



2020 GCCA Global Cold Storage Capacity Report



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for the International Association
of Refrigerated Warehouses

August 2020



A Core Partner of



Author

This report was prepared by Victoria Salin, Ph.D., under contract to the International Association of Refrigerated Warehouses (IARW), a core partner of the Global Cold Chain Alliance (GCCA). Salin is a Professor in the Department of Agricultural Economics at Texas A&M University specializing in agribusiness management and finance. Dr. Salin is co-director of the Agribusiness, Food & Consumer Economics Research Center (<http://AFCERC.tamu.edu>) and leads research and outreach projects relating to food safety, traceability, financial markets, and strategic management.

Contributors

GCCA would like to thank those who responded to the 2020 Global Cold Chain Capacity Survey. Without the data provided by members, association partners, and industry partners, this report would not have been possible.



GCCA would like to recognize Rabobank for their significant data contributions to this capacity report. Their partnership has increased the breath and robustness of the report. Rabobank is a Dutch multinational banking and financial services company headquartered in Utrecht, Netherlands. They provide food and agriculture financing and sustainability-oriented banking. As part of its Banking 4 Food strategy, Rabobank continues to have a strong focus on cold chain logistics globally, serving clients with industry insights, actionable data, and valuable financial & advisory services.

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Introduction

This report provides data on refrigerated warehouse capacity in 51 countries using information collected from international offices of the Global Cold Chain Alliance (GCCA). The primary data source was a survey administered between January and May 2020 by the GCCA staff. In addition, an official government report was a source for part of the information on the United States (U.S. Department of Agriculture).

Summary of the Findings

The total capacity of refrigerated warehouses worldwide was 719 million cubic meters in 2020, 16.7% greater than the capacity reported in 2018. The increase in reported capacity since 2018 was largely from North America and China. The United States, at 156 million cubic meters, was the single largest country market, followed by India at 150 million cubic meters and China at 131 million cubic meters.

Refrigerated warehouse space was distributed unevenly across countries based on the index of market penetration developed by the Global Cold Chain Alliance (GCCA). The market development index is calculated as cold storage capacity per urban resident. The worldwide average in 2020 was 0.15, with a range from 0.9 to less than 0.1 cubic meters per resident. The urban population is used in this benchmark because it is expected that those with middle-class income concentrate in these areas. In developing country markets, the middle-class and high-income consumer segments support the demand for refrigerated and frozen foods, which ultimately drives the refrigerated warehouse service industry.

Refrigerated warehouses serve various needs in the food logistics process: storage of seasonally produced foods to allow them to be available year-round, short-term storage staged in strategic locations to meet retail distribution needs, and import-export logistics service facilities along global transportation routes. There are two classifications of business models: warehouses available to multiple users on a for-hire basis and those operated by a food company exclusively for that company's use. In this report as in industry practice, the warehouses available for-hire are referred to the third-party logistics business model (3PLs). The refrigerated warehouses operated by a food company exclusively for that company's use are called "private" warehouses in industry terminology.



Limitations and Methodological Notes

The figures in this report are the most complete data available to document the global refrigerated warehouse industries. Certain limitations should be noted due to defining the scope of the industry and variations in units of measure.

Scope of the industry as a limitation on the data.

The intent of this study is to provide information on all refrigerated warehouse space in a country, regardless of ownership and business model (3PL or private). Because the Global Cold Chain Alliance is a trade association of 3PLs and has information sources largely in the 3PL industry, it is possible that warehouses that were operated privately may not have been thoroughly covered by the information sources affiliated with the GCCA. The experts' estimates and inclusion or exclusion of privately operated space explains the discontinuity in capacity across years in certain countries. For example, in 2020, a significant part of the growth in capacity for Canada was because information on privately operated refrigerated warehouse space was included for the first time.

Units of measure.

There is potential for error in the statistics in this report because conversion factors between quantity units must be applied. Most of the survey respondents provide information in cubic meters, which is the standard capacity unit adopted by the Global Cold Chain Alliance. Therefore, most of the units of measure are consistent throughout the report. However, a few nations customarily report in pallets, which presents a complication because the size of a standard pallet differs for European and American markets. (Please see the Appendix for the conversion factors applied). Some responses were received in metric tonnage units. Tonnage units were converted to cubic meters on the basis of an assumption provided by food industry experts.

Country Markets

The three largest countries in terms of refrigerated warehouse space were the United States, India, and China. Together, these countries comprised 61% of the refrigerated warehouse space worldwide. In the United States and China, capacity expanded rapidly. Capacity in India was reported to be stable. We also saw increases in capacity across a number of European countries due to inclusion of additional data provided by Rabobank.

The country-by-country capacity data for 2020 are shown in Figure 1 for the top 20 countries. Table 1 shows refrigerated warehouse capacity for all the countries included in the GCCA global database, 2020.

Figure 1: Capacity of Refrigerated Warehouses, Twenty Largest Country Markets, 2020, in Million Cubic Meters.

