d. Dredgers

The driving forces behind orders for dredgers are somewhat similar to those driving port tug orders: growth in world seaborne trade, growth in energy demand, the need for fleet replacement and need for both land expansion and defences against rising sea water levels as the number of crowded coastal megacities across the globe continues to increase. Finally, a marked shift in the origin of demand is taking place as national dredging companies such as the massive Chinese company CCCC Dredging increasingly demand a piece of the pie.

Growth in world seaborne trade (and of the vessels used to transport the goods) necessitates increases in port capacity and also expansion and creation of shipping canals. Examples of the latter activity are the recent work on both the Panama and Suez Canals and the possible construction of the Nicaragua Canal and Kanal Istanbul. The continuously rising energy demand also entails more dredging work. On the one hand, ports need to be extended to accommodate oil, coal and LNG terminals. On the other hand, dredgers are also involved in prepatory work for the installation of offshore wind farms. A further source of dredging activity is the maintenance of flood defences. This used to be an activity mostly restricted to the Netherlands and surrounding countries, but as water levels rise

worldwide, interest in this activity is increasing. Large scale land reclamation as witnessed in recent years in for example Dubai is currently on a lower level, but could take off again in the future, as many of the world's largest cities are located near the sea. These cities will need both extra land space and protection against the sea. Jakarta is a good example of a city which is very active in this field. Last but not least, maintenance dredging of waterways is a continuous activity, providing employment to mainly smaller and mid-sized dredgers.

Dredgers as discussed in this report are defined as sea-going self-propelled dredgers with an IMO number. Fleet information is obtained from the registers of IHS Fairplay as per January 1st, 2016.

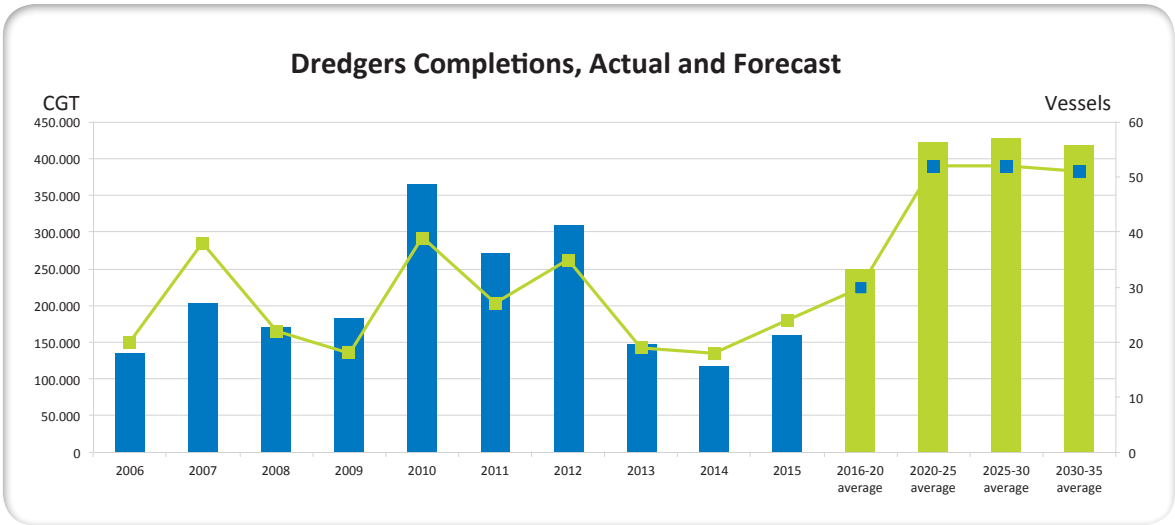
The ordering of dredging vessels has been somewhat subdued in recent years, but is bound to rise in the next years. Vessels ordered in recent years have generally been of the slightly smaller variety (below 10,000m^3 hold capacity), as major dredging companies are renewing their maintenance dredging fleet. With half of the existing fleet of some 1,600 vessels aged 30 years or older, this trend is bound to continue for the foreseeable future. While the focus of the well-known large independent dredging companies is on replacement of elderly units, national dredging companies are buying more and more vessels to compete internationally for projects. Overall, spending on newbuilds is restrained though, as the dredging market is experiencing headwinds due to lower seaborne trade growth and fewer oil and gas related projects as the oil price is currently low.

