Edu-Arctic2 learning tool kit

ENVIRONMENTAL PROBLEMS OF THE NORTH

Start

It concerns your future!

In this tool-kit, you learn about the good and the bad of our consumption of nature, and we challenge you to be conscious about both.





You can always navigate back to this main menu. Look for the menu symbol.

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pst. click to go directly to a step

Step 1 Introduction

Step 2 Understand

Step 3 Explore

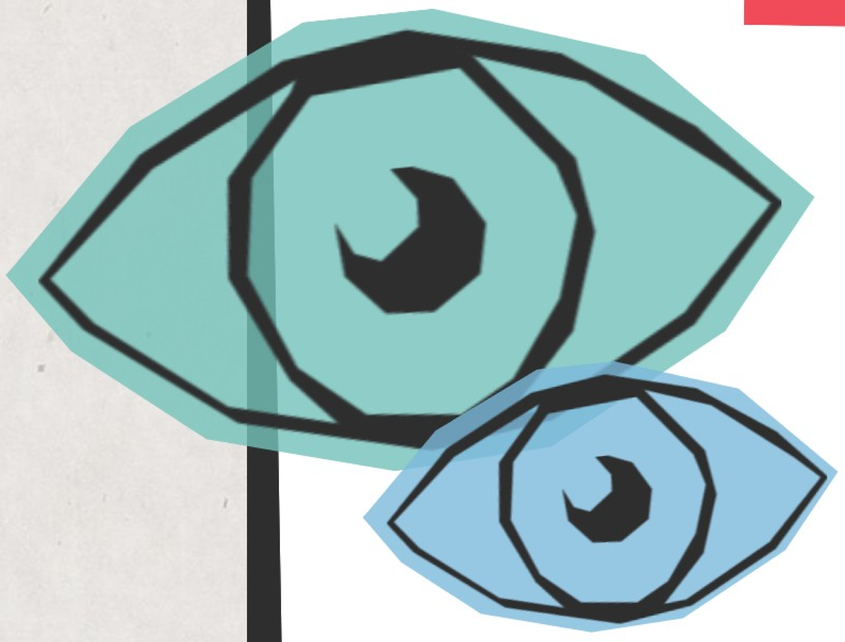
Step 4 Reflect

Step 5 Wrap-up

Step 1 of 5: Introduction

ENVIRONMENTAL PRBLEMS OF THE NORTH

LEARNING GOALS



+ pst

After completing this tool-kit, it is the goal that the student

- can describe several environmental problems in northern Europe
- grasps that when we encroach on nature, it always adds to these problems
- is familiar with which activities add to which environmental problems
- can outline a research experiment in hypotheses set-up

WHY IS THIS IMPORTANT?



Photo: Nels Israelson

TERMS TO LEARN

1

Ecosystem functioning

2

Biodiversity

3

Landscape fragmentation

4

Wildlife barrier

5

Habitat

6

Pollutants

Step 2 of 5: Understand

ENVIRONMENTAL PRBLEMS OF THE NORTH

STATE OF THE AFFAIRS

Even in the most pristine of northern Europe, we have lost almost all the long stretches of intact natural lands.

We build and travel all over the place. The environmental problems it creates are unsustainable.

It concerns your future!



An environmental problem is anything that is not sustainable. It is something humans do, or have done in the past, to reap benefits for ourselves. For something to be sustainable, it must not lead to future generations not having the same opportunities as us.

When it is not sustainable, it leads to changes in nature or in the atmosphere around the earth, which means that ecosystems can no longer function as they did before. It can happen right away, or it can go slowly over a long period of time.



The topic is huge, so we can only scratch the surface of it.

We hope you are inspired to learn more later.

SOME OF THE PROBLEMS IN THE NORTH



Fish farming



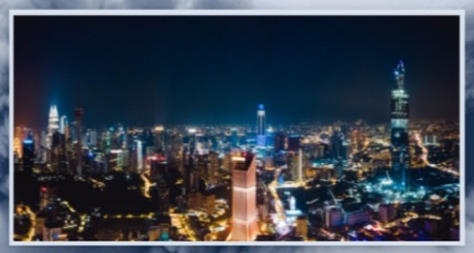
Landscape fragmentation



Mining



Forest logging



Light pollution



FISH FARMING

Click for summary

Benefits

- food for many people
- employment

Challenges for sustainability

- animal wellfare
- using everybody's resources, but mian income goes to a few private companies
- leaking of chemicals to natural ecosystems
- fertilizing effects of natural ecosystems
- fish escapes, spreading disease (lice) to wild fish, outcompeting them and threatening the native gene pool by hybridization (mating)


Fish farming

Another name for fish farming is **aquaculture**

In Fennoscandia, **Norway is by far the main actor,** with 100x as much fish produsedas Finland (decreasing its activity) and Sweden (plans to increase its activity in fish farming).





The main fish in Norway is **salmon (about 90%)**,

while in Finland/Sweden it is **rainbow trout**.

In Norway, around **1 300 000 tons of farmed fish** is slaughtered each year. In Finland and Sweden only c. 13 000 tons each.