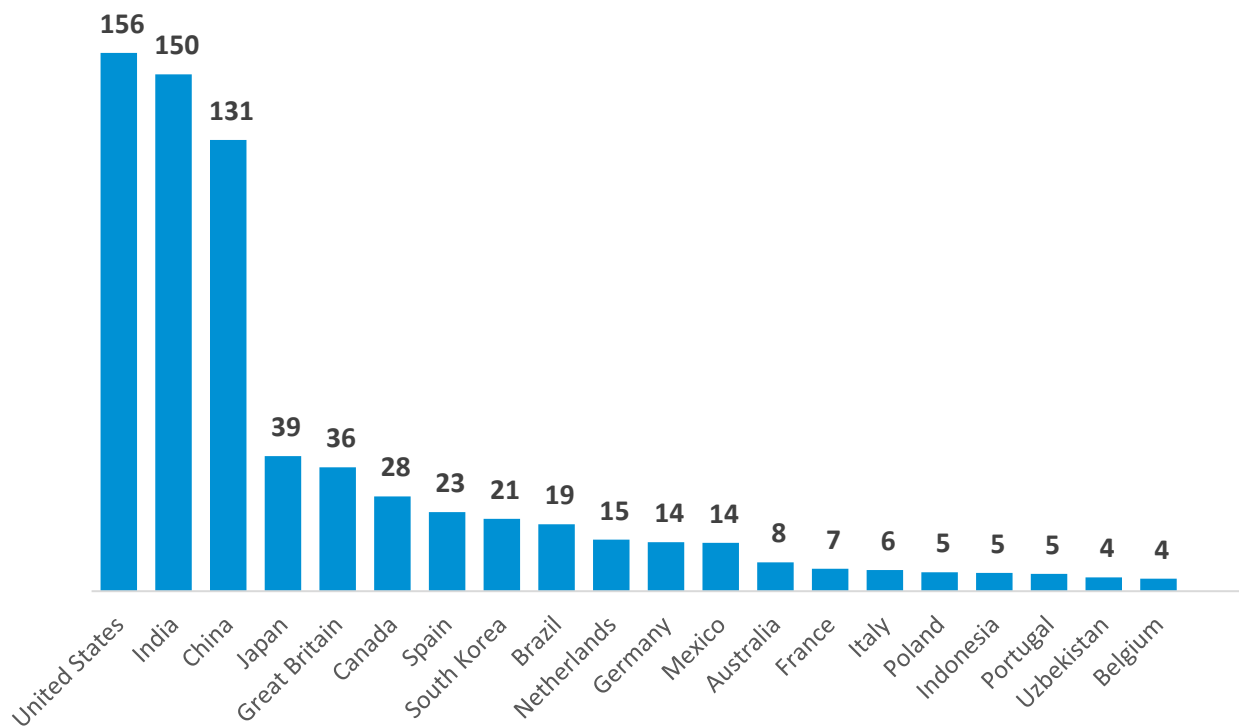


Table 1: Refrigerated Warehouse Capacity and Market Development Index, by Country, 2016-2020 as Available

| Country | 2016 | | 2018 | | 2020 | | 2020 Percentage 3PL |
|-----------------------|---------------------------|---|---------------------------|---|---------------------------|---|---------------------------|
| | Million m ³ | m ³ per urban resident | Million m ³ | m ³ per urban resident | Million m ³ | m ³ per urban resident | |
| Australia | 6.04 | 0.281 | 1.865 | 0.085 | 8.365 | 0.382 | 100 |
| Belgium | 2.70 | 0.245 | 0.10 | 0.009 | 3.6 | 0.322 | 5 |
| Brazil | 16.83 | 0.095 | 19.057 | 0.106 | 19.447 | 0.107 | 51 |
| Cambodia ^N | | | | | 0.18 | 0.046 | 77 |
| Canada | 9.91 | 0.337 | 9.653 | 0.316 | 27.516 ³ | 0.903 | 60 |
| Chile | 1.55 | 0.096 | 2.165 | 0.133 | 2.271 | 0.133 | 40 |
| China | 107 | 0.143 | 105 | 0.132 | 130.95 | 0.157 | 100 |
| Colombia | - | - | - | - | 3.065 | 0.075 | 25 |
| Costa Rica | - | - | - | - | 0.282 | 0.070 | 20 |
| Denmark | - | - | - | - | 2.45 | 0.479 | 8 |
| Ecuador | 0.043 | 0.004 | - | - | 0.056 | 0.005 | 100 |
| Egypt | - | - | 3.5 | 0.085 | 3.1 | 0.00 ² | 80 |
| Ethiopia | - | - | - | - | 0.12 | 0.005 | 0 |
| Finland | .039 | .085 | - | - | 0.48 | 0.102 | 100 |
| France | 6.29 | 0.111 | - | - | 6.52 | 0.125 | 100 |
| Georgia | - | - | - | - | 0.214 | 0.098 | 100 |
| Germany | 16.00 | 0.265 | - | - | 14.18 | 0.221 | 100 |
| Ghana ^N | - | - | - | - | 0.00 ¹ | 0.00 ² | - |
| Great Britain | 32.37 | 0.624 | 24.117 | 0.441 | 35.926 | 0.644 | 38 |
| Guatemala | - | - | 0.125 | 0.014 | 0.11 | 0.012 | 100 |
| India | 141.13 | 0.335 | 150.229 | 0.343 | 150 | 0.328 | 96 |
| Indonesia | 3.87 | 0.028 | - | - | 5.31 | 0.035 | 28 |
| Italy | 3.8 | 0.09 | - | - | 6.15 | 0.144 | 100 |
| Japan | - | - | 37.612 | 0.315 | 39.257 | 0.339 | - |
| Kazakhstan | - | - | 0.002 | 0.002 | 0.2 | 0.019 | 40 |
| Kenya | 0.0215 | 0.002 | - | - | 0.55 | 0.038 | 50 |
| Kuwait | 0.33 | 0.082 | - | - | 0.281 | 0.064 | 90 |
| Mexico | 6.5 | 0.065 | 15 | 0.152 | 14 | 0.138 | 39 |
| Morocco | 1.7 | 0.082 | - | - | 0.376 | 0.016 | 51 |
| Netherlands | 13.7 | 0.958 | - | - | 15.0 | 0.945 | 100 |
| New Zealand | - | - | 2.05 | 0.503 | 1.79 | 0.697 | 66 |
| Nigeria | - | - | 0.001 | 0.002 | - | - | - |

