Changes in global shipping and long-distance rail networks: possible impacts on hub port Singapore

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MPA Visiting Professor Public Lecture
NTU - School of Civil & Environmental Engineering
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Source: Ducruet & Notteboom (2012)
1. THE ARCTIC SHIPPING ROUTES

- **Northwest Passage**
  - Current route
  - 9300 miles

- **Northern Sea Route**
  - Current route
  - 12100 miles

Source: adapted from Rodrigue & Notteboom, 2013
Monthly March ice extent for 1979 to 2014 shows a decline of 2.6% per decade relative to the 1981 to 2010 average.

Average Monthly Arctic Sea Ice Extent
March 1979 - 2014

- From Barents Sea to Bering Strait
- Year-round navigation since 1979 in eastern NSR
- Vessel traffic rapidly increasing from 4 vessels completing the route in 2010 to 71 in 2013
  - 71 vessels sailed the whole route and transported 1.585,000 tons of cargo in 2013
  - 620 ships had permits to sail parts of NSR in 2013
- Avoids a need of Suez Canal; seasonal supplement, current season is from July to November
- Energy supply to Asian markets - shipments of liquefied natural gas (LNG) and oil from Barents Sea & Siberia
- Russia investing in infrastructure along the route - 15 current ports & 2 ports under development (Salavat & Teriberka)
- Increased commercial traffic in NSR link to economic development of Russian Arctic
- Shipping costs potentially competitive with time savings if large ships can sail with full cargo loads
- Icebreaker escort through NSR $208.000 (Lloyd's)

Major opportunities
- Ice Class vessel development
- Port and pier infrastructure, safety and service development
- Mapping, navigation and communications technology
- Energy, oil and natural gas transportation to Asia

\[ 5-15\% \text{ of China's European trade could use NSR by 2020} \]
\[ \text{LNG transport from Norway to Japan possible in 2016} \]
2. THE SUEZ CANAL EXPANSION

Container ship traffic through the Suez Canal

Container Ships Passing Through the Suez Canal
Total Number of Ships and Year-Over-Year Percent Change

Source: Suez Canal
- Total length: 192 km, total width: 300 m, width between buoys: 180 m
- There is one shipping lane with four passing areas.
- The passage takes between 11 and 16 hours. Due to the limited width of the canal, ship convoys are formed on either side of the canal.
- When a container vessel arrives late at the Canal, it misses the convoy of which it was planned to be part, leading to an additional waiting time of up to 12 hours.
- Shipping lines reserve their place in a convoy and as such want to ensure that the vessel will make it in time to the Canal’s entrance.
- Major expansion announced in August 2014
• New Canal of 37 km
• Increase two-way traffic to 50%
• Capacity from 49 now to 97 passing ships a day by 2023
• Achieve direct unstopped transit for 45 ships in the two directions
• Permissible draft to 66ft (24m) all through the Suez Canal
• Transit time: from 18h to 11h (southbound convoy)
Container ship traffic through the Panama Canal

Current Panama Canal (www.pancanal.com)

Length canal: 80 km (13.7 km in Gaillard cut)

Three lock systems

Maximum dimensions:
- Beam: 32.31 m
- LOA: 294.13 m
- Draft: 12.04 m (39.5 feet)
New Panama Canal locks (source: ACP)

Existing locks’ maximum vessel 4,800 TEU

New locks’ maximum vessel size: 12,500 TEU

Cross Section of the New Locks Complex

Water saving basins

Post-Panamax Vessel

Valve

Culvert

49m (160')

56m (180')
The Panama Canal expansion programme is 85% complete: completion scheduled for first months of 2016

Early January: the installation of the gates for the new locks of the Panama Canal has successfully begun on the Atlantic side of the waterway

In total, the new locks will have 16 rolling gates, eight in the Pacific and eight in the Atlantic.

Source: Ducruet & Notteboom (2011)
■ Some 70 percent of all shipping cargo going through the canal comes to the U.S. coasts.

