

28th Energy Conservation Training for ASEAN (ECAP28)

Energy Conservation Act for Transportation Sector in Japan

October 26, 2022

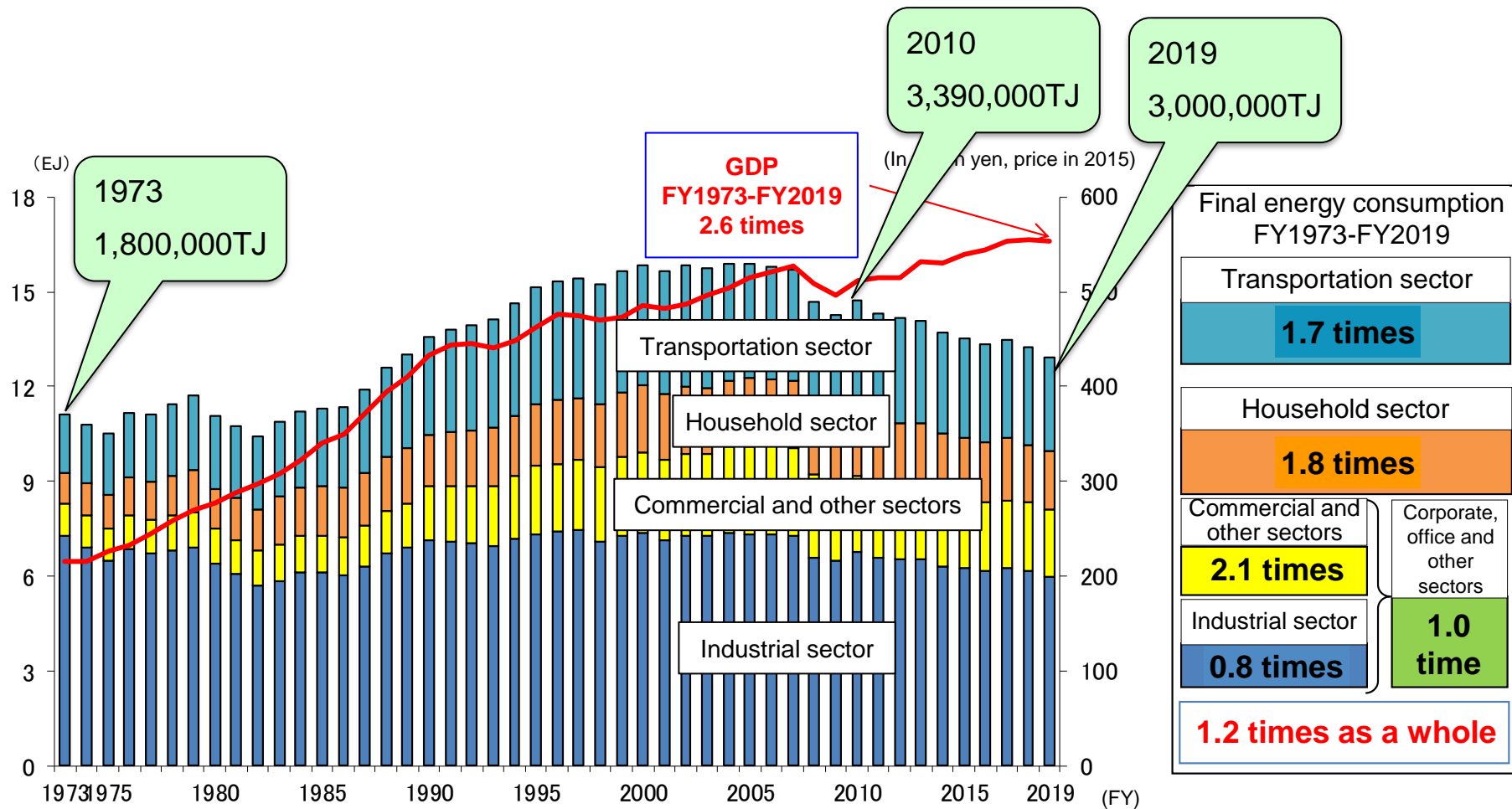


The Energy Conservation Center, Japan

Satoshi Hayakawa

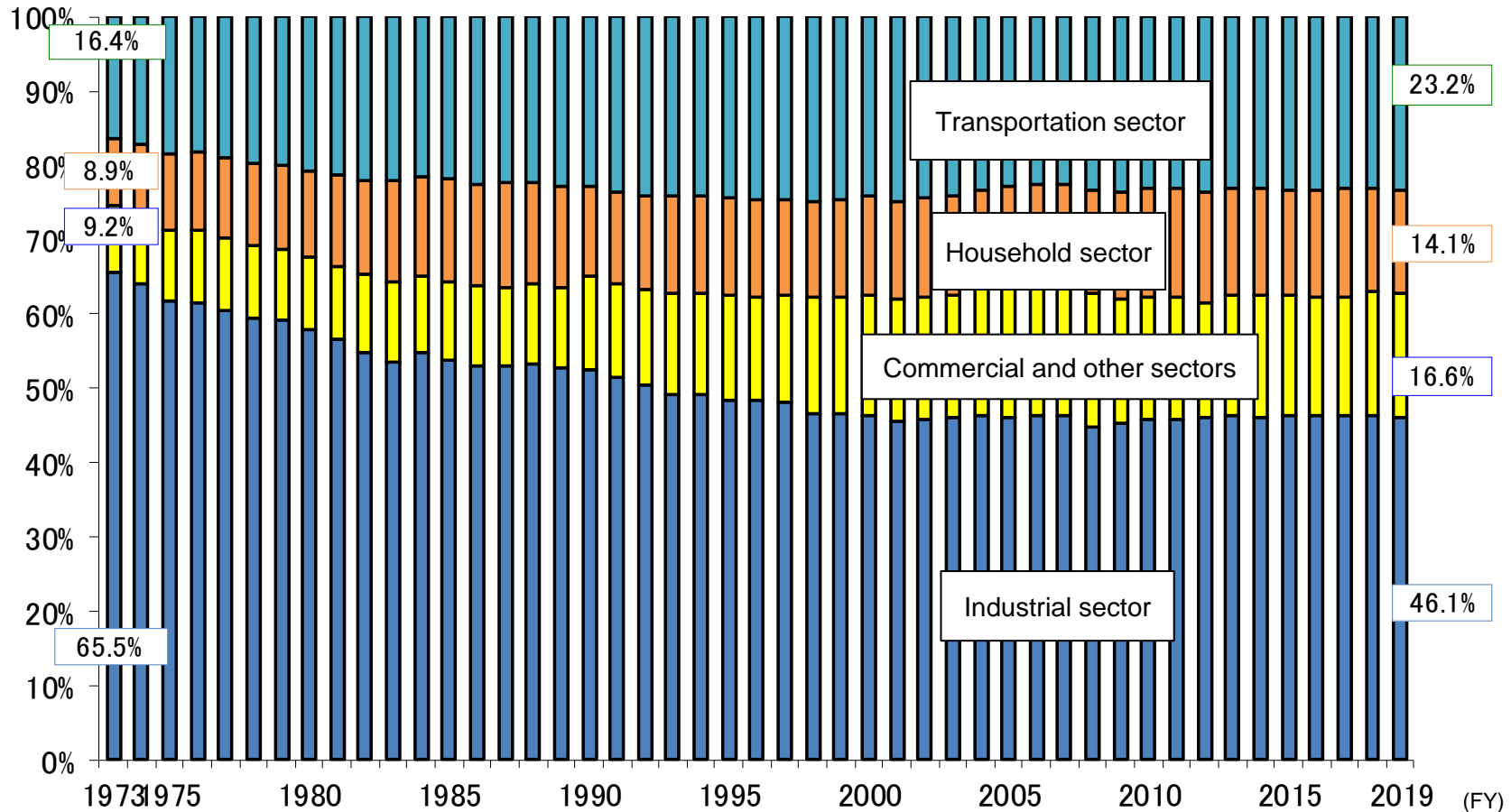
CN Solution Department

Energy consumption in the transportation sector increased about 1.7 times from 1973 to 2019.



Source: Website of METI

Energy consumption in the transportation sector accounts for 23.2% of the total (1.4 times higher than in 1973).



Source: Website of METI

What is the Energy Conservation Act?

“Act on the Rational Use of Energy (hereinafter referred to as the “Energy Conservation Act”) was enacted in 1979 with an oil crisis as an opportunity. It is intended to “contribute to securing the effective utilization of fuel resources according to the economic and social environment concerning energy in and outside Japan, take the measures required for the rational use of energy with regard to factories, etc., transportation, buildings, and machinery and equipment, and take the measures required for levelling the electricity demand as well as other necessary measures, etc. for comprehensively promoting the rational use of energy, thereby contributing to the sound development of the national economy”.

Energy in the Energy Conservation Act

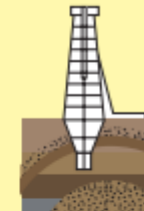
Energy in the Energy Conservation Act refers to the following fuels, heat and electricity.

Energy recovered from waste and non-fossil energies such as wind power and solar power are excluded.