-- Not available.

m³ -cubic meters.

N -Indicates countries that are new to IARW database in 2020.

¹-Less than 0.001 million m³.

²-Less than 0.005 m³ per capita.

³-2020 estimate includes private space

Table 1 - Continued: Refrigerated Warehouse Capacity and Market Development Index, by Country, 2016-2020 as Available

| Country | 2016 | | 2018 | | 2020 | | 2020 Percentage 3PL |
|----------------------|---------------------------|---|---------------------------|---|---------------------------|---|---------------------------|
| | Million m ³ | m ³ per urban resident | Million m ³ | m ³ per urban resident | Million m ³ | m ³ per urban resident | |
| Norway | - | - | - | - | 1.36 | 0.309 | 100 |
| Peru | 2 | 0.081 | 0.100 | .004 | 1.8 | 0.071 | 67 |
| Philippines | - | - | 2 | 0.037 | 2.4 | 0.043 | 80 |
| Poland | - | - | - | - | 5.45 | 0.236 | 100 |
| Portugal | 0.42 | 0.064 | - | - | 5.0 | 0.740 | 40 |
| Rwanda | - | - | - | - | 0.0193 | 0.009 | 0 |
| South Africa | 0.47 | 0.013 | - | - | 2.71 | 0.069 | 100 |
| South Korea | 12.0 | 0.281 | - | - | 21.5 | 0.509 | 62 |
| Spain | 10.0 | 0.276 | 7.5 | 0.206 | 23.0 | 0.609 | 48 |
| Sweden | 2.0 | 0.239 | - | - | 2.45 | 0.273 | 100 |
| Switzerland | 1.5 | 0.248 | 0.62 | 0.100 | 1.211 | 0.191 | 50 |
| Tajikistan | - | - | 0.10 | 0.041 | - | - | - |
| Turkmenistan | - | - | 0.072 | 0.025 | - | - | - |
| Turkey | 9.24 | 0.165 | 14.36 | - | - | - | - |
| Uganda ^N | - | - | - | - | 0.06 | 0.005 | 20 |
| United States | 118.07 | 0.440 | 130.965 | 0.490 | 156.21 | 0.577 | 82 |
| Uruguay ^N | - | - | - | - | 0.28 | 0.085 | 50 |
| Uzbekistan | 3.54 | 0.327 | 4.5 | 0.385 | 4.0 | 0.240 | 100 |
| Vietnam | - | - | 3.866 | 0.116 | 2.57 | 0.074 | 70 |

-- Not available.

m³ -cubic meters.

N -Indicates countries that are new to IARW database in 2020.

¹-Less than 0.001 million m³.

²-Less than 0.005 m³ per capita.

Variation in Refrigerated Capacity Across Countries

Countries with larger population, consumer income, and geographic area likely have differing needs for refrigerated warehousing services. To facilitate comparisons across countries, a market development index was calculated. This metric is defined as cubic meters per population in the urban areas. The global average for the market development index was 0.152 in 2020.

As expected, many of the higher-income countries had greater presence of refrigerated warehousing capacity relative to the urban population. Per-capita market penetration in the better-served markets ranged from 0.94 cubic meters to 0.3 cubic meters per urban resident (Figure 2). The highest market index levels were in Netherlands (0.94) and Canada (0.90). Portugal, New Zealand, Spain, Great Britain, and the United States ranged from 0.58 to 0.74 cubic meters of refrigerated warehouse space per urban resident.

Among the emerging market economies, India reported the highest level of market penetration with 0.33, which is nearly the same market development level since 2016. India's population is less urbanized than in China, Brazil, and other emerging market economies, so the index is likely over-stating the adequacy of refrigerated warehousing in India relative to countries at similar national income levels.

The countries in the middle ranks in terms of refrigerated warehousing per urban population include the emerging market economies of Uzbekistan (0.24), China (0.16), Mexico (0.14), and Brazil (0.11) (Figure 3). The group of countries that have low refrigerated capacity, relative to potential needs, are at less than .10 cubic meters per urban resident (Figure 4). Several of these countries have predominantly low-income households and modest presence of modern grocery retail infrastructure.

Figure 2: Refrigerated Warehouse Market Development Index (Capacity in Cubic Meters per Urban Resident), for Countries in the High Range of the Index, 2020.