New dredgers are expected to feature many advances in terms of reducing their environmental footprint. Already, the first LNG-fuelled maintenance dredgers are under construction, and more will likely follow. LNG is not the only option though. The use of hybrid propulsion (combining diesel and batteries for example) might also be a suitable option for dredgers, as the power usage of these vessels fluctuates a lot during operations. Issues like mitigation of underwater noise and disruption of sea life due to the stirring up of mud during dredging operations are also increasingly being focused upon.

Fleet replacement has in fact started. Newbuilding deliveries, at some 30 vessels per year, will be just enough to cover scrapping, which is also estimated at 30 vessels per year for the period 2016-2020. We expect scrapping to peak in the 2020-2025 period at some 64 vessels per year, as dredging companies' fortunes take a turn for the better on a recovery in energy and commodity prices and increasing investment, fuelling port expansion projects.

As the new vessels tend to be larger and more efficient than the ones they replace, we expect that fleet replacement will occur on a less than one-by-one basis, leading to a slight drop in the overall fleet size in numbers of vessels in this period. The same goes for the period 2025-2030, when the high level of scrapping will still outpace newbuild deliveries.

After 2030, we expect that the majority of fleet replacement is finished, resulting in a return of scrapping levels to more familiar levels of 30 units per year. Newbuild deliveries should still be stable at a relatively high level of 51 vessels per year, partly because as in all areas of shipbuilding, there is always a time lag between identifying the need for the vessel and finally taking delivery. In addition, world seaborne trade will continue to grow. Even if that trade growth takes place at lower levels than witnessed prior to 2011, it will still fuel the need for more dredging to accommodate ships in ports, canals and rivers. National dredging companies from emerging economies will still require more dredgers, necessary for both large projects at home and in order to compete for large projects abroad. The rise of local competitors and "local for local" shipbuilding policies have also led to an increase in the amount of yards building dredgers for the lower end of the market. It cannot be ruled out that some of these yards will gradually move towards higher-specification newbuilds.

