

How Sustainable is Iceland's Energy Use?

Iceland has the reputation for being clean and green when it comes to energy but how true is this? Is there a hidden cost to Iceland's clean energy revolution? Is it sustainable?

Use the information below to help you build a picture of where Iceland's energy comes from, how it has changed over time and why there is such a high demand for energy. This will help you form an opinion to be able to answer the question "How sustainable is Iceland's energy use?"

How has Iceland's energy use changed over time?

1. Figure 1 shows all sources of energy used in Iceland between 1940 and 2020. Describe what this shows about where Iceland gets its energy from and how this has changed over time.

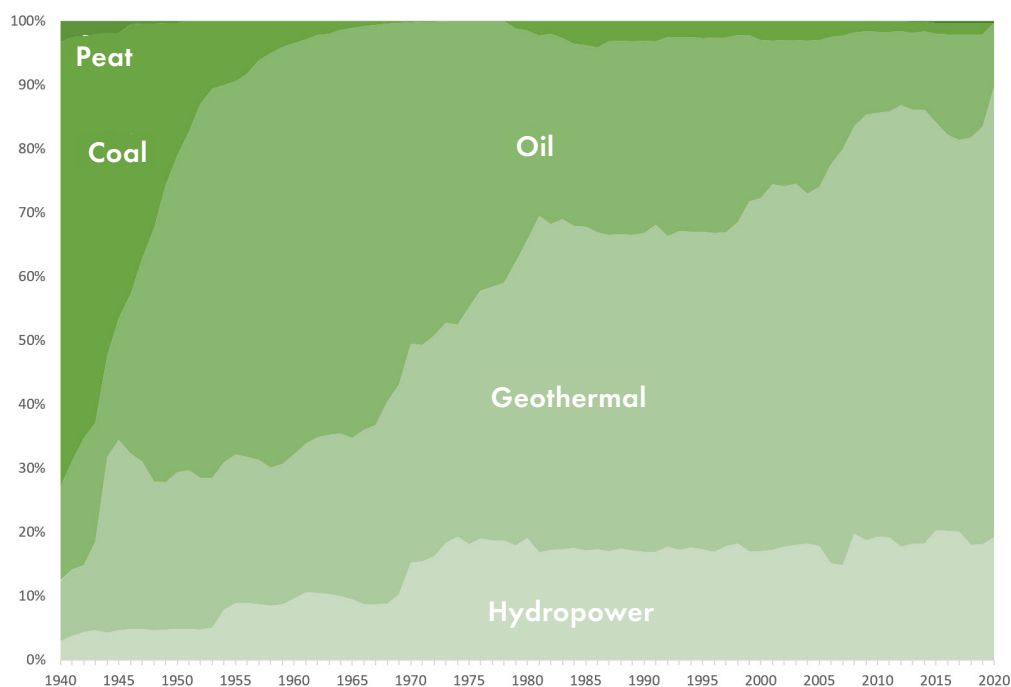


Figure 1: Primary Energy Use in Iceland 1940 to 2020. Orkustofnun (2021). OS-2021-T008-01: Primary Energy Use in Iceland 1940-2020 [data file].

Where does Iceland's energy come from today?

Energy in Iceland is used in many ways, such as for heating, electricity production, transport and industry. Remember that energy and electricity are not the same. Producing electricity is just one way that energy is used. The "energy mix" relates to the different energy sources used by a country and in what proportions.

