ARCTIC CIRCLE

COSCO SHIPPING 中远海运特种运输股份有限公司
COSCO SHIPPING SPECIALIZED CARRIERS CO., LTD.

Arctic Shipping Experience & Expectation
北极航运实践和展望

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Online Seminar organized by Arctic Circle & China Polar Research Center
on 14th Oct. 2022 I am sitting in Helsinki

CONTENT

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- **Reviewing What we did** - 北极航运实践回望
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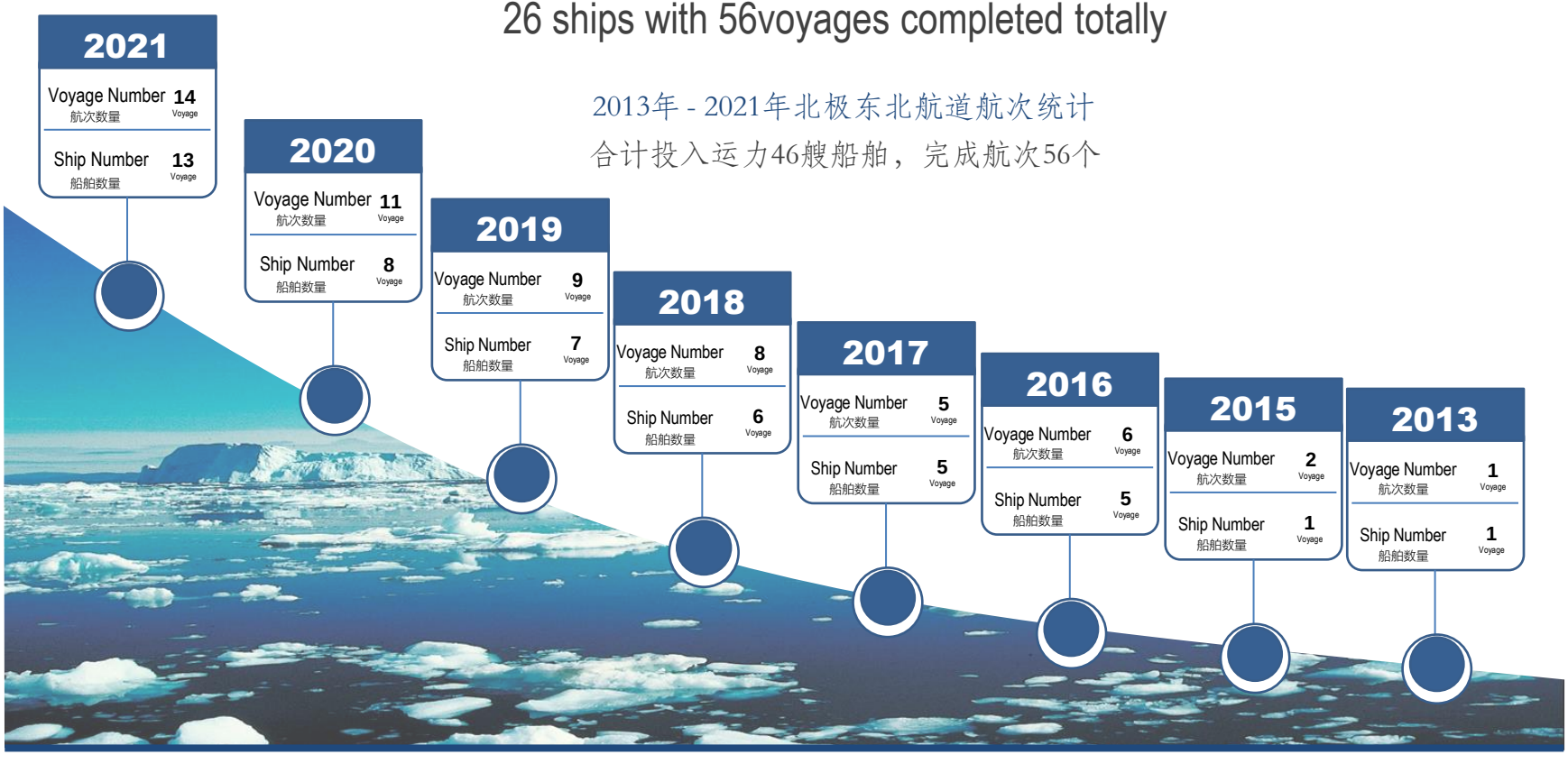
1. Arctic Shipping Revies (a)

