DCC
Department of Climate Change

Data Collection and Elaborate a Market Study in the Domestic and Retail Refrigeration Subsectors under the Food Cold Chain Sector in Viet Nam

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On behalf of the International Climate Initiative (IKI)

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1. Introduction

Viet Nam is a rapidly developing nation facing both population growth and the impact of climate change with over 99 million people and a high population density, Viet Nam's economic expansion and urbanization contribute to an escalating demand for cooling. It plays a major role in economic and social development including the food processing, freezing, electronics and pharmaceutical industries. However, this growth also intensifies the environmental strain, since the cooling sector is one of the largest sources of greenhouse gas (GHG) emissions. In 2016, it constituted 9% of the country's total emissions, emitting 28.7 Mt CO_2eq (GIZ, 2019)[1].

By actively engaging in international agreements, Viet Nam has established specific objectives and outlined pathways aimed at diminishing ozone-depleting substances (ODS) and high Global Warming Potential (GWP) refrigerants. The country became a party to the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol (MP) in January 1994. Viet Nam had pledged to halt the consumption of hydrochlorofluorocarbon (HCFC) as of 2013 and aims to eliminate 100% of HCFC consumption by 2040. However, an annual average of 2.5% usage for servicing purposes will be allowed between 2030 and 2040. Furthermore, in September 2019, Viet Nam ratified the Kigali Amendment to the MP, signalling its commitment to gradually phasing out hydrofluorocarbons (HFCs), with a target of 80% reduction by 2045. Therefore, Green Cooling will greatly contribute to supporting Viet Nam to protect the environment and mitigate climate change by replacing existing cooling technologies with green technologies of higher energy efficiency as well as transitioning to refrigerants with low or zero GWP. It is estimated that by implementing Green Cooling, Viet Nam can reduce a considerable amount of GHG emissions which adds up to 105 Mt CO_2eq by 2050 (GIZ, 2019).

The significance of cooling extends beyond environmental concerns to comprise critical roles in various sectors. In Viet Nam, the food processing, electronics, pharmaceutical industries, and especially the food cold supply chain are heavily reliant on efficient cooling. The food cold chain has an important presence in Viet Nam's economy with export turnover of agricultural, forestry, fishery and seafood products contributing to a record of 53.22 billion USD in 2022, an increase of 9.3% compared to 2021[2]. Of which, Viet Nam's seafood exports reached 11 billion USD with an enormous increase of 23% compared to 2021 due to the great loss during the COVID-19 pandemic

[1] GIZ, 2019. Greenhouse Gas Inventory of the Refrigeration and Air Conditioning Sector in Viet Nam. https://www.green-cooling-initiative.org/fileadmin/Publications/2019_C4_Inventory_Viet Nam.pdf

[2] Viet Nam Economic News, 2022. Agricultural, forestry and fishery exports will reach over 53.22 billion USD in 2022. https://congthuong.vn/nam-2022-xuat-khau-nong-lam-thuy-san-dat-tren-5322-ty-usd-232541.html

(VASEP, 2023)[3]. The agriculture, forestry, and seafood industries consumed 6,593 GWh of electricity, accounting for 3.2% of the country's electricity consumption in 2019, of which the seafood industry accounted for more than one-third of this amount. Emissions from energy use of agriculture, forestry, fishery and seafood account for 1.6% of Viet Nam's total emissions.

According to the Viet Nam Industry and Trade Information Centre, the scale of the food cold chain logistics market in Viet Nam has strongly grown in the past 5 years, despite the significant obstacles of the pandemic, with the CAGR index of 14.8% in the period of 2021-2026 (Viet Nam Industry and Trade Information Centre, 2023)[4]. Cold storage still accounts for a large proportion of the overall cold chain logistics market (including cold transportation, cold storage and other ancillary services) which is forecast to reach a scale of 600 million USD by 2026. Although its scale and growth rate are considered quite high, the current food refrigeration industry still cannot meet all the needs of the market, leading to a substantial percentage of these perishable products ranging from 20 to 40% being lost due to lack of cold storage infrastructure (VCCI, 2020)[5]. This loss not only impacts economic sustainability but also worsens emissions and resource wastage. Establishing a robust cold food chain infrastructure is pivotal, not just to curtail food loss and methane emissions but also to bolster farmers' profitability, ensure food security, and improve nutritional provisions.

Consequently, addressing this issue becomes the objective of the project, aiming to conduct a comprehensive market survey and develop a transition plan that prioritises green cooling technologies, particularly within the domestic and commercial refrigeration subsectors. The project focuses on the cold food supply chain and aligns with the dual objectives of economic growth and environmental sustainability. Through strategic adoption of green cooling technologies and low GWP refrigerants, this initiative not only aims to revolutionise cooling practices but also seeks to foster a sustainable, resilient, and environmentally conscious trajectory for Viet Nam's development.

2. Survey methodology

– Survey locations

Hanoi and Ho Chi Minh City are two key cities of Viet Nam, making great contributions to the national economy. With high population density, rapid economic development, and hot and humid climate, the demand for cooling equipment and services in these two cities is increasing.

[3] VASEP, 2023. Viet Nam's seafood exports in 2022. https://vasep.com.vn/san-pham-xuat-khau/infographic/infographic-xuat-khau-thuy-san-viet-nam-nam-2022-26133.html
[4] Viet Nam Industry and Trade Information Centre, 2023. Cold chain logistics market in Viet Nam, the world and prospects (Focusing on cold storage and cold chain transportation services).
[5] VCCI, 2021. Annual Economic Report Mekong Delta 2020: Enhancing Competitiveness for Sustainable Development. https://fsppm.fulbright.edu.vn/download/BCKT-Mekong-Delta-Eng-Final.pdf

- Hanoi and Ho Chi Minh City are the two cities with the highest population density in Viet Nam, with more than 8 million and 9 million people, respectively[6]. The demand for refrigeration equipment and services here is higher than in other localities. The density of supermarkets, hypermarkets as well as convenience stores in these two cities is quite high, accounting for 52.4%. Conducting surveys in these two cities is representative of the national refrigeration industry trends.
- These two cities contribute more than 20% of GDP to the whole country, are the economic, financial, cultural and tourism centres of Viet Nam, representing the different economic characteristics between the North and South of Viet Nam. This allows the consulting group to grasp the potential changes in cooling methods based on regional economic factors.
- Hanoi and Ho Chi Minh City both have hot and humid climates, with high average temperatures, especially in the summer. However, there are still differences due to Hanoi having a cold winter. This difference can affect the type of cooling equipment required and the overall energy consumption to maintain cold chain temperatures. Surveying both cities allows to analyse how climate affects cold chain operations.
- Both Hanoi and Ho Chi Minh City are major freight centres in Viet Nam. Surveying these cities allows consultants to gain detailed insights into the cold chain operations of not only retail stores but also potential wholesalers and distributors, who play an important role in the overall food cold chain.

This underscores the critical importance of conducting a comprehensive examination of the cold-chain equipment market in both Hanoi and Ho Chi Minh City. Such a survey will furnish a comprehensive understanding of the cold-chain landscape, serving as a foundational step toward bolstering the capabilities of both public and private entities in adopting environmentally sustainable cooling methods. This endeavour aims to facilitate the adoption of climate-friendly technologies in Viet Nam, aligning with the government's ambitious goal of achieving net-zero emissions by 2050.

– **Survey objects**

The consultants directed their attention toward assessing the supermarket and convenience store subsector, which plays a pivotal role in supplying essential food items and commodities. The considerable demand for perishable goods requiring low-temperature storage to maintain quality and satisfy consumer preferences, including meat, fish, dairy products, and beverages, underscores the significance of this segment. Consequently, the proliferation of cold storage equipment is substantial. Examining hypermarkets, supermarkets, and convenience stores becomes imperative due to their concentration of diverse refrigeration equipment. Prior to the

[6] General Statistics Office of Viet Nam (gso.gov.vn), 2022

survey, no analogous studies had been conducted concerning the specific types of refrigeration apparatus utilised within this sector.

For the residential refrigeration subsector, data on refrigeration equipment can be based on the results of a number of previous survey studies and data on refrigerator and freezer equipment on the database of the Department of Statistics.

– **Classification of supermarkets and convenience stores**

According to the Draft Circular regulating the classification and management of some types of commercial infrastructure issued by the Ministry of Industry and Trade in 2022[7], a commercial business establishment is called a supermarket and is classified as a supermarket if it has a business location which is designed following the planning of local authority and has a scale and business organisation that meets the basic criteria of 1 of 3 classes. Supermarket or mini supermarket criteria are as prescribed below:

- **Class I supermarket:** A general supermarket must have a convenient location for accessing and buying and selling goods; have a business area of 3,500 m^2 or more; do business in many industries, items, and a business catalogue of 20,000 items or more. (**Hypermarket + shopping centre**)
- **Class II supermarket**: A general supermarket with a business area of 2,000 m^2 or more; do business in many industries, items, and a business catalogue of 10,000 items or more. (**Large supermarket**)
- **Class III supermarket:** A general supermarket with a business area of 500 m^2 or more; do business in many industries, items, and a business catalogue of 4,000 items or more. (**Medium supermarket**)
- **Mini supermarket:** Has a business area of 80 m^2 or more; A business catalogue of 500 items or more. (**Mini supermarket + convenience store**)

– **Data collecting methodology**

The approach to conducting a subsector analysis included several key steps:

- **Questionnaire design**: The consultants devised a survey questionnaire tailored to gather essential data for enumerating the array of refrigeration equipment employed within the cold chain sector and quantifying the volume of refrigerants utilised. Furthermore, supplementary details such as visual documentation, data tables, or analogous materials elucidating technical specifications including nominal cooling capacity, storage volume, display dimensions, refrigerant type and quantity, nominal efficiency, and energy

[7] https://thuvienphapluat.vn/van-ban/Thuong-mai/Thong-tu-phan-loai-va-quan-ly-loai-hinh-ha-tang-thuong-mai-522339.aspx

consumption levels, where applicable, were meticulously documented. The comprehensive survey form is appended within the supplementary materials of this report.