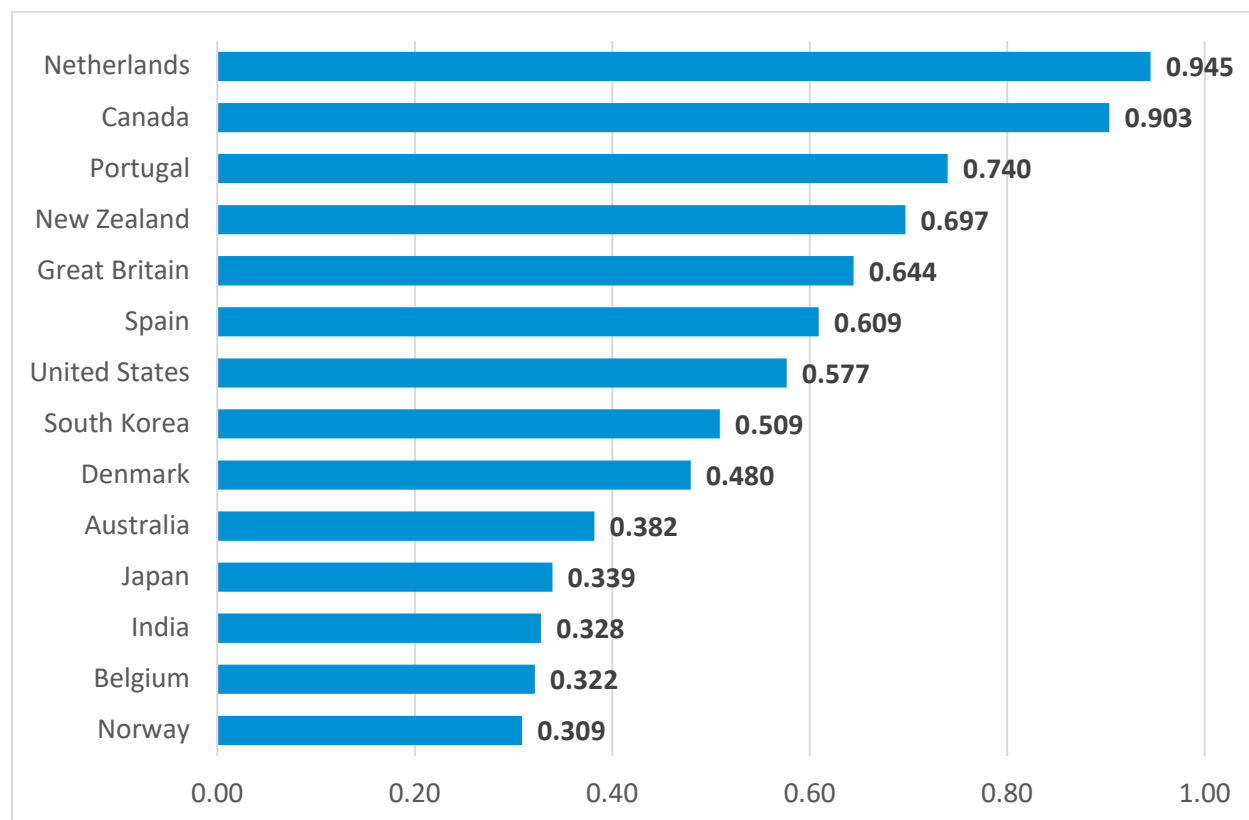


Figure 3: Refrigerated Warehouse Market Development Index (Capacity in Cubic Meters per Urban Resident), for Countries in the Medium Range of the Index, 2020.

