Port of Tokyo Carbon Neutral Port (CNP) Implementation Plan

March 2023

Tokyo Metropolitan Government
(Port & Harbor Administrator of The Port of Tokyo)

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1. Purpose of the Port of Tokyo Carbon Neutral Port (CNP) Implementation Plan

The Tokyo Metropolitan Government (TMG) has set a goal of achieving “carbon half” by 2030, with the aim of becoming fully carbon neutral (net zero CO2 emissions) by 2050, and the entire TMG is working to reduce CO2 emissions.

As environmental awareness is growing worldwide, when consignors and shipping companies choose the ports and harbors they will use, they are placing greater importance on whether consideration is made for the environment and whether there are initiatives aimed at decarbonization.

In these circumstances, TMG has established a study group consisting of port and harbor related businesses and companies with expertise in decarbonization in order to strategically promote initiatives to decarbonize the Port of Tokyo, and has made the Port of Tokyo Carbon Neutral Port (CNP) Implementation Plan (hereinafter referred to as the "Plan").

The Plan covers the entire port and harbor area, including port operators, shipping companies, trucking companies, and other private businesses that use The Port of Tokyo. It also defines specific initiatives and a roadmap for upgrading port and harbor functions and collaboration with industries located in the port and harbor, with consideration for decarbonization.

Based on this plan, TMG will actively promote decarbonization in the Port of Tokyo, aimed toward the early implementation of the Carbon Neutral Port (CNP).

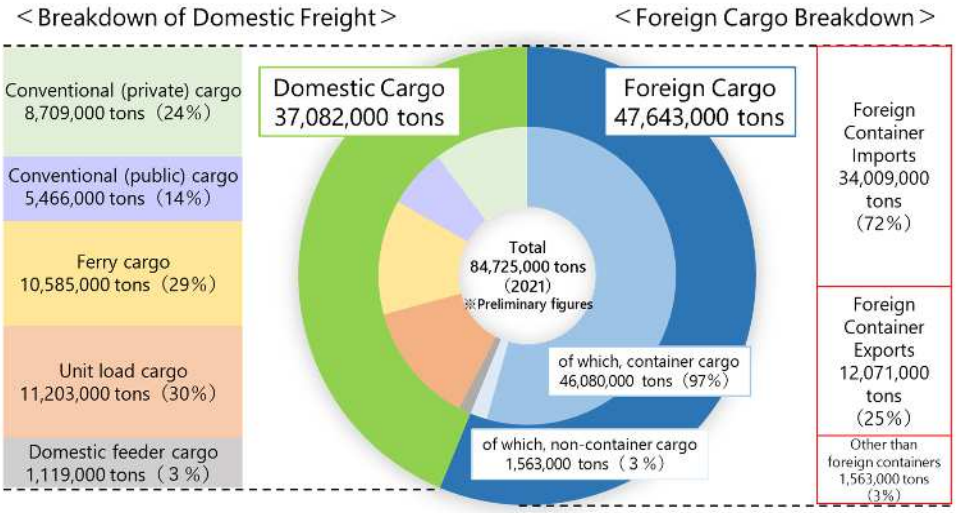
2. Features of The Port of Tokyo

■ History and Scale of the Port of Tokyo

The Port of Tokyo was opened as an international trading port in 1941, and it developed greatly by quickly responding to innovations made to container transport in the 1960s. Today it plays an important role as a port and harbor that represents Japan.

In 2021, the Port of Tokyo handled approximately 85 million tons of cargo, 56% of which was foreign trade cargo and 44% of which was domestic trade cargo, with 97% of the foreign trade cargo transported in containers.

With a major center of consumption right next to it, the Port of Tokyo is strongly characterized as an import port which receives all the goods necessary for urban activities and daily life in the Tokyo metropolitan area, and it has an import/export ratio of approximately 3:1.



Source: Created from "Port of Tokyo Status (Summary Report) 2021 Port & Harbor Statistics"

Figure 1: Port of Tokyo Status 2021

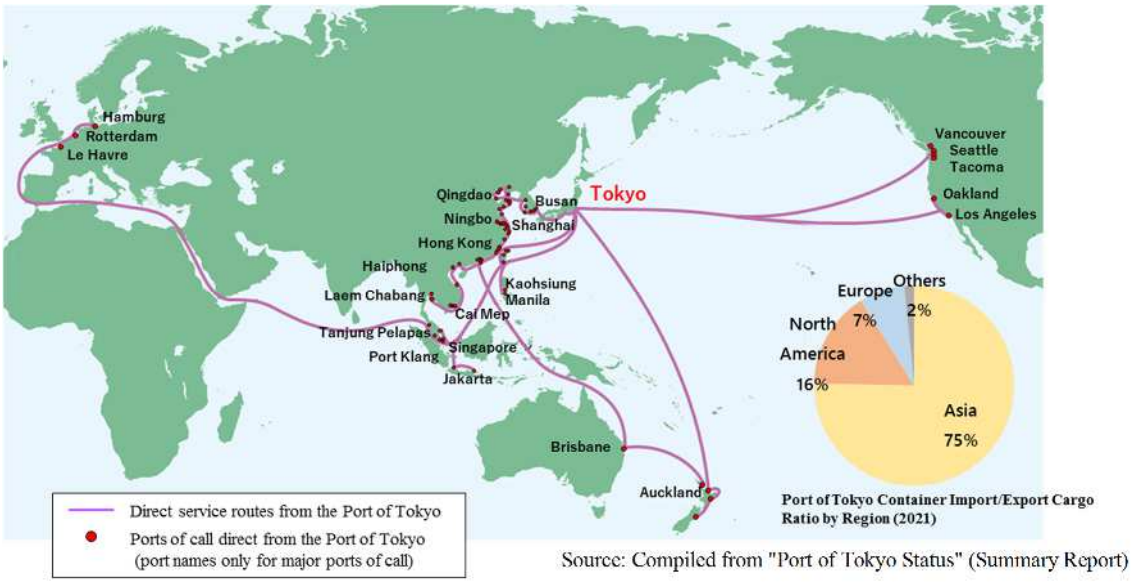
■ Trends in international shipping routes and cargo

The Port of Tokyo is connected to the major ports of the world by regular international trade routes, and it also has a well-developed road network.

For this reason, the port is used by many consignors and logistics companies in the Tokyo metropolitan area and eastern Japan. Since 1998, it has handled the largest volume of foreign trade container cargo in Japan.

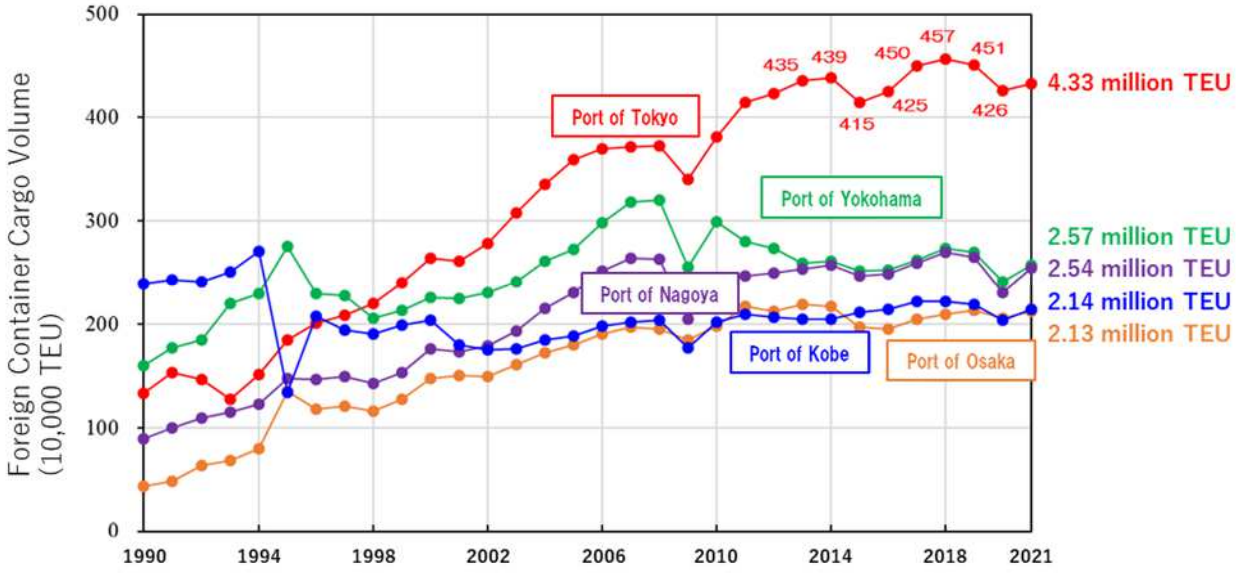
One feature of the foreign trade cargo handled by the Port of Tokyo is that a large share of the imported goods are foodstuffs, furniture, and other commodities used in daily life. As a distribution center for such cargo, the Port of Tokyo supports people's daily lives.

Furthermore, export cargo includes many high value-added products such as electric machinery and other industrial machinery, as well as automotive parts, which contribute greatly to Japan's industrial activities.



Source: Compiled from "Port of Tokyo Status" (Summary Report)

Figure 2: Regular International Trade Container Route Network



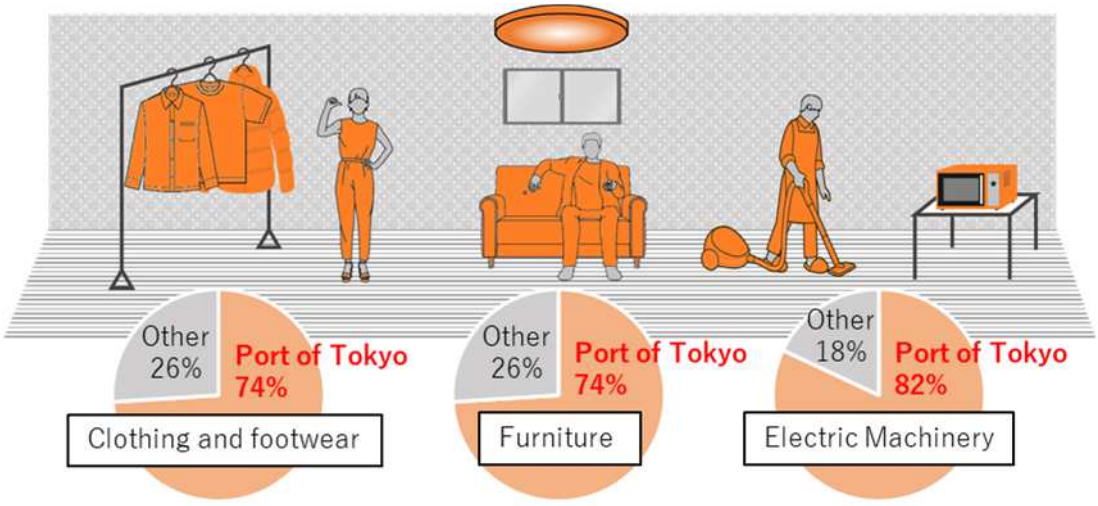
Source: Created from the port and harbor statistics of each port