Fuels

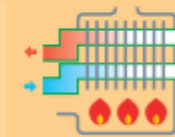
- Crude oil and volatile oil (gasoline), heavy oil, other petroleum products (naphtha, kerosene, diesel fuel, petroleum asphalt, petroleum coke, petroleum gas)
- Combustible natural gas
- Coal and coke, other coal products (coal tar, coke oven gas, blast furnace gas, converter gas)

They are used for combustion and other purposes (power generation by fuel cells).



Heat

- Heat (steam, hot water, cold water, etc.) using the above fuels as a heat source
- Exclusions: Solar heat, geothermal heat, etc. identifiable as heat only not using the above-mentioned fuels as a heat source



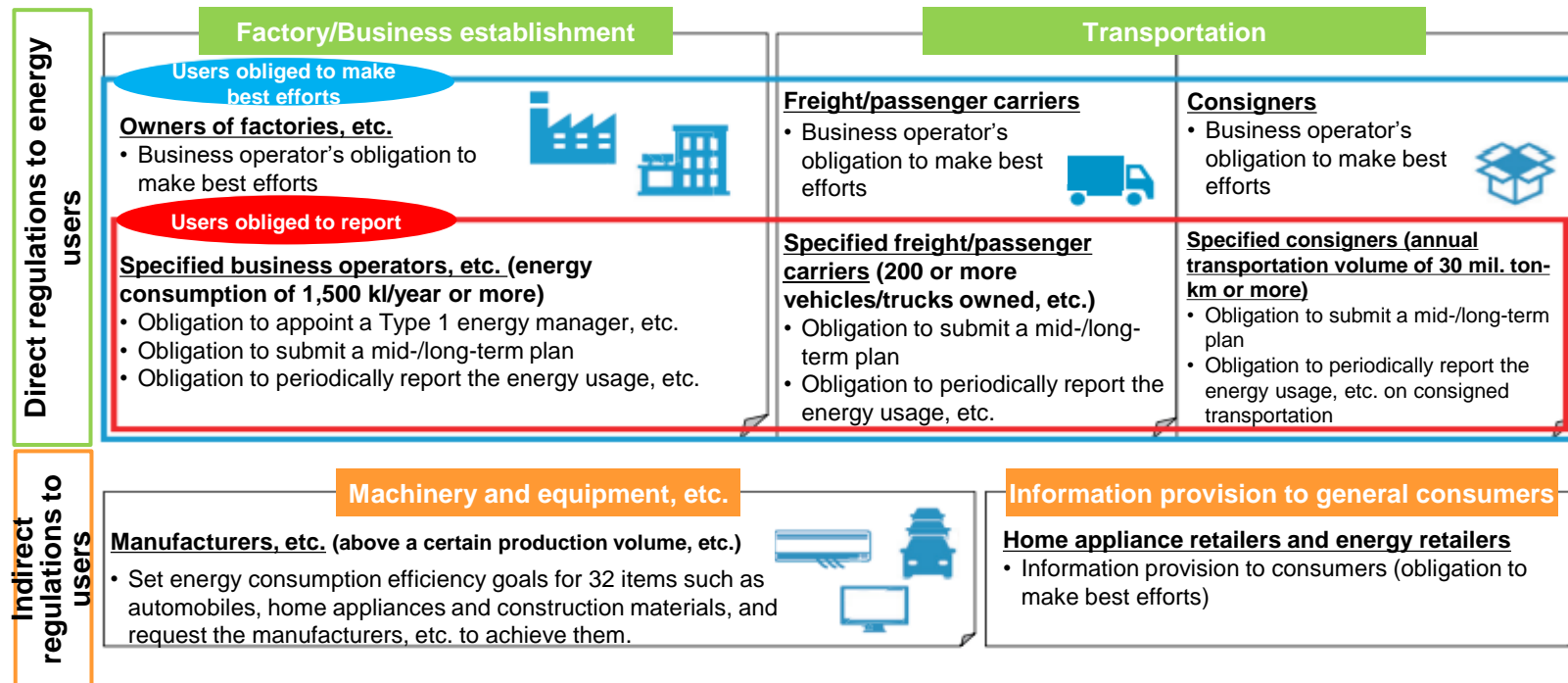
Electricity

- Electricity deriving from the above-mentioned fuels
- Exclusions: Solar power generation, wind power generation, waste power generation, etc. identifiable as electricity only not deriving from the above-mentioned fuels



Sectors regulated by the Energy Conservation Act

The Energy Conservation Act regulates energy users directly in business sectors such as factories/business establishments and transportation. To owners of factories, etc. (factories, offices and other business establishments), carriers and consigners, the Act requires business operators above a certain business scale to report the energy usage, etc. and gives a guidance/advice or instructs to create a rationalization plan, if their approaches are not enough, in addition to providing the Energy Conservation Guidelines as a reference when they implement the energy conservation activities.