■ China’s imports to the U.S. East Coast: only 20% through the Canal

■ Canal expansion could take some 35% of current West Coast freight

■ Baltimore, Miami, Jacksonville, Charleston, NY, etc.: multimillion-dollar efforts to increase their harbor capacity and local infrastructure.

■ But:
  ■ Unrealistic expectations
  ■ Many of these places don’t have the distribution activity

■ Norfolk: only port on the East Coast able to handle the Post-Panamax ships

■ Charleston: $700 million in port-related infrastructure projects + an expected $1.3 billion—mostly federal aid—over the next 10 years.

■ Miami: four super-sized cranes+ $550 million for a tunnel to connect the port directly to a highway

■ New York/New Jersey: raising the Bayonne Bridge to allow the bigger ships to pass through to New Jersey’s Port Newark => $ 1.3 billion and ready by 2017.
The Resurgence of All Water Services to the US East Coast?

1. "China Effect"
   - Eastbound Route
     - Singapore
     - Colombo
     - Hong Kong
     - Shanghai
     - Jeddah
     - Pusan
     - Gloia Tauro
     - Algeciras
     - Seattle / Vancouver
   - Westbound Route

2. West Coast Congestion
   - Landbridge Congestion
   - LA/LB

3. Growth in the Southeast New Distribution Gateway

Source: Rodrigue & Guam (2007)

Challenges and Opportunities of the New Panama Canal

- Eastbound Route
  - Singapore
  - Colombo
  - Hong Kong
  - Shanghai
  - Jeddah
  - Pusan
  - Gloia Tauro
  - Algeciras
  - LA/LB

- Westbound Route
  - Panama Route
  - Kingston
  - Suez

22
The Nicaragua Canal: a ‘fata morgana’ or the emergence of a real local contender?

- The Hong Kong-based HKND Group has a 50-year concession to build and operate the canal.
- Canal started construction in late 2014.
- Project cost: US$50 billion (estimated half of it for canal digging).
- Completion by 2019.
- No real economic feasibility study – only one academic paper.
- Role of geopolitics? Return on investment?

The Nicaragua Canal: scenarios of its future roles

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The container port system in sub-Saharan Africa

The Suez route (here via Algeciras) versus a potentially competing system for South Africa
Route competition analysis
The Suez route as competitor – summary graph for 2008

Interlining via SA takes less time and is cheaper than interlining via Algeciras.
Interlining via SA takes more time and is more expensive than interlining via Algeciras.
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Interlining via SA takes more time, but is less expensive than interlining via Algeciras.

Average transit time difference (base = interlining via Algeciras)

WAfrica-EAfrica
WAfrica-India/Pak.
SAmerEC-EAsia
WAfrica-SEAsia
WAfrica-EAsia
SAmerEC-SEAsia
SAmerEC-India/Pak.
SAmerEC-MEast
SAmerEC-Oceania
WAfrica-Oceania

= Pure interlining traffic
= Interlining traffic, but hub-and-spoke solution (feeder) also possible
= Area of strongest competition between Suez route and SA route

Estimation for year 2008

Route competition analysis
The Suez route as competitor – summary graph for 2020

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Estimation for year 2020
Potential markets for the South-south route

Main port regions for intercontinental interlining/relay

East-West mainline routes

North-South and diagonal routes (mostly secondary)

Market potential for the Cape route

Potential interlining via a regional hub (loaded containers only)

- Excluding West Africa and East Africa (GTAP model, Lee et al., 2013)

