

Scrubber Count Update & IMO 2020 Market Impact Assessment

July 2019 Update (No. 3)



Executive Summary (1)

Over 15% of global fleet by tonnage to be scrubber fitted by end 2020.

Six months to the adoption of the global 0.5% sulphur cap, an update on the latest Scrubber Count and IMO 2020 Market Impact Assessment is now available on Shipping Intelligence Network (SIN). Summarising the latest update, Steve Gordon, Managing Director of Clarksons Research commented:

Scrubber Count:

- Including further additions pending, the total scrubber count up to ~4,000 vessels (Jan 2018: ~400) (see page 7). We estimate that by start 2020 up to 11% of the world fleet by tonnage capacity will be scrubber fitted, increasing to 15% by end 2020. These estimates increase to 23% and 35% for the VLCC fleet and 20% to 26% for Capesize. (see page 8).
- Clarksons Research is preparing updates to our Time Charter Equivalent (TCE) calculations to take into account the new bunker environment in 2020. Current price spread between Heavy Fuel Oil and 0.5% basis calendar year 2020, currently ~ USD 196, according to Clarksons Platou Futures. Shipping companies preparing for implementation.

Market Impact:

- Market impact of IMO 2020 includes a range of upside “wildcards” that may disrupt shipping market supply and demand, including off hire time, vessel speed, accelerated recycling and changing oil trading patterns (see page 11). Market data around a number of IMO 2020 related issues becoming more tangible.
- Our analysis suggests off hire time for scrubber retro-fit will reduce available fleet supply across the major sectors by 0.5% to 1.4% on an annualised basis across 2019 (see page 12, plus our Tanker, Bulker and Container monthly reports on SIN for more detail). Off hire trends expected to moderate in 2020 but still reduce available fleet supply by 0.3% to 0.7%. Utilising data from our new Ship Repair Database (see World Fleet Register), assumptions of 4 weeks used for scrubber retrofit, although reports suggest timelines above and below dependent on pre-installation work and / or delays at yards.

Executive Summary (2)

Positive impact on supply/demand balance expected from IMO 2020. Interest in alternative fuels gaining traction.

Market Impact (continued)

- Demolition levels still primary driven by earnings environment but considerations on fuel economics and CAPEX items (e.g. BWTS) expected to continue in medium term (see page 14).
- Potential for slow steaming uncertain, although our analysis suggests that a 0.25 average knot reduction would reduce available fleet supply by 2-3%. More broadly, carbon emissions for the shipping industry are lower today than 2008 despite the world fleet carrying 35% more cargo and 60% more tonnage on the water due to a ~20% reduction in speed (see page 13).
- Our speed indices show a 16%, 18% and 24% speed reduction across the bulker, tanker and container fleet since 2008. Monthly speed indices for major cargo sectors will soon be available on SIN, including a split for scrubber / non-scrubber fleets, with further granularity available on our vessel tracking system *Sea/net*.
- Increases in movements of gasoil and some declines in fuel oil expected to produce a net “boost” to oil product tanker demand of up to 3% by tonne mile. Positive impact on crude oil tanker demand expected also (see page 15). The potential impact on the supply demand balance for the tanker markets can also be viewed in our new SIN outlook profiles ([click here](#)).

Alternative Fuels

- Interest in alternative fuels views beginning to gain traction (see page 20). LNG fuel capable adoption stands at ~3% of the world fleet and ~16% of the world orderbook. We estimate that 3% to 4% of world tonnage will be LNG fuel capable through 2020, albeit the majority is still in LNG carrier sector. LNG infrastructure is also ramping up, with number of ports globally with LNG bunkering increased from ~20 to ~100 in past five years (see page 21-22). LPG as a fuel also gaining traction within the VLGC sector.
- Aside from current focus on IMO 2020, broader environmental regulatory agenda continues to accelerate, with decarbonisation expected as a major theme going forward. Environmental focus for ship finance also increasing, with recent launch of “Poseidon Principles”.

Contents

Scrubber Count Update

1. Environmental Equipment Update
2. Scrubber Count Update
3. SOx Scrubbers: Top Owners

IMO 2020 Impact Assessment

1. Summary
2. Off Hire Time Estimates
3. Vessel Speed Trends
4. Potential Demolition Impact
5. Tanker Demand “Boost”
6. World Fleet Fuel Consumption & Cost

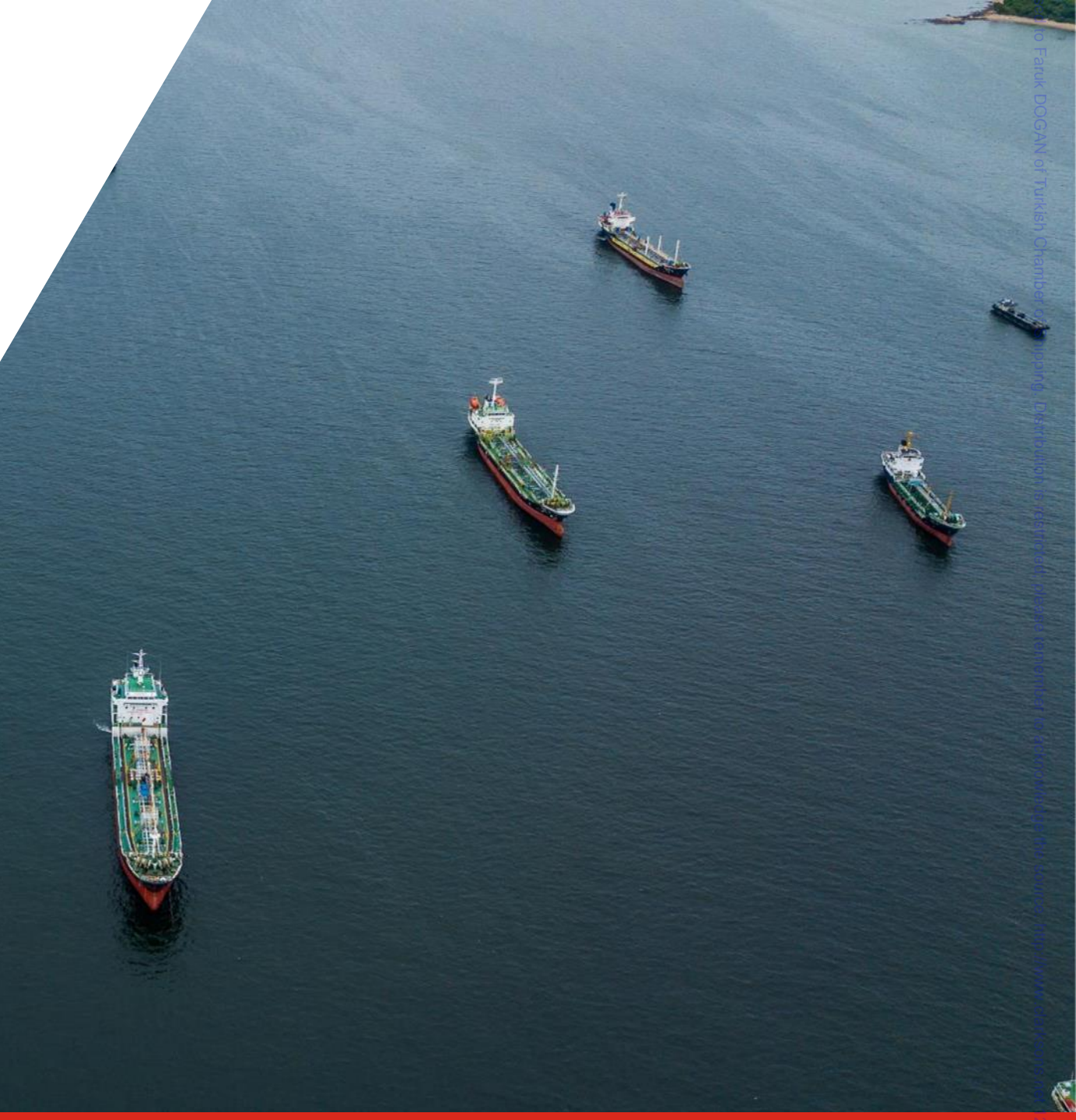
Annex

1. Regulatory Timetable
2. Alternative Fuels / LNG Bunkering Facilities



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Scrubber Count Update



Getting Timing & Technology Right?