- **Conducting survey**: The consultants conducted surveys at supermarkets, hypermarkets and convenience stores in two phases.
  The first survey was conducted from October to November 2023.
  The supplementary survey was conducted in March 2024.

3. Data results

This section is showing the results from the market survey in Hanoi, Ho Chi Minh city and also on the e-commerce channel (websites of refrigeration manufacturers and distributors). Besides, the results from consultations with experts and related authorities are also included.

3.1. Domestic refrigeration

In 2022, Viet Nam's population was characterised by a significant rural-urban divide. With a rural populace of 62,123,910 and an urban population of 37,350,500[8], the country displayed a distinct demographic distribution. In the same year, General Statistics Office also announced the results of the 2021 Population Change and Family Planning Survey. According to the results, the total number of households in Viet Nam in 2021 were 27.2 million households nationwide, with rural areas accounting for approximately 16.7 million households and urban areas for approximately 10.5 million households[9]. Statistics on the total number of households across the country in 2022 show that, for every 100 households, up to 95 households use refrigerators[10].

The Consultants have surveyed the Viet Namese market (mostly from websites of refrigeration manufacturers and distributors) and the results show a landscape of both international brands like Samsung, Panasonic, Hitachi, Toshiba, Sharp, Aqua, LG, Electrolux, Casper..., alongside well-established domestic players including Hoa Phat. Refrigerator equipment manufactured by these brands mainly uses HFC-134a and HC-600a refrigerants. HC-600a has been used in the manufacturing of refrigeration equipment in Viet Nam since 2020, as consulted from some manufacturers (LG, Samsung, AQUA, etc.). Through collected data from market survey, the proportion of each refrigerant which is used in available products, is shown as below:

[8] https://www.gso.gov.vn/en/statistical-data/
[9] https://www.gso.gov.vn/wp-content/uploads/2022/12/Ket-qua-chu-yeu-Dan-so-ke-hoach-hoa-gia-dinh-2021.pdf
[10] https://www.gso.gov.vn/du-lieu-va-so-lieu-thong-ke/2023/05/thong-cao-bao-chi-ket-qua-khao-sat-muc-song-dan-cu-2022/

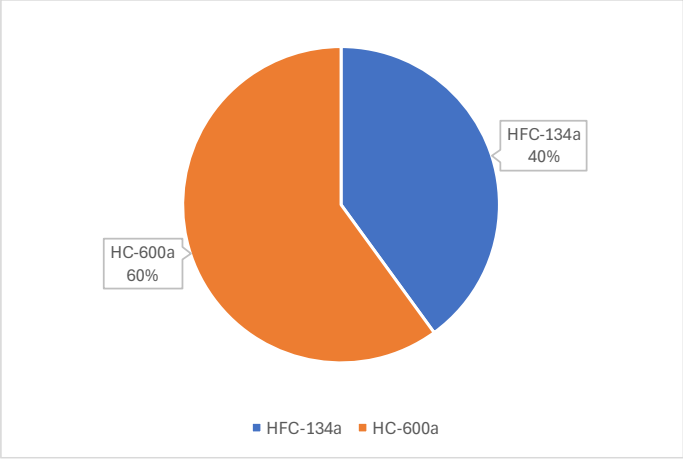

Figure 1: Ratio of refrigerant used in appliances marketed as refrigerators

The different refrigerant use leads to differing in refrigerant charge quantities in the equipment. Through the market survey and consulting with experts, the average charge quantity of the equipment using HFC-134a is 100 g, while for HC-600a it is 55 g.

From the survey, the proportion of total models of each of the domestic refrigerator brands in Viet Nam is shown below:

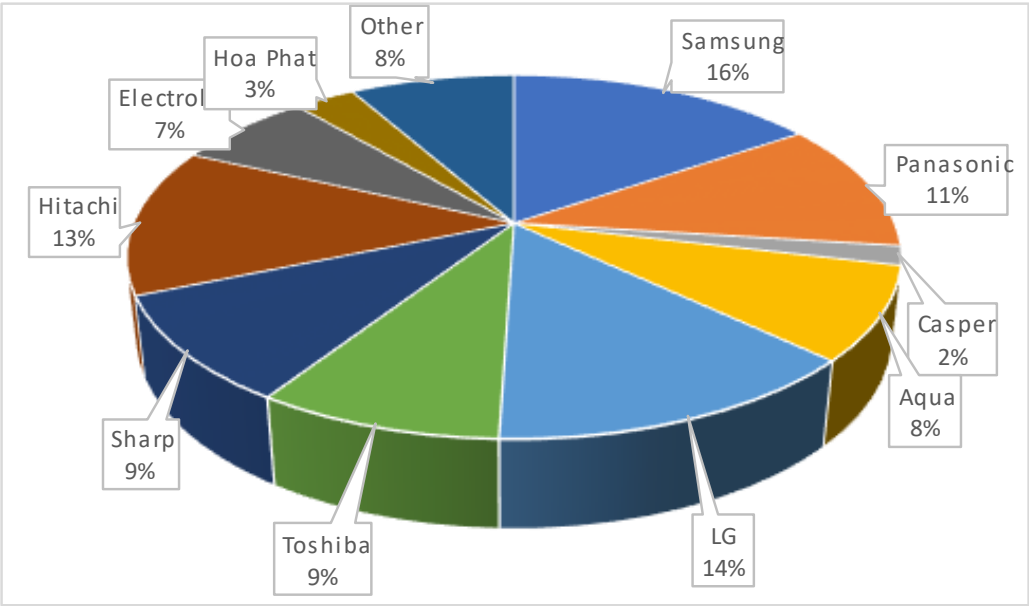

Figure 2: Share of domestic refrigerator brands in Viet Nam

**Source: Compiled by the Consultants*

According to GSO data, the number of refrigerators and freezers produced domestically is as below:

Table 1: GSO data on domestic refrigeration appliances produced domestically by years [11]

Products (Unit)	2018	2019	2020	2021	2022
Refrigerators, freezers	2,646,000	2,440,800	2,267,400	2,664,200	3,200,500

The collected data from Viet Nam Customs about National imported and exported refrigeration equipment is show as below:

Table 2: Data on imported/exported domestic refrigeration equipment from 2018 – 2022

Products (Unit)	2018	2019	2020	2021	2022
Exported equipment	754,654	650,117	756,326	1,040,913	1,306,223
Imported equipment	622,108	584,638	480,541	416,950	413,113

The proportion of domestic sale products and exported products are shown in the figure below:

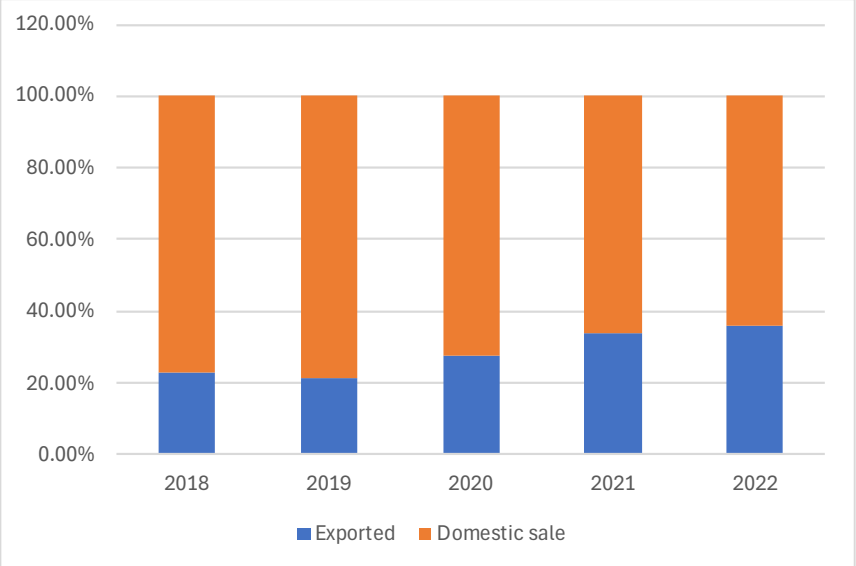

Figure 3: Share of refrigerator domestic sale products and exported products from 2018 – 2022

Based on the Circular No. 36/2016/TT-BCT issued by Ministry of Industry and Trade on 28th December 2016 on Energy labelling for means and equipment using energy under

[11] https://www.gso.gov.vn/px-web-2/?pxid=V0705&theme=C%C3%B4ng%20nghi%E1%BB%87p

management of the Ministry of Industry and Trade and the Decision No. 04/2017/QD-TTg issued by the Prime Minister on 9th March 2017 on the list of equipment and appliances to which the mandatory energy labelling and minimum efficiency standards are applied, and the roadmap to their implementation, domestic refrigerators is one of the objectives which needs to be labelled. The energy label is classified to 5 level from 1-star to 5-star, which corresponding to equipment's energy efficiency from low to high. According to the market survey, the ratio of energy star labels on available sale domestic refrigerators on the market is show as below:

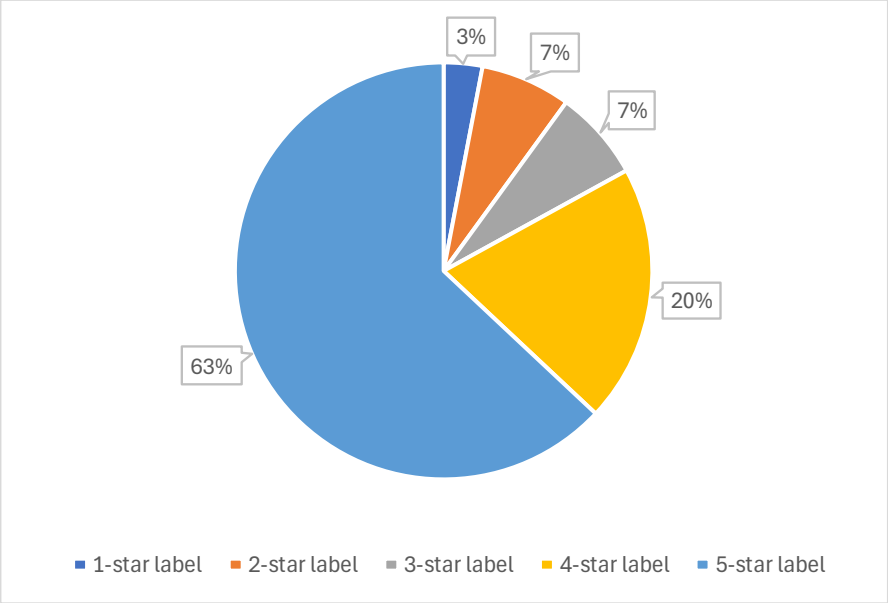

Figure 4: Ratio of energy label on available sale domestic refrigerators

3.2. Commercial Refrigeration

3.2.1. Statistics on the number of supermarkets, convenience stores

Based on the classification mentioned in Section 2. Survey Methodology, the number of each kind of hypermarkets, supermarkets and convenience stores is shown in the tables below:

Table 3: Number of hypermarkets in Viet Nam

Hypermarket	Ho Chi Minh City	Hanoi	Other	Total
AEON Mall	2	2	2	6
Crescent Mall	1			1
Diamond	1			1
Lotte Mart	5	3	8	16

Parkson	2		1	3
Robins	1	1		2
Takashimaya	1			1
Vincom	13	11	53	77
Vivocity	1			1
Total	**27**	**17**	**64**	**108**

Table 4: Number of supermarkets in Viet Nam

Supermarket	Ho Chi Minh	Hanoi	Other	Total
AEON Citimart	16	2	2	20
Big C (Tops market)	7	7	14	28
Co.opMart	43	6	79	128
Emart	1			1
Fujimart	1	2		3
Lanchi Mart		11	14	25
Mega Market	4	4	13	21
Sakuko	3	14	16	33
Satra Mart	1			1
Vinmart	18	42	29	89
Total	**94**	**88**	**167**	**349**

Table 5: Number of convenience stores in Viet Nam

Convenience store	Ho Chi Minh	Hanoi	Other	Total
7 Eleven	54			54
Bac Tom		13		13
Bach Hoa Xanh	534		1044	1578
B's Mart	108			108
Cheers	36		3	39
Circle K	207	155	32	394
Co.op food	294	54	92	440
Family Mart	116		23	139
GS25	54		7	61
Hapro foods	4	10		14
K-market	5	43	12	60
Mini stop	125		2	127

Satrafoods	189			189
Soi Bien		17		17
T-mart	12	40		52
Vinmart+	652	723	1149	2524
Zakkamart	38		2	40
Total	**2428**	**1055**	**2366**	**5849**

Table 6: Classified surveyed supermarket/convenience store by area in Hanoi

No.	Supermarket/ convenience store type	Name of supermarket/ convenience store	Number
1	Hypermarket/Shopping mall (>3,500 m^2)	AEON Mall Long Bien	1
		AEON Mall Ha Dong	1
2	Large supermarket (2000 – 3,500 m^2)	Tops Market	1
3	Medium supermarket (500 – 2000 m^2)	ViniMart	1
		Winmart	2
		Fuji Mart	1
4	Mini supermarket/convenience store (80 – 500 m^2)	Homefarm	41
		Winmart +	12
		CIRCLE K	5
		BRG Mart	2
		T-mart	3
		GOOLDMART24H	1
		Xanh - mart	1
		QQ Food	2
		Agami	2
		Okona	1
		Other	2

Table 7: Classified surveyed supermarket/convenience store by area in Ho Chi Minh City

No.	Supermarket/ convenience store type	Name of supermarket/ convenience store	Number
1	Hypermarket/Shopping mall (>3,500 m^2)	Go	1
		Lotte	1

		AEON Mall	2
2	Large supermarket (2000 – 3,500 m^2)	AEON citimart	3
3	Medium supermarket (500 – 2000 m^2)	Tops Market	2
4	Mini supermarket/convenience store (80 – 500 m^2)	7 Eleven	7
		Bach Hoa Xanh	11
		B'Mart	10
		CIRCLE K	11
		COOP FOOD	7
		Family mart	7
		GS25	9
		MINISTOP	9
		HomeFarm	6
		Winmart	6

3.2.2. Sale/Stock products in commercial subsector

In commercial subsectors, equipment used is mainly stand-alone /plug-in and remote system with an external condensing unit. Centralised systems are not used in supermarkets in Viet Nam. Manufacturers in Viet Nam (for example, Sanaky) primarily produce stand-alone appliances with capacities below 1,000 litres, while larger appliances are imported. Condensing units are also mainly imported and are used by hypermarkets/supermarkets and large food stores.

Currently there are no detailed statistics on the number of domestically produced equipment for these subsectors. However, following consultations with sector experts[12] and use of import data provided by Viet Nam Customs, the number of equipment sold in the commercial refrigeration subsectors has been approximated as shown below:

[12] *From National Green Cooling Program conducted by UNOPS, ETP and DCC*

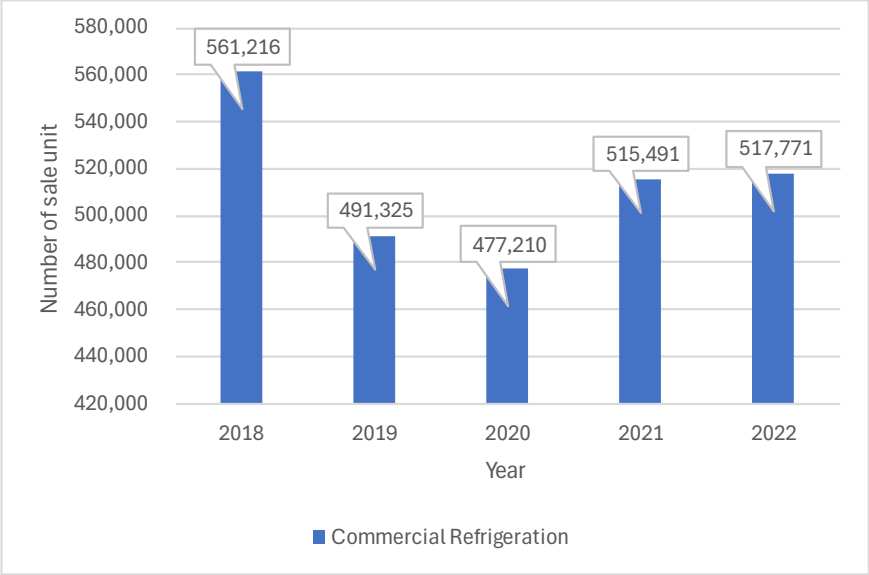

Figure 5: Sales of equipment in commercial subsector.

3.2.3. Main types of equipment used in supermarkets and convenience stores

In Hanoi:

Freezer: Based on the findings of the survey, the predominant freezer brand utilised within this subsector is Alaska, with Sanaky and Sumikura following closely behind. Horizontal cabinets emerged as the most prevalent type, while vertical cabinets, predominantly sourced from the Fukushima brand, were also notable among respondents. The classification by type and brand of freezer cabinet is as follows:

Table 8: Statistics classifying freezers by brand in Hanoi

Classify freezer by types and brands							
	No	**Brand**	**Commercial horizontal top-door freezer**		**Commercial vertical side-door freezer**		**Total**
			Plug-ins	**Condensing unit**	**Plug-ins**	**Condensing unit**	
Freezer	1	Alaska	159				159
	2	Sanaky	77				77
	3	Sumikura (SK)	63				63
	4	Liebherr	20				20
	5	Sanden	8				8
	6	Vinacool	2				2
	7	Carrier			8		8
	8	Okasu	2				2

	9	Iarp			17		17
	10	Denver	4				4
	11	Fukushima	21			54	75
	12	Others (Ugur, Darkling, Dai Thuan, Meat Deli...)	34				34
		Total	390	0	25	54	**469**

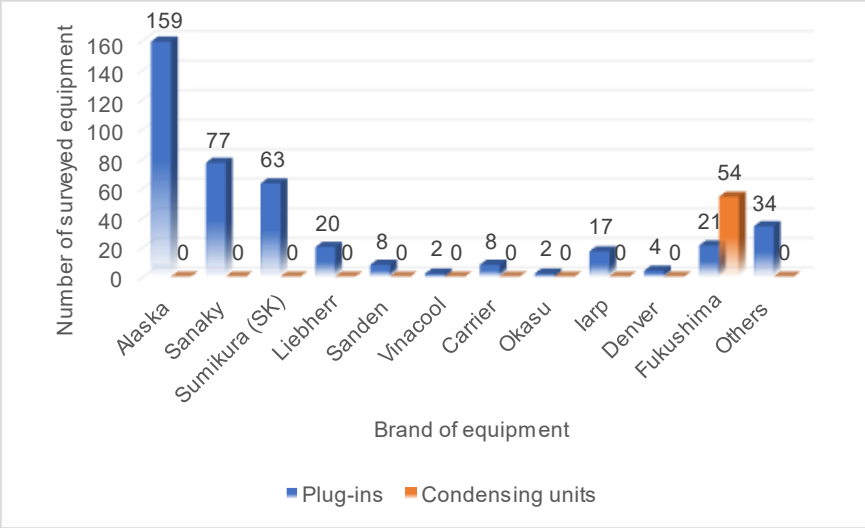

Figure 6: Statistics classifying freezers by type and brand in Hanoi

Display cabinet/Glass-door cooler: The survey findings reveal that upright refrigerators manufactured by Fukushima are the primary choice in stores and supermarkets, with Carrier and Alaska brands following closely behind. In contrast, horizontal refrigerators are less frequently employed.