STATISTICS OF VOYAGE OF SHIPPING VIA NORTHEAST PASSAGE FROM 2013 UPTO 2021

26 ships with 56voyages completed totally

2013年 - 2021年北极东北航道航次统计

合计投入运力46艘船舶，完成航次56个



The Commercial Normalization

Total 14 voyages in 2021, including 7 Westbound & 7 Eastbound

2021年北极航行14个航次，包括西行7航次、东行7航次

2021

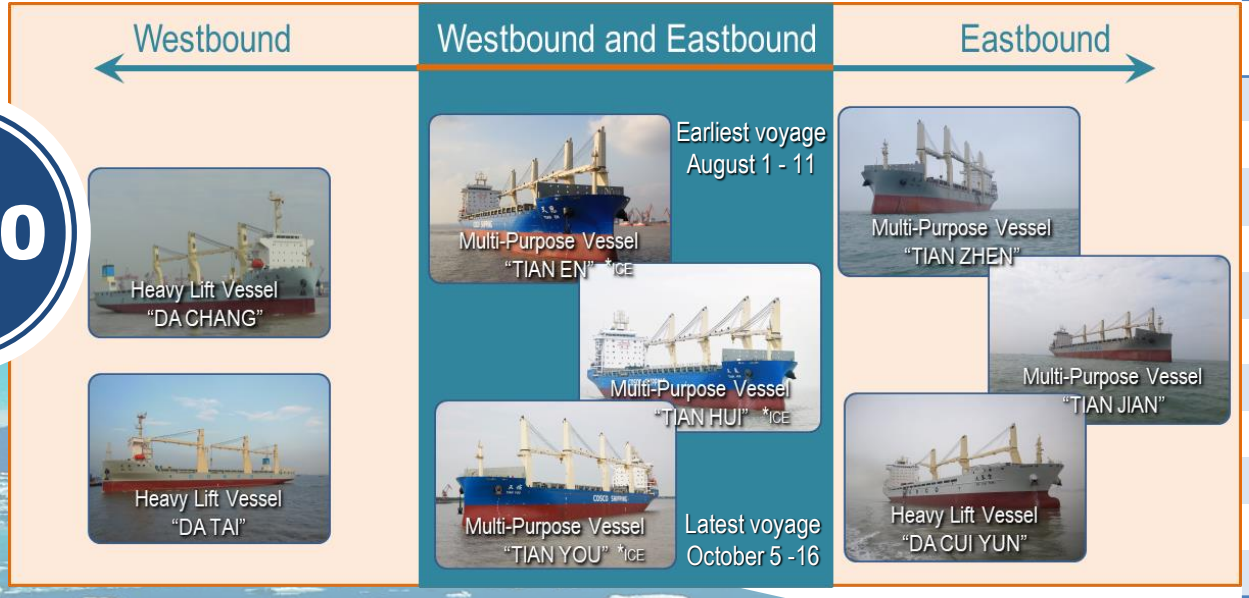
Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Assistance
TIAN EN	HELSINKI	QING DAO	YES
TIAN HUI	SHANG HAI	GISMARVIK	YES
TIAN ZHEN	HELSINKI	QING DAO	YES
TIAN QI	ST.OETERSBURG	QING DAO	YES
DA YU XIA	SHANG HAI	SWINOUJSCIE	NO
TIAN JIAN	QIN HUANG DAO	GAVLE	NO
TIAN YOU	HELSINKI	QING DAO	NO
DA DE	HAMBURG	KUSHIRO	NO
DA JI	TAI CANG	YARA	NO
TIAN LU	JAKOBESTAD	QING DAO	NO
TIAN HUI	KOTKA	QING DAO	NO
TIAN SHOU	DA FENG	GDYNIA	NO
DA TONG YUN	SHANG HAI	SWINOUJSCIE	NO
DA ZHI	QIN HUANG DAO	UDDEVALLA	NO

The Commercial Normalization

In 2020, there were 11 voyages via Arctic Ocean, including 5 westbound and 6 for eastbound

2020年北极航行11个航次，包括西行5航次、东行6航次

2020



Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Assistance
TIAN YOU	Denmark Allborg	China Shanghai	No
TIAN ZHEN	Finland Helsinki	China Qingdao	No
DA CUI YUN	Lithuania Klaipeda	China Weifang	No
TIAN JIAN	Lithuania Klaipeda	China Qingdao	No
TIAN EN	Finland Helsinki	China Qingdao	No
TIAN HUI	Finland Helsinki	China Qingdao	No
TIAN EN	China Lianyungang	Germany Emden	No
TIAN HUI	China Yangzhou	Sweden Gavle	No
DA CHANG	China Tianjin	Denmark Esbjerg	No
DA TAI	China Taicang	Denmark Esbjerg	No
TIAN YOU	China Lianyungang	Germany Emden	No

*ice Multi-Purpose vessels are classified as Swedish-Finnish 1A Ice Class for some of Tian Class vessels.

The Commercial Normalization

In 2019, there were 9 voyages via Arctic Ocean, including 4 westbound and 5 for eastbound

2019年北极航行9个航次，包括西行4航次、东行5航次

2019

Westbound

Westbound and Eastbound

Eastbound

Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Needed
TIAN XI	Finland Helsinki	China Qingdao	No
DA XIANG	Germany Hamburg	China Dalian	No
TIAN QI	Russia S. Petersburg	Vietnam Phanthiet	No
TIAN EN	Finland Helsinki	Japan Tomakoma	No
DA TAI	Russia Ust-Luga	China Rizhao	No
TIAN EN	China Taicang	Sweden Gavle	Yes
DA TAI	China Taicang	Sweden Gavle	Yes
TIAN YOU	China Shanghai	Germany Hamburg	No
TIAN HUI	China Jiangyin	Poland Gdynia	No

*ice Multi-Purpose vessels are classified as Swedish-Finnish 1A Ice Class for some of Tian Class vessels.

The Commercial Normalization

In 2018, there were 8 voyages via Arctic Ocean, including 4 westbound and 4 for eastbound

2018年北极航行8个航次，包括西行4航次、东行4航次

2018

Westbound

Westbound and Eastbound

Eastbound

Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Assistance
TIAN HUI	Germany Emden	Japan Tomakoma	Yes
TIAN JIAN	Finland Helsinki	China Qingdao	Yes
TIAN QI	Finland Helsinki	China Qingdao	No
TIAN YOU	Norway Nor Fjord	China Nansha	No
TIAN YOU	China Dafeng	Sweden Hardnosed	Yes
TIAN EN	China Lianyungang	France Rouen	Yes
TIAN LU	Vietnam Da Nang	England Hull	No
TIAN HUI	China Lianyungang	Sweden Oskarshamn	No

*ice Multi-Purpose vessels are classified as Swedish-Finnish 1A Ice Class for some of Tian Class vessels.

