Chapter 4

A Cold Chain Study of Indonesia

PT Capricorn Indonesia Consult

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Chapter 4

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4.1. Introduction

Background

The cold chain system is a type of supply chain wherein the process aims to maintain temperature so that the product is maintained during the distribution process. An important factor in maintaining cold chain products is the correct treatment in each of the main distribution points in the cold chain so that the right distribution channels will provide good quality of cold chain products.

The application of cold chains requires the provision of several facilities, both in the storage and distribution process. In the storage process, it is needed to have, among others, cold storage and freezing machines, while in the distribution process, it is necessary to have refrigerated transportation fleets (carriers, aircraft and vehicles).

Cold chain business is a major supporter of various industrial sectors such as the food processing industry, fishing industry, retail network, pharmaceutical industry and so on.

Indonesia is considered to have a potential market for cold chain business. This is supported by the user industrial sector, which shows fairly good development. The user industrial sectors such as livestock, fisheries, processed food and chemical, pharmaceutical and drug industries are still an important key for national development, and this can be seen from its contribution to Indonesia's gross domestic product (GDP) during 2018.

Based on the information from the Central Bureau of Statistics (BPS), in that period, GDP of the livestock sector had a contribution of 1.5% or Rp231.7 trillion of the total Indonesian GDP of Rp4,837.3 trillion, the fisheries sector contributed 2.6% of the total GDP, the food and beverage industry accounted for 6.2% and the chemical, pharmaceutical and drug sector amounted to 1.6% of Indonesia's total GDP.

Scope of study

This study aims to discuss more clearly the prospects for cold chain business and the obstacles faced by this industry. It also discusses the user industry such as the processed food industry, fisheries industry, agricultural industry, trade industry and pharmaceutical industry.

In addition, this study features information on companies involved in the processed food industry, fishing industry and pharmaceutical industry. Besides that, it also discusses government policies that support the cold chain industry and the cold chain market share in Indonesia.

Methodology and source of information

This study was conducted in two ways, namely, desk research and field research. Field research is performed by conducting interviews with business players or several stakeholders in related industries in Indonesia that produce primary data. While desk research is obtained based on the information in the form of studies or data from related institutions such as the Ministry of Maritime Affairs and Fisheries (KKP), Fishery Products Processing and Marketing (P2HP), Animal Husbandry and Animal Health, BPS, and Indonesian Cold Chain Associations (ARPI), which produce secondary data.

In addition, to complete the information, this study also relies on several studies and analyses originating from the data bank of PT Capricorn Indonesia Consult, Inc. (PT CIC).

4.2. General review on cold storage in Indonesia

National economic development

The prospect of Indonesia's economy is expected to improve further next year with higher growth and maintained stability. This growth is triggered by stronger domestic demand by both consumption and investment, improved export performance and declining imports. Bank Indonesia (BI) estimates that domestic economic growth will be in the range of 5.5%–6.1% until 2024.

The improving economic condition in Indonesia will certainly lift the growth of various industrial sectors, including the processed food industry, fishing industry, agricultural industry and pharmaceutical industry.

Based on BPS information, the growth rate of the processed food sector during 2014–2018 averaged 5.8% per year. The contribution of the livestock sector averaged 1.5%, the fisheries sector attained 2.5% per year and the processing pharmaceutical industry reached 1.7% per year.

In 2018, the processed food industry was the largest in contribution, namely, 6.2% of the total GDP nationally or reaching Rp927.4 trillion and increased compared with the previous year (2017), which reached Rp834.4 trillion.

The fisheries sector contributed 2.6% or reached Rp385.9 trillion in 2018. Meanwhile, the chemical industry and drug sector contributed Rp239.6 trillion, while the livestock industry contributed 1.5% with a value of Rp231.7 trillion in 2018.

Table 4.1: Gross Domestic Products Based on Current Prices, 2014–2018 (Billion Rupiah)

BUSINESS FIELD / BASED ON CURRENT PRICES	Year					Annual Average (%)
	2014	2015	2016	2017	2018	
AGRICULTURAL SECTOR						
a. Livestock	167,008	184,152	201,124	213,306	231,711	–
Contribution to GDP (%)	1.58	1.60	1.62	1.57	1.56	1.59
b. Fishery	245,488	288,917	317,190	348,854	385,936	–
Contribution to GDP (%)	2.32	2.51	2.56	2.57	2.60	2.51
PROCESSING SECTOR						
a. Food and Beverage Industry	562,017	647,072	740,810	834,425	927,444	–
Contribution to GDP (%)	5.32	5.61	5.97	6.14	6.25	5.86
b. Chemical, Pharmaceutical and Drug	180,037	209,788	223,405	236,193	239,678	–
Contribution to GDP (%)	1.70	1.82	1.80	1.74	1.62	1.74
GROSS DOMESTIC PRODUCTS (GDP)	10,569,705	11,526,333	12,401,729	13,587,213	14,837,358	–

Source: Central Bureau of Statistics (2019).

Contribution of national economic development to cold storage in cold chain business

The development of the livestock, fisheries, processed food, chemical and pharmaceutical and drug industry has a major influence on the development of the cold chain industry in Indonesia. The development of these industrial sectors will automatically affect the increase in cold chain demand.

Several policies are issued by the government to support the development of the cold chain industry by the user industry, such as the fisheries sector. The potential of Indonesian marine products is known to be very abundant. However, the abundant potential of fish catches is often constrained by the limited supporting means, of them is cold storage. The presence of cold storage at each distribution point is needed to extend the freshness of the fish for the buyer.

The fisheries sector is one of the government's special concerns to be optimised; thus, it has added value and contributes to state revenues.

In the livestock sector, the role of the cold chain is also very much needed. Animal products are one of the food sources that are rich in protein and needed to build healthy and smart communities. Food products from animals are also one of the products that are categorised as perishable food and potentially hazardous.

Apart from having to think about its availability, it must also be handled properly to be able to be beneficial and guaranteed to be healthy and safe for consumption. The government continues to try to support the implementation of the cold chain to maintain the supply of

meat to remain stable nationally and to meet not only domestic needs but also export market needs.

Likewise, in the pharmaceutical sector and the processed food industry, where cold chains are indeed needed to maintain good product quality. This condition makes it clear that cold chain industries also have significant contributions in national economic development.

Obstacles and challenges of cold storage in cold chain business in Indonesia

The development of cold chain business is not as expected as this business has many challenges and obstacles to face. Among them are obstacles in investment because of infrastructure problems the lack of fiscal facilities offered by the government.

As is known, 100% raw material of the cold chain industry is still imported, and the government has not yet agreed to provide duty exemption facility on the component as well as the provision of tax holiday facilities to build cold storage assembly plants in the country. Another challenge is the lack of availability of electric power in remote areas. This condition results in the use of cold chains by the user industry not being optimal. According to information from ARPI, the installed capacity of the industry is only half of the national demand.

Seeing the economic development of Indonesia, which is increasingly being supported by abundant natural resources, these obstacles and challenges can create opportunities, as well as challenges, for the cold chain industry in the country.

Prospects for cold storage markets in Indonesia

The need for cold storage in cold chain business in Indonesia is still quite high. This is indicated by almost all cold storage warehouses that are always fully occupied for storing meat products, fish, vegetable fruits and so on.

In addition, Indonesia's cold chain market has fairly good prospects, marked by the increasing Indonesian economic growth, followed by the development of the user industry.

Another indicator is the large population with a consumption pattern that tends to require efficiency and speed and who likes fresh products such as fresh fruits and vegetables and processed meat, milk and other products.

Besides that, the development of network retail sector and restaurant chain stores has also encouraged the development of cold storage business in Indonesia. Most retail networks have many outlets spread across several locations. This requires handling the availability of goods professionally and on time, similarly, the export and import business of fishery products, meat, fruit and vegetables and the ice cream industry.

4.3. Development of cold chain products in Indonesia

Cold storage production in cold chain business in Indonesia

To maintain cold storage facilities require a substantial investment. It is not surprising that many companies do not have their own cold storage facilities for their needs. For this reason, many of them rent or cooperate with cold storage owners.

It is very difficult to know the amount of cold storage production in Indonesia and can only be known from the production capacity of cold storage.

Several players involved in this business consist of various business sectors, namely, cold storage companies, food processing industries, meat importers including slaughterhouses, fishing industries, ice cream industries, fruit importers, retail networks and pharmaceutical industries.

Based on a survey conducted by CIC, until the end of 2018, there were around 69 major cold storage companies throughout Indonesia with a total capacity of 370,000 tons per year. Of this amount, the largest capacity is owned by PT Enseval Medika Prima Tbk., which has a cold storage production capacity of 59,000 tons. It is followed by PT Unilever Indonesia (Wall's ice cream) with a production capacity of 50,000 tons.

PT Sukanda Djaya ranked third with a total cold storage capacity of 45,000 tons and followed by other companies such as PT Kiat Ananda Cold Storage, PT Mega Internasional, PT Indomaguro Tunas Unggul and others as shown in the following table:

Table 4.2: Cold Storage Company and Capacity in Indonesia, 2018

No.	Name of Company	Capacity (Ton)	Share (%)
1	Enseval Putra Megatrading Tbk, PT	59,000	15.9
2	Unilever Indonesia, PT (Wall's ice cream)	50,000	13.5
3	Sukanda Djaya, PT	45,000	12.2
4	Kiat Ananda Cold Storage, PT	30,000	8.1
5	Mega Internasional Sejahtera, PT	21,000	5.7
6	Indomaguro Tunas Unggul, PT	15,000	4.1
7	Dharma Samudera Fishing Industries, PT	14,000	3.8
8	Savina Cold Storage	9,000	2.4
9	Wahana Cold Storage, PT	7,000	1.9
10	Lion Super Indo, PT/Super Indo	6,600	1.8
11	Bonicom Servistama Compindo, PT	6,000	1.6
12	Central Windu Sejati, PT	6,000	1.6
13	Adib Food Supplies, PT	6,000	1.6
14	Mgm Bosco Logistics, PT	5,500	1.5
15	Perum Perikanan Indonesia	5,100	1.4
16	Bumi MenaraInternusa, PT	5,000	1.4
17	Surya Alam Tunggal, PT	5,000	1.4

No.	Name of Company	Capacity (Ton)	Share (%)
18	Jalur Sejuk, PT	5,000	1.4
19	Hero Supermarket Tbk, PT/Giant	4,400	1.2
20	Trans Retail Indonesia, PT/Carrefour	4,100	1.1
21	Wirontono Cold Storage & Industry, PT	4,000	1.1
22	Supra Boga Lestari/Ranch Market, PT	3,000	0.8
23	Istana CiptaSembada (Ics), PT	3,000	0.8
24	ExpravertNasuba, PT	3,000	0.8
25	Mega Marine Pride, PT	2,000	0.5
26	Scrum Indonesia, PT	2,000	0.5
27	Wira Logitama Saksama	2,000	0.5
28	Fast Food Indonesia, PT Tbk (KFC)	1,800	0.5
29	Perikanan Nusantara, PT	1,550	0.4
30	AGB Tuna, PT	1,500	0.4
31	Alpine Cool Utama	1,500	0.4
32	Central Coldstorage PratamaSakti, PT	1,500	0.4
33	Raficon Sarijaya, PT	1,500	0.4
34	Bintang Citra International, PT	1,500	0.4
35	Guna Pratama, PT	1,500	0.4
36	Lotte Shopping Indonesia, PT/Lotte	1,300	0.4
37	Trade Corp Indonesia, PT	1,200	0.3
38	Starcon Indonesia, PT	1,200	0.3
39	Multi Guna International Persada, PT	1,100	0.3
40	Diamond Cold Storage, PT	1,000	0.3
41	Kini Cold Storage, PT	1,000	0.3
42	Central Food Lestari, PT	1,000	0.3
43	United Refrigeration, PT	1,000	0.3
44	Ercoolcoldstorage, PT	1,000	0.3
45	Rekso Nasional Food, PT/McDonald’s	1,000	0.3
46	Cold Storage Jaya Makmur, PT	1,000	0.3
47	Aneka Boga Nusantara, PT	1,000	0.3
48	IluvaIntiluhur Fuji Abadi, PT	1,000	0.3
49	Cooltech Surabaya, PT	1,000	0.3
50	Widjaya Dwi Kalmindo, PT	1,000	0.3
51	Aneka Cool Citratama, PT	1,000	0.3
52	Indopanel Sukses Makmur, PT	1,000	0.3
53	Sarana Refrigeratama, PT	1,000	0.3
54	Celcius Jaya, PT	1,000	0.3
55	Sarana Dunia Pendingin, PT	1,000	0.3
56	Wahana Boga Nusantara, PT	1,000	0.3
57	Indoguna Utama, PT	1,000	0.3
58	Belfoods Indonesia, PT	1,000	0.3
59	Armada Container Indonesia, PT	1,000	0.3
60	Inter Mitra Transindo, PT	1,000	0.3
61	Tri Putra Perkasa, PT	1,000	0.3

No.	Name of Company	Capacity (Ton)	Share (%)
62	Pluit Cold Storage, PT	500	0.1
63	Tiara Dewata Group	500	0.1
64	San Miguel Pure Foods Indonesia, PT	500	0.1
65	Japfa Santori Indonesia, PT	500	0.1
66	Hwasung Thermo Indonesia, PT	500	0.1
67	Bali Mina Utama, PT	400	0.1
68	Darta Logistic, PT	250	0.1
69	Abbatoir Surya Jaya, PT	200	0.1
TOTAL CAPACITY		**370,200**	**100.0**

Source: Survey by author.