2. Figure 2 is a graph showing Iceland's energy mix. Describe what the data in the graph shows.

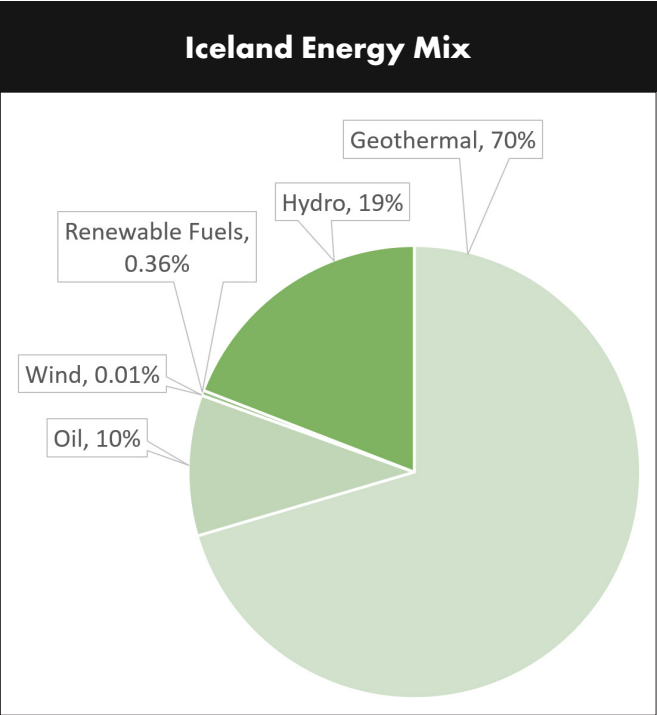


Figure 2: Orkustofnun (2021. OS-2021-T008-01: Primary Energy Use in Iceland 1940-2020 [data file].

Most sources of Iceland's energy are produced domestically apart from oil, which is imported, and mainly used by the transport sector.

3. Figure 3 shows the different sources of energy used to produce electricity in Iceland. Describe what the data in the graph shows.

