

Original Research

Review of the Carbon Management Strategies of Retail Industry in Energy Consumption and the Whole Value-Chain of the Product - A Case Study of Auchan Holding

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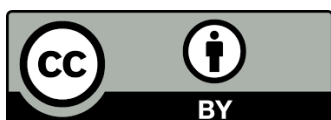
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Abstract

Many multinational retail companies are exposed to financial risk related to climate change. Carbon management is important in keeping global temperature increases below 1.5°C to prevent the exacerbated impacts of climate change. Auchan Retail in Auchan Holding provides a good example of carbon management in the retail sector. Auchan Retail's major emissions are the indirect emissions throughout their value chain (scope 3 emissions). The total estimated emission of scopes 1, 2 and 3 are 37,822,573.9 t CO₂e. The firm has reduced these by improving energy efficiency, combating food waste and altering product-sourcing methods. However, the carbon emissions estimates of Auchan Retail are not comprehensive. Internationally recognized carbon emission indicators have not been taken into account. It is crucial to work on all the indirect and direct emissions that occur both upstream and downstream of the company's operations, instead of focusing only on energy consumption (scopes 1 and 2). Auchan Retail should conduct a more comprehensive and accurate carbon emissions estimate to increase the legitimacy of their carbon management plan. This will facilitate the establishment of improved carbon reduction targets and measures in the future. Auchan Holding is recommended to be more ambitious on the carbon-offset program,



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exploring new markets and opportunities, which can effectively reach emissions reduction targets, reducing climate risks, and enhancing business growth.

Keywords

Climate change; Auchan holding; retail; carbon management; direct and indirect emissions; value chain

1. Introduction

Many multinational companies have pledged to reach net-zero carbon emissions and minimize their impacts on climate change by 2050. Carbon management is important to balance the greenhouse gas concentrations in the atmosphere at a level that would avoid the threatening human interference with the climate system as stated in the U.N. Framework Convention on Climate Change [1]. The Intergovernmental Panel on Climate Change (IPCC) predicts that if net zero emissions are achieved by about 2050, then the expected global mean temperature rises may be limited to 1.5°C [2]. Based on the emissions target of the Paris Agreement, it is crucial to balance the anthropogenic emissions and sinks of greenhouse gases (GHG) removals in this century [3].

The retail sector is one of the top 10 most carbon-intensive industries [4]. Retail stores also have one of the highest energy intensities, which is approximately 500 to 1000 kWh/m² in every year [5]. Moreover, the retailers' carbon footprint has relatively high direct GHG emissions and even higher in indirect emission [6]. In alignment with corporate social responsibility (CSR), international regulations like the Paris Agreement encourage retailers move to carbon and energy efficiency. The voluntary commitment adopted by retail signals positive environmental efforts [7]. Retailers can choose their own specific approach and ambition in implementing the voluntary custom-made corporate sustainability.

Auchan Holding, currently named Elo Group, is one of the multinational French retail companies that have committed to implement CSR in carbon emission reduction. It has started a series of carbon management policies and plans recently in undertaking the international commitment in emission reduction, especially in energy efficiency, combating food waste and product sourcing. It is a good example to investigate why retailers have changed their emissions strategy, policy and energy-related solutions with the international regulation.

Besides, the studies of reviewing existing carbon management strategies for multinational retail companies have been limited. Most of the studies are focusing on only one country's carbon management strategies for retail industry. For instance, the studies of Li et al. mainly analysed the carbon management for the Chinese retail industry [8]. The strategy for an international retail company is more complex and diverse. Therefore, this study can contribute in the field and lead to other research or new insights in the future.

2. Methodology

Auchan Retail reported both organizational and product footprint estimates in their reports. They have summarized both the direct and indirect emission by the company, such as the flow of goods from country warehouses to country stores, and the value chain and entire life cycle of

products (Figure 1) [9, 10]. The emission factors used are mainly taken from the carbon database of the French Environment and Energy Management Agency (ADEME) which are reviewed every year. Auchan Retail has estimated and categorized the GHG emissions into three emission scopes (Figure 1). Scope 1 emission is happening directly at the company and facilities [11]. Refrigerant leakage in stores is the main direct emissions from Scope 1 [9]. Scope 2 indirect emissions mostly come from the generation of purchased energy, like the electricity consumption in stores, while scope 3 is other indirect input emissions from upstream to downstream, such as transportation flows of goods and products sold in its stores [9, 11].