Development of cold chain demand in cold chain business in Indonesia

In the next five years, the demand for cold storage is expected to continue to increase, which will automatically increase the current installed capacity. Based on the trends experienced by major cold storage being surveyed, on average in the next few years, the need for cold storage will increase between 10% and 20% per year.

With this estimate, it is projected that in 2019, the demand for cold storage capacity will reach 462,700 tons, or an additional capacity of 92,500 tons is needed from the current production capacity of 370,200 tons. Until 2024, the capacity will reach 824,700 tons, or an additional capacity of 59,600 tons is needed as shown in the following table:

Table 4.3: Projection of Potential Demand for Cold Storage in Indonesia, 2019–2024

Year	Projection of Production Capacity (tons)	Additional Production Capacity (thousand tons)
2019	462,750	92,550
2020	548,359	85,609
2021	631,161	82,802
2022	692,384	61,223
2023	765,084	72,700
2024	824,760	59,677

Notes: Estimated based on the trends experienced by major cold storages being surveyed. Additional Production Capacity denotes gap between the projected capacity and the previous year's capacity.
Source: Authors.

4.4. Demand for frozen food in Indonesia

Transitions of Indonesia frozen food consumption

Indonesia is considered to have good prospects in the food and beverage industry, which is mainly driven by the frozen food industry, especially those from marine products.

The demand for frozen food in recent years is estimated to have been increasing, along with changes in the pattern of consumption of people, which tend to be fast, practical and economical but meet nutritional and health needs. With a population of around 260 million, it is a considerable market potential for the frozen food industry in Indonesia, especially supported by the increasing public purchasing power.

According to CIC's observations, in the last five years, the consumption of frozen food has increased by an average of 6.9% per year. While in 2014, the consumption of frozen food only reached 5.0 million tons, and in 2015, it increased to 5.5 million tons, up 8.6%. This condition also occurred in 2016, where frozen food consumption again increased to 5.9 million tons, up 7.4%. Until the end of 2018, frozen food consumption has reached 6.6 million tons. More information on the development of frozen food consumption during the 2014–2018 period is presented in the following table:

Table 4.4: Development of Frozen Food Consumption in Indonesia, 2014–2018 (Ton)

Year	Production	Import	Export	Consumption	Growth (%)
2014	5,629,902	280,360	828,130	5,082,132	–
2015	5,920,708	229,551	631,013	5,519,246	8.6
2016	6,211,514	314,470	600,794	5,925,191	7.4
2017	6,502,321	389,626	621,604	6,270,342	5.8
2018	6,793,127	406,179	568,774	6,630,531	5.7
Annual Average (%)					**6.9**

Notes: See footnote for frozen foods referred in this discussion.[18] Domestic consumption was estimated from production + import – export.
Source: Central Bureau of Statistics (2019).

Export of frozen food in Indonesia

Although the frozen food industry has developed in Indonesia, its marketing to the export market has not been optimal, which has good prospects. Admittedly, there are some obstacles to export frozen food overseas that must be faced and certainly difficult. For

[18] Frozen foods in this discussion consist of HS 02023000, 02032200, 02032900, 02044100, 02069000, 02043000, 02071200, 03031900, 03032300, 03032400, 03032600,03032900, 03033100, 03033300, 03033900, 03034100, 03034200, 03034300, 03034400, 03034600, 03034900, 03035300, 03035410, 03035420, 03035500 up to 03035700, 03035910, 03035920, 03035990, 03036800, 03036900, 03038100, 03038200, 03038400, 03038911, 03038913, 03038914, 03038916 up to 03038919, 03038926 up to 03038929, 03039100, 03039200, 03046100, 03046200, 03046900, 03047900, 03048100 up to 03048400, 03048700 up to 03048900, 03049100, 03049300, 03049600, 03049700, 03049900, 03061110, 03061190, 03061210, 03061290, 03061410, 03061490, 03061500, 03061600, 03061711, 03061719, 03061721, 03061722, 03061729, 03061730, 03061790, 03061900, 03071200, 03072200, 03073200, 03074310, 03074390, 03075200, 03077200, 03078400, 03079200, 03081200, 03083030, 04014020, 04014090, 07101000, 07102100, 07102200, 07102900, 07103000, 07104000, 07108000, 07109000, 07141091, 07142010, 07143010, 07144010, 07149011, 08112000, 08119000, 12122930, 20041000, 20049010, 20049090.

example, the tariff of import duty applied by various export destination countries is quite high.

Information obtained by CIC from the Indonesian Food and Beverage Association (GAPMI) stated that the export of food and beverages is targeted at 10% annually, but the import duty factor is an obstacle for food products to compete in the global market.

As an example, African countries provide better import tariffs to some countries such as China because of the cooperation of CEPT (Common Effective Preferential Tariffs). As a result of such constraint, it is not impossible, if seen from its development, for frozen food exports to decline every year.

Some frozen food products that are quite a mainstay of exports are cuttlefish and frozen squid, skipjack, frozen shrimp and other types of frozen fish.

Based on the information from the Central Bureau of Statistics (BPS) during the 2014–2018 period, frozen food exports declined every year with an average of 8.4 % per year. While in 2014, frozen food exports only reached a volume of 828,100 tons worth US$2.8 billion, in 2015, the volume dropped to 631,000 tons or decreased by -23.8% worth US$2.2 billion.

In 2017, frozen food exports increased again with a volume of 621,600 tons (3.5%) worth US$2.7 billion compared with the previous year's export volume of 2016, which reached 600,700 tons worth US$2.5 billion. And until the end of 2018, exports fell to 568,700 tons worth US$2.4 billion as shown in the following table:

Table 4.5: Development of Indonesia Frozen Food Export, 2014–2018

Year	Volume (Ton)	Growth (%)	Value (US$'000)	Growth (%)
2014	828,130	–	2,845,684	–
2015	631,013	- 23.8	2,263,607	- 20.5
2016	600,794	- 4.8	2,525,598	11.6
2017	621,604	3.5	2,715,074	7.5
2018	568,774	- 8.5	2,419,199	-10.9
Annual Average (%)		**-8.4**		**-3.1**

Source: Central Bureau of Statistics (2019).

Frozen food exports from Indonesia are aimed at various countries such as the United States, China, Japan, Vietnam, Thailand, Taiwan and Malaysia. Frozen food exports to the United States are the largest among other export destination countries.

In 2017, exports to the United States reached a volume of 129,200 tons with a value reaching US$1.2 billion or controlling 20.8% of the total export volume that year, which amounted to 621,600 tons. The second position is occupied by China (18.4%) with a volume of 114,400 tons worth US$232.7 million, followed by Japan (14.7%) with a volume of 91,300 tons worth US$452.0 million, and Vietnam with a volume of 71,200 tons (11.4%) worth US$160.8 million.

Table 4.6: Export of Frozen Food by Destination Country, 2017

Country	Volume (Ton)	Value (US$ '000)	Share (%)
United States	129,252	1,224,390	20.8
China	114,481	232,705	18.4
Japan	91,336	452,081	14.7
Vietnam	71,200	160,869	11.5
Thailand	67,606	131,502	10.9
Taiwan	33,591	81,479	5.4
Malaysia	18,496	43,678	3.0
Korea, Republic of	12,901	31,668	2.1
Italy	11,509	56,440	1.9
Philippines	11,211	18,292	1.8
Singapore	9,775	33,371	1.6
Other Countries	50,245	248,599	8.1
TOTAL	**621,604**	**2,715,074**	**100.0**

Source: Central Bureau of Statistics (2019).

Import of frozen food by Indonesia

Even though Indonesia has been able to produce frozen food, the dependence on imported products is still ongoing, even though the volume is not large. Frozen foods that enter Indonesia include frozen beef, mackerel fish, frozen potatoes, sardines, frozen beef innards and so on.

Imports of frozen food in the last five years increased by an average of 11.8% per year. In 2016, imports increased to 37.0% with a volume of 314,400 tons worth US$801.6 million. Whereas in 2017, imports increased with a volume of 389,600 tons with a value reaching US$855.4 million, up 23.9%. In 2018, imports increased again with a volume of 406,100 tons valued US$991.5 million. Details can be seen in the following table:

Table 4.7: Development of Frozen Food Import by Indonesia, 2014–2018

Year	Volume (Ton)	Growth (%)	Value (US$'000)	Growth (%)
2014	280,360	–	669,351	–
2015	229,551	-18.1	482,010	-28.0
2016	314,470	37.0	801,698	66.3
2017	389,626	23.9	855,472	6.7
2018	406,179	4.2	991,566	15.9
Annual Average (%)		**11.8**	–	**15.2**

Source: Central Bureau of Statistics (2019).

Three major countries are recorded as the major suppliers of frozen food products to Indonesia, namely, China, Australia and India. As an illustration, in 2017, frozen food products originating from China reached a volume of 102,300 tons valued at US$88.6 million or

controlled 26.3% of the total volume of frozen food imports that year, which reached 389,600 tons.

Frozen food products from Australia were ranked second after China, reaching a volume of 84,500 tons with a value of US$275.0 million or controlling 21.7%, while frozen food products from India controlled 12.3% with a volume reaching 48,000 tons valued at US$169.5 million. Then it is followed by other countries such as the United States, Oman, the Netherlands and so on as shown in the following table:

Table 4.8: Import of Frozen Food by Origin Country, 2017

Country	Volume (Ton)	Value (US$ '000)	Share (%)
China	102,347	88,674	26.3
Australia	84,555	275,025	21.7
India	48,014	169,508	12.3
United States	37,104	97,370	9.5
Oman	17,298	10,636	4.4
Netherlands	15,792	15,544	4.1
Pakistan	14,854	10,954	3.8
New Zealand	14,700	48,931	3.8
Japan	9,753	12,099	2.5
Belgium	8,296	7,970	2.1
Canada	7,591	39,238	1.9
Norway	5,785	15,822	1.5
Malaysia	4,157	5,317	1.1
Other Countries	19,378	58,384	5.0
Total	**389,626**	**855,472**	**100.0**

Source: Central Bureau of Statistics (2019).

4.5. Demand for cold storage in Indonesia

Cold storage is needed to maintain the temperature so that the product is maintained and not damaged during the distribution process. To get the right cold chain system, there are several steps that need to be observed, especially for frozen products, namely, handling during the initial process, storage and processing upon arrival, handling during transportation to the destination country and handling on loading and distribution systems to consumers.

Cold storage in Indonesia is applied to several industries, namely, the food, agricultural, fishery and pharmaceutical industries, such as medicines. Of the several industries, certainly, the handling is different. CIC reviewed cold storage needs on each user industry.

Development of Demand for Cold Storage Cargo for Foodstuff in Indonesia

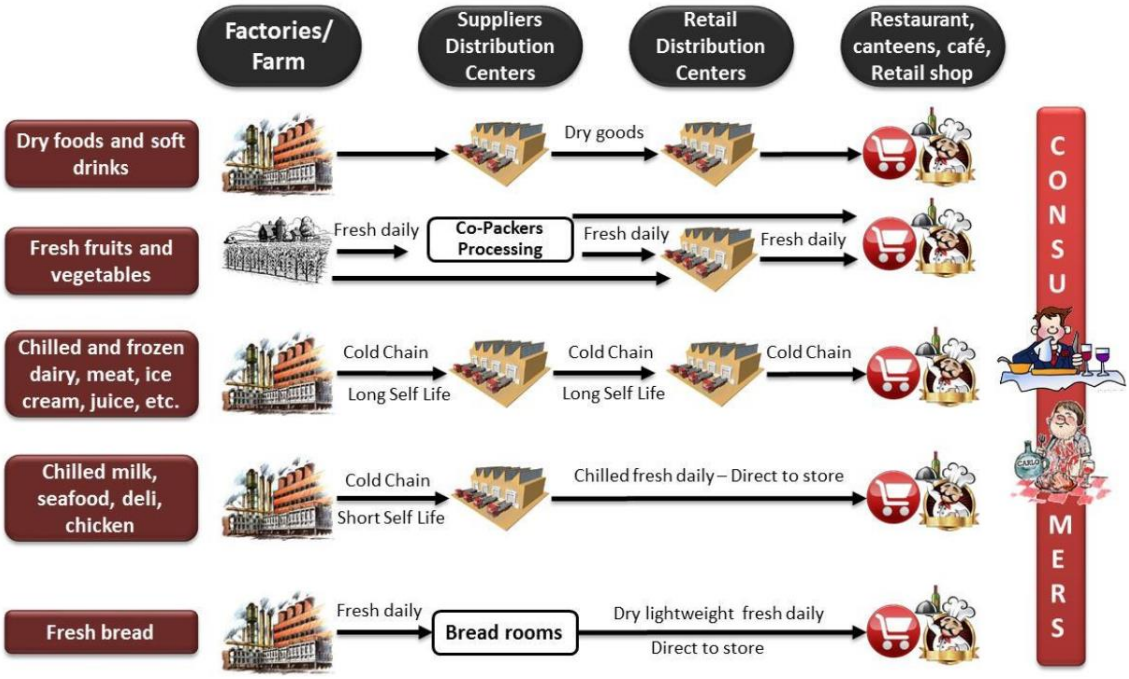
Cold storage for foodstuffs consists of freezing, storing in cold storage, transporting in refrigerated trucks, displaying in cold cabinets at food stores and, ultimately, storing in freezers at home.