Timing and technology challenges continue for owners

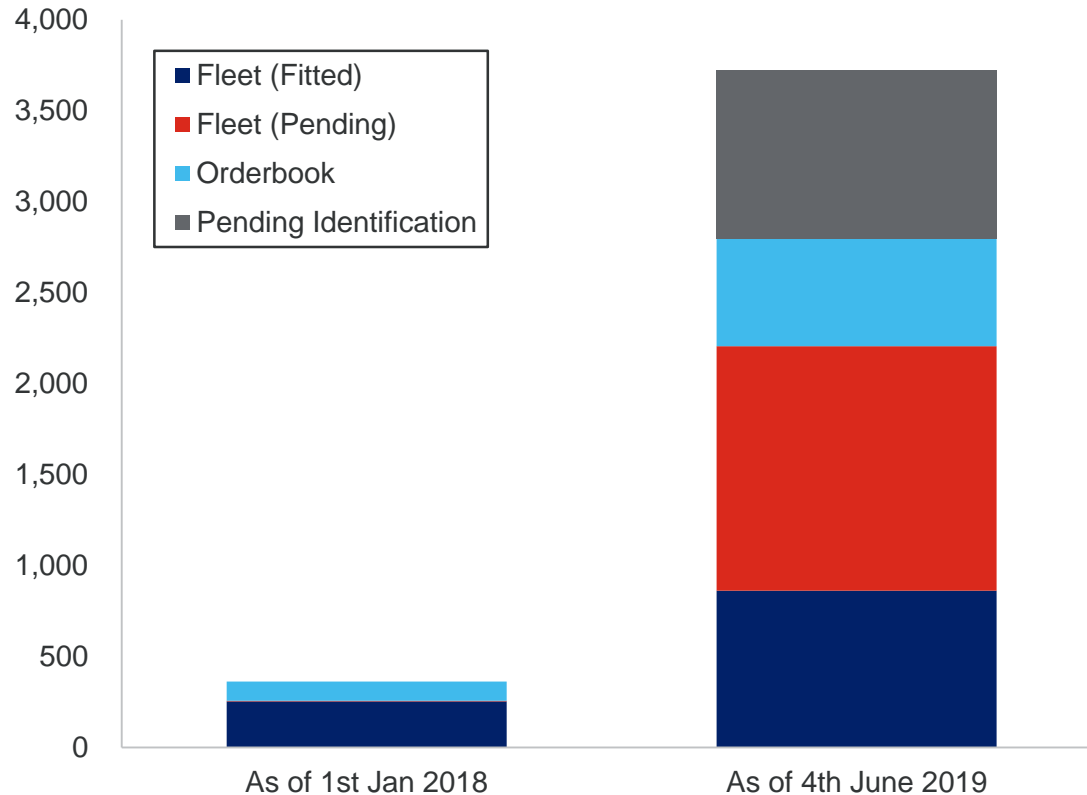
Equipment Type	SOx Scrubbers	'LNG Capable'	'LNG Ready'	Ballast Water Management Systems	NOx SCR/EGRs	HVSC Systems
Fleet	>2,219	>507	>143	>8,994	>638	>487
% Fleet (% GT Capacity)	2.3% (12.2%)	0.5% (2.8%)	0.1% (1.4%)	9.3% (32.2%)	0.7% (1.6%)	0.5% (2.1%)
Orderbook	>589	>313	>85	>2,327	>456	>45
% Orderbook (% GT Capacity)	14.5% (33.1%)	7.7% (15.9%)	2.1% (8.2%)	57.2% (93.4%)	11.2% (23.2%)	1.1% (0.8%)

Source: Clarksons Research. As at 4th July 2019, World Fleet Register. % basis fleet (c.97,000 vessels) above 100GT. Please note: data based on reported equipment in merchant fleet, this will underestimate the total size of the market. Orders for scrubbers accelerated in 2018. Figures excludes some scrubber orders still to be linked to individual ships. Count growing - contact Clarksons Research for latest numbers.

Environmental Equipment & Regulatory Agenda

Scrubber uptake accelerated significantly in 2018, ahead of the IMO 2020 global sulphur cap

Clarksons Research 'Scrubber Count' (No. Ships)



Note: Provisional data as of 10th June 2019. Fleet numbers include pending retrofits. Based on reported equipment and excludes some scrubber orders still to be linked to individual ships. As such, data coverage is not comprehensive and will under report actual numbers. Includes pending retrofits. Source: Clarksons Research

- Total scrubber number excludes some orders not yet linked to individual ships (grey area on graph). Published figures will therefore underestimate the global total.
- More than ten-fold increase in order uptake since start 2018.
- Percentage of fleet fitted with scrubbers in GT terms set to increase from 1% at start 2018 to 15% of fleet at the end of 2020. Uptake is set to be higher in certain sectors. Meanwhile, 4% of fleet projected to be capable of running on LNG fuel at end 2020.
- Higher in VLCC, Capesize, Large Containerships: Percentage of VLCC fleet fitted with scrubbers in GT terms set to reach 35% of fleet at the end of 2020, while for Capesize bulkers the percentage is projected to be 26%.