The Commercial Normalization

In 2017, there were 5 voyages via Arctic Ocean, including 3 westbound and 2 for eastbound

2017年5个航次，西行运设备、东行运林产品

2017

Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Assistance
TIAN LE	Norway Nord Fjord	Japan Tomakoma	No
TIAN FU	Denmark Greynold	China Shanghai	No
DA AN	China Tianjin	Germany Cuxhaven	No
TIAN JIAN	China Lianyungang	Denmark Esbjerg	No
LIAN HUA SONG	China Lianyungang	Denmark Esbjerg	Yes

*ice Multi-Purpose vessels are classified as Swedish-Finnish 1A Ice Class for some of Tian Class vessels.

The Commercial Normalization

In 2016, there were 6 voyages via Arctic ocean, including 3 westbound and 3 for eastbound

2016年6个航次，重点承运北极亚马尔气田装备，在赫尔辛基宣布夏季常态化营运

2016

Westbound

Westbound and Eastbound

Eastbound

Ship's Name	Port of Loading	Port of Discharging	Pilot Icebreaker Assistance
TIAN XI	Finland Kotka	China Qingdao	Yes
XIANG HE KOU	Russia Sabetta	China Qingdao	Yes
YONG SHENG	England Sheerness	China Dalian	No
ZHI YUAN KOU	China Tianjin	Russia Sabetta	Yes
XIANG YUN KOU	China Qingdao	Russia Sabetta	Yes
YONG SHENG	China Tianjin	Scotland Glasgow	Yes

*ice Multi-Purpose vessels are classified as Swedish-Finnish 1A Ice Class for some of Tian Class vessels.

M.V. Yong Sheng completed the first single Westbound voyage in 2013 and the Round-trip of Arctic Sailing in 2015 respectively.

2013年永盛轮首航北极东北航线，2015年再航实现双向通行。

2015

2013

Ship	M.V. YONG SHENG		
Port (Loading)	Hamburger Germany	Jiangyin China	**Taicang China**
Date (Sailing)	04.09.2015	22.07.2015	**15.08.2013**
Port (destination)	Busan Korea	Varberg Sweden	**Rotterdam Netherlands**
Date (Arrival)	30.09.2015 (27 days)	19.08.2015 (29 days)	**10.09.2013** **(27 days)**

a) Where COSCO SHIPPING Spe.'s vessels calling at

中远海特船舶北极航运服务覆盖区域及港口

Atlantic Region
北大西洋区域

- ✓ **Baltic Sea ports** like as Helsinki & Kotka Finland, Varbery & Gavle Sweden, Nor Fjord Norway, Esbjerg Denmark, Uts-luga & S.Petersburg Russia, Klaipeda Lithuania and etc.
- ✓ Continental & UK like as Hamburg & Emden Germany, Rotterdam Netherlands and etc.
- ✓ Possibly calling at Icelandic ports and North American ports when clients ask.

Arctic Region
北冰洋区域

- ✓ Norway: Kirkenes.
- ✓ Russia: Murmansk, Sabetta, Dutinka.

Far East Region
远东区域

- ✓ China: **Jiangshu** (Taicang, Lianyungang,Jiangyin, Dafeng mainly for Westbound), **Shandong** (Qingdao,Weifang,Rizhao mainly for Eastbound) as well as Shanghai, Tianjin, Dalian, Guangzhou and etc.
- ✓ Korea & Japan, Pusan Korea, Tomakoma Japanand and other possible ports
- ✓ South East Asia : Daning Vietnam & and other Asian ports
- ✓ Far East of Russia: Some ports like as Vladivostok, Nakhodka

b1: Categorise of Cargo shipped via Arctic Ocean overpast years

Year	Ship's Name	Port(loading)	Port(Destination)	Cargo Types
2013	YONG SHENG	China Taicang	Netherlands Rotterdam	Equipment, Steel
2015	YONG SHENG	China Jiangyin	Sweden Varberg	Equipment, Steel
	YONGSHENG	Germany Hamburg	Korea Busan	Ore, Steel
2016	TIAN XI	Finland Kotka	China Qingdao	Pulp
	XIANG HE KOU	Russia Sabetta	China Qingdao	Empty
	YONG SHENG	England Sheemess	China Dalian	Equipment, Steel
	ZHI YUAN KOU	China Tianjin	Russia Sabetta	Equipment
	XIANG YUN KOU	China Qingdao	Russia Sabetta	Equipment
2017	TIAN LE	Norway Nor Fjord	Japan Tomakoma	Bulk Cargo,Equipment
	TIAN FU	Denmark Greynold	China Shanghai	Pulp, Equipment
	DA AN	China Tianjin	Germany Cuxhaven	Equipment, Steel
	TIAN JIAN	China Lianyungang	Denmark Esbjerg	Equipment, Steel
	LIAN HUA SONG	China Lianyungang	Denmark Esbjerg	Equipment