Energy Conservation Guideline

The Energy Conservation Act provides the freight carriers, passenger carriers and consigners with respective Energy Conservation Guidelines for rational use of energy to present the matters to be implemented for energy conservation.

Freight carrier

1. Preparation of approach policy and understanding of effects, etc.
2. Use of transportation machinery and equipment with high performance in light of energy consumption
3. Operation or control of transportation machinery and equipment that contributes to the rational use of energy
4. Use of transportation machinery and equipment with high transportation capacity
5. Efficient utilization of the transportation capacity of transportation machinery and equipment
6. Other matters that contribute to the rational use of energy

Passenger carrier

1. Preparation of approach policy and understanding of effects, etc.
2. Use of transportation machinery and equipment with high performance in light of energy consumption
3. Operation or control of transportation machinery and equipment that contributes to the rational use of energy
4. Reduction of the distance of driving or navigation without passengers
5. Other matters that contribute to the rational use of energy

Consigner

I. Standards for the rational use of energy

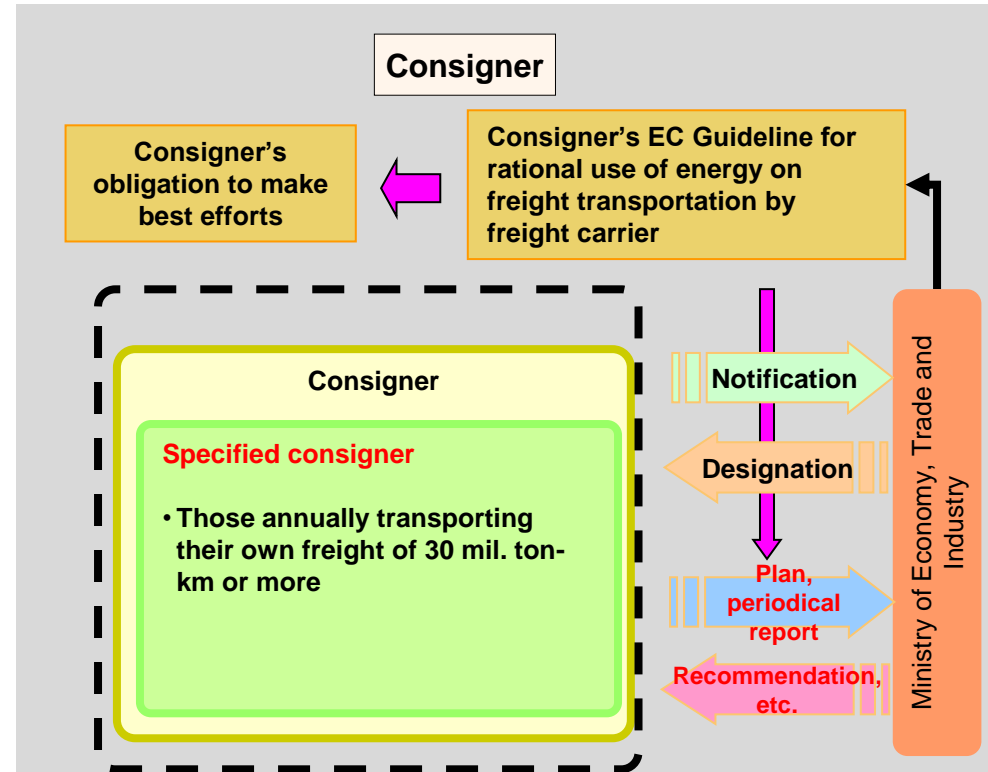
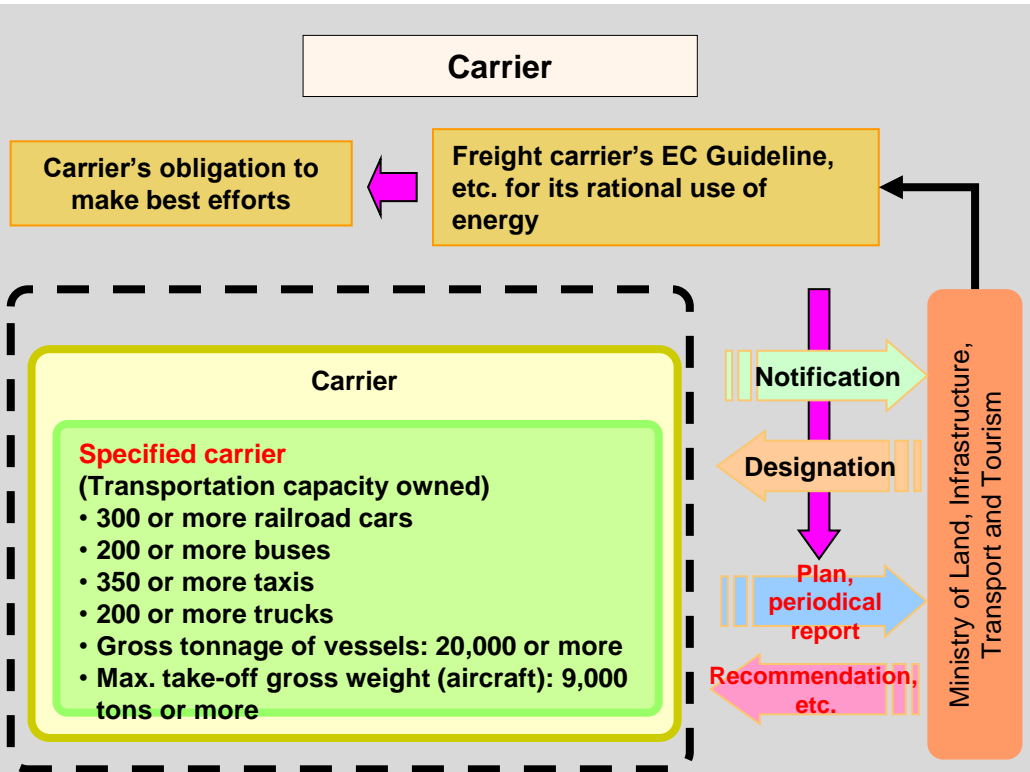
1. Common approaches

- (1) Preparation of approach policy for the goal and understanding of effects, etc.
 - (2) Shorter freight transportation distance, improved fuel efficiency, systematic freight transportation, and so on
 - (3) Lower freight transportation frequency, reduction of delivery times, and so on
2. Approaches to higher delivery efficiency of large freight mainly destined to corporations
Higher load factor, cooperation for introduction of eco-drive support devices, promotion of modal shift, use of larger transportation equipment, and so on.
3. Approaches to higher delivery efficiency of small freight mainly destined to consumers
Reduction of redelivery by allowing the consumer to specify a desired delivery date and time and a receiving place, and responding to their change, and so on.

