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# Oil and Gas Security Indexation 2017

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In EWG 50 (14-18 December 2015), **Energy Security Indexation** was proposed as one of the topics under the Oil & Gas Security Studies (OGSS) research activities for 2016.

APERC presented the proposal on **Oil and Gas Security Indexation** in 2<sup>nd</sup> OGSN Forum (10 March 2016). The study objectives are:

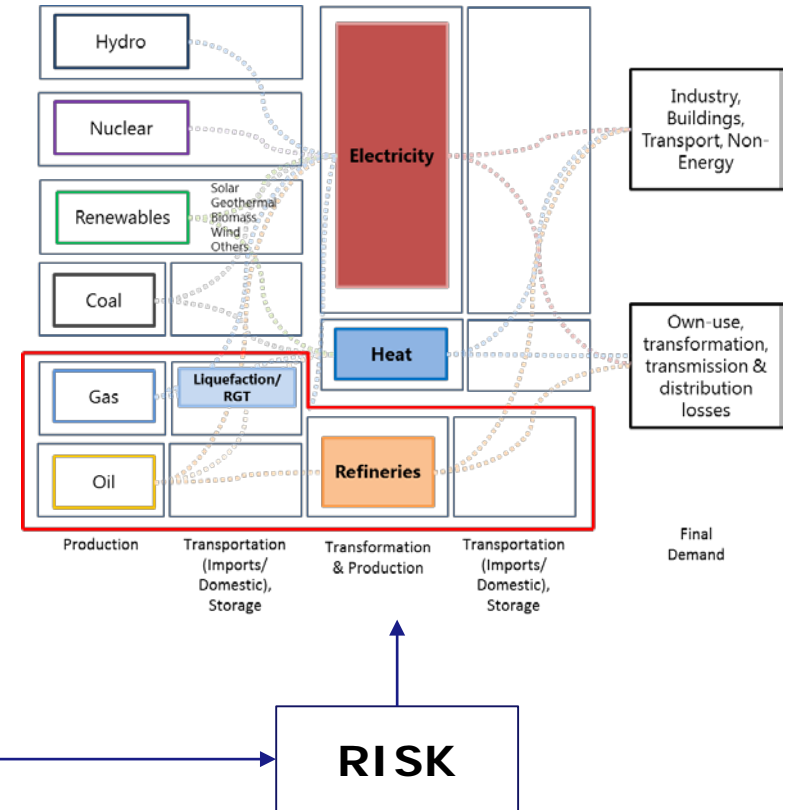
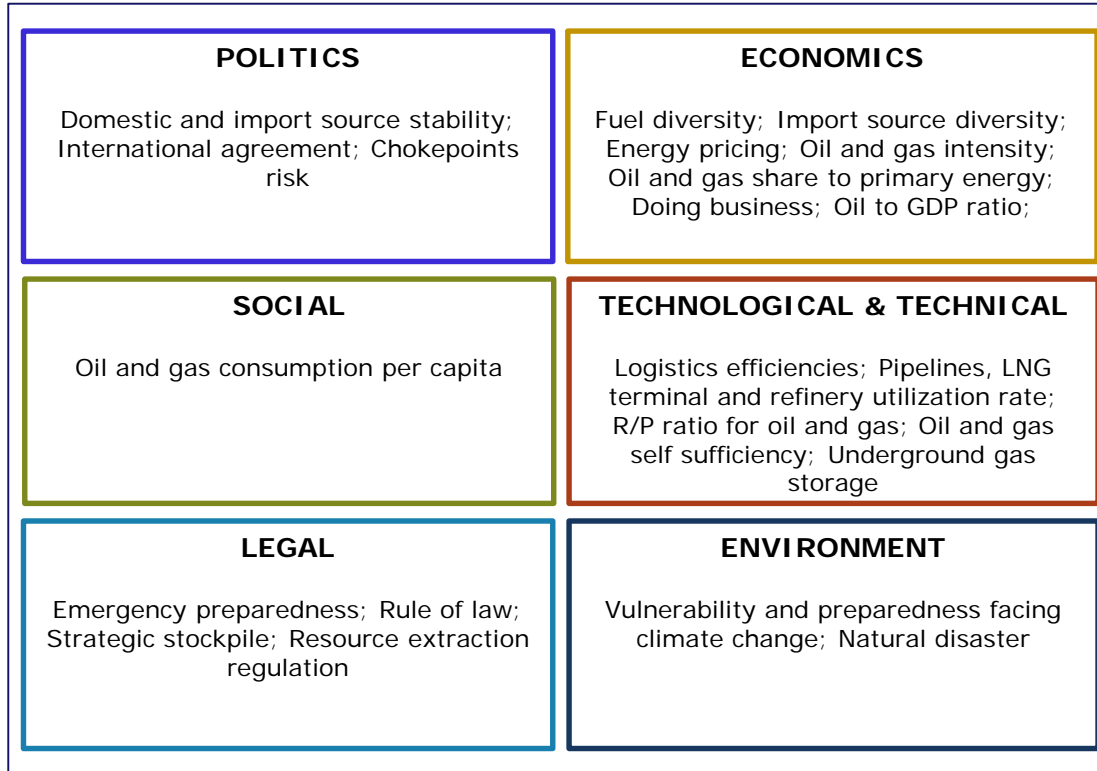
- Identifying the issues of potential risk on energy security
- Historical analysis and synthesis on energy trade, energy use etc
- No specific weightages applied on risk

In last OGSF in Irkutsk, APERC presented the results of the Oil and Gas Security Indexation by using the PESTLE methodology.

Not all indicators are relevant to one's economy but APERC hopes that this study may help individual economy to established their own energy supply security index.

# Many factors may contribute to supply interruptions

## Identifying factors by using PESTLE methodology



*Previous study focuses on production, transportation and to some extent transformation in oil and gas. Each segment poses its own challenges and supply disruption risk.*