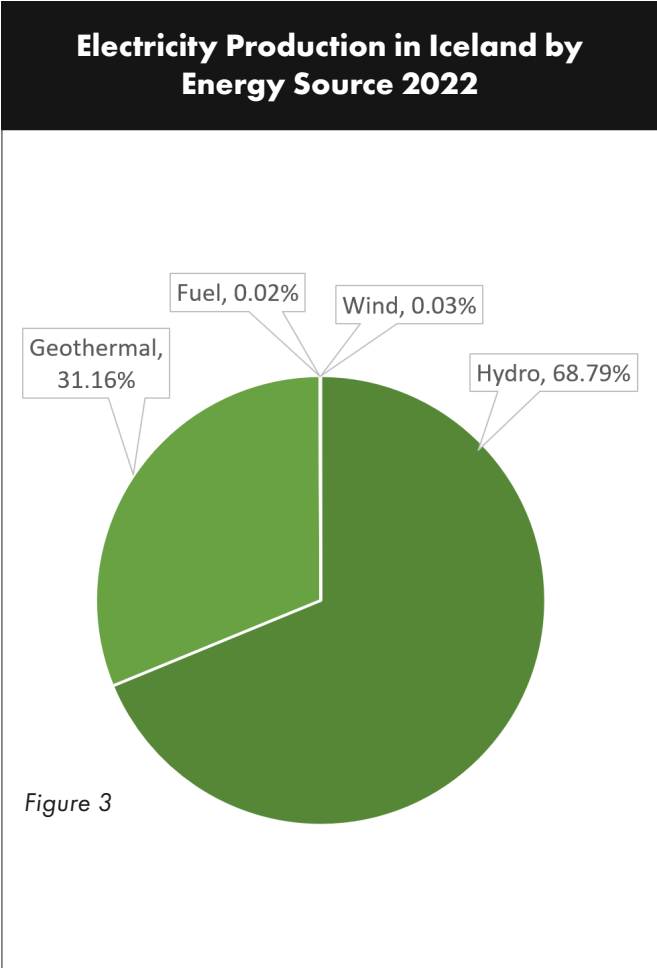


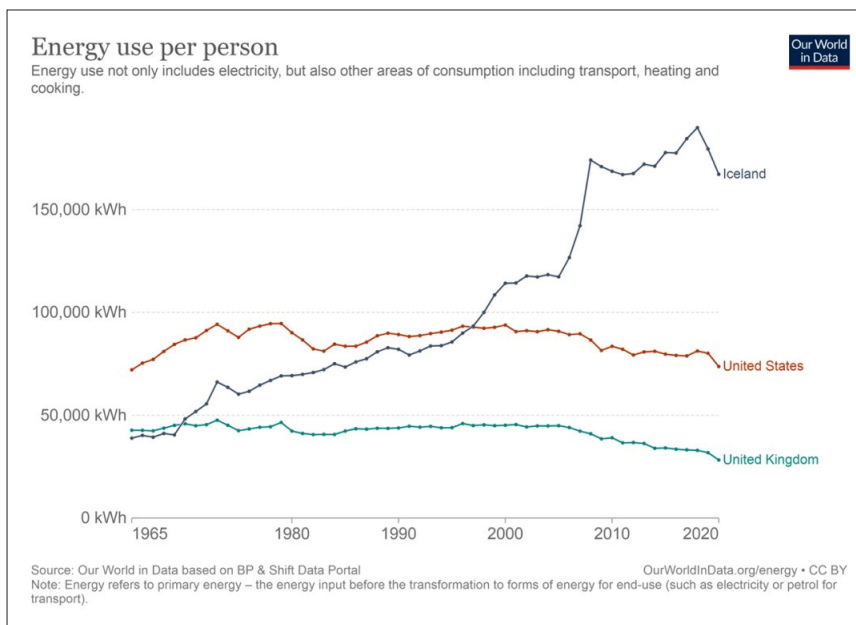
Figure 3

4. Based on the information you have so far, does this suggest that Iceland's energy production is sustainable? Explain your answer.

How much energy does Iceland use?

5. Figure 4 shows how much energy is used per person in Iceland and how this compares to the United States and United Kingdom. What conclusions can you draw from the data in figure 4?

Figure 4:



Why is energy consumption so high in Iceland?

It may surprise you to know that Iceland consumes more energy per person than any other nation. This can be explained by the following.

- The cost of electricity production is low and this is passed on to the consumer so electricity and heating bills are low. As a result households tend to take less care to conserve the amount of energy used and may be more wasteful, leaving lights on or having windows open whilst heating the house. The average cost of electricity in Iceland comes to about £18 per month, whereas in the UK this figure would amount to about £64 per month.
- Due to its latitude, winters in Iceland are cold and dark, so the demand for heat and light during this period is very high.
- Iceland also uses a considerable amount of energy on transport with a very large fleet of fishing vessels and high vehicle ownership. Most of this is imported oil.
- However, the largest proportion of the country's overall energy consumption comes as a result of demand from energy intensive heavy industries, such as aluminium and silicon production. Data centres, such as for bitcoin mining, also use a lot of energy for cooling their premises.

Iceland has 3 large aluminium smelters across the country. These are factories which produce aluminium metal from its ore, typically by electrolysis of molten alumina. The alumina is imported from countries such as China and Australia. The ferroalloy industry produces alloys of iron containing additional elements such as silicon and manganese which are then used in the steel industry. Coal is used as part of the manufacturing process. Both industries produce greenhouse gas emissions.

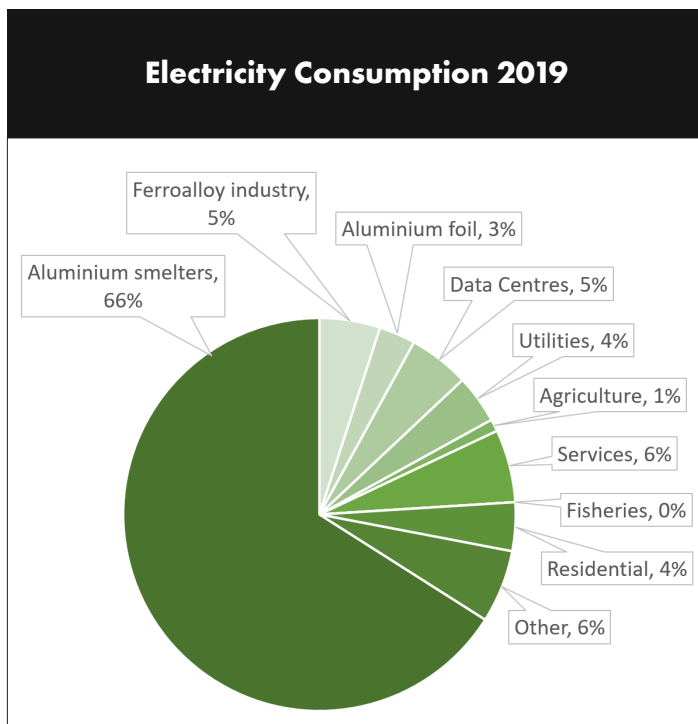


Figure 5: Electricity consumption in Iceland 2019

6. Figure 5 is a graph of Iceland's electricity consumption in 2019. Describe what the data shows.

7. Having reviewed this information does this change your opinion of how sustainable Iceland's energy production is. Explain your answer.