II. Targets for the rational use of energy and measures to be taken systematically

1. Common approaches

- (1) Preparation of approach policy and understanding of effects, etc.
Set a mid-/long-term goal for carrying on energy conservation in freight transportation, verify the effects, etc. in order to achieve the goal, and implement a more effective approach.
 - (2) Improvement of related infrastructure
Mechanization, automation, appropriate allocation, consolidation, and improvement in view of streamlining of operations, concerning the logistics facilities and bases
 - (3) Cooperation with freight carriers, etc.
Holding of a periodic social gathering and review meeting with freight carriers, etc., selection of an environmentally friendly freight carrier, and so on
 - (4) Environmentally friendly product development and improvement of production structure
Product development in view of transportation of post-use product waste, recycling resources, etc., building of a production structure enabling adjustment of shipment time in line with freight transportation, and so on
2. Approaches to higher delivery efficiency of large freight mainly destined to corporations
Higher transportation efficiency by leveling a transportation volume, higher ratio of loading trips to total trips by joint transportation/delivery and securing backhaul freight, and so on
3. Approaches to higher delivery efficiency of small freight mainly destined to consumers
Reduction of redelivery by using an easily available receiving method other than directly receiving at home , enlightenment of consumers, and so on



<Unit used>

J : Joule (one of thermal units)

kJ : Kilojoule = 1,000 J

MJ : Megajoule = 1,000 kJ = 1,000,000 J = 10^6 J

GJ : Gigajoule = 1,000 MJ = 1,000,000 kJ = 10^9 J

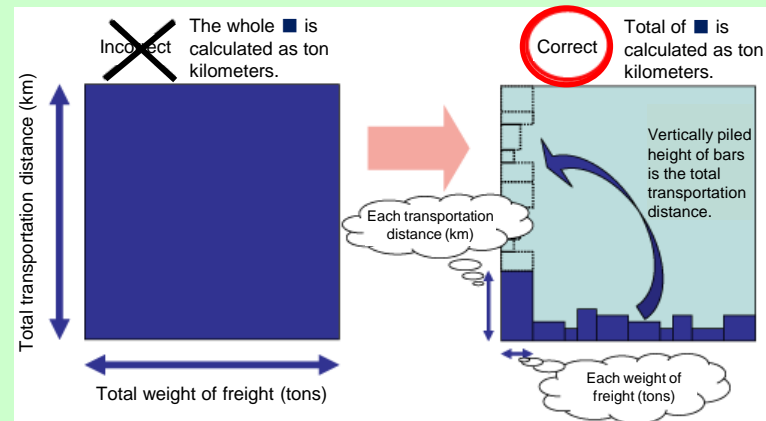
Crude oil equivalent: kl [kiloliter] = 1 GJ x 0.0258

<What is transportation ton kilometer?>

One ton kilometer refers to a transportation volume when transporting 1-ton freight 1 km and is calculated as follows for each freight or route.

$$\begin{array}{|c|} \hline \text{Weight of freight} \\ \hline \text{[tons]} \\ \hline \end{array} \times \begin{array}{|c|} \hline \text{Transportation} \\ \hline \text{distance [km]} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Transportation} \\ \hline \text{volume [ton-km]} \\ \hline \end{array}$$

* Not overall weight of freight multiplied by overall transportation distance.



Background of the consigner system in the Energy Conservation Act

The Energy Conservation Act provides the measures for rational use of energy in the transportation sector in addition to respective sectors such as factories/business establishments, buildings, machinery and equipment. For freight above all, the Act requires a “consigner” who places an order with a freight carrier, that is, not an entity who uses energy directly, to formulate an energy conservation plan and report energy consumption, etc.

This is because approaches such as utilization of railroad and vessels by modal shift and joint transportation and delivery are only allowed by the consigner’s subjective involvement. Considering it effective to urge cooperation between the freight carriers and the consigners in order to promote energy conservation measures, it was decided to require the consigners to address energy conservation ahead of the world.

Definition of the consigner

[Type 1 consigners]

Those continually having the freight carriers transport freight in connection with their own business

[Type 2 consigners]

Those practically deciding a transportation method, etc. of the freight based on a contract or other arrangements with the other business operator and conforming to the requirements set forth by the ordinance of the Ministry of Economy, Trade and Industry

Consigner's obligations

In order to properly and effectively rationalize energy use in transportation of own freight, all consigners are required to observe various standards mentioned in “Consigner’s EC Guidelines for Rational Use of Energy Pertaining to Freight Transportation by Freight Carrier” stipulated by the national government within the technically and economically possible limits and make efforts to reduce energy intensity by 1% or more on annual average from a mid- and long-term viewpoint.

Also, all consigners are required to understand their own freight transportation volumes and submit a “Notification of Freight Transportation Volume” to the director of the regional Bureau of Economy, Trade and Industry when the volume reaches or exceeds 30 mil. ton kilometers. → To be designated as a specified consigner

Consigner

Own annual freight transportation volume [ton kilometers] (Notes 1 and 2)

30 mil. [ton kilometers] or more

Specified consigner

To be designated as a specified consigner and subjected to special obligations

Less than 30 mil. [ton kilometers]

Other than specified consigner

Voluntary energy conservation efforts

Note 1: Freight transportation volume [ton-km] = Freight weight [tons] x Transportation distance [km]

Note 2: Including private logistics

<Consigner's obligations>

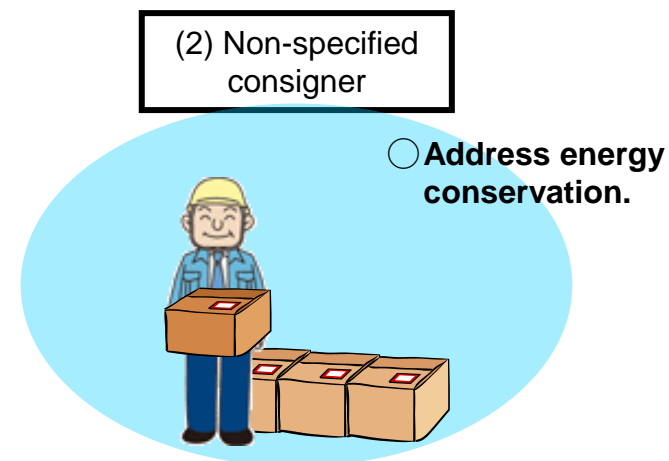
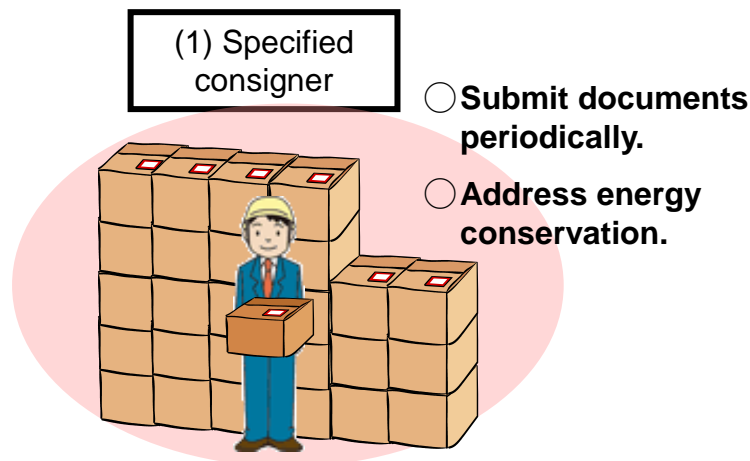
The consigner with the **annual transportation volume of 30 mil. (ton kilometers) or more** is designated as a specified consigner.