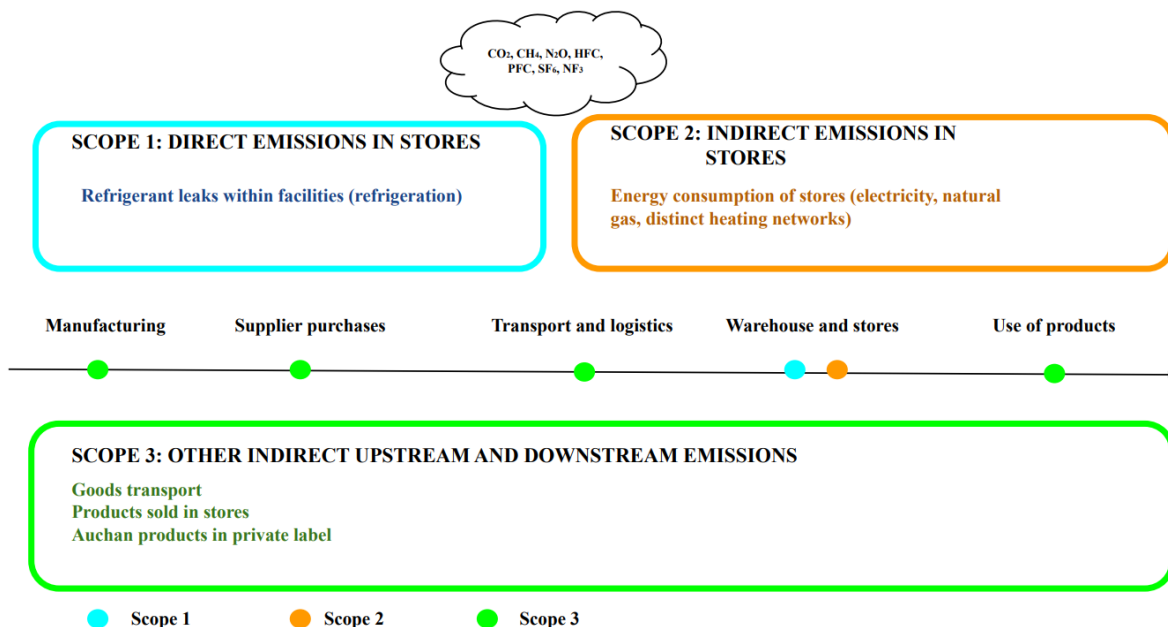


Figure 1 Diagram to show Auchan Retail measured greenhouse gas emissions. It is not an exhaustive overview for the emission (Auchan Holding 2020).

The energy consumption, total volume of waste and emission estimates are all sourced from the 2019-2020 Auchan Holding’s financial and annual reports. The company has calculated the estimated emission by multiplying the raw data and the emission factor. The emission factors used are mainly taken from the carbon database of the French Environment and Energy Management Agency (ADEME), which are reviewed every year. Auchan Retail has estimated and categorized the GHG emissions into three emission scopes (Figure 1).

This report has used six categories (emission reduction commitment, product improvement, process and supply improvement, new market and business development, organizational involvement and external relationship development) in evaluating the carbon management performance of Auchan Retail. This study also evaluates the reliability of the carbon emissions estimates and the effectiveness of the emission reduction plans in achieving the targets to combat the climate risks and support the company’s license to operate and even grow in new business at the same time. The focusing aspect of carbon management is not just energy consumption, but the whole value chain of the product to examine a holistic view of Auchan Retail’s carbon management performance in recent years.

Auchan Holding combines the two companies, which are Auchan Retail and a new generation retailer Ceetrus to develop their stores.