Figure 3: Changes in foreign trade container cargo volume (from 1990 to 2021)

Table 1: Change in foreign trade container cargo volume at the Port of Tokyo as a percentage of all Japan

		1990	1995	2000	2005	2010	2015	2021
Foreign trade container cargo volume (10,000 TEU)	Japan	734	1,007	1,269	1,576	1,685	1,728	1,791
	Tokyo	133	185	264	360	382	415	433
Tokyo as a percentage of all Japan		18.1%	18.4%	20.8%	22.8%	22.7%	24.0%	24.2%

Source: Created from "Port of Tokyo Status" and Port Modernization Promotion Council materials



* Major items with a high import ratio among lifestyle-related goods

Source: "Long-Term Vision for the 9th Revised Port and Harbor Plan of the Port of Tokyo" (TMG)

Figure 4: Ratio of imports from the Port of Tokyo of marine import cargo consumed in Tokyo

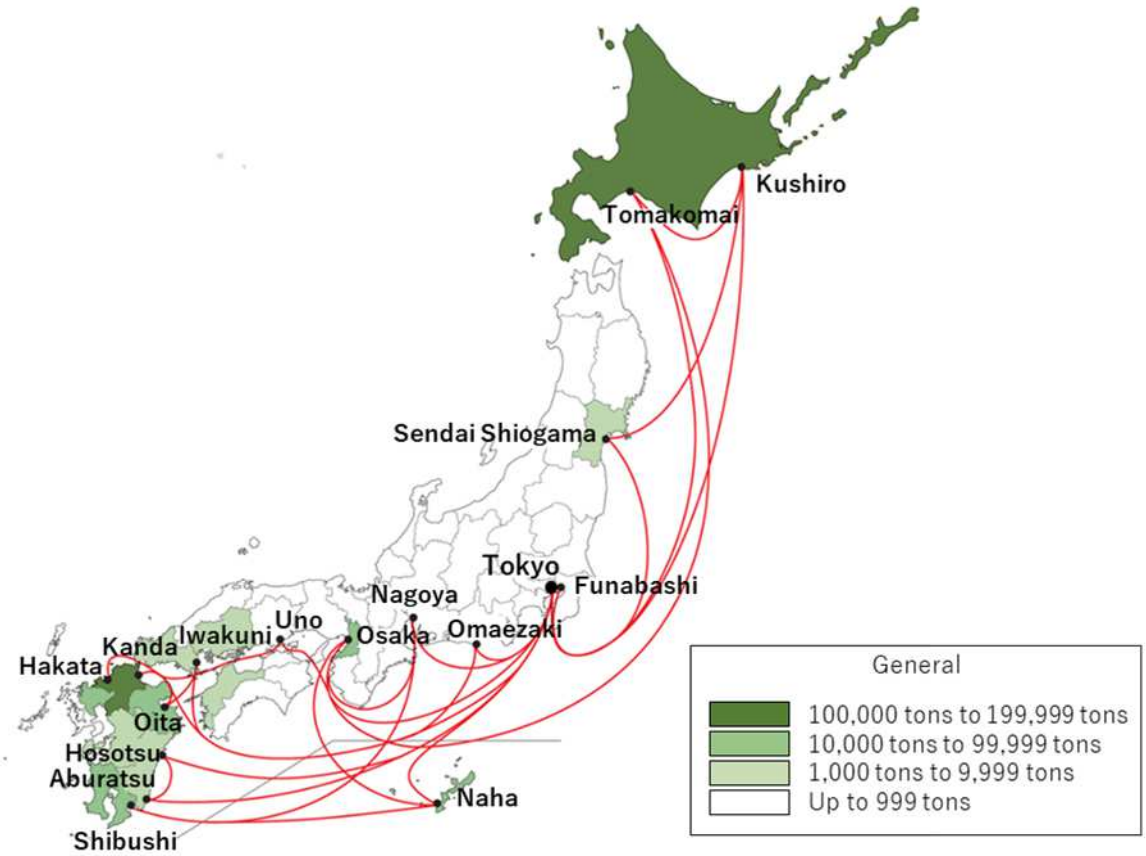
■ Trends in domestic routes and cargo

The Port of Tokyo plays an important role as a domestic marine transportation hub, with about half of the 29 long-distance RORO (roll-on/roll-off) vessel routes in Japan serving the port.

RORO vessels handled approximately 11 million tons of cargo in 2021, equivalent to about 30% of the domestic trade cargo at the Port of Tokyo. This mainly includes cargo that supports consumption and industry, such as finished automobiles, pulp and paper, and agricultural, forestry, and fishery products.

The conventional terminals handle recyclable resources such as scrap metal and soil generated by construction, in addition to meeting construction demand in Tokyo by transferring cargo such as cement, gravel, sand, steel, and other construction materials.

The port also serves as a transportation base for daily commodities and passengers to the island territories of Tokyo, contributing to the improvement of the lives of the island residents and the promotion of industry.



Source: “Long-Term Vision for the 9th Revised Port and Harbor Plan of the Port of Tokyo” (TMG)

Figure 5: Long-distance domestic RORO vessel routes serving the Port of Tokyo and cargo volume by destination (monthly values)

■ Location of terminals and other structures in the Port of Tokyo

The Port of Tokyo has a wide range of terminals for international and domestic cargo ships, ferries, and passenger vessels. Behind the terminals there is a high concentration of logistics facilities for handling marine cargo such as warehouses and refrigerated warehouses, forming clusters of warehouses in some areas of the port.

The area around the foreign trade container terminals is dotted with empty container storage areas (hereinafter, "vanpools") and parking lots for container trailers (hereinafter, "chassis pools"), which support the container logistics function of the Port of Tokyo.

In addition to logistics functions, cement-related plants and other facilities are located in the area, and there are energy facilities including thermal power plants located at Oi Terminal and Shinagawa Termnal.

The Oi Thermal Power Station has halted operations since 2016, and as of 2022, only the Shinagawa Thermal Power Station is in operation.

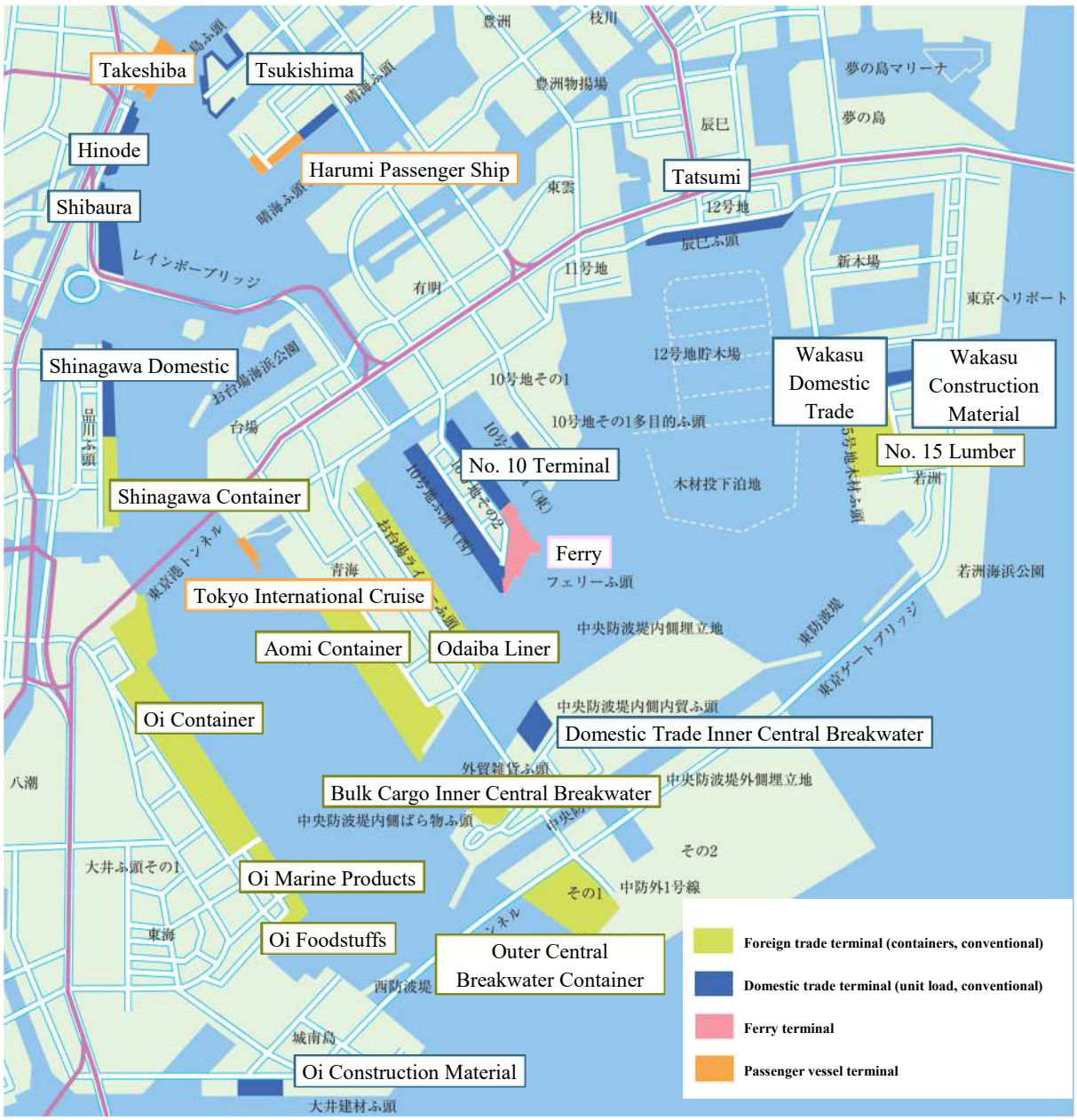


Figure 6: Location of various terminals in the Port of Tokyo

Figure 7: Facilities located behind the terminals

3. Basic Items in the Port of Tokyo Carbon Neutral Port (CNP) Implementation Plan

3.1. Policies aimed at implementation of the Carbon Neutral Port (CNP)

(1) Area-wide and efficient decarbonization of the port and harbor area

In addition to new construction and reorganization of foreign trade container terminals, TMG will promote logistics efficiency through modal shift and ICT, thereby easing truck traffic congestion and reducing marine vessel idling time, which in turn will reduce the environmental burden in the port and harbor area.

In addition, TMG will promote the use of renewable energy and energy-saving measures by installing solar power generation equipment at port and harbor facilities and privately owned warehouses and by shore power supply to vessels at berth. In response to technical developments, TMG will also promote the decarbonization of cargo handling machinery, vehicles, and vessels used at foreign trade container terminals.

Furthermore, TMG will collaborate with companies located around the port and actively promote energy-saving measures and the use of next-generation energy, so that the public and private sectors can work together to promote area-wide and efficient decarbonization in the port and harbor area, including its hinterlands.

(2) Building a supply system for hydrogen, fuel ammonia, etc.

