St. Ninian's High School
Scoill Ard Noo Ninian

Independent Learning Task

<table>
<tr><td>Subject</td><td>Science</td></tr>
<tr><td>ILP #3</td><td>Power the Island!</td></tr>
<tr><td>Week set:</td><td>Week 17</td></tr>
<tr><td>Duration:</td><td>1 hour</td></tr>
<tr><td>Hand in:</td><td>Week 19</td></tr>
<tr><td>Instructions:</td><td>You have moved to Moja Island, but there is no power!
Read the fact cards about Moja Island and decide which renewable energy resource would be best to supply your village.</td></tr>
<tr><td>Skills:</td><td>• Interpret and analyse information
• Form conclusions
• Apply knowledge to a real-world example</td></tr>
<tr><td>Marking schema:</td><td>
<table>
<tr><th>Secure</th><th>Developing</th><th>Excellent</th></tr>
<tr><td>- Work sheet completed.
- Some reason given for choices and number of installations.</td><td>- Work sheet completed.
- Reason given for choices and number of installations.</td><td>- Work sheet completed.
- Reason given for choices and number of installations.
- Explanation for the best choice.</td></tr>
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<tr><td>Additional guidance or help:</td><td>You will need to use the following:
- Map of Moja Island
- Set of Renewable Energy fact cards
- Moja Island Community cards
- Renewable Energy Choices worksheets</td></tr>
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Your Task

- You have been asked to identify the best renewable energy options for village communities on Moja Island.

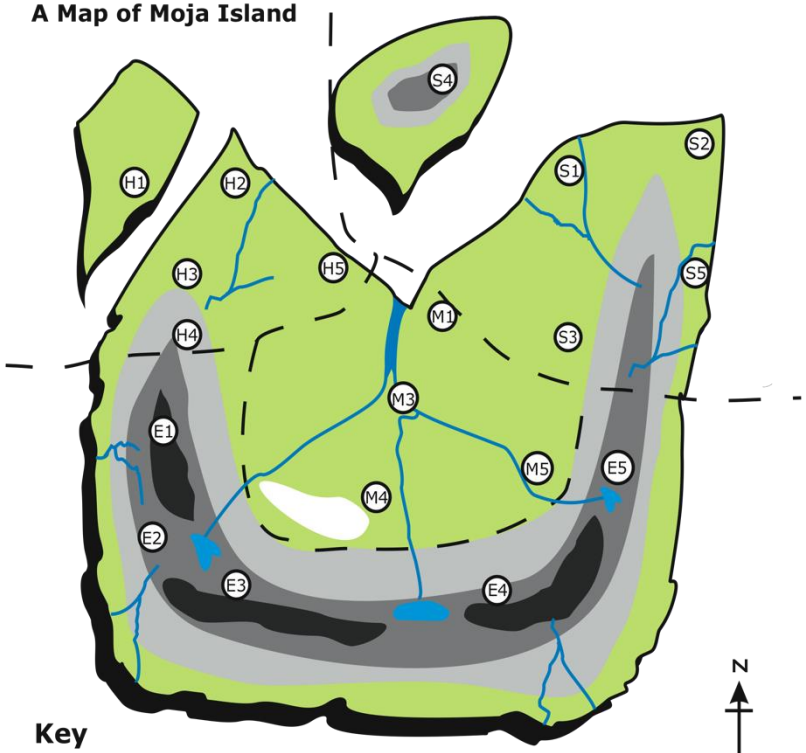
- You need to read the fact cards and decide which renewable energy would be best for your villages

Moja Island

- Moja island is a small country situated off the East Africa coast in the Indian ocean.
- It has no mains electricity.
- The 1,450 islanders mainly use kerosene lamps and candles for lighting and fuel wood for cooking food.

MOJA ISLAND

A Map of Moja Island



Key

- Water
- Mountains
- Tropical Rainforest
- Highland
- Lowland
- Geothermal Region
- Community Borders

The Ericas	E1-E5 villages
The Hankis	H1-H5 villages
The Moodis	M1-M5 villages
The Sandis	S1-S5 villages

Task Resources

- Map of Moja Island
- Set of Renewable Energy fact cards
- Moja Island Community card
- Renewable Energy Choices worksheets

No mains electricity

The majority of people do not have access to mains electricity and live in remote areas.

Communities sorting their energy solutions

Many people living without mains electricity find other ways to generate electricity.