Projected Scrubber Uptake

Proportion Of Fleet Set To Be Fitted With Scrubbers Varies Across Key Sectors

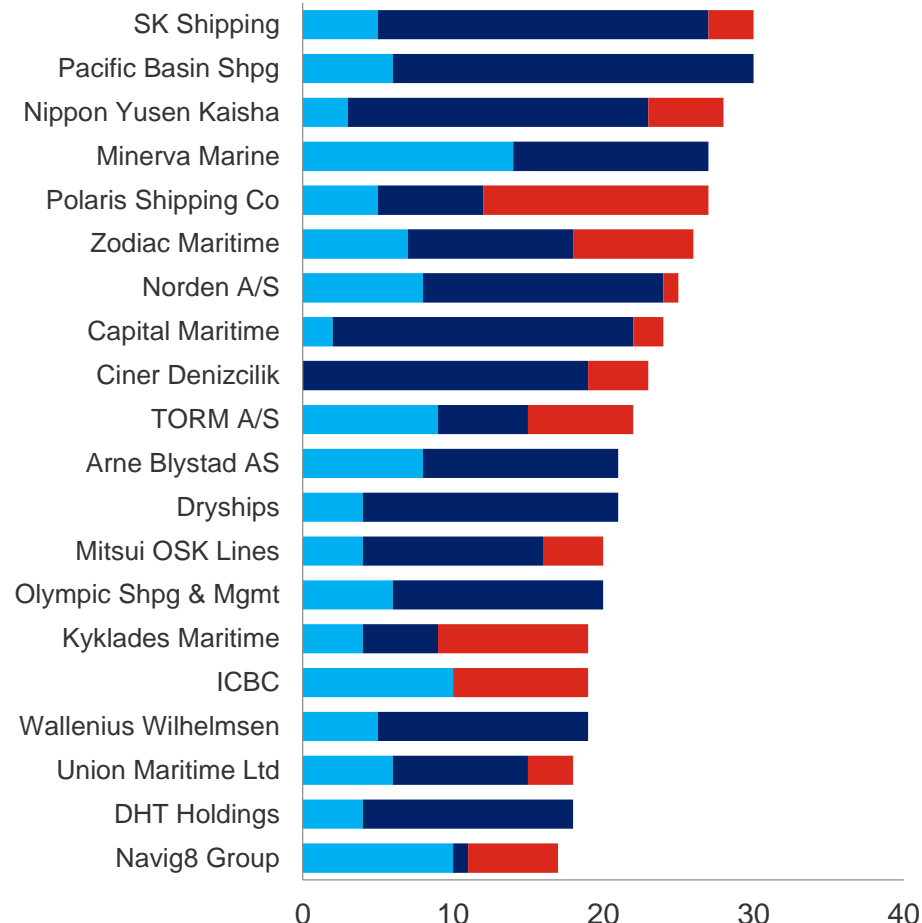
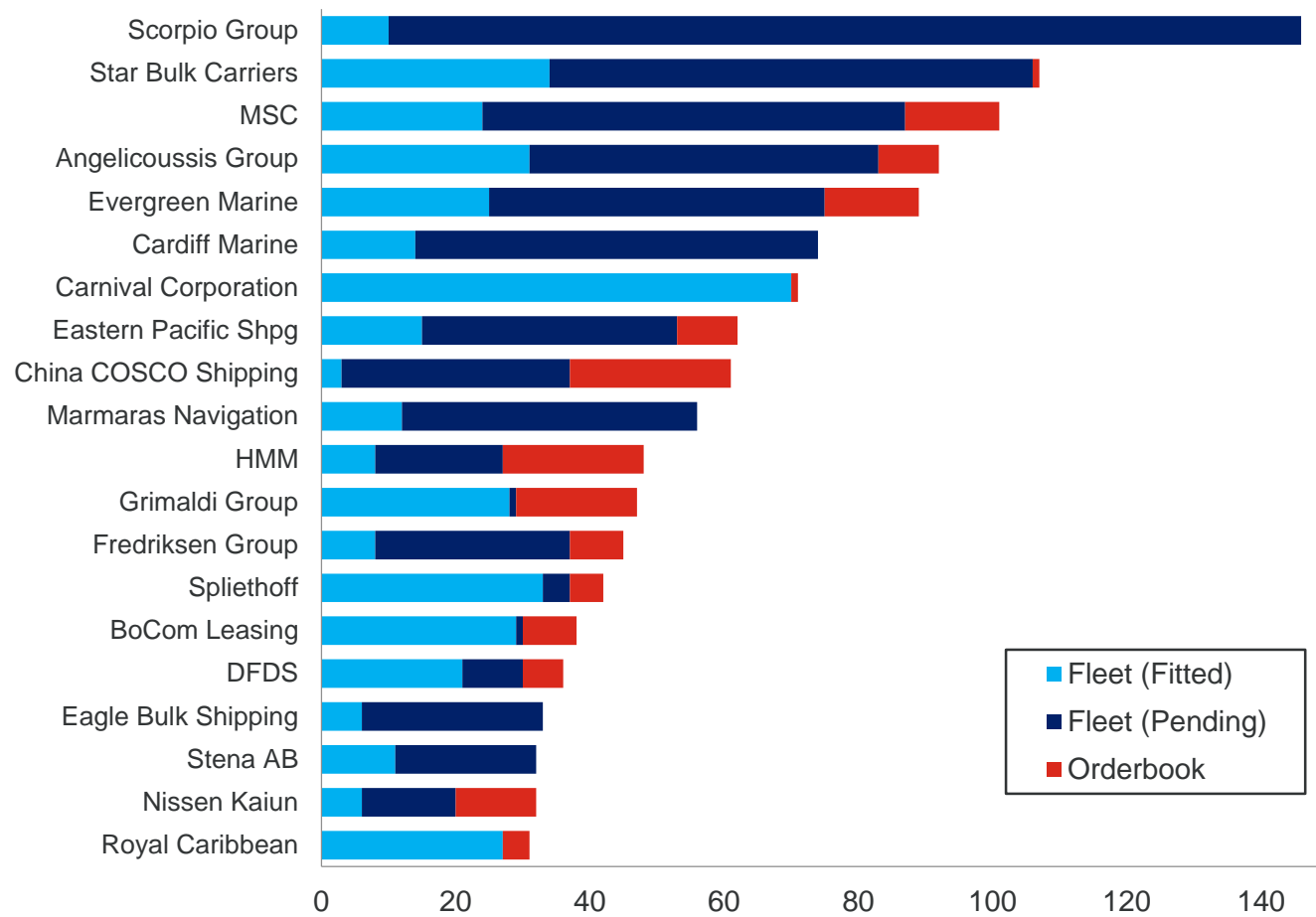
Sector	As Of Start July 2019 (%Fleet/Orderbook GT)			Projected Scrubber Fitted Fleet*, End 2019 (% GT)	Projected Scrubber Fitted Fleet*, End 2020 (% GT)
	Scrubber-Fitted	Retrofit Pending	Orderbook		
VLCC (200,000+ Dwt)	8%	16%	70%	23%	35%
Suezmax (125-199,999 Dwt)	6%	14%	42%	16%	21%
Aframax (85-124,999 Dwt)	4%	12%	23%	12%	18%
Total Tanker	5%	11%	51%	14%	20%
Capesize (100,000+ Dwt)	6%	15%	52%	20%	26%
Panamax (65-99,999 Dwt)	2%	4%	8%	6%	10%
Handymax (40-64,999 Dwt)	1%	4%	7%	5%	7%
Total Bulkcarrier	3%	8%	29%	10%	14%
Post-Panamax (15,000+ TEU)	3%	9%	61%	20%	28%
Neo-Panamax (8-14,999 TEU)	4%	20%	51%	14%	21%
Total Containership	3%	11%	50%	10%	15%
LPG	5%	5%	63%	10%	16%
Cruise	62%	3%	25%	74%	77%
Passenger Ferry	9%	1%	11%	13%	17%
Ro-Ro	21%	5%	66%	24%	30%
Total Fleet	4%	8%	33%	11%	15%

*Not including pending retrofits.

Source: Clarksons Research. Projections as of March 2019.

SOx Scrubbers: Top Owners

Top Owner Groups By Number Of Scrubber-Fitted Vessels



Source: Clarksons Research. Data basis July 2019.



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IMO 2020 Impact Assessment



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IMO 2020 Global Sulphur Cap: Upsides & Wildcards

Potential for IMO 2020 to have a range of positive impacts on the shipping markets

	Impact	Potential Extent
Vessel Time Spent Out Of Service	Active supply could be reduced by increased vessel time out of service for retrofit of technology and environmental equipment.	Vessel time out of service for scrubber retrofit* currently estimated to absorb 0.8% of bulker capacity, 1.4% of crude tanker capacity, 0.5% of product tanker capacity and 1.2% of containership capacity across 2019.
Vessel Speed	Potential for higher fuel costs to lead to slower operating speeds, absorbing supply.	A decrease of 0.25 knots in average speed across one year equates to absorbing c.2% of bulker, tanker and containership supply.
Recycling	Vessel recycling likely to be supported in early-mid 2020s by limited incentive for owners to retrofit elderly units with necessary technology or equipment, and increased fuel bills making the continued operation of older vessels less economical.	Initial 'base case' projection of 44m dwt total recycling in 2020, compared to current 2019 projection of 26m dwt . Additional 18m dwt equivalent to reducing growth in the world fleet by 0.8% in 2020 (1.1% across bulker fleet, 0.8% across tanker fleet, 0.7% across containership fleet).
Oil Products Trade	Increased trade in middle distillates (e.g. from US and Middle East to Asia and Europe) alongside decrease in fuel oil trade (although negative impact of this could be spread between the crude and products tanker sectors).	Initial estimate of 'net benefit' to seaborne products trade of 0.3m bpd in 2020 (boosting trade growth from 3.0% to 4.0%). Product tanker demand currently projected to increase by a robust 6.4% in 2020.
Crude Oil Trade	Possible increase in refinery throughput in some regions due to strong middle distillate margins; changes in refinery crude grade demand.	Projections vary but potential requirement for c.1.2m bpd additional global refinery throughput in 2020. Could lead to estimated 0.6m bpd of additional crude trade (assuming some crude is refined domestically), equivalent to boosting crude trade growth in 2020 from c.1.5% to c.3.0%
Tankers Used In Oil Storage	Possible increase in tankers used as floating storage for middle distillates or other compliant fuels if insufficient availability of shore tanks, or for surplus fuel oil volumes.	To store an additional 25m bbls of oil, could require 3.5m dwt of capacity, equivalent to around 1% of the fleet in 2020. Historically, floating oil storage levels have reached up to 215m bbls (2009).