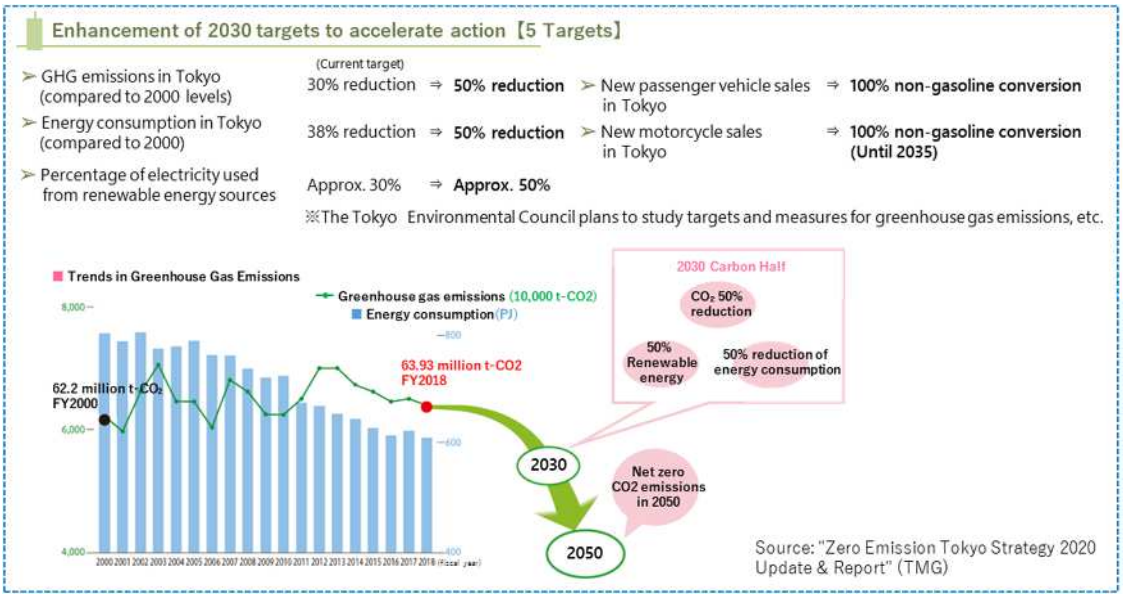
To achieve the optimal supply of hydrogen, fuel ammonia, etc. used at the Port of Tokyo, with an eye on the Keihin (Tokyo-Yokohama) coastal area as a whole, TMG will work with surrounding municipalities and energy companies to build a supply system.

3.2. Plan period, target year

The period of this plan shall be until 2050.

The interim target is set to 2030, based on the "Zero Emission Tokyo Strategy 2020 Update & Report," and the "Tokyo Metropolitan Government Basic Environmental Plan (September 2022)," which was formulated as the plan stipulated in Article 9, Paragraph 1 of the Tokyo Metropolitan Government Basic Environmental Ordinance (Tokyo Metropolitan Ordinance No. 92, 1994) and the "Local Government Action Plan on Global Warming Countermeasures (Area Policy Version)" stipulated in Article 21, Paragraph 3 of the Law Concerning the Promotion of Global Warming Countermeasures (1998 Law No. 117).

In addition to the above targets, the target years are 2026 and 2030 for the percentage of electricity use from renewable energy sources.



3.3. Scope

The scope of this plan is as follows.

- Terminals managed and operated by the Port & Harbor Administrator, Tokyo Port Terminal Corporation, and private companies (e.g., foreign trade container terminals, foreign trade conventional terminals, domestic trade unit-load terminals, etc.)
- Logistics activities in the Port of Tokyo by vessels (marine transport) and vehicles (truck transport) done via the terminals
- Business activities of private companies (warehouses, refrigerated warehouses, factories, etc.) that are located behind the terminals and use the Port of Tokyo for their business.

The specific scope of the project is shown in Figure 8 and Table 2.

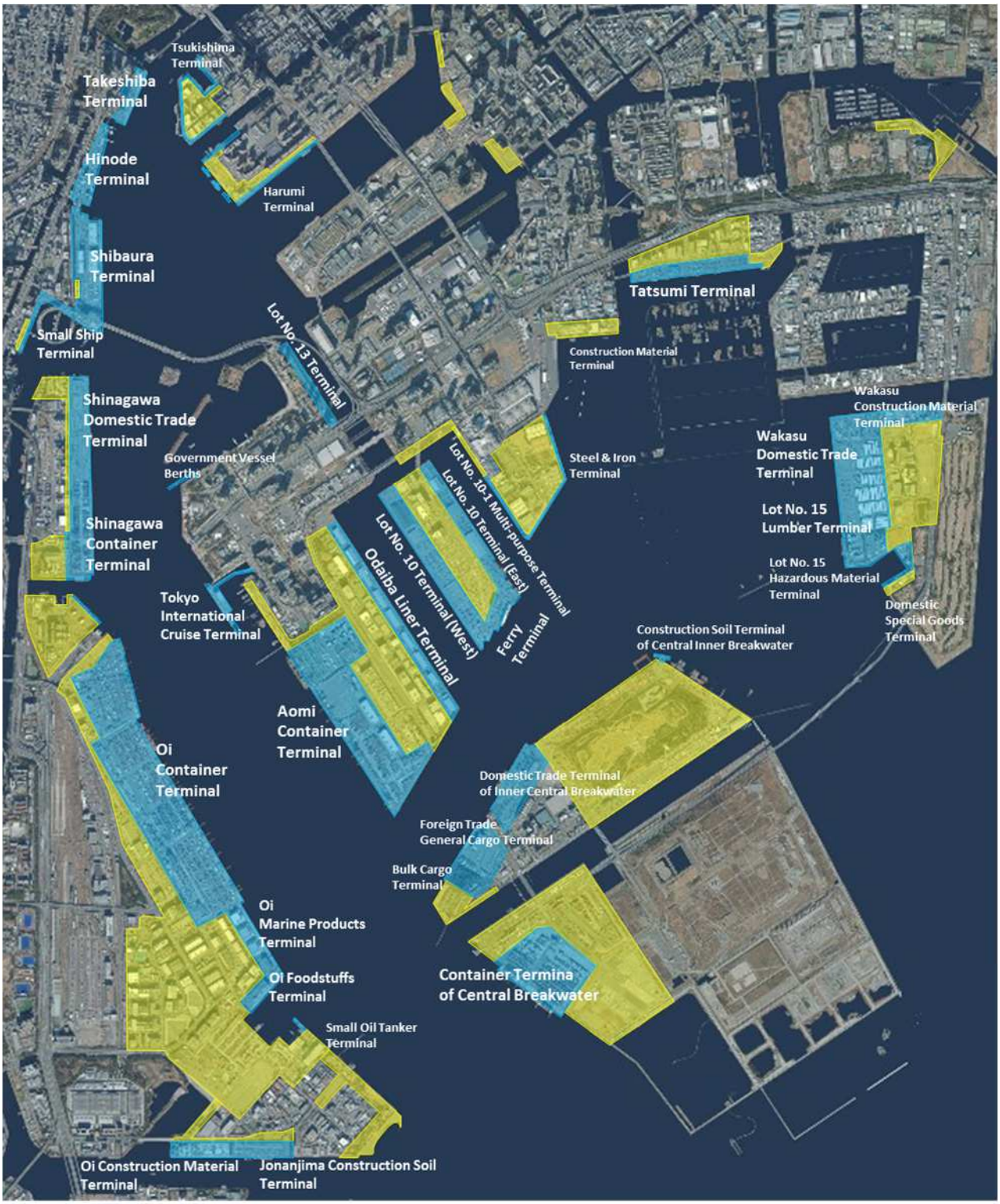


Figure 8: Scope of the Port of Tokyo CNP Implementation Plan

Table 2: Port of Tokyo CNP Implementation Plan and Scope

Category			Target Facilities, etc.	Owner/Administrator
Terminals	Foreign Trade Container Terminals	Shinagawa Container Terminal, Oi Container Terminal, Aomi Container Terminal, Container Terminal of Outer Central Breakwater	Cargo handling machinery (gantry cranes)	Tokyo Port Terminal Corporation
			Cargo handling machinery (Cargo handling machinery in yards)	Shipping companies, port operators
			Sheds, warehouses	Port & Harbor Administrator, port operators
			Refrigerated container power source, administration buildings, lighting facilities, etc.	Tokyo Port Terminal Corporation, shipping companies, port operators
	Foreign Trade Conventional Terminals	Odaiba Liner Terminal, Bulk Cargo Terminal of Inner Central Breakwater Reclamation Area, Oi Marine Products Terminal, Oi Foodstuffs Terminal, No. 15 Lumber Terminal	Cargo handling machinery (Cargo handling machinery in yards)	Port operators
			Sheds	Port & Harbor Administrator, Tokyo Port Terminal Corporation, port operators
			Consignor contact office, lighting facilities, etc.	
	Domestic Trade Unit Load Terminals	Shinagawa Terminal, No. 10 Terminal (West), Wakasu Domestic Trade Terminal, Domestic Trade Terminal of Inner Central Breakwater	Cargo handling machinery (Cargo handling machinery in yards)	Port operators
			Sheds	Port & Harbor Administrator, port operators
			Refrigerated container power source, administration buildings, lighting facilities, etc.	
	Domestic Trade Conventional Terminals	Takeshiba Terminal, Hinode Terminal, Shibaura Terminal, Tatsumi Terminal, Tsukishima Terminal, Harumi Terminal, No. 10 Terminal (East), Ferry Terminal, No. 10-1 Multi-purpose Terminal, Oi Construction Material Terminal, Wakasu Construction Material Terminal, Jonanjima Construction Soil Terminal, Construction Soil Material Terminal of Inner Central Breakwater	Cargo handling machinery (Cargo handling machinery in yards)	Port operators
			Sheds, warehouses	Port & Harbor Administrator, port operators
			Refrigerated container power sources, consignor contact office, lighting facilities, etc.	
	Passenger Vessels	Tokyo International Cruise Terminal	Administration buildings, lighting facilities, etc.	Port & Harbor Administrator
	Private Terminals	Other terminals	Cargo handling machinery (Cargo handling machinery in yards)	Port operators, etc.

Category			Target Facilities, etc.	Owner/Administrator
Terminal Hinterlands	Common	Industry located in the port district, etc.	Sheds (and auxiliary facilities)	Port & Harbor Administrator, warehouse companies, etc.
			Warehouses (and auxiliary facilities)	Warehouse companies
			Refrigerated warehouses (and auxiliary facilities)	Refrigerated warehouse companies
			Factories (and auxiliary facilities)	Cement companies, petrochemical companies
			Vanpools, chassis pools	Port & Harbor Administrator, Tokyo Port Terminal Corporation, port operators
			Other port-related facilities, etc.	Port & Harbor Administrator, private sector companies
			Thermal power station (and auxiliary facilities)	Power generation companies
Vessels / Vehicles	Common	Ocean-going vessels, coastal vessels	Vessels at berth	Shipping companies
		Incoming trucks	Container trailers	Freight forwarders
			Other trucks	
Other	Common	Carbon sink measures	Blue carbon, green space (marine parks, etc.)	Port & Harbor Administrator

3.4. System for making and promoting the plan, progress management

TMG formulated this plan, as the Port & Harbor Administrator of the Port of Tokyo, based on the opinions from the private sector and business groups that are members of the "Port of Tokyo Carbon Neutral Port (CNP) Study Group" and the status of their initiatives.

