McKinsey & Company

CHEMLOG™ INDIA 2021

Re-defining and driving growth trajectory of chemicals supply chain - Leveraging assets and networks

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Did we learn anything from the global disruptions and climate change impact over the last year?

Floods in China, Europe to further disrupt already-stifled shipping industry

Heavy floods in parts of western Europe have severely disrupted cargo including railway links. This would not only disrupt the supply chain but have a severe spillover effect on sectors such as the motor industry and domestic appliances.

TRANSPORTATION

Suez Canal blockage is delaying an estimated $400 million an hour in goods

Auto News / Latest Auto News / Commercial Vehicle / MHCVs

U.S. trucking industry disruptions to last as long as pandemic persists

"There are going to be disruptions and shocks to the system as long as the pandemic continues," he said in an interview with CNN when asked about the driver shortages in the trucking industry.

WORLD ECONOMY

Another shipping crisis looms on Covid fears in southern China

Digital transformation is 'only way' to build resilience in a company, says CEO

Climate change: Carbon emissions from rich countries rose rapidly in 2021

ENTERPRISE

The shift to digital has become a 'critical priority' for businesses

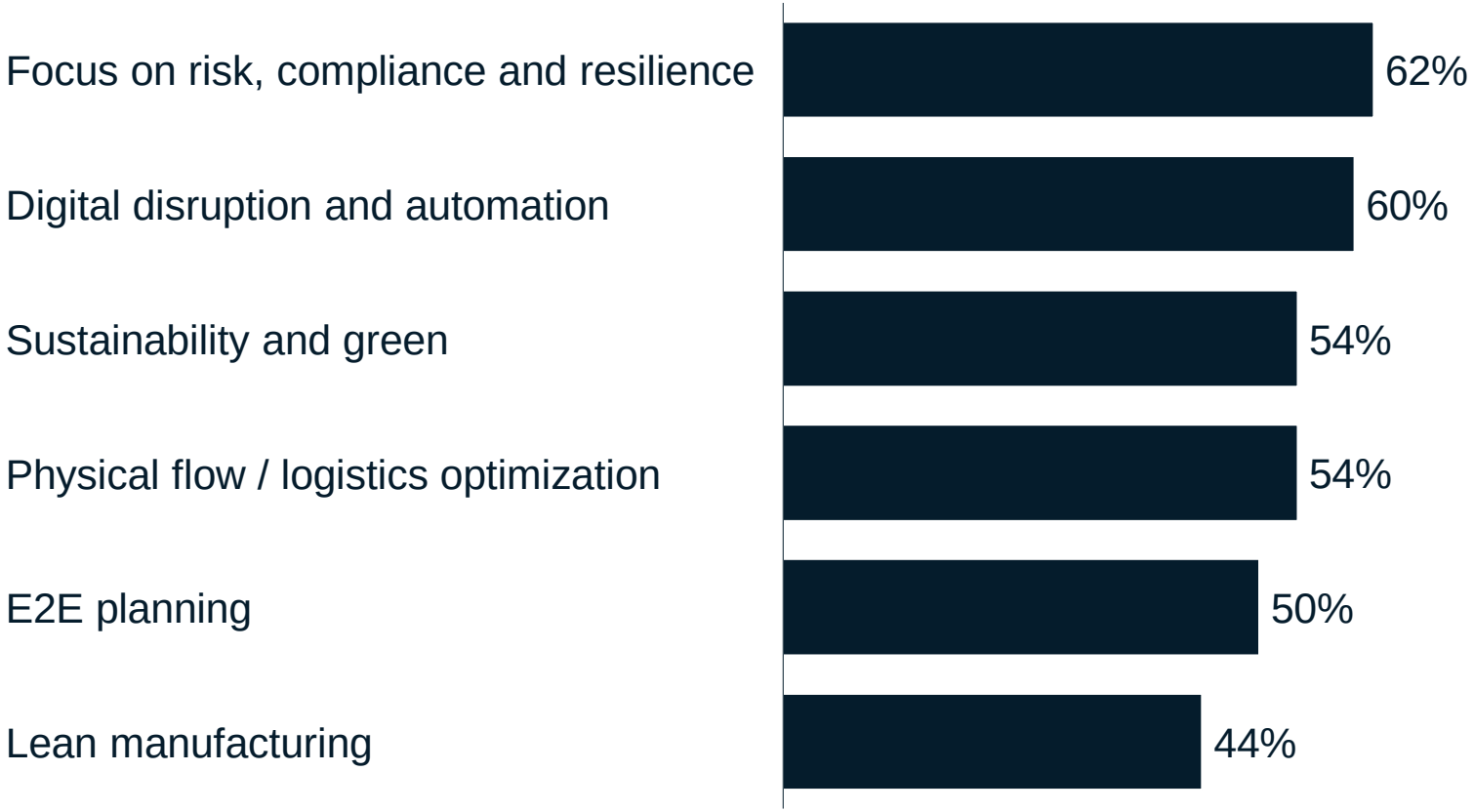
SUSTAINABLE FUTURE

The world won't be able to reach carbon neutrality without Asia, Suntory CEO says

Evolving themes in chemicals supply chain

% of respondents

Focus of discussion



Chemlog 2021 focus is in similar lines

- Is India the next destination?
- Disruption is the name of the game
- Current Affairs
- Maturity of Indian logistics sector
- Compliance is the name of the game