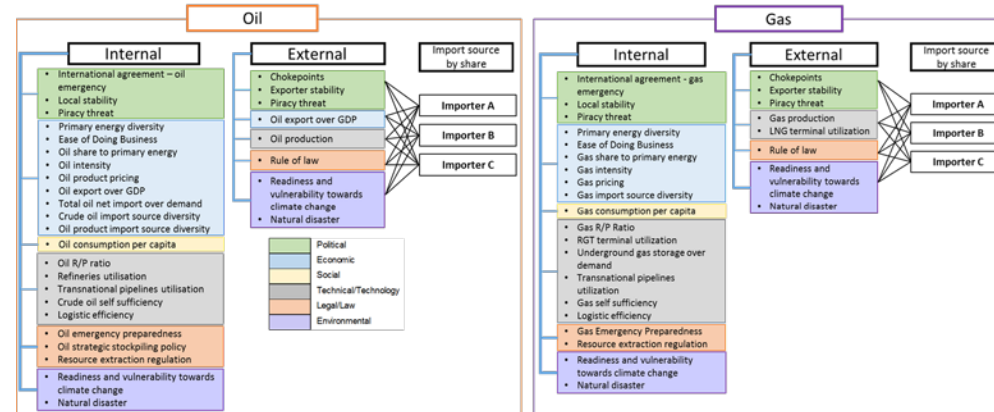
Source: APERC analysis



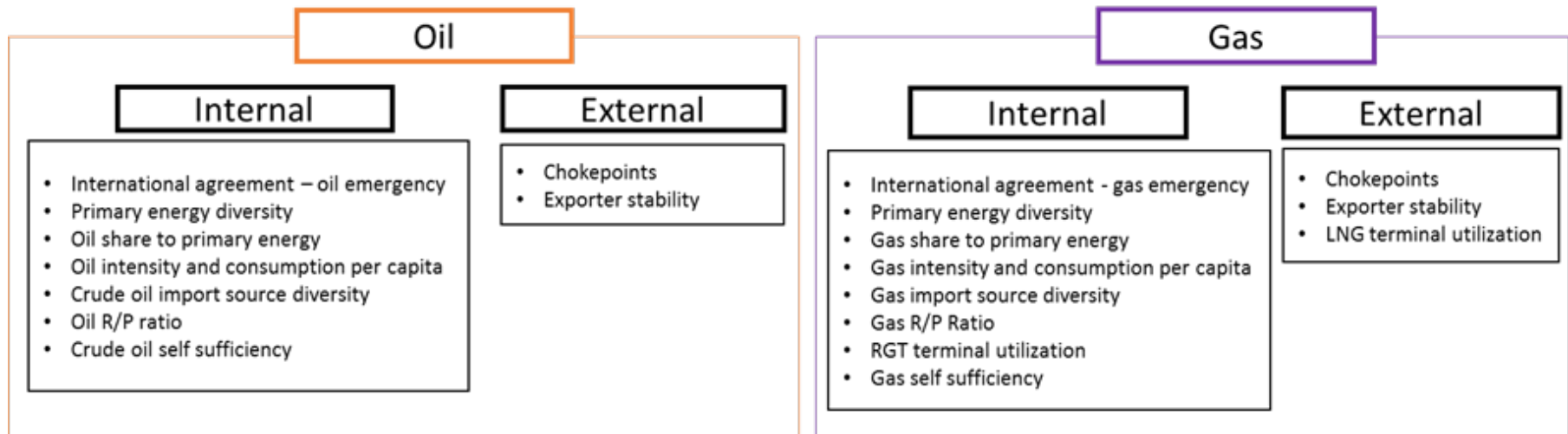
# Updates On Methodology

- A simplified version with lesser indicators without assigning to any PESTLE group.
- Maintained the calculation method for each indicator.
- The index focused on crude oil only
- Data updated to 2015

## Full version of indexation



## Simplified version of indexation




























## Key Findings:

- Overall supply security for APEC region improved slightly in 2015 when compared to 2013.
- The diversity of primary energy, oil self sufficiency and lower risk in chokepoints contributed to the improvements
- Risk in reserve to production (R/P) ratio of oil, higher oil share to primary energy and a slight increase in exporters stability offset some the overall risk reduction
- Papua New Guinea recorded the high risk reduction in oil supply security as more gas is being used in the economy. The Philippine and Viet Nam recorded highest risk increase as demand for oil increase rapidly while local production is not or barely enough to meet the demand

# Oil supply security index

## Oil Supply Security Risk by indicators, 2013 and 2015

Oil	2013	2015	Changes
Primary energy diversity	27.2 	26.5 	-0.6 
International agreement – oil emergency	47.6 	47.6 	0.0 =
Oil share to primary energy	28.3 	28.7 	0.3 
Oil intensity and consumption per capita	64.5 	64.6 	0.0 =
Oil import source diversity	8.5 	8.7 	0.2 
Oil R/P ratio	6.1 	11.3 	5.2 
Oil self sufficiency	26.0 	21.9 	-4.1 
Chokepoints	38.7 	35.0 	-3.7 
Exporter stability	54.2 	54.6 	0.4 

Internal factors

External factors

Sources: APERC analysis.

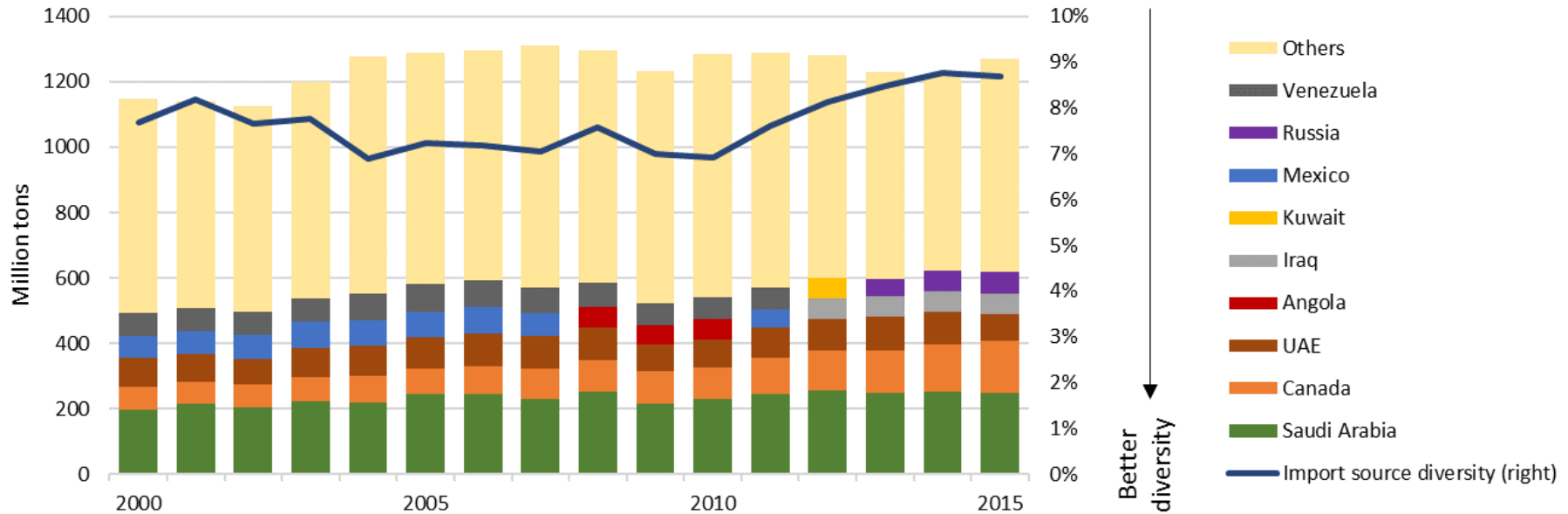
- **As more renewables being used, primary energy diversity improves. However, oil share to primary energy increased, particularly in developing economies.**
- **APEC-wide oil self-sufficiency improved by more than 4 points because of higher production in the US and Russia. Despite the improvement, the level self-sufficiency at economy level differs greatly.**