In the future, meetings will be held regularly among stakeholders in order to promote this plan, as well as to confirm and evaluate progress.

TMG will review this plan as necessary, based on the greenhouse gas reduction targets of the national government and TMG, technological progress related to implementation of the Carbon Neutral Port (CNP), and the status of initiatives made by various companies.

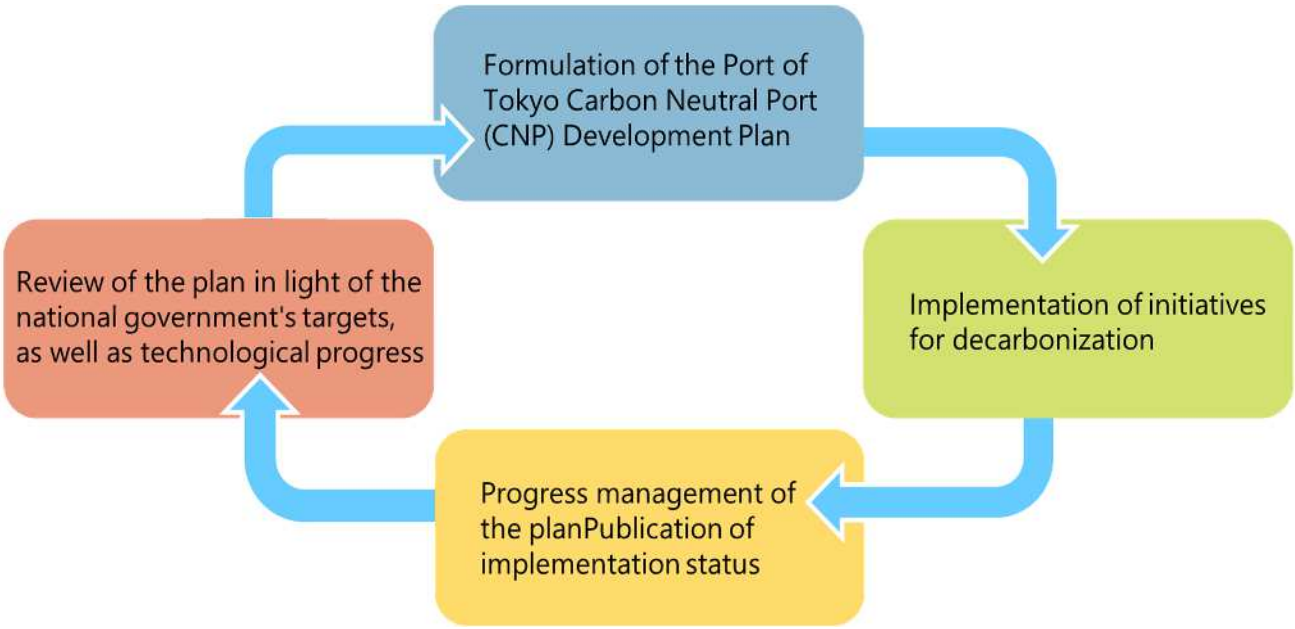


Figure 9: Implementation flow chart of the Port of Tokyo CNP Implementation Plan

4. Estimation of greenhouse gas emissions

4.1. Estimation of greenhouse gas emissions in The Port of Tokyo

In the scope defined in 3.3, TMG surveyed the energy consumption (electricity, fossil fuels, etc.) of the Port & Harbor Administrator, as well as private companies that operate in the port and harbor area and consume energy (fuel, electricity) through questionnaires and interviews, in order to estimate CO2 emissions.

For terminals, TMG ascertained the energy consumption of cargo handling machinery, sheds, lighting facilities, etc., through questionnaires and interview, in order to estimate CO2 emissions.

With regard to vessels and vehicles entering and leaving the terminals, the amount of CO2 emissions from vessels berthed at terminals was estimated for vessels, and the amount of CO2 emissions from vehicles moving inside the Port of Tokyo was estimated for vehicles, using information on vessel arrival records and published port and harbor statistics and other data.

For the port hinterland, TMG conducted questionnaire surveys and interviews targeting companies located in the port and harbor area of the Port of Tokyo (the port district). The results of the questionnaire survey and interviews were then used to ascertain the amount of energy used and estimate CO2 emissions.

For facilities of companies for which energy consumption could not be obtained, emissions were estimated by using the total floor area of buildings (warehouses, etc.) and rate of energy consumption.

Estimated CO2 emissions calculated based on the survey results are shown in Table 3 (see Reference Data 2 for the approach to emissions estimation).

Table 3: Estimation of CO2 emissions (2000 and 2020)

(Unit: t-CO_2/year)

Category			Target Facilities, etc.	Owner / Administrator	CO2 emissions	
					2000	2020
Terminals	Foreign Trade Container Terminals	Shinagawa Container Terminal, Oi Container Terminal, Aomi Container Terminal, Container Terminal of Outer Central Breakwater	Cargo handling machinery (gantry cranes)	Tokyo Port Terminal Corporation	16,362	27,696
			Cargo handling machinery (Cargo handling machinery in yards)	Shipping companies, port operators		
			Sheds, warehouses	Port & Harbor Administrator, port operators	15,197	23,405
			Refrigerated container power source, administration buildings, lighting facilities, etc.	Tokyo Port Terminal Corporation, shipping companies, port operators		

	Foreign Trade Conventional Terminals	Odaiba Liner Terminal, Bulk Cargo Terminal of Inner Central Breakwater Reclamation Area, Oi Marine Products Terminal, Oi Foodstuffs Terminal, No. 15 Lumber Terminal	Cargo handling machinery (Cargo handling machinery in yards)	port transport companies	1,575	1,608
			Sheds, consignor contact office, lighting facilities, etc.	Port & Harbor Administrator, Tokyo Port Terminal Corporation, port transport companies	24,072	21,631

Category			Target Facilities, etc.	Owner / Administrator	CO2 emissions	
					2000	2020
Terminals	Domestic Trade Unit Load Terminals	Shinagawa Terminal, No. 10 Terminal (West), Wakasu Domestic Trade Terminal, Domestic Trade Terminal of Inner Central Breakwater	Cargo handling machinery (Cargo handling machinery in yards)	Port operators	4,048	4,086
			Sheds, refrigerated container power source, administration buildings, lighting facilities, etc.	Port & Harbor Administrator, port operators	1,256	581
	Domestic Trade Conventional Terminals	Takeshiba Terminal, Hinode Terminal, Shibaura Terminal, Tatsumi Terminal, Tsukishima Terminal, Harumi Terminal, Ferry Terminal, No. 10 Terminal (East), No. 10-1 Multi-purpose Terminal, Oi Construction Material Terminal, Wakasu Construction Material Terminal, Jonanjima Construction Soil Terminal, Construction Soil Material Terminal of Inner Central Breakwater	Cargo handling machinery (Cargo handling machinery in yards)	Port operators	97,981	73,519
			Sheds, warehouses, refrigerated container power source, consignor contact office, lighting facilities, etc.	Port & Harbor Administrator, port operators	3,021	5,226
	Private Terminals	Other terminals	Cargo handling machinery (Cargo handling machinery in yards)	Private companies, etc.	208	226
			Warehouses, administration buildings, lighting facilities, etc.		518	1,145
Subtotal					**164,238**	**159,123**
Terminal Hinterlands	Common	Industry located in the port district, etc.	Warehouses (and auxiliary facilities)	Warehouse companies	182,329	169,956
			Refrigerated warehouses (and auxiliary facilities)	Refrigerated warehouse companies	25,253	29,157
			Factories (and auxiliary facilities)	Cement and petrochemical companies	83,193	111,585

			Thermal power stations (and auxiliary facilities)	Power generation companies	(1,297,482)	(1,928,068)※
			Other port-related facilities, etc.	Port & Harbor Administrator, Tokyo Port Terminal Corporation port operators	12,917	13,436
Subtotal					**303,692**	**324,134**
Vessels / Vehicles	Common	Ocean-going vessels, coastal vessels	Vessels at berth	Shipping companies	81,596	75,783
		Incoming trucks	Container trailers (of which, vehicles waiting at a foreign trade container terminal)	Freight forwarders	21,546 (3,277)	26,568 (4,487)
Subtotal					**103,142**	**102,351**
Total					**571,072**	**585,608**

*Emissions from thermal power plants are shown as reference values before allocation of electricity and heat.

4.2. CO2 emissions per TEU at the foreign trade container terminals

As shown in Table 4, the volume of foreign trade containers handled at the Port of Tokyo increased by 70.2% from 2000 to 2020.

With the increase in volume of container cargo handled, CO2 emissions at the foreign trade container terminals increased by 61.9% from 2000 to 2020.

At foreign trade container terminals, environmental measures such as the introduction of energy-saving cargo handling machinery have been promoted, and emissions per TEU of containers have decreased by 4.9%.

Table 4: CO_2 emissions per TEU at foreign trade container terminals

2000			2020					
Cargo handled (TEU)	CO_2 emissions (t-CO_2)	Emissions per TEU (t-CO_2)	Cargo handled (TEU)	Change Ratio	CO_2 emissions (t-CO_2)	Change Ratio	Emissions per TEU (t-CO_2)	Change Ratio
2,694,789	31,559	0.01171	4,585,498	70.2%	51,101	61.9%	0.01114	-4.9%

5. Greenhouse gas reduction targets and reduction plans

5.1. Greenhouse gas reduction targets

The greenhouse gas reduction targets in this plan are set as follows, based on the "Zero Emission Tokyo Strategy 2020 Update & Report," and the "Tokyo Metropolitan Government Basic Environmental Plan (September 2022)," which was formulated as the plan stipulated in Article 9, Paragraph 1 of the Tokyo Metropolitan Government Basic Environmental Ordinance (Tokyo Metropolitan Ordinance No. 92, 1994) and the "Local Government Action Plan on Global Warming Countermeasures (Area Policy Version)" stipulated in Article 21, Paragraph 3 of the Law Concerning the Promotion of Global Warming Countermeasures (1998 Law No. 117).

(1) Targets for 2030

Achieve carbon half (50% reduction from the 2000 level) for the entire scope of this plan and reduce CO2 emissions by 310,000 tons.

(2) Targets for 2050

Achieve carbon neutrality (net zero CO2 emissions) for the entire scope of this plan and reduce CO2 emissions by 586,000 tons.

In addition to the reduction targets in (1) and (2) above, targets are set for approximately 30% of electricity from renewable energy sources by 2026, and 50% by 2030.