There is about **220 individual fish per ton.**

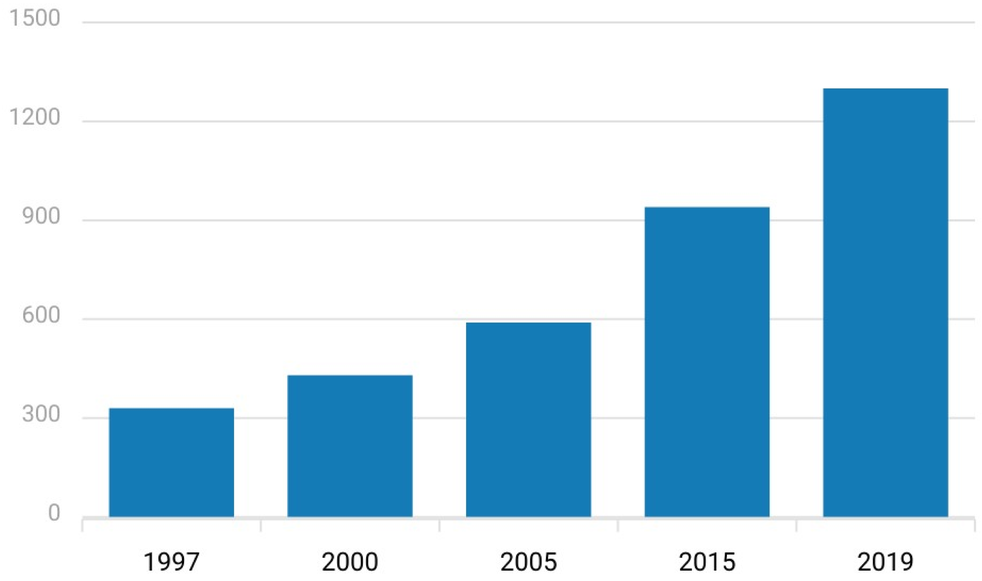
Almost all Norwegian farmed fish is exported (1 200 ooo ton in 2019). The export goes to all over the world: Europe (the most), Asia, Oceania, America)



See statistics

Amount slaughtered farmed fish

Norway (number of 1000 ton)





Norway's share of Fennoscandian farmed fish

98%

TAKE HOME MESSAGE

Fish farming is a quite new activity in Fennoscandia, and has rapidly increased



Few of the country's inhabitants get the income: In 2018, there were only 151 companies behind the entire aquaculture industry in Norway, and several of them have foreign owners. Some of the companies also have partly the same owners. The 10 largest companies slaughtered 67.5% of all the fish.

Back to benefits

CHALLENGES FOR SUSTAINABILITY

Animal wellfare issues: fish is kept dense in enclosures, fed pelleted food = highly unatural for their behaviour, causing stress and health issues. Cleaning fish are used to clean the farmed fish. for lice This is captured live at sea, and kept under

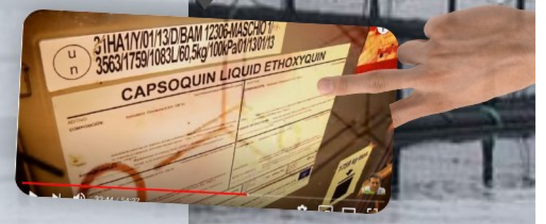
Click photo to read in-depth



Farmed fish escapes into nature. There they compete with wild fish, spread fish disease (lice) and even hybridize with the native fish.

Leaking of chemicals (antibiotics, desinfectants, additives) to natural ecosystems (and food for humans), locally at the fish farm and elsewhere on Earth due to export of fish that is processed

Watch documentary



Fertilizer effects to natural ecosystems (from fish manure and fish food)

Solutions? Use land-based fish farming, which has slightly fewer environmental issues (but more animal wellfare issues). Export less.



LANDSCAPE FRAGMENTATION

Benefits

- Infrastructure (roads, housing, rails etc.)
- of recent years: wind energy!