Rest of South America – India
30,744 TEU

Rest of South America – China
272,585 TEU

Rest of South America – Rest Asia
252,776 TEU

Rest of South America – Oceania
21,006 TEU

Rest of South America – India
43,933 TEU

Rest of South America – China
495,122 TEU

Rest of South America – Rest Asia
391,313 TEU

Rest of South America – Oceania
41,166 TEU

Brazil – India
18,068 TEU

Brazil – Rest Asia
187,915 TEU

Brazil – Oceania
17,006 TEU

Brazil – Far East
111,531 TEU

Brazil – rest Asia
133,126 TEU

Brazil – Oceania
14,739 TEU

Brazil – Far East
181,935 TEU

Brazil – rest Asia
28,915 TEU

Brazil – Oceania
21,006 TEU

Total 854,574 TEU

Total 138,691,644 TEU

(Source: Flynn Consulting)
The Trans-Siberian Railway

- Russia-China trade lane: about half of total (about 420,000 TEU in 2014)

- Russian RZD plans to invest $6 billion by 2020
  - Average travel time will be less than eight days, with a speed of about 1200 km a day (now 900 km per day)

- RZD has also plans to implement the Hasan-Rajin project (Trans-Korean Railway see map).

Eurasian landbridges

  - 15 days to cover 6,200 miles
  - Through Mongolia, the Russian Federation, Belarus and Poland

- January 2015 – Yiwu (Zhejiang Province) to Madrid
  - Longest rail link in the world
  - 3 weeks to cover 8,111 miles to Madrid via Kazakhstan, Russia, Belarus, Poland, Germany and France
  - 30 containers carrying 1,400 tons
  - Adding Spain to a route that already links Chongqing to Duisburg (and Rotterdam and Antwerp) five times a week.
  - Three transfers during the journey as a result of incompatible rail gauges.
Xi Jinping (November 8th 2014): $40 billion to “break the connectivity bottleneck” in Asia.

Central role for Kazakhstan (e.g. development of a dry port and rail yard at Khorgos, in the desert on its eastern border with China – open since late 2012)

In 2011 Kazakhstan, along with Russia and Belarus, formed a customs union

Transit time advantages:
- Upper Yangtze to Europe by barge and ship: 50 to 60 days
- Trains from Chongqing to Duisburg in Germany (10,800 km) via Kazakhstan, Russia, Belarus and Poland: 14 days (20 days in practice). Kazakhstan’s state-run railway, KTZ, promises to spend $44 billion over the next five years to make that ten days.

Cost disadvantages:
- About $9,000-$10,000 one-way (one FEU)

Scale disadvantages:
- Volume passing from China to Europe across Kazakhstan: 6,600 FEU in 2013 and 10,000 FEU in 2014
6. IMPLICATIONS FOR SINGAPORE
A regional focus: the Americas, Europe and Africa

- East Coast of the Americas:
  - Rising competition between Suez Canal, Panama Canal and Cape route
  - In distance terms (nm), Suez Canal and Cape remain best options for Singapore!

<table>
<thead>
<tr>
<th>Route</th>
<th>Via Suez</th>
<th>Via Panama</th>
<th>Via Cape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore-Georgetown (Guyana)</td>
<td>10344</td>
<td>12119</td>
<td>10659</td>
</tr>
<tr>
<td>Singapore-Buenos Aires</td>
<td>12292</td>
<td>16042</td>
<td>9336</td>
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<tr>
<td>Singapore-New York</td>
<td>16291</td>
<td>12620</td>
<td>12439</td>
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<tr>
<td>Singapore-Houston</td>
<td>11762</td>
<td>12212</td>
<td>13165</td>
</tr>
</tbody>
</table>

- Europe: NSR and landbridges will grow in significance, but..
  - Overall volumes will remain small compared to Suez route
  - Niche markets (high value products)
  - Main focus on flows originating from North East Asia and West China

- Africa: embrace south-south route to reach West-Africa
Factors with potentially high impact on attractiveness of routes and port system configurations

- Demand: trade flows between regions! => more direct calls?

- Transit fees Canals:
  - Suez Canal and Panama Canal will become more expensive

- Vessel sizes: differences between routes getting larger or smaller?

- Bunker needs, bunker costs and associated slow steaming strategies?

- Transit time and schedule integrity requirements of shippers?

- Port efficiency/productivity, connectivity, flexibility and pricing? => the hub challenge

Thank you for your attention!

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