



# energy

## 2 What Can You Observe?

### Purpose

To build on your current knowledge through observation in your surroundings

### Key question

How and where can you observe energy?

We cannot see energy itself. However, we can see the effects of energy acting on all sorts of things around us, in the natural world and in our personal lives. Become attuned to energy through an Energy treasure hunt, look for signs of the energy of the wind and sun and find out how many ways you use and experience energy through a personal energy log. Add to your Pool of Knowledge and record summarised information on your Energy Map.

### Consider

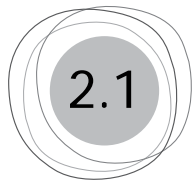
- How can you see energy when it is invisible?
- What signs of energy can you notice around your classroom/school?
- What energy do you use personally?
- Where is it coming from?

### Evaluate/Reflect

- What did you find out about energy in the school?
- Did you discover anything you hadn't noticed before?
- How is wind energy useful?
- What happens when there is too much wind energy?
- Why is the energy of the sun important to us?
- Were you surprised at all the ways you use energy?
- Is there anything you want to add to your Pool of Knowledge about energy?
- Have you any questions to add to your 'find out' sheet?

### Activities

- 2.1 Energy treasure hunt
- 2.2 Wind and sun
- 2.3 Personal energy log
- 2.4 Be an energy saving detective
- 2.5 Where is it all going?



## 2.1 Energy Treasure Hunt

This is an investigative activity which involves observing energy in your school environment using pictures from your Magazine Mindmap. Create a Map of your discoveries. Your Map will help you to look for links and establish flows of energy entering and leaving your school environment.

To begin this activity, consider how to investigate areas where others are working without disrupting them (such as administration areas, staffroom, resource room, groundstaff areas and classrooms). Arrange a suitable time to carry out observations and establish ground rules for safety.

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### You will need

- Pictures from your 1.2 Magazine Mindmap activity to be used as treasure hunt cards
- A large scale map of the school

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- 1 Make sure your large scale map is of the whole school grounds and has lots of room around the edge.
  - 2 In groups, take a treasure hunt card and find all the places in your school where you can observe that form or source of energy.
  - 3 Record them on your Map, checking information before it is recorded. Use symbols to illustrate different forms of energy. (e.g. heat, light)

The map should show

- location of built and natural features and mains areas of the school
- defined edges
- north/south orientation
- prevailing winds
- the path of the sun in different seasons
- aspects of the local environment around the outside of the school boundary that students think are important
- location of powerlines, meters and transformers
- location of boilers, fuel storage or other energy sources. e.g. gas pipes
- vegetation, especially where it provides shade
- natural energy sources such as windy or sunny site
- cultural features such as archaeological sites, landmarks and social/cultural uses

Recording information this way is a very useful basis for collective decision-making about possible improvements.

- 4 Extend your observations beyond the boundaries of your school to the original sources of energy.

### Evaluate/Reflect

- What did you notice about energy in your school?
- Was there anything that you couldn't find?
- What questions do you have about energy?
- Did some areas in the school have more energy than others?
- Why might this be?
- Where might you obtain information showing energy services in your school (e.g. a services map)?

## 2.2 Wind And Sun

This activity uses two stories to help us explore the energy that is around us in the natural world. The story of Tāwhirimatea shows that although energy is invisible, we can see its effects. The story of Māui and the sun shows that energy is critical in our lives, and that the sun is a powerful energy force. Select examples of the effects of Tāwhirimatea and Tamanuiterā in your school to record on your Energy Map.

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### You will need

- A copy of the book Ngā Āhuetanga o Tāwhirimatea by Te Aorere Riddell (Learning Media) and the translation provided in the EnviroSchools Kit
  - The story 'Māui and Tamanuiterā'
  - To do the extension, you will need the instructions and materials for Making a Manu Tukutuku
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Introduce the story about Tāwhirimatea by brainstorming how you would explain what the wind is to someone who didn't know.

