APERC Workshop
The 49th APEC Energy Working Group and Associated Meetings
Gyeongju, Republic of Korea, 22 June, 2015

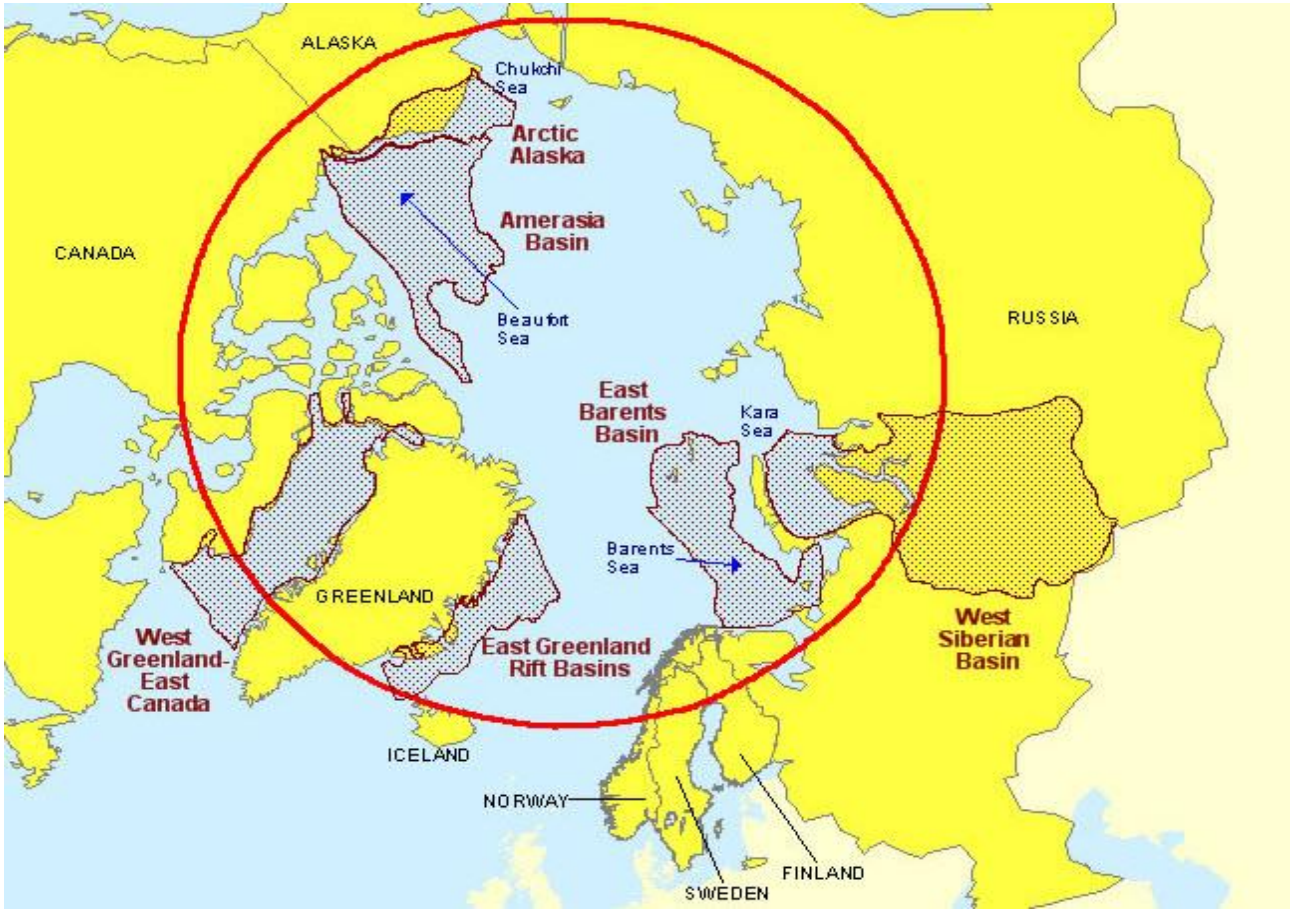
4. APEC Oil and Gas Security Initiative

4-5. Melting of the Arctic Sea Ice: Significance for the APEC Economies' Energy Security