Food products (snacks, dish foods and canned food products) that have gone through the stages of processing plants with good packaging usually have a long useful life and can be stored at normal temperatures.

The food processing industry manages the product supply cycle to all consumers in various places with special treatment for each product category and marketing channel and uses different distribution systems for small outlets and large outlets.

For food products that require cold storage such as milk and seafood before being marketed usually enter the cooling room and are distributed using a refrigerated truck before entering the store. The following shows the distribution system of food products based on handling characteristics:

Figure 4.1: Distribution System of Food Products Based on Handling Characteristics



Source: Cited from Tobing (2015).

Each food product has its own specifications in storage depending on the size and amount of food and the size of the storage. The storing temperature of each food product is different, such as for meat, fish, shrimp and its processed food with a temperature of -5°C to 0°C can

store up to three days, with a temperature of -19°C to -5°C can store up to one week and storage with a temperature below -10°C can store more than one week.

Eggs, milk and processed foods with a temperature of -5°C to 7°C can store up to three days, while temperature below -5°C can store food for up to one week.

Development of cargo equipment for cold storage for agricultural products

The agricultural sector is also the user of cold storage to store various kinds of agricultural products ranging from vegetables, meat, fish, chicken, fruits and so forth. However, there are still some limitations in terms of developing cargo equipment for agricultural products.

Limited cooling facilities range from reefer containers, regular packing process up to the use of refrigerated trucking. The potential of food products in Indonesia seems not to be maximally supported by good cold logistics, even though the distribution process and cold storage are very much needed in Indonesia.

The storage of agricultural products has different characteristics such as for vegetables that require a temperature of 6°C to 8°C with 80% to90% humidity. Fruits require a temperature of 4°C to 6°C with 80% to 90% humidity.

According to the type, cold storage is divided into four groups, namely chilled rooms, freezer rooms, blast freezers, and blast chillers. Chilled rooms and freezer rooms are used to store products according to received temperature conditioning, while blasts freezer and blast chillers are used to condition a product at a certain temperature.

A chilled room is a low-temperature cooling room between 1°C and 7°C. This room is used to store fresh food products such as vegetables and fruits and other products with a durability of up to two months. While for fresh meat, it is stored in a freezer room with a temperature of -2°C to 0°C with 80% to 90% humidity as shown in the following table:

Table 4.9: Products That Require Cold Storage, Abbreviated

Product	Temperature (°C)	Humidity (%)
Chocolate	15–18	50–60
Flower	8–16	70–75
Vegetables	6–8	80–90
Fruits	4–6	80–90
Mushrooms	0	90–95
Fresh meat	-2–0	80–90
Frozen fruits and vegetables	-10–0	–
Frozen meat	-20	–
Frozen tuna	-40–-60	–

Source: Survey by author.

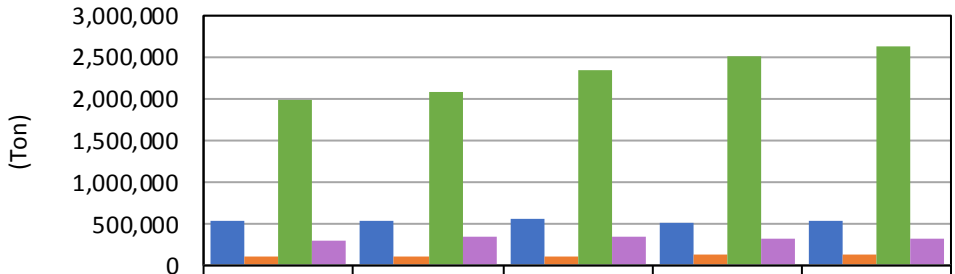
Based on the information from ARPI, Indonesia currently lacks a cold chain for agricultural commodities. Indonesia needs facilities and cold chains to support national cargo so that the transportation of agricultural products can be optimised.

According to ARPI, currently, the capacity of refrigerated trucks is only around 3,000 units with a capacity of 15,000 tons per day or only 10% of the needs, which reach an average of 150,000 tons per day.

This condition is certainly very unfortunate considering the agricultural sector, especially livestock, is a potential market for cold chain sector. As an illustration, meat production, especially chicken, on average, increased to 7.3% annually; pork increased to 2.1% per year and lamb and goat meat averaged to 1.7% per year.

The production of beef and buffalo fell -0.1%. Chicken production in 2018 reached 2.6 million tons, beef and buffalo production reached 527,000 tons, lamb and goat meat production reached 115,000 tons and pork production reached 327,000 tons.

Figure 4.2: Development of Meat Production, 2014–2018



	2014	2015	2016	2017	2018
Cow & Buffalo	532,900	542,100	550,400	515,700	527,900
Sheep & Goat	108,700	109,400	113,700	125,500	115,600
Chicken	1,978,600	2,071,500	2,349,700	2,505,700	2,620,000
Pig	302,300	330,200	339,600	317,400	327,200

Source: Director General of Animal Husbandry, Ministry of Agriculture (2019).

Chicken production increased over a period of five years (2014–2018) during which period, the production increased by an average of 8.4% per year. While in 2014, the production of chicken meat reached 1.6 million tons with a population reaching 1.5 billion, in 2015, it increased to 1.7 million tons with a population of layers and broilers of 1.6 billion tails.

In 2018, the production of chicken meat has reached 2.6 million tons, up 4.6%, compared with the production in 2017, which was only 2.1 million tons, similar with the population as seen in the table of population and production development of layers and broilers below:

Table 4.10: Development of Population and Production of Broilers and Layers, 2014–2018

Year	Layer		Broiler		Total			
	Population ('000 pcs)	Production (tons)	Population ('000 pcs)	Production (tons)	Population ('000 pcs)	Growth (%)	Production (tons)	Growth (%)
2014	146,660	97,200	1,443,349	1,544,400	1,590,009	–	1,641,600	–
2015	155,007	102,800	1,528,329	1,628,300	1,683,336	5.9	1,731,100	5.5
2016	161,364	110,300	1,632,801	1,905,500	1,794,165	6.6	2,015,800	16.4
2017	176,937	114,900	1,848,731	2,046,800	2,025,668	12.9	2,161,700	7.2
2018	181,752	116,300	1,891,435	2,144,000	2,073,187	2.3	2,260,300	4.6
Average Growth (%)						**6.9**	–	**8.4**

Source: Director General of Animal Husbandry, Ministry of Agriculture (2019).

Development of cargo equipment for cold storage for fishery products

Based on the potential value of the logistic market, the potential for cold chain utilisation in Indonesia is very large, especially for perishable commodities (agriculture, livestock and fisheries), while products are very vulnerable to damage. According to the analysis of Supply Chain Indonesia (SCI), an independent institution engaged in education, training, consultation, research and development in the field of logistics and supply chain in Indonesia, the potential value of fishery logistics market reaches Rp43.1 trillion.

Cold storage for fishery products is needed to optimise the temperature and quality of freshness of the fish. The optimisation is done by tracking the real-time temperature of the frozen fish. The real-time temperature of fish is used as input information on the energy needed for temperature and environmental conditioning that fish need to maintain quality and freshness.

The frozen fish industry uses fish processing with a system of storing in low temperatures (cold storage). Basically, freezing is the same as cooling, which is intended to preserve the natural properties of frozen products. Freezing results almost all water content in the product being frozen into ice. Frozen conditions cause microbiological activity and enzymes to be inhibited so that the product's shelf life is longer compared with products that are only refrigerated.

Based on a technical paper released by Johnston et al. (1994), fish begins to spoil immediately after death. This is reflected in gradual developments of undesirable flavours, softening of the flesh and eventually substantial losses of fluid containing protein and fat. By lowering the temperature of the dead fish, spoilage can be retarded and, if the temperature is kept low enough, spoilage can be almost stopped.

Rigor mortis, over a period of hours or days soon after death, can have a bearing on handling and processing. In some species the reaction can be strong, especially if the fish has not been chilled. The muscles under strain tend to contract, therefore, some of the tissue may break, especially if the fish is roughly handled, leaving the flesh broken and falling apart. If the muscles are cut before or during rigor, they will contract and in this way fillets from fish can shrink and acquire a somewhat rubbery texture. In many species, however, rigor mortis is not strong enough to be of much significance.

The freezing process alone is not a method of preservation. It is merely the means of preparing the fish for storage at a suitably low temperature. In order to produce a good product, freezing must be accomplished quickly. A freezer requires to be specially designed for this purpose and thus freezing is a separate process from low temperature storage. Fish that are being frozen slowly cannot be used as ingredients for certain processing such as canning, fumigation and so on. Based on the above considerations, besides to shorten the time and produce high output, fish must be frozen quickly.

Frozen fish need to be stored in suitable conditions to maintain its quality. Usually, frozen fish are stored in cold storage. This storage is the main stage of preservation and freezing method. The temperature normally recommended for cold storage is generally -30°C to -60°C, depending on needs.

To get an appropriate cold chain system, there are four critical stages that must be observed, namely, handling on the initial process, storing and processing when arriving on land, handling when transporting to the destination place and handling on loading and distribution systems to consumers.

In developing fish handling devices with cold chains, there are various system elements that must be met. First, the sensor is used to measure the temperature of the product and the environment. This temperature measurement is the key to preventing damage to fish. In further development, sensors are also used to measure humidity, moisture content and freshness of fish products. Second, the transmitter system is used to transmit/send data information to communications networks. Transmitter usually has become one package in the sensor and battery. Last, communication networks are used to build connections among supply chains.

The technology that is developing in the digital era and is compatible with cold chain communication networks, among others, is the Internet of Things (IoT). Development Internet networks now allow users to perform monitoring and handling of aquaculture wherever and whenever. IoT is also a device that can be used long term because future Internet networks will be increasingly widespread and evenly distributed.

As with the agricultural sector, the cold chain needs for the fisheries sector are also still minimal. Even though cold chain system is one of the most important components in the supply chain of fishery products in Indonesia so that it is not quickly damaged, special handling is needed to keep the fish fresh and have high quality.

To overcome this problem, the government, in this case, the Ministry of Maritime Affairs and Fisheries (KKP), allocated funds of Rp1.32 trillion for the fulfilment of the cold chain in 2017.

The total funds will be used to help 270 units of ice flake machines or ice-making machines with a capacity of Rp168 billion, 55 units of four-wheeled refrigerated vehicles at Rp21.6 billion, 75 units of six-wheeled refrigerated vehicles at Rp36.9 billion, three fish processing units with integrated cold storage 1,000 tons capacity of Rp168.6 billion and seven fish processing units with integrated cold storage of 500 tons capacity of Rp120.4 billion.

In addition, KKP will also build 2 modern fish market units at a cost of Rp190.7 billion, 10 clean fish market units with Rp30.4 billion costs, 6 traditional fish market revitalisation units of Rp8.5 billion, 10 culinary centre units of Rp13.05 billion, 15 cold storage units with a capacity of 200 tons at Rp121.4 billion, 100 freezer units of 300 litres at a cost of Rp1 billion and financing of 2 locations of Integrated Marine and Fisheries Centres in Biak and Mimika of Rp78.95 billion.

Furthermore, KKP conducted a groundbreaking for the construction of 1,000 tons of cold storage in Muara Baru, North Jakarta, in 2018. The cold storage built has two floors. The first floor consists of the receiving room, anteroom and loading room, packing room, dry storage, ABF, panel room and engine room and freezer room with a capacity of 300 tons. The second floor consists of an anteroom and freezer room with a capacity of 700 tons.

The fisheries sector is now one of the special concerns of the Indonesian government to optimise the return of its wealth so that it has added value and contributes to state revenues and especially people's welfare. Judging from its development in general, the fishing industry in Indonesia is quite promising.

This can be seen from the development of its production, which, on average, increased to 5.4% per year. While in 2014, the fisheries production only reached 19.2 million tons, in 2015, it increased to 20.4 million tons, up 6.4%. The same conditions also occurred in 2017 and 2018, where the production increased by 23.8 million tons and 25.0 million tons, respectively.