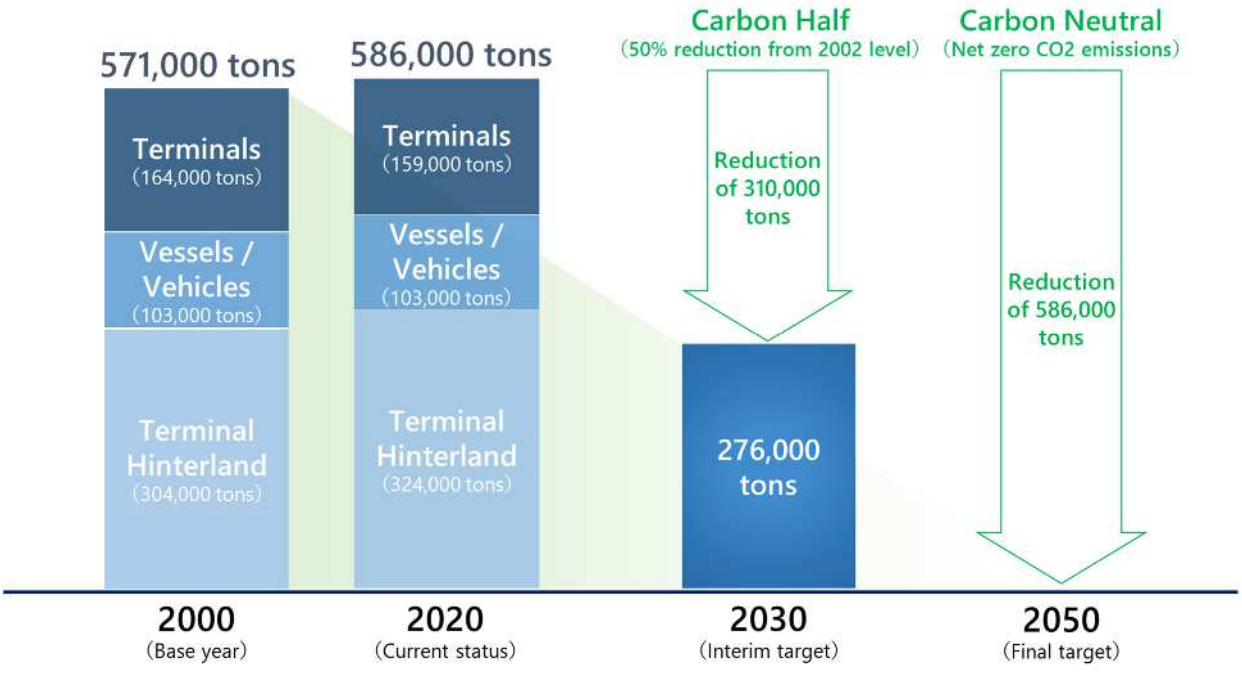


Figure 10: Greenhouse Gas Reduction Targets (Image) (2030 and 2050)

5.2. Greenhouse gas reduction plan

The main initiatives and target reductions to be implemented in order to realize the interim target for 2030 set forth in 5.1.(1) are as shown in Table 5.

Main initiatives are described with reference to the results of questionnaires given to private businesses and the policies of the national government and business associations. Target reductions are estimated with reference to the reduction targets of the government, TMG, and various business associations.

The Japanese government has proposed to the International Maritime Organization (IMO) a 50% reduction (compared to 2008 levels) in greenhouse gas emissions by 2040. In light of this, when estimating the target reductions for vessels, with regard to international shipping, the target reductions for ocean-going vessels are estimated based on this proposal.

In this plan, the remaining reduction of 22,000 tons for ships in 2050 is included in the target reduction for terminals, in consideration of the fact that it is the CO2 emitted by ships while moored at terminals.

The greenhouse gas reduction plan to realize the final target for 2050 set forth in 5.1.(2) will be further developed in the future, with revisions made appropriately, based on the progress of technologies that contribute to decarbonization.

Reference Materials

- Tokyo Metropolitan Government Basic Environmental Plan (September 2022, TMG)
- JERA Environmental Commitment 2035 (May 12, 2022, JERA Co., Ltd.)
- Carbon Neutral Action Plan (June 29, 2022, Electric Power Council for a Low Carbon Society)
- Carbon Neutral Challenge 2050 Action Plan
  (June 10, 2021, Japan Gas Association)
- IMO GHG Reduction Strategy (2018, International Maritime Organization (IMO))
- Summary of the Study Group for Promoting of Carbon Neutrality in Domestic Shipping
  (December 2021, Maritime Bureau, Ministry of Land, Infrastructure and Transport (MLIT))
- Trucking Industry Environmental Vision 2030 – 2050: Toward Carbon Neutrality
  (April 15, 2022, Japan Trucking Association)

Table 5: Greenhouse gas reduction plan to achieve targets

(Unit: t-CO_2/year)

<table>
<tr><th colspan="2" rowspan="2">Category</th><th rowspan="2">Target Facilities, etc.</th><th colspan="3">CO2 emissions
(CO2 target reduction)</th><th rowspan="2">Main Reduction Initiatives</th><th rowspan="2">Owner / Administrator</th></tr>
<tr><th>2020</th><th>2030
2050</th></tr>
<tr><td rowspan="6">Terminals, etc.</td><td rowspan="4">Foreign Trade Container Terminals</td><td>Cargo handling machinery (gantry cranes)</td><td>4,764</td><td>0
(▲4,764)

0
(▲4,764)</td><td>Introduce renewable energy and use hydrogen
・ Introduce renewable energy
(100% introduction by 2030)</td><td>Tokyo Port Terminal Corporation</td></tr>
<tr><td>Cargo handling machinery (Cargo handling machinery in yards)</td><td>22,515</td><td>9,573
(▲12,942)

0
(▲22,515)</td><td>Decarbonize energy used by cargo handling machinery
・ Introduce FC converted RTG*
(For all RTGs by 2030)
・ Convert RTG to FC, etc.
(For all RTGs by 2050)
・ Electrification, FC conversion of other cargo handling machinery (forklifts, trailer heads, etc.)</td><td>Shipping companies, port operators</td></tr>
<tr><td>Sheds, warehouses</td><td>2,718</td><td>0
(▲2,718)

0
(▲2,718)</td><td rowspan="2">Introduce renewable energy and use hydrogen
・ Introduce renewable energy
(100% introduction by 2030)
・ Develop solar power generation facilities
・ Develop stand-alone distributed power generation facilities using hydrogen, etc.

Review business activities to reduce environmental impact
・ Renew vehicles and equipment and review operations
・ CO2 absorption measures, etc.</td><td>Port & Harbor Administrator, port operators</td></tr>
<tr><td>Refrigerated container power source, administration buildings, lighting facilities, etc.</td><td>21,104</td><td>0
(▲21,104)

0
(▲21,104)</td><td>Tokyo Port Terminal Corporation, shipping companies, port operators</td></tr>
<tr><td rowspan="2">Other Terminals, etc.</td><td>Cargo handling machinery (Cargo handling machinery in yards)</td><td>78,296</td><td>71,932
(▲6,364)

0
(▲78,296)</td><td>Decarbonize energy used by cargo handling machinery
・ Electrification, FC conversion of other cargo handling machinery (forklifts, trailer heads, etc.)</td><td>Port & Harbor Administrator, Tokyo Port Terminal Corporation, port operators</td></tr>
<tr><td>Sheds, warehouses, refrigerated container power source, administration buildings, consignor contact office, lighting facilities, etc.</td><td>29,726</td><td>8,896
(▲20,830)

0
(▲51,969)</td><td>Introduce renewable energy and use hydrogen
・ Introduce renewable energy
(50% introduction by 2030)
・ Develop solar power generation facilities
・ Develop stand-alone distributed power generation facilities using hydrogen, etc.

Review business activities to reduce environmental impact
・ Renew vehicles and equipment and review operations
・ CO2 absorption measures, etc.</td><td>Port & Harbor Administrator, port operators, private companies, etc.</td></tr>
<tr><td colspan="3">Subtotal</td><td>159,123</td><td colspan="3">2030 CO2 emissions (target reduction) 90,401 (▲ 68,722)
2050 CO2 emissions (target reduction) 0 (▲181,366)</td></tr>
</table>

*Acronym for Rubber Tired Gantry Crane, a type of equipment used for handling international marine containers.

<table>
<tr><th colspan="2" rowspan="2">Category</th><th rowspan="2">Target Facilities, etc.</th><th colspan="2">CO2 emissions
(CO2 target reduction)</th><th rowspan="2">Main Reduction Initiatives</th><th rowspan="2">Owner / Administrator</th></tr>
<tr><th>2020</th><th>2030
2050</th></tr>
<tr><td rowspan="3">Terminal Hinterland</td><td rowspan="3">Industry located in the port district, etc.</td><td>Factory</td><td>111,585</td><td>32,617
(▲78,968)

0
(▲111,585)</td><td>Review business activities to reduce environmental impact
・Introduce renewable energy
(50% introduction by 2030)
・Promote energy conservation (change to LED lighting, etc.)
・Renew vehicles and equipment and review operations
・Introduce construction materials that utilize decarbonization technology
・CO2 absorption measures, etc.</td><td>Cement, petrochemical companies, etc.</td></tr>
<tr><td>Warehouses, refrigerated warehouses</td><td>199,113</td><td>83,292
(▲115,821)

0
(▲199,113)</td><td>Review business activities to save energy and reduce environmental impact in logistics activities
・Introduce refrigeration and cooling equipment that uses natural refrigerants
・Save energy used by air conditioning equipment
・Introduce energy-saving forklifts
・Improve the efficiency of logistics using ICT technology and promote joint operation of trucks
・Promote energy conservation (change to LED lighting, etc.)
・Renewal of vehicles and equipment and review of operations
・CO2 absorption measures, etc.

Use renewable energy
・Introduce renewable energy
(50% introduction by 2030)
・Develop solar power generation facilities</td><td>Port & Harbor Administrator, warehouse companies, refrigerated warehouse companies</td></tr>
<tr><td>Other port-related facilities, etc.</td><td>13,436</td><td>3,871
(▲9,565)

0
(▲13,436)</td><td>Review business activities to reduce environmental impact
・Introduce renewable energy
(50% introduction by 2030)
・Promote energy conservation (change to LED lighting, etc.)
・Renew vehicles and equipment and review operations
・CO2 absorption measures, etc.</td><td>Port & Harbor Administrator, Tokyo Port Terminal Corporation, port transport companies</td></tr>
<tr><td colspan="3">Subtotal</td><td>324,134</td><td colspan="3">2030 CO_2 emissions (target reduction) 119,780 (▲204,354)
2050 CO_2 emissions (target reduction) 0 (▲324,134)</td></tr>
</table>

<table>
<tr><th colspan="2" rowspan="2">Category</th><th rowspan="2">Target Facilities, etc.</th><th colspan="3">CO2 emissions
(CO2 target reduction)</th><th rowspan="2">Main Reduction Initiatives</th><th rowspan="2">Owner / Administrator</th></tr>
<tr><th>2020</th><th>2030</th><th>2050</th></tr>
<tr><td rowspan="3">Vessels / Vehicles</td><td rowspan="2">Ocean-going vessels, coastal vessels</td><td rowspan="2">Vessels at berth</td><td rowspan="2">75,783</td><td>46,803
(▲28,980)</td><td rowspan="3">Initiatives for carbon neutral vessels
・ Energy saving and introducing next -generation energy ships
・ Reduce CO2 emissions of coastal vessels (Reduction of 17 % from 2013 levels by 2030)
・ Reduce CO2 emissions of ocean-going vessels (Reduction by 50 % from 2008 levels by 2040)
・ Use shore power, etc.</td><td rowspan="2">Shipping companies</td></tr>
<tr><td>22,243
(▲53,540)</td></tr>
<tr><td rowspan="3">Incoming trucks</td><td rowspan="2">Container trailer, other trucks</td><td rowspan="2">26,568</td><td>19,122
(▲7,446)</td><td rowspan="3">Initiatives for carbon neutral trucks
・ Introduce next -generation trucks with excellent energy saving and environmental performance
・ Reduce CO2 emissions rate of trucks (Reduction of 31 % from 2005 levels by 2030)
Etc.</td><td rowspan="3">Freight forwarding companies</td></tr>
<tr><td>0
(▲26,568)</td></tr>
<tr><td>(Of which, those that wait on the container terminals)</td><td>(4,487)</td><td>(1,919)
(▲2,568)</td><td>(0)
(▲4,487)</td></tr>
<tr><td colspan="3" rowspan="2">Subtotal</td><td rowspan="2">102,351</td><td colspan="4">2030 CO2 emissions (target reduction) 65,925 (▲ 36,426)</td></tr>
<tr><td colspan="4">2050 CO2 emissions (target reduction) 22,243 (▲ 80,108)</td></tr>
<tr><td colspan="3" rowspan="2">Total</td><td rowspan="2">585,608</td><td colspan="4">2030 CO2 emissions (target reduction) 276,106 (▲309,502)</td></tr>
<tr><td colspan="4">2050 CO2 emissions (target reduction) 0 (▲585,608)</td></tr>
</table>

6. Hydrogen supply target and supply plan

(1) Hydrogen demand estimation and supply targets

Table 6 shows the amount of fossil fuels directly consumed at the Port of Tokyo in 2020 based on the results of the questionnaires given to companies.