Lower index represent lower supply risk

Some numbers may not calculated correctly due to rounding adjustment

# APEC continue to rely on Middle East for crude oil supply

## Crude oil import source (top 5)

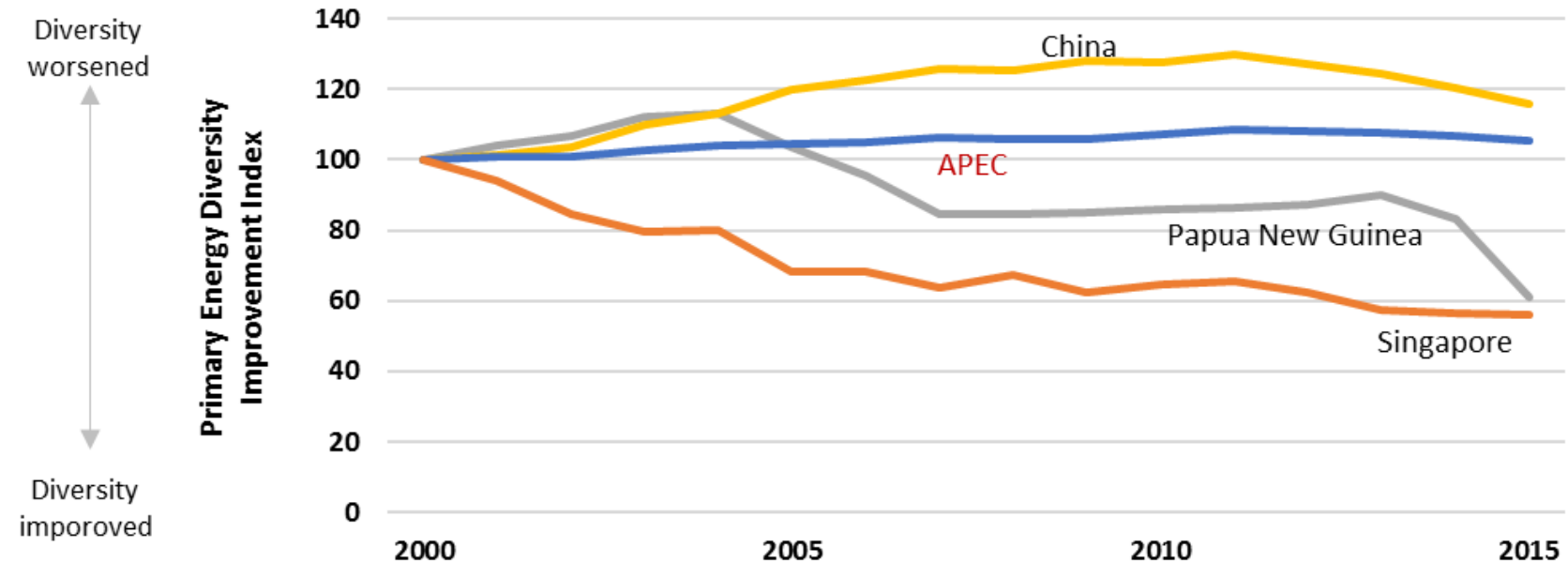


Sources: UN Comtrade and APERC analysis.

***Despite high reliance on Middle East, oil imports from APEC members i.e Canada and Russia are increasing***

# APEC's Primary Energy Diversity improved slightly since 2011

## Primary Energy Diversity, 2000-15



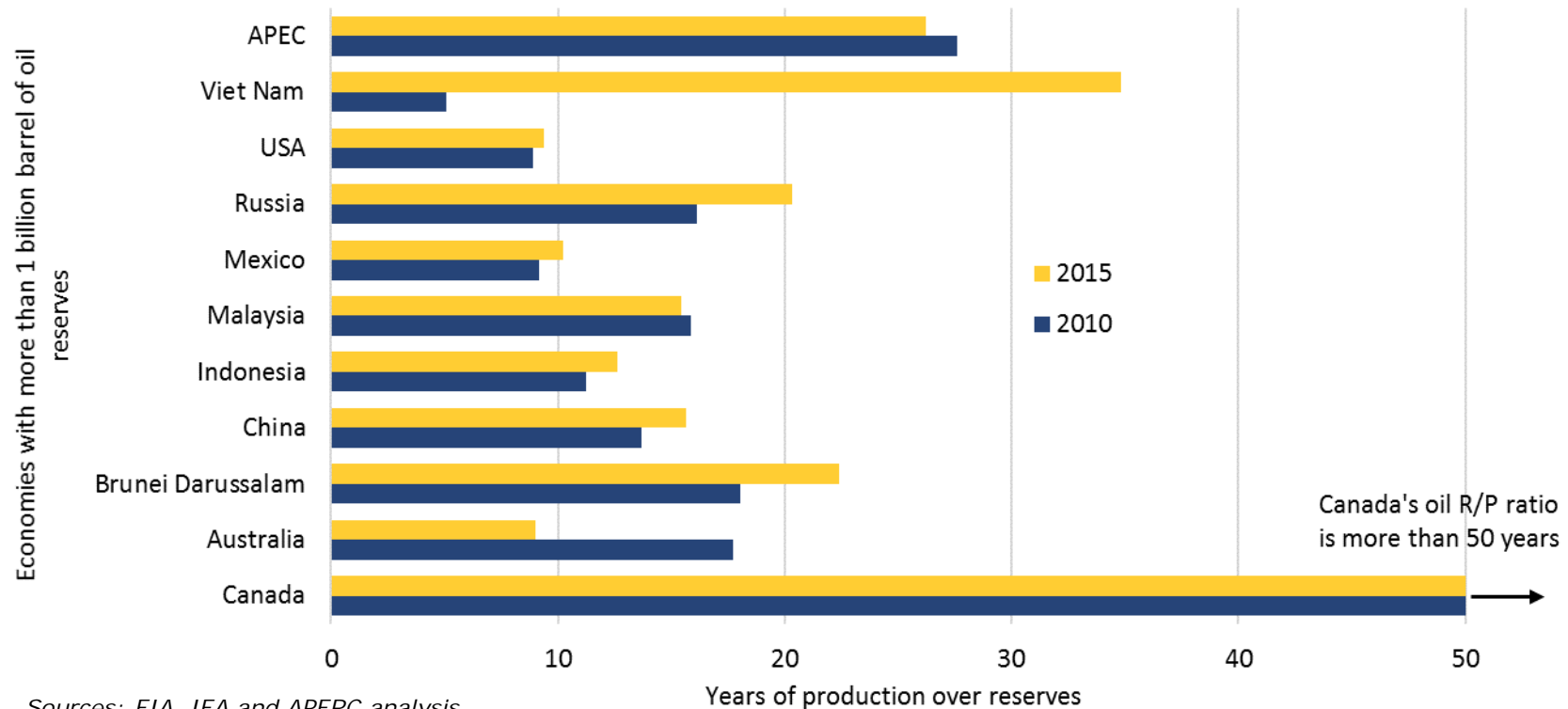
Sources: APERC analysis.