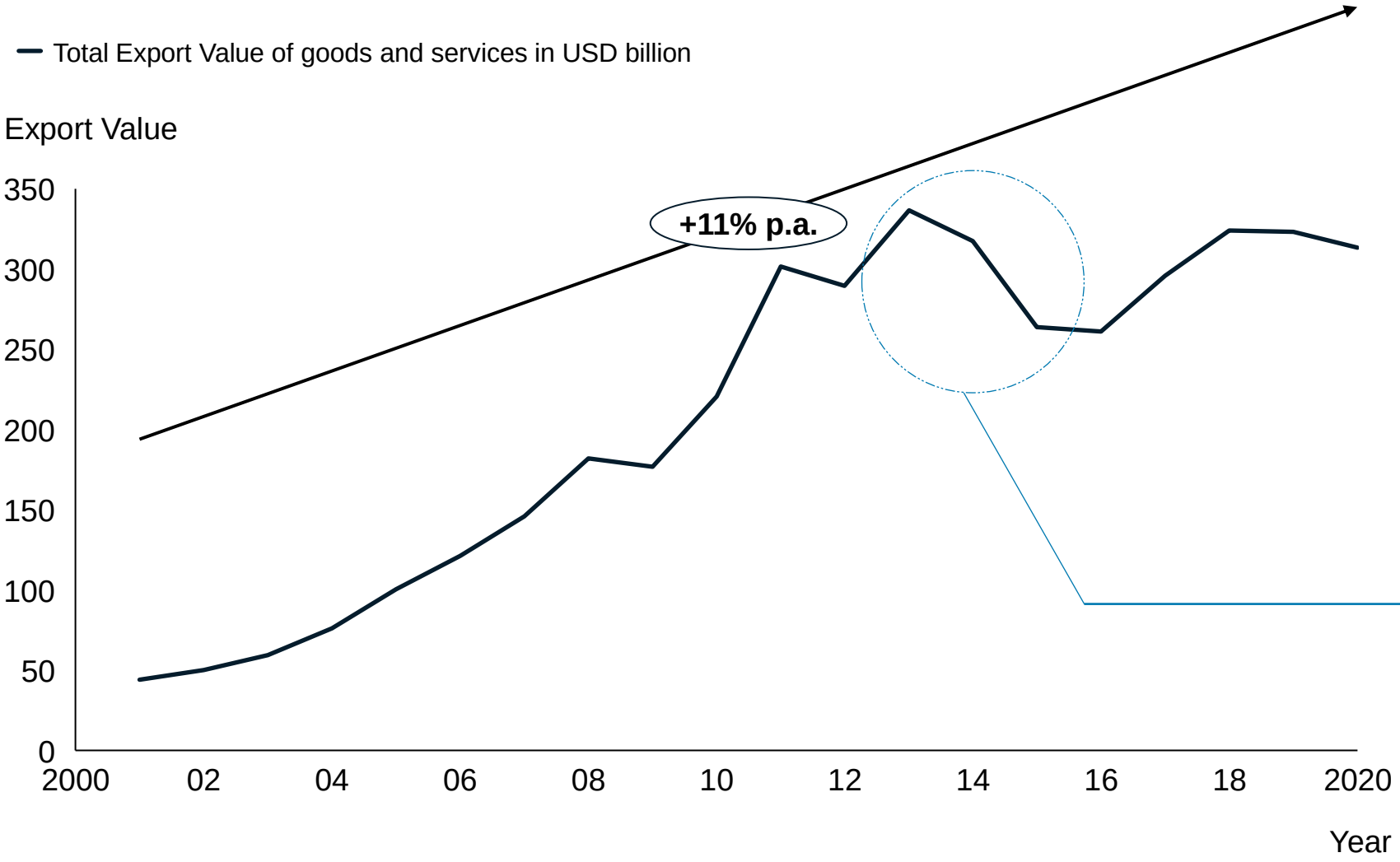
Agenda

Is India the next destination?

Disruption is the name of the game

Current affairs

Indian exports to the world have seen a sharp increase, rising by ~11% in last 20 years

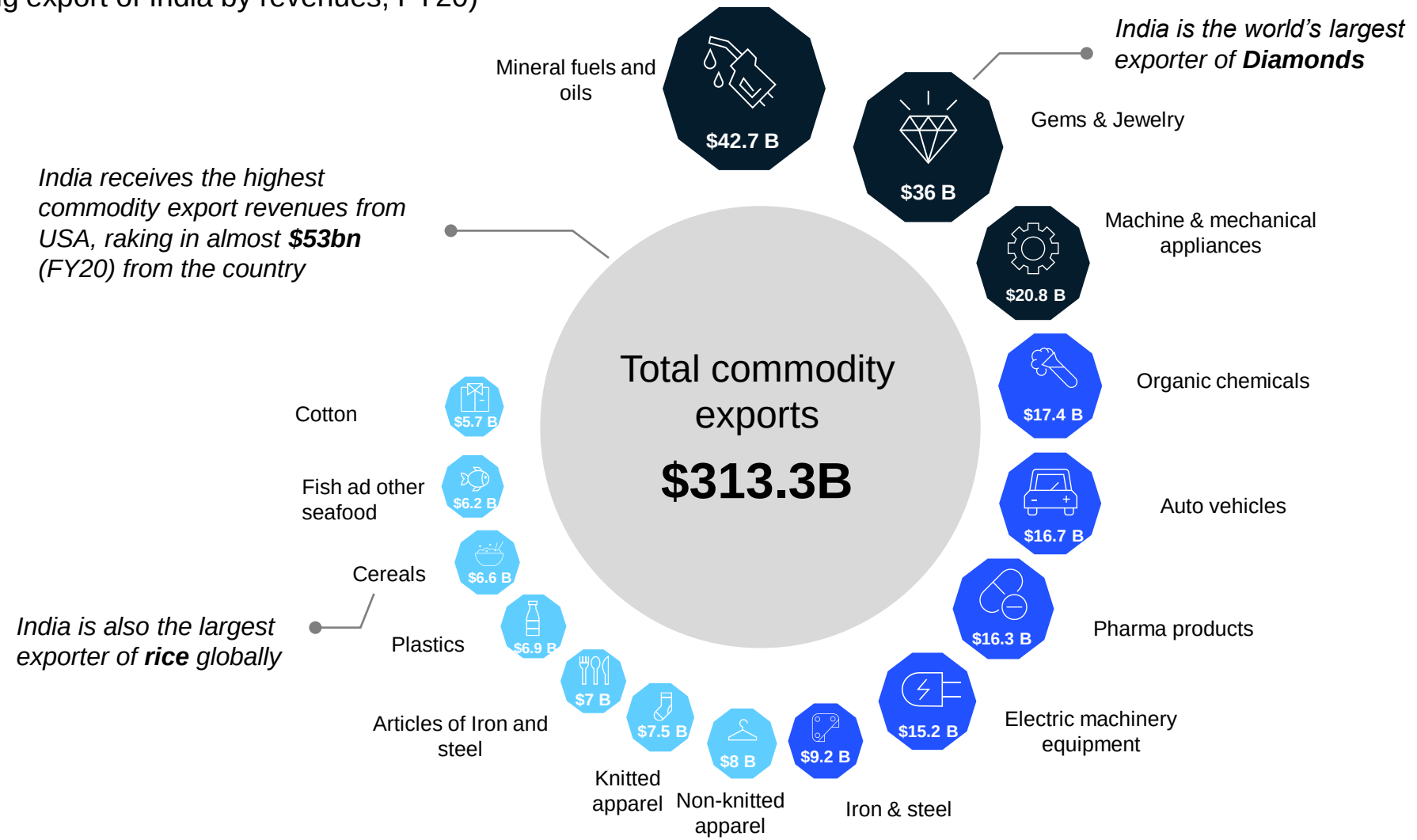


- India's total export volume in 2020 was 313.3 USD Billion
- India's exports have risen sharply from nearly 44 USD Billion in 2001 to it's all time high of 336 USD Billion in 2013
- The top 10 export goods and services have a huge chunk of share of nearly 60% in the total export value
- **2014 Dip**: India's export in 2014-2016 period decreased due to global slowdown and decrease in demand from China

