

Plans for the Fuel Supply during Mega Disasters

(In expectation of Nankai Megathrust Earthquakes)

March 2016



The Oil Information Center

In the Great East Japan Earthquake of March 11, 2011, the supply of oil products temporarily became chaotic due to damage to the oil product bases, including oil refineries, and the bottleneck effects in the distribution chains caused by severe damage to road conditions and the loss of tank trucks in tsunamis.

However, quick action by Japanese Government and the private sector resolved major problems in the supply of oil products in early April (about one month after).

Meanwhile, the economic damage caused by Nankai Megathrust Earthquakes in the near future is expected to amount to about ten times the damage caused by the Great East Japan Earthquake (about 20 trillion yen).

This document summarizes how Japanese Governments and the private sector are trying to control the damage and prepare for Nankai Megathrust Earthquakes by learning from the experience of the Great East Japan Earthquake and mainly focusing on the expected damage and damage control measures implemented by the Cabinet Office and the Ministry of Economy, Trade and Industry.

1. Expected Damage from Nankai Megathrust Earthquakes

1-1 Nankai Megathrust Earthquakes

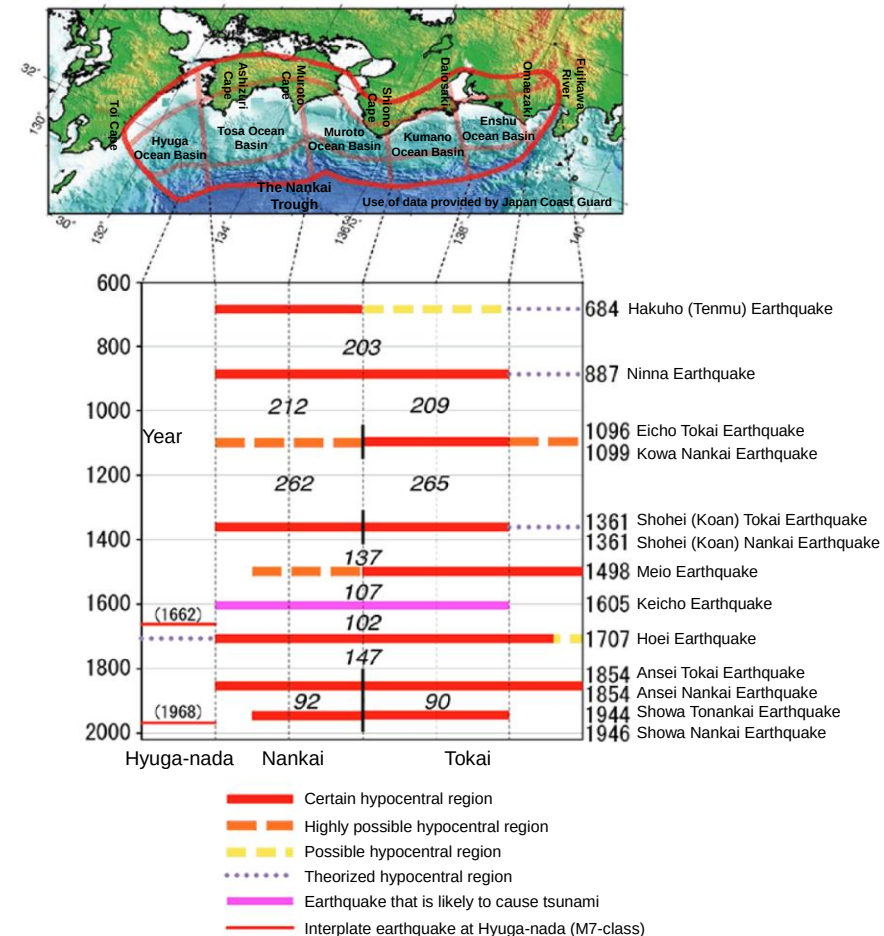
Hypocenter : A wide region along the Nankai Trough

Magnitude : **M9** class

Tsunami : The wave height of more than **10m**, maximum height of **34m** on Kochi Pref.

Type of earthquake : Massive active fault type

Past record of earthquake in this region :
Showa Tonankai Earthquake (1944)
Showa Nankai Earthquake (1946).