Table 4.11: Production of Fishery Products of Indonesia Based on Its Source, 2014–2018

Type	Volume (tons)					Annual Average (%)
	2014	2015	2016	2017	2018*	
Capture Fisheries	**6,436,000**	**6,678,000**	**6,580,000**	**6,600,000**	**6,930,000**	–
Growth, %	–	3.76	-1.47	0.30	5.00	1.52
Marine Fisheries	6,038,000	6,205,000	6,115,000	6,133,587	6,440,266	–
Inland Fisheries	398,000	473,000	465,000	466,413	489,734	–
Aquaculture	**12,795,000**	**13,792,000**	**15,456,000**	**17,220,000**	**18,081,000**	–
Growth, %	–	7.79	12.06	11.41	5.00	7.25

Type	Volume (tons)					Annual Average (%)
	2014	2015	2016	2017	2018*	
Marine Culture	8,379,000	9,035,000	9,773,000	10,888,397	11,432,817	–
Pond, Brackish Water	2,345,000	2,428,000	3,012,000	3,355,761	3,523,549	–
Pond, Fresh Water	1,774,000	1,964,000	2,289,000	2,550,245	2,677,757	–
Cage Cultivation	200,000	221,000	204,000	227,283	238,647	–
Paddy Field	97,000	144,000	178,000	198,315	208,231	–
TOTAL	**19,231,000**	**20,470,000**	**22,036,000**	**23,820,000**	**25,011,000**	–
Growth, %	–	**6.44**	**7.65**	**8.10**	**5.00**	5.44

* Preliminary value

Source: Ministry of Maritime Affairs and Fisheries (2018).

Meanwhile, if viewed from the company side the frozen industry of fishery products has developed quite a long time. Based on CIC's records, there are currently around 59 companies involved in this business and spread throughout Indonesia with a total capacity of 816,800 tons.

Based on the region, East Java province is the largest with 21 companies engaged in the frozen fish sector. It is followed by Central Java and Jakarta as many as six companies, South Sulawesi and Bali as many as four companies and other regions such as Bali, Lampung, South Kalimantan, West Java and West Sumatra to the Papua region.

Of the 59 companies, PT Bone Commercial Company (Bonecom) is the oldest. PT Bonecom is located in Makassar, South Sulawesi, and founded in 1960. PT Bonecom has a frozen goods production capacity of 12,300 tons per year consisting of frozen shrimp of 4,000 tons, frozen tuna/skipjack of 5,000 tons, frozen bony fillets of 2,500 tons and frozen sunfish fillets of 800 tons. In addition, PT Bonecom also has a cold storage capacity of 14,700 tons per year.

In addition to Bonecom, another company that is long in the frozen fish business is PT Diamond Cold Storage, located in Ancol, North Jakarta. The company was founded in 1970. In addition to being known as a company that deals with ice cream and soft drink industry, it is also involved in the frozen fish business with a capacity of 2,000 tons per year. Besides in Jakarta, this company has branches in Cimahi, West Java, Yogyakarta and Surabaya.

When viewed from its production capacity, the company that has the largest frozen fish capacity is PT Central Proteina PrimaTbk with a production capacity of 400,000 tons per year. The company that has existed in the field of animal feed business, in 2007, also expanded into the frozen shrimp industry in the Tulang Bawang region, Lampung, with a capacity of 1.6 million tons per year. See the following table for more information:

Table 4.12: Frozen Fish and Shrimp Company in Indonesia, 2018

No	Name of Company	Year Established	Location	Production Capacity (tons)
1	Bali Mina Utama, PT	1987	Bali	4,670
2	Canning Indonesian Products, PT	1948	Bali	2
3	Industri PerikananTerpadu Chiu Shih, PT	1996	Bali	160
4	Sari Segar Laut Indonesia, PT	2002	Bali	3,000
5	Aorta, PT	1979	Central Java	1,000
6	Aquafarm Nusantara, PT	1998	Central Java	1,200
7	Karya Mina Putra, CV	1996	Central Java	6,500
8	Maya Food Industries, PT	1995	Central Java	5,000
9	Seafer General Food, PT	1991	Central Java	10,000
10	Toxindo Prima, PT	1997	Central Java	540
11	Aneka Boga Nusantara, PT	1998	East Java	1,000
12	Aneka Tuna Indonesia, PT	1991	East Java	650
13	Bumi Menara Internusa, PT	1985	East Java	5,000
14	Bumi Pangan Utama, PT	1996	East Java	7,000
15	Central Proteina PrimaTbk, PT	1996	East Java	400,000
16	Charoen Pokphand Indonesia Tbk, PT	1996	East Java	36,000
17	Ciomas Adisatwa, PT	1987	East Java	6,000
18	IluvaIntiluhur Fuji Abadi, PT	1997	East Java	700
19	Istana Cipta Sembada, PT	1987	East Java	1,500
20	Kelola Mina Laut Gresik, PT	1994	East Java	7,000
21	Marine Cipta Agung, PT	1994	East Java	1,800
22	Megamarine Pride, PT	1992	East Java	2,000
23	Rex Canning, PT	1990	East Java	5,000
24	Scrum Marine, PT	1997	East Java	2,100

No	Name of Company	Year Established	Location	Production Capacity (tons)
25	Sekar BumiTbk, PT	1997	East Java	24,000
26	Sekar Mulia, PT	1984	East Java	1,500
27	SK Foods Indonesia, PT	1990	East Java	800
28	Suri Tani Pemuka, PT	1987	East Java	7,200
29	Surya Alam Tunggal, PT	1984	East Java	5,000
30	Tani Abadi Sulawesi, PT	1985	East Java	900
31	Wonokoyo Jaya Corporation, PT	1994	East Java	10,600
32	Sumber Kalimantan Abadi, PT	1986	East Kalimantan	4,800
33	Lola Mina, PT	1983	Central Jakarta	1,800
34	Central Pertiwi Bahari, PT	1998	Lampung	77,700
35	Dipasena Citra Darmaja Tbk, PT	1987	Lampung	72,900
36	Sumber Haslindo, PT	1977	North Jakarta	6,000
37	Diamond Cold Storage, PT	1970	North Jakarta	2,000
38	Lousiana Far East, PT	1995	North Jakarta	1,350
39	Lucky Samudra Pratama, PT	1983	North Jakarta	3,000
40	Ocean Mitramas, PT	1989	North Jakarta	6,000
41	Shing Sheng Fa Ocean, PT	2000	North Sulawesi	2,600
42	Sinar Pure Foods International, PT	1991	North Sulawesi	1,000
43	Central Windu Sejati	1994	North Sumatera	5,400
44	Medan Tropical Canning and Frozen, PT	1999	North Sumatera	1,000
45	Timur Jaya Cold Storage, PT	1970	North Sumatera	3,000
46	Alfa Kurnia, PT	2009	Papua	300
47	Dwi Bina Utama, PT	1975	Papua	1,459
48	SahabatInko, PT	1989	South Kalimantan	425

No	Name of Company	Year Established	Location	Production Capacity (tons)
49	Samarinda Cendana Cold Storage& Industry, PT	1975	South Kalimantan	1,800
50	Bone Commercial Company, PT	1960	South Sulawesi	12,300
51	Dharma Samudera Fishing Industries, PT	1999	South Sulawesi	25,200
52	South Suco, PT	1989	South Sulawesi	5,200
53	WahyuPradanaBinamulia, PT	1996	South Sulawesi	3,700
54	Lauraindo, PT	1990	South Sumatera	720
55	Fega Aquafarmindo, PT	1983	Tangerang	4,900
56	Grobest Indomakmur, PT	1989	Tangerang	180
57	Adijaya Guna Satwatama, PT	1998	West Java	3,400
58	Frozen Foods Pahala, PT	1998	West Java	900
59	Danitama Mina, PT	1989	West Sumatera	10,000
TOTAL				**816,856**

Source: Survey by author.

Development of cargo equipment for cold storage for processed foods

The growth of the processed food industry sector in Indonesia has not yet been matched by the presence of the food cold chain industry, which has an installed capacity of only 50% of national needs. For this reason, in food industry policy in the context of implementing the industry 4.0 roadmap, the government will make improvements by building a better cold chain network.

The processed food industries that are highly depending on cold chain systems include the sausage and nugget industry. In addition, there are also burgers, meatballs, corned beef, smoked meat and roulades, all of which must pass the sterilisation process to increase the durability of the product. Cold chains are needed starting from raw materials, processing, up to the product ready to consume by consumers because it must be stored in the refrigerator to extend its durability.

Nowadays, there are lots of frozen food items such as sausages and nuggets. In recent years, the sausage and nugget industry is quite developed in Indonesia.

Based on CIC's records, up to 2018, the number of companies engaged in the sausage business reached around 112, and the nugget business reached 117 with a capacity of 90,200 tons and 67,100 tons, respectively.

Meanwhile, when viewed from its production over the past five years, sausage production increased by an average of 3.4% per year from 17,800 tons in 2014 to 20,300 tons in 2018. Likewise, the production of nuggets over the past five years increased by 6.8% per year from 51,400 tons in 2014 to 66,900 tons in 2018.

Table 4.13: Development of Sausage and Nugget Production, 2014–2018

Year	Production of Sausages (tons)	Growth (%)	Production of Nuggets (tons)	Growth (%)
2014	17,839	–	51,443	–
2015	18,478	3.59	55,317	7.53
2016	19,118	3.46	59,191	7.00
2017	19,757	3.35	63,064	6.54
2018	20,397	3.24	66,938	6.14
Annual Average Growth (%)		**3.41**	–	**6.81**

Source: Survey by author.

In Indonesia, sausages have been known since the Dutch colonial era. Only the first known sausage product is sausages which are packaged in cans and are fully imported. The first sausage industry in Indonesia was pioneered by PT Badranaya, which was founded in 1918. The forerunner of PT Badranaya was inseparable from the effort pioneered by Lambert Scroeder, a Dutch national who made sausages by utilising leftover meat that was not sold.

After the establishment of PT Badranaya, it is then followed by the Mantrust Group with the prime mover of the late Tegoeh Soetantyo AKA Tan KienLiep, formerly known as the champion of canned food products, especially canned fish (tuna, sardines and mackerel) and corned beef, through PT Canning Indonesia Products and PT Pengambengan Raya.

However, the sausage business which was pioneered in the decade of the 1940s was less successful; thus, it was more focused on developing canned fish and corned beef. After that, it was followed by Perusahaan Titiles in Denpasar, which was founded in 1950, UD. Ananda in Denpasar (1974), PT Kemang Food Industries in Jakarta (1975), UD. Dilamo in Bandung (1980) and PT Suba Indah in Jakarta (1980). In its development, PT Suba Indah was subsequently taken over by San Miguel; thus, the name was changed to PT San MiguelPure Foods Indonesia.

In line with the current development, based on the information obtained by CIC, there are 64 companies engaged in the sausage industry. PT So Good Food Manufacturing as a producer of sausage brands SG SOZZIS, SO NICE and SO GOOD is listed as the owner of the

largest production capacity in Indonesia, namely, 45,000 tons per year, or its role constitutes 49.9% of the total sausage production capacity nationally, which is 90,200 tons per year.

The second place is occupied by PT Charoen Pokphand Indonesia Tbk., with a sausage production capacity of 12,000 tons per year (13.3%). It is then followed by PT MadusariNusaperdana with 5,000 tons per year (5.5%), PT San MiguelPure Foods Indonesia with 4,500 tons per year (5.0%), PT Kemang Food Industries with 3,000 tons per year(3.3%), PT Belfoods Indonesia and PT ElodaMitra are each 2,000 tons per year (2.2%), PT Wonokoyo Jaya Corporindo with 1,500 tons per year (1.7%), PT Soejasch Bali and PT DagsapEnduraEatore with 1,000 tons (1.1%) and so on.

As for the nugget industry, the largest production capacity of nugget in Indonesia in 2018 was held by PT Charoen Pokphand Indonesia Tbk., which produces the brand of FIESTA, GOLDEN FIESTA, CHAMP and OKEY with a capacity of 17,500 tons per year, or 26.1% of the total national nugget production capacity, which in 2018 reaches 67,100 tons per year.