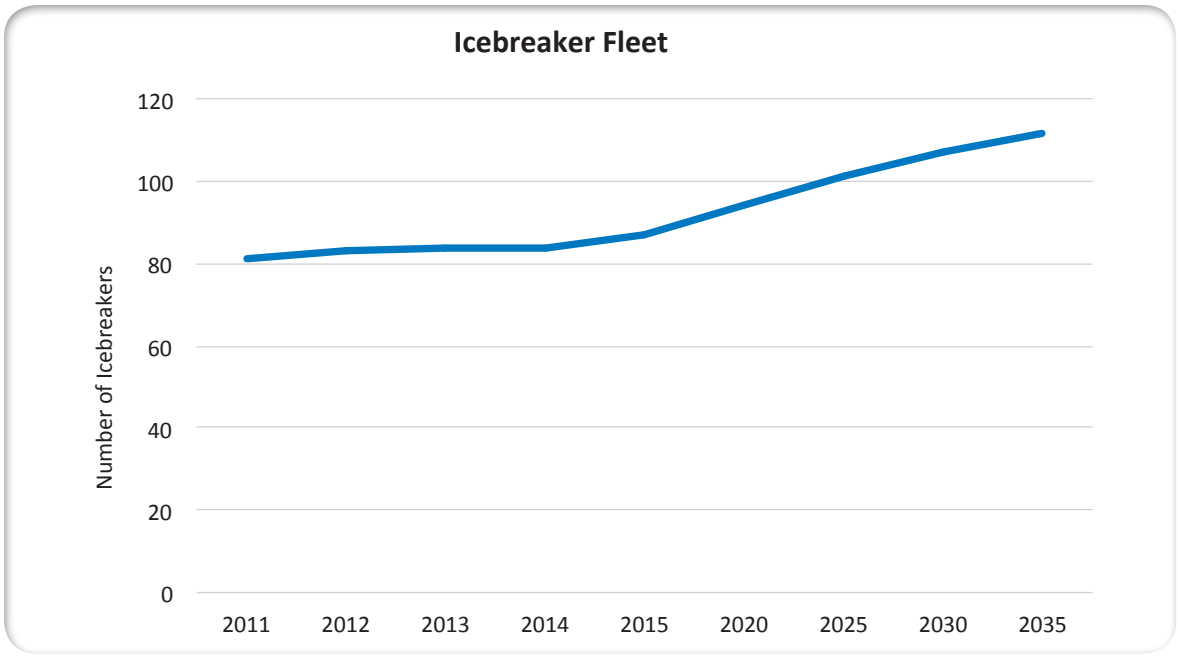


Source: SEA Europe / IHS Fairplay, 2016
Note: The bars represent CGT, while the line represents number of vessels.

e. The Arctic Market

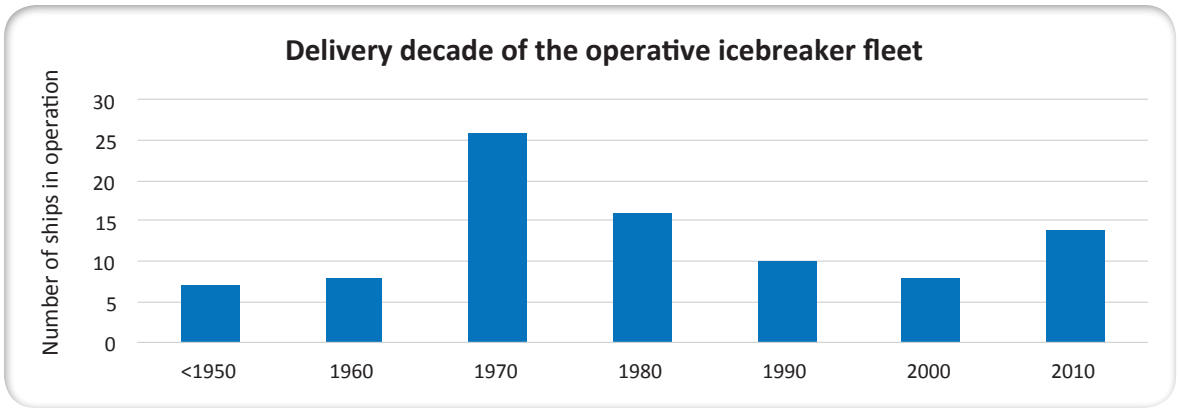
The Arctic is usually considered to be the area inside the Arctic Circle. The main characteristics of the Arctic market are the ice covering of the sea and the harsh and cold environment. This makes the nature also particularly vulnerable. The driver promoting the market growth and opening new opportunities is the melting polar ice that opens new business opportunities and routes for shipping. However, the traffic is still at low level. It is estimated that Arctic shipping could potentially account even for as much as 10% of all cargo transported between Europe and the Pacific in the long run. This means that icebreakers and ice-strengthened tonnage capable of Arctic operations are needed to guide ships through the Northern Sea Route and the North West Passage and for offshore operations: exploration and extraction of natural resources, oil and gas in particular. There is also a need for icebreakers at the northern areas of the world, like the Baltic Sea, where icebreaking is needed during winters. Also increasing research activity at polar areas creates demand for icebreaking research vessels.

The picture on page 54 describes the fleet of traditional icebreakers (IHS Database definition) and the estimated growth of it. Traditional icebreaker fleet is quite small. There are also other types of multipurpose ships that act as icebreakers. The number of traditional icebreakers and this kind of ships combined is around 150. In recent years, there has been a slight growth in the fleet. In 2015, there were 87 traditional icebreaker vessels. The fleet is expected to stay at these levels, or grow modestly.