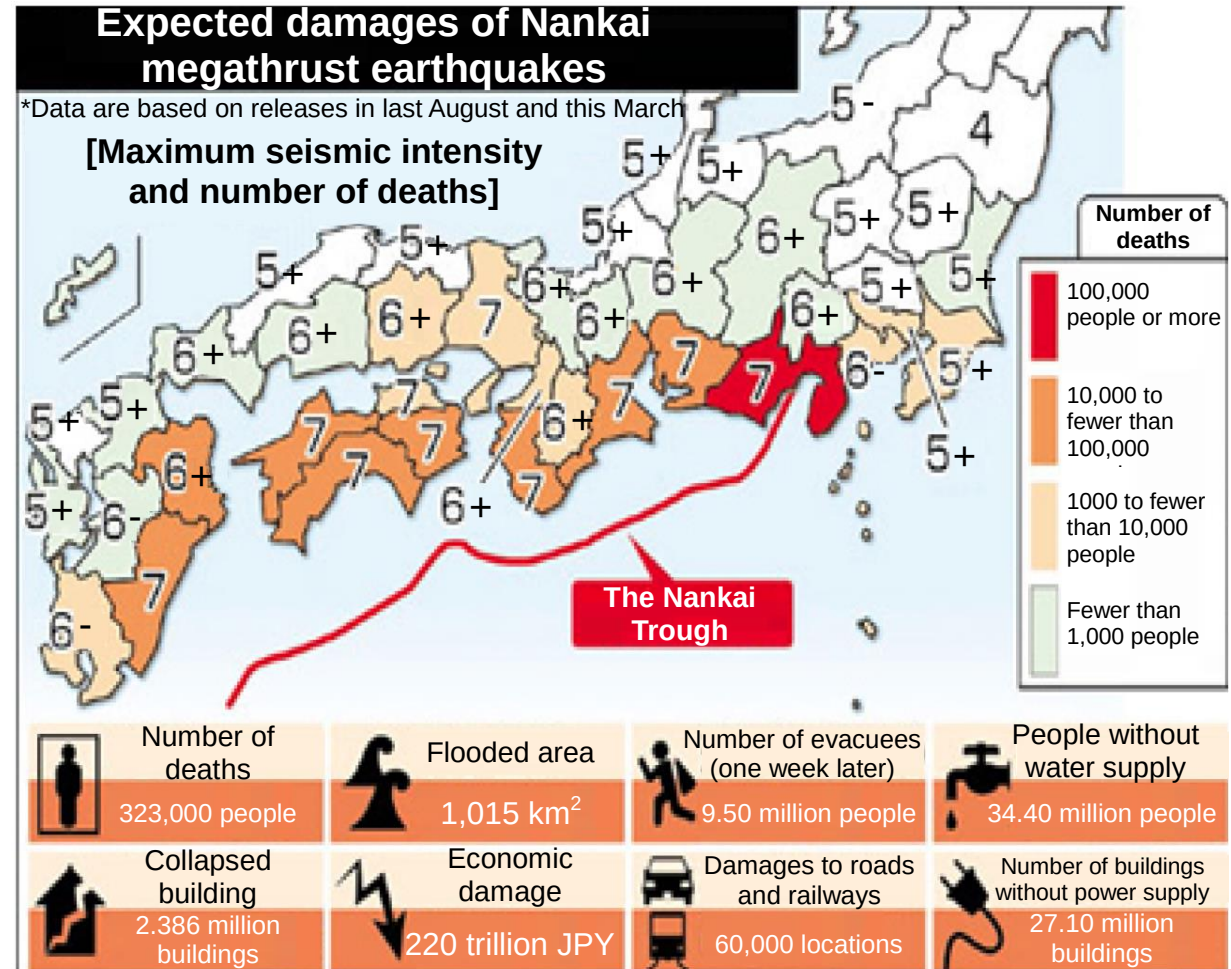
1. Expected Damage from Nankai Megathrust Earthquakes

1-2 Overview of Expected Damage

Expected Damage
by the “Central Disaster Management
Council of the Cabinet Office”

Number of deaths : **323,000**
Flooded area : **1,015 km²**
Economic damage : **220.3**
trillion Yen*
(42% of GDP)

*Ten times the damage from the
Great East Japan Earthquake.