Hooman Peimani, Ph.D.
Research Fellow, APERC

Asia-Pacific
Economic Cooperation

Resource Basins in the Arctic Circle Region

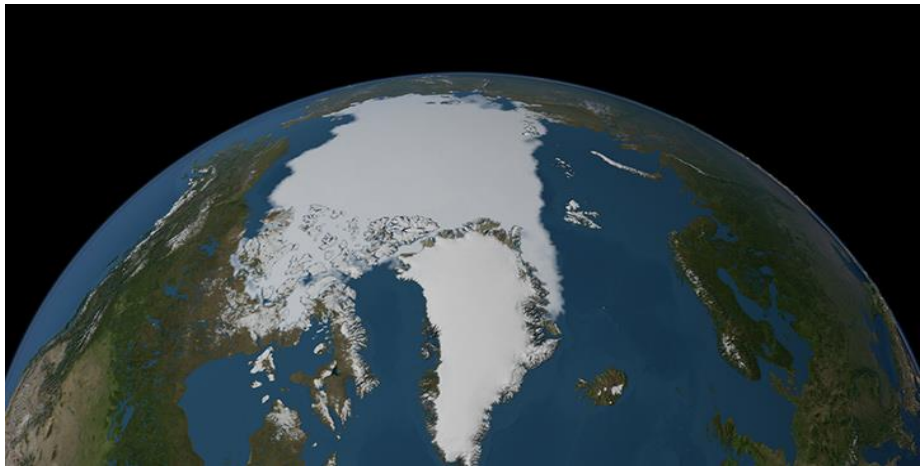


Source: Map supplied courtesy of: [US Energy Information Administration (EIA), (2012), "Arctic Oil and Natural Gas Resources", *Today in Energy*, 20 January 2012, http://www.eia.gov/todayinenergy/detail.cfm?id=4650]

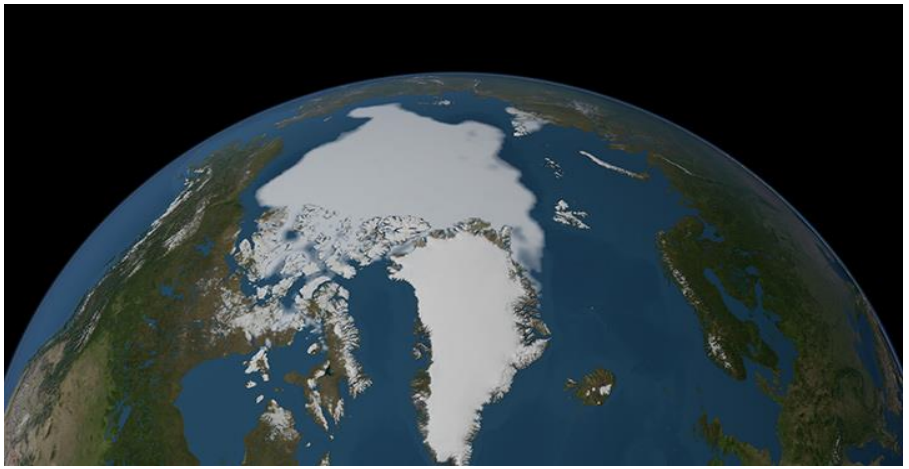
I-Melting of the Arctic Sea Ice

As evident in the following pictures/table, the Arctic sea ice has been melting because of global warming caused by greenhouse gases, particularly CO_2, whose main source of emission has been heavy consumption of fossil energy for over two centuries.