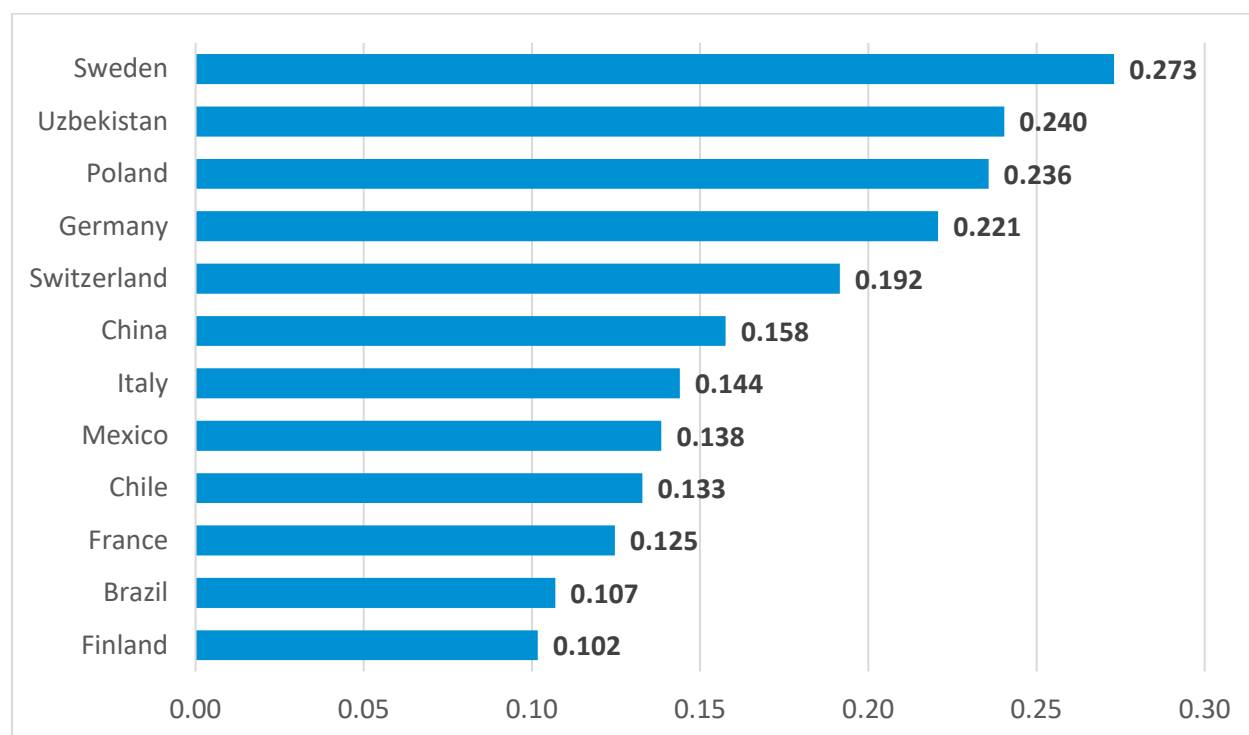
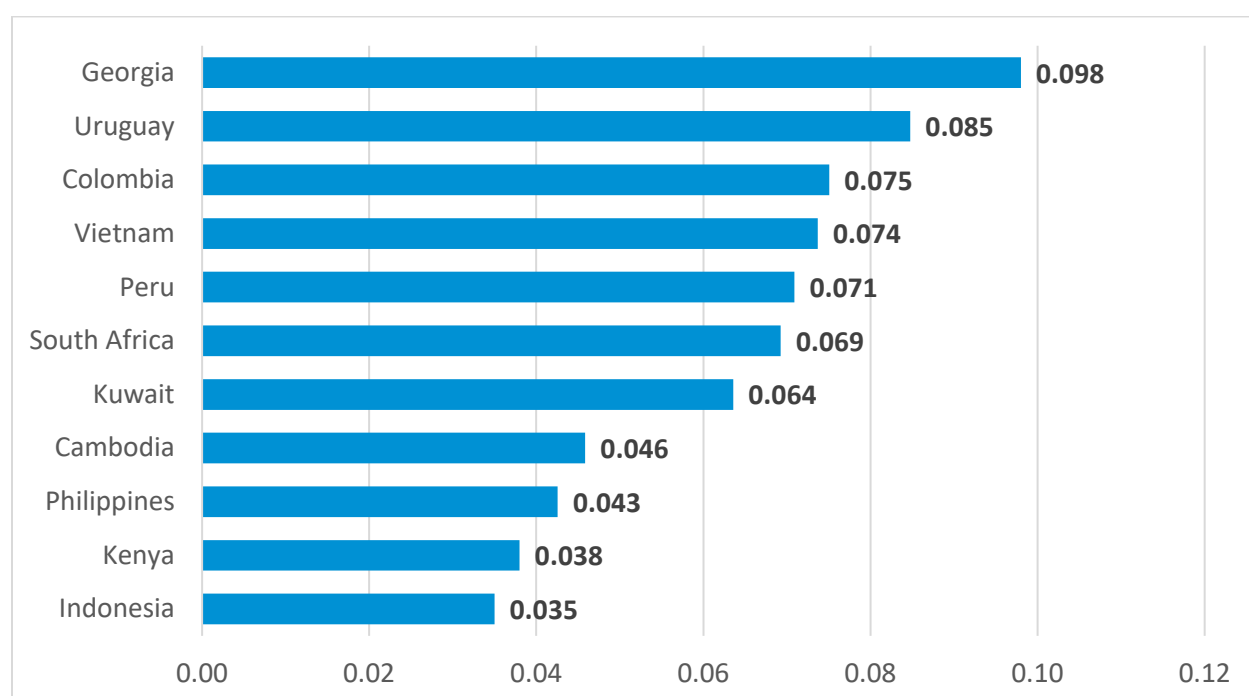


Figure 4: Refrigerated Warehouse Market Development Index (Capacity in Cubic Meters per Urban Resident), for Countries in the Low Range of the Index, 2020.



Size Ranges of Refrigerated Warehouses

In some countries, large warehouses are typical (Table 2). The 2020 survey indicated consolidation of the industry by an increase in the average size of facilities compared with 2018. The average size of refrigerated warehouses was over 100,000 cubic meters per facility in the most consolidated markets.

Table 2: Average Size of Refrigerated Warehouse, by Country, 2020

| Country | m ³ | Country | m ³ | Country | m ³ |
|----------------------------------|----------------|--------------------------|----------------|-------------------------|----------------|
| Canada^G | 131,027 | Kenya | 36,667 | Japan | 12,057 |
| United States^G | 123,290 | Uruguay | 35,000 | Kazakhstan ^G | 9,524 |
| Brazil^G | 109,256 | Uganda | 30,000 | Chile | 9,082 |
| Netherlands | 107,143 | South Africa | 27,663 | Egypt | 6,200 |
| Peru | 90,000 | Cambodia | 25,714 | Colombia | 5,837 |
| Mexico^G | 87,500 | Switzerland | 20,183 | Kuwait | 4,683 |
| Spain^G | 85,185 | India | 19,621 | Indonesia | 4,593 |
| Great Britain | 84,333 | Philippines ^G | 18,462 | Rwanda | 3,852 |
| Denmark | 72,059 | Portugal | 14,286 | China | 3,785 |
| Belgium | 67,925 | Costa Rica | 14,129 | Morocco | 3,357 |
| New Zealand | 57,859 | Guatemala ^G | 12,222 | Georgia | 2,432 |
| Vietnam | 53,542 | South Korea | 13,556 | Uzbekistan | 1,667 |

G -Indicates countries that reported growth in the average size of facilities in 2020 relative to 2018.