Source: UN Comtrade, Ministry of Commerce and Industry

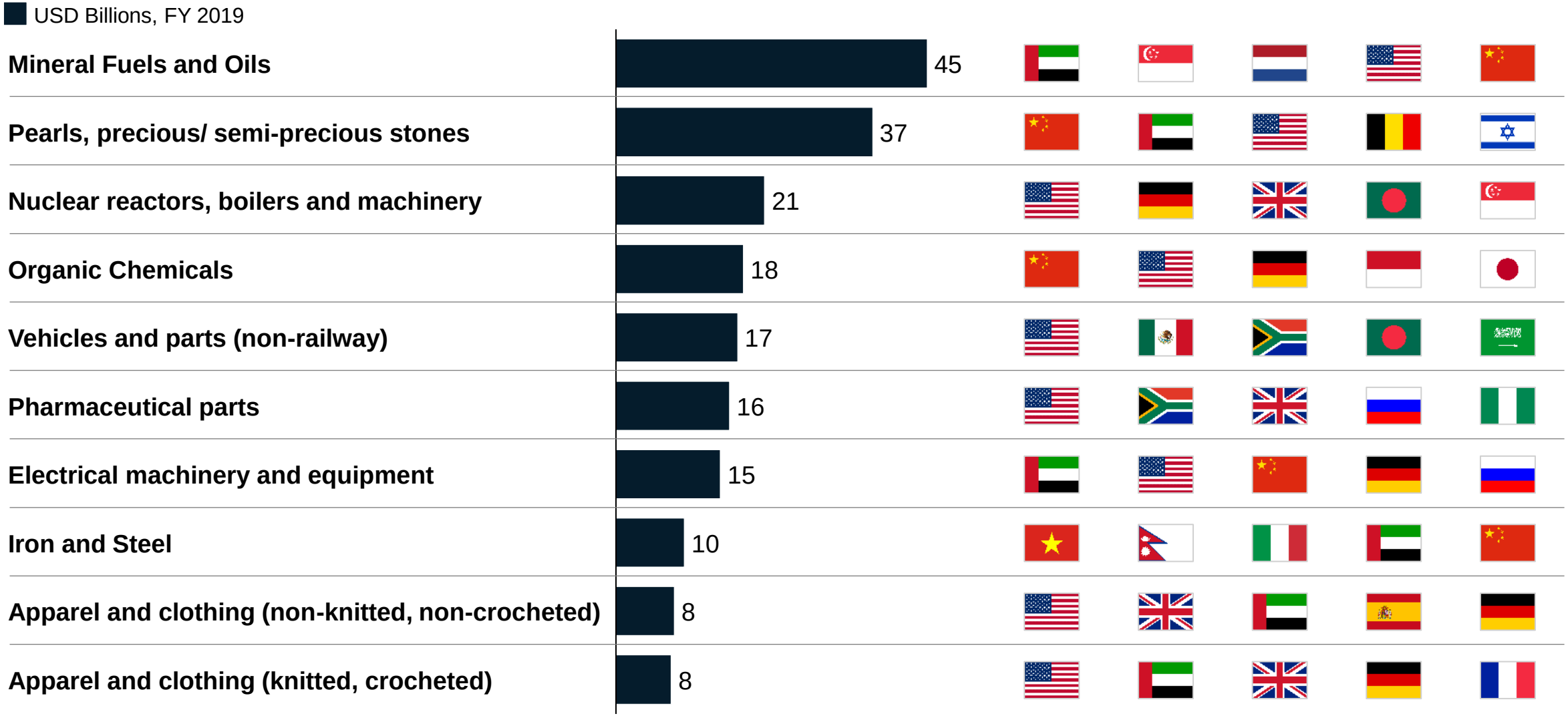
Commodity exports account for ~USD 313 billion export value in 2020, with mineral fuel and precious gems holding ~25% of the share

(Top 15 leading export of India by revenues; FY20)



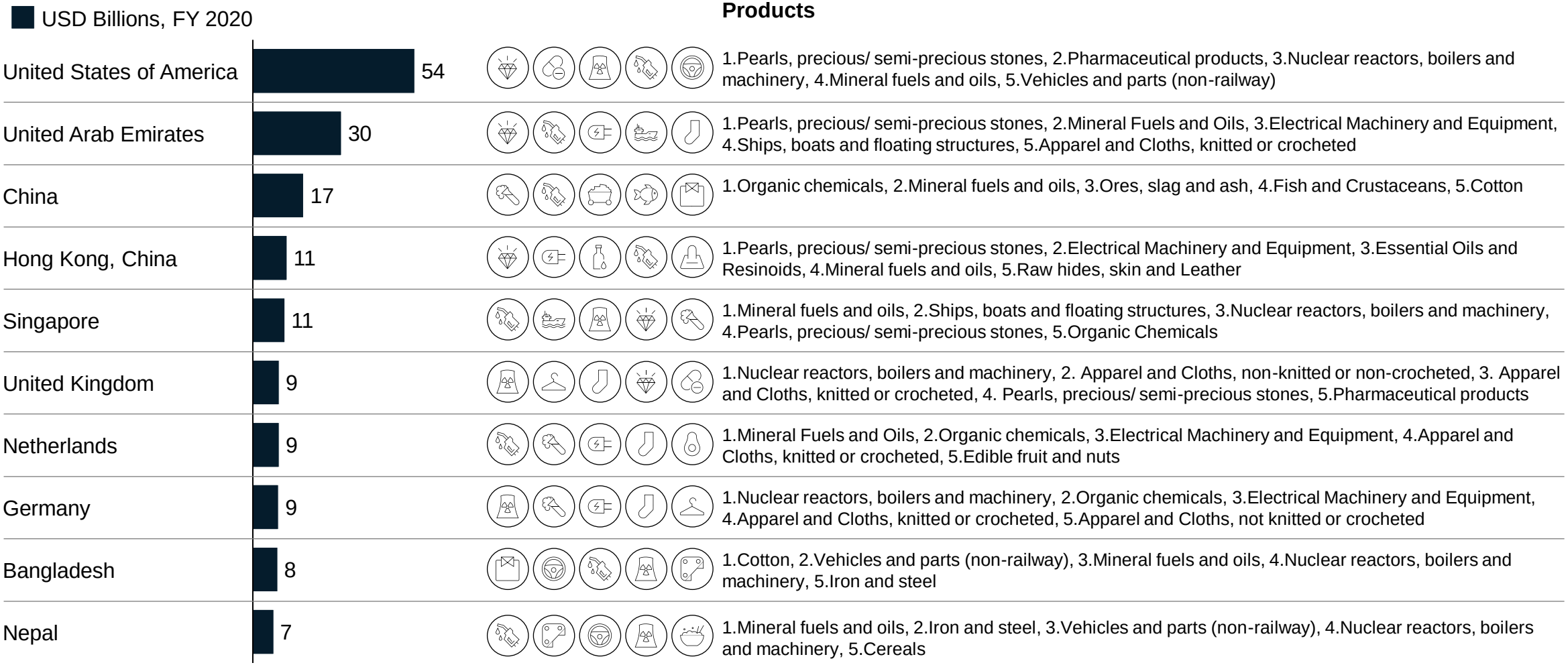
Source: Ministry of Commerce and Industry

