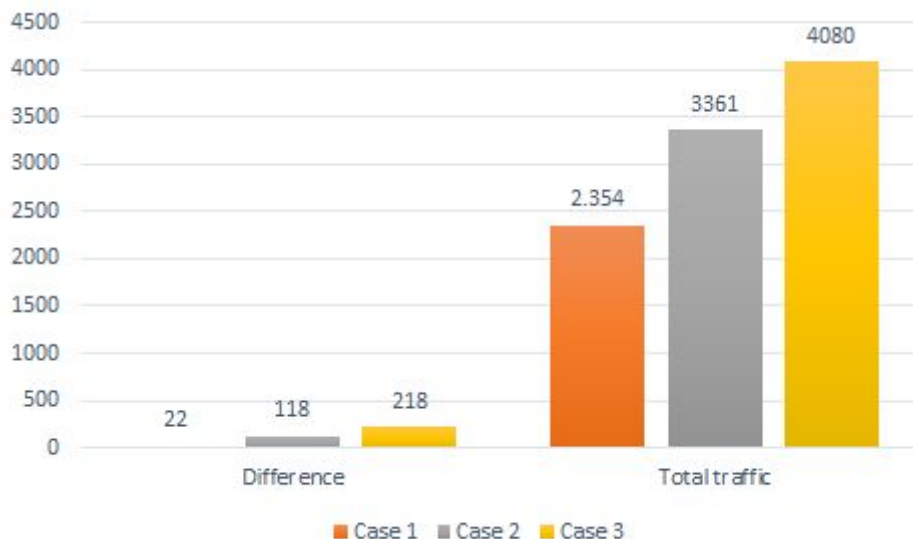


# Unlikely that Arctic sailings provide a basis for operating a transshipment port in Iceland in the near future

Sea ice currently hinders large scale shipping in the Arctic Ocean. But due to rising temperatures and sea ice melt, Arctic sea routes become more accessible. The Arctic passages might provide feasible alternatives to the more traditional routes such as Suez or Panama canals when it comes to transport between the North Atlantic and Eastern Asia. The feasibility is dependent upon destinations. The *Institute of Economic Studies* set up a gravity model to predict the number of container shipping vessels that would pass through the Arctic Ocean as time progresses. The model's prediction is determined by production (GDP) at the origin and destination as well as the distance between the two. We also review experts' opinions regarding shipping of homogeneous loads in the Arctic, for example oil and gas in tankers. Increased traffic via Arctic shipping routes requires additional infrastructure in order to service the passing crew and cargo. Most likely, specially strengthened ships would be needed, and even icebreakers for protection against sea ice on the way. Fortified ships move slower than traditional ones and are more expensive to make and operate. Thus, it may be profitable to transship containers into faster and less expensive vessels when leaving the main sea ice area. If it turns out to be more cost-effective to transship in Iceland than elsewhere, Icelanders might capture a part of the dividend with port fees and charges. For the time being, experts do not agree on the net benefits of Arctic sailing along the Siberian coast. However, there is some consensus that they could become more lucrative later on. Several studies have compared costs between the route over the Arctic Ocean and the Suez canal. We cite four forecasts regarding the number of ships sailing over the Arctic. Det Norske Veritas (2010) estimated that approx. 1.4 million TEUs will be moved across the Arctic Ocean in 2030. That is equivalent to 480 container shipping vessels. In the summer of 2050, the ships are expected to be about 850 which carry approx. 2.5 million containers. Det Norske Veritas are moderately optimistic regarding technological development and expect high oil prices. They further expect that sailing across the Arctic will only be possible in one third of a normal year. Bekkers et al (2017) forecast much more traffic in the Arctic Ocean, or a total of about 10,000 ships a year, of which 3,000-4,000 will be container ships, and that even in the next few years. Bekkers et al expect that sea ice will melt faster than Det Norske Veritas and also expect faster progress in navigation technology. It is assumed that the Northeast route will fully replace the Suez Route if it's cheaper. The International Council on Clean Transportation (2015) looked at scenes with various economic growth, changes in the flow of transport around the northeastern route and degrees of utilization of natural resources in the Arctic. Based on these scenarios, it's estimated that in 2025, 200-800 container shipping vessels will sail the northeastern route. Finally, Bensassi et al (2016) conclude, based on a forecast of increased trade between Eastern Asian and European countries, that due to the opening of the northeastern route, 200-400 ships will sail that route each year.

The Institute of Economic Studies' forecast assumes that only new vessels in the fleet sailing between the North Atlantic and Eastern Asia will pass through the Arctic Ocean in the coming years, i.e. ships that are not currently sailing between continents. That assumption is due to shipping companies' reluctance to change shipping routes and uncertainty regarding port capacity on the route. The Institute expects the addition is probably several hundred container ships a year. As time passes, and the route proves to be more efficient, one would expect more and more vessels to cross the Arctic. Results indicate that thousands of ships will finally sail across the Arctic Ocean each year, even though delays and additional costs for Arctic sailing have been considered. The picture below shows, on the left, where only additional shipping traffic between Western Europe and Eastern Asia passes through the Arctic, and on the right, where all cost-effective shipping uses this route. It seems only advantageous to sail across the Arctic Ocean if ships are sailing between Western Europe and Japan. In case one, we look at the average number of sailings every year for the next decade, in case two we look at the next 15 years thereafter and in case three, ship traffic per year in more than 25 years is assessed.



