AQUACULTURE:

Higher Geography Research Questions

Possible Research Topics:

1. Investigate the role that Aquaculture has in Scotland and the potential it has in addressing future food shortages by 2050.

2. Investigate the growth of aquaculture in comparison to capture fisheries in Scotland and the impact this may have on the marine environment/communities.

3. Does Aquaculture have the potential to help aid global food insecurity by 2050 and what challenges will the industry face in relation to climate change?

4. Investigate the growth of sustainable aquaculture in Scotland and the benefits it brings to fragile coastal communities.

5. What considerations goes into planning an aquaculture site and what environmental risks may be present?

Contact SAIC for more information or to try arrange a field trip, as part as the pupils research project:

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RESEARCH TOPIC 1:

Investigate the role that Aquaculture has in Scotland and the potential it has in addressing future food shortages in Scotland by 2050.

Aquaculture plays a massive role in Scotland and it is the **2nd largest food and drink export**, following whiskey. Not only does it provide **support** and **income** for many people, seafood supplies people with the required **nutrients** in order to live a healthy life.

With a growing **global population** and the impacts of **climate change**, the demand in global food production is increasing. Scientists estimate that we will need a **70%** increase in food production by **2050** in order to feed the future population. This is a major global challenge and without sustainable solutions, **global food insecurity** will become a reality for many people. Food insecurity occurs when people are not able to access enough **safe and nutritious food** to meet their requirements for a **healthy life**. The lack of available food globally in the future food will cause **food price shocks**, meaning the value of food will increase dramatically. Studies show that **nearly one in ten people** in Scotland are already **food Insecure**, as a result of **poverty**. These numbers are likely to increase as food resources become more limited. **Aquaculture** sets out to help aid food insecurity, by providing nutrition and economic security for Scotland and it's fragile communities. **The Aquaculture 2030 Strategy** sets out to double the amount of food production, whilst also providing 9,000 new jobs in the sector by 2030.

Questions to think about:

- What is food security? What is Aquaculture? How can it help?
- Why is aquaculture so important to Scotland? Do you think it will have greater importance in the future *(as a food resource and to Scottish economy)*?
- What impact will food price shocks have on fragile urban and rural communities in Scotland?
- What future threats does aquaculture production in Scotland face and how may this impact future growth?
- What other changes need to occur to help tackle food security in Scotland?

Possible Primary Sources of Information: questionnaires *(awareness/views of aquaculture and food security/consumption patterns)*, annotated photographs *(if aquaculture site field trip is available)* and interviews of people in industry *(contact SAIC for further guidance)*.

Possible Secondary Sources of Information: produce graph with Excel spreadsheet data *(provided by teacher)*, news articles, official reports *(e.g. Marine Scotland, The World Bank, Scot.Gov)*, maps, global future predictions software *(e.g. world bank data, international futures data, UKCP data)*.

RESEARCH TOPIC 2:

Investigate the growth of aquaculture in comparison to capture fisheries in Scotland and the impact this may have on the marine environment /communities.

Fishing in Scotland dates back to around **7,000 BC** and throughout history it has been a way of providing food and income to many peoples lives. Overtime, Scottish fish production has greatly increased and methods of fishing have developed, in order to increase fishing boats' **efficiency** to **increase the size of catch**. Around the world, **trawl fisheries** became a common method for fish capture, which resulted in **overfishing** and collapse of fish stocks across the globe. The United Nations (UN) have stated that nearly **90%** of the world's marine fish stocks are now fully exploited, overexploited or depleted.

Aquaculture has been used to help reduce pressure on **capture fisheries**; reducing demand for wild fish so they can recover. In recent years, aquaculture production has exceeded capture fisheries production, becoming increasingly important for Scotland. **Sustainable conservation aquaculture** can help fragile wild stock populations, especially through **seaweed and shellfish farming**. It is a much more sustainable method of fishing in comparison to methods such as trawling and has the potential to help overfishing and increase vulnerable fish stocks numbers, if the correct **sustainable practices** are put in place.

Questions to think about:

- What is the difference between aquaculture and capture fisheries?
- How is overfishing a problem? How can aquaculture help restore our oceans?
- How does aquaculture industries limit their impact on their environment?
- What practices are carried out on site to limit the impact on other marine species?
- As food demand increases, how can aquaculture develop in a sustainable way forward?

Possible Primary Sources of Information: questionnaires *(Awareness of overfishing/need for change. Do people know how to check if their seafood is from a sustainable source?)*, annotated photographs *(if aquaculture site field trip is available)* and interviewing people in industry *(contact SAIC for further guidance)*

Possible Secondary Sources of Information: produce graph with Excel spreadsheet data *(provided by teacher)*, news articles, official reports *(e.g. Marine Scotland, SEPA, Gov.Scot)*, maps and documentaries.

RESEARCH TOPIC 3:

Does Aquaculture have the potential to help aid global food insecurity by 2050 and what challenges will the industry face in relation to climate change?

By **2050**, the world's population is expected to rise from 7 billion to 9.1 billion (a 34 percent increase). The amount of food needed to meet the demands of this growing population has been a concern amongst scientists. At the current rate of human consumption, it has been estimated that we need to produce around **70% more food by 2050** or **food insecurity** will begin to be more apparent. Food insecurity occurs when people are not able to access enough **safe and nutritious food** to meet their requirements for a **healthy life**. Food insecurity can lead to many serious problems such as: malnourishment, poverty, life-threatening illnesses and even death.