Table 9: Statistics classifying Display cabinet/Glass-door cooler by brand in Hanoi

Classify chiller cabinet by types and brands							
Display cabinet/ Glass-door cooler	**No**	**Brand**	**Commercial vertical side-door cabinet**		**Commercial horizontal top-door cabinet**		**Total**
			Plug-ins	**Condensing**	**Plug-ins**	**Condensing**	
	1	Alaska	31				31
	2	Carrier	39		2		41
	3	Sanden	29				29
	4	Denver	1				1
	5	Frigoglass	1				1

	6	Frigorex	1				1
	7	Fukushima		71	8	6	85
	8	Galilei	18				18
	9	Goldcool	1				1
	10	Nakano	20				20
	11	Larp	1				1
	12	Okiwi	2				2
	13	Panasonic	1				1
	14	Sanaky	12				12
	15	Scoolman	2				2
	16	SK	10				10
	17	Systemform	22				22
	18	Others	11		16		27
		Total	202	71	26	6	305

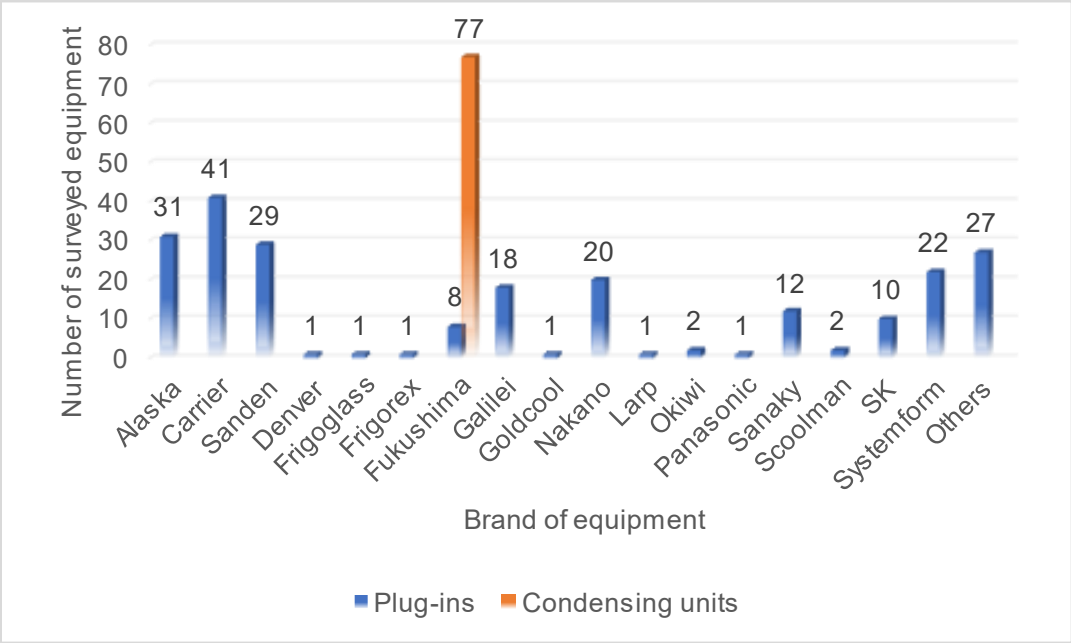

Figure 7: Statistics classifying Display cabinet/Glass-door cooler by type and brand in Hanoi

In Ho Chi Minh City:

Freezer: Based on the survey data, Liebherr horizontal freezers are prevalent in stores and supermarkets, with Sanaky and Sanden following suit. Horizontal freezers exhibit higher rates of utilisation compared to other types.

Table 10: Statistics classifying freezers by brand in Ho Chi Minh city

Classify freezer by types and brands							
	No	**Brand**	**Commercial horizontal top-door freezer**		**Commercial vertical side-door freezer**		**Total**
			Plug-ins	**Condensing units**	**Plug-ins**	**Condensing units**	
Freezer	1	Sanden	26		1		27
	2	Sanaky	85		2		87
	3	Darlinh	23				23
	4	Oscartielle	6				6
	5	Liebherr	97				97
	6	Alaska	17				17
	7	Fukushima	1				1
	8	Iarp		10			10
	9	Others	15				15
		Total	270	10	3	0	283

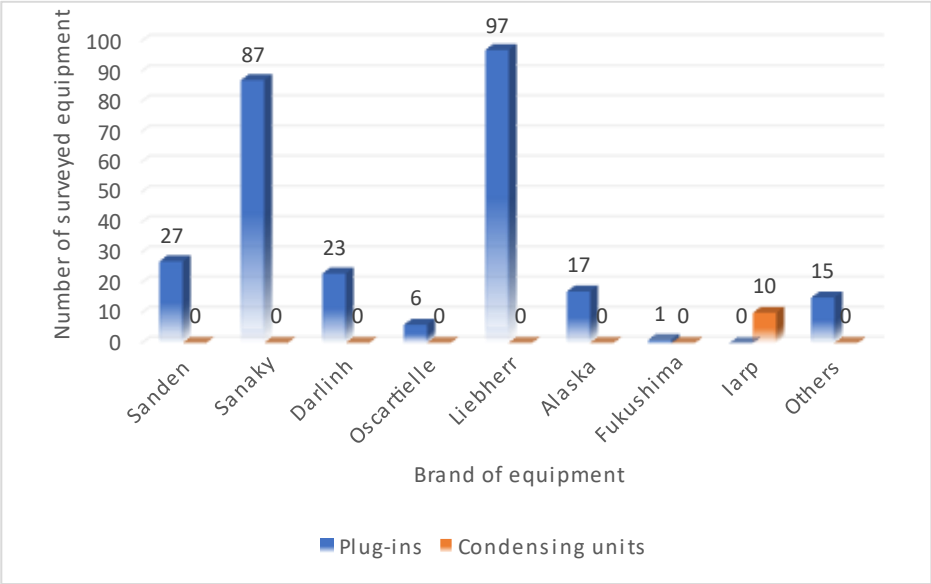

Figure 8: Statistics classifying freezers by type and brand in Ho Chi Minh city

Display cabinet/Glass-door cooler: Based on the survey data, Sanaky upright refrigerators are the predominant choice, succeeded by Sanden and Carrier models. Upright refrigerators demonstrate greater prevalence in usage.

Table 11: Statistics classifying Display cabinet/Glass-door cooler by brand in Ho Chi Minh city

Classify chiller cabinet by types and brands							
	No	**Brand**	**Commercial vertical side-door cabinet**		**Commercial horizontal top-door cabinet**		**Total**
			Plug-ins	**Condensing units**	**Plug-ins**	**Condensing units**	
Display cabinet/ Glass-door cooler	1	Carrier	43				43
	2	Frigoglass	8				8
	3	Lucky Star	13				13
	4	Sanaky	65		9		74
	5	Systemform	26				26
	6	Fukushima	33	2			35
	7	Hoshizaki	5				5
	8	Panasonic	14		2		16
	9	Kistem	5				5
	10	Alaska	24				24
	11	Sanden	55				55
	12	Northwind	8				8
	13	Epta	10			39	49
	14	Others	105		1	8	114
		Total	414	2	12	47	475

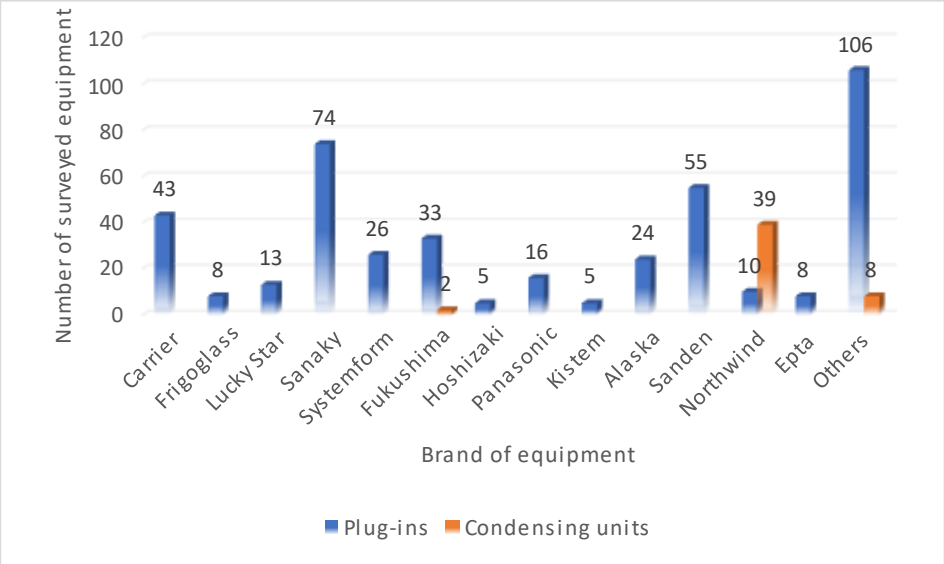

Figure 9: Statistics classifying Display cabinet/Glass-door cooler by brand in Ho Chi Minh city

Cold storage: Cold storage is usually available at the medium supermarket scale up above such as: Go, Lotte, AEON Mall, AEON citimart, Tops Market and Winmart. This is due to the area's scale of supermarket and their services. At this scale, the supermarkets often have services for preparing and processing meat and fish products. Therefore, building and installing cold storage on site is necessary.

Through the conducted survey, the used equipment for cold storage are mainly imported. The brand of the compressor in the surveyed equipment includes Mycom, Bitzer... Mostly, these equipment are still using HCFC-22, R-404A and R-507C. In some cases, the cold storage could use the same condensing system with the freezer/cabinet.

3.2.4. Main refrigerants used

Hanoi:

Freezer: According to survey data, the number of freezers using HFC-134a refrigerant accounts for the largest number, followed by R290 and R404A refrigerants.