Table 6: Annual fossil fuel consumption at the Port of Tokyo (2020)

Category	Diesel	Gasoline	LPG
Container terminals	**8,589 kl**	**91 kl**	**49 kl**
Other terminals, warehouses, factories, etc.	**59,272 kl**	**84 kl**	**27,202 kl**
Total	**67,861 kl**	**175 kl**	**27,251 kl**

* Excludes fuel used by ships and incoming trucks (trucks that enter and exit the terminals, warehouse, etc.)

The supply target for hydrogen in this plan is the supply corresponding to the demand for hydrogen based on the demand estimates listed in Table 7.

It is estimated that hydrogen demand in 2050 will be about 13,000 tons/year, assuming that all fossil fuels used in 2020 will be replaced by renewable energy electricity and hydrogen energy.

Table 7: Annual demand for hydrogen at the Port of Tokyo (2050)

Category	Target Facilities, etc.	2050
Foreign trade container terminals	・ **Cargo handling machinery (RTG)** ・ **Other cargo handling machinery** (Straddle carriers, reach stackers, trailer heads, forklifts, etc.) ・ **Stand-alone distributed power generation equipment**	**Approx. 13,000 tons**
Other terminals		
Terminal hinterland		

(2) Hydrogen supply plan

In order to optimize the supply of hydrogen at the Port of Tokyo, we will work with surrounding municipalities and energy providers to examine the supply method of hydrogen received from overseas, including pipelines, the development of facilities necessary for hydrogen supply, and the use of green hydrogen produced in Japan, while keeping in mind the national government's "Future Expansion of Hydrogen Introduction Assuming Carbon Neutrality in 2050 (Image)" (Figure 11).

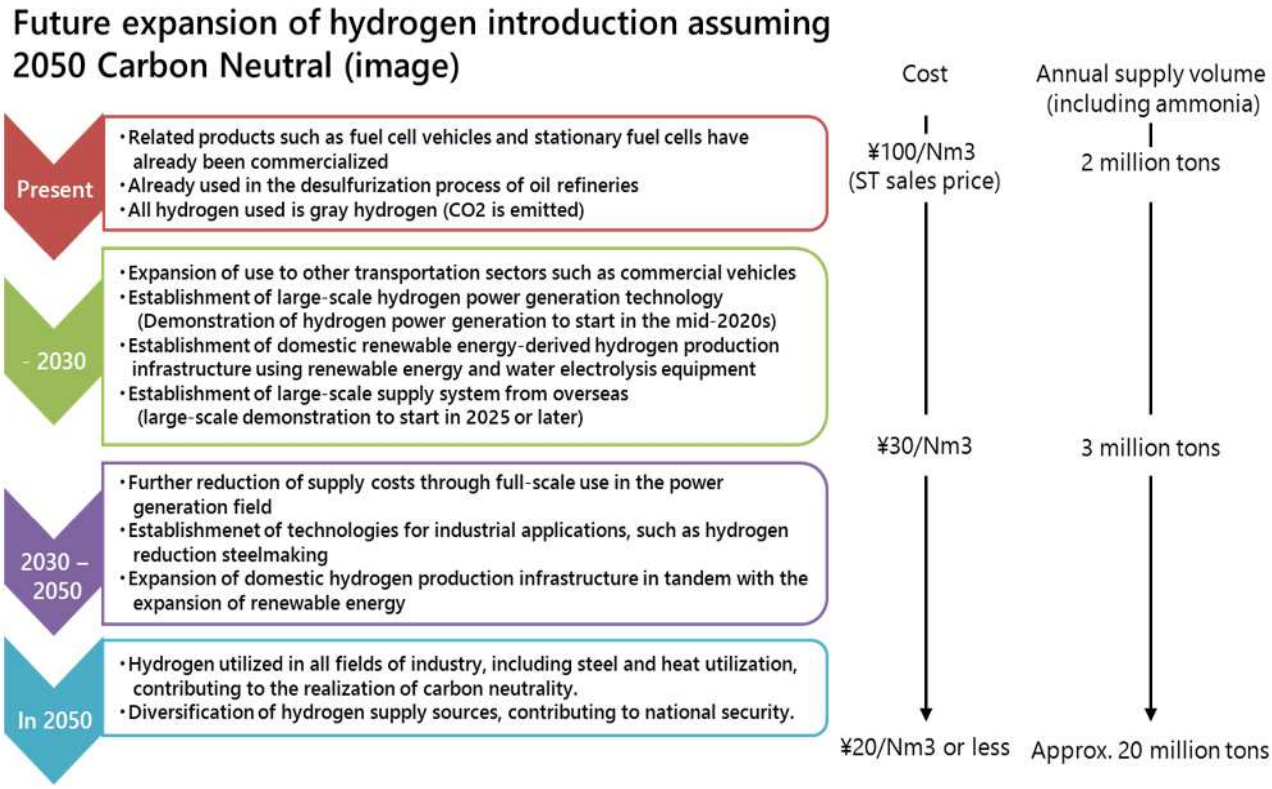


Figure 11: Agency for Natural Resources and Energy, "Current Status of Hydrogen and Ammonia and Direction of Future Studies" p. 17

(March 29, 2022, General Resources and Energy Investigation Committee, 1st Energy Saving and New Energy Breakout Session, Subcommittee on Hydrogen Policy / Resources and Fuels Breakout Session, Subcommittee on Ammonia and Other Decarbonized Fuels Policy, joint meeting materials)

7. Key Initiatives towards Carbon Neutrality in the Port

The Port of Tokyo is working to reduce its environmental burden by enhancing the functions of its foreign trade container terminals, implementing modal shift, logistics streamlining with IICT, and other measures to reduce the burden of traffic. It is also working to reduce its environmental burden through energy-saving cargo handling machinery and the introduction of solar power generation facilities at port and harbor facilities, and will continue to expand and strengthen these initiatives.

TMG will promote the introduction of renewable energy electricity, shore power supply to ships, and the spread of electric-powered vessels and vehicles. TMG will also work to create and preserve seaweed beds that make up the blue carbon ecosystem, which is expected to have great potential as a CO2 sink.

Looking forward to the spread of hydrogen and other next-generation energies and the launch of next-generation energy ships, TMG will promote the use of next-generation energies in ships, cargo handling machinery, trucks on premises, etc., adopting stand-alone power generation systems, and the establishment of supply systems for hydrogen and fuel ammonia.

In order to promote private sector initiatives to decarbonize, TMG will request the national government to deregulate the use of hydrogen and provide financial support and tax incentives for private sector capital investment, as well as implement original support measures for the private sector.

Through these initiatives, TMG aims to develop the Carbon Neutral Port (CNP) and make the Port of Tokyo the port and harbor of choice for shipping companies and consignors who are working to decarbonize shipping routes and supply chains.

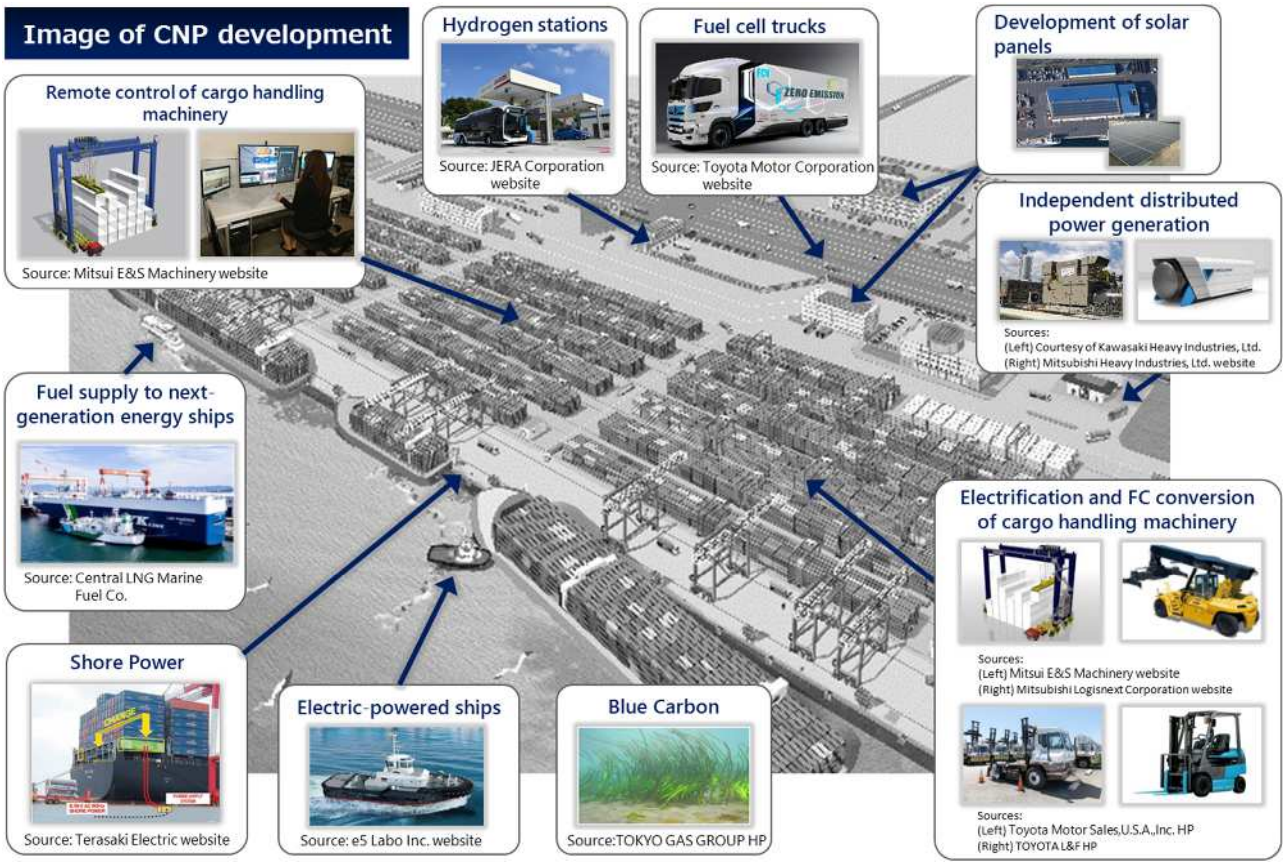


Figure 12: Image of Carbon Neutrality in Port of Tokyo

8. Roadmap

In order to systematically promote initiatives aimed at development of the Port of Tokyo as a Carbon Neutral Port (CNP), TMG has made a roadmap summarizing each initiative, including those set forth in the Greenhouse Gas Reduction Plan, for the short, medium, and long term, as shown in Figures 13 through 15. The roadmap will be reviewed as necessary based on the status of initiatives conducted by various companies and trends in technical development related to decarbonization.