Aquaculture aims to aid the problem of food insecurity and has been linked to increased nourishment and decreased poverty trends. Fish contains omega-3, containing micro and macro nutrients, supplying **nourishment** to live a healthy life. The industry **supplies jobs** and can be carried out at a local level to help prevent fragile communities from falling into **poverty**. However, **climate change** poses a threat to aquaculture and the industry will be faced with **major challenges** when trying to tackle food insecurity.

Questions to think about:

- What is food security? What is aquaculture? How can aquaculture help?
- What climate change driven challenges does aquaculture face and what implications will this have towards creating more food for a growing population?
- What other changes need to occur in order to tackle food security? *(Are people aware of food insecurity being a global problem? Do we need to change our wasteful consumption patterns? Do we need to more sustainable food industries?)*

Possible Primary Sources of Information: questionnaires *(awareness/views of aquaculture and food security)*, annotated photographs *(if aquaculture site field trip is available)*, interview people in industry *(contact SAIC for further guidance)*, mapping areas of climate change risk.

Possible Secondary Sources of Information: produce graph with Excel spreadsheet data *(provided by teacher)*, news articles, official reports *(e.g. Marine Scotland, The World Bank)*, maps, global future predictions software *(e.g. world bank data, international futures data, UKCP data)*.

RESEARCH TOPIC 4:

Investigate the growth of sustainable aquaculture in Scotland and the benefits it brings to Scotland's fragile coastal communities and the economy.

Aquaculture in Scotland has become a major contributor to the **economic growth** of Scotland and has provided many jobs to **fragile coastal communities**. Coastal hazards and climate change are major issues, making coastal communities much more vulnerable, with many people's livelihoods being at risk. Aquaculture aims to provide protection for coastal regions, making them more **resilient** and allowing them to deal with **future shocks**.

Coastal communities (within 5km of the coast) make up **41%** of the total population of Scotland. These areas have different levels of rurality. **32%** of these areas are undeveloped or isolated, with the most remote rural coastal communities being located along the west coast of Scotland. For these regions, **marine fisheries** are highly important. Higher rates of **poverty** normally exist in rural communities with a trend of **outward migration to urban areas**, meaning rural communities cannot keep their skilled workers. Aquaculture provides **skilled employment** to local communities, where other skilled job opportunities are limited.

Aquaculture also provides great economic benefits to the whole of Scotland. The Scottish Government states that aquaculture is a key sector contributing to **sustainable economic growth**. It is the 2nd largest food and drink export and is **highly productive** in producing fish such as Atlantic salmon, Rainbow trout and mussels. With the increase in food demand, aquaculture production will grow, playing a massive role in determining the **sustainability of Scotland**.

Questions to think about:

- What is aquaculture? How is it suited to coastal rural communities?
- What causes rural to urban migration? What are the push and pull factors?
- What role does Aquaculture play in Human Geography? How can it benefit people, especially those who are considered fragile?
- What economic benefits does aquaculture bring to Scotland and will this increase with the global rise in population? Will it help future threats such as poverty and food insecurity?

Possible Primary Sources of Information: questionnaires *(awareness/views of aquaculture "would people be more willing to live in rural areas if there was better employment opportunities?")*, annotated photographs *(if aquaculture site field trip is available)*, interviews of local people

Possible Secondary Sources of Information: produce graph with Excel spreadsheet data *(provided by teacher)*, news articles, official reports *(e.g. Marine Scotland, Scot.Gov)*, maps.

RESEARCH TOPIC 5:

What considerations goes into planning an aquaculture site and what environmental risks may be present?

Aquaculture aims to be an extremely sustainable, productive and environmentally/culturally sensitive industry. In order to achieve this, **good site section** is essential. The location of an aquaculture site must bring benefits to **local communities** but must also consider **environmental risk**. If aquaculture sites are not sited and managed correctly, they have the potential to have **adverse effects** on the environment and result in bad fish welfare.

Many considerations goes into planning an aquaculture site **such as**:

- Water depth at high and low tide
- Proximity to other aquaculture farms and wild stock populations
- Future oceanic/climatic conditions (climate change)
- Proximity to other marine users (e.g. fishing, tourism, sailing and shipping)
- Proximity to local communities

Why might this be? There are many environmental hazards associated with aquaculture that must be considered to ensure there will be **no significant adverse effect** on the environment and on the fish. Scotland's aquaculture sites monitor environmental risks **daily** and ensure that **good fish welfare** is maintained. The sector aims to **double its food production by 2030**, to help tackle global **food insecurity**, requiring more sites across Scotland. **Pick 2-3** of the considerations and elaborate on why they are important to reduce negative impacts or to promote good fish welfare.

Questions to think about:

- What is aquaculture? What is the Aquaculture 2030 Strategy? Why do we need sustainable development of food production sectors?
- Why must aquaculture sites be carefully placed? What benefits can it bring to local people? What unwanted impacts could occur through poor site placement?
- What are the environmental hazards associated with aquaculture?
- Why are fish important? Can they help tackle global issues? Why is fish welfare important?

Possible Primary Sources of Information: interviews of site workers and local people *(contact SAIC for details)*, annotated photographs, field sketches of good aquaculture site, data collection *(if aquaculture site field trip is available)*

Possible Secondary Sources of Information: produce graph with Excel spreadsheet data *(provided by teacher)*, news articles, official reports *(e.g. Marine Scotland, Scot.Gov)*, maps of sites.