Top 10 principal exports in terms of commodity groups account for as much as 78% of total merchandise exports



Source: Trademap

10 countries account for more than 50% of India's export volumes, with USA and UAE capturing majority shares of 16.8% and 9.8% respectively



Source: Trademap

Key industries holding best cost country (BCC) sourcing opportunities in India

Pharmaceutical

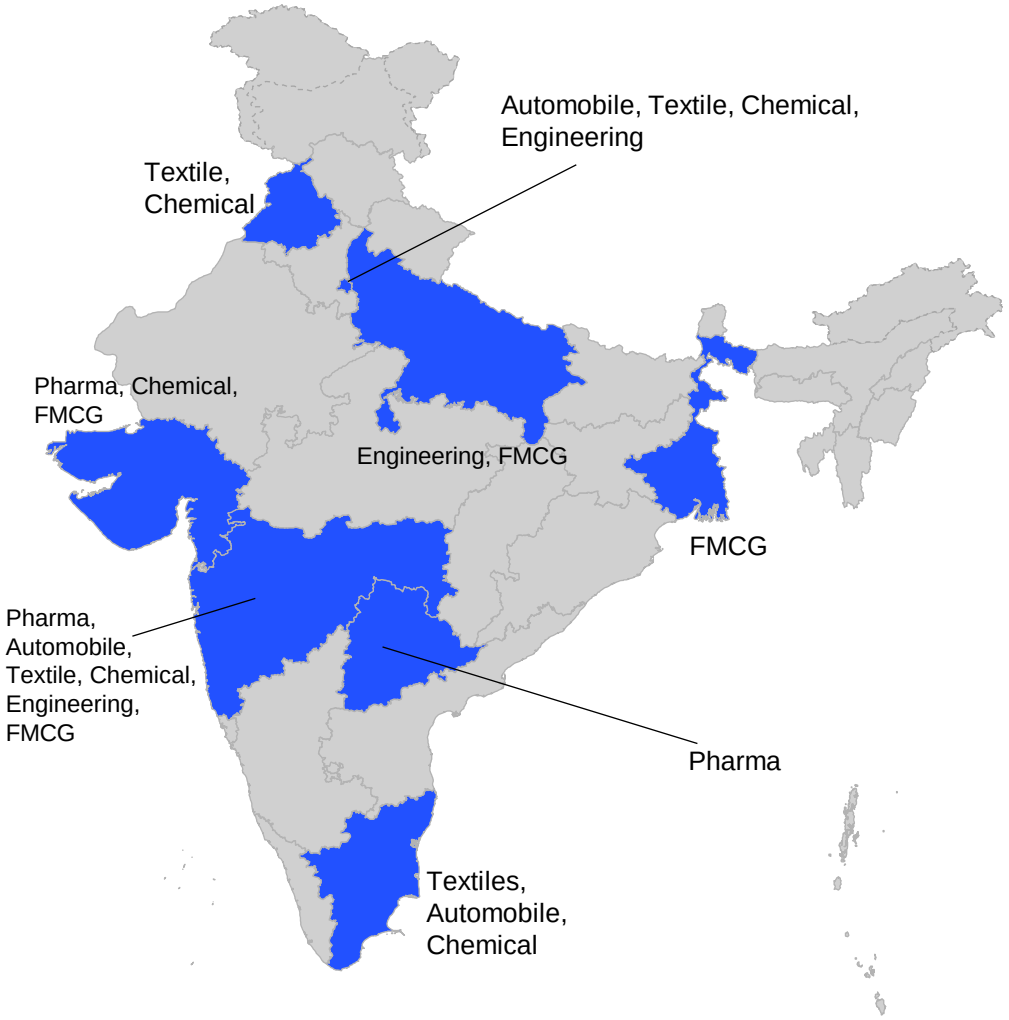
Cipla, Zydus dedicated to life, Sun Pharma, Aurobindo, Lupin, Dr. Reddy's, Alkem, Wockhardt, Divis

Automobile

Ashok Leyland, Bajaj Distinctly Ahead, Eicher, Force Motors, Mahindra, Hyundai, Hero, Tata Motors, Maruti Suzuki

Textiles and Apparels

Bombay Dyeing, fabindia Celebrate India, Grasim, Vardhman, Raymond, Sutlej, Trident Group Excellence in nature, Loyal Textile Mills Ltd.



Chemical and Petrochemicals

Pidilite, Tata Chemicals Limited, UPL, GFL Gujarat Fluorochemicals Limited, Reliance Industries Limited, IndianOil, ONGC, HMEL, CPCL

Engineering

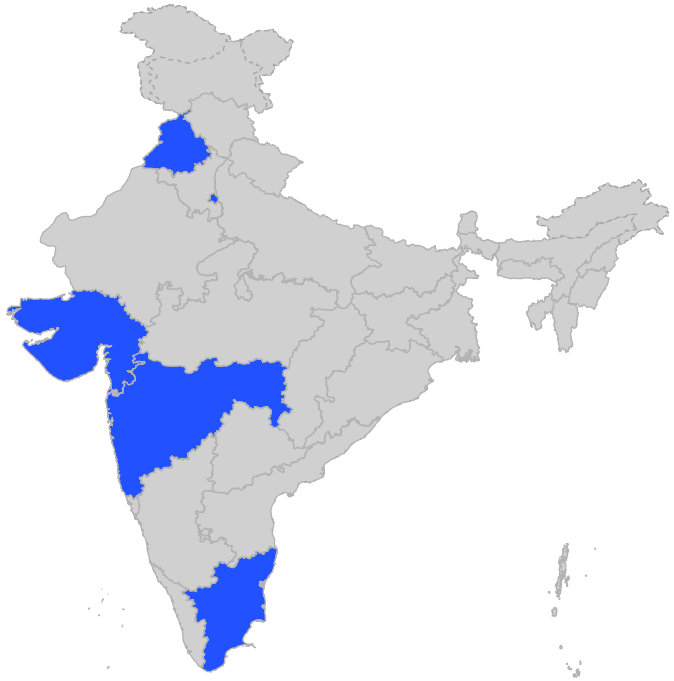
L&T, Tata, Reliance Industries Limited, Godrej, BHEL, Havells