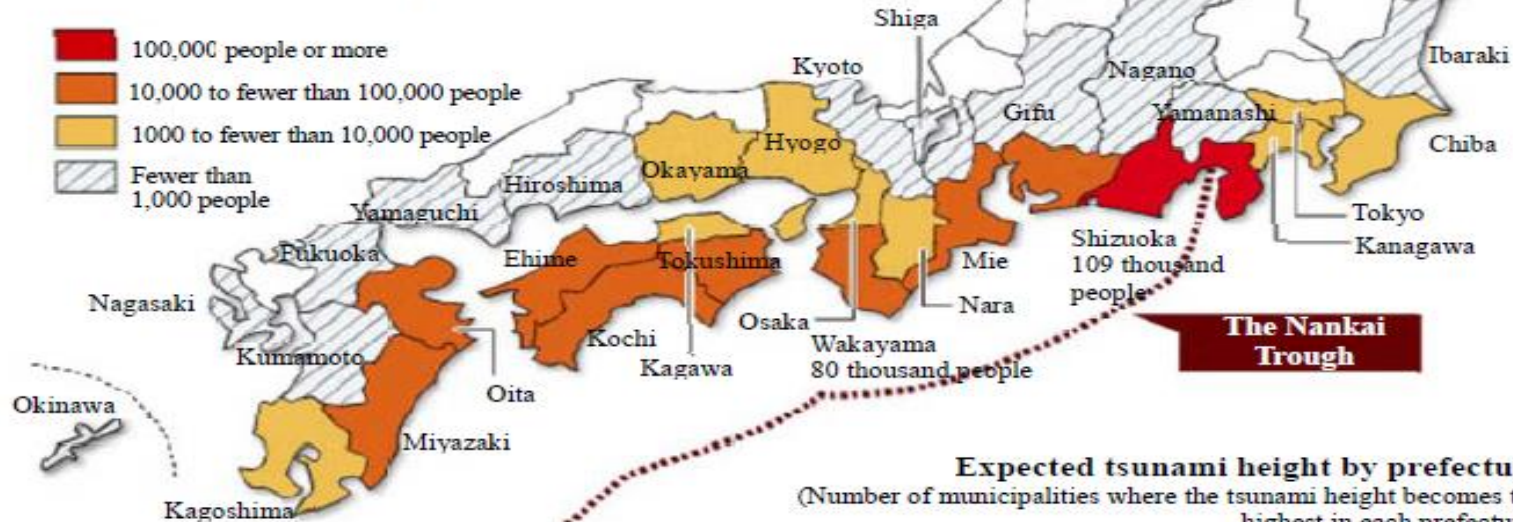


1. Expected Damage from Nankai Megathrust Earthquakes

1-3 Overview of Expected Damage

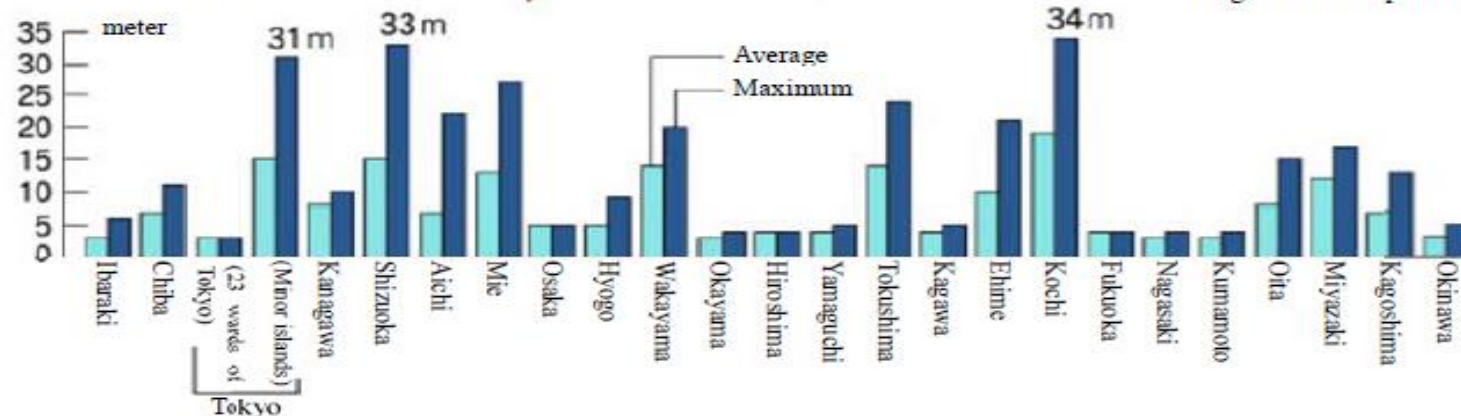
Expected number of deaths in Nankai megathrust earthquakes

(Maximum number when the onset is at midnight in winter, with the wind speed of 8 meters per second)



Expected tsunami height by prefecture

(Number of municipalities where the tsunami height becomes the highest in each prefecture)