- *Singapore showed the best improvement in energy diversity since 2000*
- *Papua New Guinea showed a sharp decrease in diversity risk as gas gaining a huge share in the mix*
- *China's energy diversity deteriorate for 2003-2011 period as coal becomes really dominant the energy mix. However, things improved since 2011 as more gas and renewables being consumed*



# APEC's reserves to production ratio decreased slightly

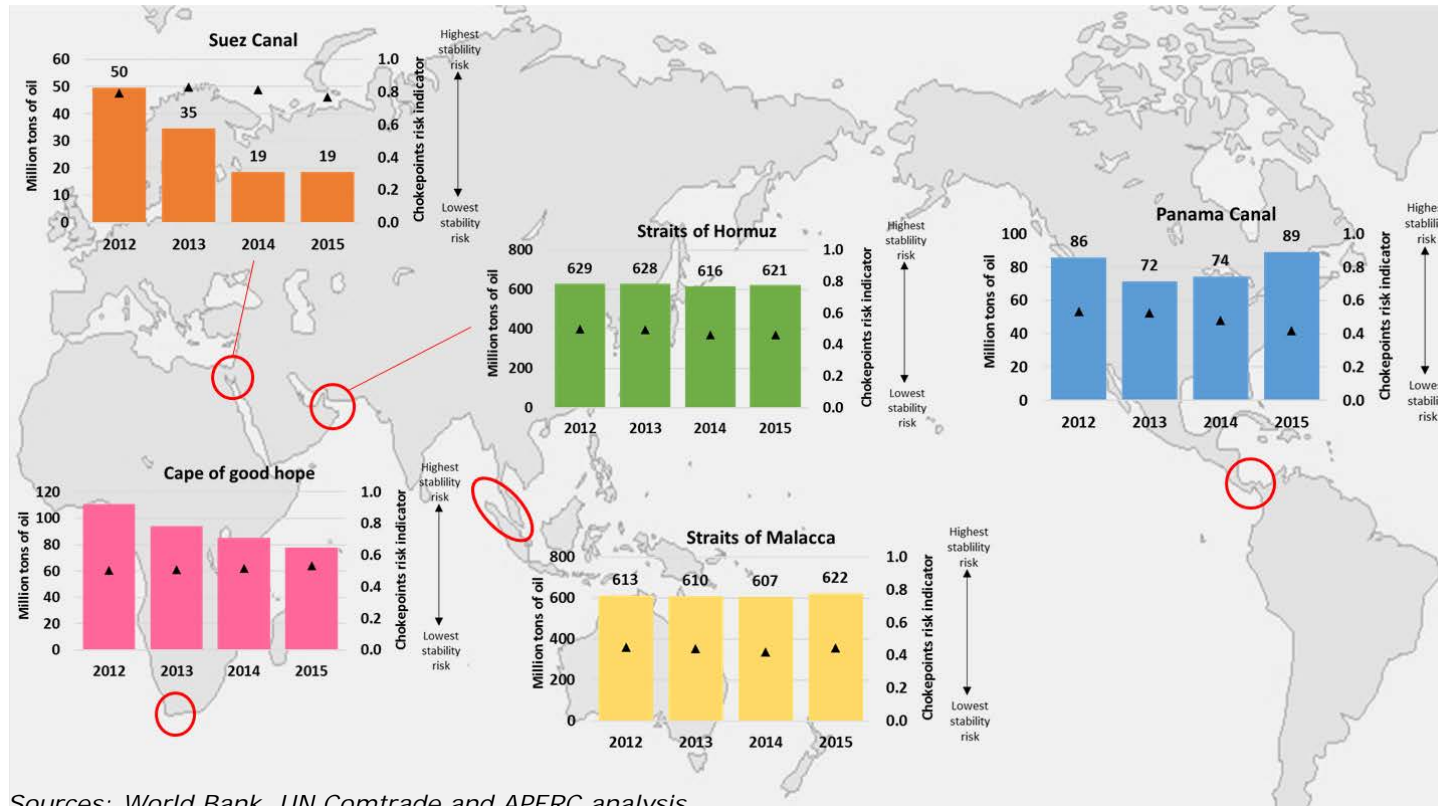
## Reserves to production ratio, 2010 and 2015



*The low oil price environment may result to lower exploration mission in APEC, which subsequently reduced APEC's R/P ratio*

# Straits of Malacca and Hormuz continue to be the major transit point for oil import to APEC

## Chokepoints risk derived from surrounding economies stability, 2012-15

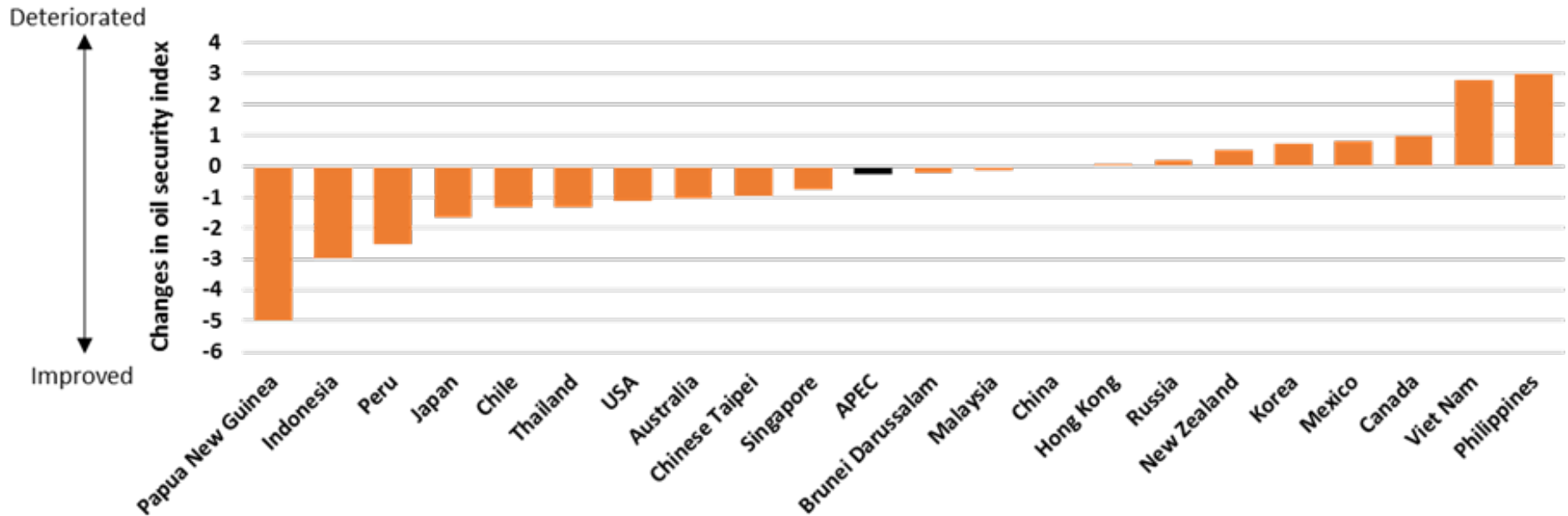


Sources: World Bank, UN Comtrade and APERC analysis.