Year	Ship's Name	Port(loading)	Port(destination)	Cargo Types
2018	TIAN HUI	Germany Emden	Japan Tomakoma	Pulp
	TIAN JIAN	Finland Helsinki	China Qingdao	Pulp
	TIAN QI	Finland Helsinki	China Qingdao	Pulp,Equipment
	TIAN YOU	Norway Nor Fjord	China Nansha	WTG
	TIAN YOU	China Dafeng	Sweden Hardnosed	WTG
	TIAN EN	China Lianyungang	France Rouen	WTG
	TIAN LU	Vietnam Da Nang	England Hull	WTG
	TIAN HUI	China Lianyungang	Sweden Oskarshamn	WTG
2019	TIAN XI	Finland Helsinki	China Qingdao	Pulp
	DA XIANG	Germany Hamburg	China Dalian	Fertilizer, Equipment
	TIAN QI	Russia S. Petersburg	Vietnam Phanthiet	Fertilizer
	TIAN EN	Finland Helsinki	Japan Tomakoma	Pulp, Containers
	DA TAI	Russia Ust-Luga	China Rizhao	Petroleum Coke
	TIAN EN	China Taicang	Sweden Gavle	WTG
	DA TAI	China Taicang	Sweden Gavle	WTG
	TIAN YOU	China Shanghai	Germany Hamburg	Equipment
	TIAN HUI	China Jiangyin	Poland Gdynia	Equipment

b2: Categorise of Cargo shipped via Arctic Ocean overpast years

Year	Ship's Name	Port(loading)	Port(Destination）	Cargo Types
2020	TIAN YOU	Denmark Allborg	China Shanghai	Bulk Cargo, WTG
	TIAN ZHEN	Finland Helsinki	China Qingdao	Pulp
	DA CUI YUN	Lithuania Kpaipeda	China Weifang	Fertilizer
	TIAN JIAN	Lithuania Kpaipeda	China Qingdao	Fertilizer
	TIAN EN	Finland Helsinki	China Qingdao	Pulp
	TIAN HUI	Finland Helsinki	China Qingdao	Pulp
	TIAN EN	China Lianyungang	Germany Emden	WTG
	TIAN HUI	China Yangzhou	Sweden Gavle	WTG
	DA CHANG	China Tianjin	Denmark Esbjerg	WTG
	DA TAI	China Taicang	Denmark Esbjerg	WTG
	TIAN YOU	China Lianyungang	Germany Emden	WTG

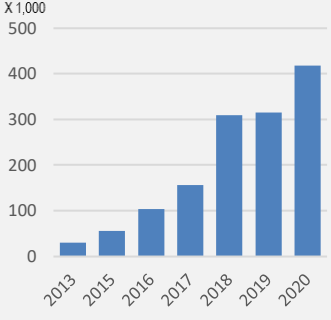
Year	Ship's Name	Port(loading)	Port(destination)	Cargo Types
2021	TIAN EN	Finland Helsinki	China Qingdao	Pulp
	TIAN HUI	China Shanghai	Norway Nismarvik	WTG
	TIAN ZHEN	Finland Helsinki	China Qingdao	Pulp
	TIAN QI	St. Petersburg	China Qingdao	Fertilizer
	DA YU XIA	China Shanghai	Poland Swinoujscie	WTG
	TIAN JIAN	China Qinhuangdao	Sweden Gavle	WTG
	TIAN YOU	Finland Helsinki	China Qingdao	Pulp
	DA DE	Germany Hamburg	Japan Kushiro	Equipment, Agriproducts
	DA JI	China Taicang	Norway Yara	Equipment
	TIAN LU	Finland Jakobstad	China Qingdao	Pulp
	TIAN HUI	Finland Kotka	China Qingdao	Pulp
	TIAN SHOU	China Dafeng	Poland Gdynia	WTG
	DA TONG YUN	China Shanghai	Poland Swinoujscie	WTG
	DA ZHI	China Qinhuangdao	Sweden Uddevalla	WTG

B3: Cargo category & volume shipped by COSCO SHIPPING SPE. via Arctic Ocean

中远海特船舶北极航运承运的货类和货量

Year	Ship's Name	Port (Loading)	Port(destination)	Cargo Types
2013	YONG SHENG	China Taicang	Netherlands Rotterdam	Equipment, Steel
2015	YONG SHENG	China Jiangyin	Sweden Varberg	Equipment, Steel
	YONG SHENG	Germany Hamburg	Korea Busan	Ore, Steel
2016	TIAN XI	Finland Kotka	China Qingdao	Pulp
	XIANG HE KOU	Russia Sabetta	China Qingdao	Empty
	YONG SHENG	England Sheemess	China Dalian	Equipment, Steel
	ZHI YUAN KOU	China Tianjin	Russia Sabetta	Equipment
	XIANG YUN KOU	China Qingdao	Russia Sabetta	Equipment
2017	TIAN LE	Norway Nor Fjord	Japan Tomakoma	Bulk Cargo, Equipment
	TIAN FU	Denmark Greynold	China Shanghai	Pulp, Equipment
	DA AN	China Tianjin	Germany Cuxhaven	Equipment, Steel
	TIAN JIAN	China Lianyungang	Denmark Esbjerg	Equipment, Steel
	LIAN HUA SONG	China Lianyungang	Denmark Esbjerg	Equipment
2018	TIAN HUI	Germany Emden	Japan Tomakoma	Bulk Cargo, Equipment
	TIAN JIAN	Finland Helsinki	China Qingdao	Pulp
	TIAN QI	Finland Helsinki	China Qingdao	Pulp
	TIAN YOU	Norway Nor Fjord	China Nansha	Pulp, Equipment
	TIAN YOU	China Dafeng	Sweden Hardnosed	WTG
	TIAN EN	China Lianyungang	France Rouen	WTG
	TIAN LU	Vietnam Da Nang	England Hull	WTG
	TIAN HUI	China Lianyungang	Sweden Oskarshamn	WTG
2019	TIAN XI	Finland Helsinki	China Qingdao	Pulp
	DA XIANG	Germany Hamburg	China Dalian	Fertilizer,Equipment
	TIAN QI	Russia S. Petersburg	Vietnam Phanthiet	Fertilizer
	TIAN EN	Finland Helsinki	Japan Tomakoma	Pulp, Containers
	DA TAI	Russia Ust-Luga	China Rizhao	Petroleum Coke
	TIAN EN	China Taicang	Sweden Gavle	WTG
	DA TAI	China Taicang	Sweden Gavle	WTG
	TIAN YOU	China Shanghai	Germany Hamburg	Equipment
	TIAN HUI	China Jiangyin	Poland Gdynia	Equipment
2020	TIAN YOU	Denmark Allborg	China Shanghai	Bulk Cargo,WTG
	TIAN ZHEN	Finland Helsinki	China Qingdao	Pulp
	DA CUI YUN	Lithuania Klaipeda	China Weifang	Fertilizer
	TIAN JIAN	Lithuania Klaipeda	China Qingdao	Fertilizer
	TIAN EN	Finland Helsinki	China Qingdao	Pulp
	TIAN HUI	Finland Helsinki	China Qingdao	Pulp
	TIAN EN	China Lianyungang	Germany Emden	WTG
	TIAN HUI	China Yangzhou	Sweden Gavle	WTG
	DA CHANG	China Tianjin	Denmark Esbjerg	WTG
	DA TAI	China Taicang	Denmark Esbjerg	WTG
	TIAN YOU	China Lianyungang	Germany Emden	WTG

