

Activity Title:

Climate change in the Bay

Learning objective

Describe examples of how climate change will affect the Bay of Plenty

Focusing question

How will climate change affect the Bay of Plenty?

Resources required

 (resources marked * can be found on the following pages)

- The story of Āhuarangi (climate) and the realm of Tāwhirimātea, learning questions and fill the gaps activity*
- Attitudes about climate change multi-choice activity*
- Prior Knowledge Chart*
- Pens and Paper
- Āhurangi Climate and Āhua o te rangi Weather cards*
- Copies of the weather record sheet*
- Access to internet
- Devices, screen or projector for viewing film clips / websites
- Mindmap template*
- Graphic: How is the Bay of Plenty expected to change?*
- PMI chart*
- Summary quiz questions* / Kahoot quiz

ACTIVITY

5h(i)

Activity Title:

Climate change in the Bay

Education for Sustainability Aspect:

- Environmental Aspect
- Economic Aspect
- Socio-cultural political Aspect

Key Competencies:

- Thinking
- Sustainability

Curriculum Links:

- Science
- Social science

See green panel below for detail

Curriculum Links continued:

SCIENCE Level 1 & 2:

Nature of Science: Participating and contributing. Explore and act on issues and questions that link their science learning to their daily living.

Planet Earth and Beyond:

Interacting systems. Describe how natural features are changed and resources affected by natural events and human actions.

SCIENCE Level 3 & 4:

Nature of Science: Participating and contributing. Use their growing science knowledge when considering issues of concern to them. Explore various aspects of an issue and make decisions about possible actions.

Nature of Science: Investigating in Science. Build on prior experiences, working together to share and examine their own and others' knowledge. Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.

Communicating in Science: Begin to use a range of scientific symbols, conventions, and vocabulary.

SCIENCE Level 5 & 6:

Nature of Science: Investigating in Science. Develop and carry out more complex investigations, including using models. Show an increasing awareness of the complexity of working scientifically, including recognition of multiple variables. Begin to evaluate the suitability of the investigative methods chosen.

Level 5 Planet Earth and Beyond.

Earth Systems: Investigate the composition, structure, and features of the geosphere, hydrosphere, and atmosphere. Interacting Systems: Investigate how heat from the Sun, the Earth, and human activities is distributed around Earth by the geosphere, hydrosphere, and atmosphere.

Level 5 Planet Earth and Beyond.

Interacting Systems. Develop an understanding of how the geosphere, hydrosphere, atmosphere, and biosphere interact to cycle carbon around Earth.

SOCIAL SCIENCE: Conceptual Strand: Place and Environment.

SOCIAL SCIENCE Level 2:

Understand how places influence people and people influence places.

SOCIAL SCIENCE Level 3:

Understand how people make decisions about access to and use of resources.

SOCIAL SCIENCE Level 4:

Understand how exploration and innovation create opportunities and challenges for people, places, and environments. Understand that events have causes and effects.

SOCIAL SCIENCE Level 5:

Understand how people's management of resources impacts on environmental and social sustainability. Understand how the ideas and actions of people in the past have had a significant impact on people's lives.

GEOGRAPHY Level 6: Understand how people interact with natural and cultural environments and that this interaction has consequences.

Prior learning

NA

Method

ĀHUARANGI (CLIMATE) AND THE REALM OF TĀWHIRIMĀTEA

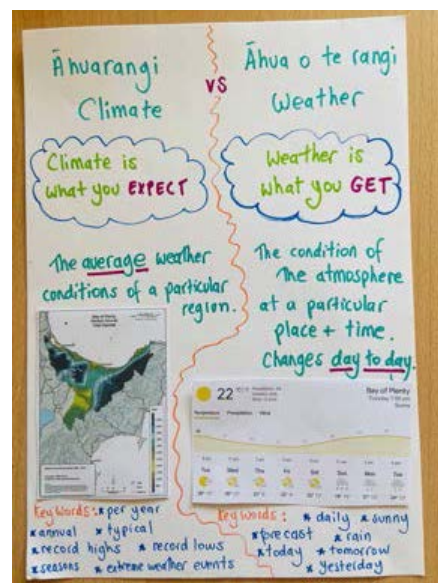
1. Depending on the age of learners, use the story sheet or adapt Te Ara's Story: [Tāwhirimātea – the weather](#) to tell the story of Āhuarangi (climate) and the realm of Tāwhirimātea and / or have learners read the story themselves and answer the learning questions or complete the fill the gaps activity (**Teacher answers for learning questions activity: 1a, 2c, 3d, 4a, 5d, 6b**).
2. Inquiry:
 - What other Tāwhirimātea stories do you know?
 - What other stories are told amongst your family / whānau to help explain climate and weather?
 - Do you have any family traditions related to weather – e.g. rainy days, frosty days, hot sunny days...