- 1 Read the story Ngā Āhuetanga o Tāwhirimatea (translation provided). Find examples of the effects of Tāwhirimatea in your school. Record these on your map.
- 2 Read the story Māui and Tamanuiterā. Find examples of the effects of Tamanuiterā in your school.
- 3 Consider the following
  - What good things and challenges do we get from the energy of Tāwhirimatea?
  - What good things and challenges do we get from the energy of Tamanuiterā?
  - Why did Māui need his brothers' help to slow down the sun?
  - If you had washing out on the line today, would it be getting dry? Who would be drying it - Tāwhirimatea or Tamanuiterā?

### Evaluate/Reflect

- How do Tāwhirimatea and Tamanuiterā affect your school?
- What effect do they have on you?

### Extension

Use the instructions provided to make a manu tukutuku, then fly the manu tukutuku using the energy of Tāwhirimatea.

# The Ways of Tāwhirimatea

On beautiful days Tāwhirimatea is good.

Good at drying clothes and flying flags.

Good at cooling down your body and helping you surf.

Good at sailing yachts and flying kites.

Good at soaring gliders and turning windmills.

But sometimes, Tāwhirimatea is a bit of a challenge.

Losing hats and turning umbrellas inside out.

Blowing up skirts and tangling up washing on the line.

Making storms at sea and tossing about aeroplanes.

Uprooting trees and breaking power lines.

Blowing off roofs and turning up cars.

Causing landslides and flooding rivers.

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In fact, a lot of the time Tāwhirimatea is more of a challenge than he is good. But we can't really change that, because he's still fighting with his other brothers, the ones who agreed to separate their parents Ranginui and Papatūānuku.

Translation from Ngā Āhuetanga a Tāwhirimatea (Published in Māori)

By Te Aorere Riddell and illustrated by Maari Gardiner - He Purapura, Learning Media

# Making a 'Manu Tukutuku'

## Extension

Let's make a 'manu tukutuku' to fly in the wind.

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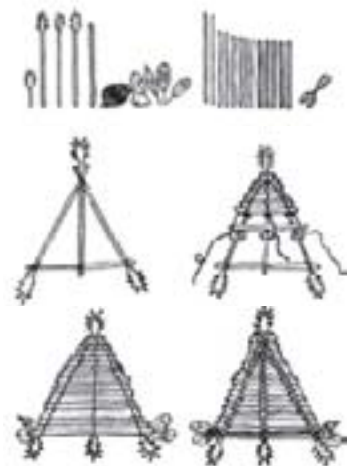
## You will need

- pieces of light wood such as manuka branch, raupo stalk, korari (flax flower) stalk, toetoe or rarauhe
  - raupo leaves
  - harakeke – stripped into string
  - a long cord
  - feathers
  - toetoe flowers
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## Construction

Look at the pictures below to guide you.

- 1 Place four pieces of raupo stalk, or whatever you have chosen to use, like this, to make a frame for your manu tukutuku.
- 2 Lie the raupo leaves carefully over the frame, trimming and cutting the leaves to follow the shape of your frame and to ensure that you have enough leaves to cover the frame.
- 3 Tie each piece of raupo leaf to your frame using the harakeke. Tie some toetoe flowers and feathers to the frame as shown in the picture, to make a tail for your manu tukutuku. Attach the long cord securely to your frame.



## Flying your manu tukutuku

Here is a waiata to sing to encourage your manu tukutuku to fly.

E rere e rere, taku manu e	Fly away, fly away, my kite
Piki mai, piki mai	Rise up, rise up
Ki te rangi e	to the sky
Ki te taha o te hau...nui	to the side of the big winds
Hei kawē taku mihi	take my greetings
ki a Tawhiri e	to Tawhiri

Adapted from: 1977 Te Wharekura 30, Learning Media

## Maui and Tamanuitera

A long, long time ago, long before your great-grandparents were alive, in the time of Māui-pōtiki and his brothers, the sun moved so quickly across the sky that the hours of daylight were too short.

There was very little time to do anything during the daylight. There wasn't enough time to gather food from the forest of Tāne, not enough time to go fishing for the children of Tangaroa. There was not enough time to cultivate the food of Rongomātāne in their gardens or for the plants to get enough light energy and warmth from the sun to grow, and especially not enough time to play.

Taranga, the mother of Māui, asked her sons to do something about it. The older brothers weren't too keen, but Māui-pōtiki, who was also known as Māui-tinihanga and Māui-i-toa, had an idea.