FMCG

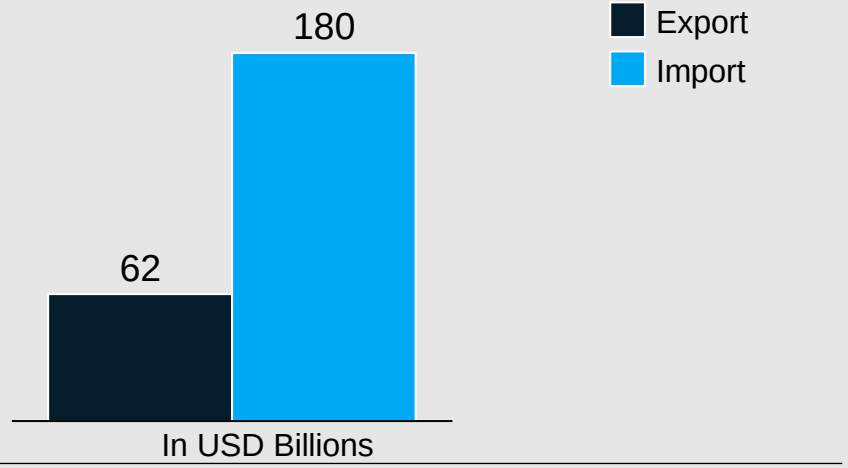
Godrej, Parle Agro, ITC Limited, Marico, Dabur, Amul, Hindustan Unilever Limited

Source: IBEF, Invest India, McK Analysis

Chemical and Petrochemical Industry



- India is fourth largest Agrochemicals manufacturer and sixth largest manufacturer of chemicals in the world
- India is a big global dye supplier, holding approximately 16% of the world production of dyestuff and dye intermediates
- 100% FDI is allowed under the automatic route in the chemicals sector
- Tax breaks and special incentives through PCPIRs (Petroleum, Chemical and Petrochemical Investment Region) or SEZs will further support the industry
- Due to global monopoly of OPEC countries, India is importing fuel and petroleum in large amount. However, the processing and distribution of petrochemical products cater to a huge chunk of the Indian Market



Source: IBEF, Invest India, Ministry of Commerce and Industry

Agenda

Is India the next destination?

Disruption is the name of the game

Current affairs

We see three areas of potential significant impact for Digital and dvanced Analytics (AA) in Chemicals supply chain

Enabling technology

1 Predictive analytics in demand planning	▪ Probabilistic demand forecasting using predictive analytics (e.g., statistical regression and machine learning) and leveraging big data ▪ Increased forecast accuracy and granularity	▪ Machine learning: tree-based models, neural networks, etc. ▪ Advanced computing
2 Analytics based E2E network optimization	▪ E2E network optimization including closed-loop planning & margin-optimized production incorporating raw material supply, production planning, distribution, inventory, sales and demand ▪ Digital S&OP with integrated profit optimization ▪ Real-time supply chain visibility / transparency	▪ Advanced optimization engines ▪ Advanced modelling (e.g., multi-method modelling) ▪ Cloud-based technologies ▪ Digital ways of working (DWoW)
3 Robotics in material handling and transport	▪ Automated warehouse robots, robotic / automated cargo handling, autonomous guided vehicles (AGVs) for transport ▪ Increased speed, flexibility and safety while reducing cost	▪ Robotics including sensory systems ▪ Artificial intelligence (AI) & cognitive systems

Robotics use case examples in Chem SC and logistics (1/2)

Warehouse picking

IAM Robotics' Swift picks up specialty chemicals to fill order

Vision technology enables the robot to see and locate objects in 3D and real-time

Automated barcode scanning ensures the right products are picked and packed

Swift picks up specialty chemicals

Palletizing and depalletizing

- Palletizing & depalletizing robots can autonomously handle incoming raw materials and end-of-line packing and loading
- Robots can palletize / depalletize cases, boxes, bags, buckets, etc.
- For example…
  - MMCI robots palletize bags of fertilizer
  - Kuka robots palletize buckets of chemicals
- Robotic systems can also unload and load trucks
- Autonomous loading / unloading significantly, if not completely, reduces need for human handlers for loading and unloading

MMCI robot palletizes bags of fertilizer

Kuka robot palletizes buckets of chemicals

SOURCE: IAM Robotics, Kuka, MMCI

Robotics use case examples in Chem SC and logistics (2/2)

Autonomous cargo movement

- BASF partnered with the VDL Groep to develop an autonomous guided vehicle
- The AGV is steered via transponders embedded in the road surface
- It formerly **took around 22 hours** for a railway tank car to be delivered from BASF's train station to one of the loading stations at the site; **with the AGV, this time is cut to just one hour**

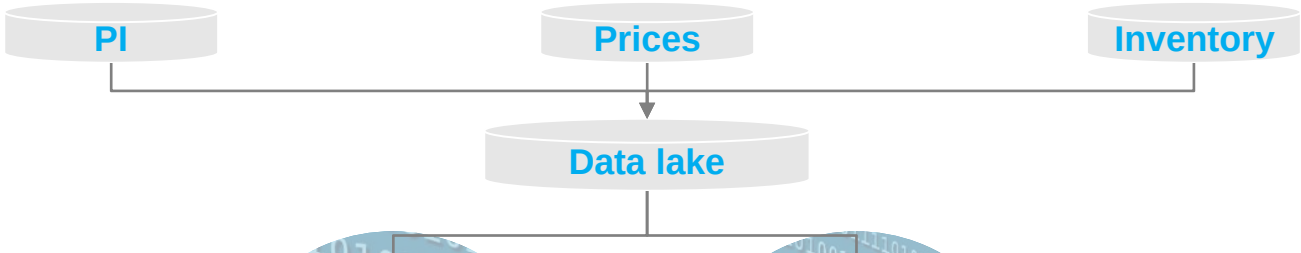
BASF & VDL's autonomous guided vehicle transports chemicals

- Katoen Natie started operating its first driverless truck at ExxonMobil's world-scale integrated manufacturing site in Singapore in 2018, transporting products between the company's packaging and intermediate storage facilities
- The pilot truck will operate on a **24/7 basis moving some 250,000 tons of product annually**
- After a six-month test run, the project will be gradually expanded to 12 trucks, moving some 3 million tons of product annually

Katoen Natie's autonomous guided vehicle transports chemicals

SOURCE: VDL Group, BASF, Katoen Natie, ExxonMobil

A digital S&OP process enables a new operating model with cross-functional digital interfaces



Process optimization

Process model suggests process parameters

Product mix / profit optimization

Profit model suggests production mix (grades) to produce

Digital Performance mgmt.

