

# Energy Security of APEC Economies in a Changing Downstream Oil Environment

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## ❑ Traditional Oil Security

- Direct foreign investment to oil field in oil producing countries
- Diversification of crude oil import partners
- Petroleum refining at consuming countries
- Strategic oil stockpile

## ❑ Changing oil security environment

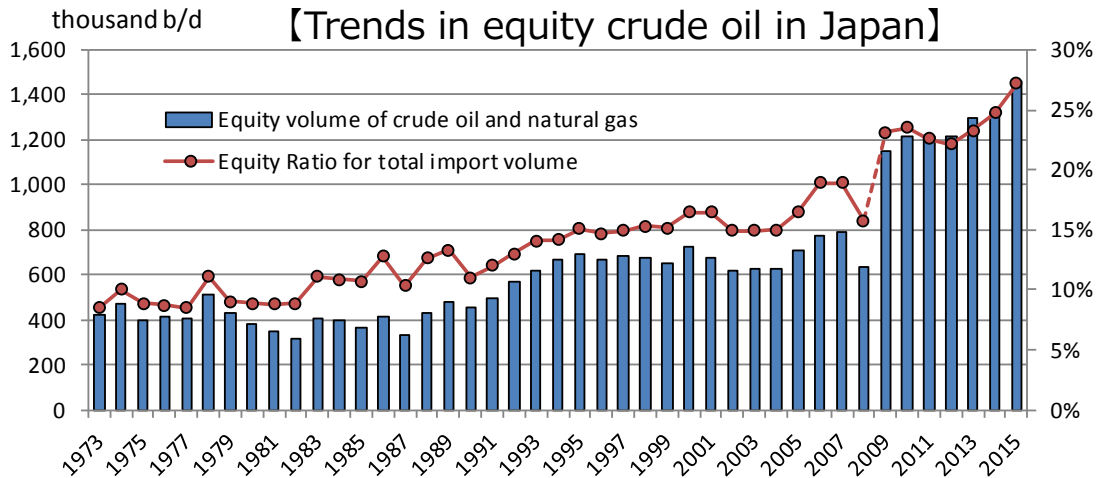
- Increase of crude oil supply from non-OPEC
- Change of strategy in OPEC
- Increase of trade volume of petroleum products

## ❑ To establish new oil security

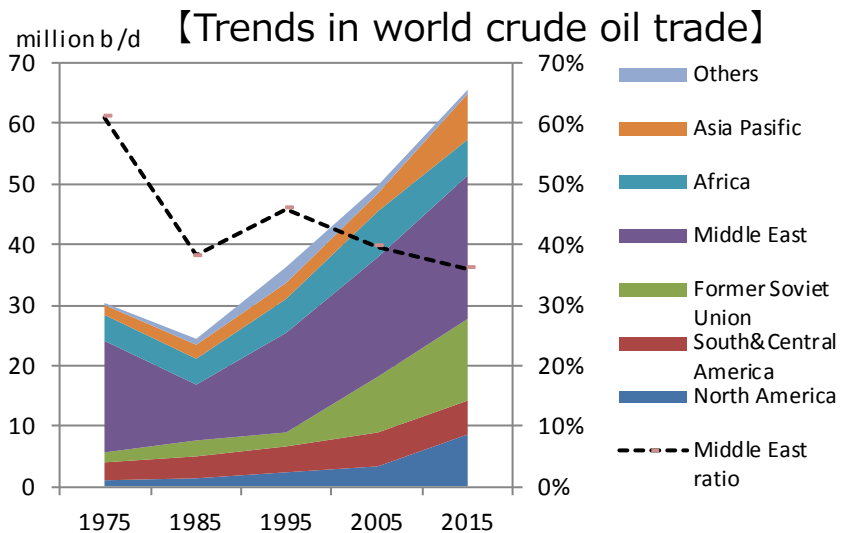
- Add refining capacity in the Pacific coast region and utilizing surplus capacity
- Security improvement by constructing a highly liquid product market
- Review the roll of stockpiling