CLIMATE CHANGE: PRIOR KNOWLEDGE

1. Inquiry:
 - What do you think climate change is?
 - What causes it?
 - Why is climate change a hot issue?
 - What will climate change mean for us as we get older?
 - How will it affect people in the Bay of Plenty?
 - Is there anything we can do about it?
 - What do we need to know before we can make decisions?
 - How reliable is information you find on the web?
2. Do the multi-choice activity 'Attitudes about climate change'. Discuss, compare or you could even graph answers!
3. Use the Prior Knowledge Chart and record what we already know and what we would like to know more about how climate change will affect the Bay of Plenty.

THE DIFFERENCE BETWEEN CLIMATE AND WEATHER

1. Inquiry:
 - How would you describe today's weather?
 - What is the weather forecast for today?
 - If climate tells you what clothes to buy for the season. And weather tells you what clothes to wear that day... then what is 'weather' and what is 'climate'?
 - How are weather and climate different?
2. Create an anchor chart like the one shown here.
3. Use the Āhuarangi / Climate and Āhua o te rangi / Weather cards (or create your own) to reinforce understanding about the difference between climate and weather.

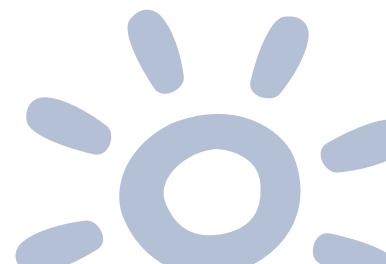
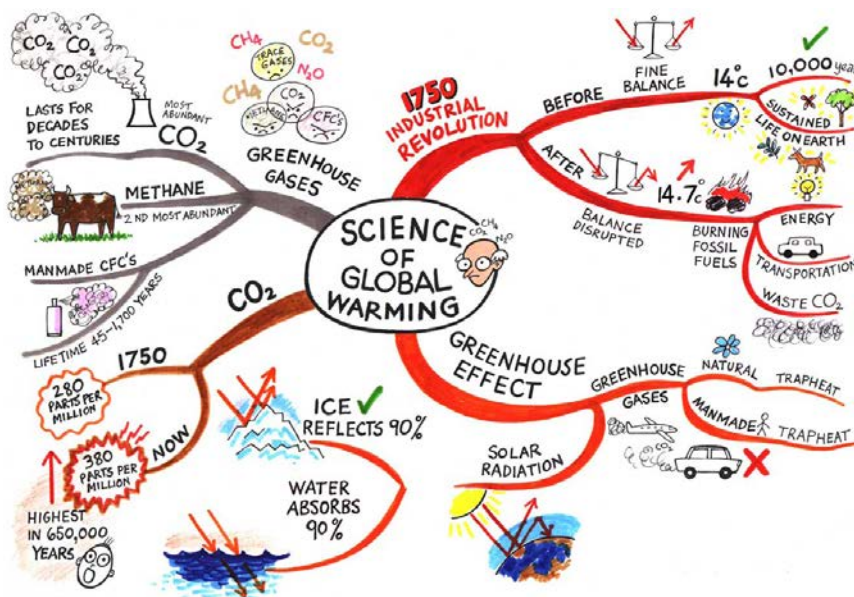


KEEPING A WEATHER RECORD


1. Use the weather recording sheet provided to create a weather record for one week or record and graph the actual and forecasted temperature and rainfall for one week.
2. Use the data collected to work out fractions and percentages for weather conditions.
3. Inquiry:
 - Does the record look like you expected it to?
 - Was there anything surprising on your weather record?
 - Compare weather records with others from your rōpū / group. How are they different and similar?
 - Why might they be different / similar?
 - How did your weather record match or differ from the weather forecasted?
4. Explore NIWA's slides about [ngā tohu o te taiao](#).
5. Inquiry: What signs do you and your whānau use to predict the weather?
6. Keep your own daily diary and record your weather observations. Look for links between changes in the weather and responses in the environment, such as the sound of breaking waves or the behaviour of birds and insects.