Experts are more optimistic about tanker transport than containerized shipping across the Arctic Ocean. Container transport requires high accuracy in timing, which is challenging when passing through rough terrains. The possibility of loading and unloading containers along shipping routes is valuable, since it increases efficiency. Such options are currently limited along the Arctic shipping routes. Transport in tankers with homogenous products, like gas and oil, are not subject to such strict deadlines as container shipping.

Iceland's role as a service provider for Arctic shipping route was examined by comparing four scenarios: Goods are transhipped in an Icelandic port, Svalbard, northern continental Norway or sailing straight from Eastern Asia to mainland Europe without transshipment. In all cases which include transshipment, goods are transported from transshipment location to mainland Europe using ordinary ships. Then it is examined whether Iceland has an advantage in some areas of port location and construction and whether it is cheaper to transship in Iceland than in the aforementioned places. The table below shows variable

shipping costs depending on whether the goods are being transshipped in Iceland, mainland Norway or Svalbard or if the merchandise is not transshipped at all.

	<b>Cost (\$/container unit)</b>	<b>Transshipment fee (\$/container unit)</b>	<b>Total cost (\$/container unit)</b>	<b>Cost difference (\$/container unit)</b>	<b>Cost difference ratio</b>
<b>Inner northeastern route, 4.330 container units, ships with a strengthened haul.</b>					
<b>Transshipment in Iceland</b>	168	60	218		
<b>Transshipment in N-Norway</b>	92	60	152	-66	-30%
<b>Straight to Rotterdam</b>	146	0	146	-72	-33%
<b>Inner northeastern route, 4.330 container units, regular ships.</b>					
<b>Transshipment in Iceland</b>	113	60	173		
<b>Transshipment in N-Norway</b>	92	60	152	-21	-12%
<b>Straight to Rotterdam</b>	77	0	77	-96	-55%

<b>Polar route</b>					
<b>Transshipment in Iceland</b>	166	60	216		
<b>Transshipment in Svalbard</b>	106	60	169	-47	-22%
<b>Transshipment in N-Norway</b>	175	60	235	19	9%
<b>Straight to Rotterdam</b>	173	0	173	-43	-20%

Evidently, Iceland is never the most advantageous option. The difference in cost is about \$ 50-100 per container between transshipping in Iceland and in the most advantageous case. It is expected that the transshipment cost is \$ 60 per container. This means that Iceland would have to give a substantial discount of the transshipment fee to be competitive. In most cases calculations indicate that it is advantageous not to transship. The estimates also indicate that it is not economical to tranship in Iceland when it comes to ships navigating between Asia and North America. In that case, it's more advantageous to transship in Svalbard compared to Iceland. It is approx. as expensive to transship in Svalbard as it is to sail the entire Northwest route on an ice-strengthened ship. If global warming continues and Arctic sea ice continues to retreat so that the transpolar passage (the route over the North Pole) becomes passable, that would be the most efficient way to transfer merchandise across the Arctic. The transpolar passage is short and without restrictions on draft. As a result, it could be operated on very large vessels, utilizing economies of scale to the fullest. In that case, Iceland could have a competitive advantage, when it comes to servicing these large vessels. Finnfjörður, a fjord in East Iceland, is a promising deep port location. Depth restrictions apply in most ports in north-western Europe, but established ports in Western Europe are looking at ways to increase their capacity.

The table below displays the pros and cons of three port locations along the Arctic route. Plus means positive, minus means negative and zero means neutral.

	Iceland	Kirkenes, N-Norway	Svalbard
<b>Natural conditions for port</b>	+	-	-
<b>Electricity cost</b>	+	-	-
<b>Ship fuel</b>	0	0	0
<b>Ship fuel switching to electricity</b>	+	-	-
<b>Infrastructure</b>	+	+	-
<b>Labor cost</b>	0	0	0

The performance of ports in neighboring countries was examined. Economies of scale appear to be considerable in port operations. Profit grows by more than 20% per additional million container units a year.

Finally, we look into the effects of a transshipment port on an area in the immediate vicinity to the port. We consider how big a village the harbor would sustain. Work at the port is considered a “*base job*”. Base jobs are in trades such as fishing, fish processing, aluminium smelting, hotels and ports, i.e. in production of goods and services that are exported out of the region. Those jobs attract services for the local population, such as retail, banking, consulting, public services, etc. The overall ratio of all jobs to base jobs is multiplied by the number of jobs that one expects the port to provide directly, that is:

*Number of jobs in a village = jobs directly at the harbor \* (actual ratio of all jobs to base jobs).*

The table below shows an estimate of the population at a village in the vicinity of a transshipment port in Iceland, a) assuming it would be similar in size as the port in Sines, Portugal, and b) assuming that all new ships sailing over the Arctic between East Asia and Western Europe would stop here (according to the results of the Institute of Economic Studies analysis). We also use two ratios of all jobs to base jobs, that is 2.3, which is the actual ratio for Iceland as a whole excluding the capital area, and 1.5, which is the ratio for Eastern Iceland.

	Number of base jobs	Total number of jobs		Population of a possible village	
		Ratio used: 2.3	Ratio used: 1.5	Ratio used: 2.3	Ratio used: 1.5
<b>Port equally large as the port in Sines, Portugal</b>	175	400	270	720	490
<b>All new ships according to the Institutes forecast transship in Iceland</b>	110	260	170	460	310
<b>All ships according to the Institutes forecast transship in Iceland</b>	250	580	380	1.050	680

The goal is only to give an idea of the relationship between ship traffic and settlement. As mentioned earlier, a transshipment port in Iceland appears to be out of the way for ships in

Arctic sailings, at least over the next few decades. It therefore seems unlikely that Arctic sailings provide a basis for operating a transshipment port in Iceland in the near future.