# Traditional oil security

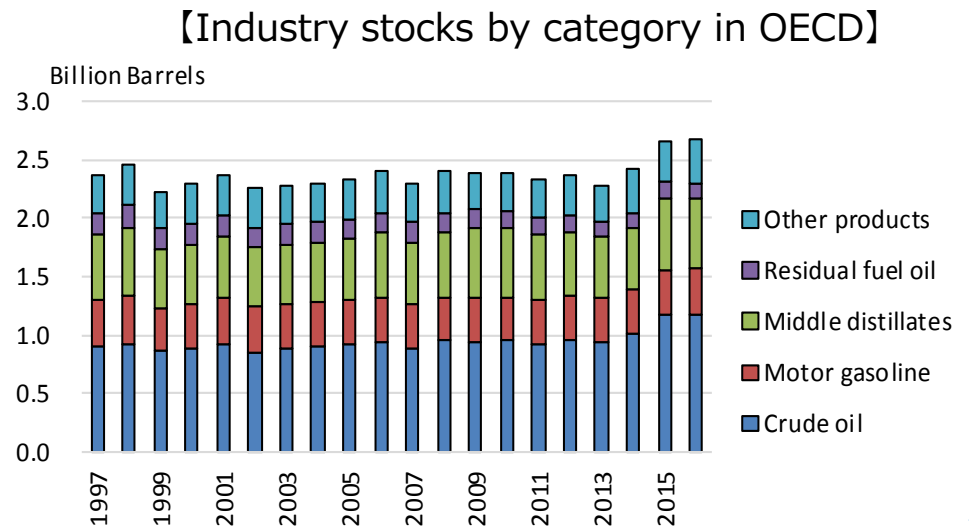
## Direct foreign investment to oil field in oil producing countries



## Diversification of crude oil import partners



## Stockpiling of crude oil and petroleum products



# Changing environment

Do we need to realign oil security reflecting the new environment?

- ❑ Increase in crude oil supply from non-OPEC
- ❑ Changes in oil strategy by OPEC
  - Cooperation with non-OPEC (Joint production cut since December 2016)
  - Expand downstream business (Develop refinery in consuming country)
- ❑ Increase in trade volume of petroleum products

(million ton)	Products Export			Products Import		
	2001	2016	Change	2001	2016	Change
USA	41.7	203.1	↗	118.3	104.5	
Other USA	75.1	67.8		35.5	160.3	↗
Europe	40.5	132.2	↗	105.3	200.8	↗
FSU	70.6	159.7	↗	5.5	13.9	
Middle East	107.9	184.3	↗	4.4	55.1	↗
Africa	39.3	34.4		18.3	92.4	↗
China	7.9	46.0	↗	28.0	74.5	↗
Japan	4.5	14.7		45.2	39.1	
Other Asia Pacific	61.4	263.0	↗	94.8	364.8	↗
· Australasia	5.0	3.9		4.4	27.6	
· India	na	61.9		na	30.0	
· Singapore	na	93.7		na	121.4	
· Others	56.4	103.5	↗	90.4	185.8	↗
Asia Pacific Total	73.8	323.7	↗	168.0	478.4	↗
Unidentified	26.4			20.0		
Total	475.3	1,105.2	↗	475.3	1,105.2	↗

【Products trade volume】  
Y2001 Y2016

475.3 ⇒ 1,105.2Mton

【Products tank capacity】  
Y2001 Y2016

2 ⇒ 9MMm<sup>3</sup>

Especially increase in Asia

- Refining capacity cannot keep up with the increase of oil demand.
- Presence of the trading market in Singapore.