Table 12: Main refrigerants used in Freezer in Hanoi

	Refrigerant	No. of surveyed equipment	Share
Freezer	HFC-134a	216	47.7%
	HC-290	112	24.7%
	HFC-404A	99	21.9%
	HC-600a	1	0.2%
	HFC-507A	17	3.8%
	HCFC-22	8	1.8%
Total surveyed		**453**	**100.0%**

The data on refrigerants used in freezers in Hanoi reveals that HFC-134a is the most prevalent, accounting for 47.7% of the surveyed equipment, followed by HC-290 at 24.7%, and HFC-404A at 21.9%. The significant use of HFC-134a and HFC-404A indicates a reliance on synthetic refrigerants with high GWP, despite global efforts to reduce their usage. Notably, HC-290, a natural refrigerant with low GWP, is gaining traction, reflecting a shift towards environmentally friendly alternatives. However, HC-600a is scarcely used, at just 0.2%, likely due to safety concerns and limited availability. Other refrigerants like HFC-507A and HCFC-22 are less common, making up 3.8% and 1.8%, respectively, with HCFC-22 being phased out due to its ozone-depleting potential.

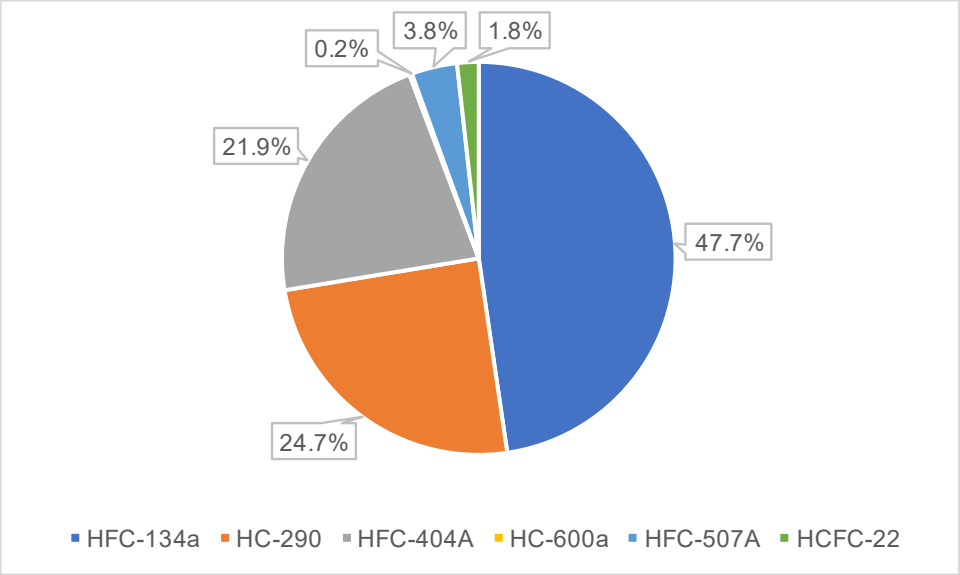

Figure 10: Ratio of main types of refrigerants used in Freezer in Hanoi

Display cabinet/Glass-door cooler: Based on the survey data, the highest quantity of refrigerators employs R404A refrigerant, trailed by HFC-134a and R290.

Table 13: Main refrigerants used in Display cabinet/Glass-door cooler in Hanoi

	Refrigerant	No. of surveyed equipment	Share
Display cabinet/Glass-door cooler	HFC-134a	64	22.0%
	HCFC-22	21	7.2%
	HC-290	21	7.2%
	HFC-404A	168	57.7%
	HFC-410A	9	3.1%
	HFC-507A	1	0.3%
	HC-600a	6	2.1%
	R-744	1	0.3%
Total surveyed		**291**	**100.0%**

The data on refrigerants used in display cabinets and glass-door coolers in Hanoi shows that HFC-404A is the most commonly used, accounting for 57.7% of the surveyed equipment, followed by HFC-134a at 22.0%. The significant presence of HFC-404A, despite its high GWP, indicates ongoing reliance on synthetic refrigerants. Despite of the trend of natural refrigerants, the using of these refrigerants on display cabinets and glass-door coolers is still limited, with HC-290 and HC-600a comprising 7.2% and 2.1% of the surveyed equipment, respectively. HCFC-22, an older refrigerant being phased out globally due to its ozone-depleting potential, and HFC-410A, another high-GWP refrigerant, are used in 7.2% and

3.1% of equipment, respectively. The minimal use of HFC-507A and R-744 (0.3% each) highlights the limited adoption of these alternatives.

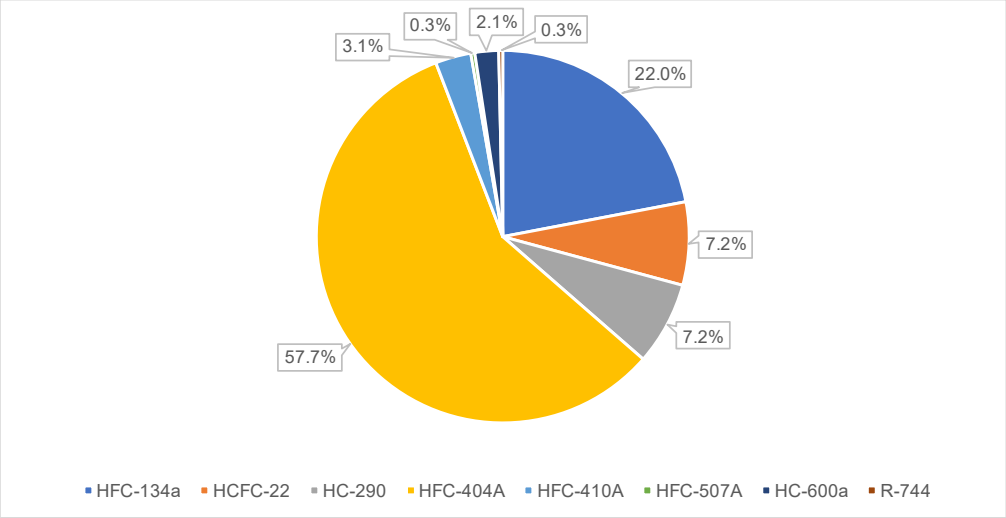

Figure 11: Ratio of main types of refrigerants used in Display cabinet/Glass-door cooler in Hanoi

Ho Chi Minh city:

Freezer: According to survey data, the number of freezers using R404A refrigerant is the most common, followed by HFC-134a and R22 refrigerants.

Table 14: Main refrigerants used in Freezer in Ho Chi Minh city

	Refrigerant	No. of surveyed equipment	Share
Freezer	HFC-404A	77	26.2%
	HFC-134a	66	22.4%
	HCFC-22	51	17.3%
	HC-290	29	9.9%
	R-410A	22	7.5%
	HC-600a	40	13.6%
	R-744	9	3.1%
Total surveyed		**294**	**100.0%**

The data on refrigerants used in freezers in Ho Chi Minh City reveals that HFC-404A is the most commonly used, comprising 26.2% of the surveyed equipment, followed by HFC-134a at 22.4%. HCFC-22 is still used in 17.3% of freezers, indicating a significant reliance on older synthetic refrigerants. However, natural refrigerants are gaining ground, with HC-290 and HC-600a making up 9.9% and 13.6% of the surveyed equipment, respectively. This shift towards natural refrigerants, which have lower GWP and are more environmentally friendly,

reflects increasing environmental awareness and regulatory pressures. R-410A, another synthetic refrigerant with a high GWP, is used in 7.5% of freezers, while R-744, a natural refrigerant, is used in 3.1% of units, indicating limited adoption.

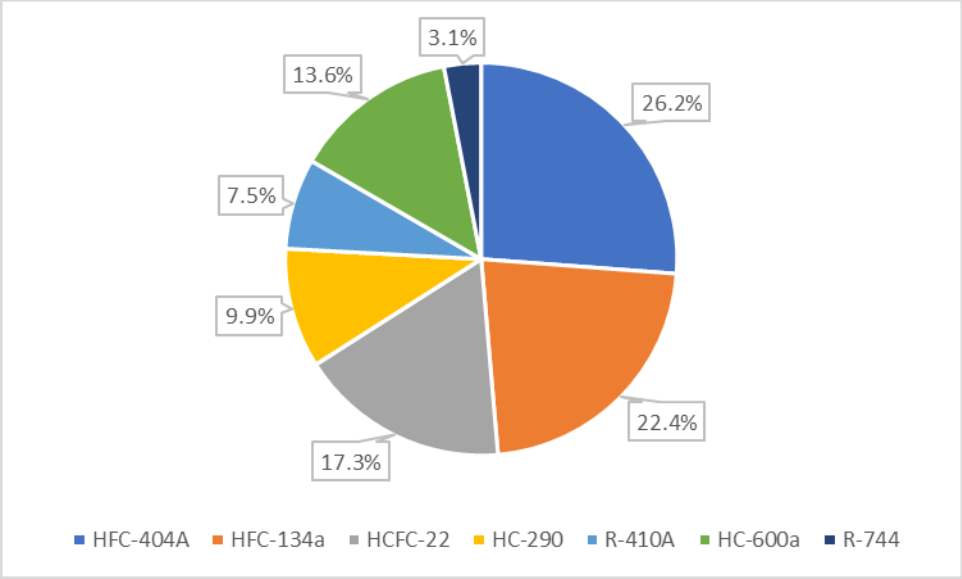

Figure 12: Ratio of main types of refrigerants used in Freezer in Ho Chi Minh

Display cabinet/Glass-door cooler: According to survey data, the number of refrigerators using HFC-134a refrigerant is the most common, followed by R290 and R404A refrigerants.

Table 15: Main refrigerants used in Display cabinet/Glass-door cooler in Ho Chi Minh

	Refrigerant	No. of surveyed equipment	Share
Display cabinet/Glass-door cooler	HFC-404A	38	16.6%
	HFC-134a	107	46.7%
	HFC-32	6	2.6%
	HC-290	65	28.4%
	HFC-507A	2	0.9%
	HC-600a	11	4.8%
Total surveyed		**229**	**100.0%**

The data on refrigerants used in display cabinets and glass-door coolers in Ho Chi Minh City indicates that HFC-134a dominates the market, comprising 46.7% of the surveyed equipment. HFC-404A is the second most common refrigerant, used in 16.6% of the units. Despite their high GWP, these synthetic refrigerants are still prevalent. However, there is a significant shift towards natural refrigerants, with HC-290 making up 28.4% and HC-600a

comprising 4.8% of the surveyed equipment. The increased use of HC-290, a natural refrigerant with low GWP, highlights the industry's move towards more environmentally friendly options. HFC-32, another synthetic refrigerant, is used in 2.6% of the units, while HFC-507A is minimally used at 0.9%.