Source: SEA Europe (according to IHS Database definition)

Planned lifetime of new icebreakers is 50 years, for older vessels it is somewhat less. The average age of the icebreaker is currently 36 years. The average age of scrapping is around 34 years, but there has been very few scrappings in the last 20 years, so the average age does not tell the whole story. A lot of scrappings have been postponed in the past years so there are major refit needs. The below picture shows the delivery decades of the icebreakers currently in operation. It can be seen that large parts of the fleet are constructed in the 1970's and the fleet is getting old.

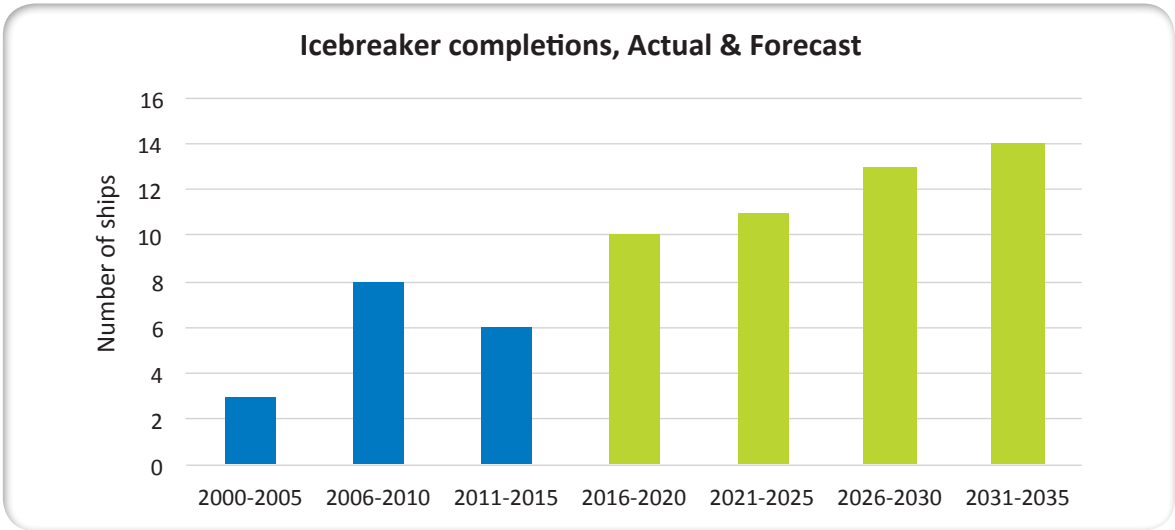


Source: SEA Europe

Due to the ageing fleet, there is demand for newbuildings. Many older Russian icebreakers will be at the end of their lifecycle in the next few years, so the country estimates it needs to build up to thirty more before 2030. In Finland, a large part of the fleet is planned to be replaced by 2030 and Sweden has quite the same situation. There are also some plans of cooperation. US and Canadian governments are considering their Arctic responsibilities. The USA has announced a statement of Polar icebreaker recapitalisation project for constructing a fleet of up to three heavy and three medium ships to meet mission demands in the high latitudes. It is said that it might take around ten years before the first ship sails.

Along with an ageing, limited and increasingly thin supply, the demand for icebreaking vessels is expected to increase in the decade to come. It is assumed that most of the icebreakers over 50 years need to be scrapped or refitted. However, some scrappings have to be postponed – there are not

enough resources to renew a very large part of the fleet in the same period. Some scrappings will probably be postponed by refits. The picture below describes the completions of icebreakers after year 2000 and the estimation of completions to 2035 in number of ships completed in 5 year periods.



Source: SEA Europe (according to IHS database definition)

There are also some uncertainties of what kind of demand there will be. Northern sea routes create new demand. Climate warming may increase the need of icebreaking in some areas, but it may also decrease the demand in other areas and some vessels may not be replaced. On the other hand, climate warming makes the weather less predictable so there may be more need for icebreaker support in this way too.