It is then followed by PT MadusariNusaperdana with 12,000 tons per year (17.9%), PT Belfoods Indonesia with 8,000 tons (11.9%), PT So Good Food Manufacturing with 6,5000 tons per year (9.7%), PT Kemang Food Industries with 5,000 tons (7.5%) and PT Frozen Food Pahala with 4,600 tons per year (6.9%) as shown in the following table:

Table 4.14: Producers of Sausage and Nugget in Indonesia and Its Capacity, 2018

No.	Name of Company	Production Capacity (tons)	Share (%)
Producer of Sausage			
1	So Good Food Manufacturing, PT	45,000	49.9
2	Charoen Pokphand Indonesia Tbk., PT	12,000	13.3
3	Madusari Nusaperdana, PT	5,000	5.5
4	San Miguel Pure Foods Indonesia, PT	4,500	5.0
5	Kemang Food Industries, PT	3,000	3.3
6	Belfoods Indonesia, PT	2,000	2.2
7	Eloda Mitra, PT	2,000	2.2
8	Wonokoyo Jaya Corporindo, PT	1,500	1.7
9	Soejasch Bali, PT	1,000	1.1
10	Dagsap Endura Eatore, PT	1,000	1.1
11	Makanan Sehat Nusantara, PT	800	0.9
12	Macroprima Pangan Utama, PT	750	0.8
13	Suryajaya Abadi Perkasa, PT	650	0.7
14	Diamond Cold Storage, PT	600	0.7
15	SicmaInti Utama, PT	500	0.6
16	Titiles, Perusahaan	400	0.4
17	Dunia Daging Food Industries, PT	360	0.4
18	Sorin Maharasa, PT	350	0.4
19	Petra Sejahtera Abadi, PT	350	0.4
20	Sumber Prima Anugrah Abadi, PT	300	0.3

No.	Name of Company	Production Capacity (tons)	Share (%)
21	Aroma Duta Rasaprima, PT	300	0.3
22	Sumber Pangan Jaya, PT	300	0.3
23	Elson Bernardi, PT	250	0.3
24	Winner Food Industry, PT	250	0.3
25	Pasir Kaliki, PD	200	0.2
26	Miko PanganUtama, PT	200	0.2
27	Perikanan Nusantara, PT	150	0.2
28	Satria Pangan Sejati, PT	150	0.2
29	Bumifood Agro Industri, PT	150	0.2
30	Other Producers	6,190	6.9
TOTAL CAPACITY		**90,200**	100.0
Producers of Nugget			
1	Charoen Pokphand Indonesia Tbk., PT	17,500	26.1
2	Madusari Nusaperdana, PT	12,000	17.9
3	Belfoods Indonesia, PT	8,000	11.9
4	So Good Food Manufacturing, PT	6,500	9.7
5	Kemang Food Industries, PT	5,000	7.5
6	Frozen Food Pahala, PT	4,600	6.9
7	Wonokoyo Jaya Corporindo, PT	1,500	2.2
8	Suryajaya Abadi Perkasa, PT	1,500	2.2
9	Soejasch Bali, PT	1,250	1.9
10	Macroprima Pangan Utama, PT	1,200	1.8
11	Makanan Sehat Nusantara, PT	1,000	1.5
12	Sorin Maharasa, PT	600	0.9
13	San Miguel Pure Foods Indonesia, PT	500	0.7
14	Dagsap Endura Eatore, PT	500	0.7
15	Diamond Cold Storage, PT	250	0.4
16	Pasir Kaliki, PD	250	0.4
17	Petra Sejahtera Abadi, PT	200	0.3
18	Sumber Prima Anugrah Abadi, PT	200	0.3
19	Sakana Indo Prima, PT	200	0.3
20	Aroma Duta Rasaprima, PT	150	0.2
21	Elson Bernardi, PT	150	0.2
22	Perikanan Nusantara, PT	150	0.2
23	Central Pertiwi Bahari, PT	150	0.2
24	Satria Pangan Sejati, PT	100	0.1
25	Other Producers	3,650	5.4
TOTAL CAPACITY		**67,100**	100.0

Source: Survey by author.

Development of cargo equipment for cold storage for chemical products, pharmaceuticals, and drugs

Cold chain processes in chemical, pharmaceutical and drug industries are also needed to prevent damage to their chemical structure. Changes and damage to chemical structures can cause potential loss, and drugs becomes useless as vaccines for immunisation. Failure to provide good cold chains causes damage to almost 50% of vaccines worldwide every year.

Since the discovery of vaccines and vaccine manufacturing techniques that are growing rapidly to date, there is one thing that absolutely must exist if we talk about vaccine storage, namely, cold chain, which is a vaccine storage system with a temperature of between 2°C and 8°C, so that the components in a bioactive vaccine do not get damaged because of high temperatures or too low temperatures. With the right storage temperature, the potential for vaccine protection will be maintained except for certain types of vaccines such as oral OPV polio vaccine, which must be stored below -20°C.

As for the consideration in choosing the cold chain, it includes the number of targets; the volume of vaccines to be loaded; the available energy sources; the nature, function and temperature stability of storage facilities; the parts and recommendations of WHO or the results of research or trials that have been conducted.

Table 4.15: Storing Temperature and Age of Vaccine Based on Type of Vaccine

Type of Vaccine	Storing Temperature	Age of Vaccine
BCG	+2°C up to +8°C or -15°C up to -25°C	1 year
Polio	+2°C up to +8°C	6 months
	-15°C up to -25°C	2 years
Measles	+2°C up to +8 °C or -15°C up to -25°C	2 years
DPT	+2°C up to +8°C	2 years
Hepatitis B	+2°C up to +8°C	26 months
TT	+2°C up to +8°C	2 years
DT	+2°C up to +8°C	2 years
DPT – HB	+2°C up to +8°C	2 years

Source: Galazka, Milstien, and Zaffran (1998).

The use of cold chains in the chemical, pharmaceutical and drug industry is like the horns of a dilemma. On the one hand, the cold chain is necessary, while on the other hand, the use of cold chain is quite expensive. Based on the information obtained, cold chain costs for vaccines from the beginning of production until they are used in hospitals or clinics can reach around 80% of the selling price of the vaccine itself.

Seeing this condition, the use of cold chains becomes a problem, especially for health service providers and pharmaceutical companies and especially with conditions in some areas, where the availability of electricity is still a problem.

The pharmaceutical industry has been developing in Indonesia for a long time. Various kinds of drugs have been able to be produced in increasing numbers with an increasingly extensive distribution network; thus, they can reach almost all levels of society. Even the pharmaceutical industry is one of the business sectors that still survive.

Based on data collected by CIC, the total number of pharmaceutical companies in Indonesia (both companies that have factories and importing companies that hold imported product licenses) that registered at the relevant agencies up to the end of 2018 reached 259 companies, consisting of 217 companies that already have its own pharmaceutical factories and the remaining 42 companies that are only listed as companies holding licenses for imported pharmaceutical products.

4.6. Cold chain business model in Indonesia

In Indonesia, there are two models of cold chain business player, namely, those that are used alone (integrated) and those that are fully leased. The main function of that is used alone is to store its own products, either temporarily or for long periods, as stock.

Companies with business models like this are usually integrated with the company's main activities and become supporting of its operational activities. Therefore, the activity of storing, shipping goods or distributing is performed by the company itself in accordance with its business activities. Examples of integrated business models are the ice cream industry; importers of meat, fruit, vegetables and food; and exporters of fish or seafood.

Occasionally, it is also leased to other parties, but the space offered is limited. An example of an integrated company is PT Dharma Samudera Fishing Industries, which engaged in the fisheries sector, and PT Unilever Indonesia Tbk., which produces the Wall's ice cream brand.

For the leased one, there are two types of companies, namely, logistics and forwarders, transportation companies, and companies that specifically engaged in the rental of cold storage, among others are PT Wahana Cold Storage and PT Pluit Cold Storage.

Cold storage operated in Indonesia

Cold storage is a room designed with certain temperature conditions and is used to store various products with the aim of maintaining freshness and material content. There are several types of cold storage that are operated, namely, chilled room, freezer room, blast freezer and blast chiller.

Chilled rooms and freezer rooms are used to store products according to received temperature conditioning, while freezer blasts and blast chillers are used to condition a product at a certain temperature. Chilled room is a low-temperature cooling room between 1°C and 7°C. This room is used to store fresh foodstuffs, such as vegetables, fruits and other ingredients with a durability of up to two months.

For freezer rooms, generally, the room temperature is between -15°C and -20°C for storing fish, meat, chicken, sausages, milk, cheese, potatoes and all types of foodstuffs and other ingredients that require freezing temperatures.

Blast chillers are used for rapid cooling after the cooking process is complete with a target temperature of 1°C to 4°C. Blast freezers are used for fast frozen refrigeration for processed foods as well as for meat, fish and shrimp. The purpose of using blast chillers and blast freezers is to avoid bacterial contamination, maintain the taste of food, avoid reducing water content and maintain the nutrient levels.

Meanwhile, according to its capacity and function, cold storage in Indonesia is grouped into two groups, namely, commercial and industrial. Commercial cold storage is generally used for the needs of its owners and is leased and does not become an integrated and special part of an industrial activity, for example, storing meat, fish, fruit and vegetable products owned by supermarkets and hypermarkets. Commercial cold storage capacity in Indonesia is generally under 1,000 tons.

Cold storage industries generally function as part of the production chain or become special business activities, such as cold storage rental and logistics businesses. The capacity of industrial cold storage in Indonesia is generally more than 1,000 tons.

Cold storage operated in Jabodetabek [19] is divided into two categories, namely, for commercial and industrial purposes. Commercial cold storage is generally used for the purposes of the owner and leased out. Examples are the storage of meat, chicken, fish, fruit and vegetable products owned by supermarkets and hypermarkets. Commercial cold storage capacity is generally below 1,000 tons.

Cold storage is used to store various kinds of products ranging from vegetables, meat, fish, chicken, fruits and so on. These products have different characteristics, both temperature and humidity, such as 4°C to 6°C with 80% to 90% humidity. Fresh meat requires a temperature of -2°C to 0°C with 80% to 90% humidity as shown in the following table:

Table 4.16: Products That Require Cold Storage, Detailed

Product	Temperature (°C)	Humidity (%)
Chocolate	15–18	50–60
Flower	8–16	70–75
Banana, one-half matured durian	4–16	80–90
Vegetable	6–8	80–90
Cake	4–8	60–70
Fruits	4–6	80–90
Matured durian	4–6	80–90
Mushroom	0	90–95

[19]Jabodetabek denotes Jakarta, Bogor, Depok, Tangerang and Bekasi or usually states as Greater Jakarta Area.

Product	Temperature (°C)	Humidity (%)
Grapes and fresh dates	0	80–90
Dairy product (cheese, milk, yoghurt)	0	–
Fresh meat	-2–0	80–90
Fruit juice	-2–0	–
Frozen french fries	-10–0	–
Fruits and frozen vegetable	-10–0	–
Seafood (fish, shrimp, shellfish)	-2	95–100
Frozen meat	-20	–
Ice cream	-20	–
Frozen fish (seafood)	-20	–
Frozen premium beef	-40–-50	–
Frozen tuna	-40–-60	–

Source: Survey by author.

Cold storage for industrial needs generally functions as production chain or becomes a special business activity such as warehouse rental and logistics. Industrial cold storage capacity is generally more than 1,000 tons.

Business model by cold chain players in Indonesia

As stated previously, there are two models of cold chain business player, namely those that are used alone (integrated), and those that are fully leased. The main function that is used alone is to store its own products, either temporarily or for long periods of time as stock.

Companies with business models like this are usually integrated with the company's main activities and become supporting its operational activities. So that the activities of storing and shipping goods or distribution are carried out by the company itself in accordance with the business activities of the company. Examples of integrated business models are the ice cream industry, importers of meat, fruit, vegetables and food and exporters of fish or seafood.

But sometimes it is also leased to other parties, but the space offered is limited. An example of an integrated company is PT Dharma Samudera Fishing Industries which engaged in the fisheries sector and PT Unilever Indonesia Tbk. which produces the Wall’s ice cream brand.

Whereas for the leased one, there are two types of companies, namely logistics & forwarders, transportation companies, and companies that specifically engaged in the rental of cold storage, among others are PT Wahana Cold Storage and PT Pluit Cold Storage.

Number of cold chain players in Indonesia and storage capacity

Based on a survey conducted by CIC and information from various other sources, the number of major companies engaged in the cold chain business in Indonesia reached 69 with a total capacity of 370,000 tons. The 69 companies consist of various business sectors, namely, the

cold storage companies, food and beverage industry, marine products processing industry, ice cream industry, pharmaceuticals, meat importers, restaurants, retail/supermarket industry, container suppliers, logistics and forwarders and transportation.

Companies that are specifically engaged in the cold storage industry are as many as 20 companies with a total capacity of 131,000 tons. Seafood processing companies that lease out all or part of their cold storages to other companies amount to 17 with capacities reaching 76,000 tons, and companies engaged in importing meat, ice cream, restaurants and others can be seen in the following table:

Table 4.17: Number of Cold Storage Company by Business Field, 2018

Business Field	Number of Company	Capacity (tons)
Cold Storage	20	131,000
Food and Beverage	3	8,000
Seafood Processing	17	76,050
Ice Cream	2	51,000
Pharmaceutical	1	59,000
Meat Importer	5	3,200
Restaurant	2	2,800
Retail/Supermarket	6	15,800
Container Supplier	4	4,900
Logistics and Forwarder	3	7,600
Transportation	6	10,850
TOTAL	**69**	**370,200**

Source: Survey by author.

Major players of cold storage in Jabodetabek

Currently, there are 20 companies that are specifically engaged in the cold storage industry in the Jabodetabek area. Of the 20 companies, there are 5 major players in the cold storage business. The 5 companies are PT Sukanda Djaya (PT SD), PT Kiat Ananda Cold Storage (PT KICS), PT Mega Internasional Sejahtera (PT MIS), PT Wahana Cold Storage (PT WCS) and PT Jalur Sejuk (PT SJ).

PT Sukanda Djaya (PT SD) has a capacity of 45,000 tons or controls 34.3% of the total capacity of the company engaged in the cold storage industry, namely, 131,000 tons. PT SD was founded in 1978 and is one of the largest food distribution companies in Indonesia. Most of the ice cream products owned by PT Diamond Cold Storage (PT DCS) are stored in cold storage owned by PT SD.

At present, PT SD customers consist of several large chain store restaurants. Those chain store restaurants are Pizza Hut, Mc Donald's, Sizzler and A & W, which rent PT SD's cold storage to store frozen products consisting of meat, chicken, potatoes and spices for restaurant needs.

PT SD handles all distribution of goods to all restaurant outlet chain stores of the customers for the Java region.

