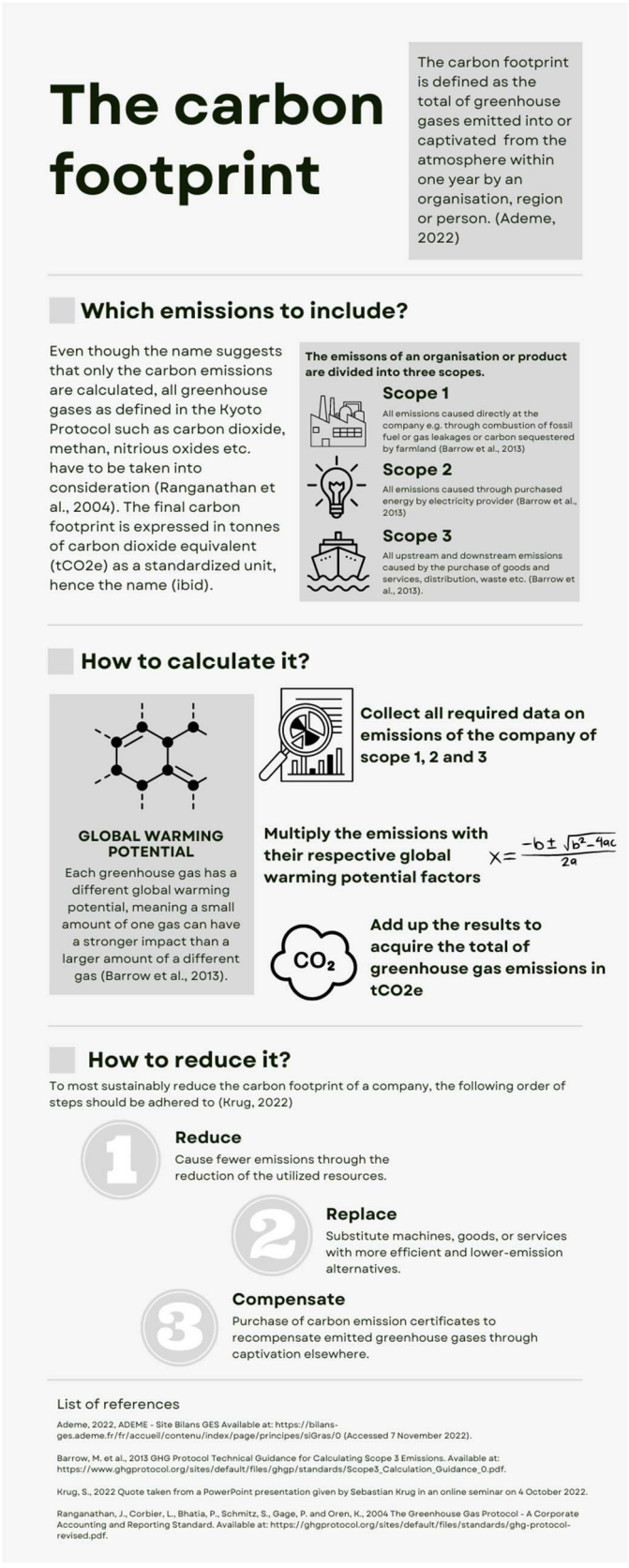


Figure 31 - Infographic

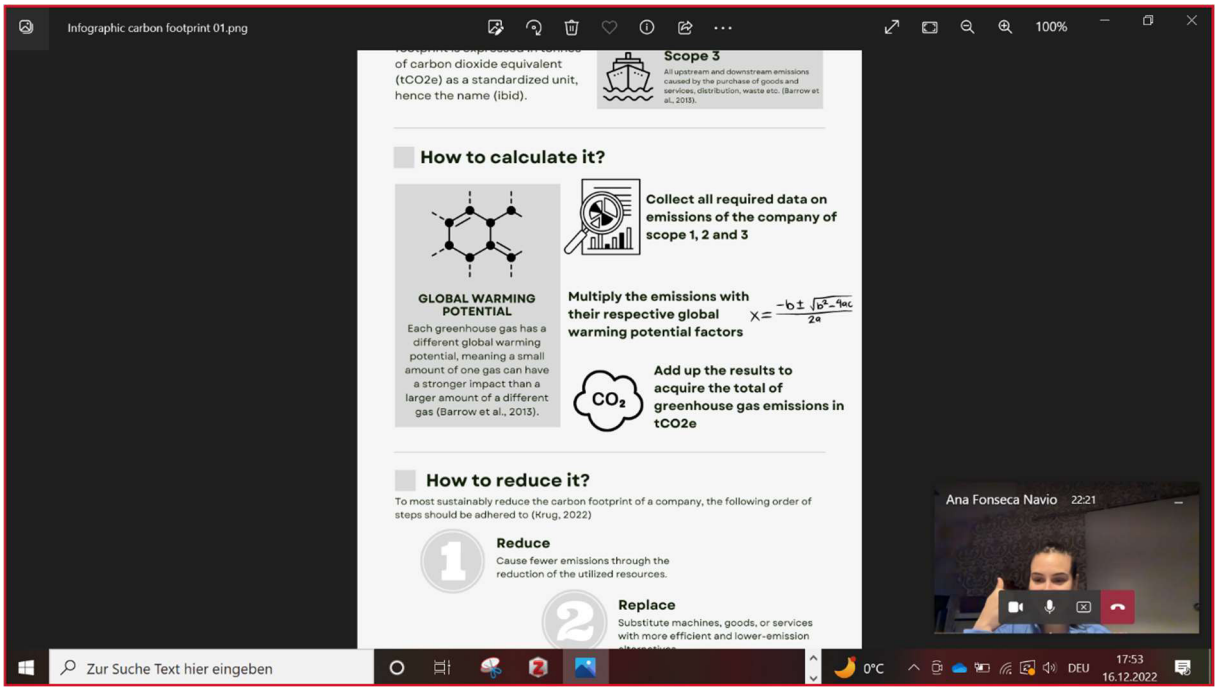
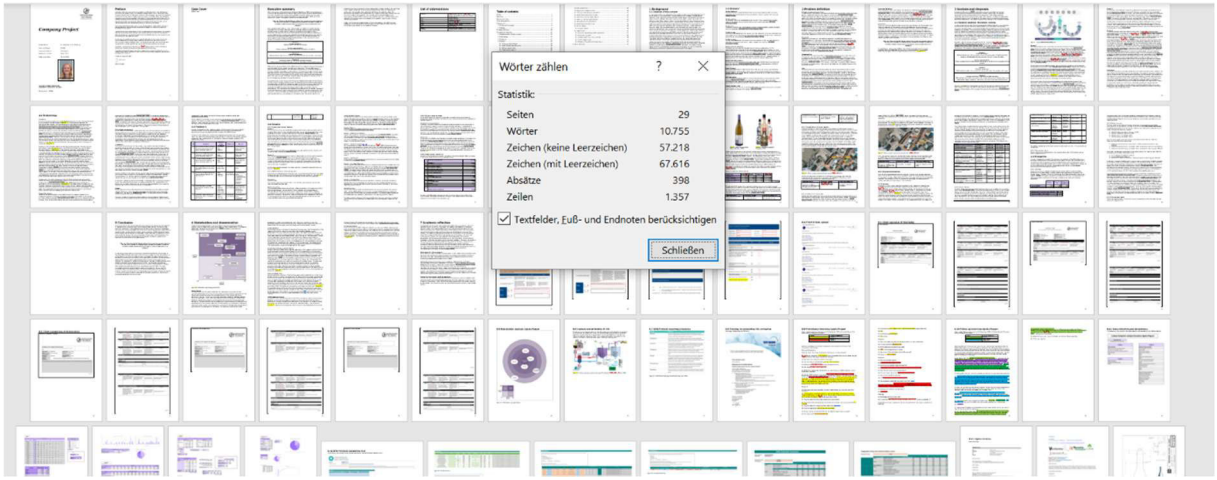


Figure 32 - Proof of dissemination

8.20 Proof of wordcount

Words in pictures 81+15+28+41+51=216



10,755 + 216 = 10,971

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