Key Refrigerated Warehouse Companies

The Global Cold Chain Alliance is a trade association of temperature-controlled warehouses and therefore has robust capacity information on members within the industry who are a part of the third-party cold chain logistics (3PL) business. Each year, the association publishes a Global Top 25 List of the largest members based on their capacities – note this only includes GCCA members as of July 15, 2020.

Table 2: Largest Refrigerated Warehouse Companies, Locations, and Capacity, 2020

| Company | Locations | Million m ³ |
|---|---|------------------------|
| Lineage Logistics¹ | Australia, Belgium, China, Denmark, Netherlands, New Zealand, Peru, Sri Lanka, United Kingdom, United States, Vietnam | 50.66 |
| Americold Logistics | Argentina, Australia, Canada, China, New Zealand, United States | 31.43 |
| United States Cold Storage | United States | 10.59 |
| AGRO Merchants Group, LLC² | Australia, Austria, Chile, Ireland, Netherlands, Poland, Portugal, Spain, United Kingdom, United States | 6.87 |
| NewCold Advanced Cold Logistics | Australia, France, Germany, Poland, United Kingdom, United States | 5.51 |
| Nichirei Logistics Group, Inc.³ | France, Japan, Netherlands, Poland | 5.19 |
| Kloosterboer | Canada, France, Germany, Netherlands, Norway, South Africa, Sweden, United States | 4.85 |
| VersaCold Logistics Services | Canada | 3.48 |
| Interstate Warehousing, Inc. | United States | 3.28 |
| Frialsa Frigoríficos | Mexico | 2.89 |
| VX Cold Chain Logistics | China | 2.75 |
| Burris Logistics | United States | 2.12 |
| Congebec Logistics, Inc. | Canada | 1.64 |
| Conestoga Cold Storage | Canada | 1.60 |
| Constellation Cold Logistics⁴ | Belgium, Netherlands, Norway | 1.60 |
| Superfrio Armazéns Gerais | Brazil | 1.48 |
| Comfrio Soluções Logísticas | Brazil | 1.38 |
| Hanson Logistics | United States | 1.24 |
| Magnavale Ltd. | United Kingdom | 1.16 |
| Friozem Armazéns Frigoríficos | Brazil | 1.05 |
| Holt Logistics Corp. | United States | 0.99 |
| Confederation Freezers | Canada | 0.98 |
| Agri-Norcold A/S | Denmark | 0.98 |
| Trenton Cold Storage, Inc. | Canada | 0.97 |
| Bring Frigo | Norway, Sweden | 0.82 |

¹Lineage Logistics includes recent acquisition of Henningsen Cold Storage

²AGRO Merchants Group's global space does not include Comfrio Soluções Logística (Brazil) which is shown separately. AGRO Merchants Group has a 22% participation in Comfrio Soluções Logística

³Nichirei Logistics Group, Inc.'s global space includes Eurofrigo, Frigo Logistics, Godfroy Transport & Entrepôts S.A., HIWA Rotterdam Port Cold Stores