PT SD's cold storages are located in Cibitung, currently one of the largest cold storage warehouses in Indonesia. PT SD has a warehouse of 14,000 sq.m with a cold storage capacity of 45,000 tons. Currently, the truck fleet is 100 units. Whereas for handling activities in the warehouse, the company operates 10 units of forklifts. In addition, PT SD also has several distribution centre branches spread across Denpasar (Bali), Surabaya (East Java) and Bandung (West Java) and Balikpapan (East Kalimantan).

The second largest in the cold chain industry is PT Kiat Ananda Cold Storage (PT KA) with a capacity of 30,000 tons or controlling 22.9%. PT KA Kiat Ananda is an experienced and trusted cold supply chain management company, which is for frozen food products.

Founded in Jakarta in 1998, Kiat Ananda provides an integrated cold supply chain management solution starting from the process of purchasing goods to suppliers (import and local), shipping goods from suppliers to clients, storing client items to distributing goods from clients to distributors up to retailers.

PT KA has a cold storage located on Jl. Raya Narogong, Bekasi, with an area of 3 ha. The cooling warehouse owned by PT KA has a building area of 1.6 ha and is supported by modern cooling technology with layered doors, which are able to maintain temperature stability at 15°C to -25°C, and have more than 15 doors to speed up the loading and unloading process. PT KA's cold storage is able to accommodate 30, 000 pallets, equivalent to 30,000 tons.

To support the supply chain process in terms of shipping goods from upstream to downstream, from suppliers to retailers, Kiat Ananda has prepared more than 400 fleets of trucks with cooling systems.

The third largest is PT Mega Internasional Sejahtera (PT MIS) with a capacity of 21,000 tons or a portion of 16.3%. PT MIS is a cold storage service company operating at the end of 2013 located in the MM2100 Cibitung Industrial Estate, Bekasi, West Java.

With a capacity of 21,000 tons, this company has four freezer rooms and two chillers. The temperature of the cold storage room/frozen temperature of this company is -20°C to -28°C, cold storage with a temperature of -20°C to -28°C, cold storage/chill with a temperature of 0°C to +10°C and chilled storage with a temperature of 0°C up to +10°C.

Other companies that are specialised in the cold chain industry can be seen in the following table:

Table 4.18: List of Companies Engaged in the Cold Storage Industry in Jabodetabek, 2018

Company	Year Established	Capacity (tons)	Share (%)
Sukanda Djaya, PT	1974	45,000	34.35
Kiat Ananda Cold Storage, PT	1998	30,000	22.90
Mega Internasional Sejahtera, PT	2013	21,000	16.03

Company	Year Established	Capacity (tons)	Share (%)
Savina Cold Storage	–	9,000	6.87
Wahana Cold Storage, PT	1997	7,000	5.34
Jalur Sejuk, PT	1987	5,000	3.82
Alpine Cool Utama	1985	1,500	1.15
Aneka Cool Citratama, PT	1997	1,000	0.76
Celcius Jaya, PT	1992	1,000	0.76
Central Food Lestari, PT	2007	1,000	0.76
Cold Storage Jaya Makmur	2010	1,000	0.76
Cooltech Surabaya, PT	2005	1,000	0.76
Ercoolcoldstorage, PT	2011	1,000	0.76
Indopanel Sukses Makmur, PT	–	1,000	0.76
Kini Cold Storage	–	1,000	0.76
Sarana Dunia Pendingin, PT	2006	1,000	0.76
Sarana Refrigeratama, PT	–	1,000	0.76
United Refrigeration, PT	2004	1,000	0.76
Widjaya Dwi Kalmindo, PT	2008	1,000	0.76
Pluit Cold Storage, PT	2003	500	0.38
TOTAL CAPACITY		131,000	100.00

Source: Survey by author.

- Companies engaged in cold storage rental

The need for renting cold storage arises when large-scale food industry and retail companies only have cold storage facilities with limited capacity. There are even companies that do not have cold storage facilities at all, even though the products they produce or their raw materials must be stored in cold storage before being used or distributed. Thus, the company needs to rent cold storage facilities from other parties.

Most of the cold storage rental companies initially served only the main users and then developed into cold storage rental companies that serve various types of customers. Generally, these kinds of cold storage companies have many cold storages with a relatively small size.

There is also a cold storage company that changes its function, which was originally used alone such as by seafood product processing company that changed its storage function, besides for its own use but also for rent.

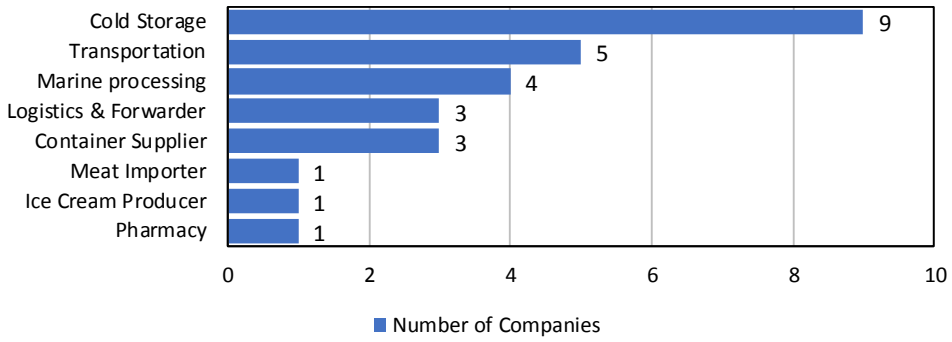
Fees charged to tenants are usually calculated based on rental rates per square meter (M2) per month, while all activities ranging from storing goods to shipping goods are the responsibility of the tenant. Most of the products stored in cold storage facilities are processed food products, frozen food, fruit, vegetable and so on.

The holding capacity of commodities such as fisheries, meat, dairy products, vegetables and fruit is currently still insufficient; thus, it is necessary for cold storage rental business, AKA refrigerated storage space, to be very potential.

During holidays, companies like Diamond need additional cold storage for their dairy products. Unfortunately, additional capacity cannot be gained from cold storage that integrated with processing companies. This is why the company is currently using it for internal storage purposes.

Based on a survey conducted by PT CIC in Jabodetabek (Jakarta, Depok, Bogor, Tangerang and Bekasi), there are 27 major companies that rented their cold storage to other companies. Of the 27 companies, nine of them are companies that are indeed engaged in cold storage business, five companies engaged in transportation, four marine processing companies, three logistics companies and forwarders, three container supplier companies, one pharmaceutical company, one meat importing company and one ice cream company with a total capacity of 2,009,100 tons.

Figure 4.3: Total Cold Storage Rental Company by Business Field, 2018



Source: Survey by author.

The nine companies that rent their cold storages to other companies include PT Wahana Cold Storage. In addition to selling, PT WCS also rents cold storages for food and beverage industry, fisheries, meat exports/imports, fruits and vegetables.

According to information obtained by PT CIC, cold storage rental system applied by PT WCS is per day with a minimum of five days storage costs. For cold storage rental costs, there are six component costs, namely, storage costs, handling in, handling out, handling out loose, plug in, and overtime costs.

The storage cost is Rp13,000/pallet/day with a minimum storage cost of five days. The storage costs do not include handling costs of Rp40,000/pallet, handling out loose costs of Rp60,000/pallet, plug in cost of Rp50,000/hour and overtime cost of Rp200,000 per hour as shown in the following table:

Table 4.19: Cold Storage Rental Cost of PT WCS, 2018

No.	Cost Component	Cost	Description
1	Storage	Rp13,000/pallet/day	Standard pallet size 1m x 1.2m x 1m
2	Handling In	Rp40,000/pallet	
3	Handling Out	Free	Goods out, full (one pallet)
4	Handling Out Loose	Rp60,000/pallet	Goods out, less than one pallet
5	Plug In	Rp50,000/hour	
6	Overtime	Rp200,000/hour	

Note: Price excludes VAT.
Source: Survey by author.

PT Bintang Citra Internasional (PT BCI) is one of the players in the cold storage business. The company was founded in 1998 and began operating since 1999. The core business of this company is container suppliers that sell, modify/repair and rent out containers both with refrigerators as well as without refrigerators, measuring 20 feet to 40 feet in size.

Among large companies which recorded having used PT BCI's services are PT Unilever, Jababeka, PT Astra Truck Indonesia, PT Halliburton Oil and Gas, PT Wijaya Karya, PT Tyco Europipe Indonesia, PT Sharp Indonesia and so on.

According to information obtained by PT CIC, the cost of a reefer container sized 20 feet at 80% condition is offered at a price of Rp6,000,000/unit/month, while a reefer container sized 40 feet at 80% condition is offered at a price of Rp8,000,000/unit/month. In addition to renting out refrigerated containers, PT BCI also sells containers at a price of Rp90 million for the size of 20 feet and Rp107 million for the size of 40 feet, all of which are in 80% condition.

Table 4.20: Cost of Rental and Sales of Reefer Container by PT BCI, 2018

No.	Description	Size	Cost/Unit/Month (Rp)
RENTAL SYSTEM			
1	Reefer Container	20 feet, condition 80%	6,000,000
2	Reefer Container	40 feet condition 80%	8,000,000
3	Lolo (liftoff/lifton)		1,000,000
4	Maintenance Technician Visit		500,000
5	Reefer Container Deposit	20 feet, condition 80%	90,000,000
6	Reefer Container Deposit	40 feet, condition 80%	107,000,000
SALES SYSTEM			
1	Reefer Container	20 feet, condition 80%	90,000,000
2	Reefer Container	40 feet, condition 80%	107,000,000
3	Lolo		500,000

Notes: Excludes VAT, delivery, and handling at location. Terms of payment: cash before delivery or DP 50% and full payment 50% after delivery. Ranger temperature: 30°C up to -18°C. Power supply: 380/460 VAC, three phase, 32 Amp.
Source: Survey by author.

Similarly, PT Raficon Sari Jaya (PT RSJ) is engaged in container suppliers that sell and rent reefer containers (containers equipped with refrigerators). The container is prepared for shipping goods that require special care such as frozen fish, fresh vegetables and fruit.

Reefer containers made by PT RSJ are equipped with a dehumidification system that guarantees the temperature and humidity of the container and the super freezer that can maintain temperatures at -60°C/-76°F. As for the rental of containers owned by this company, according to information, for one month with the size of 20 feet, it is rented at a price of Rp7 million, while the size of 40 feet is Rp9 million.

- Capacity of cold storage rental company

As mentioned above, based on the CIC survey, there are 27 cold chain rental companies with a production capacity of 209,000 tons. Of the 27 companies, the largest capacity is owned by PT Enseval Medika Prima Tbk.

It is followed by PT SukandaDjaya with a capacity of 45,000 tons, PT KiatAnanda Cold Storage with a capacity of 30,000 tons, PT Mega Internasional Sejahtera with a capacity of 21,000 tons, PT Wahana Cold Storage with a capacity of 7,000 tons and so on.

Table 4.21: Cold Storage Rental Company and Its Capacity in Jabodetabek, 2018

Company	Year Established	Capacity (tons)
Enseval Medika Prima, TbkPT	1974	59,000
Sukanda Djaya, PT	1974	45,000
Kiat Ananda Cold Storage, PT	1998	30,000
Mega Internasional Sejahtera, PT	2013	21,000
Savina Cold Storage	–	9,000
Wahana Cold Storage, PT	1997	7,000
Bonicom Servistama Compindo, PT	1960	6,000
Mgm Bosco Logistics, PT	1995	5,500
Perum Perikanan Indonesia	1990	5,100
Expravert Nasuba, PT	2009	3,000
Wira Logitama Saksama	1996	2,000
Perikanan Nusantara, PT	1998	1,550
Alpine Cool Utama	1985	1,500
Bintang Citra International, PT	1998	1,500
Guna Pratama, PT	2002	1,500
Raficon Sarijaya, PT	2005	1,500
Starcon Indonesia, PT	2009	1,200
Trade Corp Indonesia, PT	1990	1,200
Multi Guna International Persada, PT	2014	1,100
Central Food Lestari, PT	2007	1,000
Diamond Cold Storage	1974	1,000

Company	Year Established	Capacity (tons)
Inter Mitra Transindo, PT	2011	1,000
Kini Cold Storage	–	1,000
Hwasung Thermo Indonesia, PT	2014	500
Pluit Cold Storage, PT	2003	500
Darta Logistic, PT	2014	250
Abbatoir Surya Jaya, PT	–	200
TOTAL CAPACITY		209,100

Source: Survey by author.

Major players of cold chain transportation rental company

There are eight main players in cold chain transportation rentals in Jabodetabek. PT Armada Container Indonesia (PT ACI) was established in 2007 and is located in Cakung, East Jakarta. PT ACI is a company that has long been involved in container transportation services. In addition to renting out its containers, this company also sells and modifies containers from standard containers to base office containers, storage and so on. Based on the information obtained by CIC, the reefer containers of PT ACI consist of various types from 10 feet, 20 feet to 40 feet.

Another company that quite exists in cold chain transportation is PT Hwasung Thermo Indonesia (PT HTI). In Indonesia, the presence of PT HTI is represented by PT Hwasung Thermoindo, which is the sole distributor of Hwa Sung cooling machines for the Indonesian market, which has been operating since 2014. PT Hwasung Thermoindo provides cooling solutions for the transportation of products that require refrigeration for either freezer or chiller applications for vegetables, fruits, frozen foods, milk, cheese, ice cream, nuggets, chicken, sausages and others. The type of cooling unit owned by PT Hwasung Termindo according to information is four-wheeled, six-wheeled, and 10-wheeled Mercedes-Benz and Fuso trucks. In addition, there are also car-type refrigerated transportation, namely, Suzuki Carry, Daihatsu Granmax and L300.