Arctic Sea Ice 1979



Arctic Sea Ice 2013



Year	Arctic Ice September Average Extent (millions of square kilometers)
1979–2000 mean	7.0
2013/2014	5.4

Source: Pictures supplied courtesy of: [NASA - Global Climate Change (2015), 1979 and 2013 Pictures, In *Time Series: 1979-2013 - Arctic Sea Ice Minimum*, http://climate.nasa.gov/vital-signs/arctic-sea-ice/]; Table supplied courtesy of: [Lindsey, Rebecca (2015), NASA - Earth Observatory, "Arctic Sea Ice", http://earthobservatory.nasa.gov/Features/WorldOfChange/sea_ice.php]

II-Implications/Significance of the Arctic Sea Ice's Melting

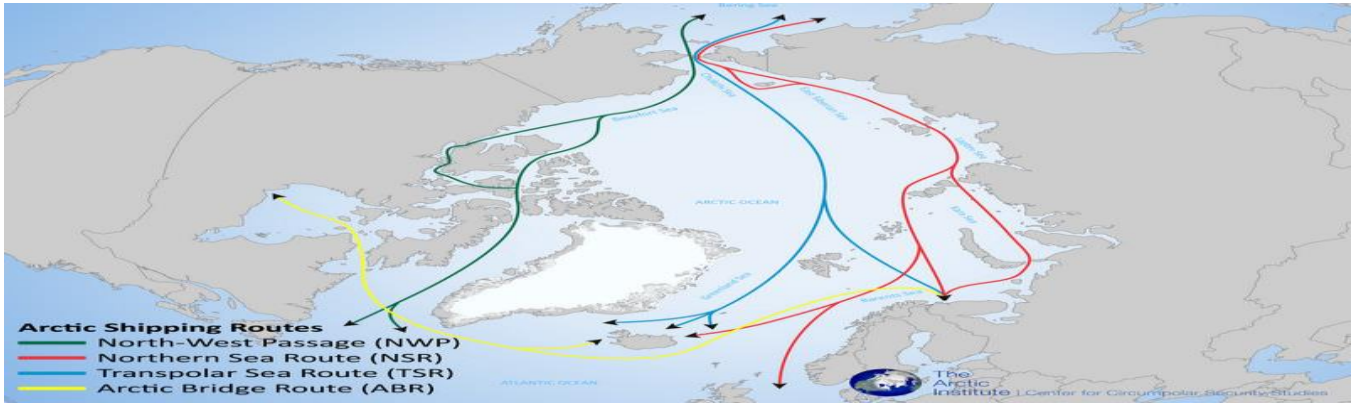
A-Environmental implications, including, rising sea levels to threaten the APEC economies' oil/LNG terminals located at coastal areas.

B-Economic/trade implications, including **four sea routes** (**short-cuts**) available a few weeks a year in summer time to become longer gradually over decades should the current melting continue.

●**Of these sea routes, two are more suitable for a varying amount of large-scale intercontinental cargo shipping and energy shipping (oil/LNG tankers):**

The Northern Sea Route through Russia's Arctic region

The Northwest Passage via Canada's Arctic region



Source: Map supplied courtesy of: [Humpert, Malte and the Arctic Institute (2015), *Arctic Sea Routes*, http://www.thearcticinstitute.org/2012/10/the-future-of-arctic-shipping.html]

Implications/Significance

C-Energy implications: The melting of the Arctic ice may well unlock the vast regional **undiscovered oil/gas resources**, which are **mainly offshore (84%)** scattered unevenly among the Arctic economies/countries.

- **Estimated undiscovered oil/gas resources: 90 bb** of oil, **48.11 tcm** of gas and **44 bb** of natural gas liquids equal to about **413 btoe in total**, according to the **2008 US Geological Survey**.

The bulk of the oil and gas resources are in Russia (**41%; 70%)** followed by the USA (**28%; 14%),** Greenland (**18%; 8%**), Canada (**9%; 4%**) and Norway (**4%; 4%**).

D-Significance: The significance of these resources for the global and APEC energy markets depends on their **actual size**, that is their proven recoverable volume **(proven reserves),** for which explorations are required.