He called his brothers together and shared his idea with them.

"That tupuna of ours is travelling across the sky at such a speed that there isn't time for us to do all the things we have to do, let alone have time to do some of the things we want to do."

"Our tupuna Tamanuiterā is very strong. I cannot solve this problem on my own. It will take all of us, my brothers and the help of the women of the village to change this. He mahi ngātahi!" said Māui.

Māui's brothers laughed at him, "Don't be crazy! If we try to catch him, he will burn us to the ground in no time at all! We wouldn't even get close to Tamanuiterā!"

Māui-pōtiki continued with his plan. His brothers were always beaten before they started.

"We will ask the women to make long ropes from harakeke that are very strong. Then, when they are finished, we will walk to the place where Tamanuiterā comes up every morning. When we get there I will tell you what to do next."

"Oi Māui! You sure come up with some way-out plans! But this beats them all!" But they had also seen the things that Māui had already done and had to admit to each other that he had achieved some rather 'way-out' things that were of benefit for all people. So they thought, this might just be possible.

While the people were preparing the ropes, the brothers prepared for their journey. "We have to get there before the sun rises," said Māui.

It was still dark when they set off to Te Rua-o-te-Rā. It was really cold when they arrived there. "Find a place to shelter from the hot rays of the sun," instructed Māui-pōtiki. Then he added, "Soon you won't be cold! Soon you'll be so hot that you won't be able to sit down!"

The brothers all mumbled under their breath about this silly idea, but went about finding a place to hide so they wouldn't get burnt. They were laughing and yelling out to each other. "Turituri!" said Māui.

"If you make that much noise, Tamanuiterā will know that we are here and may work out what we're going to do! Just keep down behind those rocks and hold on tight to your rope."

They had made a big snare with the ropes spread over Te Rua-ote-Rā.

"Kia hiwa rā! Kia matāra!" yelled Māui. At that point Tamanuiterā started to rise out of the Rua. First his head was caught and then his shoulders.

"Kumea! Kumea! Don't let him get away!"

Māui's brothers pulled with all their strength. The sun struggled to free himself, but it was hopeless. Every time he wriggled the ropes cut into him.

Māui pulled out his sacred jawbone that came from his grandmother, Murirangawhenua and began a karakia to bring strength to him and his brothers and to make the ropes hold strong.