Most of the reports from Auchan Holding focus on Auchan Retail carbon emissions after the transition of the Auchan Group into Auchan Holding, and Auchan Retail contributes most of the emission than Ceetrus from the statistics provided by Auchan Holding. Moreover, the Ceetrus reduction in emission of energy consumption is primarily due to the impacts of COVID-19 and the partial closure of shopping malls in 2020. Therefore, this report will mainly focus on analyzing policies of Auchan Retail's emission reduction and their estimated carbon footprint.

2.1 Overview of the Firm

Auchan Holding is a multinational French retail company. It is present in 14 countries on three continents. According to the 2020 annual financial report and non-financial performance statement, Auchan Holding's revenue was €32 billion that Auchan Retail held 98.5% and Ceetrus held 1.5% of the revenue [9]. There are 180,560 employees including 108,936 employee shareholders. Auchan Retail has 179,590 employees and Ceetrus has 970 employees [9]. Auchan Retail is a food retail sector with hypermarket, supermarket and convenience stores, while Ceetrus is a commercial real estate that focusing on the development of mixed-use property [9].

The risk of the economic and non-market impacts of uncertain climate changes, and adaptation and mitigation response options of Auchan Retail are assessed by using climate change risk assessment framework (CCRAF). According to the CCRAF, Auchan Retail is facing high probability of financial risks linked to the impact of climate change [12, 13]. The extreme climatic events, such as flood and drought can hamper the stores' supply operations and sales activities [13]. This can lead to rise in prices of raw material over the short, medium or long term [13]. Therefore, Auchan Retail started to commit in helping fight against global warming to avoid further exceptional unplanned expenditure linked to climate change in the future. On the other hand, the company has also considered the reputation risk, which is the changing customer perceptions of whether a company's contribution to a lower-carbon economy. Hence, Auchan Retail is working on different emission reduction pledges to reach the target of the international commitments, such as energy efficiency plans and limit their food waste to reduce the company's carbon footprint in the countries. This can significantly reduce the probability of risks related to climate change.

2.1.1 Pledges of Auchan Retail

Auchan Retail is one of the *French Business Climate Pledge* signatories [9]. They have committed to significantly reducing scopes 1, 2 and 3 carbon emissions and investing in low-carbon technologies. The energy management system of Auchan Retail is also based on the ISO 50001 (International Organization for Standardization 50001) in EU countries [9].

Scopes 1 & 2 Action Plan. According to the commitment made at the COP21 during the One Planet Summit in 2015, Auchan Retail has successfully reduced its energy consumption per square meter in stores by over 20% from 2014 to 2020 [14]. Auchan Retail aims to reduce energy consumption in stores by 25% (baseline 2014, like-for-like basis) by 2022 [9]. Refrigerant leakage is its second source of direct emissions of greenhouse gases. The company aims to replace refrigeration equipment with less emitting fluids (R448A, CO₂) in its cold systems by 2030 for all

branches in Europe [9, 14]. Additionally, Auchan Retail has committed to promoting low-carbon energies and renewables with the consumption of 50% of low-carbon electricity in 2022 and 100% renewable electricity by 2030 [9].

Scope 3 Action Plan. Auchan Retail has targeted to reduce its carbon footprint by 20% by 2022 (using 2014 as a baseline) [9]. It has started to measure its carbon footprint connected to the transport of goods sold in stores in 2020 [9]. This can help in tracking the change in carbon emission from different sectors, such as goods transport and sold products, in the value chain. Moreover, they aim at 100% of private label packaging reusable, compostable (at home), recyclable by 2022 to reduce waste in the process.

3. Results

3.1 Emissions Estimates

The energy consumption of Auchan Retail has decreased 15.4 KWh/m² (3.1%) from 497.9 KWh/m² in 2019 to 482.5 KWh/m² in 2020 (Table 1) [9]. This reduction is due to modernized equipment, the energy efficiency plan and targeted action plans across all countries.

Table 1 Energy consumption per square meter of surface (Auchan Holding 2020).