Figure 6: Ex-Prime Minister Sigmundur Davíð Gunnlaugsson's industrial ambitions for Iceland

This image is taken from the web site Saving Iceland. Saving Iceland is a global network of individuals who are dedicated to opposing the destruction of Icelandic wild nature for the benefit of corporate industry in the form of aluminium multinationals. The image is an example of informal representation of place. It is trying to communicate something specific and challenge our view of Iceland.”.

8. What do you think Figure 6 is trying to portray about Iceland?

9. What are the limitations of using informal representation as a source of information?

10. *Many of the protestors on the Saving Iceland site are not Icelandic.*
a) *To what extent should people from outside Iceland have a say on what happens in the country?*

- b) *How might the opinion of people in Iceland differ to the opinion of people from outside the country?*

The Kárahnjúkar Hydropower Project, Iceland



Figure 7: The Kárahnjúkar Dam and Halslón Reservoir

The Kárahnjúkar hydropower project in eastern Iceland is the **largest** in the country and cost **\$2 billion** to build. It involved damming **2 powerful glacial rivers**, the Jökulsá á Dal and the Jökulsá í Fljótssdal, with **five dams**, creating **three reservoirs**. Water from the reservoirs is then diverted through 73 kilometres (45 mi) of underground water **tunnels** and down a 420-metre (1,380 ft) vertical **penstock** towards a single **underground power station**. (see figure 8)

The energy generated is used to power the big Fjarðaál **aluminium smelter** built by the global company, Alcoa, 75 kilometres (47 mi) to the east in Reyðarfjörður. The Fljótssdalur Power Station and the new Alcoa smelter both started operating in 2007.

The Kárahnjúkar project is **controversial**. Many people were against its construction due to its **impacts** on the highland wilderness area, all to provide power for an international company. Others supported the project because of the expected **socio-economic benefits** it would bring to the region.

11. Using the information above, what was the main reason for the construction of the hydropower project?

Study the map on the following page which shows the location of the Kárahnjúkar hydropower project. Read the annotations which outline some of the impacts resulting from the construction.