PT Wira Logitama Saksama or Wira Logistic is also a company that rents refrigerated transportation throughout Indonesia. This company which was founded in 1996 and has many branches in Indonesia also has several kinds of warehouses with dry, cold storage, frozen and chiller rooms.

PT ASSA Transport is a company that also serves refrigerated transportation rentals. The company, which was founded in 1985, serves the shipping of various kinds of products such as fish, chicken, meat and processed products such as fillets, nuggets, meatballs and sausages that serve almost all islands in Indonesia.

Table 4.22: Refrigerated Transportation Rental Company in Jabodetabek, 2018

No.	Name of Company	Established	Location
1	Armada Container Indonesia, PT	2007	Jakarta
2	ASSA Transport, PT	1985	Tangerang
3	Hwasung Thermo Indonesia, PT	2014	East Java
4	Manggala Kiat Ananda, PT	1996	Tangerang
5	MgmBosco Logistic, PT	1995	Bekasi
6	Raficon Sarijaya, PT	2005	Jakarta
7	Selaras Mandiri Raya Trans, PT	2010	Tangerang
8	Wira Logitama Saksama, PT	1996	Bekasi

Source: Survey by author.

- Major transportation rental players for low-temperature goods

Based on the information obtained from PT Hwasung Thermindo, on average, the company rents out refrigerated fleets capable of cooling cargo space temperatures between 0°C and -20°C. The Hwasung thermo machine can cool cargo temperature starting from 0°C to -20°C with cooling capacities ranging from 2.5 x 1.6 x 1.7 meters to cargo space measuring 9.2 x 2.4 x 2.25 meters.

- Number of fleet/trucks of rental company to load low-temperature goods

Refrigerated truck fleets are needed to distribute goods from factory to warehouse and from warehouse to final customer. The function of the refrigeration truck is that the goods carried, especially food that is easily damaged, are still in good condition.

In its operation, most companies that rent refrigerated fleets use trucks of varying sizes. The number of truck fleets owned depends on the extent of distribution reach and the number of customers owned by the company.

PT MGM Logistics is a company that has experience in the refrigeration transport business. Currently, it has a large enough fleet of trucks reaching 720 trucks spread across several branches such as Surabaya, Banjarmasin and Makassar. Based on the information obtained, the distribution of PT MGM Logistic cooling products reached almost 100 cities in Indonesia with 200 customers.

Likewise, with PT WiraLogitamaSaksama or Wira Logistic, it has around 300 vehicle fleets serving the market in Java region. This company has several well-known customers such as Sari Roti, Petronas, Coca-Cola, Givaudan, Adidas, Solaria, Danone, Unilever, Carrefour, Philip Morris and so on.

- Price of new refrigerated fleet/trucks

Based on the survey at a dealership of Mitsubishi conducted by CIC, the price of new refrigerated truck varies greatly depending on the carrying capacity of each truck and the type of cooler used, such as for four-wheeled trucks with FE 71 110 type with Thermoking SV 400, it is sold atRp400 million per unit. While trucks of the same type with different cooling brands (Starkool SK 350) is sold for Rp370 million per unit.

Trucks with type FE 74 HDF 125 PS 6 BAN with SV 600 Thermoking cooling machines are sold at Rp510 million. The Hwasung HT-250 cooling machine is sold at a price below of Rp495 million. The same type of car with Denso FS-32 cooler is sold for Rp485 million per unit. The following is an overview of the prices of new refrigerated trucks of several types:

Table 4.23: Price of New Refrigerated Truck, 2018

Truck Brand	Type	Cooler	Price (Rp'000)
MITSUBISHI	FE 71 110 PS 4 BAN	THERMOKING SV 400	400,000
	PS 110 PS 4 BAN	THERMOKING SV 400	405,000
	FE 71 L 110 PS 4 BAN	THERMOKING SV 400	425,000
	FE 71 110 PS 4 BAN	STARKOOL SK-350	370,000
	PS 110 PS 4 BAN	STARKOOL SK-350	375,000
	FE 71 L 110 PS 4 BAN	STARKOOL SK-350	395,000
	FE 73 110 PS 6 BAN	THERMOKING SV 600	480,000
	FE 73 HD 110 PS 6 BAN	THERMOKING SV 600	490,000
	FE 73 110 PS 6 BAN	STARKOOL SK-550	460,000
	FE 73 HD 110 PS 6 BAN	STARKOOL SK-550	470,000
	FE 74-S 125 PS 6 BAN	THERMOKING SV 600	505,000
	FE 74-S 125 PS 6 BAN	STARKOOL SK-550	480,000
	FE 74 HDF 125 PS 6 BAN	THERMOKING SV 600	510,000
	FE 74 HDF 125 PS 6 BAN	HWASUNG HT - 250	495,000
	FE 74 HDF 125 PS 6 BAN	DENSO FS - 32	485,000
	FE 74 HDF 125 PS 6 BAN	THERMO FROZEN RG	475,000
	FE 74 HDF 125 PS 6 BAN	STARKOOL SK-350	470,000
	FE 74 S LONG 125 PS 6 BAN	THERMOKING SV 600	525,000
	FE 74 S LONG 125 PS 6 BAN	HWASUNG HT - 500	505,000
	FE 74 S LONG 125 PS 6 BAN	DENSO FS - 42	495,000
	FE 74 S LONG 125 PS 6 BAN	THERMO FROZEN RG	485,000
	FE 74 S LONG 125 PS 6 BAN	STARKOOL SK-550	480,000
	FE 84 HDL 136 PS 6 BAN	THERMOKING SV 600	550,000
	FE 84 HDL 136 PS 6 BAN	HWASUNG HT - 500	530,000
	FE 84 HDL 136 PS 6 BAN	DENSO FS - 42	525,000
	FE 84 HDL 136 PS 6 BAN	THERMO FROZEN RG	515,000
	FE 84 HDL 136 PS 6 BAN	STARKOOL SK-550	510,000
	COLT L 300	BOX FREEZER	255,000
	COLT L 300	THERMO FROZEN	260,000
	COLT L 300	THERMOKING	285,000

Source: Survey by author.

Main users of cold chain service

- Food processing company

As mentioned before, the cold chain is also very much needed in various industries, including food processing industries. The processed food industry is very dependent on the cold chain system. Two companies are noted as main users of cold chain service for food processing companies, namely, PT So Good Food Manufacturing (PT SGM) and PT Charoen Pokphand Indonesia Tbk.

PT So Good Food Manufacturing, initially named PT Japfa Osi Food Industries, was established in Jakarta on May 25, 1994. The scope of products produced by PT SGFM is processed chicken and beef, including sausages, nuggets, meatballs, whole muscle products (karaage, katsu, chicken steak, spicy wings and spicy chicken) and other processed meat and seafood such as corned beef and chicken, shumai, spring rolls, brainbox, dumplings, postage stamps and so on.

For sausage products, PT SGFM classifies sausages based on how they are served, that is, sausages that are ready to eat and are not ready to eat, meaning they need to be cooked first. For sausages that are ready to eat, the company markets its products with two brands, namely, SG SOZZIS and SO NICE. SG SOZZIS was launched in 2002.

The distribution of all products produced by the company is directly handled by the parent company, PT So Good Food, previously named PT Supra Sumber Cipta. Until now, sausage and nugget products are still oriented to the domestic market.

PT Charoen Pokphand Indonesia Tbk., initially named PT Charoen Pokphand Indonesia Animal Feed, was founded in 1967. On December 6, 1990, the company was renamed to PT Charoen Pokphan Indonesia Tbk. In 1995, PT Charoen Pokphan Indonesia established a company named PT Charoen Pokphan Indonesian Chicken Processing Plant (PT CPIT–CPP) as a slaughterhouse and chicken meat processing industry.

PT CPIT–CPP currently produces various processed meat products, including sausages, processed chicken (nugget, spicy wing, karaage, meatballs, dumplings, fried potatoes, etc.), cut chicken and others (fish, fried rice and snacks). Initially, the nugget and sausage products being the mainstay of this company was the FIVE STAR brand. However, the brand's existence only lasted until 2006 and was replaced by various brands that are quite successful in gaining market share, including FIESTA, GOLDEN FIESTA, CHAMP and OKEY. For snack products, the company uses the ASIMO and DUGEM brands.

- Trading company

PT Sumber Alfaria Trijaya Tbk., known as Alfamart, is one of the trading companies that need cold chains to store chicken products, meat, beverages and other processed foods. Alfamart is a supermarket chain that has many branches in Indonesia.

The company was originally named PT Alfa Mitramart Utama and founded by PT Alfa Retailindo Tbk. and PT Lancar Distrindo in 1999. On August 1, 2002, the ownership of PT Alfa

Mitramart Utama was transferred to PT Sumber Alfaria Trijaya, which shares are owned by HM Sampoerna (70%) and PT Sigmantara Alfindo (30%).

Until now, Alfamart already has more than 1,000 outlets in Indonesia. More than 200 food products and other living goods are available at competitive prices.

- Distribution company

PT Unilever Indonesia Tbk. is the largest distribution company that also requires cold chains for the produced products. Unilever produces food, drinks, cleansers and body treatments. Unilever has more than 400 trademarks, and its products are well-known in Indonesia such as Lux, Magnum, Dove, Margarine, Rexona, Sunsilk, Lifebuoy, Clear, Rinso, Molto, Wall's ice cream, Blue Band, Surf and so on.

PT Unilever Indonesia Tbk. is divided into four main divisions, namely food, beverages and ice cream, household care and body care. In distributing its products, PT Unilever involves around 500 Unilever distributors spread throughout Indonesia.

PT Unilever Indonesia Tbk. has six factories in Jababeka Industrial Estate, Cikarang and Bekasi and two factories in the Surabaya Rungkut Industrial Estate in East Java with its head office in Jakarta.

- Retail company

In line with the rapid growth of retail business networks in major cities in Indonesia in recent years, encouraging goods storage services in cold storage has increased. Most retail networks in Indonesia have a number of outlets spread in several locations; thus, there must be standardisation of goods in all outlets. This requires handling the availability of goods in a professional and timely manner.

However, some retail networks only have limited cold storage space to accommodate their trading commodities, including frozen food products, drinks, ice cream, fruit, meat, fish and so on. With the limited capacity of its own cold storage, several large-scale network retailers then rent logistics facilities for cold storage space.

Retail network business is divided into two groups, namely, hypermarkets and supermarkets. Based on the classification from the Ministry of Trade, the minimum area of supermarkets is around 600 m^2 and minimarkets or convenience stores at least 140 m^2, while hypermarkets have bigger floor space than supermarkets.

Included in hypermarket group is Carrefour, which has a network in Jabodetabek (41 outlets); Giant (44 outlets); Hypermart (100 outlets) and Lotte (13 outlets). Meanwhile, the supermarket group includes Hero with 132 outlets, Alfa with 587 outlets and Starmart with 145 outlets in 2018.

Based on a survey conducted by CIC, each of these outlets, such as Carrefour, Giant, and Lotte, has its own cold storage with a capacity of between 10 and 100 tons.

The big potential market of Indonesia has pushed the courage of retail entrepreneurs to add outlets in Indonesia. Retail entrepreneurs are optimistic that retail businesses in Indonesia, especially supermarkets, hypermarkets and shipping companies, have bright prospects in the future.

Type of products that require and use cold chain service

- Food company

Cold chains in the food industry are needed so that food is not quickly damaged. Food products that require cold chains are sausages and nuggets as well as chocolate, sardines, coconut juice and so on.

Table 4.24: Food Products of Some Food Companies That Require Cold Chain Service

Name of Company	Brand	Product
Carrefour Indonesia, PT	CARREFOUR	Sausage and Nugget
Diamond Cold Storage, PT	DIAMOND	Ice Cream
Garuda Food, PT	CLEVO, OKKY JELLY	Milk, Coconut Jelly
Hero Supermarket, PT	GIANT	Nugget
Kelola Mina Laut, PT	MINAKU	Sausage and Nugget
Lion Superindo, PT	365	Sausage Beef
Lotte Shopping Indonesia, PT	LOTTEMART SAVE	Sausage
Matahari Putra Prima Tbk, PT	VALUE PLUS	Sausage and Nugget
Olagafood, PT	OLAGA	Beverage
Petra Food, PT	SILVER QUEEN	Chocolate
Prima Food International, PT	FIESTA DAN GOLDEN FIESTA	Nugget
Rekso Nasional Food, PT	MCDONALD'S	Sausage and Nugget
Sekar Bumi Tbk., PT	BUMIFOOD	Nugget
Sekar Laut, PT	FINNA	Sardines
Sierad Produce, PT	DELFARM	Nugget
So Good Food Manufacturing, PT	SO GOOD	Sausage

Source: Survey by author.

- Trading company

In developing its business, PT Sumber Alfaria Trijaya Tbk. also collaborates with large companies and small producers with small and medium enterprises (SMEs) scale in marketing their products. For this reason, Alfamart created a house brand private label (HBPL) which is specially packaged in a package that has the identity of the place that sells it, and the product can only be obtained at that place.