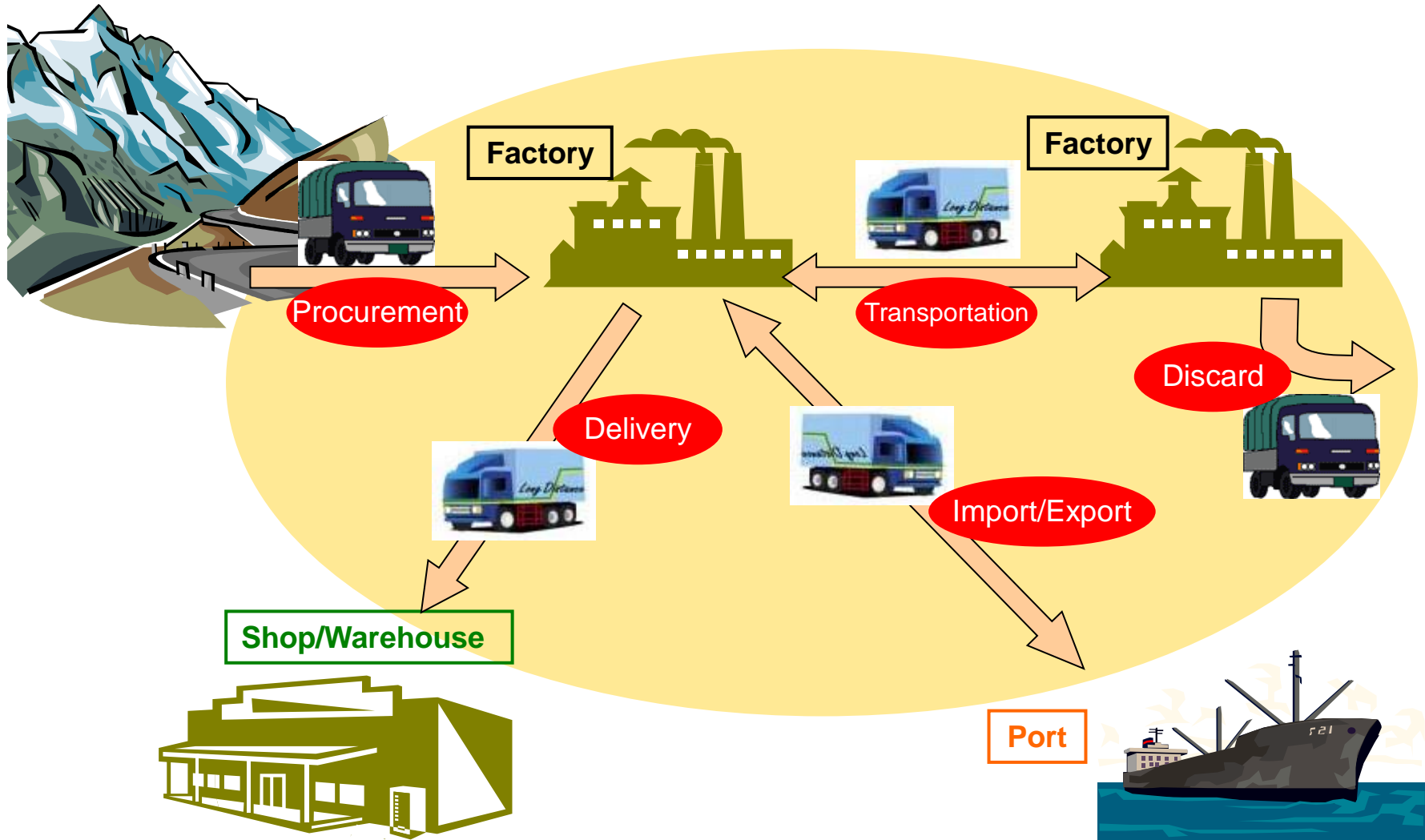
1. The specified consigner is required to periodically prepare and submit documents.

Specifically, it is obligated to “prepare an energy conservation plan” and “periodically report energy consumption, etc.” from a viewpoint of promoting modal shift and logistics outsourcing. It is also necessary to systematically address energy conservation.

