

## Teachers' Guidelines

### Title of the package: Maritime transport in the Arctic

#### Information about the package:

**Brief description:** The Arctic is an area where feedback between the processes of global warming and economic expansion is more visible than in other parts of the world. Shipping routes in the Arctic Ocean are becoming competitive with traditional sea routes, and energy resource extraction centers are developing intensively. Climate change in the Arctic is more than twice as fast as in lower latitudes.

**How does the package relate to STEAM education:** The package deals primarily with issues related to Earth sciences (*science*) with economical approach. It presents sea routes available in the Arctic, and explains their importance to the economy or tourism. The last section of the package "Activities" contains some exercises related to *mathematics*, because students are asked to compare distances of some sea routes.

**Keywords:** sea routes, Arctic, Arctic Ocean, Northwest Passage, Northeast Passage, Northern Sea Route, Trans Polar Route

**Age range:** 14-18

**Didactical hours:** 1 hour + "Activities" section that might be treated as homework

#### Learning objectives:

Student will:

- know what sea routes there are in the Arctic, and why they are important for global economy,
- learn what are the main sea routes in the world, and be able to show them on a map,
- learn what factors despite of the distance should be taken into consideration when talking about the sea transport.

#### Content of the package and guidelines for teachers:

Link to the package: <https://graasp.eu/s/pxkk49>

We encourage teachers to copy the graasp package to their own graasp space to become "owner" and modify the content, hide or unhide some materials, add quizzes, etc. Moreover, teachers may share the package with their students and check the progress of each student.

A short video tutorial on how to do it is available at:

<https://view.genial.ly/5f7ef81f1b2b330d2efa3411/video-presentation-tutorial-graasp>

If you don't have access to the graasp package, contact us: [edukacja@igf.edu.pl](mailto:edukacja@igf.edu.pl)

The package consists of 5 sections described in detail below:

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EDU-ARCTIC 2: from polar research to scientific passion – innovative nature education in Poland and Norway receives a grant of ca. 240 000 EUR received from Iceland, Liechtenstein and Norway under EEA funds. The purpose of the EDU-ARCTIC 2 project is to: enhance the knowledge about nature, geography, natural resources, political specificities concerning polar regions and increase awareness of environmental issues and climate change, increase of interest in pursuing STEM education and careers due to enhancement of knowledge about scientific research, and their place in the modern world, familiarizing young people with scientific career opportunities; introduce innovative tools by way of an e-learning portal and effective methods of teaching science in schools.

## 1. Long history short

That section presents three main sea routes in the Arctic: Northwest Passage (NWP), Northern Sea Route (NSR), Trans Polar Route (TPR), and the short history of their exploration.

### Materials:

- Presentation “Maritime transport in the Arctic” (slides 2-6)
- “Long history short” section on [graasp.eu](http://graasp.eu)

**Estimated time: 10 minutes**

## 2. Status & Climate change

In this section climatic issues are discussed. Due to the climate change, which makes Arctic sea routes more accessible, Arctic countries see more opportunities to explore that territory for economical purposes. In 2012 Arctic sea ice reached its record minimum. The predictions for nearest and further future show that sea ice might be continuously decreasing.

### Materials:

- Presentation “Maritime transport in the Arctic” (slides 7-12)
- “Status & Climate change” section on [graasp.eu](http://graasp.eu)
- Charctic Interactive Sea Ice Graph, <https://nsidc.org/arcticseaicenews/charctic-interactive-sea-ice-graph/>

**Estimated time: 10 minutes**

## 3. Geopolitical issues

This section compare traditional sea routes with the possible ones that might be accessible in the nearest future due to climate change. Taking into account that Arctic territory is rich in natural resources some Arctic countries have territorial claims connected with that area.

### Materials:

- Presentation “Maritime transport in the Arctic” (slides 13-17)
- “Geopolitical issues” section on [graasp.eu](http://graasp.eu)

**Estimated time: 10 minutes**

## 4. Threats

This section indicates some threats connected with decreasing of Arctic sea ice and raising economical activities of some countries in the Arctic. It might affect the natural environment and thus have an impact on us as humans. In this section students are asked to describe what results according to them will have a rapid growth of maritime transport in the Arctic.

### Materials:

- Presentation “Maritime transport in the Arctic” (slides 18-21)
- “Threats” section on [graasp.eu](http://graasp.eu)

**Estimated time: 15 minutes**

## 5. Activities

This section can be treated as additional homework, so the time to complete it depends on the form chosen by the teacher. All exercises are available in the worksheet attached. Answers to the tasks can be found below in the "Answer Key" section.

Answer key:

#### **exercise 4**

September – ice conditions on NEP allow this route to be used by SuperPANAMAX vessel

Distance: 7 010 NM

Time travel:  $7010 : 12 = \text{approx. } 584 \text{ h} = \text{approx. } 24 \text{ days}$

Oil consumption:  $24 \times 52 \text{ T/day} = \mathbf{1248 \text{ T}}$

February – ice conditions on NEP don't allow to use this route

Version a.

SuperPANAMAX vessel route via Cape of Good Hope

Distance: 14 448 NM,

Time travel:  $14\,448 : 12 = 1\,204 \text{ h} = \text{approx. } 50 \text{ days}$

Oil consumption:  $50 \times 52 = \mathbf{2600 \text{ T}}$

Version b.

2 PANAMAX vessels route via Panama Canal

Distance: 11 040 NM

Time travel:  $11\,040 : 10 = 1104 \text{ h} = 46 \text{ days}$

Oil consumption:  $46 \times 38 = 1748 \text{ T} \times 2 \text{ vessels} = \mathbf{3496 \text{ T}}$

**In both cases it is more advantageous to hire a SuperPANAMAX vessel, it will use the least fuel sailing through NEP in September.**