Source: Clarksons Research. Basis June 2019 estimates.

Scrubber Retrofitting Expected To Limit 'Active' Supply Growth

Historical and projected fleet growth by sector

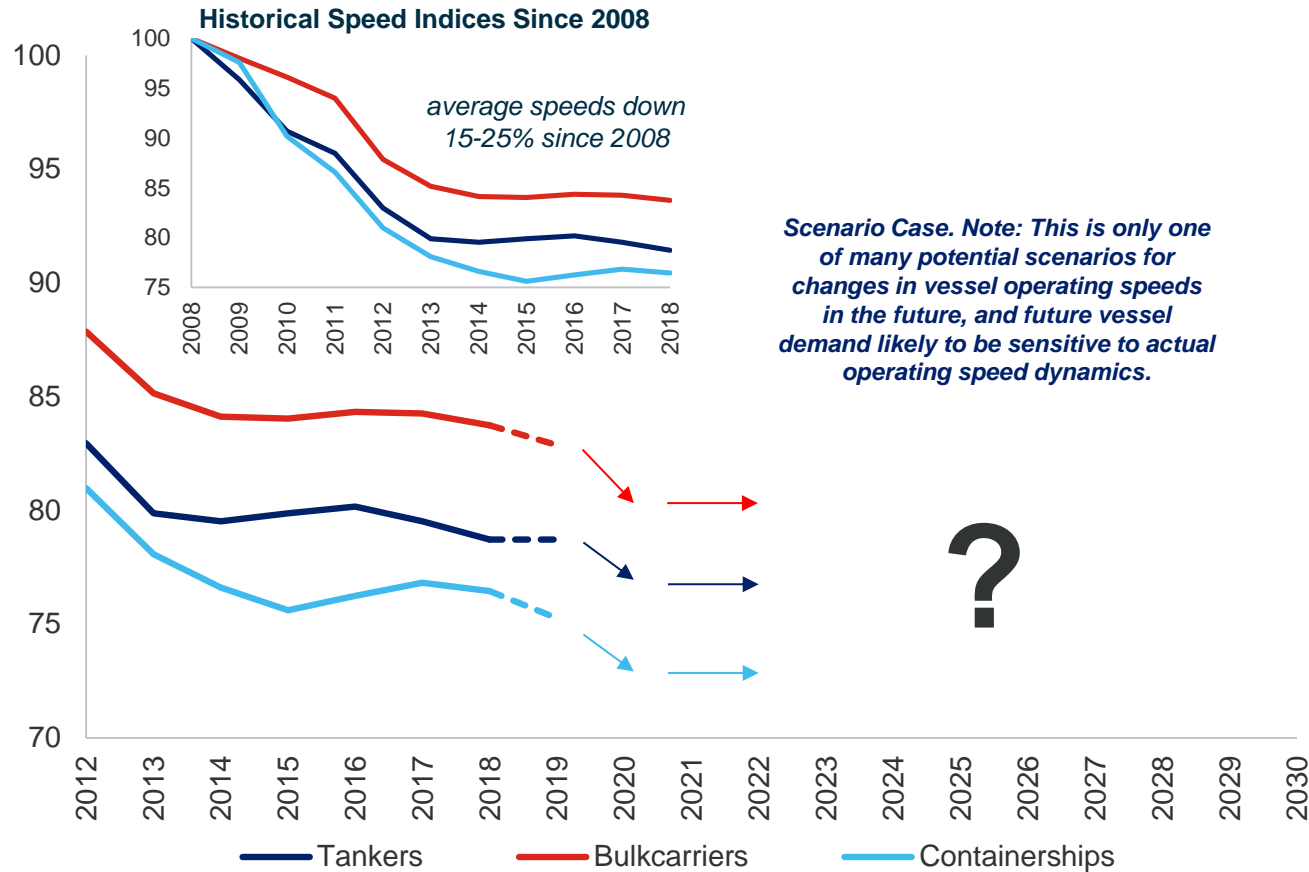
Fleet growth (capacity)	2016	2017	2018	2019 (f) Total Fleet Growth	2019 (f) 'Active' Fleet Growth*	Estimated Fleet 'Out of Service' For Scrubber Retrofit Across 2019
Bulkcarrier	2.2%	3.0%	2.9%	2.4%	1.6%	0.8%
Crude Tankers	5.9%	5.1%	0.6%	5.0%	3.6%	1.4%
Products Tankers	6.3%	4.3%	1.8%	3.4%	2.9%	0.5%
Containerships	1.3%	3.8%	5.6%	2.7%	1.5%	1.2%

Source: Clarksons Research. Basis June 2019 estimates. **'Active' fleet growth based on total fleet growth minus estimated vessel capacity 'out of service' across 2019 for scrubber retrofitting (see table).

Speed Could Be A Key Variable

Potential for changes in operating speeds to have a significant impact

Average Vessel Speed Index (Year Averages), 2012-2030f



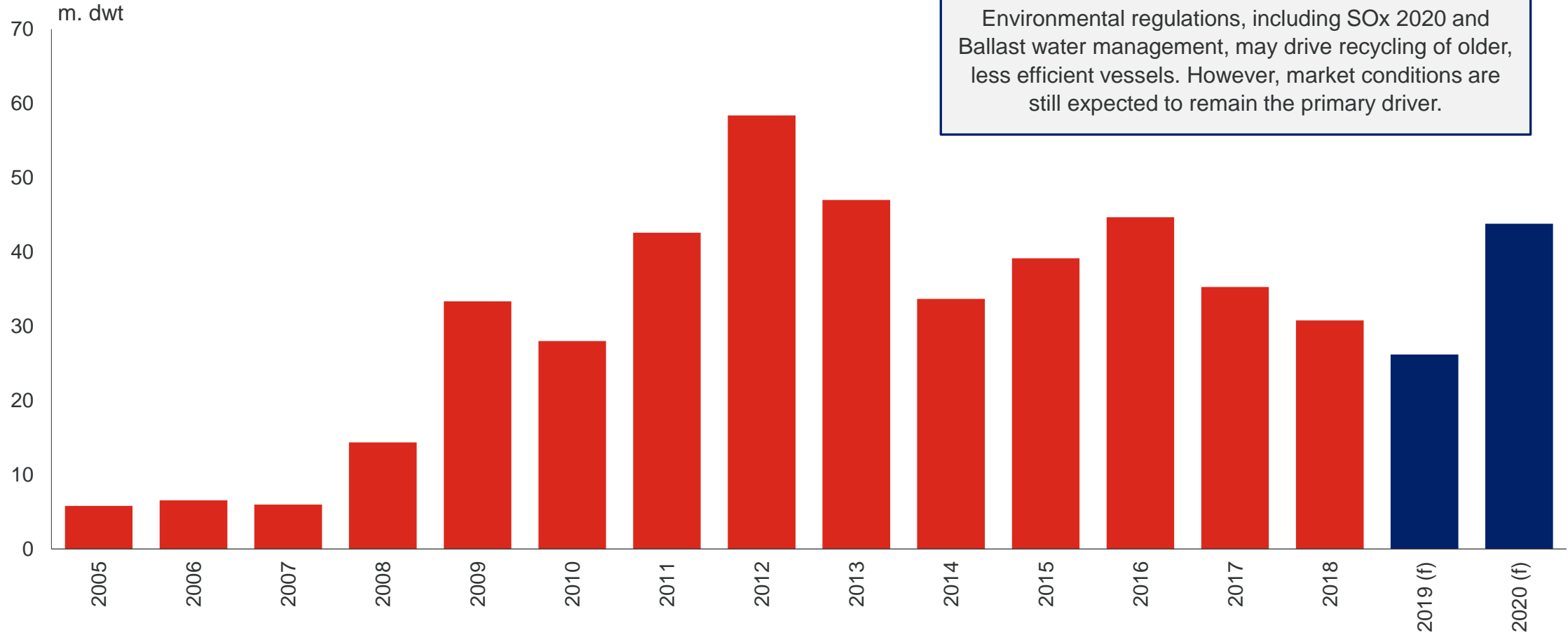
Potential Pressures On Future Vessel Speeds:

- **IMO 2020:** Impact of increased fuel bill may result in a drop in operating speeds as owners attempt to reduce fuel consumption. However, uncertainty remains over the extent to which this might occur.
- **Environmental pressures:** Greater environmental pressures/awareness may discourage significant speed increases, particularly in the containership sector, even against a backdrop of improved markets.
- **2030 carbon targets:** The target for the marine industry to reduce its carbon intensity by 40% from 2008 levels by 2030 could de-incentivise shipowners to increase speeds further ahead. Speeds could even drop back down again in the run-up to 2030 in order to cut carbon emissions, though hard to predict accurately.

Source: Clarksons Research. Historical speed indices basis Clarksons SeaNet data and industry sources.

IMO 2020: Potential Demolition Impact

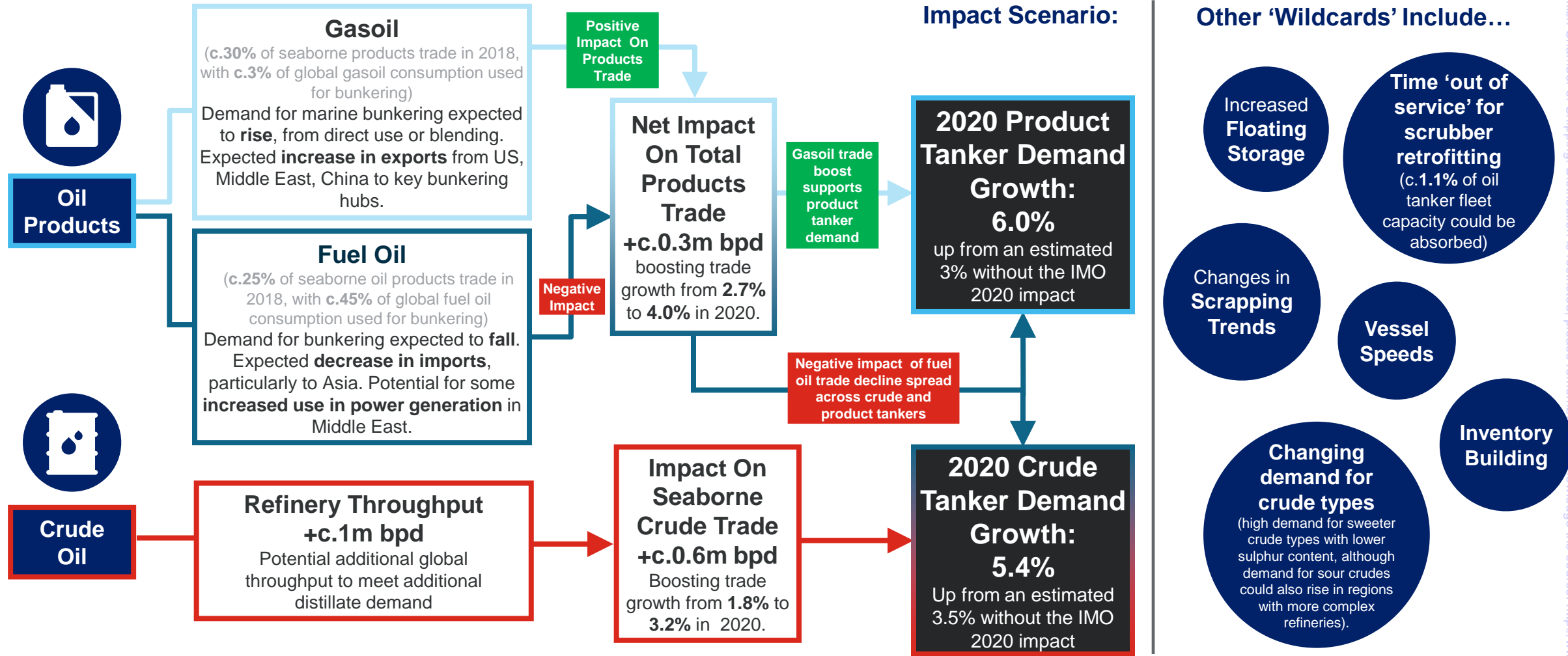
General regulatory and environmental concerns may encourage early demolition



Source: Clarksons Research. See World Shipyard Monitor report for more detailed demolition forecasts.

IMO 2020: Potential Positive Impact On Tanker Demand

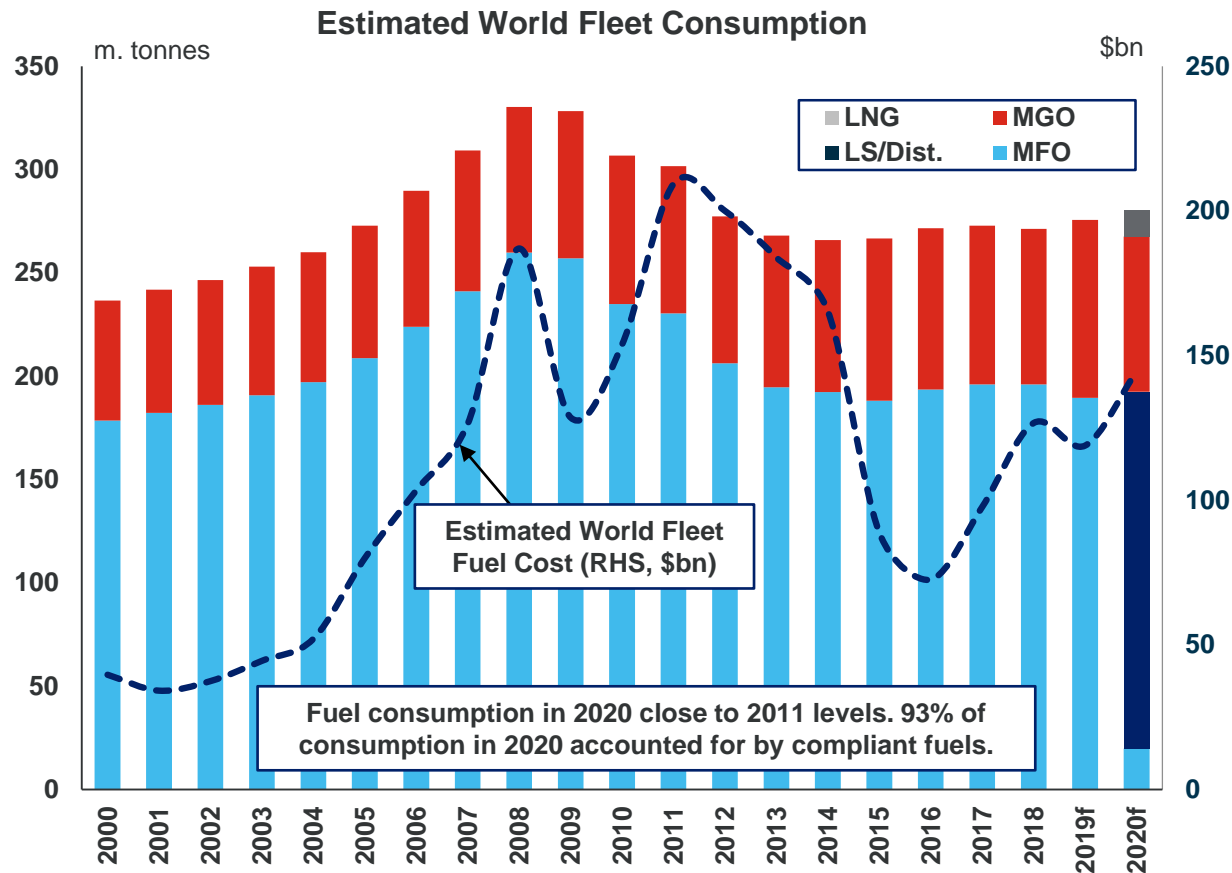
Uncertainty remains given range of scenarios, but potential for 'boost' to crude and products trade...