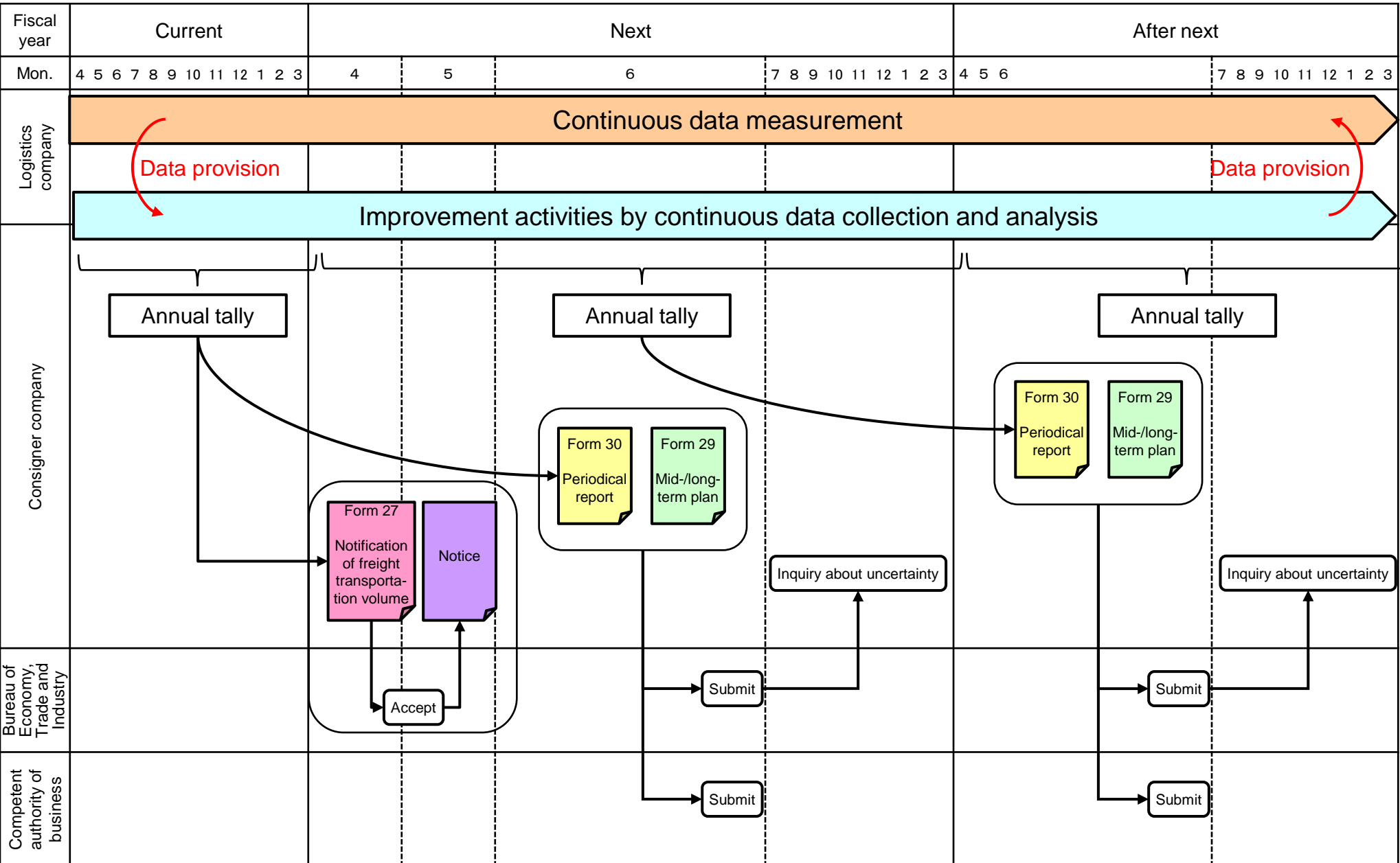
2. Even a non-specified consigner is required to address energy conservation.

Specifically, it is necessary to address energy conservation by approaches such as “selecting a transportation method with lower energy consumption” and “improving utilization efficiency of transportation capacity including a higher load factor of trucks, etc.”





7. Schedule for Periodical Report, Etc.



The following three methods are available to calculate energy consumption.

Fuel method

$$\text{Energy consumption [GJ]} = \text{Fuel consumption [kl]} \times \text{Unit calorific value [GJ/kl]}$$

Fuel efficiency method

$$\text{Transportation distance [km]} \div \text{Fuel efficiency [km/l]} \times \frac{1}{1,000}$$

Ton kilometer method

[Truck]

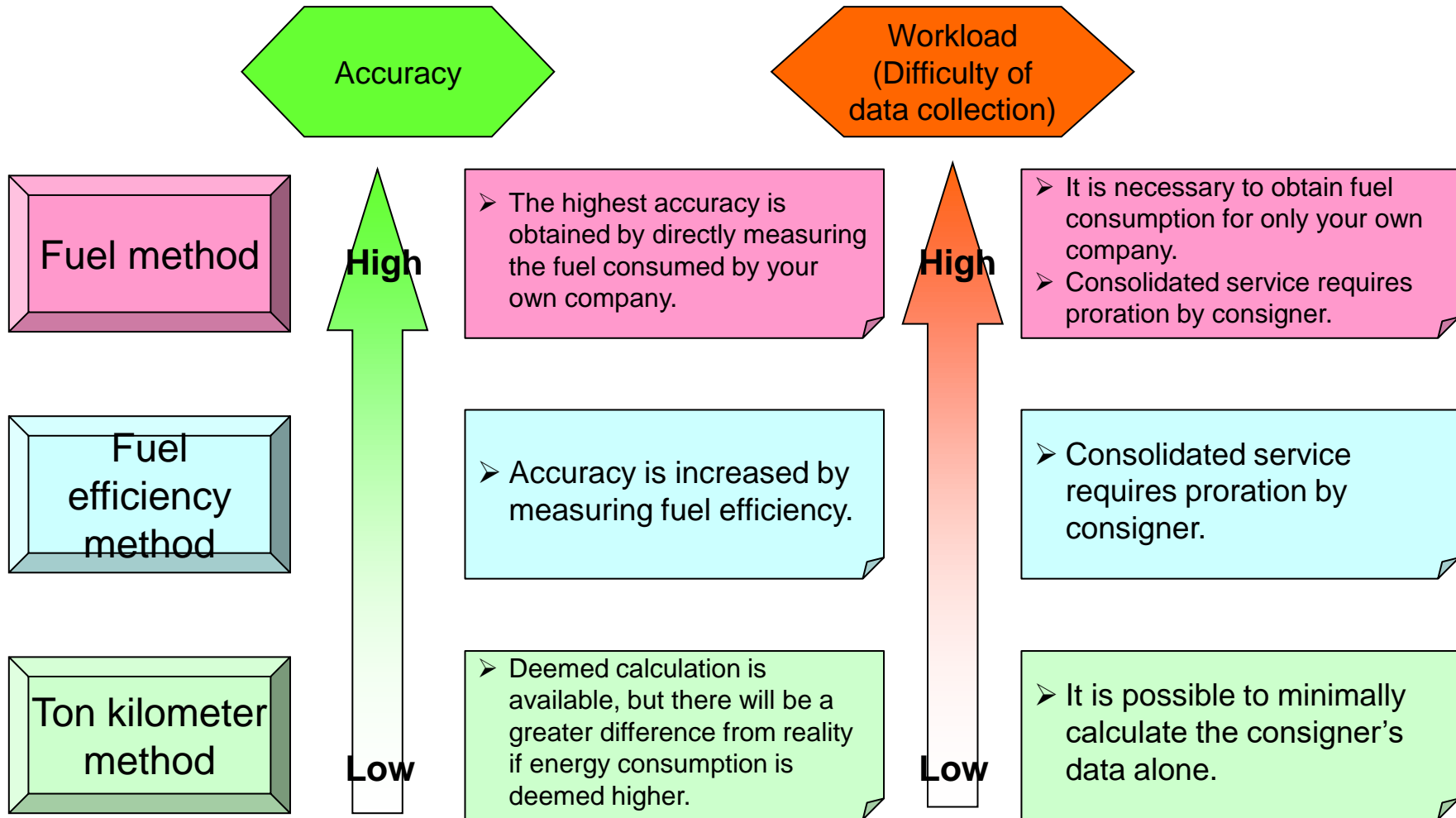
$$\text{Energy consumption [GJ]} = \text{Freight transportation volume [ton-km]} \times \text{Improved ton kilometer method Fuel intensity [l/ton-km]} \times \frac{1}{1,000} \times \text{Unit calorific value [GJ/kl]}$$