Production teams debrief shift performance on **digital whiteboards**

Digital Operations

Control room and field operators use **real-time optimized parameters** to run the process

Digital S&OP process

Digital S&OP meeting btwn production, product and planner to **test scenarios & validate production mix**

Digital product mgmt.

Product manager makes **volume allocation simulations** to maximize asset utilization

Digital Sales

Commercial representative makes **price / volume simulation** during negotiation

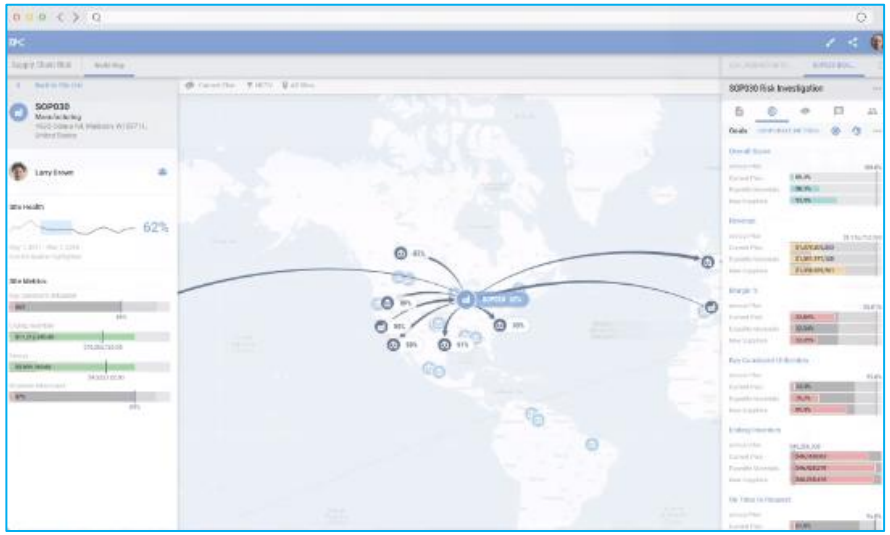
BASF targets E2E Supply Chain transparency with Kinaxis

- BASF recently piloted Kinaxis RapidResponse®, a leading cloud-based supply chain management solution based on concurrent planning

- RapidResponse uses a single cloud-based planning platform that lets users plan concurrently (via advanced analytics and machine learning) for every part of the supply chain – from sales and operations planning (S&OP) to demand, inventory, supply, capacity

"Creating a transparent and connected business process is key to our supply chain operations. Kinaxis provides us with the E2E planning platform, reducing planning latency, improving alignment of dependent processes, and fostering transparency between all functional elements of our business"

- Mr. Jan Brüning, Smart Supply Chain Cluster Lead, BASF



SOURCE: http://info.kinaxis.com/request-for-demo?campaign=70139000000ee8J&ls=ii

Agenda

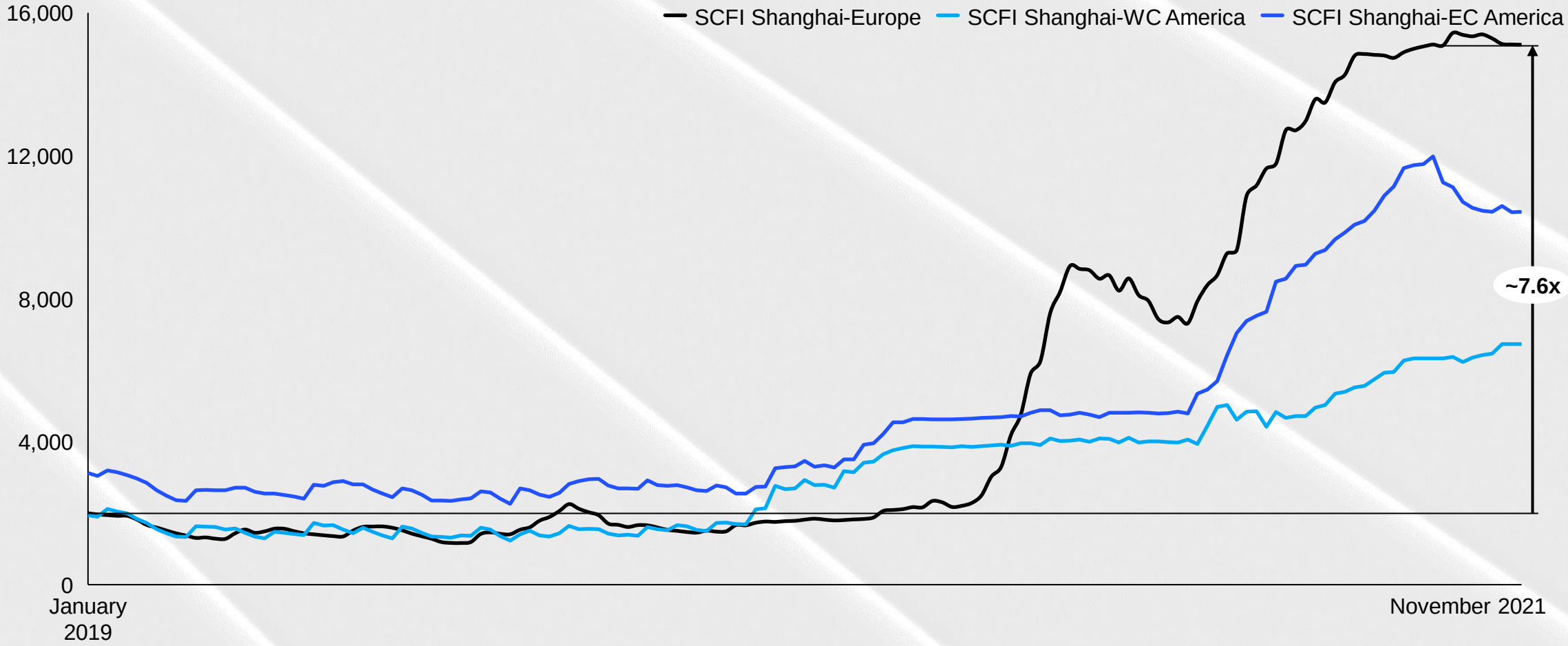
Is India the next destination?