Year	Cargo Weight (Tons)
2013	29,703
2015	55,686
2016	102,951
2017	156,016
2018	308,815
2019	315,443
2020	417,814
2021	600,000
Total	2000,000



b4: Cargo category of shipments via Arctic Shipping Service

东西行货类图示

Eastbound from North Atlantic region

- Wood pulp / Timber
- Ore Concentrate
- Grain / Feed / Fertilizer
- Steel cargo
- Wind project cargo / general project cargo




Westbound from Far East

- Project cargo: Wind project cargo / Railway project cargo (wagon and rail) / Power plant project cargo / Chemical project cargo / Oil drilling project cargo
- Other deck cargo： Barge / Tug boat / Yacht / RTG lifter
- Steel cargo: Steel coil / Steel pipe / Steel billet / Steel plate / Steel bar / Wire rod






C-1) Advantages of Shipping via NEP of Arctic Ocean

From 2013 to 2021, COSCO SHIPPING SPECIALIZED CARRIERS arranged 33 of multipurpose vessels and semi-submersible vessels sailing with total 42 voyages via Arctic NorthEast Passage with carrying the cargoes of 1.38 million freight tons,14 voyages of which were piloted by the icebreakers. Comparing with the conventional shipping journey via SUEZ:

- ✓ It shortens the transport time with time saving for about 10 days per voyage for consignee to receive goods early. The sailing time for 42 voyages were decreased by 508.5 days.
- ✓ It reduced the emission of carbon dioxide of 45,450 tons.
- ✓ It reduced the fuel consumption of 14,550 tons
- ✓ It had cost-saving pretty much in comparing with conventional shipping via Suez when fuel-saving, vessel fixed-cost saving for ten days. All these cost-saving looks not a small figures, which has significant economic benefits for MPP vessels sailing via Arctic Ocean.
- ✓ It reduced the risk of pirate in Aden Area.

c-2) Comparison between Arctic Route and Conventional Route via SUEZ from 2013 to 2020

2013年—2020年北极东北航道航行与常规航线比较汇总表

	Voyage Number 航次数量	Total nautical mile reduced 节省里程	Sailing Time saved 节省船期	Bunker Saving 节省燃料	Total Carbon Emission reduced 减少排放
2013	1 Voyage	2,500 N. M.	11.5 Days		850 Tons
2015	2 Voyage	7,000 N. M.	23 Days		1,700 Tons
2016	6 Voyage	32,100 N. M.	108 Days		12,700 Tons
2017	5 Voyage	25,300 N. M.	81 Days		6,300 Tons
2018	8 Voyage	26,400 N. M.	82 Days		6,400 Tons
2019	9 Voyage	31,500 N. M.	90 Days		7,800 Tons
2020	11 Voyage	38,500 N. M.	113 Days		9,700 Tons
2021	14 voyage	54,819 N.M	222.5 Days		
总计Total	56 Voyage	218,119 N. M.	734 Days	**19,784** Tons	**62,718** Tons