Source: Clarksons Research.

World Fleet Fuel Consumption & Cost

Regulatory Changes And Fuel Price Dynamics Bringing Fuel Economics Back Into Play...



Vessel speed has been a key driver in our estimation that total global fuel consumption of the world shipping fleet has fallen by 18% since 2008, from an estimated 330 mtpa to an estimated 271 mtpa in 2018, with an according fall in the carbon footprint.

Over the same period global seaborne trade has grown by 37% to 11.8 bn tonnes and the world fleet has grown by 61% in tonnage terms to 1.3 bn gross tonnes (GT).

Since 2008 average vessel operating speeds have fallen by around 17%, 21%, and 25% in the bulkcarrier, tanker and containership sectors respectively.

2014 IMO study estimated CO2 for shipping as:

Est. CO2 emissions from shipping in 2007: 885 million tonnes, = 2.8% of global total.

Est. CO2 emissions from shipping in 2012: 796 million tonnes, = 2.2% of global total.

International Council On Clean Transportation report, suggests that CO2 emissions from shipping as a percentage of the global total fell from 3.5% in 2008 to 2.6% in 2015.

Notes: Preliminary estimates subject to wide range of assumptions including basis global merchant fleet development, prevailing speed trends with consumption adjusted accordingly, estimated 'steaming days', time spent in ECAs from 2015, use of scrubbers and LNG as a fuel from 2020, fuel prices basis historical data and forward price curves. For further details contact Clarksons Research.

Source: Clarksons Research



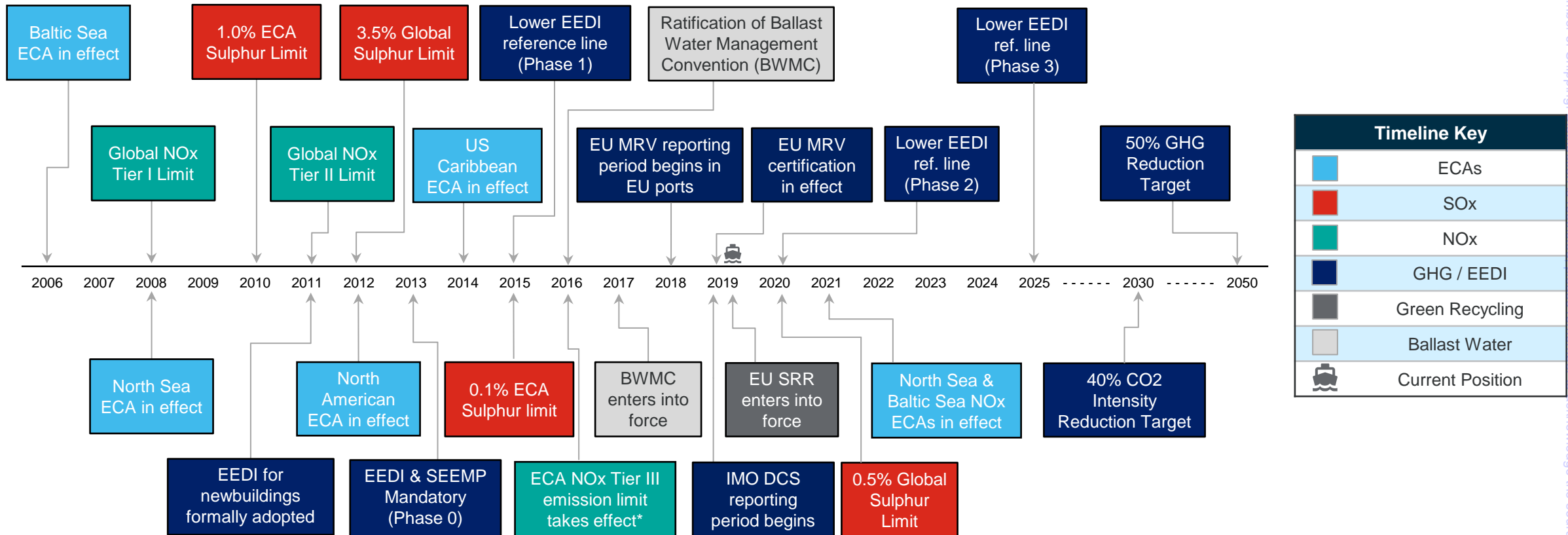
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Environmental Regulation