Disruption is the name of the game

Current affairs

Rates have surged

Rate development by trade lane, USD / FEU

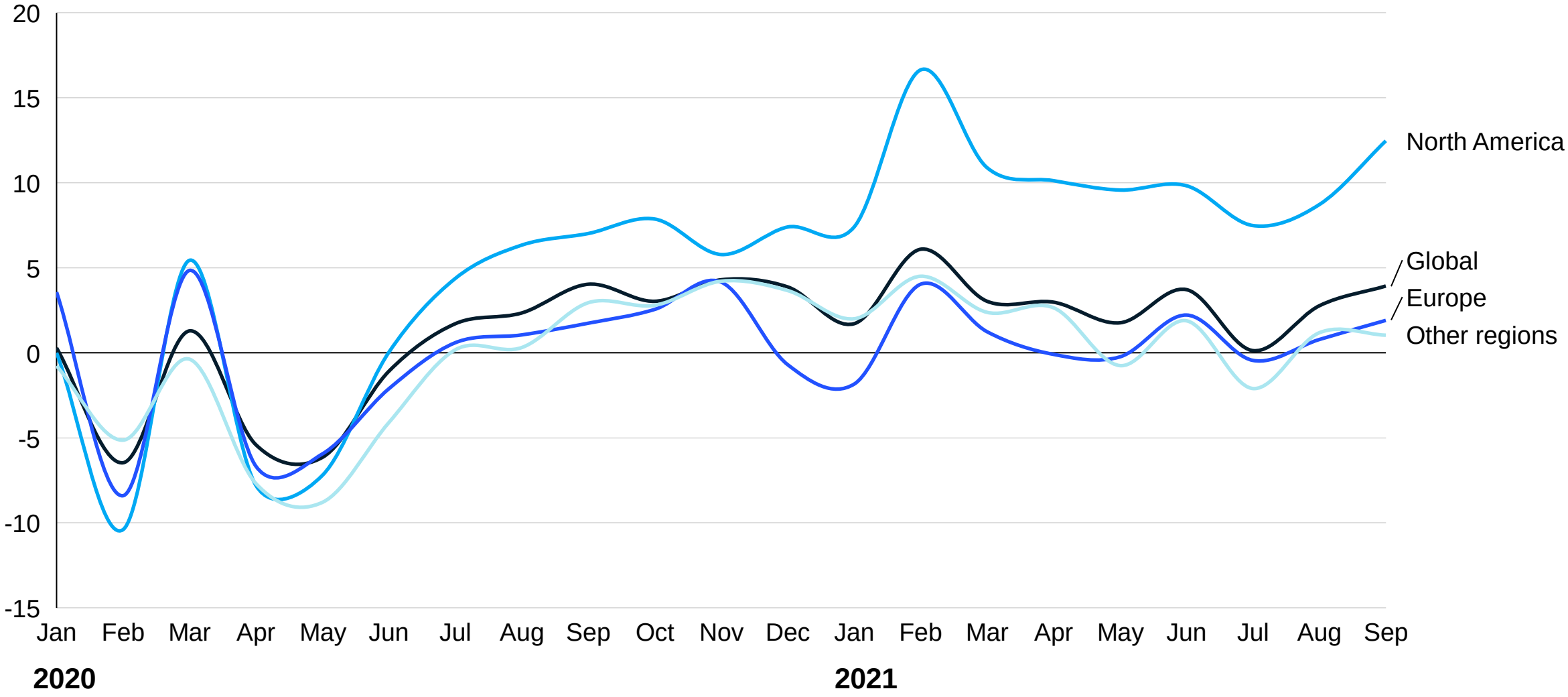


1. Additional surcharges putting it more than quoted prices

Source: SCFI data sourced from SIN Clarksons

But it's not driven by global demand – only North America sees a peak

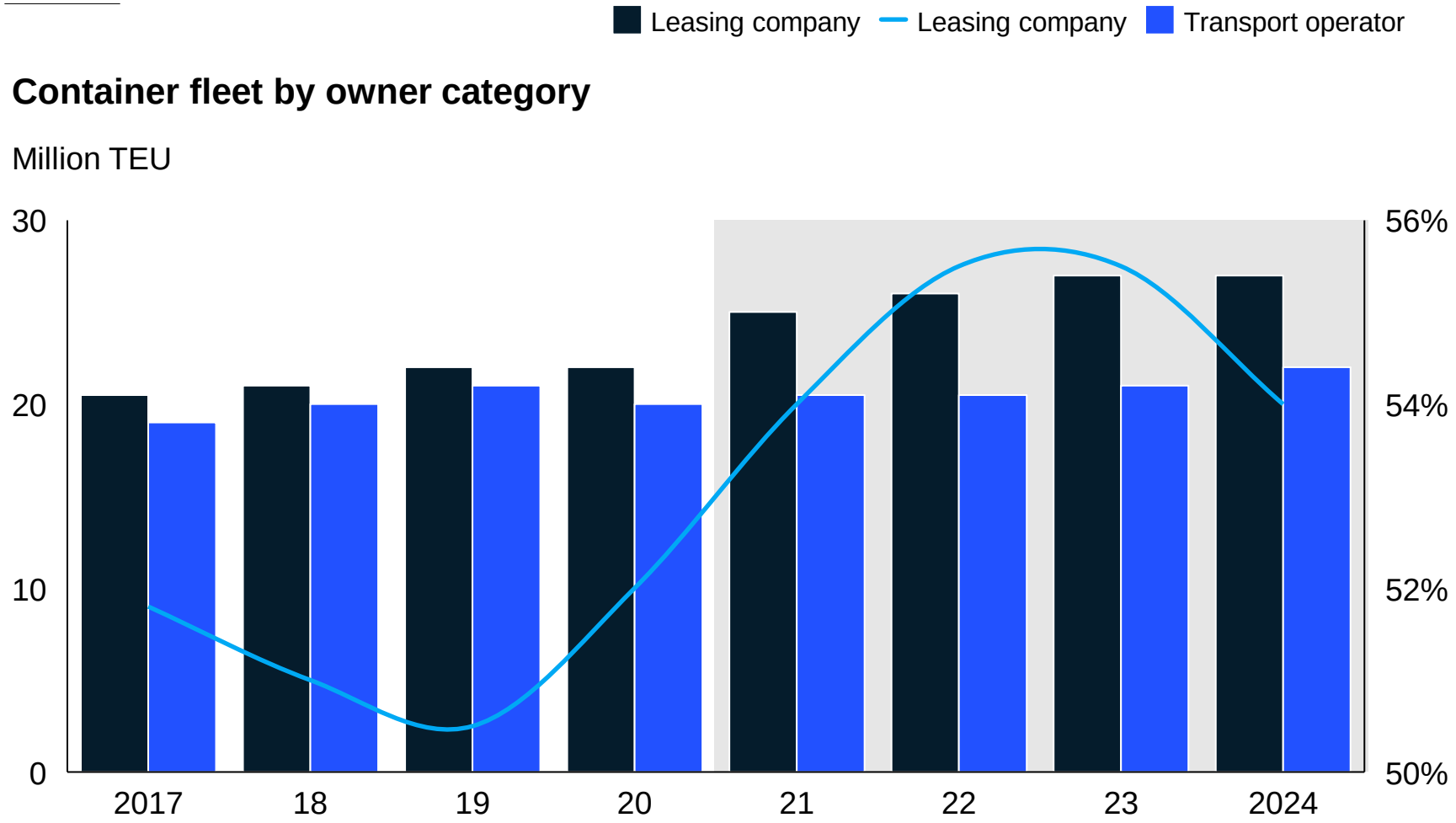
Cumulative average growth rate vs. 2 years before, %