It has been estimated that the traditional icebreaker demand will decrease, if customers start to ask for multipurpose icebreaking ships that are capable to other kinds of operations also during summertime. In this case, the forecast of needed completions should be interpreted to be meaning this kind of multipurpose vessels. Also research vessels and for example special ice strengthened passenger ships may have increasing demand, if Arctic tourism and research increase at the pace it now seems. Icebreaking offshore support vessels and icebreaking construction vessels are expected to see increasing demand if the arctic operations continue. The oil and gas reserves in the Arctic areas are located under ice-covered, deep water and very harsh conditions and arctic offshore energy operations will require top-of-the-range vessels.

When the activity in the area is increasing, the demand for new products, especially for environmental protection technology, safety technology and ICT is increasing. The main threats for operations in the area are oil spills, which are harder to recover in the ice-covered areas, and also e.g. black carbon emissions that could increase the melting of the polar ice. The IMO's new Polar Code is setting up some requirements so that the operations in the area would be safe and environmentally friendly.

The Arctic market development faces a lot of uncertainties. The current political situation between Russia, Europe and the United States has a heavy toll on the Russian economy. There is also a lack of (port) infrastructure in the Arctic that needs to be addressed in order to facilitate expansion of Arctic shipping and operations. The real problem at the moment is the low oil price. At low oil price levels, most investments in Arctic oil and gas exploration were postponed. However, recent development is that oil companies have managed to cut cost so that the breakeven oil prices have come significantly down making many projects profitable again.

Icebreakers have seen significant technology developments in recent years. Increasing vessel sizes set new standards also for icebreakers: oblique icebreaker breaking wide channel sideways is one solution. New icebreakers are also more stable when sailing in open waters. Also, the first LNG powered icebreaker has been built by Arctech Helsinki Shipyard. Finland and Russia have been strongholds

of icebreaker expertise. Finnish yards have built both ships for domestic use and most of the current Russian icebreaking fleet. Icebreaker design has also been mainly Finnish (Aker Arctic, etc). Finnish, Russian and Norwegian yards have been increasing production of icebreakers and icebreaking supply vessels. Russia is also investing heavily in its own yards and is starting to build specialised Arctic ships, like nuclear-powered icebreakers and icebreaking LNG carriers. Competition from Asia is intensifying too, when the Asian shipyards are moving to build more specialised ships. For instance, China is now building its first polar icebreaker.

f. Other Specialised Vessels

The remaining group of specialised vessels is a very mixed group of about 2,900 vessels, consisting of a wide variety of vessel types. It is a challenging group to keep track of, as certain subgroups of vessels move in and out of this category over time in the registers. This has to do with the employment of these vessels, which is often related to other large vessel groups such as offshore vessels, dredgers or naval vessels for example.

Numbering close to 700 vessels, the largest subgroup of Other Special Vessels is that of the patrol vessels. Although patrol vessels are more related to navy ships than to regular commercial vessels, many are built these days by commercial shipbuilders and along commercial standards. Also, some of the smaller patrol vessels are offered as a multi-role design which can be customised as a crew boat or supply tender. Production of patrol vessels is rising. Developing nations are building up their navies, while navies in the Western world are increasingly looking at the deployment of patrol vessels as a more cost effective way of performing some duties which used to be performed by frigates and corvettes, enabling the latter ship types to deploy more exclusively on the more dangerous tasks.

Utility vessels and work/repair vessels also form a relatively large group, amounting to some 538 vessels. These are mostly small multirole vessels, commonly known as “workboats” and often used as auxiliary vessels in port construction, dredging and offshore construction projects. These vessels are usually equipped with a crane and an open deck and often have a catamaran hull form in order to provide a relatively stable working platform on such a small vessel.

Also heavily involved in offshore energy projects are the crane vessels, of which there are over 240 vessels.