III-Opportunities

The Arctic undiscovered oil/gas resources could contribute to the APEC economies' energy security in certain areas provided the sustainability of their large-scale production and exports at competitive prices:

- **Supply availability:** Increasing the available petroleum supplies to the APEC economies depending on oil/gas (LNG) imports.

- **Supplier diversification:** Increasing the number of the APEC economies' petroleum suppliers and decreasing to some extent their reliance on their largest supplier, the conflict-prone Middle East.

- **Supply-route diversification:** Suppling oil/gas (LNG) to the APEC economies through shorter routes or those routes not passing through the potentially dangerous waters due to **piracy** (Gulf of Eden & Strait of Malacca) and **possible expansion of civil war to the sea routes** (Yemen's civil war affecting Gulf of Eden & Bab-al-Mandeb).

- **Price sustainability:** Potentially helping sustain oil and gas (LNG) prices by preventing drastic price hikes due to shortages.

IV-Challenges

Certain challenges to large-scale oil/gas production/exports in the Arctic region could prevent/delay the achievement of these objectives:

1-Technical challenges: Inadequate infrastructure, scarcity of ice-class equipment/vessels, long-process of drilling, harsh working condition, technologically difficult and costly environmental requirements and high cost of production.

2-Environmental challenges: As a factor, extensive offshore oil/gas extraction (in absence of a fully-implemented comprehensive code of conduct governing such activity) could speed up the Arctic sea ice's melting in the affected areas**.**

3-Economic challenges: Necessity of a sustainable strong and growing demand for oil/gas at high prices to sustain costly petroleum operations in the Arctic and make its oil/gas prices competitive.

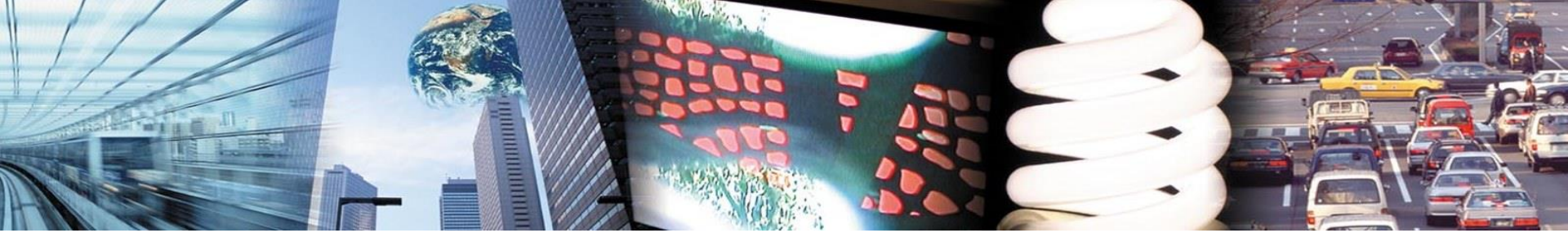
4-Political challenges: Various political factors, particularly potential ownership disputes between/among the Arctic economies/countries over oil and gas-rich areas beyond their exclusive economic zones in absence of a legal regime for dividing such zones.

V-Possible Scenarios for Oil/Gas Development in the Arctic Region

1-Delayed development scenario: Various internal/external factors, including the mentioned challenges, will delay for a significant period of time the large-scale development of the Arctic undiscovered petroleum resources to leave their bulk intact, **the likely case in this decade**.

2-Limited development scenario: Development of the Arctic undiscovered petroleum resources will be limited in terms of geography and scale, mainly to the extent justified to fill the gap caused by the regional economies/countries' non-Arctic oil/gas reserves' depletion, **a possibility in the ongoing decade and the first half of the following one.**

3-Extensive development scenario: Extensive development of the Arctic undiscovered petroleum resources will take place due to certain global/regional developments (e.g., significant increases in the global oil/gas demand to require Arctic petroleum and sustainable oil/gas high prices), **an unlikely scenario in the foreseeable future due to the mentioned challenges**.



THANK YOU
FOR YOUR KIND ATTENTION

http://aperc.ieej.or.jp