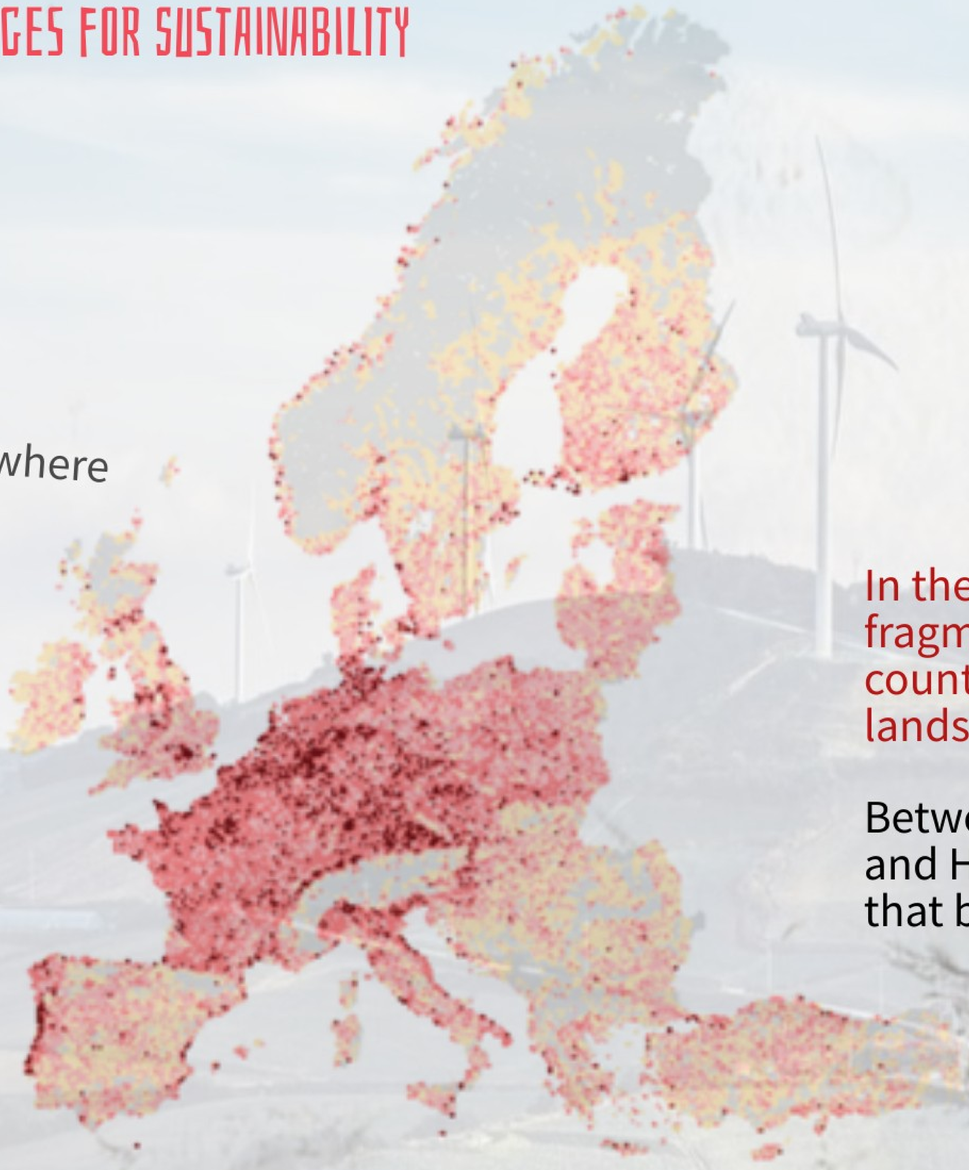


Challenges for sustainability

- Reduces biodiversity, by removing area of natural lands
- Splits habitats for wildlife, who needs continous land
- Erejct physical barriers for wildlife, so they cannot reach resources
- The barriers often also kill the wildlife (they collide with cars, wind turbines etc.)
- Noise and light pollution for people and wildlife
- Much conflict with people who value intact natural lands (it destroys esthetical values, but most of the conflict concerns issues about ecosystem sustainability)

Interested in noise pollution? Here's in-depth material for you!

CHALLENGES FOR SUSTAINABILITY



zoom in where you live

Fragmentation_2015_mesh_density

- Least fragmentation
- Medium fragmentation
- Highest fragmentation

In the nations with the highest fragmentation, for example the Benelux countries, more than 70% of the landscape is fragmented!

Between 2009 and 2015, Poland, Greece and Hungary had the highest shift of areas that became 'highly fragmented'

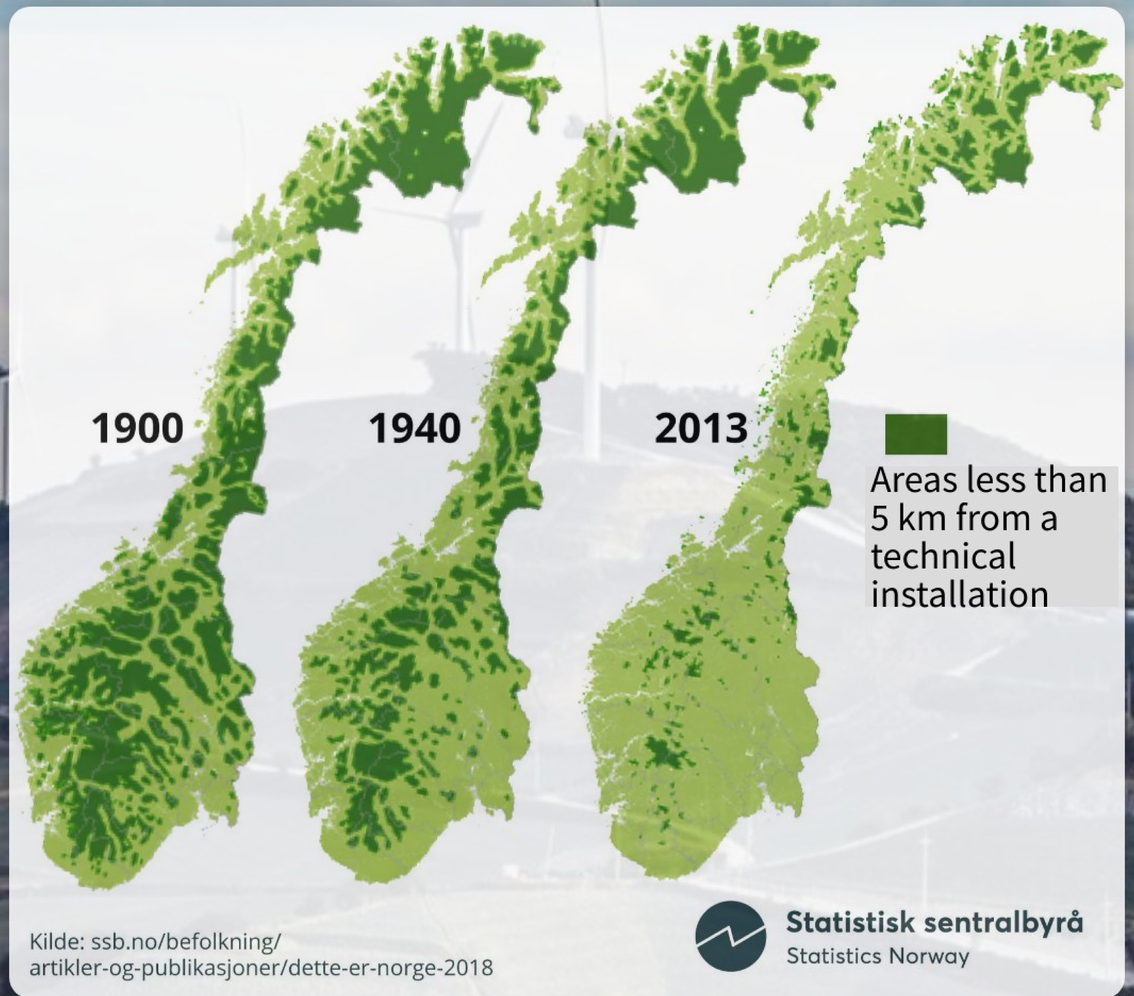
European Environment Agency

Because only major roads and settlements are included in the previous map, even those areas appearing to be almost not fragmented at all in that map, are indeed highly fragmented.
Here is a closer look at Norway:

Why we need intact lands



click ⊠ to enlarge



A recent and most serious addition to landscape fragmentation is wind turbines. While it started out being placed in areas aleady altered by humans, they are now being placed in nature. This is particulary the case in Fennoscandia.