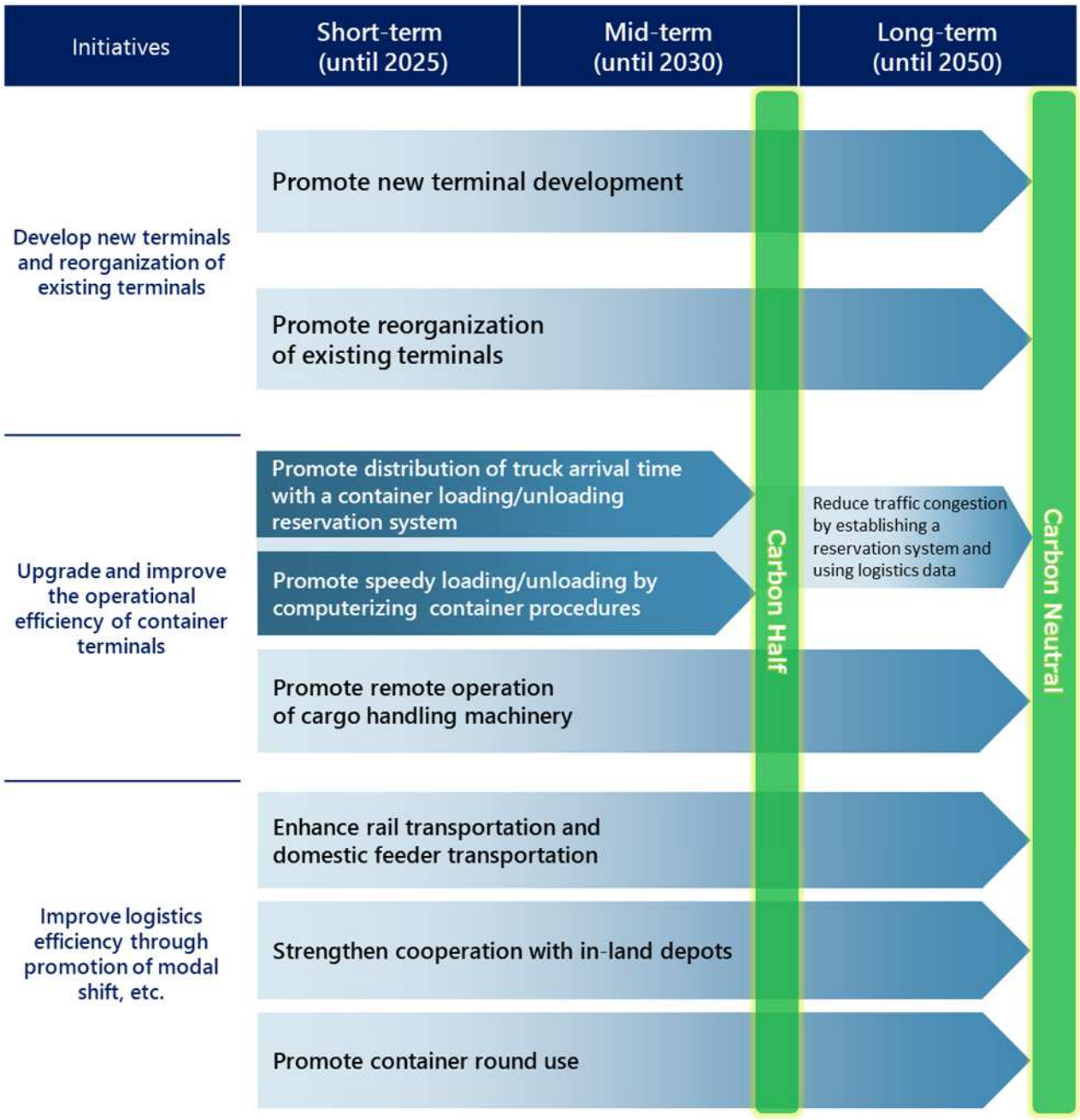


Figure 13: Reduction of environmental burden by enhancing functions of terminals and improving logistics efficiency, etc.

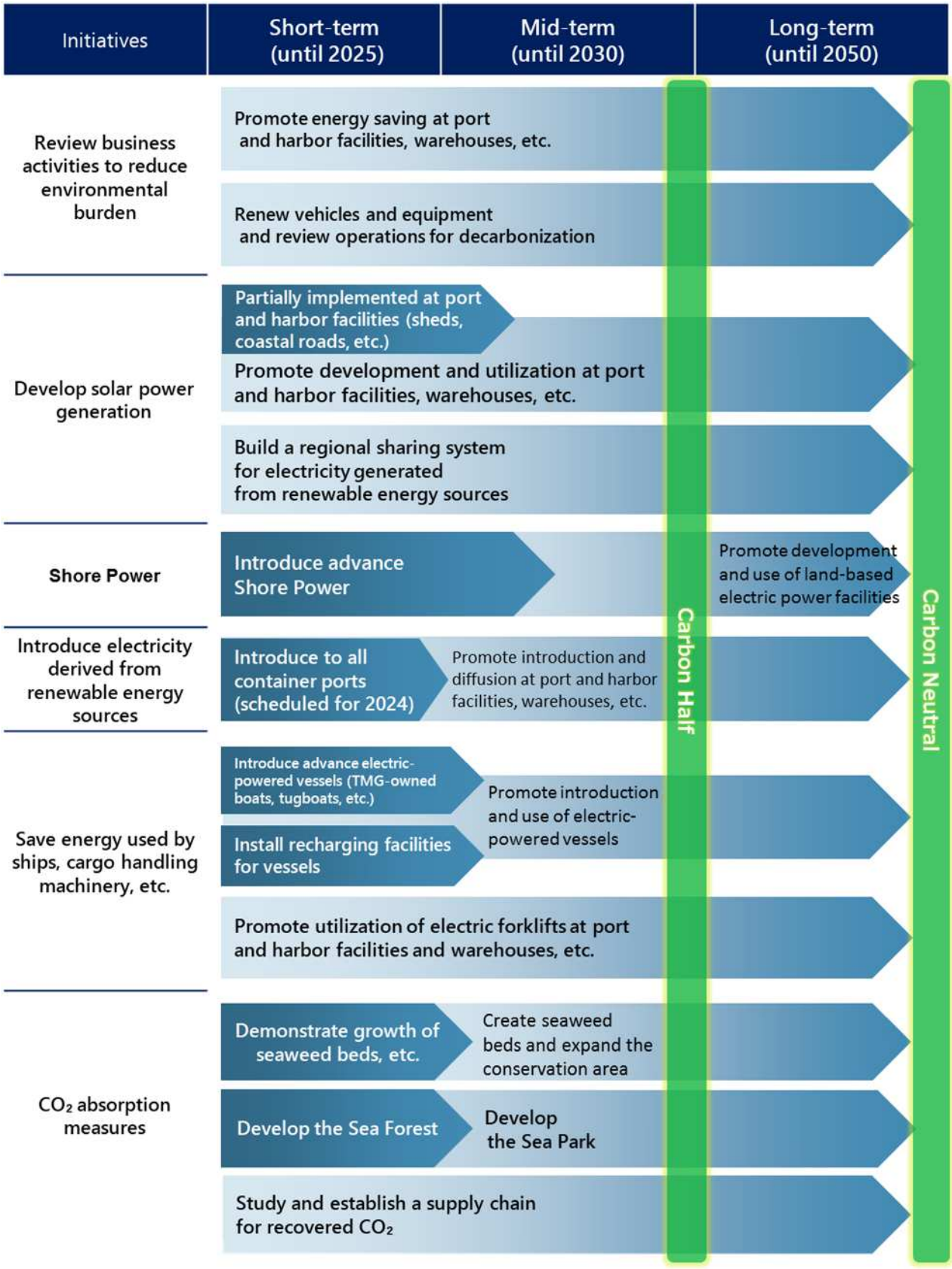


Figure 14: Promotion of solar power generation, energy conservation, etc.