***In 2015, two-third of crude oil imports to APEC passed through at least one of these chokepoints***

# Higher oil demand increased the supply risk in some economies

## Changes in average of oil security risk index, 2013 and 2015



***Most APEC members showed improvements because of lower oil consumption, improvement in oil reserves, lower risk from import sources and highly stable domestic situation***

Source: APERC analysis






























Note: Oil includes crude and product

## Key Findings:

- Overall supply security for APEC region deteriorate slightly in 2015 when compared to 2013.
- Two indicators contributed to the risk increase – Gas R/P ratio and LNG (production) terminal utilization. The latter indicator can be a bigger issue in the future if there is no major investment made now.
- LNG sources become a bit more diverse in 2015 than 2013 while gas consumption per capita and intensity decreased, which subsequently offset the increase in supply security risk.
- Higher intra-APEC LNG trade managed to reduce chokepoints risk
- Papua New Guinea notched the highest deterioration in gas supply risk (an offset to oil security risk index) as more gas being used in the energy mix. Korea on the hand managed to reduce the supply risk because of lower share of gas to primary energy and lower gas consumption per capita



## APEC continue to be a gas self-sufficient region...

Gas	2013	2015	Changes
Primary energy diversity	27.2 	26.5 	-0.6 
International agreement - gas emergency	59.5 	59.5 	0.0 =
Gas share to primary energy	20.7 	20.9 	0.2 
Gas intensity and consumption per capita	53.8 	53.3 	-0.5 
Gas import source diversity	9.9 	9.7 	-0.3 
Gas R/P Ratio	5.4 	8.9 	3.6 
RGT terminal utilization	33.3 	30.8 	-2.5 
Gas self sufficiency	0.0	0.0	0.0 =
Chokepoints	15.4 	12.7 	-2.6 
Exporter stability	42.7 	42.4 	-0.3 
LNG terminal utilization	89.8 	96.2 	6.3 

Internal factors

External factors

Sources: APERC analysis.

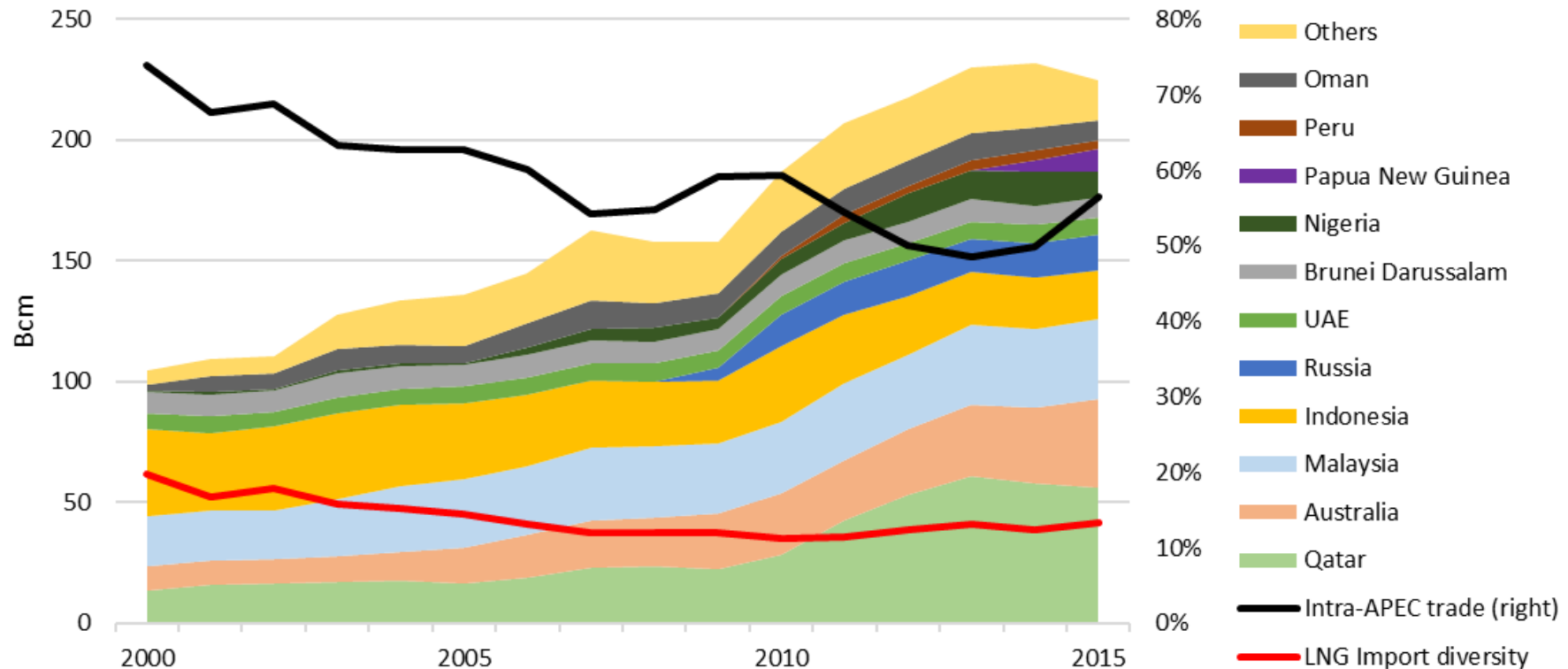
**...although different level of sufficiency can be seen among members. Risk on infrastructure utilization posed the highest risk changes as the utilization rate of export terminal becomes higher**