The Regulatory Timeline Continues To Accelerate

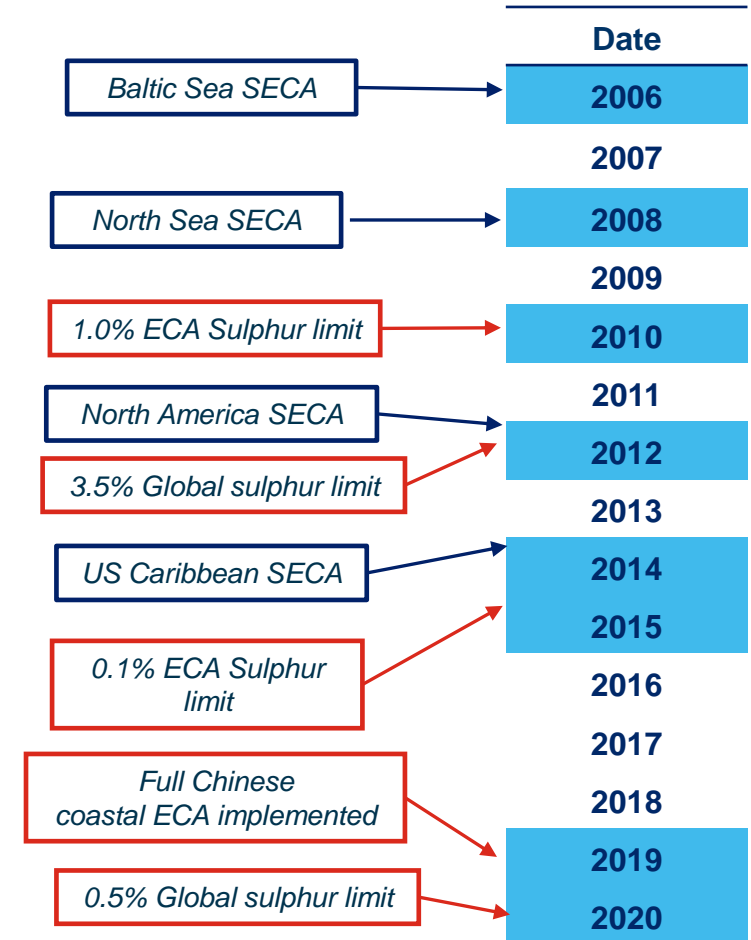


Source: Clarksons Research, June 2019

SOx: Regulation Timeline

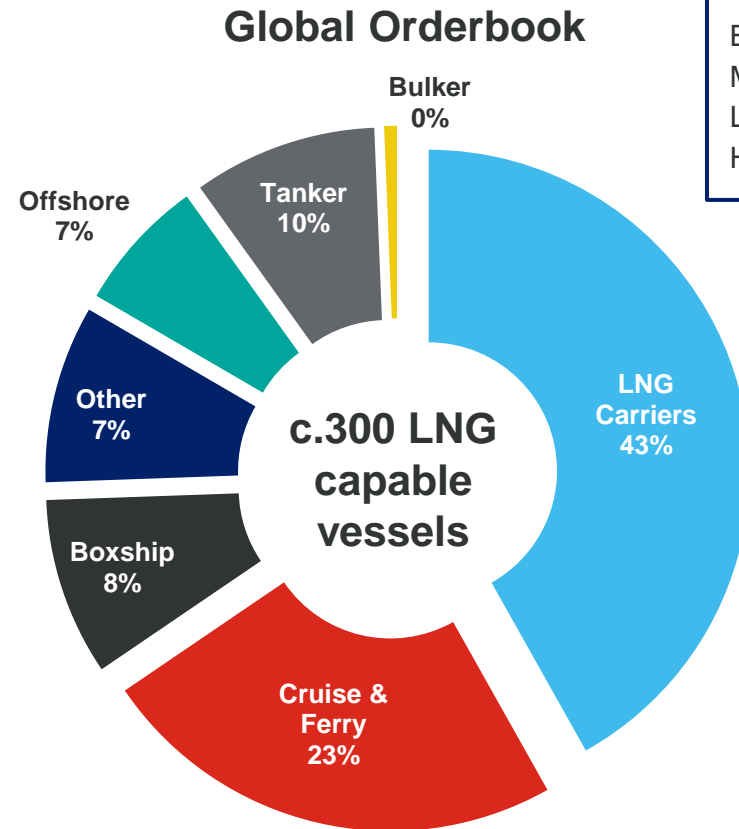
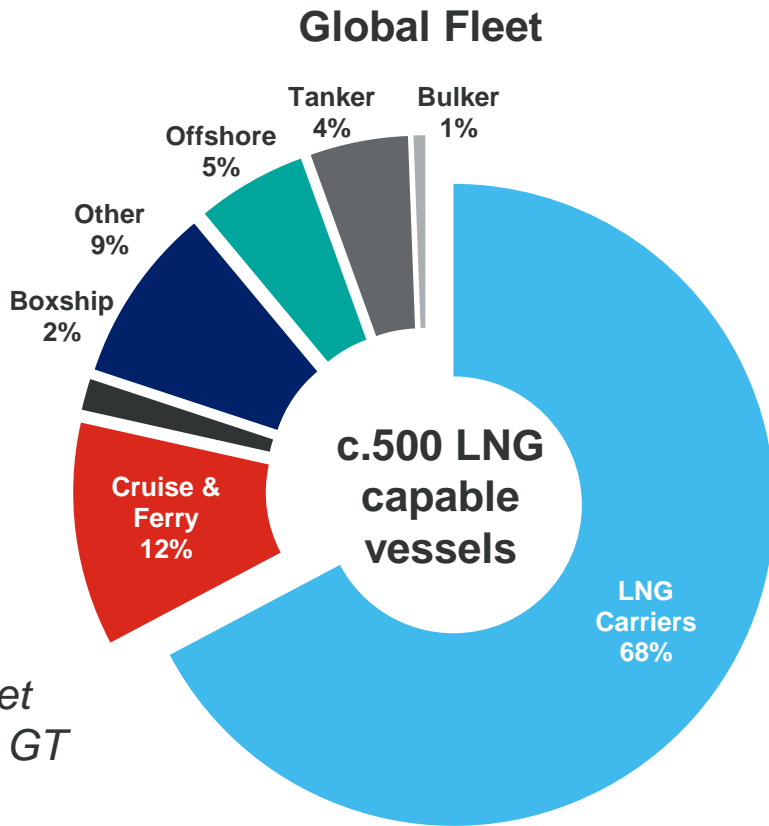
Summary Of Existing & Upcoming Regulation On SOx Emissions

- In 2006 the IMO first introduced limits on the sulphur content of fuel within Emission Control Areas (ECAs), under MARPOL Annex VI.
- Currently SOx limits are in place in the four IMO ECAs: North America, US Caribbean, Baltic Sea and North Sea. A 0.1% limit on the sulphur content of fuel is imposed on vessels sailing in these areas.
- Meanwhile, the Chinese Ministry of Transport confirmed in December last year that it will extend its domestic ECAs to include the entire Chinese coastline, and a 0.5% sulphur limit has been in place in this region since 1st January 2019. Furthermore, a 0.1% sulphur limit will be in place in two domestic ECAs from 1st January 2020 (located along the Yangtze and Xi rivers), as well as in the waters around Hainan Island from 1st January 2022.
- Authorities in Hong Kong and Taiwan have also implemented the 0.5% sulphur limit one year ahead of schedule (from 1st January 2019).
- Current global limits can be met without engine or fuel type modifications. However, abatement technologies or low sulphur fuels are required to meet the stricter ECA limit of 0.1% and 2020 global limit of 0.5%.



Update – ‘LNG Capable’ Ships

Uptake Still Low But Increasing Outside LNG Carrier Sector



Confirmed Uptake Of Other Alternative Fuels/Power:

- Batteries: c.150 vessels
- Methanol: c.12 vessels
- LPG: c.4 vessels
- Hydrogen: c.2 vessels

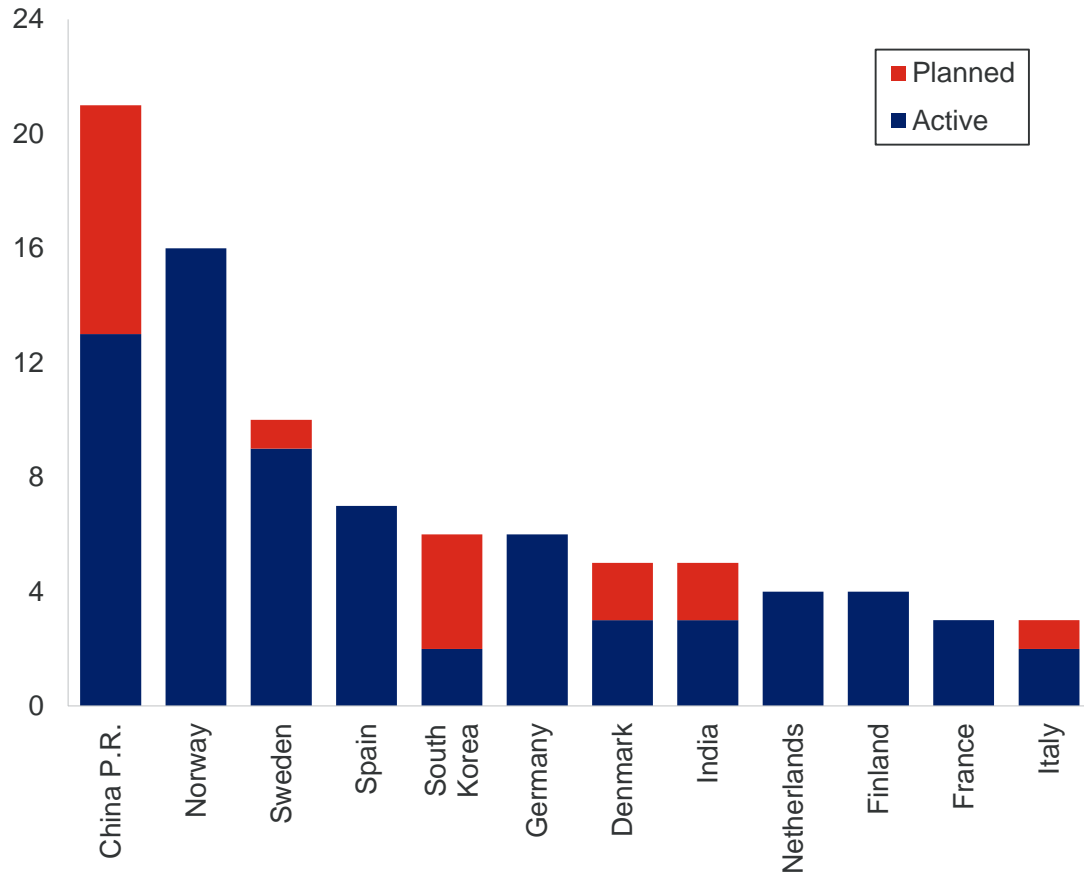
Data as of July 2019. Please note that data coverage is not comprehensive.