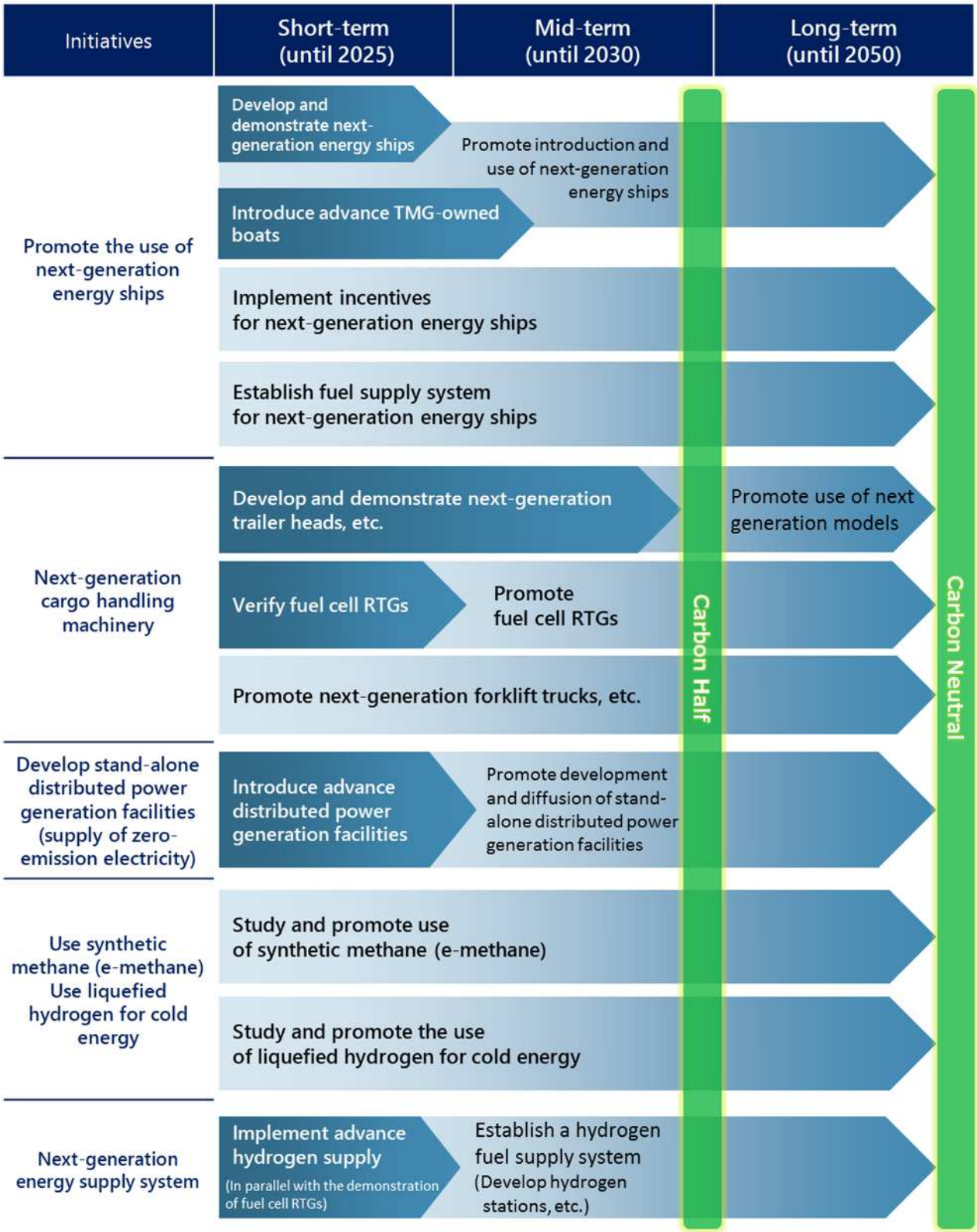


Figure 15: Use of next-generation energy (hydrogen, fuel ammonia, biofuel, etc.)

Reference Data 1: Port of Tokyo Carbon Neutral Port (CNP) Study Group

■ Members of the Study Group

[Companies and organizations] (unofficial name translations shown in parentheses)

Iwatani Corporation
Utoc Corporation
ENEOS Corporation
Ocean Network Express Pte. Ltd.
Japan Foreign Steamship Association
Kawasaki Kisen Kaisha, Ltd.
Kawasaki Heavy Industries Ltd.
Kanto Ryokyaku Senkyou Kai (Kanto Passenger Ship Association)
Kuribayashi Steamship Co., Ltd.
JERA Co., Inc.
Mitsui O.S.K. Lines
Sumitomo Corporation
Tokyo Gas Co., Ltd.
The Tokyo Harbor Transportation Association
Tokyo Port Terminal Corporation
Tokyo Souko Kyoukai (Tokyo Warehouse Association)
Tokyo Association of Refrigerated Warehouses
Toshiba Energy Systems & Solutions Corporation
Toyota Motor Corporation
Japan Machinery Center
Nippon Express
NYK Line
Honda R&D Co., Ltd.
Mitsui E&S Machinery Co., Ltd.
Mitsubishi Group

[Administrative Organizations]

Kanto Regional Development Bureau, MLIT
Bureau of Industrial and Labor Affairs, Tokyo Metropolitan Government
*The first meeting was held at the Bureau of Environment, Tokyo Metropolitan Government.

[Secretariat]

Bureau of Port and Harbor, Tokyo Metropolitan Government

■History of meetings

1st Study Group Meeting

Date/Time: Monday, June 6, 2022 from 10:00 a.m. to 12:00 p.m.

Venue: TMG Main Building No. 2, 1st Floor, Main Building No. 2 Hall

Agenda: (1) Introduction to the Port of Tokyo

(2) Long-term Vision for the 9th Revised Port and Harbor Plan of the Port of Tokyo

(3) Study for development of the Port of Tokyo as a CNP

(4) Opinions of companies and organizations on development of the Port of Tokyo as a CNP

(5) Plan and schedule of future studies

2nd Study Group Meeting

Date/Time: Wednesday, September 14, 2022 from 10:00 a.m. to 11:30 a.m.

Venue: TMG Main Building No. 2, 1st Floor, Main Building No. 2 Hall

Agenda: (1) Estimation of Greenhouse Gas Emissions from the Port of Tokyo

(2) Port of Tokyo Carbon Neutral Port Development Plan (Draft Framework)

(3) Future plan and schedule

3rd Study Group Meeting

Date/Time: Tuesday, November 8, 2022 from 10:00 a.m. to 11:30 a.m.

Venue: TMG Main Building No. 2, 1st Floor, Main Building No. 2 Hall

Agenda: (1) Port of Tokyo Carbon Neutral Port Development Plan (Draft)

(2) Future plan and schedule

4th Study Group Meeting

Date/Time: Wednesday, December 21, 2022 from 10:00 a.m. to 11:30 a.m.

Venue: TMG Main Building No. 2, 1st Floor, Main Building No. 2 Hall

Agenda: (1) Port of Tokyo Carbon Neutral Port Development Plan (Draft)

(2) Future plan and schedule

Reference Data 2: Approach to emissions estimation at the Port of Tokyo

Approach to estimating emissions from terminals and terminal hinterlands

○ For terminals and terminal hinterlands, emissions are estimated by either method (1) or (2) (see p.13 and p.14 of the main text)

(1) For facilities for which actual energy consumption is known, the following formula is used for estimation

【 Formula for CO2 emissions 】

Energy consumption*1 × Emission factor*2 = CO2 emissions

Example: Calculation for cargo handling machinery at a foreign container terminal (P13)

Category	Type	Energy consumption (fuel type)	Emission factor	CO_2 emissions
Foreign container terminal (2020)	Cargo handling machinery (electricity)	12,555,509 kWh (Electricity)	0.000441 t-CO_2/kWh	5,537 t-CO_2
	Cargo handling machinery (diesel)	8,589 kL (Diesel)	2.58 t-CO_2/kL	22,159 t-CO_2
Total				27,696 t-CO_2

(2) For facilities where actual energy consumption is not known, the following formula is used for estimation.

【 Formula for CO2 emissions 】

Total floor space*4 × Energy consumption rate*5 × Emission factor = CO_2 emissions

Example: Calculation for Warehouse A and Refrigerated Warehouse B

Category	Total floor area	Energy consumption rate	Emission factor	CO_2 emissions
Warehouse A	9,289 m2	0.04 MWh/m2	0.000441 t-CO_2/kWh	164 t-CO_2
Refrigerated Warehouse B	15,637 m2	419 MJ/m2	0.124 t-CO_2/GJ	813 t-CO_2

Emission factor	
Gasoline	2.32 t-CO_2/kL
Diesel	2.58 t-CO_2/kL
Liquefied petroleum gas	3.00 t-CO_2/t
Liquefied natural gas	2.70 t-CO_2/t
Electricity*3	0.000441 t-CO_2/kWh
Emission factors for fuel use	
Electricity use (national average coefficient)	0.124 t-CO_2/GJ

Energy consumption rate	
Warehouses, offices, etc.	0.04 MWh/m2
Refrigerated warehouses	419 MJ/m2
Cement	3,739 MJ/t
Oil refining	8.41 kL crude oil/1,000 kL
Thermal power generation	8,126 MJ/MWh

1. Set based on actual data.
2. Based on the "Carbon Neutral Port (CNP) Development Plan" Formulation Manual, 1st Edition, December 2021, MLIT"
3. Emission coefficients for electricity are those of TEPCO Energy Partner.
4. Area was measured from aerial photographs.
5. Based on "Carbon Neutral Port (CNP) Development Plan" Formulation Manual, 1st Edition, December 2021, MLIT"

Approach to estimating emissions from vehicles

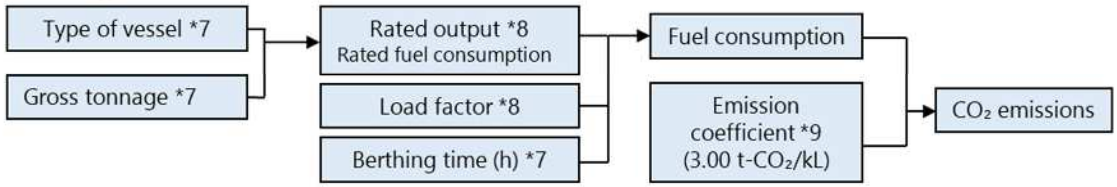
○ For mobile vehicles, the fuel consumption method is used at container terminals, and the ton-kilometer method is used for unit load terminals, ferry terminals, and conventional terminals (see p. 14 of the main text).

Fuel consumption method: calculation parameters	Remarks
(1) Transportation distance (5.3 km)	Set as the distance traveled within the Port of Tokyo.
(2) Number of containers handled	Set for each terminal based on data from "Port of Tokyo Status: 2020 Port & Harbor Statistics" and "Port of Tokyo Status: 2000 Port & Harbor Statistics".
(3) Emissions factor*6 (0.001014 t-CO2/km/container)	Used the value for average travel speed of 20 km/h from "Basis for Calculating Vehicle Emission Factors Used for Road Environmental Impact Assessment (FY2010 Version) / February 2012 / National Institute for Land and Infrastructure Management (NILIM) Document No. 671". The average travel speed of 20 km/h is based on a total of 19.3 km/h for general roads in the 12-hour average travel speed (km/h) during the daytime in Tokyo (special wards) from the "2015 National Survey of Road and Street Traffic Conditions".
(4) = (1)×(2)×(3) CO_2 emissions(t-CO_2)	Applicable to container terminals
Ton-kilometer method: calculation parameters	**Remarks**
(1) Transportation distance (5.3 km)	Set as the distance traveled within the Port of Tokyo.
(2) Volume of cargo handled(t)	Set for each terminal based on data from "Port of Tokyo Status: 2020 Port & Harbor Statistics" and "Port of Tokyo Status: 2000 Port & Harbor Statistics".
(3) Fuel consumption per ton-kilometer (0.0421 L/t・km)	Set from "Greenhouse Gas Emissions Calculation and Reporting Manual Ver. 4.8, January 2022, Ministry of the Environment".
(4) Emissions factor (2.58 t-CO_2/kL)	Set from "Carbon Neutral Port (CNP) Formation Plan Manual, First Edition, December 2021, MLIT"
(5) = (1)×(2)×(3)×(4) CO_2 emissions(t-CO_2)	Applied to unit load terminals, ferry terminals, and conventional terminals.

6. The value of 5km/h average driving speed (0.001646 t-CO2/km/vehicle) was used when estimating the emissions from standby vehicles.
   Note that emissions from standby vehicles are estimated only for container terminals.

Approach to estimating emissions from vessels

○ Emissions from ships at berth are estimated based on the following flow chart (see p. 14 of the main text).



7. Set for each terminal based on actual data of vessel arrivals in FY2000 and FY2020.
8. Based on the "Manual for Calculating Greenhouse Gas Emissions from Ports and Harbors (Draft) Ver. 1.0, June 2009, MLIT".
9: Based on the "Carbon Neutral Port (CNP) Formation Plan Manual, First Edition, December 2021, MLIT" (emission coefficient for fuel oil).