1. Expected Damage from Nankai Megathrust Earthquakes

1-4 Damage to Infrastructures

(1) Lifelines

- Lose access to tap water: Up to about **34.40 million people** in the Tokai and Kinki regions
- Lose power : Up to about **27.10 million households**
- Lose the supply of city gas: Up to about **1.80 million households**

(2) Damage to traffic facilities

- Road traffic facilities to be damaged: **30,000 to 41,000 locations,**
- Railroad facilities to be damaged: **13,000 to 19,000 locations,**
- Mooring facilities of ports to be damaged: **3,000 to 5,000 locations**
- Airports to be flooded by tsunami: Chubu International Airport,
Kansai International Airport,
Kochi Airport,
Oita Airport,
Miyazaki Airport

2. Effects to Oil Refinery Facilities

2-1 Expected damage to Oil Refineries

- Oil refineries, which are expected to be affected by earthquakes, account for **89.4%** in all of Japan.
- 51.7%** of the national unit capacity may suffer long-term effects (six months to one year).
- At **Tonen Wakayama Refinery** and **JX Oita Refinery**, the expected tsunami heights are 10 meters and 9 meters, respectively.
- Responses to this situation include added operation rate of oil refineries located in the eastern part of Japan and increase the imports of products among others.

Region	Company	REF	TP capacity thousand B/D	Seismic intensity*	Tsunam i*	
				5-	m	
Kanto	JX	Negishi	270	5+	3	
	JX	Kashima	189	5-	6	
	Idemitsu	Anegasaki, Chiba	220	5-	3	
	Cosmo	Goi, Chiba	240	5-	3	
	Toa	Keihin	70	5-	3	
	Tonen	Chiba KPI	152	5-	3	
	Tonen	Kawasaki	258	5+	3	
	Fuji	Sodegaura, Chiba	143	5-	2	
		Subtotal	1,542			
		TP ratio in the country	39.1%			
Chubu	Idemitsu	Aichi	175	7	5	
	Cosmo	Yokkaichi	132	6+	5	
	Shell	Yokkaichi	255	6+	5	
			Subtotal	562		
		TP ratio in the country	14.2%			
Kinki	Cosmo	Sakai	100	6-	5	
	JX	Sakai	115	6-	5	
	Tonen	Sakai	156	6-	5	
	Tonen	Wakayama	132	7	10	
			Subtotal	503		
			TP ratio in the country	12.7%		
Chugoku & Shikoku	JX	Marifu	127	6-	3	
	JX	Mizushima	345	6+	4	
	Shell	Seibu	120	6+	4	
	Taiyo	Kikuma	118	6+	4	
			Subtotal	710		
		TP ratio in the country	18.0%			
Kyushu	JX	Oita	136	6+	9	
			TP ratio in the country	3.4%		
Okinawa	Nansei	Nishihara	100	-	3	
			2.5%			
Total			3,553			
TP ratio in the country			90.0%			
Tsunami height 4 m or more			1,973			
TP ratio in the country			50.0%			
Tsunami height 5 m or more			1,390			
TP ratio in the country			35.2%			

3. Plans concerning Fuel Supplies

3-1 Review of the Great East Japan Earthquake

(1) Reactions of the government

The government requested the installation of emergency headquarters within the PAJ.