Source: Container Trade Statistics

Container liners and other owners are expected to continue investing in new boxes to solve the equipment shortage

Illustrative



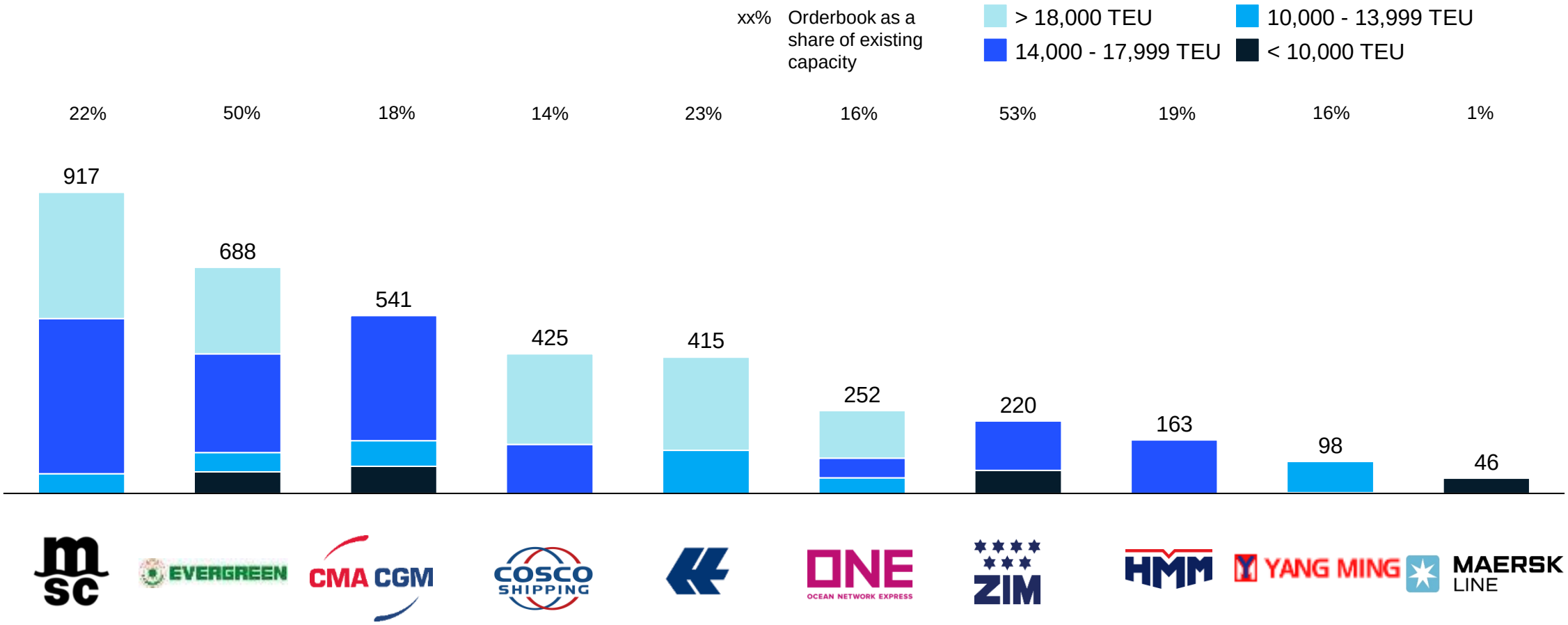
Source: Drewry's Container Equipment Forecaster 4Q20; JOC; McKinsey

Liners are already investing to grow their fleet employing a mix of owning and leasing strategy:

- **Maersk**: increased 40-foot HC fleet by 9.7%, in 2020 and expects to increase that by a further 2% in 2021
- **Hapag-Lloyd**: executed an order of 210,000 container since April 2021
- **CMA CGM**: increased its container fleet by 8.7% in the second half of 2020.

Liners slowly adding orders for new vessels with some aggressively – Evergreen's current orderbook is >50% of its capacity

Top container liners current orderbook, 000 TEUs



1. As of August 8th

Source: Alphaliner; McKinsey

Current disruption is expected to normalize over the next 5-6 months in the 'Optimistic scenario'

Deep dive on our Optimistic Scenario

Constrained | Constraint begins easing | Stable operation

Marginal capacity relief expected before EOY | **Relief in most subsystems** | **Stabilization at 'new normal'**

Value chain		Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Port and Hinterland logistics transport	Ports	Volume significantly slowing down from peak	Terminals improve loading/unloading productivity and process vessels faster as congested yards loosen			
	Drayage	Drayage crunch slowly easing up as demand slows down	Chassis and other equipment availability improves with increased turnover and empty dropping appointments slots increase			
	Rail intermodal	Rail catching up demand and improving dwell time	Cargo owners leveraging weekend-in gates to and extended hours to discharge loaded cargo quickly to hinterland			
	Over-the road trucking	Driver capacity improving slowly	Trucking companies increase cooperation with customers to ease shortage (e.g. labor assistance at DCs)			
	Equipment availability	Intervention improving existing equipment turnover	New domestic container and chassis to start entering service			
	Warehousing	Capacity remaining tight until peak season is over	Intermodal companies and shippers align their working hours to keep sufficiently staffed warehouses open 24/7, and move loaded containers quickly using newly unlocked capacity			
Ocean transport	Ocean carriers	Holiday season cargo is either en route or already delivered – no increase in flows	Liners deploy extra loaders to reposition empties back to Asia and opening space at empty storage of terminals			
	Equipment availability	Intervention improving existing equipment turnover	New container boxes orders start entering service			
Labor	Labor availability	Labor shortage remains	Trucking/drayage and other sectors improving labor availability using labor coming back from e-ecommerce sector			

Source: External expert interviews

Thank You

End