Lower index represent lower supply risk

Some numbers may not calculated correctly due to rounding adjustment

# Intra-APEC trade for LNG improved slightly in 2015

## LNG import source (top 5)

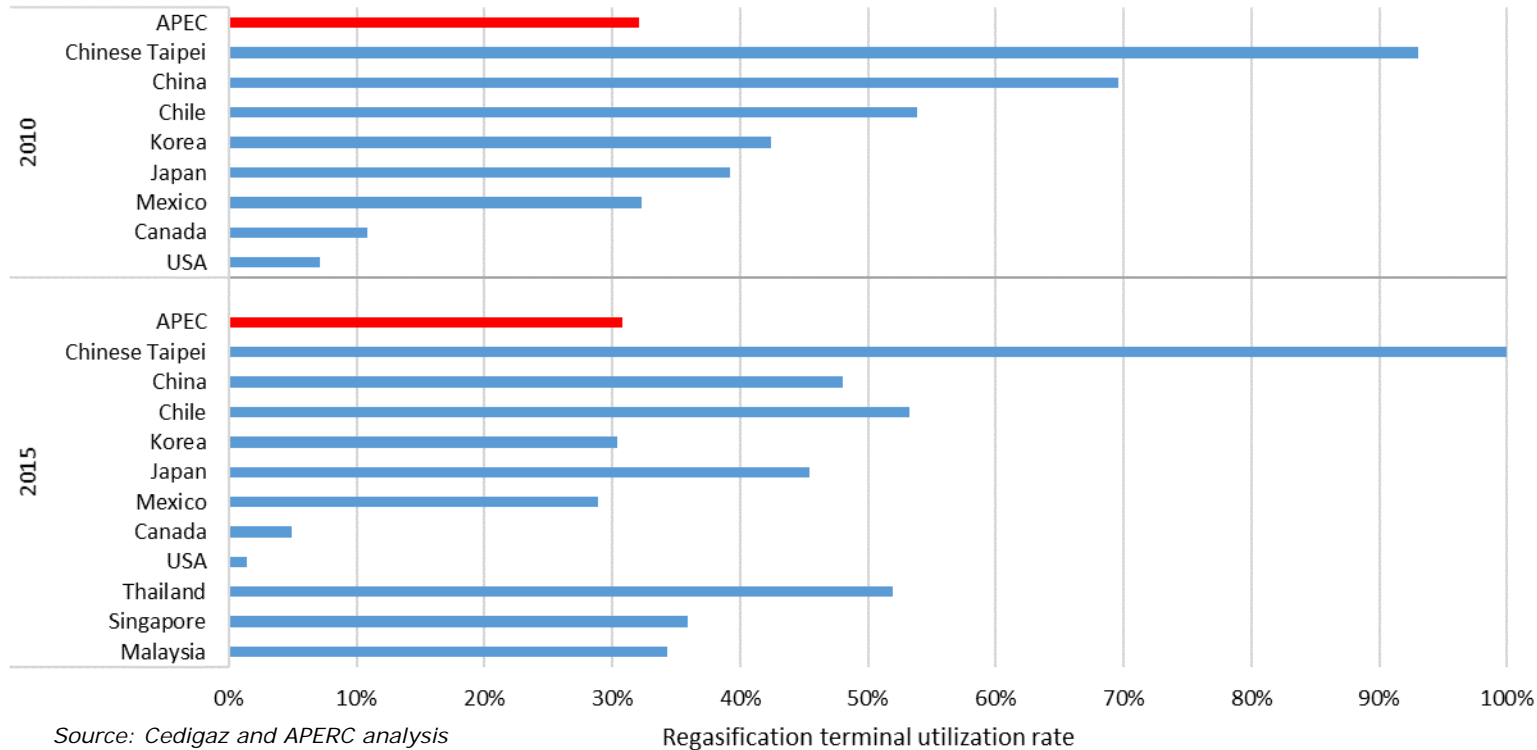


Sources: Cedigaz and APERC analysis.

***New production from Australia improved Intra-APEC trade shares to nearly 60%, a trend that might continue in near future with completion of export terminal in Australia, Malaysia and the US***

# APEC LNG import terminal utilization rate improved as the US produced more domestic gas

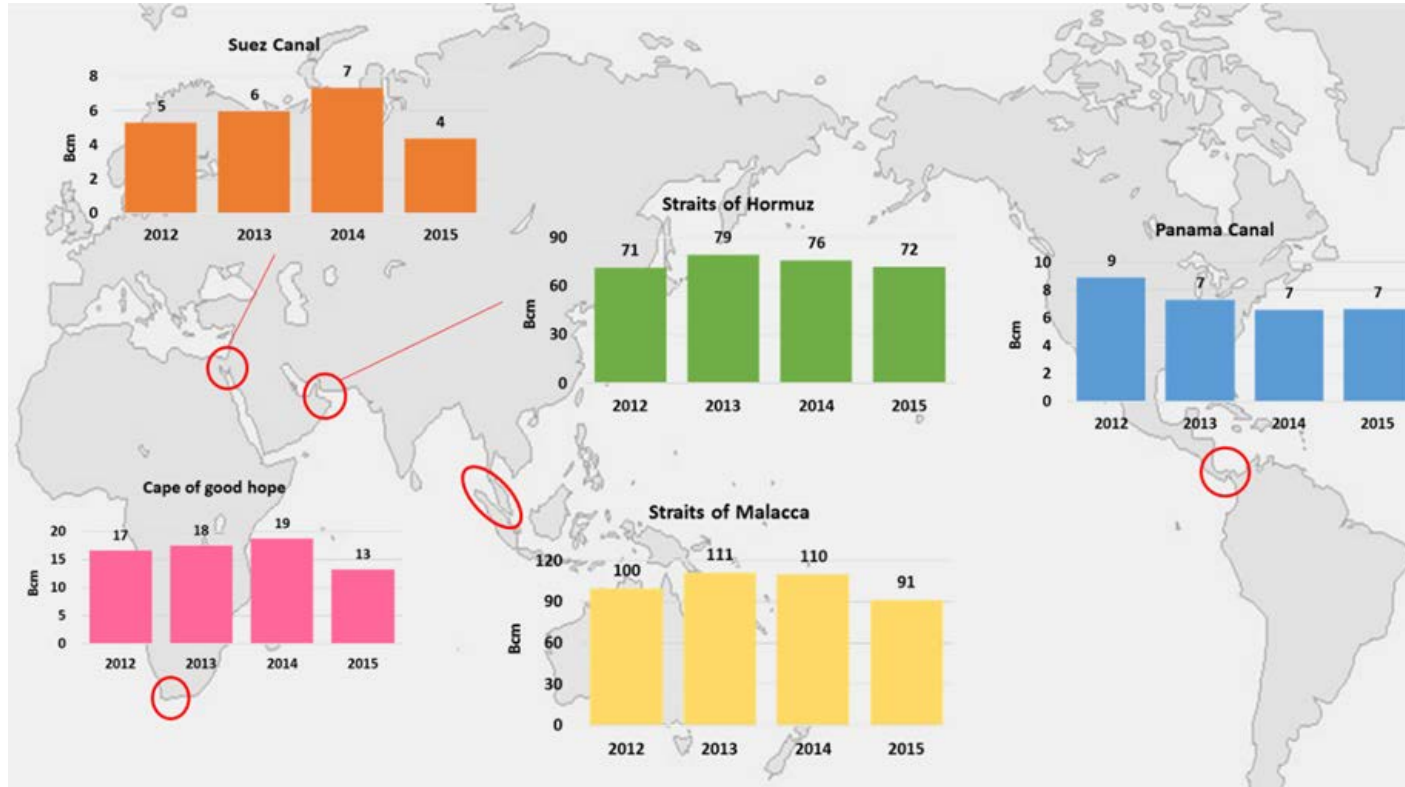
## Annual regasification terminal utilization rate, 2010 and 2015



***More than half of APEC members owned RGT in 2015, up from only 8 economies in 2010. This trend will continue in the future with new RGT expected in the Philippines and Viet Nam.***