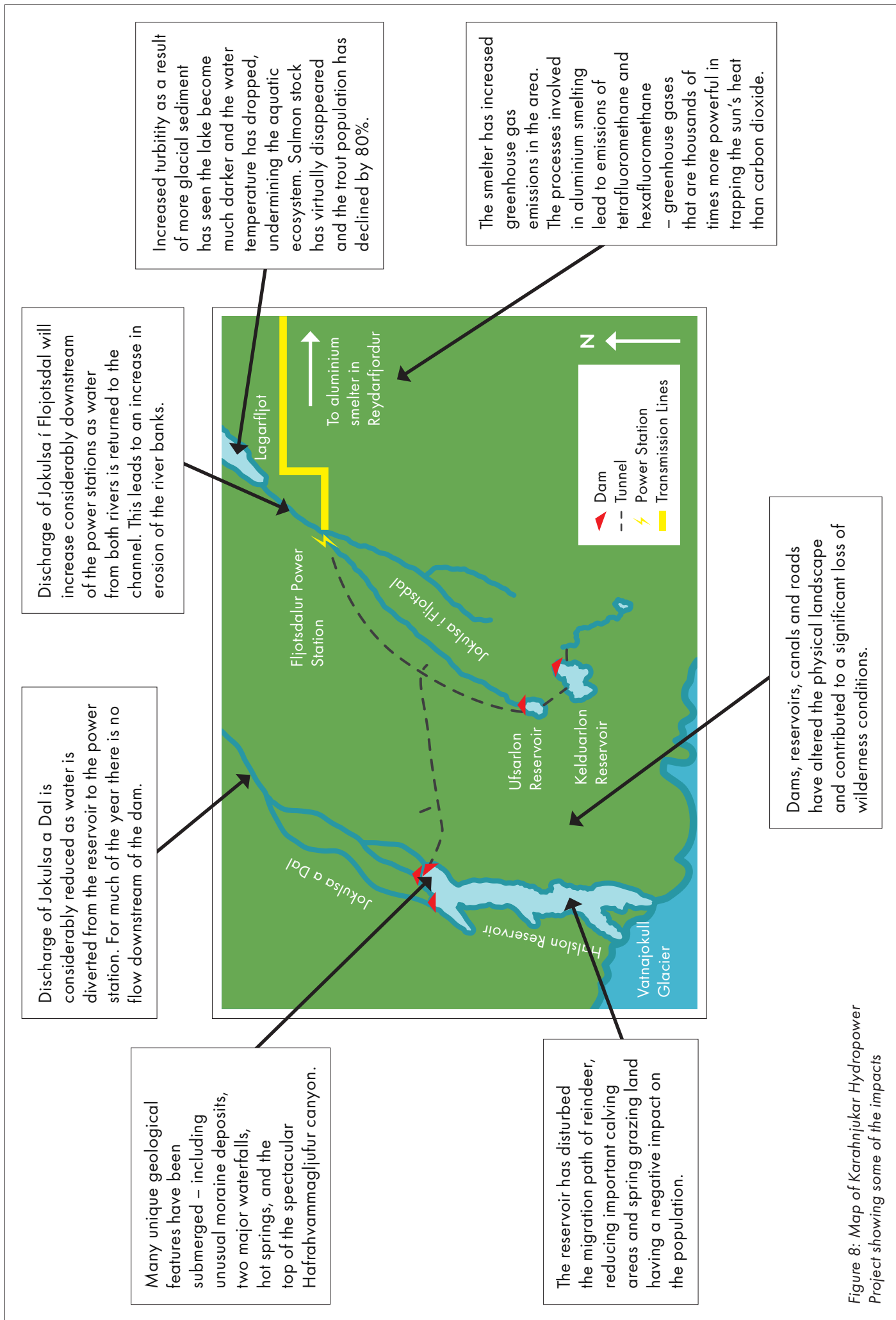


Figure 8: Map of Karahnjúkar Hydropower Project showing some of the impacts

There are a number of different stakeholders who have been affected by the hydropower project and the construction of the aluminium smelter. Some of their views are outlined below. Read through these viewpoints.