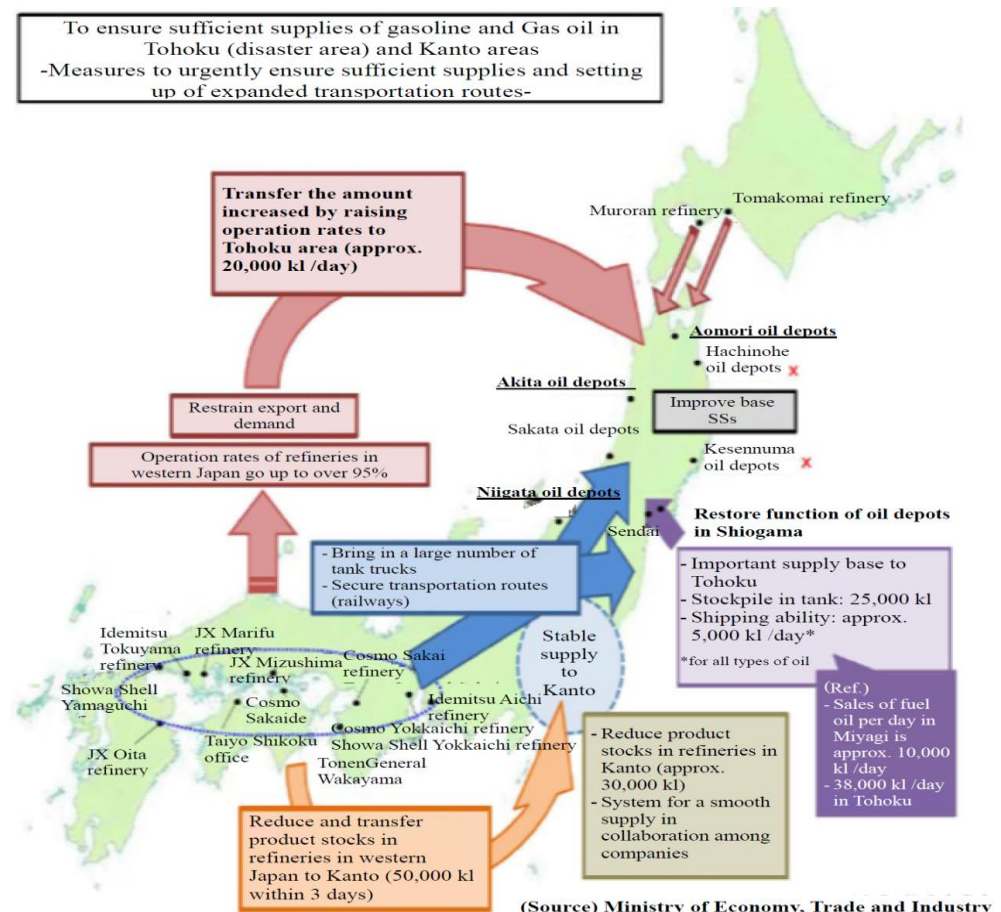
The government also requested oil suppliers via the PAJ to supply fuels as requested by the Official Residence of the Prime Minister.

They also determined to lower the mandatory private-sector storage.

(2) Reactions of the private sector

Immediately after the earthquake, **six oil refineries stopped** their operations. **Three oil refineries** then gradually resumed their operations by **March 21**. Non-damaged oil refineries increased their operations. Export of oil products was cancelled, and emergency oil import started.

Oil was transported from western Japan and Hokkaido to Tohoku region.



3. Plans concerning Fuel Supplies

3-2 Plans concerning Fuel Supplies in the Nankai Megathrust Earthquakes

A cross-group fuel supply system is established based on BCP*s, when many oil refineries, tanks, and stations in the Pacific coastal areas are damaged in the Nankai megathrust earthquakes.