UNDERSTANDING CLIMATE CHANGE


1. Inquiry:
 - What is climate change?
 - What causes it?
 - How will climate change affect you?
 - How will climate change affect people in other countries?
 - How might we adapt to climate change?
 - Is there anything we can do about climate change?
2. Deepening the inquiry:
 - Explore NIWA's [Climate Change: the science](#)
 - Watch the [short film from Ministry for the Environment – #OurClimateFuture](#) (about a young girl talking to her father about climate change).
3. Use the mind map template or create your own concept to explain the science of climate change. (see example from [learningfundamentals.com.au](#) below)

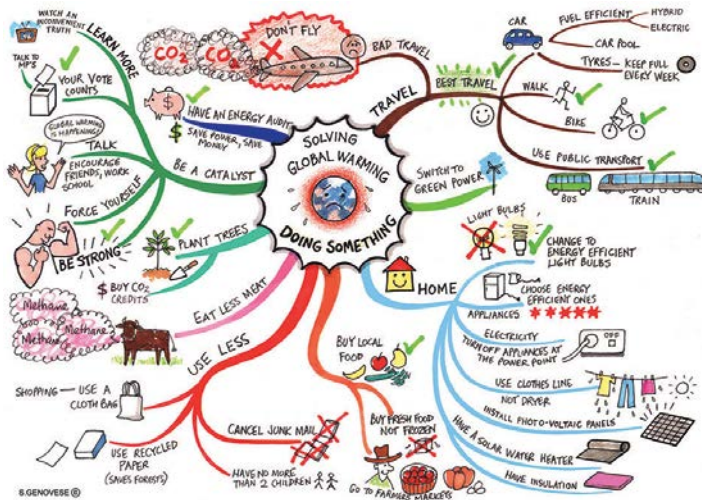


OUR CHANGING BAY OF PLENTY CLIMATE

1. Study the graphic 'How is the Bay of Plenty climate expected to change?' that summarises some of the changes likely to occur in the Bay of Plenty arising from climate change.
2. Use a PMI (Plus Minus Interesting) Chart to graphically organise how you feel about how the changes impact you and the things you like to do? What other effects might these changes have – think food production, recreation, housing, schools, health...
3. Share and discuss as a ropū / class.
4. Complete the  [Kahoot quiz: Climate Change in the Bay of Plenty](#).

TAKING ACTION: WHAT CAN WE DO?

1. Watch the short film [#OurClimateFuture](#)  [What are Kiwis doing to reduce their climate impact?](#)
2. Make a list of things we can do to help reduce our impact of climate change.
3. Create a concept or mind map (see example from learningfundamentals.com.au) around what we can do to help mitigate and adapt to climate change.



Possible next steps

5h (ii) Climate Change: Changing Beach and Coastline Profiles

Additional resources

- [Bay of Plenty Regional Council. Climate Change](#)
- [Bay of Plenty Regional Council. Bay of Plenty climate change overview](#)
- [Landcare Research. 2021. He huringa āhuarangi, he huringa ao: a changing climate, a changing world](#)
- [Ministry for the Environment our climate future films](#)
- [Ministry for the Environment. Climate Change and our wellbeing](#)
- [Ministry for the Environment. Adapting to sea level changes](#)
- [Ministry for the Environment - Our climate, our future](#)
- [NIWA climate change teacher resources](#)
- [NIWA climate change student resources](#)
- [NIWA. Ngā Tohu o te Taiao – Māori environmental indicators](#)
- [Te Ara stories about climate and atmosphere](#)

Kōrero pukapuka / read

Āhuarangi (climate) and the realm of Tāwhirimātea

(Adapted from Ministry for the Environment 2021)



Clouds are the children of Tāwhirimātea

Many of our Māori creation myths tell how Ranginui (sky father) and Papatūānuku (earth mother) were bound together by their great love for each other. They gave birth to many children who were raised in the darkness between them. But the children wanted to live in daylight, and discussed the idea of separating their parents. When their parents were separated, the children came into the world of light, te ao mārama. The children of Ranginui and Papatūānuku are atua of the natural world.

One son, Tāwhirimātea, did not agree with the plan to separate his parents, but he couldn't stop it. Tāwhirimātea is the atua of winds and weather. In his sadness and anger over his parents' separation, he

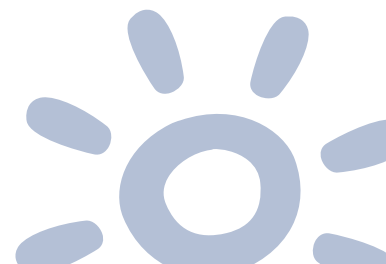
frequently attacks his siblings using storms, cyclones, droughts, and extreme weather. Tāwhirimātea is the parent of kōhauhau (atmosphere) and āhuarangi (climate).

Another son, Tānemāhuta, is atua of forests, birds, and insects. Tāne collected the sacred red clay of Kurawaka to form the first human, and breathed life into her. She is known as Hineahuone. Tāne mated with Hineahuone and from her womb came the first human, Hinetītama (the dawn maiden), from whom all humans are descended.

This is one version of the Māori creation story that helps us understand our connection to the natural world, including the world's climate and atmosphere.