LNG Bunkering Ports

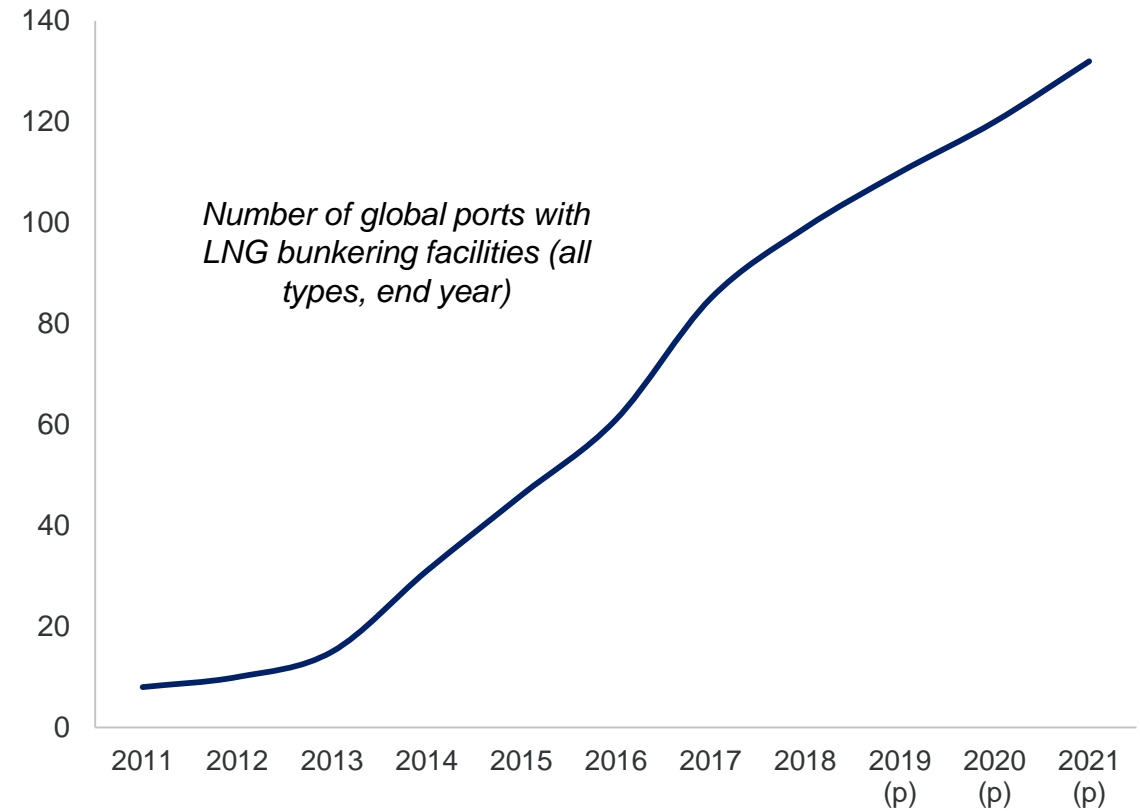
Current Facilities & Planned Expansion

Clarksons Research is also collecting data on additional “eco” facilities at ports, including sulphur reception facilities, “cold ironing” besides local regulations (e.g. Open Loop Scrubber Bans).

Number Of LNG Bunkering Ports By Country



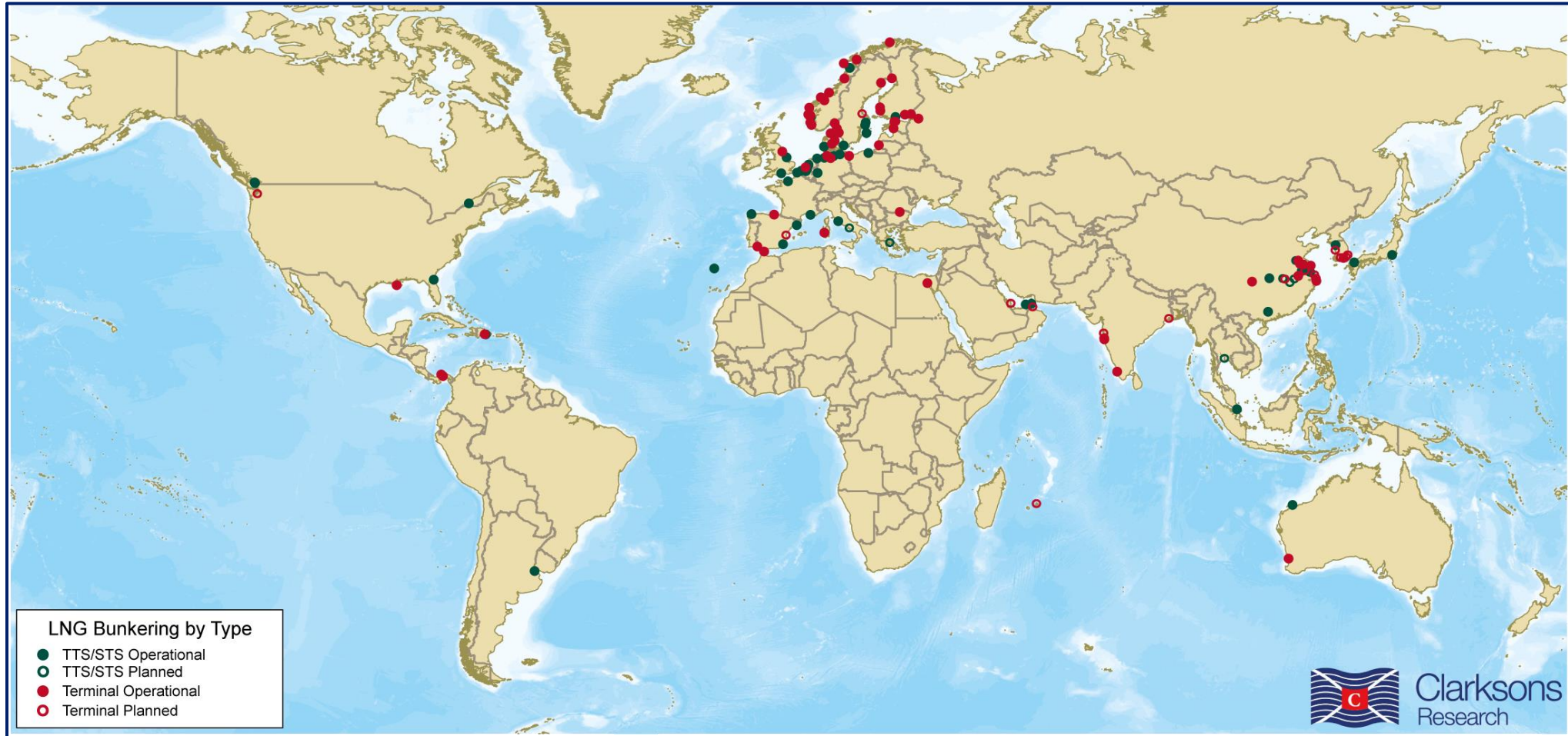
Global Active LNG Bunkering Ports



Source: Clarksons Research. Data as of June 2019.
 Estimated number of active ports from 2019 onwards basis current data on planned start-up dates of planned LNG bunkering facilities.

Global LNG Bunkering Facilities

Expanding Rapidly But Still Regional



Source: Clarkson Research, Various Sources. Data as of June 2019.

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