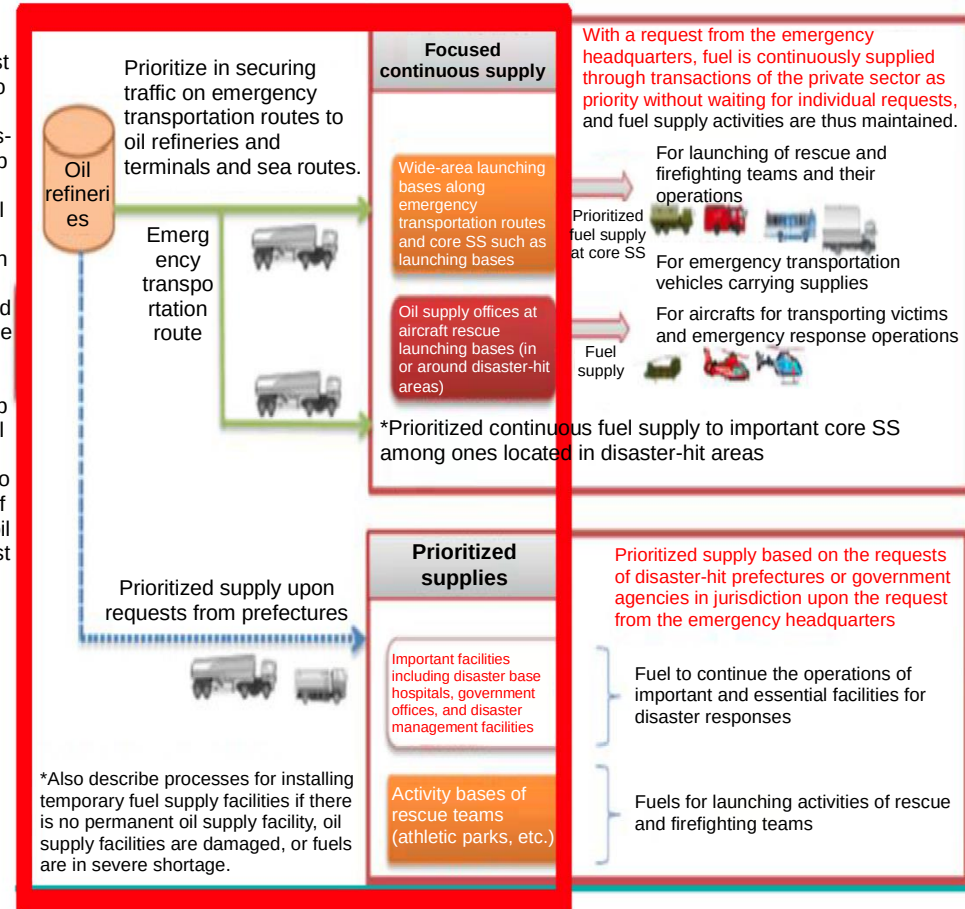
* BCP: Business Continuation Plans

Fuel transportation networks are quickly established by prioritizing in securing roads and sailing routes to oil refineries and oil tanks.

Smooth and prioritized supply of fuel to important facilities and rescue bases will be secured to continuous supply of fuel to focused areas.

After installing an emergency headquarters, Minister of Economy, Trade and Industry immediately advises the implementation of the emergency oil supply cooperation plan

Construction of cross-group fuel supply which is based on the BCP for group supply networks of the oil industry



Source: METI

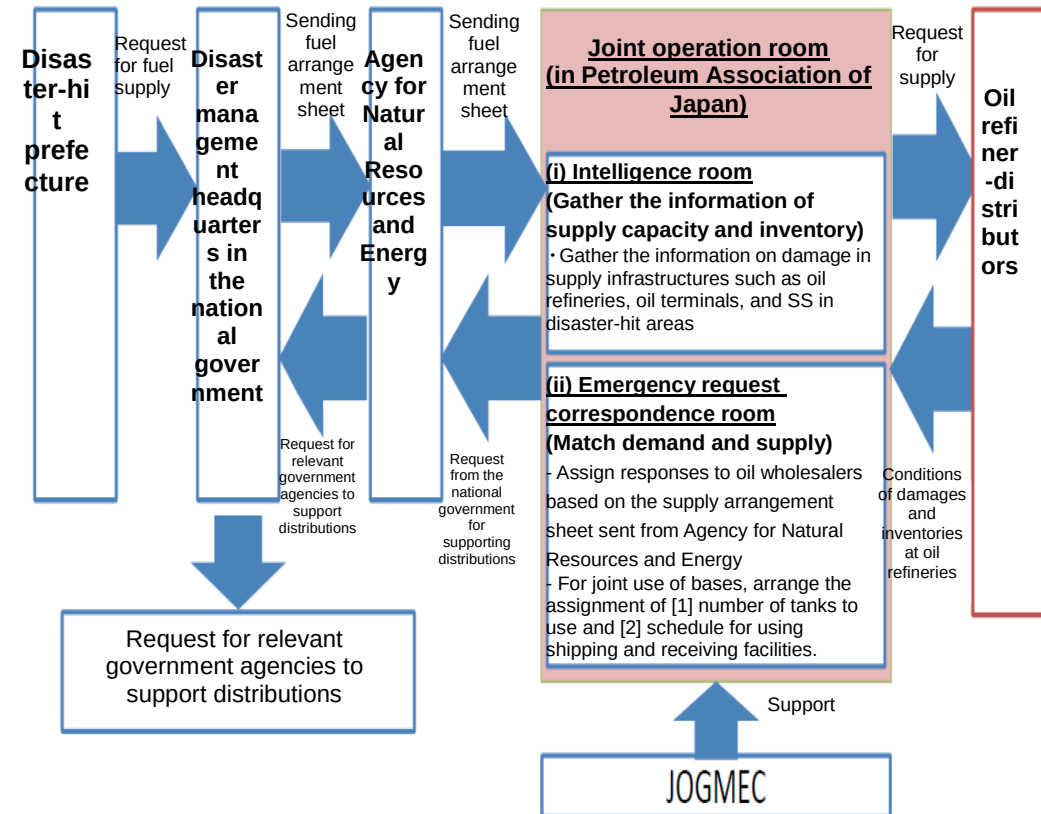
3. Plans concerning Fuel Supplies

3-3 Establishment of Fuel Supply Cooperation System of oil refiners

Learning from the experiences of the Great East Japan Earthquake, the system for submitting an emergency oil supply plan is already in place so that oil refiners can jointly supply oil.

The government is also going to implement a new system to ensure the smooth supply of gasoline and kerosene to hospitals, police departments, and shelters in cooperation with oil refiner-distributors in case of mega disasters.