+ CLICK SLIDE

With 40-50 turbines, the landscape is transformed into an industrial area.





MINING

Benefits

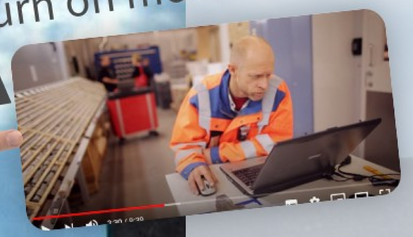
- Without it, most of our technology would not work



Challenges for sustainability

- Massive destruction of local ecosystem
- Destroys habitats for wildlife and people (e.g. indigenious cultures who live off natural lands), also through its infrastructre (roads, docks, storage).
- Peat mining releases vast amounts of CO2.
- Refining of products creates toxic waste to air and water.
- Creates huge stone deposits, which is toxic too and must be stored 4ever.

Turn on movie



In Fennoscandia there is mining for **peat** and **metals/minerals**.

Foreign companies ran much of the mining industry in the nordic countries (not in Russia)

Finland is a huge consumer of peat for energy, while Sweden and Norway mostly use peat for improvement of soils for agricultural purposes.

Finland has extensive mining for gold. Sweden exports mainly iron and copper. Norway is a main exporter of aluminium (from bauxitt mined in Brazil!) and olivin. Fennoscandia also exports, e.g., cadmium, cobalt, nickel, silver, zinc, lead and titanium

The largest mineral mines have been Kiruna in Sweden, Kittilä in Finland and Nikel in Russia. All are in the very north of Fennoscandia.

CHALLENGES FOR SUSTAINABILITY

Mining has **massive ecological effects locally** at the mining site, and it has **global** effects because the products are **exported** abroad.

It **destroys habitats** for wildlife and people (e.g. indigenious cultures who live off natural lands) and through its infrastructre (roads, docks, storage).

Peat mining **releases vast amounts of CO2**.

Mining products must be "refined", and these processes **create toxic waste to air and water**. It also often produces a lot of stone deposits, which is toxic too and must be stored 4ever.

Although only a few persons make money on it, **mining is driven by us all**. We all buy products from mining, from our food to smartphones.

Solution? each of us must **consume less material goods + recycling**

watch movie



watch movie





FOREST LOGGING

Benefits

- Vast array of use (energy, building materials, clothes, even food)
- income for many people



Challenges for sustainability (depends on HOW the forest is cut and cultured)

- Reduces biodiversity, especially by removing dead wood and planting monocultures
- Can reduce (but also facilitate) habitats for wildlife
- Can contribute to (but also reduce) CO2 emissions
- Much conflict with recreationalists (because it destroys trails and affects the esthetical views, but some prefer to walk in a cultivated forest)

Watch movie



33% of Norway, **69% of Sweden and 73% of Finland is forest land**.

70-90% of the forest is **privately owned**. Many Fennoscandian landowners care deeply for their forest. There is a distinct 'forestry culture' (**silviculture**) in these countries, that emphasizes responsibility of keeping forests *productive*.

The three countries cut a total of 140 000 000 m3 of timber/year. Only 10-20% of the timber is used for energy, while **80-90% is used for building or paper**.

Especially **a lot of the Swedish timber (60%) is exported**

Recently, almost all forest harvesting was **clear-cuts, which means all trees in an area are cut at the same time**. *This is changing in some areas,* especially in Finland, where they cut more by picking single trees.

+ READ MORE

Clear-cuts take at least 50-100 years or more to re-grow to mature forest, which is when the trees no longer increase much in size

CHALLENGES FOR SUSTAINABILITY

Watch another movie



Silviculture in several instances clashes with natural ecosystem functioning. For example, to avoid pests like bark beetles, silviculture does not want to have much **dying or dead wood. But these are also the habitats for much of the forest biodiversity**.

Productivity in terms of timber output means **higher densities of trees in monocultures**, and **shorter rotation times**, which has consequences for any life-form in the forest, both on the land, in the air and in the rivers and streams. A very few species may benefit, but **for almsot all the biodiversity this is negative.** Most people are so used to forests being cultivated that they do not notice how different it is compared to howo it would have been without forestry.

In Fennoscandia there is **much historical dispute and fighting** between the forestry stakeholders (landowners, industry) and environmentalist (or just ordinary people who use forests for recreation).



LIGHT POLLUTION



Benefits

- Pleasure and safety for humans

Challenges for sustainability

- Confuses the night-day orientation of all living beings
- Confuses the spatial orientation of species navigating by moon and stars
- Leads to sleep deprivation and reduced sleep quality (in humans)
- Affects predator-prey relationships
- Leads to collisions between wildlife and human traffic/infrastructure

CHALLENGES FOR SUSTAINABILITY

See short intro



Light pollution is a fairly new environmental issue. It has been increasing for some decades, but exploded with the invention of the LED light. Scientists now call for alarm.

It is estimated that in many countries **light pollution have increased with more than 50% in just 4 years**. This means than in one decade it has more than doubled! This varies of course strongly between areas.

In Fennoscandia, electricity is cheap compared to many other places on Earth. Especially Norway has cheap electricity from hydropower. Norwegians have therefore rarerly learnt to save on lighting.