# Oil in APEC economies

	Proved Reserve		Crude Prod. 2016 Mb/d	Oil Products Consumption		Refinery Capacity		TPES import ratio	Oil Import Ratio
	2016E Bn bbl	R/P Year		2015 Mb/d	2030(A) Mb/d	2015(B) Mb/d	B-A Mb/d		
Australia	4.0	30.3	0.359	0.870	1.047	0.512	▲ 0.535	298%	60%
Brunei	1.1	24.9	0.121	0.013	0.028	0.010	▲ 0.018	593%	-1269%
Canada	171.5	105.1	4.460	1.957	2.268	2.008	▲ 0.260	171%	-178%
Chile	0.2		0.012	0.295	0.409	0.233	▲ 0.176	35%	98%
China	25.7	17.5	3.999	10.770	16.412	10.710	▲ 5.702	84%	60%
Chinese Taipei	0.0		0.028	0.812	0.708	1.310	▲ 0.602	11%	100%
Hong Kong	0.0		0.000	0.065	0.092	0.000	▲ 0.092	na	100%
Indonesia	3.3	10.3	0.881	1.326	2.026	1.167	▲ 0.859	189%	43%
Japan	0.0		0.136	3.227	2.940	3.917	▲ 0.977	7%	100%
Korea	NA		0.097	2.043	1.926	2.970	▲ 1.044	18%	100%
Malaysia	3.6	14.0	0.705	0.564	0.912	0.527	▲ 0.385	112%	-8%
Mexico	8.0	8.9	2.456	1.742	1.986	1.540	▲ 0.446	98%	-42%
New Zealand	0.0		0.044	0.133	0.152	0.117	▲ 0.035	78%	70%
PNG	0.2		0.056	0.042	na	0.032	na	na	57%
Peru	1.2	24.0	0.135	0.295	0.577	0.193	▲ 0.384	104%	37%
Philippines	0.1		0.026	0.312	0.501	0.276	▲ 0.225	50%	96%
Russia	109.5	26.6	11.227	3.096	4.342	5.692	▲ 1.350	188%	-275%
Singapore	0.0		0.000	0.299	0.496	1.345	▲ 0.849	2%	100%
Thailand	0.4	2.3	0.479	1.063	1.421	1.246	▲ 0.175	56%	74%
United States	48.0	10.6	12.354	15.813	16.374	18.097	▲ 1.723	88%	40%
Viet Nam	4.4	36.2	0.333	0.373	0.466	0.148	▲ 0.318	95%	11%
APEC Total	381.1		37.908	45.110	55.083	52.050	▲ 3.065		