d) The proportion of Voyages of Shipping via NSR of Arctic Ocean

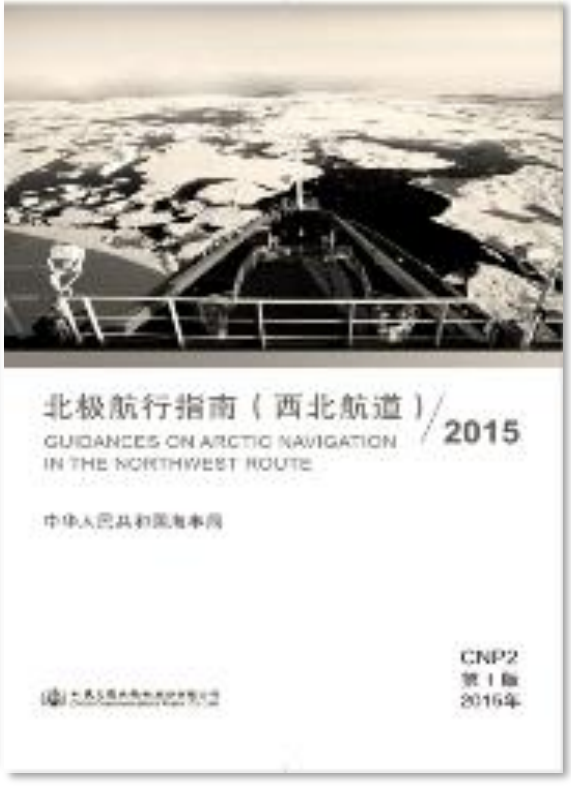
北极航线航次占比

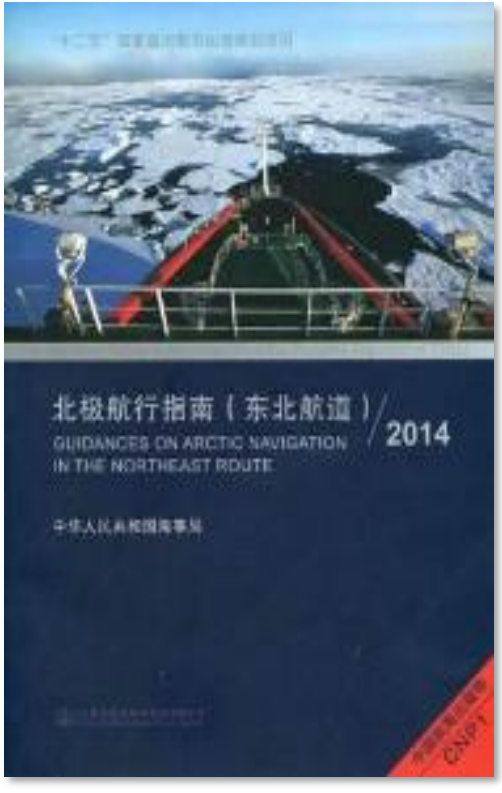
	2018 Number of voyage / Number of Ships / Number of Cargo	2019 Number of voyage / Number of Ships / Number of Cargo	2020 (by end of Oct. 31) Number of voyage / Number of Ships / Number of Cargo
Number of voyage / Number of Ships / Number of Cargo (k tons) **北极航行航次数 / 船舶数 / 货量** （千吨）	2022 / 227 / 20180 ktons	2694 / 278 / 31531 ktons	2266 / 307 / --
Includes Cargo Ship: Number of voyage / Number of Ships **其中货船航次数 / 船舶数**	1493 / 136 / --	2041 / 169 / --	1718 / 165 / --
Includes MPP Ship: Number of voyage / Number of Ships **其中多用途船航次数 / 船舶数**	422 / 66 / --	546 / 75 / --	520 / 77 / --
POL and POD both are within the NSR waters **装卸港都在北极NSR水域内**	558 27.6%	730 27%	574 25.4%
One of POL and POD within the NSR waters **装卸有一港在北极NSR水域内**	1360 / 77 67.2%	1801 / 126 66.8%	1526 / 122 67.3%
POL and POD are not in the NSR waters **装卸港都不在北极NSR水域内**	27 / -- / -- E12 W15	37 / -- / 697 ktons E19 W18	44 / -- / >1000 ktons E26 W17
COSCO SHIPPING Spe. accounts **其中中远海特占比**	8 / 6 /308 ktons abt 30%	9 / 7 /315 ktons Abt 24% abt 45%	11 / 8 /418 ktons abt 25% abt 40%

Date Source: CHNL & Cosco

3. Achievement & Cognition(a)

A: To follow Navigation Guidance (below) and QHSE Rules (left) is basic for safety sailing.





Foundation for the Global Compact

Global Compact LEAD PARTICIPANT

ISO 9001:2008 | GB/T 19001-2008 / ISO 9001:2008 | GB/T 24001-2004 / ISO 14001:2004 | GB/T 28001-2011 / OHSAS 18001:2007

DNV

3. Achievement & Cognition (b)

B. It is extremely important to issue and update the Operation Manual gradually as per own experience.

Right side pls find copy of 《Polar Water Operation Manual》and《Heavy Cargo Securing Guidance》, which was edited on basis of own performance of shipping via Arctic Ocean over past years.

3. Achievement & Cognition (c) & d)

C. The crews must be trained to acknowledge info about the Arctic Ocean and the Northeast Passage, and each voyage should be guided by experienced crews.

D. The company has to create 《The Voyage Plan with operation specifications, emergency measures for each voyage》 before sailing.

e) It is basic requirement to cooperate with partners

- ✓ With Icebreaker Pilot service provider.
- ✓ With info providers of Ice condition, Weather and etc.
- ✓ With emergency assistant.

f) Challenge for Shipping via NEP

- ✓ The navigable period via Arctic Northeast Passage is mostly fm July to October only, not regular sailing route annually.
- ✓ The climate of Arctic Northeast Passage is changeable, ships' sailing with instant info of weather limited.
- ✓ The infrastructure construction along the passage is undeveloped.
- ✓ Reliable navigation information is limited.