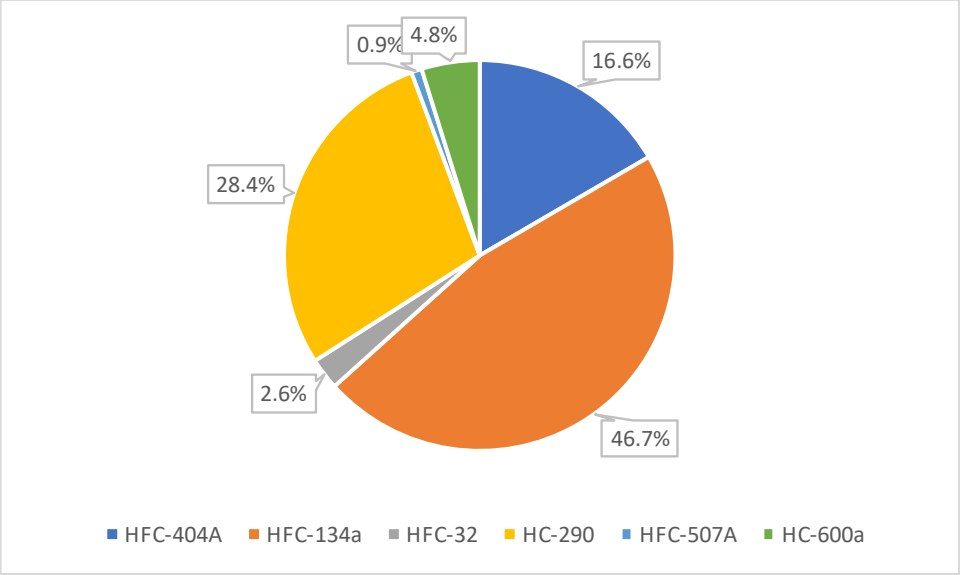

Figure 13: Ratio of main types of refrigerants used in Display cabinet/Glass-door cooler in Ho Chi Minh

Through the surveyed equipment:

- The stand-alone equipment usually uses HFC-134a, HC-290, HC-600a and rarely some equipment uses HFC-32 (as the case in Ho Chi Minh city). The initial charge amount of these equipment is depend on the type of used refrigerant and the volume of the equipment. With HFC-134a, the charge ranges from 185 -270g/equipment. This number is 60-100g for the equipment use HC-290 while with HC-600 is 80-90g.
- The condensing units are usually using R-404A, R-410A, R-507A, HCFC-22 and some case is R-744. The charge for the equipment is varied based on the cooling capacity, therefore, there is no specific number for this one.

3.2.5. Cooling capacity

Due to the surveyed equipment not showing cooling capacity, therefore the Consultant need to estimate the equipment's cooling capacity using he Coefficient of Performance (COP).

Cooling capacity = COP × Power input

The COP is estimated following the usual average temperature inside the refrigerator. The lower temperature inside the refrigerator, the lower the COP.

From surveyed equipment in Hanoi and Ho Chi Minh city, the range of cooling capacity is classified as below:

Table 16: The range of Cooling capacity of surveyed equipment in Hanoi

	Cooling capacity (W)	**No. of surveyed equipment**
Freezer	<500	217
	500-1000	15
	>1000	3
	Total	235
Display cabinet/Glass-door cooler	**Cooling capacity (W)**	**No. of surveyed equipment**
	<500	12
	500-1000	43
	>1000	20
	Total	75

Table 17: The range of Cooling capacity of surveyed equipment in Ho Chi Minh

	Cooling capacity (W)	**No. of surveyed equipment**
Freezer	<500	200
	500-1000	41
	>1000	24
	Total	265
Display cabinet/Glass-door cooler	**Cooling capacity (W)**	**No. of surveyed equipment**
	<500	86
	500-1000	108
	>1000	99
	Total	293

In Hanoi, commercial refrigeration equipment predominantly features lower cooling capacities suitable for minimarts and convenience stores, reflecting a focus on energy efficiency and space optimization. Display cabinets and freezers typically operate in the <500 W and 500-1000 W ranges, with fewer units exceeding 1000 W. In contrast, Ho Chi Minh City shows a more diverse distribution across all cooling capacity ranges, indicating a broader market catering to various retail formats, including supermarkets and hypermarkets. This suggests a more mature and adaptable approach to commercial refrigeration, accommodating a wider range of consumer needs and retail environments compared to Hanoi's more concentrated usage in smaller-scale retail settings.

Appendix

3.1. Questionnaires

ĐẠI HỌC BÁCH KHOA HÀ NỘI
TRƯỜNG CƠ KHÍ
KHOA NĂNG LƯỢNG NHIỆT

Địa chỉ: C7- Đại học Bách Khoa Hà Nội
Điện thoại: 024 38682625
Fax: 024 38683634 Email: sheer@hust.edu.vn
Web: http://sheer.hust.edu.vn

PHIẾU KHẢO SÁT TÌNH HÌNH SỬ DỤNG LẠNH THƯƠNG MẠI TẠI VIỆT NAM

DÀNH CHO CÁC DOANH NGHIỆP NGÀNH LẠNH DÂN DỤNG VÀ BÁN LẺ DƯỚI LĨNH VỰC CHUỖI LẠNH THỰC PHẨM Ở VIỆT NAM

(For businesses in the domestic cold chain and retail refrigeration sectors in Viet Nam)

....., ngày ..... tháng ... năm 2023

Chúng tôi, Khoa Năng lượng Nhiệt thuộc Trường Cơ khí của ĐHBKHN đang tiến hành nghiên cứu thị trường là cơ sở để phát triển chuyển đổi sang công nghệ làm lạnh xanh trong ngành lạnh dân dụng và bán lẻ dưới lĩnh vực chuỗi lạnh thực phẩm ở Việt Nam. Rất mong Quý công ty hỗ trợ cho chúng tôi một số thông tin.

Mục tiêu của dự án là tăng cường năng lực của các bên tham gia công và tư nhân về phương pháp làm lạnh xanh và từ đó hỗ trợ quá trình chuyển đổi sang các công nghệ thân thiện với khí hậu tại Việt Nam, góp phần đạt được mục tiêu của Chính phủ về khí thải "zero" net vào năm 2050. Các hoạt động của dự án dựa trên ba trụ cột chính: tư vấn chính sách, chuyển giao công nghệ và xây dựng năng lực.

Rất mong Quý công ty hỗ trợ chúng tôi một số thông tin. Xin chân thành Cảm ơn.

Tất cả thông tin trong phiếu khảo sát này sẽ chỉ được sử dụng duy nhất vào mục đích thống kê và nghiên cứu. Chúng tôi cam kết sẽ không công bố cụ thể các nội dung của phiếu khảo sát này.

I. THÔNG TIN CHUNG

Tên Công ty/Doanh nghiệp: _____

Địa chỉ tại VN: _____

_____

Họ tên người liên hệ: _____

Bộ phận/đơn vị: _____

Số điện thoại: _____

Email: _____

II. PHẦN CÁC CÂU HỎI KHẢO SÁT

1. Diện tích cửa hàng/siêu thị (Acreage of store/minimarket):

☐ 20m^2 - 25m^2 ☐ 40m^2 - 45m^2

☐ 25m^2 - 30m^2 ☐ 45m^2 - 50m^2

☐ 30m^2 - 40m^2 ☐ > 50m^2 (.....)

2. Số ngày mở cửa siêu thị/cửa hàng trong tuần(The number of days the supermarket/store is open during the week):

☐ Cả tuần/All days per week ☐ 5 ngày/5 days

☐ 6 ngày/6 days ☐ < 5 ngày/ < 5 days

3. Số giờ làm việc của siêu thị/cửa hàng trong ngày (Opening hours of the store/minimarket):

☐ > 14h(.....) ☐ 10h-12h

☐ 8-10h ☐ 12-14h

4. Số lượng và chủng loại Tủ lạnh đang sử dụng (Number and type of using refrigerator):

Phân loại tủ mát	Thương hiệu	Công suất điện (W)	Dung tích (Lít)	Môi chất	Số lượng	Thời gian làm việc (giờ)	Lượng nạp môi chất (gam)

Phân loại tủ đông	**Thương hiệu**	**Công suất điện (W)**	**Dung tích (Lít)**	**Môi chất**	**Số lượng**	**Thời gian làm việc (giờ)**	**Lượng nạp môi chất (gam)**

5. Các thiết bị tiêu thụ điện khác trong cửa hàng/siêu thị (Other electrical appliances at the store/minimarket)

A. Số lượng và chủng loại máy điều hòa đang sử dụng (Number and type of using AC) và năng suất lạnh của điều hòa sử dụng trong cửa hàng/siêu thị (Rated cooling capacity of using AC):

Phân loại	Công suất điện (W)	Môi chất lạnh	Số lượng	Thương hiệu	Biến tần/không biến tần
Máy 2 cục dân dụng Res. Split type AC					

Điều hòa thương mại Commercial AC					
Điều hòa Multi splits Multi split type AC					
Điều hòa VRV/VRF VRV/VRF AC					
Điều hòa kiểu đứng Standing floor AC					

B. Các thiết bị tiêu thụ điện khác trong cửa hàng/siêu thị (Other electrical appliances at the store/minimarket)

Phân loại	Số lượng	Công suất	Thời gian làm việc
....			
....			
....			