Energy Consumption (KWh/m²)	2019	2020	Change
Auchan Retail	497.9	482.5	(-3.1)%

Regarding to the intensity of scopes 1 and 2 GHG, the carbon intensity of Auchan Retail stores has reduced 7.5% of emissions from 267.9 (t CO₂e/ m²) in 2019 to 247.9 (t CO₂e/ m²) in 2020 (Table 2) [9].

Table 2 Intensity of Scope 1 and 2 GHG (Auchan Holding 2020).

Greenhouse gas emissions related to energy consumption (t CO₂e/m²)	SCOPES 1 & 2 (Stores' carbon intensity)			SCOPE 1 (Refrigerants)			SCOPE 2 (Energy)		
	2019	2020	Change	2019	2020	Change	2019	2020	Change
Auchan Retail	267.9	247.9	(-7.5)%	106.2	94.0	(-11.5)%	161.6	153.9	(-4.8)%

The total scope 1 emissions measured by Auchan Retail is 482.3 t CO₂e/m² in 2020, which has decreased 18.9% as compare to 2019 (Table 3). On the other hand, the total scope 2 emission is 869.6 t CO₂e/m², which has slightly down for 5.2% as compare to 2019 (Table 3). The total scope 3 emissions is 36,470.6 t CO₂e/m² in terms of just goods transport and sold products in 2020 [9].

Table 3 Volume of Auchan Retail’s and Tesco’s Scopes 1 + 2 + 3 GHG (Auchan Holding 2020).

Greenhouse gas emissions (t CO ₂ e/m ²)	2019	2020	Change
Auchan Retail Scope 1	595.0	482.3	(-18.9)%
Auchan Retail Scope 2	917.5	869.6	(-5.2)%
Auchan Retail Scope 3 (Goods Transport)		224.7	
Auchan Retail Scope 3 (Sold products)		36,246.0	

In comparing emissions to other multinational retailers, such as Tesco, Auchan Retail still has relatively higher scopes 1 and 2 carbon emission and significantly higher emission in scope 3 in 2020 [15]. However, the calculation method of scope emissions may be different between two companies. This is hard in comparing scope emission as the included scope factors varies in different companies.

It is estimated that the total volume of **scopes 1, 2 and 3** greenhouse gases emissions is **37,822,573.9 t CO₂e** in Auchan Retail [9]. **Scope 3** emissions account for **over 90% of the company’s greenhouse gas emission**, especially the sale of fuel and the products sold in stores (food products) as shown in Figure 2 [9].