g) Development Philosophy

理念和意义

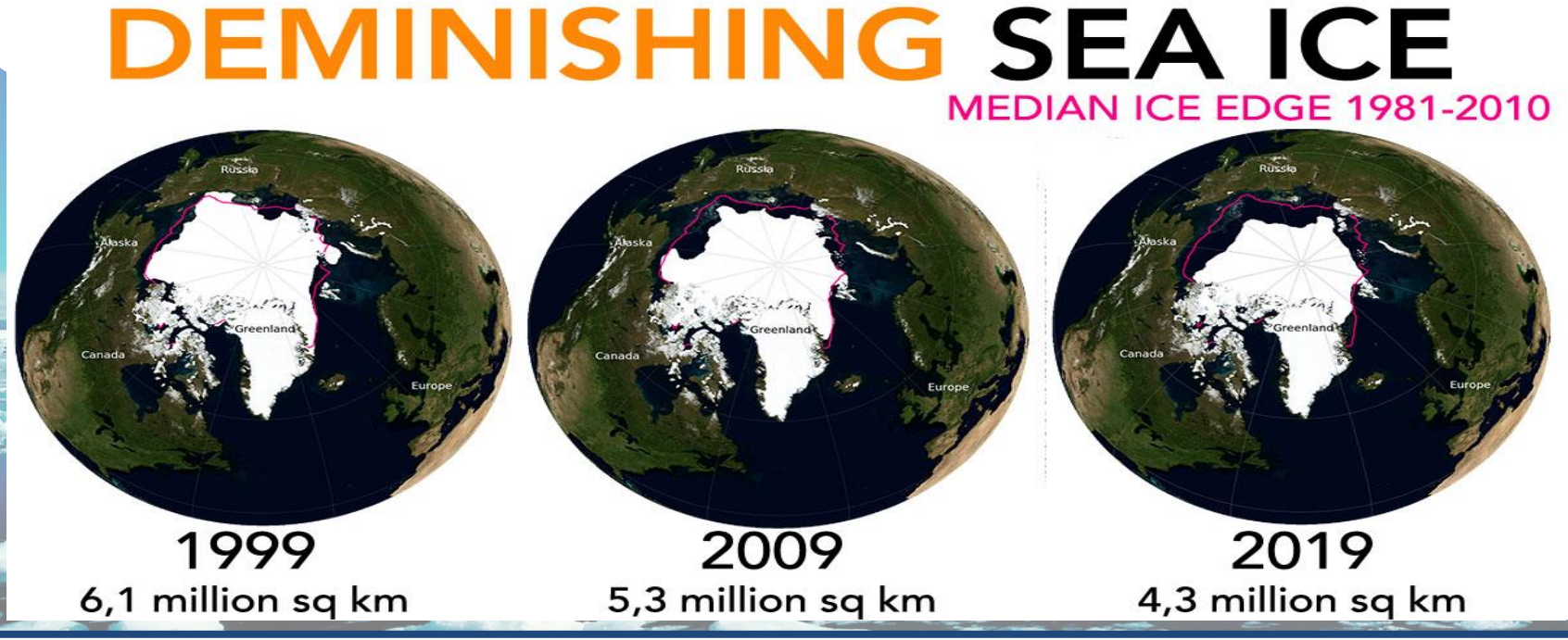
- Serving International trade between Northern Europe and Far East smoothly & quickly.
- Green Environmental Protection when sailing.
- Sustainable Shipping Service in accordance with Rules and Regulation.

a) Preface About Arctic

序言：关于北极

The Arctic region usually refers to the area north of the Arctic Circle at 66°34 'N. It covers a total area of 21 million square kilometers, accounting for 1/25 of the earth, among which the land and island area is about 8 million square kilometers, and the water area is more than 13 million square kilometers. The average water area in winter is about 3/4 to be covered by ice, namely 10 or 11 million square kilometers, and in summer is about 1/2 covered by ice, namely 6 to 8 million square kilometers. Ice area trends smaller over past 20 years. The smallest ice time is about more than 3 million square kilometers for this year even.

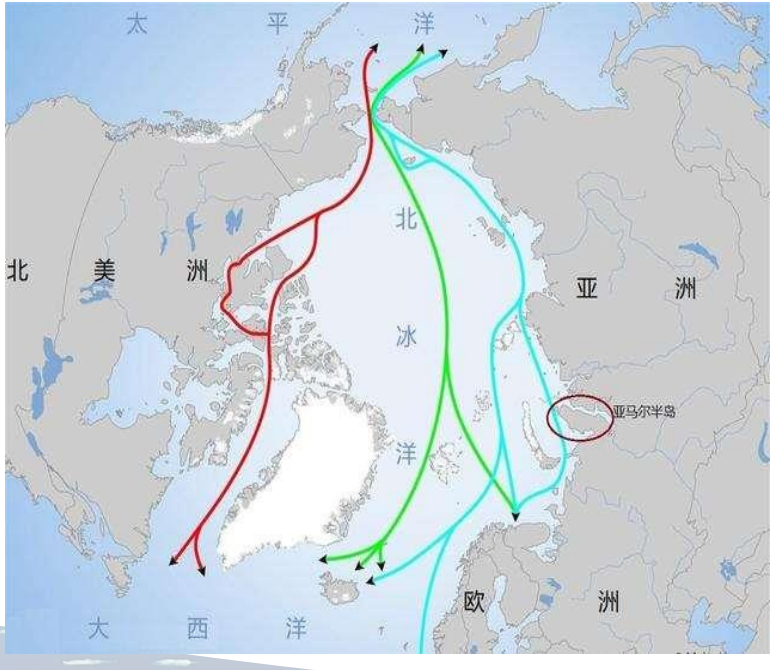
北极区域通常指北极圈北纬66°34′以北区域，总面积2100万平方公里、占地球的1/25，其中陆域和岛屿面积约800万平方公里，水域1300多平方公里，冬季平均约3/4水域为冰盖即1000或1100万平方公里、夏季平均约1/2为冰盖即600-800万平方公里，但冰盖面积近20年趋小。



To develop 1: Information service and scientific research

拓展之一：信息服务与科研

- There is a shortage of instant information in Arctic Area, including:
  北极水域相对短缺资讯，包括：
  - Ice situation
    冰况
  - Waves situation
    海浪
  - Climate
    气象
  - Rescue capability
    救援
  - Maintenance service
    维修
  - Emergency medical service
    应急医疗