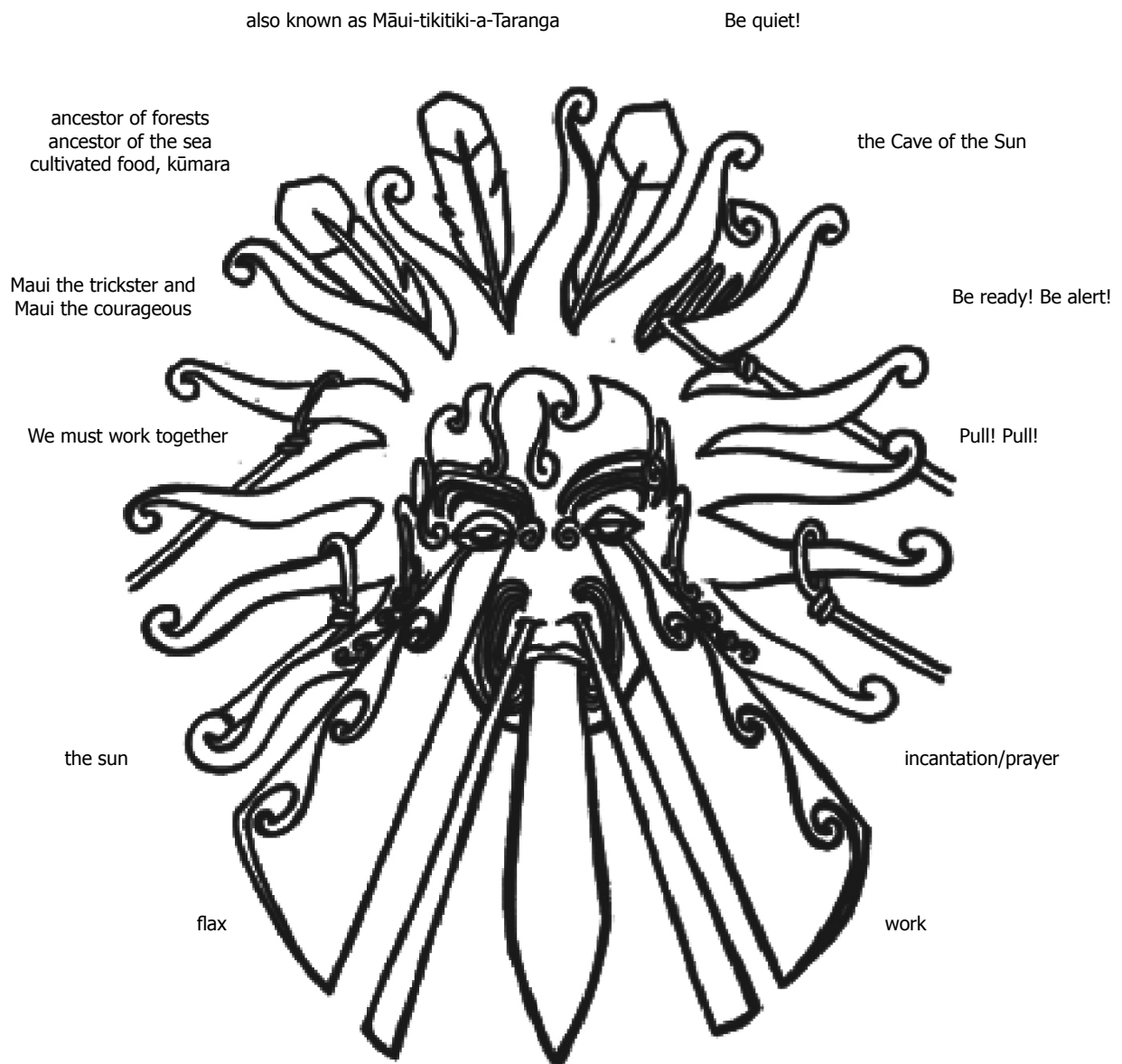
"Aueeē! Are you going to kill me? Let me go!" pleaded Tamanuiterā.

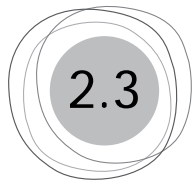
"We won't hurt you. But you must promise to move more slowly across the sky. We need more daylight hours to do all our mahi. Our children need more time to play. We'll let you go if you promise that our days will be longer."

The sun agreed, after a little persuasion, to move at a slower pace across the sky and the people had plenty of time to do the things they needed to do and to play.

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We can be thankful to Māui and his brothers and his iwi for what they did. The plants and trees now have enough energy from the sun to grow, and we have enough daylight to do what we need to do. We can plant our crops and go fishing. We can get warm from the sun and dry our clothes, and there is enough daylight to play in.





## 2.3 Personal Energy Log

This activity builds awareness and understanding of our personal connections with energy in our everyday lives. Start by telling a story about your connections with energy in a typical day. Talk about your activities from the time you wake up, noting connections with energy. Be sure to include eating, transport, movement and electricity use. Then build on these ideas by filling in personal energy log books.

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### You will need

- Your own copy of 'Personal Energy Log'

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- 1 Listen to a story that highlights our everyday connections with energy.

For example

"Three things reminded me to get up this morning

- the sun streaming through my window
- the alarm clock blaring out music
- the cat leaping onto my bed

I began to notice how much energy plays a part in my life and I started mentally noting everything happening to me and around me..."

- 2 In small groups, adopt an energy form (e.g. one group is heat, one is light, one is movement, etc.) or a source (e.g. food, electricity, the sun). Listen to the story again. When your form or source of energy appears in the story, your group stands up and waves its hands, then sits down again.
- 3 Take notice and record your personal connections with energy, for one week day and one weekend day. Write your observations in a personal log book. The log book will need careful introduction and monitoring so that everyone is confident in its use. Link energy forms with the source of that energy. Discuss different forms of energy and introduce an enlarged copy of your log to fill in together. Build on ideas from students about the source of energy and what it does for you. The log is to give an idea of your starting point in understanding sources and forms of energy. These are explored further in other activities.