6. Hóa đơn tiền điện hàng tháng tại cửa hàng/siêu thị (Monthly electricity bill of the store)

☐ < 500.000 đồng (.....VND)

☐ 500.000đ - 5.000.000đ (.....VND)

☐ 5.000.000đ - 10.000.000đ (.....VND)

☐ 10.000.000đ - 20.000.000đ (.....VND)

☐ 20.000.000đ - 30.000.000đ (.....VND)

☐ > 30.000.000 đồng (.....VND)

7. Khi mua tủ lạnh/tủ đông mới, Qúy vị quan tâm đến những yếu tố nào? (When buying a new refrigerator/freezer, which factors do you consider?)

☐ Thương hiệu nhà sản xuất/Trademark

☐ Tiết kiệm điện/Energy saving

☐ Giá bán /Price

☐ Đơn vị cung cấp, lắp đặt a (supplier and service company)

8. Khi cần bảo trì và sửa chữa tủ lạnh/tủ đông, Quý vị sẽ liên hệ (When maintaining and repairing refrigerator/freezer, you will contact)

☐ Hãng bán / Supplier

☐ Công ty/Cá nhân đã lắp đặt(Company/Person installing refrigerator,freezer)

.....

.....

.....

.....

Trân trọng cảm ơn sự hợp tác của Quý vị!

Thank you very much for your cooperation!

3.2. List of surveyed supermarkets and convenience stores

Hanoi:

No	Name	Address	Survey date
1	HOMEFARM	Số 34 Hàng Bè, Phường Hàng Bạc,Quận Hoàn Kiếm, TP Hà Nội	28.09.2023
2		Số 49 Lý Nam Đế, Phường Hàng Mã, Quận Hoàn Kiếm, TP Hà Nội.	28.09.2023
3		Số 44 đường Hàm Tử Quan, Phường Chương Dương Độ, Quận Hoàn Kiếm, TP Hà Nội	28.09.2023
4		Số 30 Thành Công, Phường Thành Công, Quận Ba Đình, TP Hà Nội	28.09.2023
5		33 Thụy Khuê, Phường Bưởi, Quận Ba Đình, TP Hà Nội	28.09.2023
6		Số 164B Đội Cấn, Phường Liễu Giai, Quận Ba Đình, TP Hà Nội.	28.09.2023
7		Số 113 Yên Phụ, Phường Yên Phụ, Quận Tây Hồ, TP Hà Nội.	27.09.2023
8		461 Thụy Khuê, Phường Bưởi, Quận Tây Hồ, TP Hà Nội	27.09.2023
9		Số 142 Lê Trọng Tấn, Phường Khương Mai, Quận Thanh Xuân, TP. Hà Nội	26.09.2023
10		Số 282 Hoàng Văn Thái, Phường Khương Trung, Quận Thanh Xuân, TP Hà Nội	26.09.2023
11		Số 208 Phố Khương Trung, Phường Khương Đình, Quận Thanh Xuân, TP Hà Nội.	26.09.2023
12		Số 446 Khương Đình, Phường Khương Đình, Quận Thanh Xuân, TP Hà Nội	26.09.2023
13		Số 80 Phố Tân Mai, Phường Tân Mai, Quận Hoàng Mai, TP Hà Nội	21.09.2023
14		Số 260, Phố Đại Từ, Phường Đại Kim, Quận Hoàng Mai, TP Hà Nội	21.09.2023
15		Số 88 Lĩnh Nam, Phường Lĩnh Nam, Quận Hoàng Mai, TP Hà Nội.	21.09.2023
16		Số 02 Nguyễn Hữu Thọ, Phường Hoàng Liệt, Quận Hoàng Mai, TP Hà Nội	21.09.2023
17		Số 134 Trương Định, Phường Trương Định, Quận Hai Bà Trưng, TP Hà Nội.	21.09.2023
18		Số 242 Minh Khai, P. Minh Khai, Q. Hai Bà Trưng, TP Hà Nội	21.09.2023
19		Số 31 Lê Văn Hưu, Phường Ngô Thị Nhậm, Quận Hai Bà Trưng, TP Hà Nội	21.09.2023

20		Số 71 Lê Thanh Nghị, P.Đồng Tâm, Quận Hai Bà Trưng, TP. Hà Nội	21.09.2023
21		Số 56 Ngõ 102 Trường Chinh, Phường Phương Mai, Quận Đống Đa, TP Hà Nội	26.09.2023
22		Số 115 - A11 Tôn Thất Tùng, Phường Trung Tự, Quận Đống Đa, TP. Hà Nội.	26.09.2023
23		103 E6 Thái Thịnh, Phường Ngã Tư Sở, Quận Đống Đa, TP Hà Nội	26.09.2023
24		Số 116C1 Lương Định Của, Phường Phương Mai, Quận Đống Đa, TP Hà Nội	26.09.2023
25		Số 123 Trung Kính,Phường Yên Hòa, Quận Cầu Giấy, TP Hà Nội	27.09.2023
26		Số 49 Khúc Thừa Dụ, Phường Dịch Vọng Hậu, Quận Cầu Giấy. TP Hà Nội	27.09.2023
27		Số 59 Nghĩa Tân, Phường Nghĩa Tân, Quận Cầu Giấy, TP Hà Nội	27.09.2023
28		Số 347 Đại Mỗ, Phường Đại Mỗ , Quận Nam Từ Niêm, TP. Hà Nội	5.10.2023
29		Số 16 Hàm Nghi, Phường Mỹ Đình 2, Quận Nam Từ Liêm, TP Hà Nội.	5.10.2023
30		Số 15 Ngõ 92 Nguyễn Sơn, Phường Ngọc Lâm, Quận Long Biên, TP.Hà Nội.	4.10.2023
31		Số 176 Ngọc Lâm, Phường Ngọc Lâm, Quận Long Biên, TP Hà Nội.	4.10.2023
32		Kiot 01-20 CT1B Homeland , Phường Thượng Thanh, Quận Long Biên, TP Hà Nội	4.10.2023
33		Số 94 đường Doãn Kế Thiện, Phường Mai Dịch, Quận Cầu Giấy, TP Hà Nội	5.10.2023
34		Số 274 Goldmark City, Phường Phú Diễn, Quận Bắc Từ Liêm, TP Hà Nội	5.10.2023
35		310 Đường Hồ Tùng Mậu, Phường Cầu Diễn, Quận Bắc Từ Liêm, TP Hà Nội	5.10.2023
36		Số 168 Xóm 2, Thôn Quỳnh Đô, xã Vĩnh Quỳnh, huyện Thanh Trì, TP Hà Nội	10.10.2023
37		Số 73 Tứ Hiệp, xã Tứ Hiệp, huyện Thanh Trì, TP Hà Nội	10.10.2023
38		Số 21 Bà Triệu, Phường Nguyễn Trãi, Quận Hà Đông, TP Hà Nội	5.10.2023
39		Số 3 LK6C Nguyễn Văn Lộc, Phường Mộ Lao, Quận Hà Đông, TP Hà Nội	5.10.2023
40		Tòa S2.19 Vinhomes Ocean Park, Xã Đa Tốn, Huyện Gia Lâm, TP Hà Nội	10.10.2023

41		Tòa S2.10 KĐT Vinhomes Ocean Park, Xã Đa Tốn, Huyện Gia Lâm, TP Hà Nội	10.10.2023
42	Winmart +	TRUNG KÍNH, Q.Cầu Giấy	21.10.2023
43		VŨ NGỌC PHAN, Q.Đống Đa	21.10.2023
44		Thanh Trì	10.10.2023
45		65 Cổ Điển, Thanh Trì	10.10.2023
46		S210 Oceanpark, Gia Lâm	10.10.2023
47		Ô 103, tầng 1, tòa nhà HH An Bình 1, KDTM Định Công, Q.Hoàng Mai	14.10.2023
48		NGUYỄN LÂN, Q.Thanh Xuân	14.10.2023
49		PHAN ĐÌNH GIÓT, Q.Thanh Xuân	14.10.2023
50	CIRCLE K	KDT TRUNG YÊN, Q.Cầu Giấy	21.10.2023
51		NGUYỄN THỊ ĐỊNH, Q.Cầu Giấy	21.10.2023
52		288 GIẢI PHÓNG, Q.Thanh Xuân	14.10.2023
53		Ô D22, Nơ 12 KDTM Định Công, Q.Hoàng Mai	14.10.2023
54	BRG Mart Cổ Điển	Cổ Điển, Thanh Trì	10.10.2023
55	T-mart Store Vĩnh Quỳnh	Vĩnh Quỳnh, H.Thanh Trì	10.10.2023
56	GOOLDMART 24H NGUYÊN HỒNG	Đống Đa	21.10.2023
57	Link-Mart	Gia Lâm	25.10.2023
58	T Mart	Gia Lâm	25.10.2023
59	Xanh mart	Gia Lâm	25.10.2023
60	ViniMart	Bắc Từ Liêm	5.10.2023
61	QQ Food	Ngọc Lâm, Q.Long Biên	4.10.2023
62	Agami Trần Đại Nghĩa	Trần Đại Nghĩa, Q.Hai Bà Trưng	30.9.2023
63	Winmart Phạm Ngọc Thạch	Phạm Ngọc Thạch, Q.Đống Đa	30.9.2023
64	BRGMART Ngọc Lâm	Ngọc Lâm, Q.Long Biên	4.10.2023
65	Winmart Nguyễn Sơn	Nguyễn Sơn, Q.Long Biên	4.10.2023
66	Winmart Ngọc Lâm	Ngọc Lâm, Q.Long Biên	4.10.2023
67	QQ Food Ngọc Lâm	Ngọc Lâm, Long Biên	4.10.2023
68	Winmart Văn Quán	Văn Quán, Q.Hà Đông	27.1.2024
69	AEON MALL	Long Biên	18.11.2023
70	Winmart Thái Thịnh	Thái Thịnh, Q.Đống Đa	13.12.2023
71	Tops Market	3 Lê Trọng Tấn, Q.Thanh Xuân	13.12.2023
72	AEON MALL	Hà Đông	2.2.2024
73	FUJI MART	Hà Đông	2.2.2024