In Sri Lanka – these children are looking forward to having light in their home generated by a small wind turbine.

MOJA Island

Name:.....

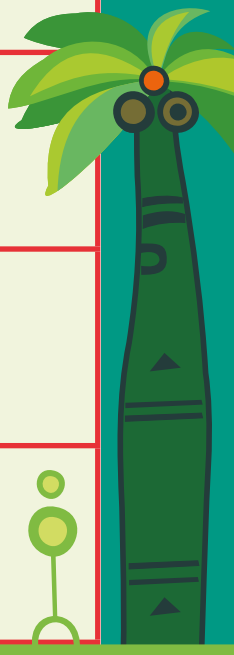
You have been asked to identify the most appropriate renewable energy options for a community on Moja Island.

Firstly, look at the map of the island and find where your community lives.

Next, read the information card about your community group.

Then use your Renewable Energy fact cards to help you make the best choice for each ! of the five villages in your community. You will be asked to report back in class.

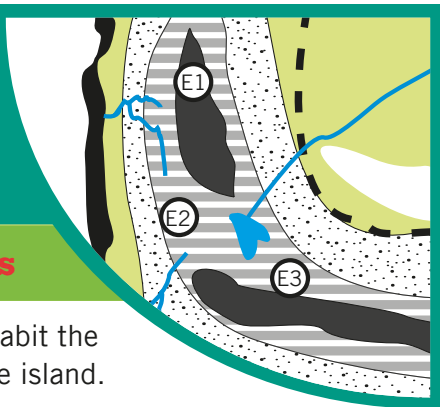
Community name	Renewable energy choice	Number of energy installations needed per village	Reasons for choice
Village 1			
Village 2			
Village 3			
Village 4			
Village 5			



Renewable energy choices

Moja Island community cards

The Ericas



Location: inhabit the South of the island.

Geography: mountainous area.

Total population: 300

No of villages: 5

Homes: each village has 20 dwellings.

Livelihoods: Ericas are livestock farmers. They keep goats and cattle.

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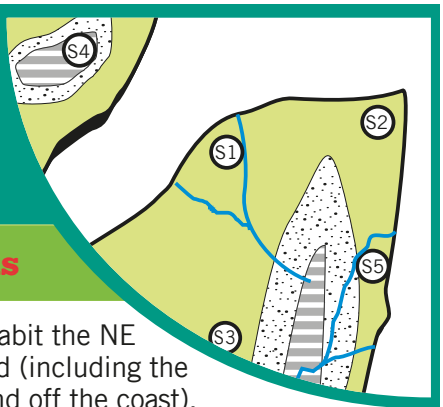
PRACTICAL ACTION

The Sandis



Location: inhabit the NE of the island (including the large island off the coast).

Geography: partly mountainous, partly fertile.

Total population: 450

No of villages: 5

Homes: each village has 40 dwellings.

Livelihoods: Sandis are livestock farmers. The goats and cattle are kept in the mountainous areas. Crops, including sugar cane, are grown on fertile land.

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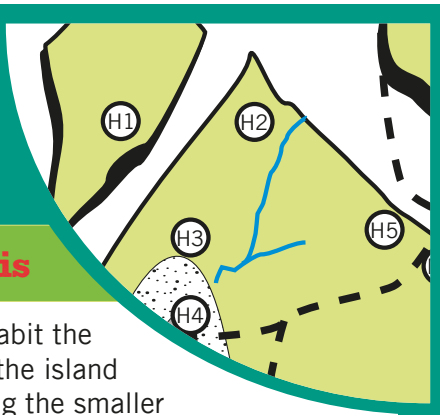
PRACTICAL ACTION

The Hankis



Location: inhabit the NW area of the island (including the smaller island off the coast).

Geography: area is fertile and flat.

Total population: 300

No of villages: 5

Homes: each village has 20 dwellings.

Livelihoods: Hankis grow a variety of crops (though mainly sugar cane) on both the mainland and on the smaller island. Sea fishing is the main industry.

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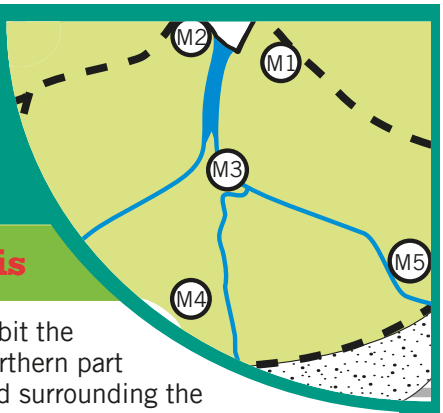
PRACTICAL ACTION

The Moodis



Location: inhabit the central and northern part of the island surrounding the estuary. One village is situated on the island in the estuary.