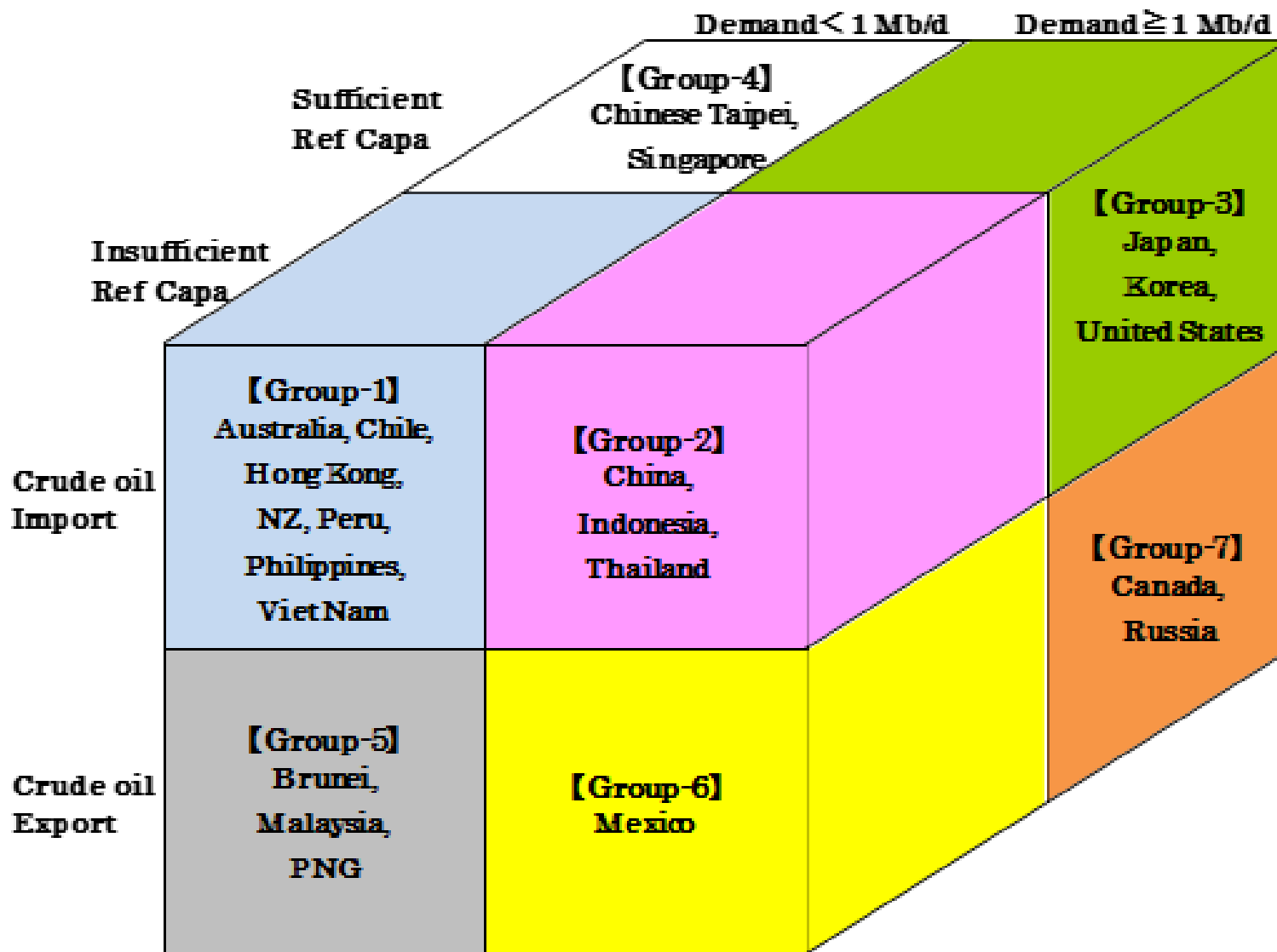
TPES=total primary energy supply

Source) Crude oil reserve, Production : BP Statistical Review of World Energy 2017

Oil consumption, Refining capacity : Convert (kb/d) from APERC data (Mtoe)

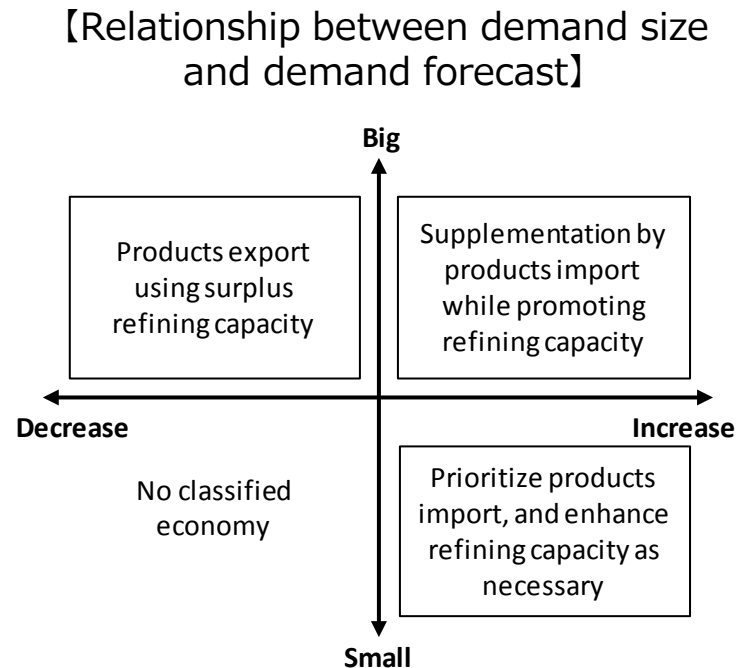
TPES import ratio, Oil import ratio : IEA, Energy Balance 2017

# How can we classify the economies?



# Security viewpoint and possible actions

- ① Import / Export position of crude oil
  - Importer :Supply security
  - Exporter :Demand security
- ② Refining capacity
  - Sufficient :Maximize operation and product export
  - Insufficient :Build up refining capacity, supply security of products
- ③ Size of oil demand
  - Large, increasing, credible:
    - Increase refining capacity
  - Small, decreasing, incredible:
    - Product export if sufficient in refining capacity
    - Product import if insufficient in refining capacity