74	Điểm giới thiệu và bán sản phẩm	Đống Đa	18.1.2024
75	Circle K Hàng Bông	Hàng Bông, Q.Hoàn Kiếm	18.1.2024
76	Winmart Bạch Mai	Bạch Mai, Q.Hai Bà Trưng	18.1.2024
77	Agami Bạch Mai	Bạch Mai, Q.Hai Bà Trưng	18.1.2024
78	Okona Bạch Mai	Bạch Mai, Q.Hai Bà Trưng	18.1.2024
79	WINMART CT3B Định Công	CT3B Định Công, Q.Hoàng Mai	19.1.2024
80	T Mart Linh Đàm	Linh Đàm, Q.Hoàng Mai	19.1.2024

Ho Chi Minh City:

No	Name	Address	Survey date
1	7 ELEVEN	81 NGUYỄN DU, P.BẾN NGHÉ, Quận 1	21/11/2023
2		ĐƯỜNG SONG HÀNH, SA LỘ HÀ NỘI, Q2	21/11/2023
3		THE ART GIA HOA, Q9	21/11/2023
4		155 BẾN VÂN ĐỒN, P6,Q4	21/11/2023
5		QUẬN THỦ ĐỨC	21/11/2023
6		37/2e Trịnh Đình Trọng, Phường 5, Quận 11	21/11/2023
7		10A Trần Quốc Toản, Võ Thị Sáu, Quận 3	15/12/2023
8	BÁCH HÓA XANH	81 ĐĂNG VĂN BI, BÌNH THỌ,THỦ ĐỨC	
9		30 ĐƯỜNG SỐ 3,TRẦN NÃO,Q2	
10		36B ĐƯỜNG TÂY HÒA, PHƯỚC LONG A, Q9	
11		87 THÍCH QUẢNG ĐỨC,P4,PHÚ NHUẬN	
12		118 VĨNH HỘI, P4,Q4	
13		265B NGUYỄN VĂN ĐẬU,P11, BÌNH THẠNH	
14		871 ÂU CƠ,TÂN SƠN NHÌ,TÂN PHÚ	
15		SỐ 2 LÊ LỢI, P4, GÒ VẤP	
16		SỐ 718-720 ÂU CƠ, P 14, TÂN BÌNH	
17		393 HƯƠNG LỘ 3, BÌNH HƯNG HÒA,BÌNH TÂN	
18		597 NGUYỄN VĂN QUÁ, ĐÔNG HƯNG, Q12	
19	B'Mart	96 ĐƯỜNG HẬU GIANG,P 12, Q6	
20		126 ĐƯỜNG BÁ TRẠC, P 2, QUẬN 8	
21		352 LÊ VĂN LƯƠNG,TÂN QUY, QUẬN 7	
22		2A VĨNH HỘI, QUẬN 4	21/11/2023
23		11 PHÚ MỸ, P22, BÌNH THÀNH	21/11/2023
24		43 CHƯƠNG DƯƠNG, LINH CHIỂU,THỦ ĐỨC	21/11/2023
25		66 ĐƯỜNG SỐ 15,AN PHÚ,Q2	21/11/2023
26		268 ĐƯỜNG LÊ VĂN SỸ,P 14,QUẬN 3	
27		25C Đ. SƯ VẠN HẠNH, P 9, QUẬN 5	
28		131 Đ. TÔ HIẾN THÀNH, P 13,QUẬN 10	

29	CIRCLE K	43 PHẠM NGỌC THẠCH, P 6, QUẬN 3	
30		37 THUẬN KIỀU, P 12, QUẬN 5	
31		92 HẬU GIANG, P 12, QUẬN 6	
32		31 NGUYỄN HỮU THỌ, TÂN HƯNG, QUẬN 7	
33		172 NGUYỄN THỊ TẦN , PHƯỜNG 2, QUẬN 8	
34		HẺM 285 CÁCH MẠNG THÁNG TÁM, PHƯỜNG 12, QUẬN 10	
35		319 LÝ THƯỜNG KIỆT, PHƯỜNG 15,QUẬN 11	
36		04 Nguyễn Văn Bảo, Phường 4, Gò Vấp	15/12/2023
37		32 Nguyễn Hữu Cầu, Phường Tân Định, Quận 1	15/12/2023
38		32 Phan Xích Long,Phường 3 ,Quận Phú Nhuận	15/12/2023
39		190 Đ. Phan Văn Trị, Phường 11, Bình Thạnh	15/12/2023
40	COOP FOOD	110 Phổ Quang, P9, Bình Thạnh	
41		102-104 VĨNH HỘI,P4,Q4	
42		SỐ 1 ĐẶNG VĂN BI,BÌNH THỌ,THỦ ĐỨC	
43		33 ĐƯỜNG SỐ 2, BÌNH AN, Q2	
44		149-149A TÂY HÒA, KHU PHỐ 2, PHƯỚC LONG A , QUẬN 9	
45		182 PHAN VĂN HÂN, P 14,BÌNH THẠNH	
46		241 TRẦN QUANG KHẢI,Q1	
47	Family mart	97-99 Nguyễn Hữu Cầu, Phường Tân Định, Quận 1	15/01/2024
48		27 Đ. Nguyễn Hữu Thọ, Tân Hưng, Quận 7	
49		706 Đ. Nguyễn Trãi, Phường 11, Quận 5	
50		Family Mart, Đường Vĩnh Viễn, phường 9, Quận 10	
51		487 Hậu Giang, phường 11, Quận 6	
52		54-56 Thái Thị Nhạn phường 10,quận Tân Bình	
53		163 trường trinh,Q12	
54	GS25	Quận 3	
55		706 Đ. Nguyễn Trãi, Phường 11, Quận 5	
56		1472 Đ. Võ Văn Kiệt, Phường 3, Quận 6	
57		33 Đ. Nguyễn Hữu Thọ, Tân Hưng, Quận 7	
58		196 Đ. Cao Lỗ, Phường 4, Quận 8	
59		GS25, Hoàng Dư Khương, Phường 12, Quận 10	
60		156 Nguyễn Thị Búp, Q12	
61		605 Âu Cơ, Phú Trung, Tân Phú	
62		RMCQ+824, Phường 4, Gò Vấp	15/12/2023
63	MINISTOP	62 BÌNH GIÃ, TÂN BÌNH	
64		71 NI SƯ HUỲNH LIÊN, TÂN BÌNH	
65		113 THÍCH QUẢNG ĐỨC, PHÚ NHUẬN	

66		141 THỐNG NHẤT, TÂN THÀNH, TÂN PHÚ	
67		165 BẠCH ĐẰNG, TÂN BÌNH	
68		363 BÌNH TRỊ ĐÔNG, BÌNH TÂN	
69		527 LÊ ĐỨC THỌ, P16, GÒ VẤP	
70		120 BÌNH THỚI, QUẬN 11	
71		43 Trần Quý Cáp, Phường 11, Bình Thạnh	15/12/2023
72	HOMEFARM	84B1 TRẦN HỮU TRANG, PHÚ NHUẬN	
73		282 TÂN SƠN NHÌ, TÂN SƠN, TÂN PHÚ	
74		282A GÒ XOÀI, BÌNH HƯNG HÒA, BÌNH TÂN	
75		1028 NGUYỄN VĂN QUÁ Q12	
76		1054 LÊ ĐỨC THỌ P13 GÒ VẤP	
77		352 Lãnh Binh Thăng, Phường 11, Quận 11	
78	WINMART	32 PHAN VAN TRỊ	
79		66B NGUYỄN SỸ SÁCH	
80		82 Đ SỐ 9 BÌNH TÂN	
81		108 ĐÔNG HƯNG THUẬN	
82		219 TÂY THẠNH	
83		476 PHAN XÍCH LONG	
85	GO! Trường Chinh	11 Đ. Trường Chinh, Tây Thạnh, Tân Phú	21/03/2024
86	LOTTE Mart Gò Vấp	242 Nguyễn Văn Lượng Gò Vấp	21/03/2024
87	Tops Market	An Phú Khu nhà phức hợp Cantavil, B1, Song Hành	21/03/2024
88	Tops Market	Thảo Điền 12 Đ. Quốc Hương	21/03/2024
89	Aeon Citimart Somerset（Nguyễn Thị Minh Khai）	23 Đ. Nguyễn Thị Minh Khai, Bến Nghé, Quận 1	21/03/2024
90	Aeon Citimart	96 Đ. Cao Thắng, Phường 4, Quận 3	21/03/2024
91	Aeon Citimart（ Thao Dien）	49 Đ. Số 66, Thảo Điền, Quận 2	21/03/2024
92	AEON MALL Tân Phú	30 Đ. Tân Thắng Tân Phú	21/03/2024

GREEN COOLING INITIATIVE III

The Green Cooling Initiative III (GCI III) is a global project commissioned by the German Federal Ministry of Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). GCI III supports 07 partner countries, one of which is Viet Nam, in tackling specific challenges in shifting to green cooling technologies.

In Viet Nam, GCI III aims to strengthen the capacity of public and private actors for the Green Cooling approach and thereby support the transformation towards climate-friendly technologies, contributing to achieving Viet Nam's goal of net-zero emissions by 2050. The project works with the Department of Climate Change, Ministry of Environment and Natural Resources as its political partner, and the Hanoi Industrial Vocational College as one of the implementing partners.

The work of GCI III is based on 03 pillars: Policy advise, technology transfer, and capacity building. Regarding policy advise, GCI III supports its Viet Namese partners to include green cooling measures into the 2022 updated Nationally Determined Contribution (NDC), conduct market study and develop an implementation plan for Green Cooling technologies, and facilitate access to appropriate financing channels for Green Cooling projects. The project also organises study tours to China for local manufacturers on the production of energy-efficient R290 split air conditioners and supports the development of the supply chain for R290 air conditioners and heat pumps. Lastly, the project organises on-site training for the National Ozone Unit staff, revises the vocational training curriculum of 02 vocational colleges, and deploys training of both trainers and trainees on safe use of natural refrigerants.

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