The work flow of "Emergency oil supply cooperation plan" based on the Oil Stockpiling Act



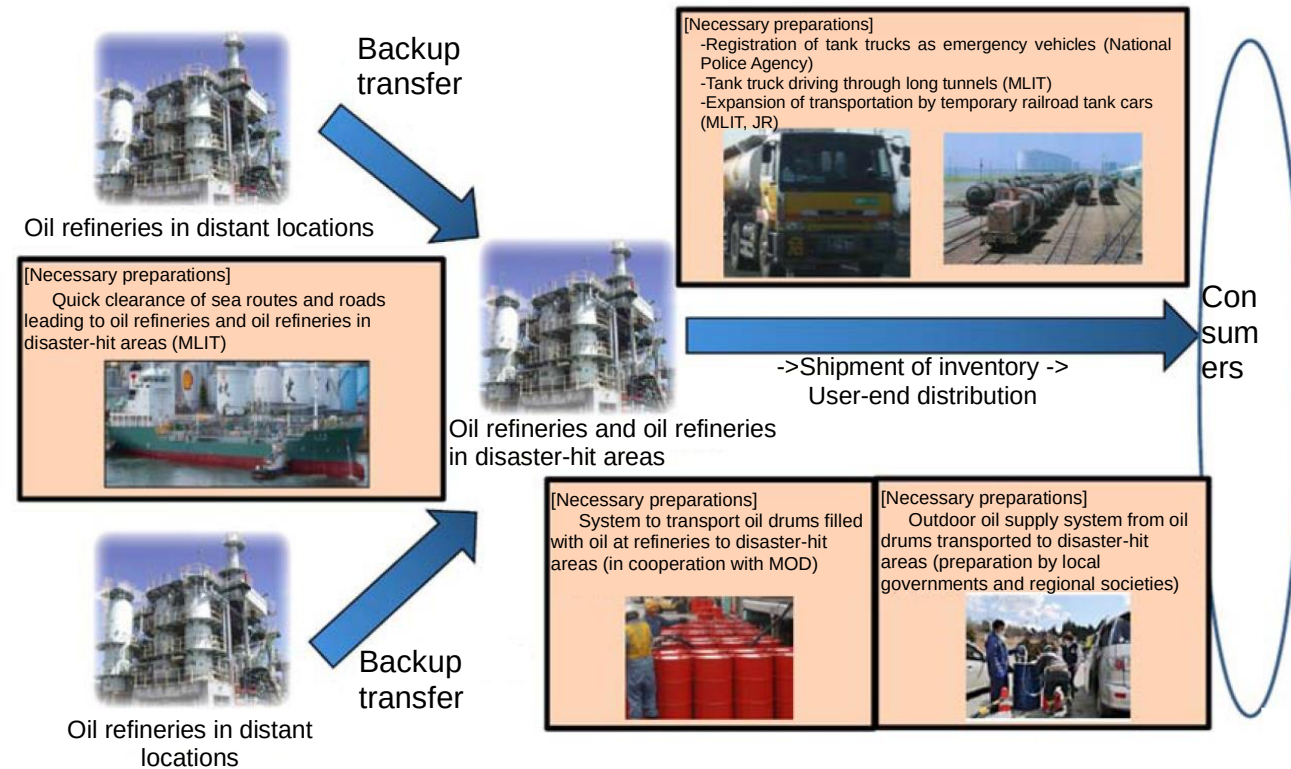
Source: METI

3. Plans concerning Fuel Supplies

3-4 Preparation of Supply Support Systems in cooperation with relevant government agencies

Supports of relevant government agencies are essential for inter-regional transfers of backup fuels and user-end distributions conducted by oil refiner-distributors and during disasters.

Preparation of emergency response programs and **joint training** concerning damage control in industrial complexes and the oil supply are being planned together with the Cabinet Office, Ministry of Defense, Fire and Disaster Management Agency, and National Police Agency.



Source: METI

3. Plans concerning Fuel Supplies

3-5 Maintenance and reinforcement of regional oil product supply chains.

The reinforcement of disaster response ability of regional oil product supply chains is important for controlling and reducing nationwide damage.

With this recognition, 20 to 40 **Core SS for disaster** equipped with power generators and large tanks that become regional oil product bases are going to be established in each prefecture.

About 1,700 **Core SS** have already been designated around the country.