# Suggested mid-stream security policy

	Develop own capacity	Utilize oil market	Utilize excess capacity
Australia		✓	
Brunei	(✓)	✓	
Canada	✓		
Chile	✓		
China	✓	✓	
Chinese Taipei			✓
Hong Kong		✓	
Indonesia	✓		
Japan			✓
Korea			✓
Malaysia	✓		
Mexico	✓		
New Zealand		✓	
PNG	(✓)	✓	
Peru	✓		
Philippines	✓		
Russia			✓
Singapore			✓
Thailand	(✓)	✓	
United States			✓
Viet Nam	✓		



# Policy recommendation 1

**Group 1:** Crude oil import, Insufficient refining capacity, Smaller demand size economies

Economy	Analysis	Implications
Chile, Peru	<ul style="list-style-type: none"> <li>- Depends on product import from N. America</li> <li>- Mainly via Panama Canal</li> <li>- Oil demand is expected to grow</li> <li>- Expansion of refining capacity shortage</li> </ul>	<ul style="list-style-type: none"> <li>- Refinery construction</li> <li>- Products import</li> </ul> <p>Peru : Utilize domestic natural gas to substitute oil</p>
Australia	<ul style="list-style-type: none"> <li>- Depends on Singapore market</li> <li>- Net exporter of TPES</li> </ul>	<ul style="list-style-type: none"> <li>- Strengthening oil stockpile for transportation demand</li> </ul>
Hong Kong New Zealand	<ul style="list-style-type: none"> <li>- A little refining capacity shortage in 2030</li> </ul>	<ul style="list-style-type: none"> <li>- Products import is better than refinery construction</li> </ul>
Philippines Viet Nam	<ul style="list-style-type: none"> <li>- Steady growth of oil demand</li> <li>- Expansion of refining capacity shortage</li> </ul>	<ul style="list-style-type: none"> <li>- Refinery construction</li> <li>- Products import during construction period</li> <li>- Enhance stockpile</li> </ul> <p>Viet Nam : Increase crude oil production</p>

# Policy recommendation 2

## Group 2: Crude oil import, Insufficient refining capacity, Larger demand size economies

Economy	Analysis	Implications
China	<ul style="list-style-type: none"> <li>- Extremely large demand size</li> <li>- Further oil demand increase</li> <li>- Great impact on international oil market</li> </ul>	<ul style="list-style-type: none"> <li>- Combination of refinery construction and product import</li> <li>- Refinery construction considering the uncertainty of demand growth</li> <li>- Concerted oil security development with global market</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>- Declining crude oil production</li> <li>- Increasing oil demand</li> <li>- Expansion of refining capacity shortage</li> </ul>	<ul style="list-style-type: none"> <li>- Refinery construction</li> <li>- Utilize domestic natural gas and coal to substitute oil</li> </ul>
Thailand	<ul style="list-style-type: none"> <li>- Declining crude oil production</li> <li>- Refining capacity shortage in the future</li> </ul>	<ul style="list-style-type: none"> <li>- Refinery construction for domestic demand is risky</li> <li>- Study a possibility to count foreign demand for potential new refinery</li> </ul>

# Policy recommendation 3

## Group 3: Crude oil import, Sufficient refining capacity, Larger demand size economies

Economy	Analysis	Implications
United States	<ul style="list-style-type: none"> <li>- Crude oil production supported by shale oil</li> <li>- Sufficient refining capacity for future oil demand</li> </ul>	<ul style="list-style-type: none"> <li>- Attention to shale oil production</li> <li>- Effective use of existing refining and storage capacity</li> <li>- Strengthen measures for natural disasters</li> </ul>
Japan Korea	<ul style="list-style-type: none"> <li>- Negligible crude oil resource and production</li> <li>- Declining oil demand</li> <li>- Different operation purpose of refinery</li> </ul>	<ul style="list-style-type: none"> <li>- Effective use of existing refining and storage capacity</li> </ul> <p>Japan : Considering increase oil product import rather than self-sufficient in refining capacity</p> <p>Korea : Reaffirm the role of refining capacity</p>