[Vessel, railroad, aircraft]

$$\text{Energy consumption [GJ]} = \text{Freight transportation Volume [ton-km]} \times \text{Energy consumption intensity [MJ/ton-km]} \times \frac{1}{1,000}$$

Energy consumption intensity for each transportation method	
Transportation method	Calorific value of fuel per freight transportation volume [MJ/ton-km]
Railroad	0.491
Vessel	0.555
Aircraft	22.2

Accuracy and workload of calculation methods

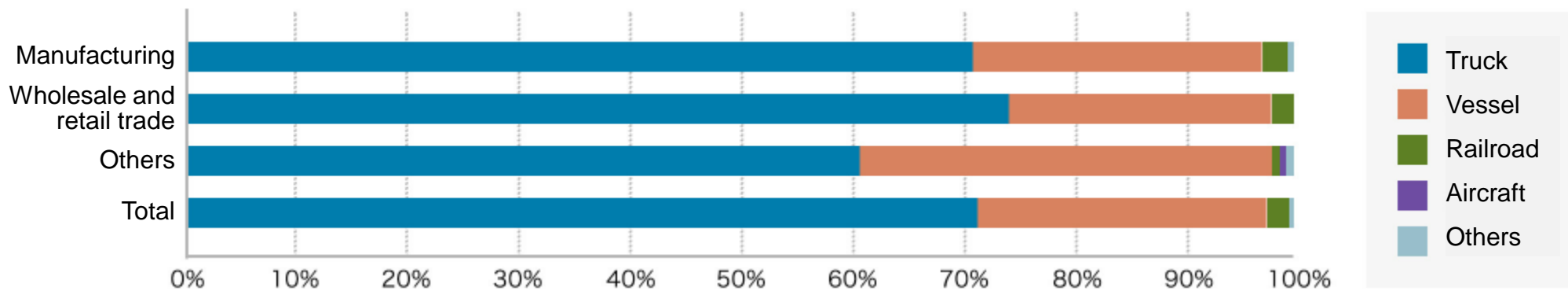


Since the ton kilometer method has the limit of evaluating the energy conservation approaches (for example, improvement of fuel efficiency is not reflected), it is recommended to switch in an early stage to a calculation method capable of reflecting energy conservation effects on numerical values (fuel method or fuel efficiency method).

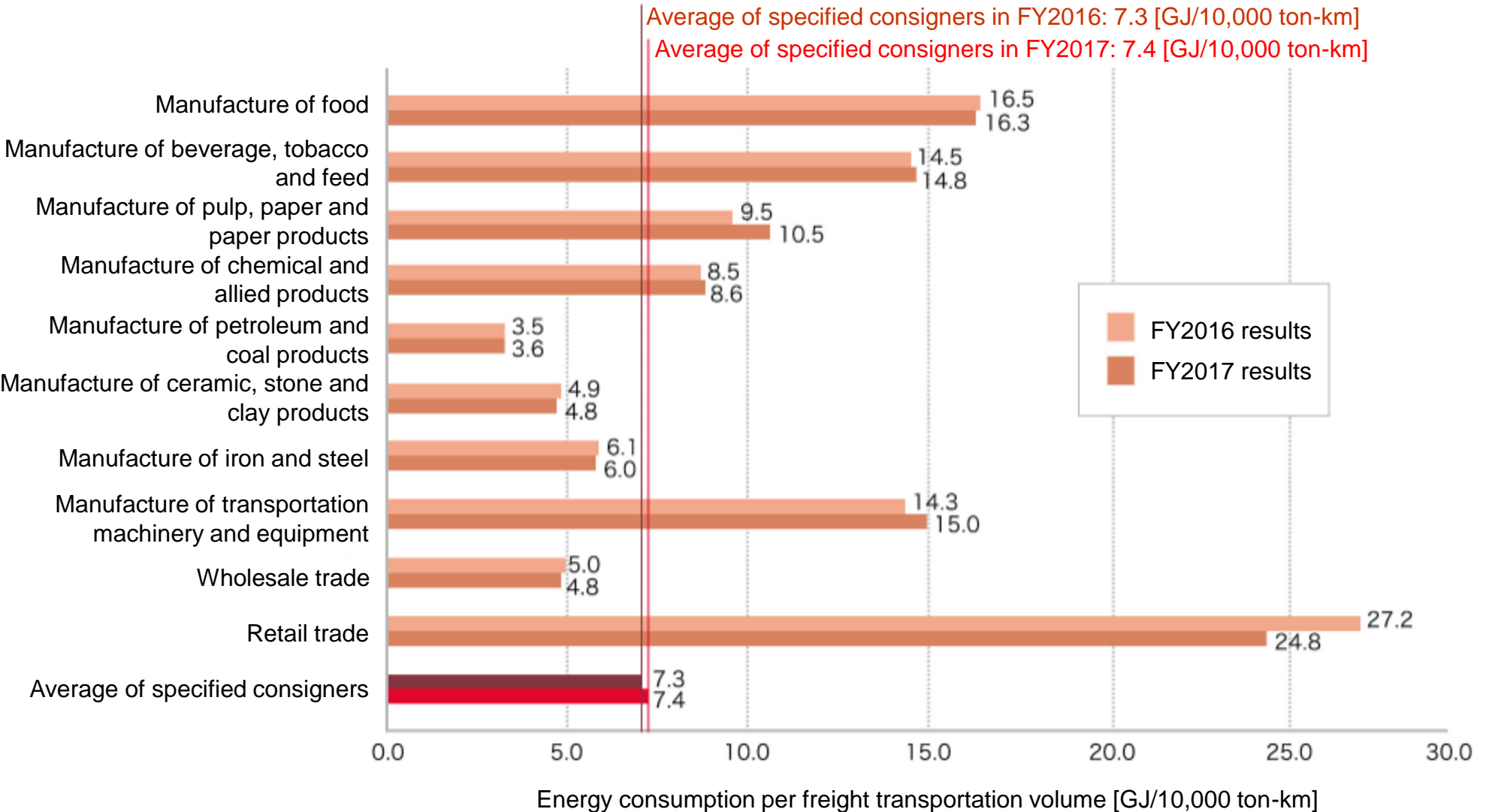
Energy consumption of specified consigner

Type of business/ No. of business operators	Energy consumption [GJ]	Ratio	Energy consumption per specified consigner [GJ]
Manufacturing	148,857,828	77.4%	261,154
Wholesale and retail trade	34,747,191	18.1%	299,545
Others	8,761,891	4.6%	175,238
Total	192,366,910	100.0%	261,368