Geography: land is mostly low lying, flat and fertile. At the southern end of their territory is an area of geothermal springs.

Total population: 400

No of villages: 5

Homes: each village has 25 dwellings.

Livelihoods: Moodis grow a wide variety of crops and they fish in the river in the estuary.

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PRACTICAL ACTION

Renewable energy fact cards

Geothermal Energy

Made by: underground water being heated by hot rocks in the Earth. The steam can be used to turn turbines which then power generators to produce electricity.

For: it is free and available day and night.

Against: only available in certain parts of the world. Sometimes poisonous gases are given off.

Impact on the environment: some impact from the installation of the equipment that is needed to direct steam to turbines.

Energy provided: one geothermal power plant provides enough electricity for 20 dwellings.

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PRACTICAL ACTION

Solar Energy

Made by: using the sun's energy in two main ways:

1) to heat solar panels which in turn can be used to heat water;
2) in solar cells which can transfer light energy directly into electricity.

For: sun's energy is freely available whenever the sun is shining

Against: solar panels require continuous sunshine, unless the energy can be stored in batteries. Solar cells are expensive to buy.

Impact on the environment: some impact as may need large area for solar cells.

Energy provided: a single photo voltaic cell provides enough electricity for 5 dwellings.

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PRACTICAL ACTION

Wind Energy

Made by: the wind turning blades which drive a turbine which in turn drives the generator to produce electricity.

For: whenever the wind blows energy is provided.

Against: large number of turbines are needed to produce a high amount of energy. Only works well in windy places (mountains or off-shore).

Impact on environment: some impact from installing wind turbines.

Energy provided: two windmills provide enough electricity for 15 dwellings.

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PRACTICAL ACTION

Hydroelectric Energy

Made by: the falling water being diverted from a river and turning a waterwheel or turbine, which in turn drives the generator to produce electricity.

For: if there is good rain supply, there will always be water to produce energy.

Against: only suitable for hilly areas with rivers.

Impact on environment: some impact from diverting rivers. This may upset the ecology of the area or the fertility of surrounding land.

Energy provided: a single hydroelectric plant provides enough electricity for 40 dwellings.

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PRACTICAL ACTION

Renewable energy fact cards

Tidal Energy

Made by: placing a barrage across the mouth of an estuary. Tidal water passes through holes in the barrage. The moving water drives a turbine which in turn drives the generator to produce electricity.

For: whenever there are tides, energy is provided.

Against: barrages are expensive to build.

Impact on the environment: some impact through barrier installation can disrupt tidal flow to shore and hence the movement of nutrients and organisms.

Energy provided: a single barrage provides enough electricity for 25 dwellings.

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PRACTICAL ACTION

Wave Energy

Made by: placing buoys (floats) in the water (sea) which convert wave movement into vertical movement inside the buoy. The vertical movement drives a turbine which in turn drives the generator to produce electricity.

For: whenever there are waves, energy is provided.

Against: a large number of buoys are needed to generate enough electricity for a town. Only works where there are big waves.

Impact on the environment: minimal impact caused only when there are many floats in the water.

Energy provided: 10 buoys provide enough electricity for 10 dwellings.

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PRACTICAL ACTION

Biomass Energy

Made by: solid organic materials (wood, dung, sugar cane) being combusted and the heat released being used to produce steam, which in turn can be used to drive a generator to produce electricity.

For: plants are renewable; they can be grown continuously.

Against: combustion produces carbon dioxide and other pollutants.

Impact on environment: pollution caused by combustion.

Energy provided: a single generating plant provides enough electricity for 25 dwellings.

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PRACTICAL ACTION

Biogas Energy

Made by: the decomposition (rotting) of plants and animal manure in a tank. The methane gas produced is combusted and the heat released is used to produce steam, which in turn drives a generator to produce electricity.

For: uses natural waste products.

Against: combustion produces carbon dioxide and other pollutants.

Impact on environment: pollution caused by combustion.

Energy provided: a single generating plant provides enough electricity for 20 dwellings.

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PRACTICAL ACTION