The purpose of creating HBPL products is to provide a choice of good quality products at affordable prices to consumers. Therefore, the products issued by Alfamart are products made by large and trusted factories in their fields.

Various products found in Alfamart require cold chains such as beverage products (Sprite, Fanta, Coca-Cola, bottled tea, ice cream, Aqua, Le-Minerale, yoghurt and so on), food products (fresh meat, sausages, fruits, sardines, nata de coco, pudding, dates).

- Distribution company

As explained above, the products produced by PT Unilever are more than 400 brands that are well-known to the public. Of the 400 brands, there are several products that are produced requiring cold chains so that the quality of these products is maintained and guaranteed. These products are food products and beverages such as Blue Band Margarine, Wall's ice cream, Lipton and Buavita.

Table 4.25: Products of PT Unilever That Require Cold Chain

Name of Product	Weight
Blue Band Serbaguna*	1 kilogram, 17 grams, 55 grams
Blue Band Master Original Margarine	5 kilogram
Blue Band Serbaguna Sachet	200 grams
Blue Band Cake and Cookie	1 kilogram, 200 grams
Blue Band Serbaguna Tube	250 grams
Blue Band Master Original Margarine Tin	2 kilograms
Lipton Tea	
Lipton Peppermint Jewel 15 Sachets	1.5 grams
Lipton Strawberry 15 sachets	1.5 grams
Lipton Yellow Label Black Tea 25 Teabags	2 grams
Buavita Juice Royale Sunshine Carrot	250 ml
Buavita Juice Slim Orange	250 ml
Buavita Juice Slim Jambu	250 ml
Buavita Juice Royale Chloro Broccoli	250 ml
Buavita Juice New Mango	1000 ml
Buavita Juice Slim Lychee	250 ml
Buavita Juice New Guava	1000 ml
Buavita Juice Slim Apple	250 ml
Buavita Juice Slim Mangga	250 ml
Walls Ice Cream	38 ml
Walls Ice Cream Magnum Almond	90 ml
Walls Ice Cream Feast Vanilla	65 ml
Walls Ice Cream Feast Chocolate	65 ml

*Name of variant from Blue Band.

Source: Survey by author.

4.7. Utilisation of storage

Utilisation of storage and trucks for ordinary temperatures

Storages are needed as a means to store goods and must be arranged properly so they can be used optimally. Also, they can facilitate the storing, searching, and retrieval of goods.

Goods stored in the storage can be in the form of raw materials, semi-finished goods, spare parts or finished products. A good storage system is a storing system that can utilise its storage space effectively.

Storage utilisation for ordinary temperatures must be designed in a good condition with sufficient radiation, must be easy to clean, and have a temperature range from 19°C to 21°C, especially for food storage, which should be close to the production unit.

Ordinary temperature storage is usually used to store food products, tubers, potatoes, garlic, shallots or tuber vegetables and shoots.

Utilisation of storage and truck for cold temperature

Storage utilisation for cold temperatures is usually performed in coolers that are stored at a temperature of 5°C to 8°C. Besides, the cleanliness of the refrigerator must also be maintained, not close to the source of heat and not directly exposed to the sun.

Products that are usually stored in cold temperature storage are food products in cans, plastic, bottles or other dry food products. This type of food will be easily damaged if it is deviated to a storage that is unclean, irregular and improperly maintained.

There are several factors that are considered in storing food products for cold temperatures, namely, temperature controlling and humidity, arranging and placing food products, food labelling, food ingredients recording and security as well as storage locations.

Utilisation of storage and truck for freezing temperature

Storage for freezing temperatures usually used to store perishable foodstuffs and dairy products, such as eggs, butter, meat, and milk. Food will be saved if stored at temperatures between -1°C and -7°C.

The foodstuff must be placed separately because if put together, it will cause contamination, resulting in damage to the food.

Other foods stored in freezing temperature are various types of meat and ice cream, which are consumed for a long time. Storage of this type of food is stored at a temperature of -18°C or lower.

Utilisation of storage being rented by each company

Storage is a facility that functions as a location for distributing goods from suppliers to end users. In practice, each company tends to have uncertainty in demand.

This encourages the emergence of policies from the company to conduct an inventory system. This policy encourages companies to provide storage facilities as a place to store goods.

In general, warehouse utilisation rented by each company has four objectives, namely, reduction in transportation and production costs, coordination between supply and demand, production needs and warehouse needs.

The benefits of the storage are as a means to support the production process, as a place to sort goods to be sent to customers and as a place to protect goods to be safe from the dangers of theft, fire, floods and other security problems.

Potential demand for cold storage in Indonesia

To calculate the share of cold storage demand in Indonesia, the approach is based on the amount of production (meat, fish, fruit, vegetables, ice cream, etc.) which usually requires storage in cold storage.

The calculation of cold storage demand is based on the assumption of storage time on average per type of foodstuffs such as meat requirements of 80% cold storage with an average storage time of 30 days, fish 50% with a storage time of 30 days, fruit and vegetable products 10% with storage time of 15 and seven days, respectively. Ice cream products need 100% cold storage with a storage time of 15 days.

Based on these assumptions, the potential for cold storage needs can be known. In 2018, the potential need for cold storage is estimated at 17.6 million tons per year. The amount consists of cold storage needs for each product, namely, 397.0,000 tons of beef, 12.5 million tons of frozen fish/frozen shrimp, 1.7 million tons of chicken, 2.8 million tons of fruits, 72.0,000 tons of vegetables, 42.0,000 tons of ice cream and for other needs (nugget, sausage, pharmaceutical and other products) amounting to 24.7,000 tons.

Compared with the cold storage capacity 370,000 tons of surveyed 69 major companies (Tables 2 and 17), the estimated needs 17.6 million tons suggest an overwhelming lack in the supply. There would be a quite large potential to develop cold storage particularly for the fishery sector in Indonesia.

Table 4.26: Demand for cold storage in Indonesia, 2018

Product	Production (tons/year)	Cold Storage Needs (tons/year)	Percentage of Cold Storage Needs (%)
Beef	496,300	397,040	80
Fishery	25,011,000	12,505,500	50
Chicken	2,144,000	1,715,200	80
Fruits	19,021,099	2,853,165	15
Vegetable	480,483	48,048	10
Ice Cream	42,000	42,000	100
Others	95,000	24,700	26
TOTAL	**47,289,882**	**17,585,653**	**37**

Note: Cold storage needs were estimated from production × percentage of cold storage needs.
Source: Author.

4.8. Government policy

Policy on investment

Investment in the cold chain industry in Indonesia still seems to be open both in the context of domestic investment and foreign investment. Based on Presidential Regulation No. 44 of 2016 concerning Negative Investment List, the cold chain is not included and is open to investment.

With the enactment of this Presidential Regulation, Presidential Regulation Number 39 of 2014 concerning list of closed business fields and business fields open with requirements in the investment sector is declared revoked and not valid.

Policy on trade and production

Policy on cold chain trade and production in Indonesia refer to the action plan for the acceleration of the development of national fisheries industry as stipulated in the Regulation of the President of the Republic of Indonesia No. 3 of 2017. The purpose of the issuance of the regulation is to improve the welfare of the community for fishermen, cultivators, processors and marketers of fishery products as well as to increase employment and foreign exchange.

One of the mentioned programs for fisheries processing industry by the government in the period of 2016–2019 is government must provide access to electricity and cold chains for raw materials. The output to be achieved from this activity is the fulfilment of electrical energy for cold chain systems in 31 fishing industry priority locations.

Policy on export and import

Meanwhile, in export and import policy, the government continues to make efforts to balance the food supply and demand by applying cold chains to post-harvest meat, both

broiler and beef. In addition, the regulation also stipulates how to use cold storage. These policies are issued by Minister of Agriculture Regulation No. 32 of 2017 concerning the supply, distribution and supervision of broiler and eggs and Minister of Trade Regulation No. 20 of 2018, which is the Second Amendment of Regulation No. 59/M-Dag/Per/8/2016 concerning provisions on exports and imports of animals and animal products.

In article 11 of the Regulation of the Minister of Trade No. 20 of 2018, it is stated that to obtain approval for importation of animals and animal products, companies must submit applications to the director general of import of the Ministry of Trade by attaching requirements, including proof of ownership of cold storage and proof of ownership of refrigerated transportation means.

Government policy on storage and transportation that uses temperature control or cooling system

The key government policy regarding storage and transportation that uses temperature control or cooling system is Presidential Regulation No. 71 of 2015 stating determination and storage of basic commodity and important goods. This policy indirectly supports the role of warehousing to ensure the smooth management of basic commodity and important goods.

The meaning of basic commodities is goods that concern the lives of many people with a high scale of fulfilment of needs that can become a supporting factor for people's welfare, while important goods are strategic goods that play an important role in determining the smoothness of national development.

The determination of basic commodities is based on the allocation of national household expenditure for these goods, while the determination of important goods is carried out based on the strategic nature of national development.

Types of basic commodities and/or important goods as intended include livestock and fisheries products: beef, broiler, chicken eggs and fresh fish (milkfish, bloated and cod/tuna/skipjack).

The regulation also states how to manage stocks and logistics by optimising inter-island trade, monitoring stock availability in the warehouse and port, providing and optimising distribution facilities, coordinating with relevant ministries and heads of non-ministerial agencies in the provision of transportation modes and coordinating with ministers and heads of non-ministerial government institutions related to the provision of stocks and reserves of certain basic commodities controlled by the government.

Government policy supports the development of cold chain business in Indonesia

The government continues to encourage the development of cold chain business in Indonesia, especially in the fisheries sector. The Ministry of Maritime Affairs and Fisheries has encouraged the development of marketing facilities with cold chain systems to a number of

retail areas and property. This step is expected to support the distribution of capture fisheries products to consumer centres.

The government continues to encourage the entry of investments in the cold chain industry in Indonesia, one of which is by cooperating with several investors, including 13 Japanese companies that participated in a business forum[20] that was organised by KKP and Japan External Trade Organization (JETRO). In this forum, the participants discussed opportunities for investment in fisheries, especially in the construction of cold chain facilities from upstream to downstream fisheries.

The 13 companies are FTI Japan Co., Ltd., PT Daisei Retail Indonesia, Nichirei Logistics Group Inc., Hanwa Co., Ltd., Harada Corporation, Dah Chong Hong (Japan) Ltd., PT Seino Indomobil Logistics, PT Sumitomo Indonesia, Taiho Shoji Co., Ltd., Zensho Holdings Co., Ltd., PT Sinfonia Technology Indonesia, Okamoto Seihyo and Musashi Industry.

KKP hopes to attract investment from companies of Japan in the amount of Rp1 trillion this year. With this investment, KKP wants to build direct logistics from Eastern Indonesia such as in Makassar or Bitung. As is known so far, the map of Indonesian fisheries exports is still centralised in the Jakarta, Surabaya and Denpasar regions.

KKP revealed that in 2018, Japan's investment in the fisheries sector reached Rp500 billion to Rp600 billion, and this year, it is expected to double. In addition to the cold chain sector, other sectors that can be entered by business players are the logistics, trade and processing sectors.

4.9. Conclusion

In general, the cold chain industry in Indonesia continues to experience growth, given the rapid development of its industrial user such as livestock, fisheries, processed food, pharmaceuticals and so on.

In addition, another factor that supports the development of cold chain business is the development of network retail business and restaurants chain store in big cities and also food and beverage processing industry as the users of cold storage. These big network retailers are Carrefour, Giant, Hypermart and Lotte Mart, and large restaurants chain store include Kentucky Fried Chicken, McDonald's, Pizza Hut, Hoka-Hoka Bento and others. The ice cream industry includes Diamond Cold Storage, Unilever and others.

These sectors are the largest users of cold storage facilities, to store their products such as frozen food, drinks, ice cream, fruit, meat, fish and so on, which require certain cold temperatures.

Cold chain implementation requires the provision of several facilities, both in the process of storage and distribution. In the storage process, it needs, among others, cold storage. In

[20] Indonesia–Japan business and investment forum: shaping partnership for sustainable marine and fisheries development, Jakarta, 29 January 2019.

Indonesia, the existence of major cold storage companies is estimated to reach 69 with a total capacity of 370,000 tons per year.

In the next five years, cold storage needs are expected to continue to increase, which will automatically increase the available current installed capacity. CIC estimates that by the end of 2019, it is projected that the demand for cold storage will reach 462,700 tons, or an additional capacity of 92,500 tons is needed from the current production capacity of 370,200 tons. And until 2024, the demand for the capacity is projected to reach 824,700 tons.

The development of cold chain business has challenges and obstacles in investment, which are caused by infrastructure problems and the lack of fiscal facilities offered by the government. The government has not yet provided component import duty exemption of cold storage equipment, similarly, the provision of tax holiday facilities to build cold storage assembly plants in the country. In addition, the lack of availability of electricity in remote areas is also a challenge.

Cold chain needs in cold storage business in Indonesia are still quite high. Based on Presidential Regulation Number 44 of 2016 concerning negative investment list, cold chains are not included and are open to investment. For this reason, the government opens as wide as possible for investors, both domestic and foreign.

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