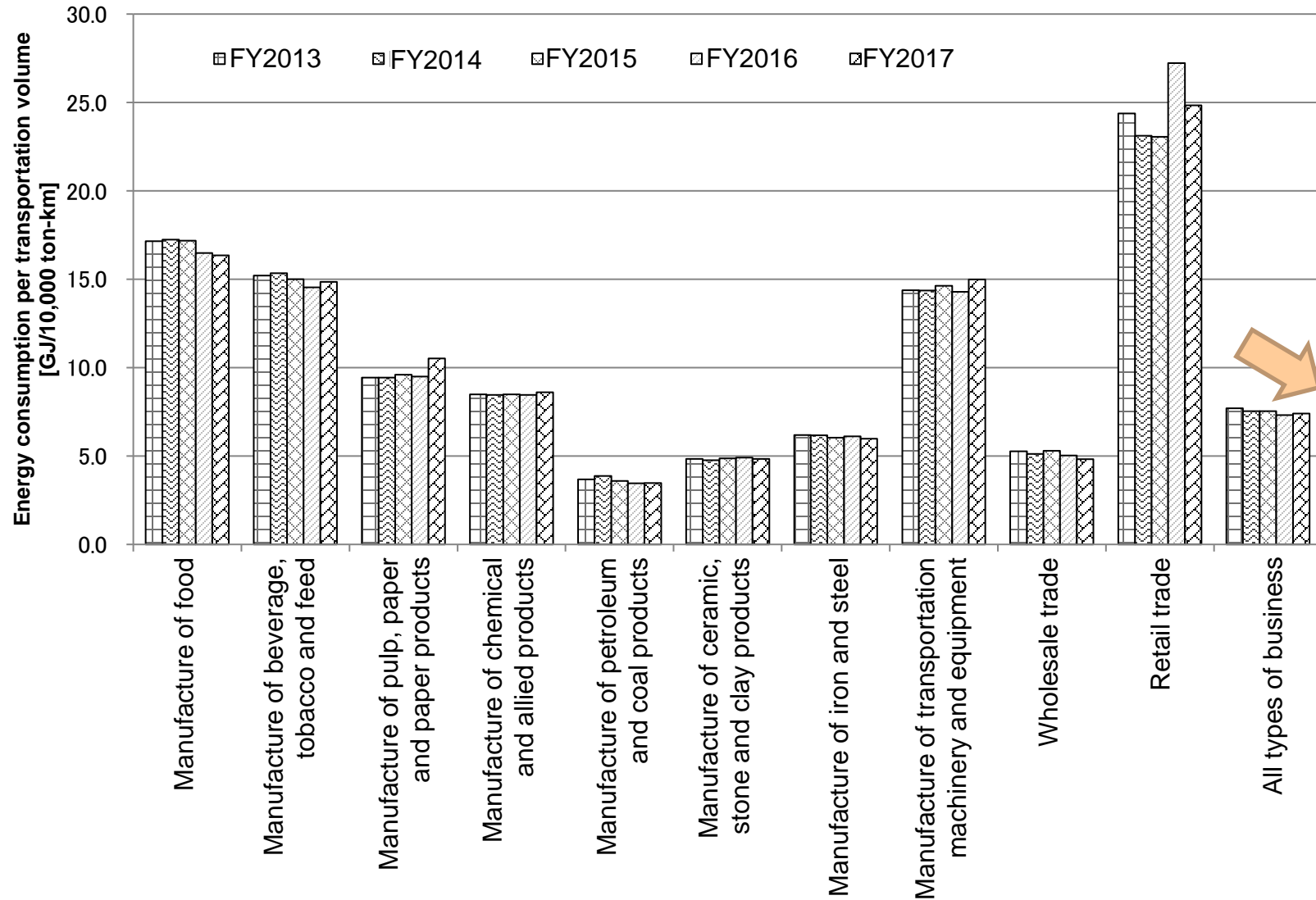
Energy consumption by transportation mode of specified consigner



Average energy consumption per freight transportation volume of specified consigner (Major types of business)



Transition of energy consumption per transportation volume in major types of business of specified consigners



Downsizing of outer boxes
 – “Overall optimization” is a keyword –

Nippon Suisan Kaisha, Ltd.

Advantages for customers by ordering by the full-load vehicle or the pallet
 – The issue is next measures for joint logistics, eco-rail marks and more efficient unit of order –

Lion Corporation

Use of cooperative relations with competitors for energy conservation in logistics
 – Promotion of energy conservation and higher efficiency by joint delivery –

Sapporo Breweries Limited

Modal shift of frozen food transportation to vessels
 – Simultaneous achievement of “environmental friendliness” and “cost reduction” –

Nichirei Foods Inc.

Integration of forward and reverse logistics
 – Promotion of various approaches such as larger vehicles, eco-drive workshop and utilization of natural gas vehicles, in addition to promotion of recycling –

Tokyo Gas Co., Ltd.

Begin with understanding of the reality!
 – Accurate understanding of data is the key to higher efficiency –

Kokubu Group Corporation

Begin with building a basis, or an approach structure!
 – Green logistics is one of 3 environmental approaches as a group –

Panasonic Corporation

Promotion of efficient “planned delivery” by contracting ordering tasks
 – With a load factor already enhanced to the limit, the key to higher efficiency is to increase each transportation volume –

Cosmo Oil Co., Ltd.

Collaborative approaches with the group’s sales company
 – With group-wide improvement of awareness, the approaches are achieved –

Isuzu Motors Limited

Cooperation between multiple business operators is essential to approaches
 – Enhancement of further cooperation and information sharing to revitalize plateaued approaches! –

Canon Inc.

Thorough understanding of transportation data by the freight
 – Promotion of effective approaches based on affluent data –

Sanyo Chemical Industries, Ltd.

Promotion of reduction activities across the overall supply chain
 – Accurate judgment of modal shift and IT-based centralized vehicle dispatch management –

Fujitsu Ltd.

Energy conservation approaches begin with down-to-earth ones by collaboration with a broad view and propagation/enlightenment
 – Promotion of energy conservation approaches with cost reduction and improved logistics quality in mind –

Meiji Dairies Corporation

- Before** Submitted in the form of paper
- Issue** Administrative cost for document management and database compilation
- Now** Prepare the periodical report, etc. with web tools and submit directly online



The screenshot shows the login interface for the EECS system. At the top, logos for the Agency for Natural Resources and Energy, the Ministry of Land, Infrastructure, Transport and Tourism, and the Ministry of the Environment are displayed. Below them is a blue banner with the text "省エネ法・温対法・フロン法電子報告システム (EECS)". The main heading is "EECSへログインをする". A paragraph explains that EECS (Energy Efficiency and Global Warming Countermeasures online reporting system) allows for simultaneous reporting of energy efficiency, global warming countermeasures, and CFCs, and enables integrated management of information on greenhouse gas emissions. A note states that users of the old systems can use their accounts as is. The login form includes fields for "ログインID" and "パスワード", a link for "パスワードを忘れた方はこちら", and a reCAPTCHA verification box with the text "私はロボットではありません" and "reCAPTCHA プライバシー・利用規約". A blue "ログイン" button is at the bottom.