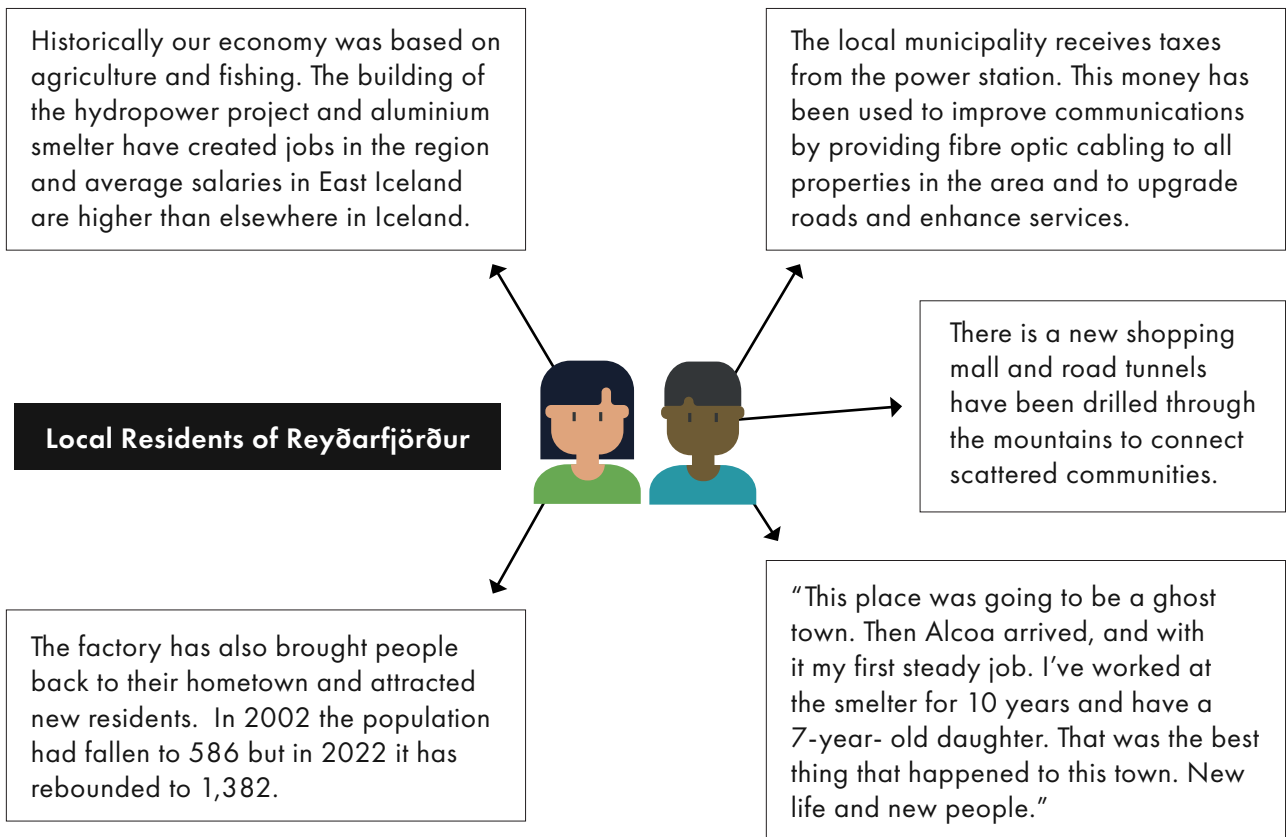


Figure 9

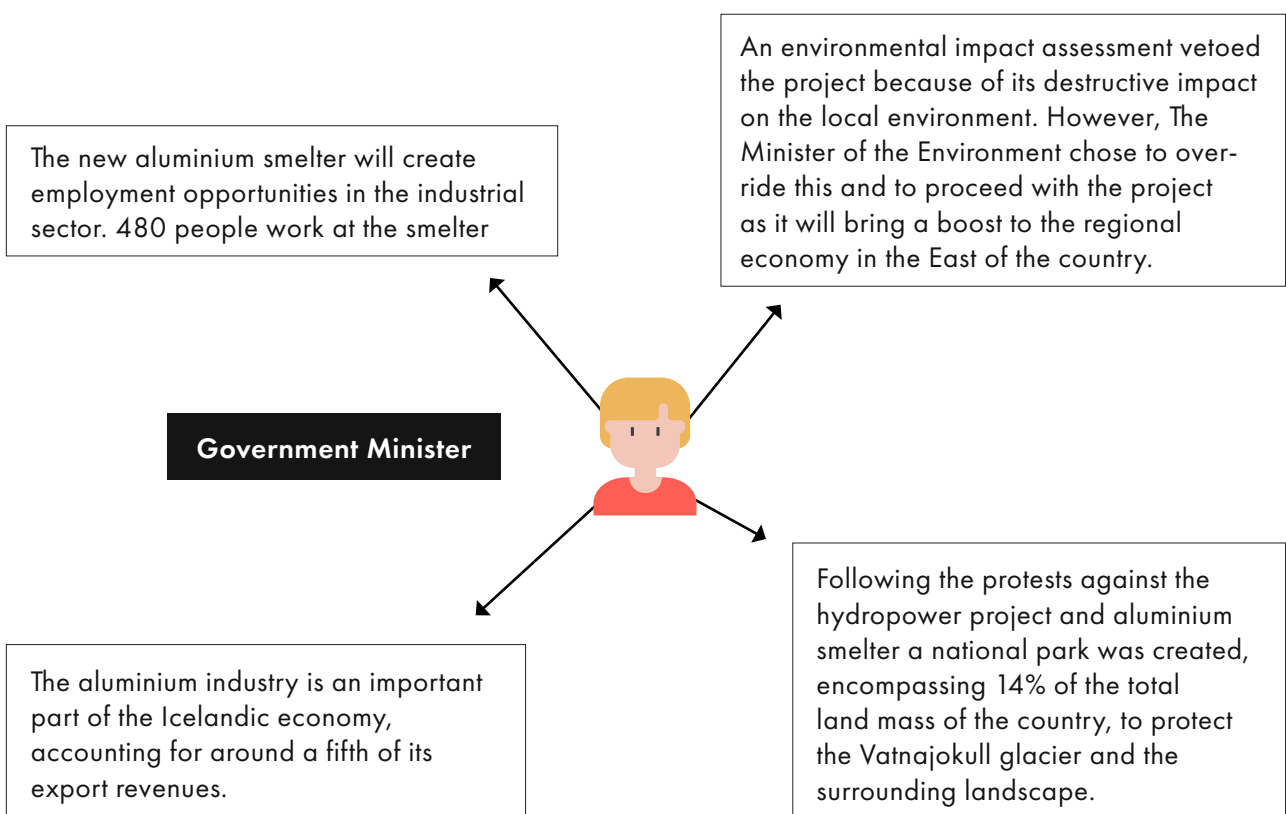
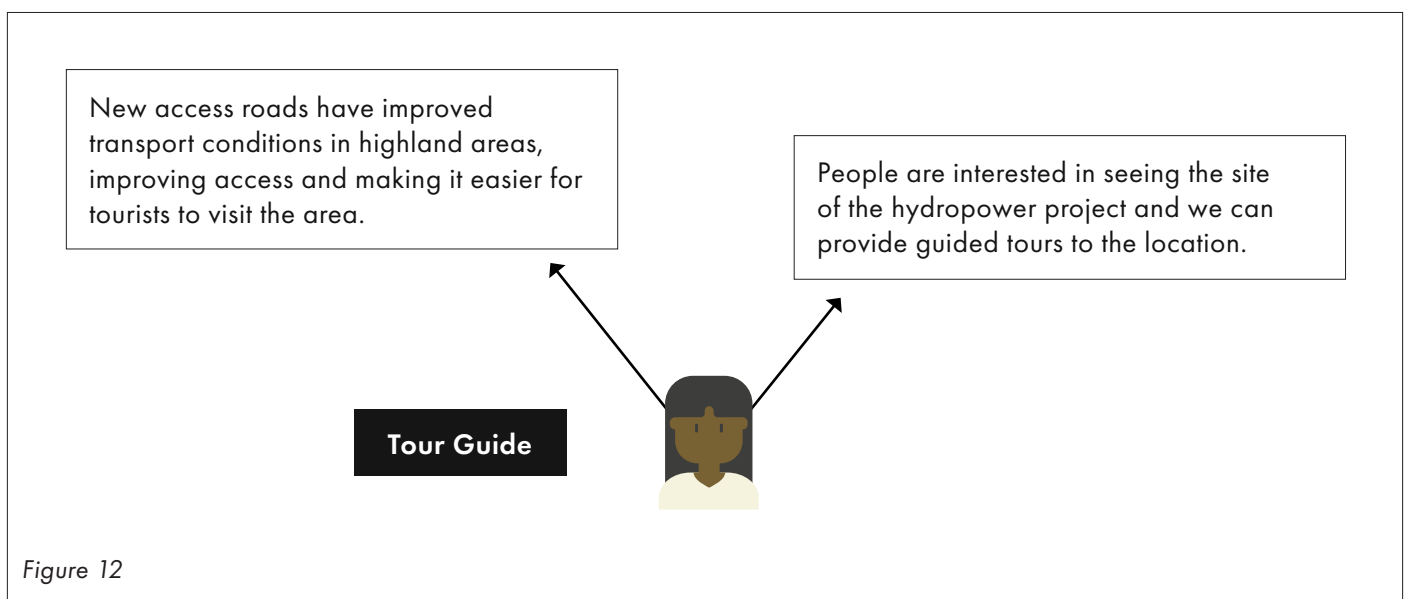
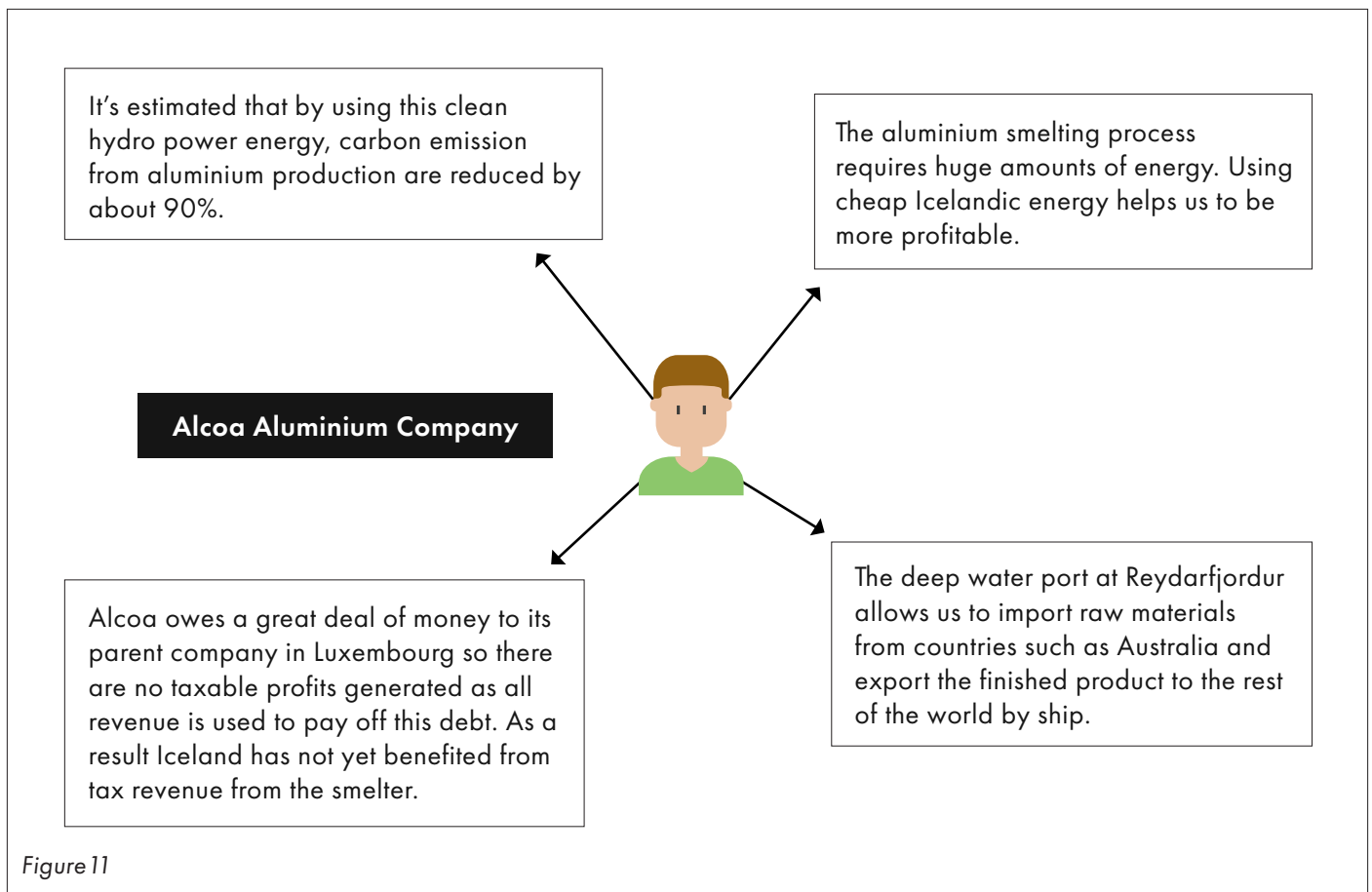


Figure 10



The construction of the hydropower project and the aluminium smelter has resulted in a number of impacts, both positive and negative.

- 12.
- Complete the table on the following page with the social, economic and environmental impacts of the project, deciding whether these are either positive or negative.
 - Once you have completed the table, use different colours or symbols to identify whether the impacts are short term or long term as well as having an impact locally, nationally or globally. Complete the key under the table with your chosen colour or symbol.

	Positive Impacts	Negative Impacts
SOCIAL		
ECONOMIC		
ENVIRONMENTAL		

Short Term Impacts

Long Term Impacts

Local Impacts

National Impacts

Global Impacts



Figure 13: The Icelandic wilderness and dry river canyon following the construction of the dam.

c) Which of the impacts do you consider to be the most important? Explain your answer.

d) Which of the impacts do you consider to be the least important? Explain your answer.

13. Should more hydropower projects be allowed to be built in other parts of Iceland? Explain your answer.

14. Based on all of the information provided on how energy is produced and consumed in Iceland, in your opinion is Iceland's energy use sustainable? Justify your opinion.