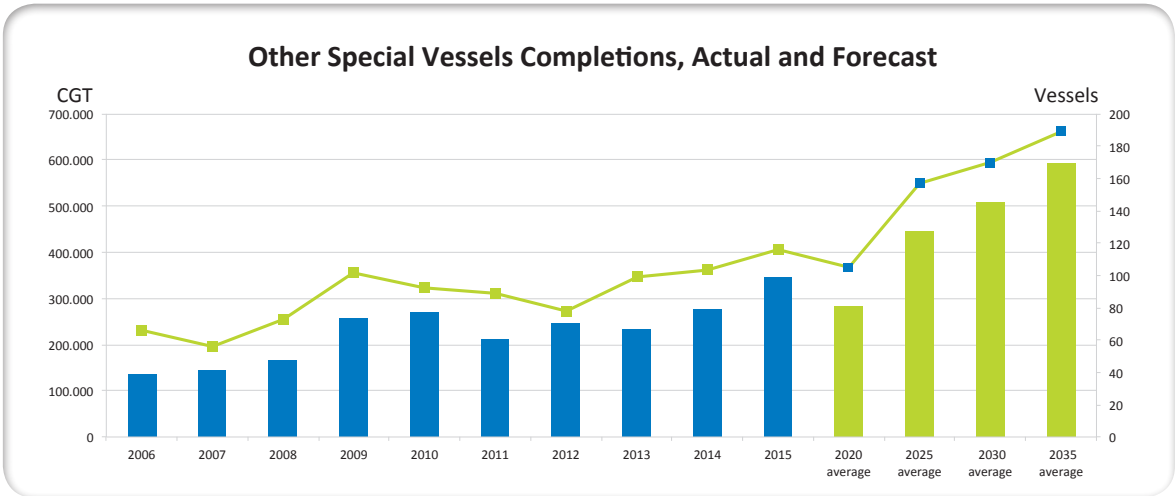
Ships owned by governments or ports, such as pollution control vessels, buoy tenders, pilot vessels, search & rescue vessels, training ships and salvage ships make up most of the remainder of this category.

Most of the other special ship types are built in very small numbers, with production in the low single digits each year. The most notable exceptions are the larger categories of workboats and patrol vessels. The average production of patrol vessels has almost doubled, from 17 units per year in the period 1996-2005 to 33 units per year in the period 2006-2015. The production of utility vessels and work/repair vessels has also sharply increased, from less than 10 units per year before 2006, to an average of around 21 units per year in the last ten years. Although the production numbers are relatively small, the vessels themselves are often high-value specialised vessels.

The economic crisis of 2009 and the collapse of the oil price since 2014 have both had a relatively limited impact on this segment. The use of many of these vessels is related to port operations and port development, both activities which continue to grow steadily in line with the growth of world seaborne trade. Workboats are also increasingly being employed in the construction of offshore windfarms, an industry which is growing fast in Europe, but which has yet to really take off outside Europe.

Growth areas for offshore wind outside Europe are China, Japan and the United States. The increase in size of the windmills themselves also calls for more capable crane vessels, so that subsegment may also see some new orders. Finally, the versatility of workboats means that they are also increasingly employed in the growing fish farming industry.

We expect the requirement for ships in the Other Special Vessels category to grow at slightly below the projected annual growth rate of world seaborne trade. As this growth has settled on a lower level after 2011, and is expected to remain relatively low until 2020 (Source: OECD/ITF), we expect deliveries of newbuilds to remain relatively unchanged at around 105 vessels per year during the period 2016-2020. Scrapping will continue at a relatively low level of around 27 vessels per year until 2025, as the very specialised nature of vessels in this fleet tends to lead to lengthy careers. Afterwards, scrapping will gradually rise until it peaks at around 42 units per year in the period 2030-2035. As a result, we expect a gradual rise in deliveries of other special vessels after 2020 until it reaches 189 vessels per year during the period 2030-2035.



Source: SEA Europe / IHS Fairplay, 2016