# As Intra-APEC trade improved, chokepoints risk decreased

## LNG Imports to APEC, 2012-15



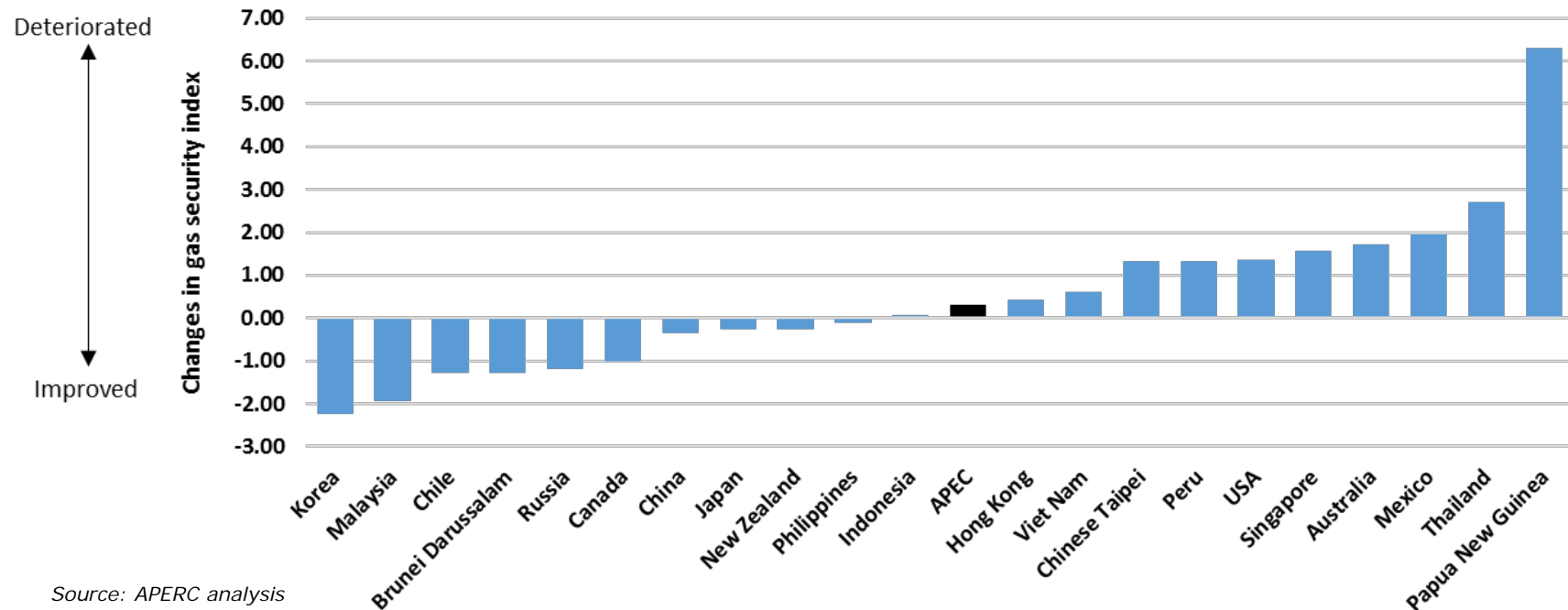
Sources: World Bank, Cedigaz and APERC analysis.

***As 40% of LNG imports to APEC passed through at least one of these chokepoints, a more diversified (and APEC Centric) trade can reduced the chokepoints risk***



# Unconventional gas managed to improve gas security in North America

## Changes in average gas security index, 2013 and 2015

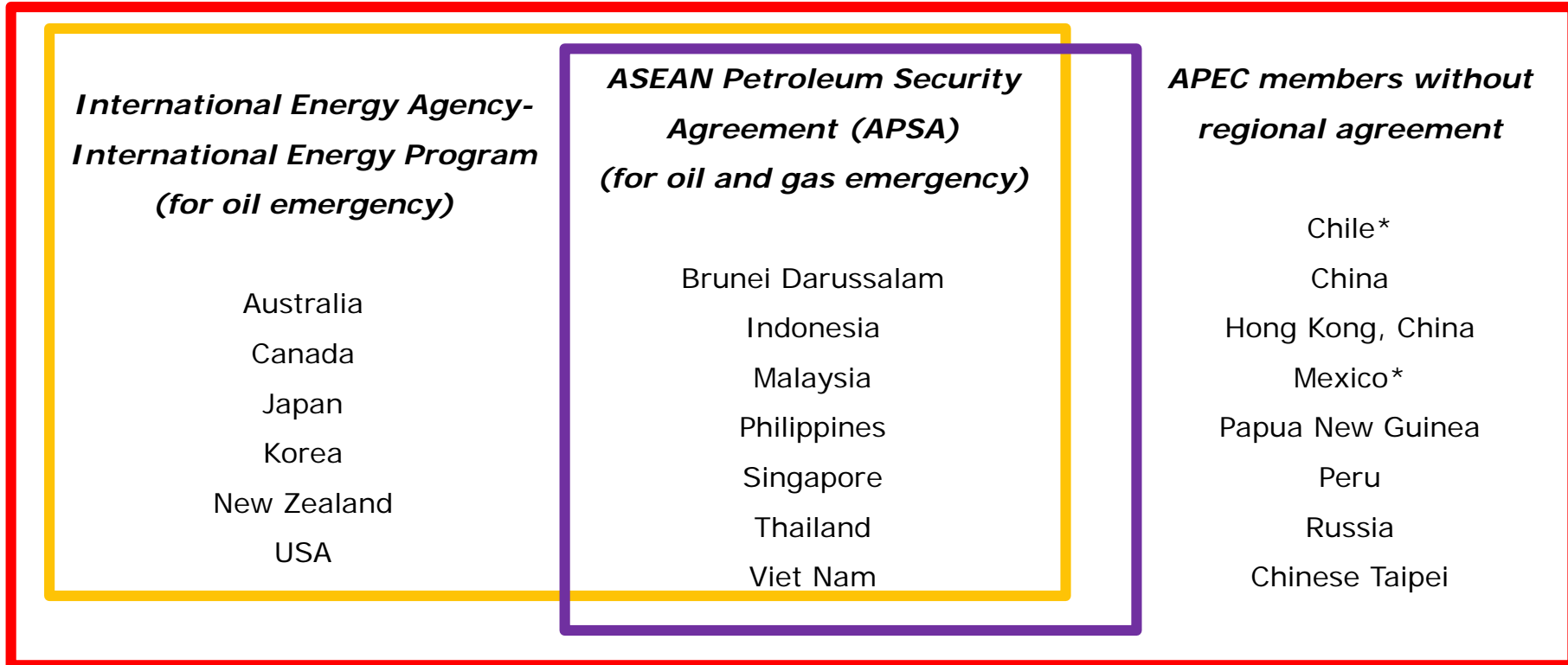


Source: APERC analysis

***...But nearly half of APEC members gas security index deteriorated because of the increase in gas consumption, higher dependency on imports and lack of infrastructure to meet demand***