To develop 2: Ports terminal and Rescuing capacity

拓展之二：港口码头与救援

Because cargo volume in the Arctic region is generally small, ports and wharves are limited. With the development of industry in the Arctic region, such as Yamal GAS in Russia, The demand for shipping & ports service is increased, including shipping supply and rescuing need to be increased. Ports to be attentionned including

- Kirkenes in Northern Norway: There is a small wharf with iron ore hills nearby. The EU and Finland and Norway are planning to build a new Arctic railway from the port to Helsinki, and an undersea tunnel from Helsinki to Tallinn, Estonia, to form a continental link to the North Pole.
- The Finnaforjd new port in the northeast corner of Iceland
- Murmansk、Sabetta、Dudinke in Russia

北极区域内货运量普遍少，因此港口码头有限，随着北极区域内工业兴起如俄罗斯亚马尔气田投产，航运需求的提升，对港口码头的需求、包括航运补给救援的需求将会增长，值得关注的港口有：

- 挪威北部的 Kirkenes:已有小规模的码头，附近有铁矿石山。欧盟及芬兰挪威正在策划新建从该港口至赫尔辛基的北极铁路、再新建赫尔辛基连爱沙尼亚塔林的海底隧道，形成欧陆连接北极的通道。
- 冰岛东北角的 Finnaforjd 新兴港口计划。
- 俄罗斯的 Murmansk、Sabetta、Dudinke。

To develop 3: International cooperation

拓展之三：国际合作

As the nation location closing to the Arctic region, We are hoping to develop international cooperation **while** utilization and protection of the Arctic area, including cooperation with countries from Arctic region and out of Arctic region, with governmental and civil society, for the purpose of scientific research, and navigation practice, information service, etc.

中国作为近北极国家，在推进北极开发与保护中，需要开展国际合作、包括与北极圈内国家和其它国家。
层级上，包括政府间、民间等。
内容上，包括科研、港航实务、信息服务等。

To develop 4: The window period should be extended with the assistance of Icebreakers

拓展之四：运用破冰船助力、扩展航运窗口期

The current window period for shipping is about 2.5 months, but it should be extended to longer duration between 4 and 5 months with the assistance of Icebreakers to bring more benefit for clients from Eu and FE.

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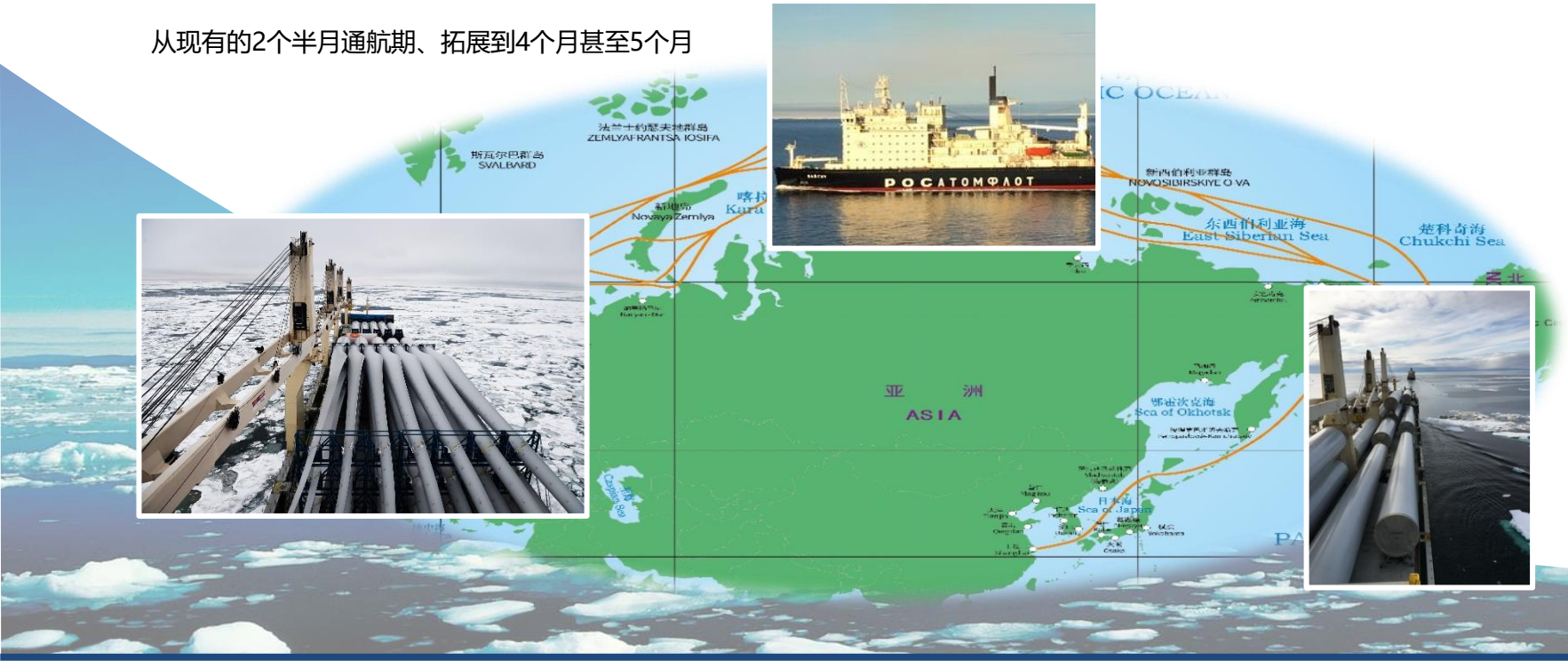
从现有的2个半月通航期、拓展到4个月甚至5个月



Thanks / 谢谢

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