### Evaluate/Reflect

- Were you surprised by how many of your daily activities use energy?
- Were any of the energy sources difficult to identify?
- Were there a lot of energy uses that were common to many students?
- What questions do you have about energy that you need to investigate further?
- How will you prioritise your questions?
- What steps will you take to help you investigate?



## What is Energy?

Energy is power. If you have power, you can get out of bed in the morning, ride a bicycle, do your homework and feel energised!

## Energy sources

Sources of energy are all around us and come in a variety of different forms - heat, light, sound, movement and growth. In nature, we can get energy from the sun, wind, falling water and from the earth. We can also get energy from materials that contain stored energy. We call these materials "fuels". Wood and coal are examples of fuel used for heating. Food is a fuel which allows us to move and keep our bodies warm.

Everything we use takes energy to make, but most people hardly notice.

## Where do you get your Energy?

The personal energy log allows you to learn more about you and energy, where it comes from and what it does for you.

## ENVIROSCCHOOL

### MY PERSONAL

### ENERGY LOG

Name:

## Energy Forms

Heat		Light	
Growth		Movement	
Sounds		Stored	

## Energy sources

Sun		Wind	
Falling water		Tide	
Wave		Food	
Batteries		Geothermal (from the earth)	
Fuels (gas, petrol, coal, wood)			

## Where do you get your Energy?

For two days, stop, think, observe and record each time you make a connection with energy.

Record the form of energy you observe, the energy source and the feeling you get from what it does for you.

Time of day	Object of energy	Energy Forms	Energy Source	Feeling I get
7.00	Alarm clock rings	Sound	Batteries	Awake
	Jump out of bed	Movement	Food	Motivated
7.30	Shower	Heat	Gas	Fresh Warm
	Dressed	Movement	Food	Warm
8.00	Breakfast	Stored	Food	Energised Growth
	Television	Electrical	Hydro power	Entertained
9.00	Bicycle	Movement	MEI	

## 2.4 Be An Energy Saving Detective

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### You will need

- A torch
  - A pen
  - A piece of paper to record anything you detect
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- 1 Switch off all the lights in the house one evening.
- 2 Walk carefully round each room looking for any sources of light.
- 3 Look for lights on telephones, microwaves, TVs, computers etc. These lights may be very small. They are often red or green lights.
- 4 Appliances on 'standby' are using electricity even though they seem to be switched off. Using a remote control to turn off a TV is not the same as turning the TV off at the set or at the wall.
- 5 As you go from room to room, write down anything you find.

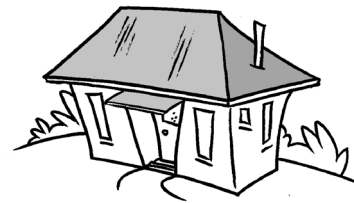


### Evaluate/Reflect

- Some appliances like fridges and freezers need to be left on, but others can be turned off to save energy. Could any of the appliances you saw on 'standby' be switched off when they are not being used?
- Think about your house. How many things use electricity?
- Does your house have any energy efficient lights or appliances?
- What could you do to save energy at home?

### Did you know?

- In an average house, 20% of the electricity is used to run appliances
- About 5% of that is used to run appliances on standby



## 2.5 Where Is It All Going?

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### You will need

- A copy of the table for each student or group
  - Old magazines
  - Scissors
  - Glue
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We use a lot of electricity in our school. Electricity is used to run equipment and appliances around the school.

### Look around you now

- 1 Can you see anything that uses electricity in your classroom?
- 2 Are these things using electricity at the moment?
- 3 Why are they using electricity at the moment?  
(Is it dark? Are you listening to music?)
- 4 Are there any appliances on standby that could be switched off (aren't being used)?
- 5 Fill in the table to show the electrical appliances in your classroom. Write the name of the appliance, draw a picture of it or cut a picture out of an old magazine.

Appliance	On/Off	Reason

### Evaluate/Reflect

- Is more electricity used on some days than others or at different times of the day?
- Think about electricity used on hot days, cold days etc. or when you are doing different activities