Although Fennoscandia may show up as quite dark on global light maps, compared to for example Las Vegas, the amount of light pollution per inhabitant is much higher.

Solution? Turn off unnecessary lights, use bulbs that do not spread the ligth out far, minimize where and how we build housing/roads etc. that reflect light in nature or space.


Why the Stars Are Disappearing
Watch later
Share
THE
DISAPPEARING
NIGHT
Watch on YouTube

Step 3 of 5: Explore

ENVIRONMENTAL PRBLEMS OF THE NORTH



Fish



Fragmentation



Mining



Timber



Light

Done

NOW, LET'S SEE HOW MUCH YOU LEARNT!

SURE !

CREATE YOUR OWN EXPERIMENT!

This exercise is best done together with at least one other student. Research is always best done as teamwork. Scientists work by themselves for parts of the research, but come together to plan their next move and to discuss their findings. Research resulting from team-work is also likely to be perceived as more credible by the society.



Look at the photo, answer the questions on the next pages. Use your free imagination to get you started on question #1. As long as you are serious, no research problem is stupid or not good enough.

What in the photo makes you wonder about something? Think especially about the photo in the context of climate change. Make the experiment about that thing which makes you wonder. The experiment you create does not have to be carried out in practice, although it would be cool if you do!

1) formulate your research problem in familiar words

2) formulate your research in the form of hypothesis

(The null hypothesis H0 = if.... is true, then we will observe it as..... The alternative hypothesis H1 = if... is not true, then we will observe it as...)

3) describe how you will test this in practice

4) list the tools, materials, objects etc. you need for the testing

5) if you had found support for your null hypothesis, does that mean that the null hypothesis is the TRUTH?

6) if you had NOT found support for your null hypothesis, does that mean that the null hypothesis is NOT true?

7) Let's imagine you found support for your null hypothesis, what would be the value of your results? Who could use it for what?

Step 4 of 5: Reflect

ENVIRONMENTAL PRBLEMS OF THE NORTH

LOOK AT THE LEARNING GOALS AGAIN

After completing this tool-kit, the goal is that the student

- can describe several environmental problems in northern Europe
- grasps that when we encroach on nature, it always adds to these problems
- knows which activities add to which environmental problems
- can outline a research experiment with hypotheses set-up

We believe the last learning goal is the most important. Write a short essay of at least 200 words or make a creative file (audio, video, drawing etc.) about why this learning goal is so important. Why is it important that YOU know which activities add to which environmental problems? Why is it important for the society that as many as possible know this?