# Policy recommendation 4

**Group 4:** Crude oil import, Sufficient refining capacity, Smaller demand size economies

Economy	Analysis	Implications
Singapore	<ul style="list-style-type: none"> <li>- Asian oil trade hub</li> <li>- 4.5 times refining capacity against domestic demand</li> <li>- Hold large storage capacity</li> </ul>	<ul style="list-style-type: none"> <li>- Maintain liquid and transparent product market</li> <li>- Infrastructure development supporting enhanced trading</li> </ul>
Chinese Taipei	<ul style="list-style-type: none"> <li>- Declining oil demand</li> <li>- High oil import dependency</li> <li>- Products export using surplus capacity</li> </ul>	<ul style="list-style-type: none"> <li>- Review the roll of existing refining capacity</li> <li>- Effective using of existing refining and storage capacity</li> </ul>

**Group 5:** Crude oil export, Insufficient refining capacity, Smaller demand size economies

Economy	Analysis	Implications
Malaysia	<ul style="list-style-type: none"> <li>- Half of recoverable reserve are small scale fields</li> <li>- Become net crude oil importer in the future</li> <li>- Insufficient refining capacity</li> </ul>	<ul style="list-style-type: none"> <li>- Development of small scale oil fields</li> <li>- Increase refining capacity</li> <li>- Utilize natural gas to substitute oil</li> </ul>

# Policy recommendation 5

## Group 5: continued

Economy	Analysis	Implications
Brunei PNG	<ul style="list-style-type: none"><li>- Small oil demand</li><li>- Crude oil export position</li><li>- Insufficient refining capacity</li></ul>	<ul style="list-style-type: none"><li>- Develop small scale refining capacity</li><li>- Crude oil supply+outsource refining</li><li>- Petroleum products import</li></ul>

## Group 6: Crude oil export, Insufficient refining capacity, Larger demand size economies

Economy	Analysis	Implications
Mexico	<ul style="list-style-type: none"><li>- Crude oil export to the US+ products import from the US</li><li>- Decreasing crude oil export to the US</li><li>- Most of the crude oil production in Gulf of Mexico</li><li>- Domestic crude oil transmission by pipeline</li></ul>	<ul style="list-style-type: none"><li>- Pioneering crude oil export destination</li><li>- Increase refining capacity (ex. Expand Salina Cruz refinery, expand pipeline capacity to the Pacific coast)</li></ul>

# Policy recommendation 6

## Group 7: Crude oil export, Sufficient refining capacity, Larger demand size economies

Economy	Analysis	Implications
Canada	<ul style="list-style-type: none"><li>- Insufficient refining capacity in the future</li><li>- Crude oil production mostly in Mid-Western</li><li>- 33% increase of crude oil production in 2030 from 2016</li><li>- Over supply of crude oil even after the Keystone XL pipeline completed</li><li>- Small refinery capacity at the Pacific side</li></ul>	<ul style="list-style-type: none"><li>- Secure crude oil export destination</li><li>- Increase refining capacity at the Pacific coast</li></ul>
Russia	<ul style="list-style-type: none"><li>- Sufficient crude oil production and refining capacity in the future</li><li>- Declining oil production in the West Siberia</li><li>- Old fashioned refinery</li><li>- Export destinations mostly for Europe</li></ul>	<ul style="list-style-type: none"><li>- Develop East Siberia oil field and increase export to the Pacific coast</li><li>- Modernization of refinery</li></ul>

Liquid product market can compliment traditional oil security.

## 1. Add refining capacity in the Pacific coast and utilize surplus capacity

- Many economies are crude oil import position and insufficient refining capacity
- Develop own refinery when rationale (firm demand and economically viable).
- It could be economic option to utilize surplus capacities in some economies.

## 2. Create highly liquid and transparent oil product market

- Integration of quality standards for petroleum products
  - ⇒ Increase tradability, hence to reduce transportation and transaction cost of oil products.
  - ⇒ Easy to procure necessary products in emergency case.
- Abolish subsidies for petroleum products
  - ⇒ Make the market mechanism work under the appropriate price signals.

## 3. Review the strategic stockpile

- Balance between crude oil and oil products.
- Not only import disruption but also need respond to natural disaster more frequently.