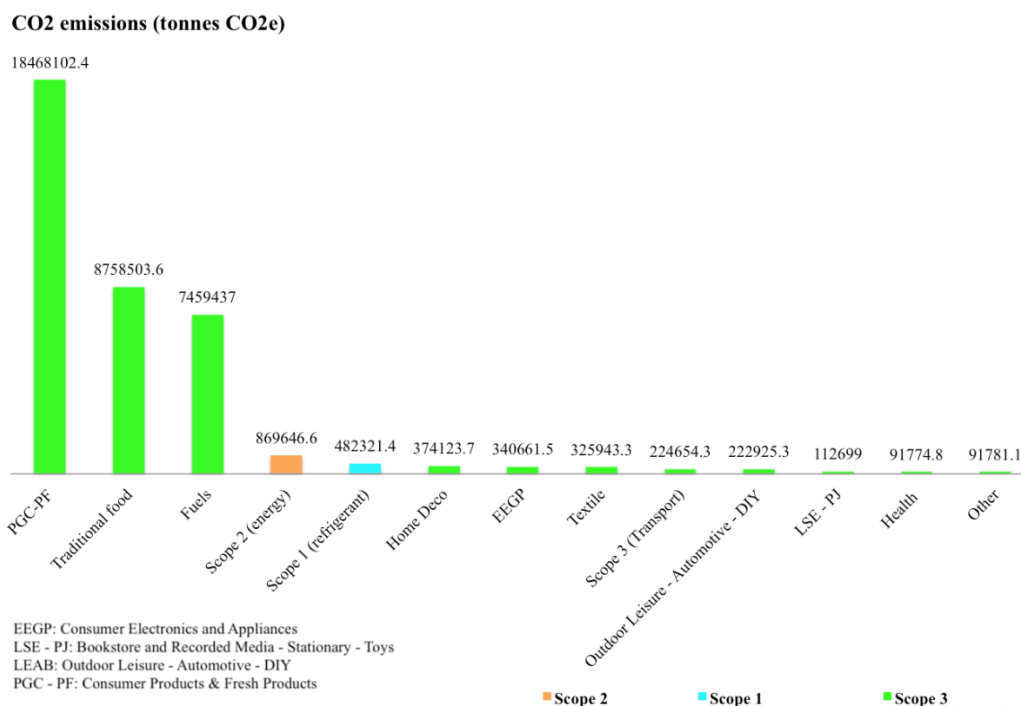


Figure 2 Detail of Auchan Retail’s scopes 1, 2 and 3 GHG (t CO₂e) (Auchan Holding 2020). PGC – PF: Consumer Products & Fresh Products. EEGP: Consumer Electronics and Appliances. LEAB: Outdoor Leisure – Automotive – DIY. LSE – PJ: Bookstore and Recorded Media – Stationary – Toys.

3.2 Emissions Reductions

Auchan Retail uses several emission reduction measures in meeting the target of the international commitment. They have started to carry out these plans in recent years. Some of the plans are still not holistic enough. In comparing different methods, energy efficiency project has the most significant reduction in carbon emission for the company. Auchan Retail claims that they have already decreased its electricity consumption per square meters by more than 20% from 2014 to 2020 in achieving the commitment at COP21 as compare to 2014 [9]. Auchan Retail has invested €215 million on the energy efficiency program between 2015 and 2020 [9]. It is estimated that the additional investment on energy efficiency program between 2020 and 2022 will cost €45 million. The actions and technologies implemented in stores involve using low-energy LED lighting, replacing refrigerants with high warming power for commercial refrigeration, installing smart level detectors for less emitting fluids (R448A₂, CO₂), use of divisional meters, installing closed doors on the cooling units, changing heating and ventilating equipment [9]. Auchan Retail's second phase of the energy efficiency program is mainly focusing on low carbon energy and renewable energies. For instance, the Auchan Retail Spain has sourced low-carbon electricity through certificates of origin from mid-2018 for all its stores [9]. The green energy purchase through origin has also implemented in Auchan Retail Portugal and Auchan Retail Spain. They have been consuming fully renewable electricity from 1 January 2020.

The energy consumption has decreased 3.1% from 497.9 kWh/m² to 482.5 kWh/m² between 2019 and 2020 in Auchan Retail (Table 1) [9]. In combining Scopes 1 and 2 stores' carbon intensity, it has significantly reduced 7.5% of emissions from 267.9 t CO₂e/m² to 247.9 t CO₂e/m² between 2019 and 2020 (Table 2) [9].

Auchan Retail stores made up the vast majority of the waste produced. Apart from the energy efficiency program, Auchan Retail has adopted the circular economy to ensure the products live as long as possible and that at the end of their lifespan. They are promoting the sustainable production model to include all phases of the product's life cycle from the design to the end of life, such as working on the eco-design and the second life of the product through its in-store operations. For instance, they have launched a range of FSC-certified recycled aluminium stoves and recycled plastic pens and provide spare parts and reparability for consumer electronics and appliances or donate the unsold items. They have also worked on private label packaging reusable, recyclable and compostable at home, and the waste management through the operational waste recovery. For instance, stores are recycling the packaging materials used in transporting goods, such as flexible plastics and cardboard, by recovering and sorting the maximum of waste they create. In cutting down the food waste and aligning the "Zero Waste" plan, recovered the unsold non-packaged fruit and vegetable waste through vermicomposting [16]. This can produce a natural soil-enriching agent that would help in growing organic produce. Besides, Auchan Retail France has converted the wasted food into products for animal feed in zoo. This has significantly reduced 6% of the total volume of waste in Auchan Retail's hypermarkets from 444,933 tones in 2019 to 419,148 tones in 2020. The volume of recovered waste has reduced 7% from 308,585 tones to 287,908 tones in 2020 [9]. The hypermarkets' waste recovery rate has slightly increased for 0.6% [9] (Table 4). However, the report doesn't specify how were emission reduced and the cost of the emission reduction.