Step 5 of 5: Wrap-up

ENVIRONMENTAL PRBLEMS OF THE NORTH

Muscic courtesy by Alexander Blu https://orangefreesounds.com/

wrapping up

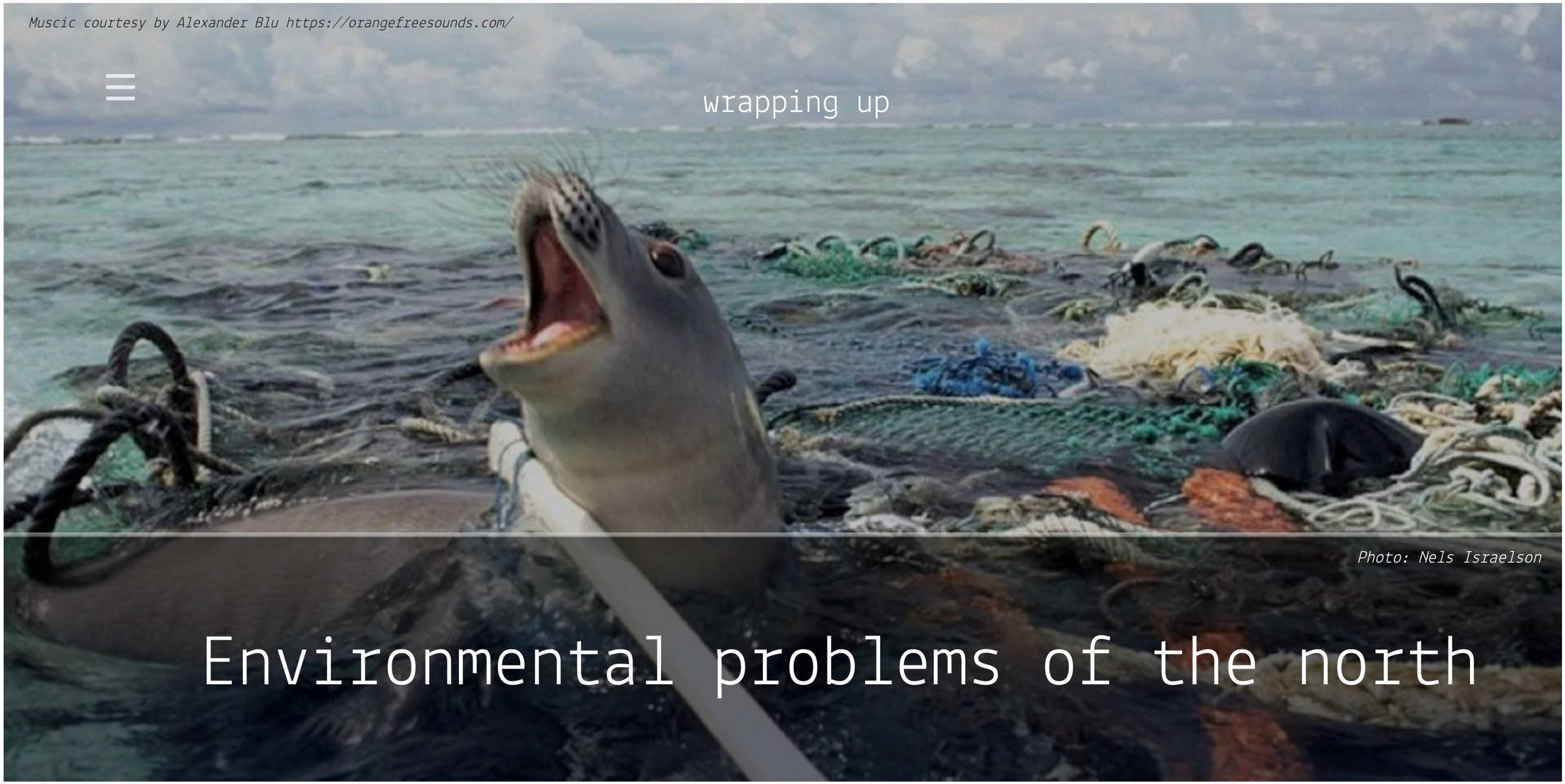
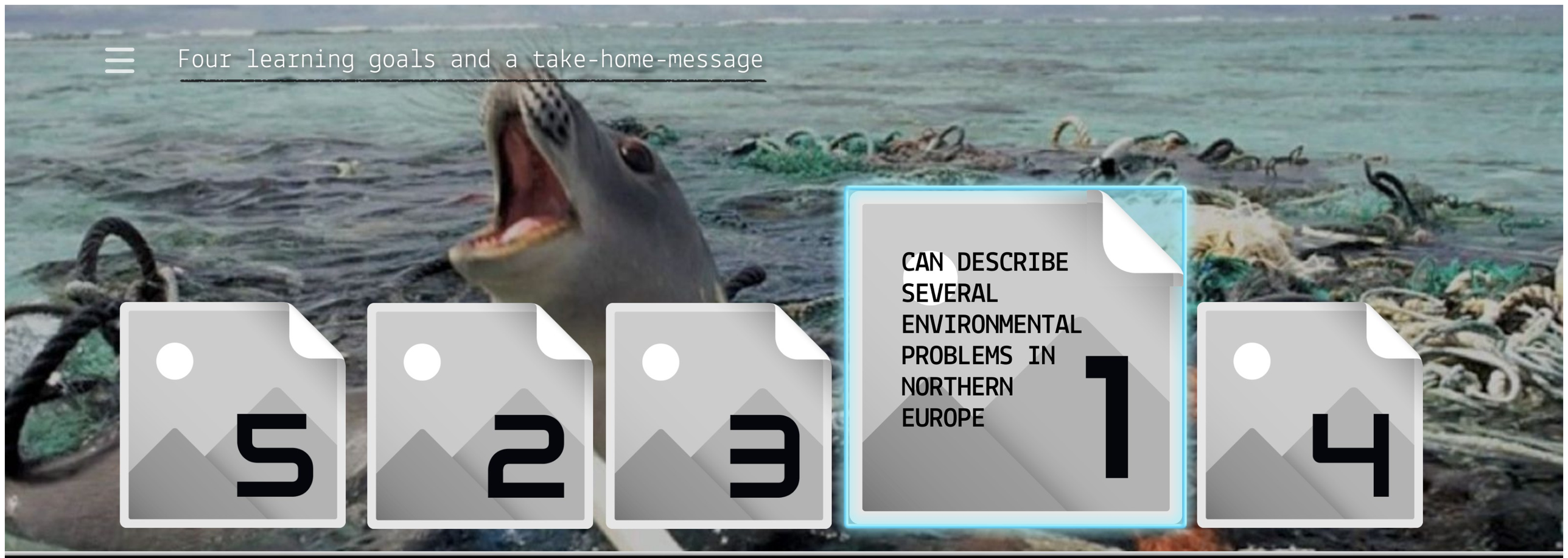