Status of construction of core SS in Japan

Prefecture	Number of core SS		
Hokkaido	73	Mie	26
Aomori	35	Shiga	27
Iwate	58	Kyoto	14
Miyagi	44	Osaka	54
Akita	23	Hyogo	39
Yamagata	23	Nara	15
Fukushima	55	Wakayama	26
Ibaraki	55	Tottori	16
Tochigi	49	Shimane	16
Gunma	53	Okayama	42
Saitama	48	Hiroshima	43
Chiba	43	Yamaguchi	28
Tokyo	130	Tokushima	17
Kanagawa	38	Kagawa	21
Niigata	35	Ehime	21
Toyama	19	Kochi	6
Ishikawa	18	Fukuoka	31
Fukui	22	Saga	14
Yamanashi	19	Nagasaki	14
Nagano	54	Kumamoto	33
Gifu	53	Oita	33
Shizuoka	57	Miyazaki	33
Aichi	47	Kagoshima	37
		Okinawa	17
		Total	1674

Source: METI 12



Source: The Agency for Natural Resources and Energy

3. Plans concerning Fuel Supplies

- Training targeting core SS started in all prefectures starting in FY 2013.

(Detail of the training)

- Explanation of roles and duties of core SS and disaster response guidelines
- Measures to avoid confusions at SS in during disasters (role-playing)
- Method of operating and maintaining power generators
- Training to report conditions of damages based on disaster response guidelines



[Examples of cooperation among local governments and oil co-operatives]

Example 1: Oil co-operatives cooperated with the general disaster management training organized by the government of Tokyo. Fuel supply training was conducted at core SS to supply fuel to police vehicles (Nov. 2013).



Example 2: The prefecture and oil co-operatives organized training in Gunma. (*As a voluntary activity without using the subsidy) Fuel supply training was conducted at core SS to supply fuel to police vehicles (Mar. 2014).



Source: METI

4. Current Status of Implemented Measures and Challenges

Oil supply infrastructure reinforcement project (revised budget in FY 2015) 12.5 billion yen

It is important that the oil supply is continued by shipping stocks and reserves of fuels such as gasoline, diesel, and kerosene in oil refineries while oil refining functions are stopped after a massive earthquake.

Therefore, the national government allocated budgets for “oil infrastructure reinforcement projects”, “oil product shipping function reinforcement projects”. The government is thereby promoting these measures.

1) Safe emergency shutdown of facilities

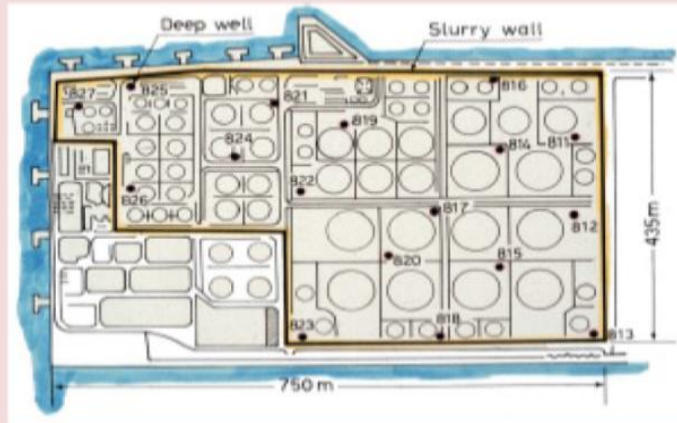
Reinforcement and other necessary measures for emergency shutdown valves of pipes and automatic tanker release systems to contribute to safe emergency shutdowns and prevent damages from spreading in case of emergencies

[2] Earthquake resistance reinforcement, prevention of ground liquefaction, and tsunami damage control

Earthquake resistance reinforcement of receiving and shipping facilities (tanker piers, seawalls, pipes in premises, tank truck shipping lanes, etc.), measures to prevent ground liquefaction, etc.

[3] Reinforcement of the capacity of acceptance and shipping facilities, preparation for quick recovery

Reinforcement of the capacity of acceptance and shipping pumps, tank truck shipping lanes, pipes in premises, and preparation for materials and equipment for early recovery in case of emergency



4. Current Status of Implemented Measures and Challenges

Oil product shipping function reinforcement project (budget for FY 2016) 5.1 billion yen.

Support for the purchase of "three-piece emergency set" at oil refineries

- [1] Emergency power generators
- [2] Emergency information communication system (satellite communications, etc.)
- [3] Oil drum filling and shipping facility



Shipping facilities are operated using emergency generators in oil refineries.



Oil drums are filled with oil and shipped.



Oil drums are transported to disaster-hit areas to supply oil there (provisional permissions for the storage and handling of explosives)

Source: METI