Table 4 Total volume of waste and recovery rate in Auchan Retail’s hypermarket (Auchan Holding 2020).

Auchan Retail (Hyper)	2019	2020	Change
Total volume of waste (in t)	444,933	418,148	6%
Volume of recovered waste (in t)	308,585	287,908	7%
Recovery rate	68.1%	68.7%	0.6%

Regarding reducing the transportation impacts in emission scope 3, the Auchan Retail have increased the use of Euro 5 or even Euro 6 certified vehicles. Retail depends on trucks running on natural gas and biogas recently. Moreover, some of the supermarkets have invested in trucks that run on liquefied natural gas to decrease the emission. They have the alternatives to road transport are used to reduce the emission and transport mix developed in Russia, France and Romania [11]. The cost of the emission reduction is not specified in the report. The total carbon emission in goods transport (scope 3) is 224.6543 t CO₂e/m² in 2020 (Table 3) [9]. The total change of the carbon emission in goods transport (scope 3) cannot be quantified as it has just started the measurement in 2020. In addition, Auchan Retail promotes local sourcing and developing local products supply, and manufactured near the stores to reduce the travel distance of goods. This can further reduce the carbon footprint. However, most of the emission reduction methods and strategies have not specified how were emission reduced.

4. Discussion

Comparing the annual reports of Auchan Holding’s companies in the past years, the accuracy and scoping in measuring the carbon footprint has improved in 2020. Before 2020, there are not many specific carbon emission indicators present in the report. In the report of 2020, they have started to categorize different scopes of carbon emission estimates and have emission estimates in monitoring how the emission reduction methods can help in fight against climate change. The carbon emission reduction strategies are more diverse, concrete and scope-focused.

A good carbon management performance should include six key categories: emission reduction commitment, product improvement, process and supply improvement, new market and business development, organizational involvement and external relationship development [17]. The following table has examined the level of how proactively Auchan Retail is in adopting and implementing the carbon management activity into the firm’s general operational and strategic activities according to the information provided in their reports (Table 5):

Table 5 Scope and level of carbon management activities in Auchan Retail (Lee 2012).

Auchan Retail	
Scope of Carbon Management Activity	Level of Carbon Management Activity
Emission Reduction Commitment	Medium (e.g. Target of reducing its carbon footprint by 20% by 2022)
Product Improvement	Medium (e.g. Auchan products in private label and extend the product life cycle)

Process And Supply Improvement	High (e.g. Replacing refrigeration equipment with less emitting fluids (R448A, CO ₂) in its cold systems)
New Market And Business Development	Medium
Organizational Involvement	High (e.g. Training of employees in awareness of sorting, recycling waste and sustainable development)
External Relationship Development	High (e.g. Carbon Disclosure Project (CDP))

Auchan Retail is generally proactive in the six categories of carbon management activity. Nevertheless, there are still improvements in regarding to the emissions estimates, the effectiveness of the carbon management plans in reaching emissions reduction targets and develop the new market and business opportunities.

The emission reduction commitment should quantify all the related carbon footprint in the entire value chain [18]. It can allow in setting clear carbon reduction targets and preparing measures to achieve them. The carbon emission estimates of Auchan Retail on carbon footprint are not comprehensive. The carbon emission estimates didn't include the food waste and the waste to landfill parts. Food waste can cause high GHG emissions in terms of produce process, preserve transport and pack food. The reports have stated that some local municipalities cannot provide comprehensive information on the destination of the waste collected by them. This makes store-by-store record of waste data impossible [9]. Besides, Auchan Retail has not yet introduced international level indicator in monitoring carbon footprint for supply logistics, because of they do not have the means in tracing the required statistical information. Moreover, the emission factor for all countries stores is mainly based on carbon database of ADEME, but the emission factor may vary in different countries, places and occasions. All these can lower the accuracy and reliability of the emission estimates of Auchan Retail.