# A regional agreement for emergency supply will help to improve supply security

## International/regional emergency supply agreement



*A region-wide agreement will be able to lower risk of supply of disruption*

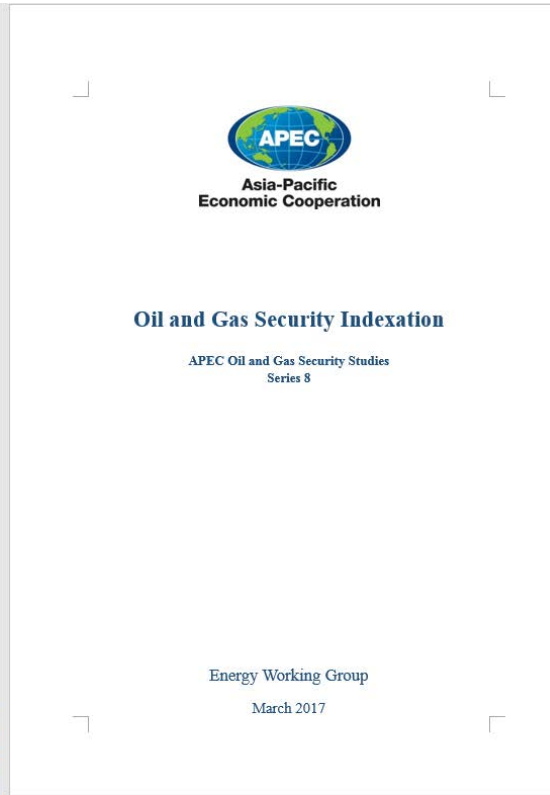
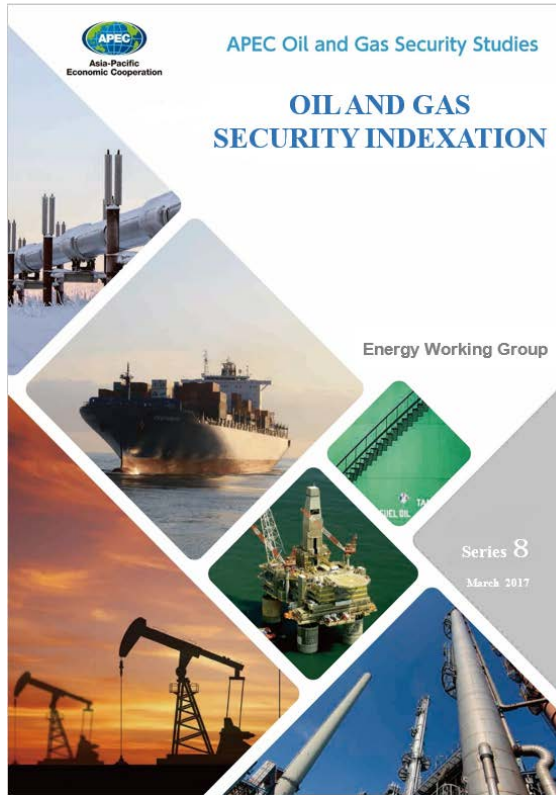
Source: IEA, ASCEAN and APERC analysis

Note: Chile and Mexico are currently candidate economies for IEA membership

## Reiterating the same message from previous study

- APEC economies should try to expand intra-APEC energy trade as APEC members are politically stable
- APEC could consider formulating a strategy for possible joint stockpiling among and between member economies, which could improve the region's overall risk on supply disruptions
- Reducing oil demand or oil intensity will help improve supply security, as demonstrated by some of the APEC economies (such as New Zealand)
- APEC may consider developing its own oil and gas security framework agreement covering supply sharing in the event of domestic or regional supply emergencies.

# Download links



- [http://aperc.ieej.or.jp/file/2017/5/16/Oil\\_and\\_Gas\\_Security\\_Indexation.pdf](http://aperc.ieej.or.jp/file/2017/5/16/Oil_and_Gas_Security_Indexation.pdf)
- [http://publications.apec.org/publication-detail.php?pub\\_id=1838](http://publications.apec.org/publication-detail.php?pub_id=1838)



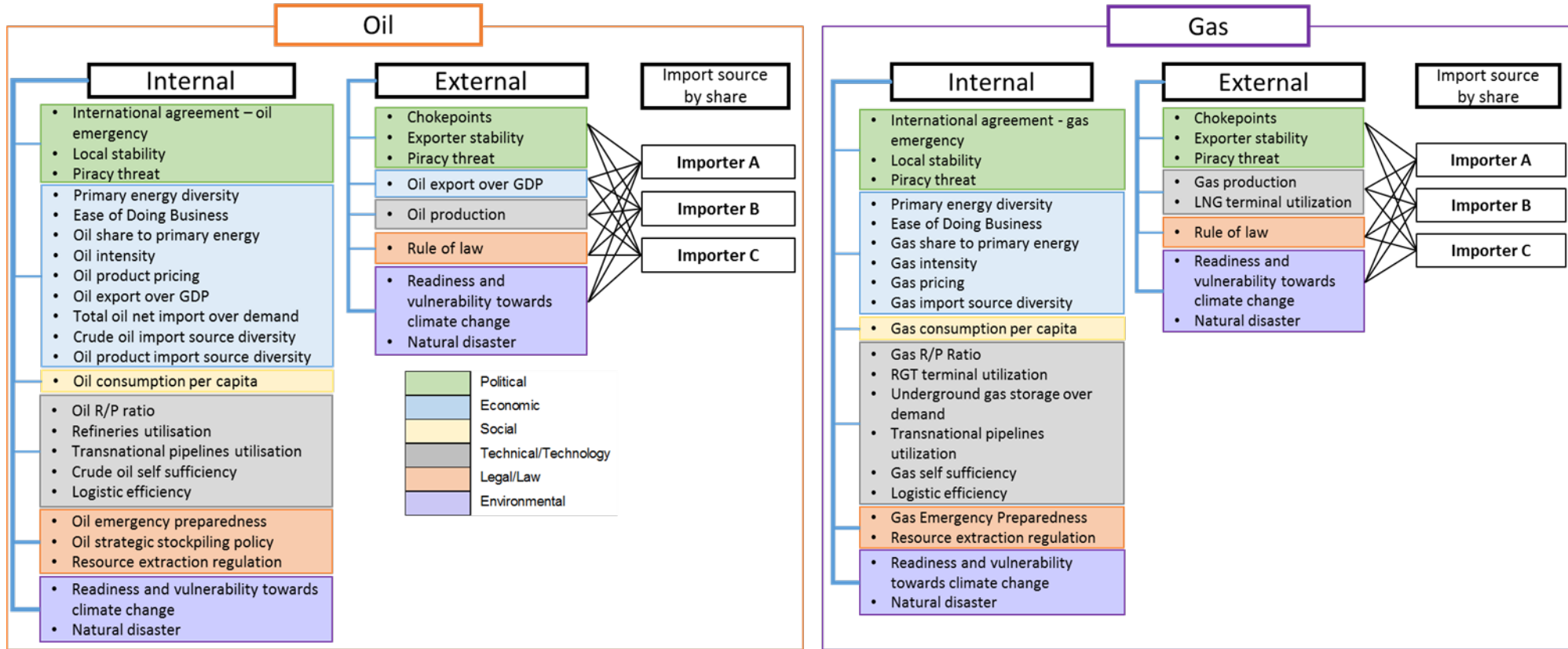


**Thank you for your kind attention**

<http://aperc.ieej.or.jp/>

# Index Building Blocks

## Oil and gas security indexation sub-indicators



***Each segment poses its own challenges and supply disruption risk.***

Source: APERC analysis

Notes: Oil includes crude and product. However, external risk for crude and product is calculated separately. Each import source was calculated separately

## Source of information and data

- Trade data (UN Comtrade)
- World Governance Indicator 2014 (World Bank)
- Piracy and Armed Robbery against ship (International Chamber of Commerce - Maritime Bureau)
- Doing Business Report 2004-2015 (World Bank)
- Logistic Performance Index 2006-2013 (World Bank)
- World Economy Outlook 2013 (International Monetary Fund)
- Global Petroleum Survey 2007-2014 (Frasier Institute)
- University of Notre Dame Global Adaptation Index (ND-GAIN) 1995-2015
- Centre for Research on the Epidemiology of Disasters (CRED)
- World Energy Statistics 2015 (IEA)
- International Energy Statistics (EIA)
- Oil and Gas Security Forum (APERC)
- Oil and Gas Journal (subscription)
- Cedigaz (subscription)
- World LNG Report (IGU)

***APERC has been trying to use open data as much as possible. Since this study is focusing on supply risk, the lower index reading become means better supply security.***