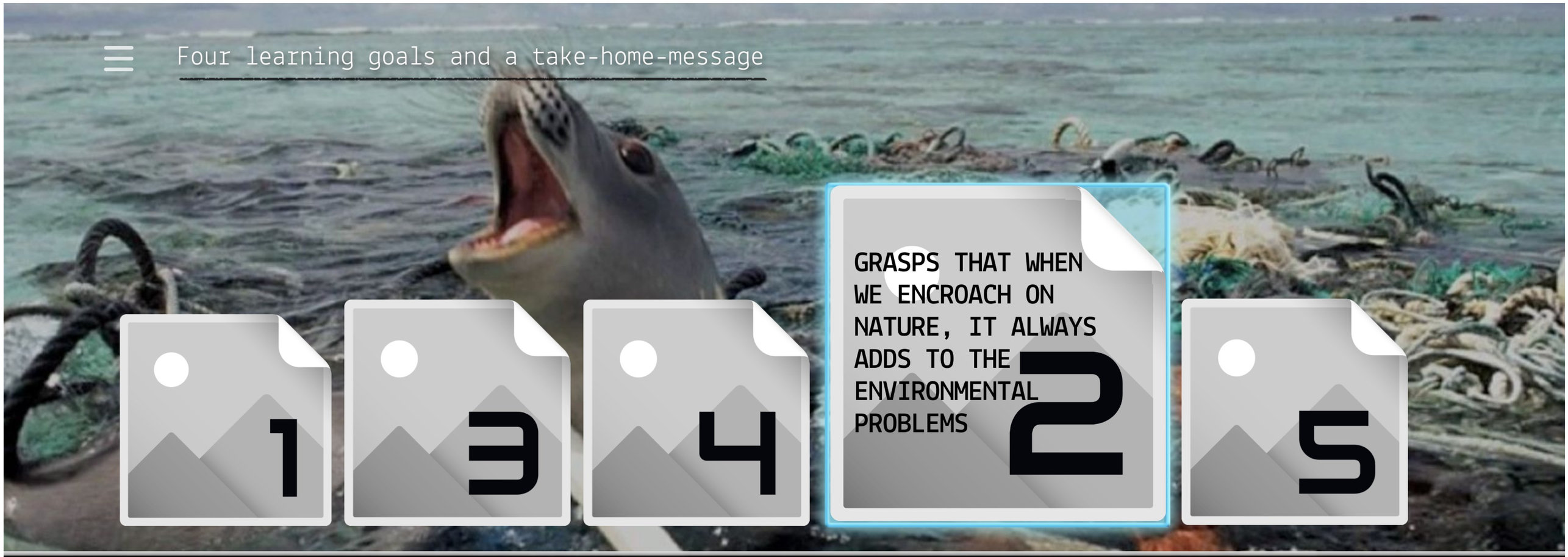
Photo: Nels Israelson

Environmental problems of the north

Four learning goals and a take-home-message



We explored a few of the many environmental problems of the north: **Fish farming**, leaking pollutants and disease to natural ecosystems. **Landscape fragmentation** (roads, wind turbines etc.) which likely is the biggest problem of all. **Mining**, which destroys local ecosystems and pollutes globally. **Forest loggging**, which can be beneficial for some wildlife, but harmful for most if it is done too intensively. And the rather new phenonmenon of **light pollution**, which disrupts day-night and seasonal rythms of wildlife.



Four learning goals and a take-home-message

1

3

4

GRASPS THAT WHEN WE ENCROACH ON NATURE, IT ALWAYS ADDS TO THE ENVIRONMENTAL PROBLEMS

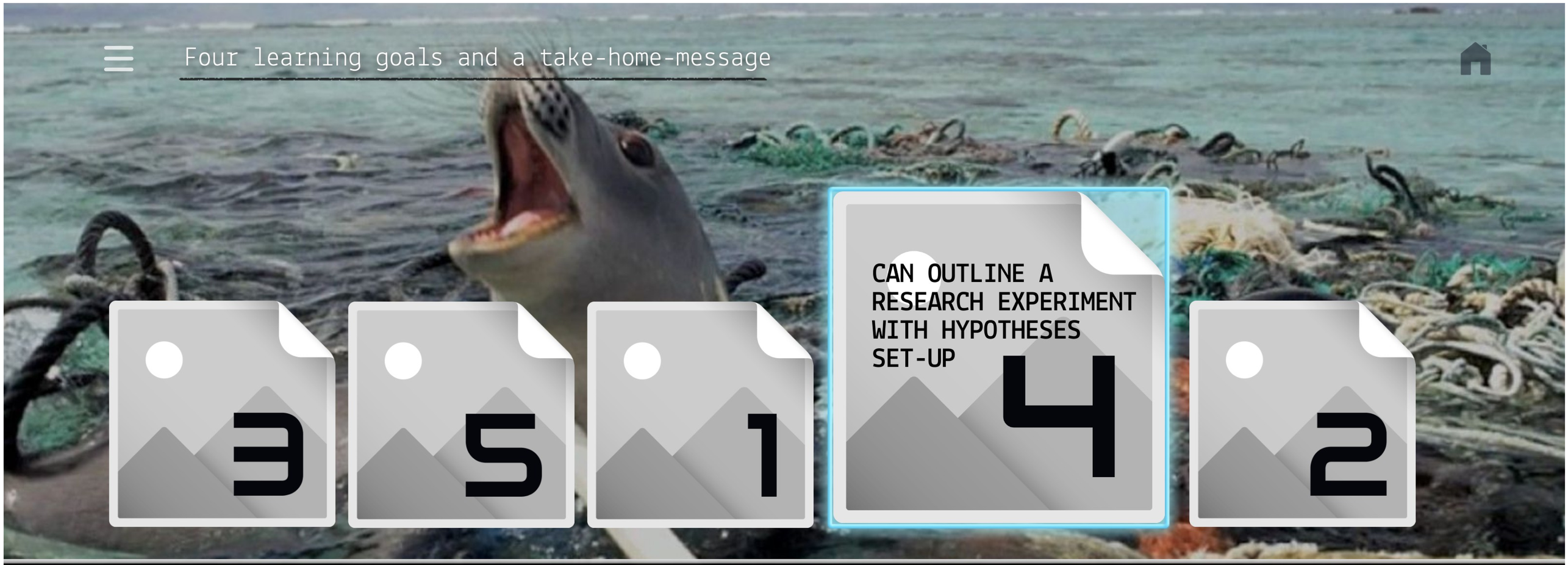
2

5

Human encroachment of nature is our transformation and fragmenation of natural lands into human-made landscapes. You can never put any type of technical installion in nature without it having a negative impact on ecosystems. Each of what may seem like one rather innocent installation, adds up to many over time.