On the other hand, it is important to emphasize on product improvement and supply chain measures for a holistic carbon management. It should include the sum of a product's indirect, direct emissions and the entire value chain of the products [19]. The emission estimates for Auchan Retail are more focusing on energy consumption (Scope 2) and refrigerant leaks (Scope 1). Auchan Retail has only reported certain scope 3 categories indirect GHG emissions, such as the flow of goods from country warehouses to country stores. However, it excludes the international purchases, upstream from suppliers, downstream from and to customers. Emission from company offices and retail store usually only occupy small proportion of the retailer's total emission [20]. Most emissions are from upstream through the goods production, their transportation and downstream through consumption and disposal of the product. In comparing the performance to other retail company, Amazon's carbon footprint includes diverse set of indirect and direct emission that occur both upstream and downstream of the company's operations, such as purchased delivery services, packaging and even lifecycle emissions from customers' trips to Amazon's physical store (e.g. Whole Foods Market) [21]. Amazon also used a specific emissions factor for transportation. The emission factor covers emissions relates to the impacts of "well-to-wheels" [21]. The detailed breaking of the emission scope and the appropriate emission factor are vital to accurately estimate the carbon footprint. Another good example is Tesco. The Scope 1 carbon estimation of Tesco has included not just refrigerant gas leakage from systems in their vehicles and stores, but also the emissions from

leased vehicles transporting the products that they sell and the fuel consumption in Tesco owned [22].

Auchan Retail has just started the emission reduction strategies in recent years and not in a mature stage with respect to implementing organizational change. It is hard to convert all their carbon management activities into those companies that advanced enough in accommodating climate change [17]. Auchan Retail has tried to focus on changes in a few specific areas, especially in energy consumption, combating food waste and product sourcing. These are the areas that Auchan Retail prioritize and allocate their resources into. Despite the efforts of the production process, Auchan Retail can re-up their ambitions and commitments on carbon offset program. Carbon offset program is a common practice for company to compensate for emissions they produced and reduce their carbon footprint, if they cannot lower their emission as much as they would like to. It can also help environmental projects that cannot secure their funding, such as planting trees and develop renewable energy sources [23]. As part of France's commitment to the decisions made at COP26, the country has currently signed four main climate change pledges [24]. This includes decreasing use of fossil fuel, increasing funding towards renewable energy causes and investment to end deforestation [24]. This allows Auchan Retail in France to reach net-zero possible with more available resources provided by the government.

5. Conclusion

This report has summarized the scopes 1, 2, 3 estimated carbon emissions and the related carbon emission reduction strategies undertaken by Auchan Retail. The general performance of Auchan Retail is acceptable to achieve the emission reduction target. However, Auchan Retail should develop a more diverse set of indirect and direct emissions reductions measures that occur both upstream and downstream of the company's operations, instead of focusing only on energy consumption. Additionally, Auchan Retail can carry out a more comprehensive and accurate carbon emissions estimate throughout the value chain. This can help in setting clear carbon reduction targets and measures in the future. This study has used the six categories in evaluating the carbon management performance of Auchan Retail, this assessment can be subjective and more considerations should be included for a complete evaluation.

It is recommended that Auchan Holding can set up a more ambitious carbon offset program to achieve carbon neutral in the company. Auchan Holding can also explore new markets, business development and new opportunities that are 'climate smart' by creating specific plans. They can aim to commercialize carbon-free technologies using low-carbon aspects as an exclusive selling point, such as carbon labeling. Firms can then attain growth of revenue through enhancing their reputation by minimizing the environmental impacts of their processes and products [17].

Author Contributions

Yat Nam Leung contributes the main conceptual ideas, outline and drafting of the article. Paul Dargusch and Genia Hill participated in revising it critically for crucial intellectual information.

Competing Interests

The authors have declared that no competing interests exists.

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