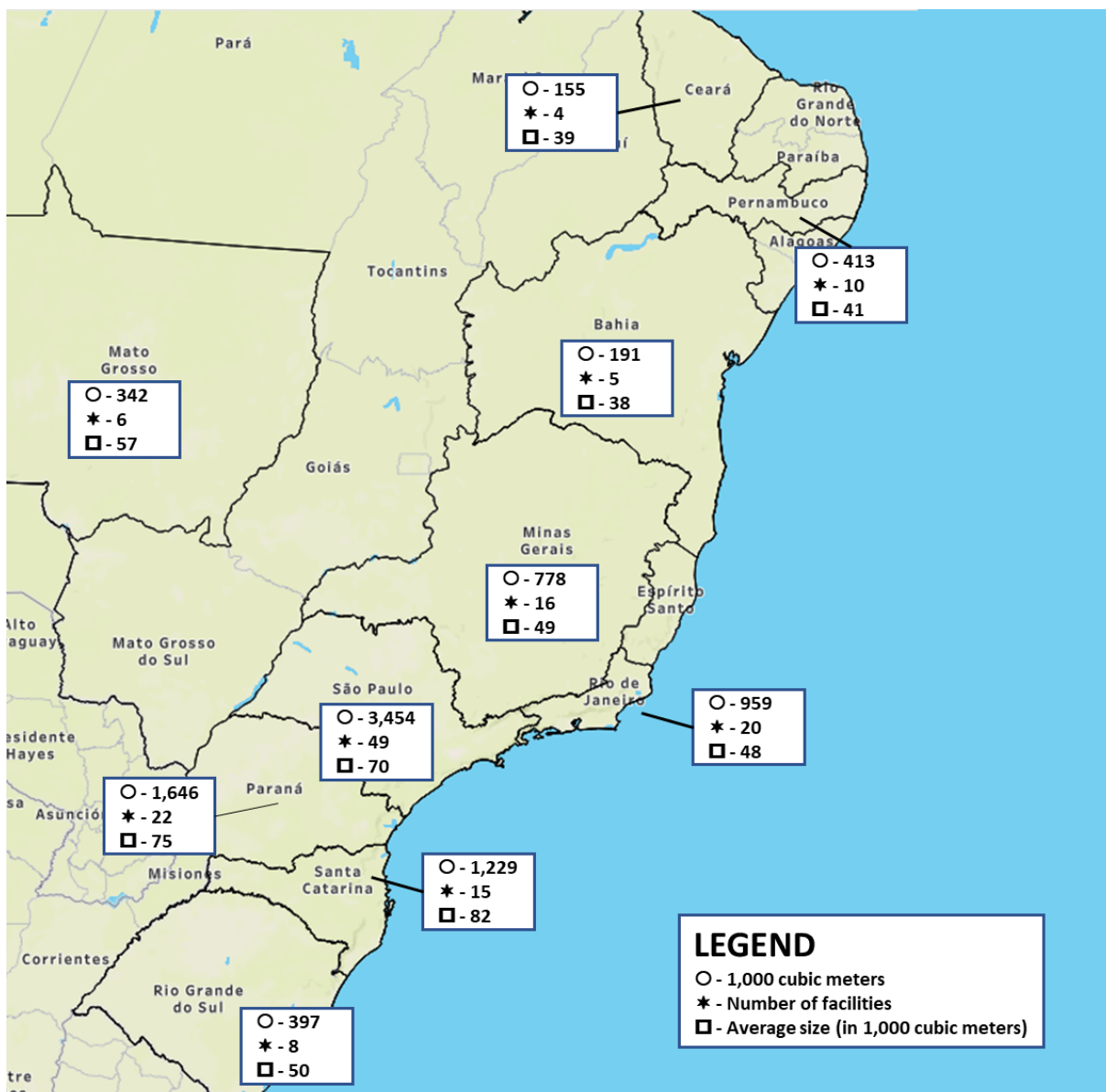
⁴Constellation Cold Logistics includes Glacio Cold Chain Logistics Partners AS, Koel- en Vrieshuis Lintelo BV, and Stockhabo

Select Country Reports

Brazil

Locations and characteristics of third party operated refrigerated warehouses in Brazil are shown in the Figure 5 and Table 3. Relative to 2018, total 3PL capacity increased nearly 400,000 m³ and the average warehouse size increased by about 8,000 m³.

Figure 5: Refrigerated Warehouse Capacity (3PL only) in Brazil (top 10 states), Number of Facilities, and Average Size of Facility, by State 2020



Source: ABIAP (Associação Brasileira da Indústria de Armazenagem Frigorificada) Trabalho da Rede Brasileira de Armazéns Frigoríficos, 2020.

Table 4: Refrigerated Warehouse Capacity (3PL only) in Brazil, Number of Facilities, and Average Size of Facility, by State 2020

| State | Capacity in 1,000 m ³ | Number of facilities | Average size in 1,000 m ³ |
|---------------------|----------------------------------|----------------------|--------------------------------------|
| Sao Paulo | 3,454 | 49 | 70 |
| Parana | 1,646 | 22 | 75 |
| Santa Catarina | 1,229 | 15 | 82 |
| Rio de Janeiro | 959 | 20 | 48 |
| Minas Gerais | 778 | 16 | 49 |
| Pernambuco | 413 | 10 | 41 |
| Rio Grande do Sul | 397 | 8 | 50 |
| Mato Grosso | 342 | 6 | 57 |
| Bahia | 191 | 5 | 38 |
| Ceara | 155 | 4 | 39 |
| Districto Federal | 138 | 5 | 28 |
| Goiás | 99 | 3 | 33 |
| Espirito Santo | 70 | 2 | 35 |
| Amazonas | 58 | 3 | 19 |
| Para | 48 | 3 | 16 |
| Alagoas | 8 | 3 | 3 |
| Rio Grande do Norte | 6 | 1 | 6 |
| Paraiba | 5 | 1 | 5 |
| Acre | 2 | 1 | 2 |
| Maranhao | 1 | 1 | 1 |
| Total | 9,998 | 178 | 56 |