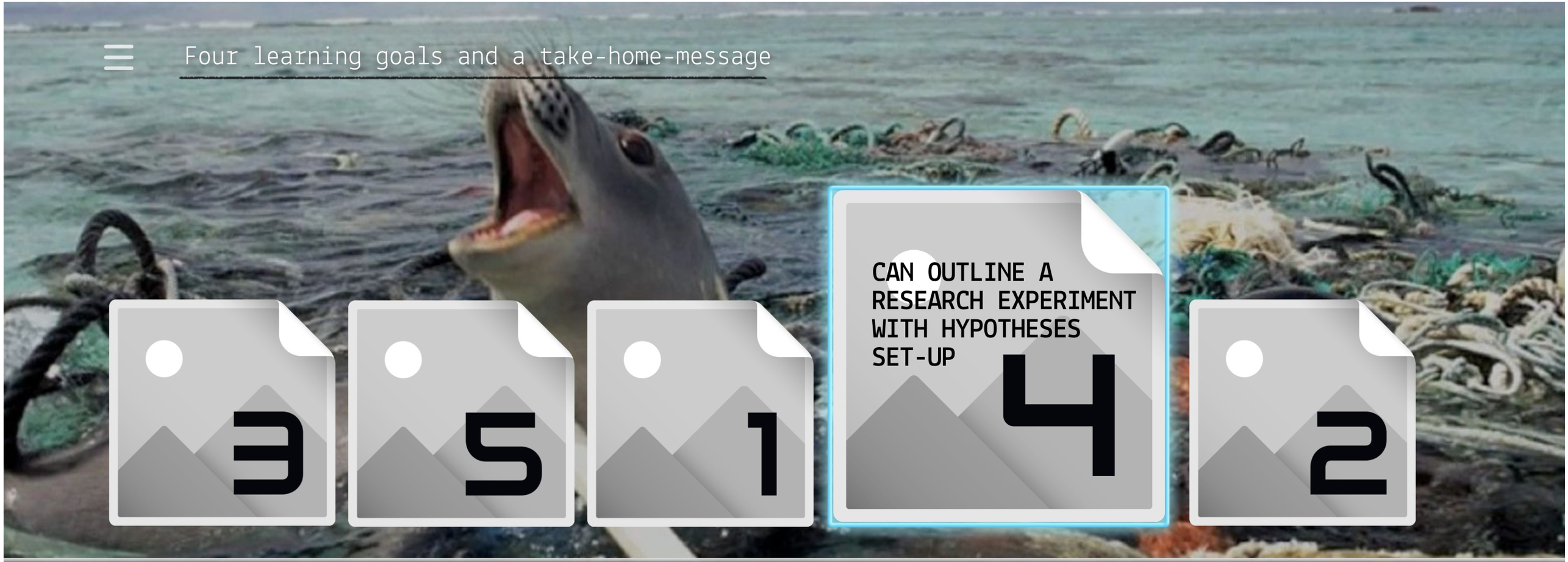


This is the most important learning goal of this tool-kit. You should know which of your own actions that contributes to which environmental problems. For example, streaming a movie on high resolution may lead to more wind turbines being erected in nature. Buying a new thing, especially technical ones, demands more mining for minerals.



You explored this in the explorer's lab. We hope that you learnt some science from it if you want to become a researcher. For others, hypotheses theory has no value. For those, we hope you learnt something from the eagle still avlive with its wing cut off by a wind turbine.

Four learning goals and a take-home-message



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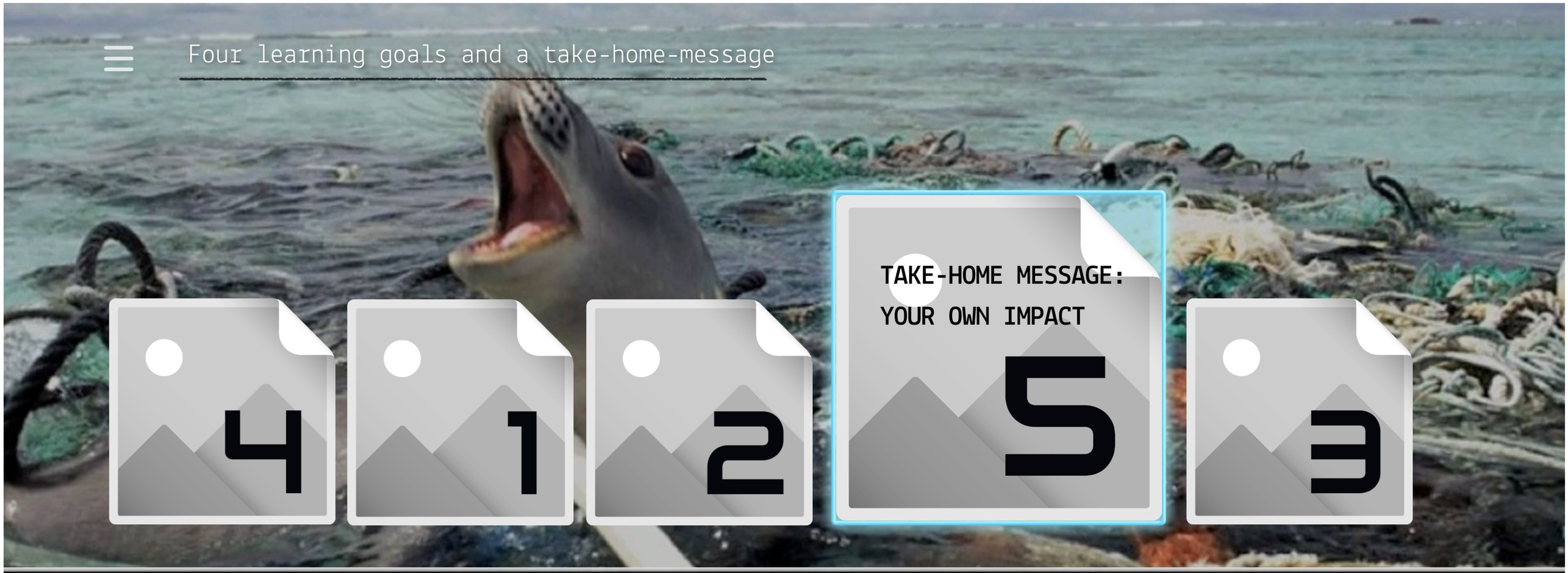
Four learning goals and a take-home-message



All new stuff that you buy or travels that you make takes its toll on nature.

ENVIRONMENTAL PROBLEMS OF THE NORTH

TOOL KIT COMPLETED