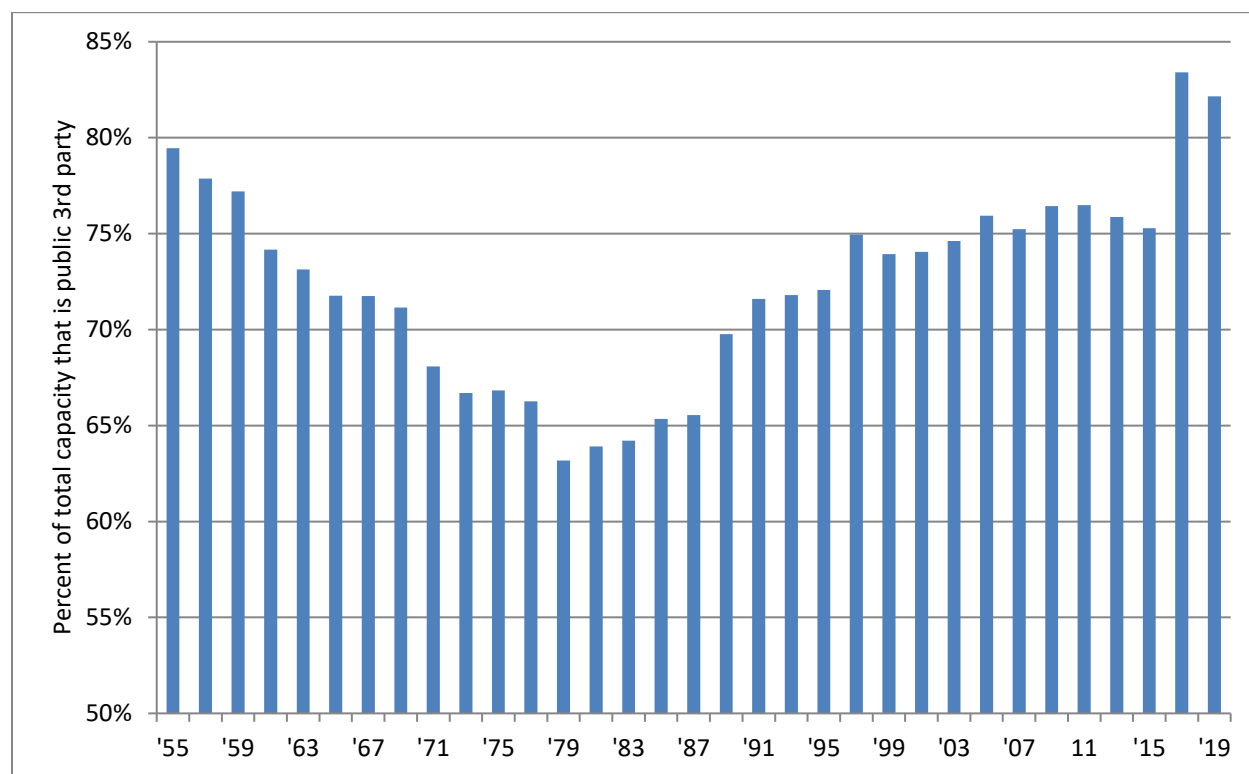
Source: ABIAP (Associação Brasileira da Indústria de Armazenagem Frigorificada) Trabalho da Rede Brasileira de Armazéns Frigoríficos, 2020.

United States

Growth in reported capacity in the USA in the past two years, has been partly due to construction of new facilities and expansion of existing warehouses as well as improvement in data collection. While the growth rate appears significant over the last two years (since the last Global Capacity Report), when the U.S. capacity trend is smoothed over a 10-year period, the rate of growth was 3.8% annually since 2010 (compound annual growth rate 2010-2020).

The estimated capacity of refrigerated warehouses in the USA is largely based on membership records of the Global Cold Chain Alliance (GCCA) and its contact information on warehouses that are operated as third-party for hire refrigerated warehouses. GCCA does not have an estimate for the privately-operated warehouses and therefore a U.S. Department of Agriculture survey is used as a source of information on warehouses that are privately-operated. According to our best estimates, more than 80% of U.S. refrigerated storage capacity is third-party for hire (Figure 5).

Figure 6: Share of U.S. Refrigerated Warehouse Capacity that is 3PL for-Hire, 1955-2019, in Percent



Source: For 1955-2015, U.S. Department of Agriculture based on biennial survey conducted October 1 in each year. Data for 2017-2019 are from GCCA and the U.S. Department of Agriculture.



Conclusions

Globally, cold storage capacity reached 719 million cubic meters in 2020, an increase of 16.7% since 2018. The three largest country markets—the United States, India, and China—accounted for 60.8% of the global total of refrigerated space. Note that a portion of this growth is due to reporting from new countries as well as improvements in data collection.

Total refrigerated warehouse capacity was compared with urban population to obtain a market development index that sheds light on the extent of unmet needs in a particular country. Variation in the market development index across countries was significant, as a result of differences in consumers' buying power in the countries as well as differences in food production and trading patterns. Based on the findings for 2020, Mexico, Brazil, and China had the largest unmet need for refrigerated warehouse space.

Beyond continued increased demand based on consumer's buying power, the recent COVID-19 pandemic has caused various disruptions in the food supply chain highlighting the critical role for cold storage capacity. Despite challenges, now more than ever, cold chain capacity and logistics will play a critical role in ensuring that safe, high quality food reaches all consumers.



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Appendix: Conversion Factors

There are various ways to measure refrigerated warehouse capacity; the key difference is weight basis compared with volume basis. The conversion from weight-based units (metric tons) to volume units (cubic meters) depends on the product in storage, and we lack specific information on products for many countries. As a result, the IARW approximated capacity in cubic meters for certain countries that reported in pallet positions or in metric tons. The conversions that were used in this report are:

1 Pallet = 4.28 cubic meters, for countries in the Americas.¹ European pallets were converted at 1 Pallet = 1.944 cubic meters.

1 Metric ton = 4.3 cubic meters

1 Cubic meter = 35.31 cubic feet

¹ In 2020 the IARW revised downward the conversion factor used for American pallets.