'Ko ahau te taiao ko te taiao ko ahau: I am the environment and the environment is me' is a whakataukī (proverb). This whakataukī explains a view that the values and traditions that make us who we are, are gifts from Papatūānuku passed down through our ancestors. In turn, we must pass them on to those who come after us.

Our responsibility as kaitiaki (guardians) of Aotearoa, is to protect and care for what we have been given, for future generations. We can draw strength from carrying our ancestors with us in this challenge, 'Kia whakatōmuri te haere whakamua: we walk backwards into the future with our eyes fixed on our past'. By working together, acknowledging the past and with new ways of thinking and acting, we can walk into the future with a greater understanding of how to accept the wero (challenge) that is climate change.



Āhuarangi (climate) and the realm of Tāwhirimātea

- 1. The children of Ranginui and Papatūānuku are _____ of the natural world.**
 - a. Atua
 - b. Parents
 - c. Underdogs
 - d. Animals
- 2. According to this story, which son did not agree with the plan to separate his parents?**
 - a. Hineahuone
 - b. Ranginui
 - c. Tāwhirimātea
 - d. Tānemāhuta
- 3. Who is atua of winds and weather?**
 - a. Hineahuone
 - b. Papatūānuku
 - c. Tānemāhuta
 - d. Tāwhirimātea
- 4. True or false? This story says that in his sadness and anger over his parents' separation, Tāwhirimātea frequently attacks his siblings using storms, cyclones, droughts, and extreme weather.**
 - a. True
 - b. False
- 5. According to the legend described in this story, Tāwhirimātea is the parent of kōhauhau (atmosphere) and _____ .**
 - a. ngahere (forest)
 - b. tangaroa (ocean)
 - c. manu (birds)
 - d. āhuarangi (climate)
- 6. What does this story say, is our responsibility as kaitiaki (guardians) of Aotearoa?**
 - a. To use what we have been given, for this generation.
 - b. To protect and care for what we have been given, for future generations.
 - c. To use the environment to earn as much as we can!
 - d. We have no responsibility!



Āhuarangi (climate) and the realm of Tāwhirimātea

Adapted from Ministry for the Environment 2021

Use the kupu (words) in this box to fill in the gaps in the following story:

human
connection

Papatūānuku
climate

children
together

weather
protect



Clouds are the children of Tāwhirimātea

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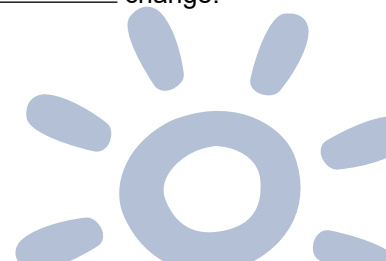
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Attitudes about climate change

(Adapted from STELR, Climate Change and Oceans)

1. Is our climate changing?

- a. Yes
- b. No

2. What best describes your thoughts about climate change?

- a. I don't think the climate is changing
- b. I have no idea whether climate change is happening or not
- c. I think that climate change is happening, but it is just due to natural changes in the Earth's temperatures
- d. I think that climate change is happening, and I think that humans are largely causing it

3. Which of the following statements best describe how you feel about climate change? (you can choose more than one but not more than three!)

- a. I'm not worried at all about climate change
- b. I'm a little worried about climate change
- c. I'm very worried about climate change
- d. I think there will be some positive effects from climate change
- e. I just accept that it is happening and we just have to adapt

4. Which of the following do you think are likely to happen due to climate change?

- a. More rain during certain times of the year
- b. Less rain at certain times of the year

5. How much do you think climate change will affect you personally?

- a. Not at all
- b. A little
- c. A lot

6. Have you personally already noticed climate change?

- a. No
- b. Just a little
- c. Yes, a great deal

7. How have you been affected by climate change?

- a. Not at all
- b. Just a little
- c. Yes, a great deal

8. How important is climate change to you?

- a. Not important at all
- b. Not very important
- c. Very important

9. Has your family made any of the following changes to help mitigate against climate change?

- a. Drive less or use an electric vehicle
- b. Use solar or other renewable power sources
- c. Plant more trees and vegetation
- d. Be mindful about what we buy and eat (as our choices have consequences for climate change)

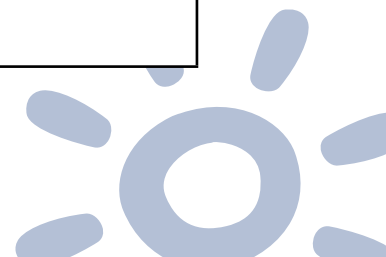
10. Which of the following statements best describes how you feel about our governments response to climate change?

- a. The government is doing enough about climate change
- b. The government is doing too much about climate change
- c. The government is not doing enough about climate change
- d. The government is not doing the right things about climate change



Prior knowledge chart

How is the Bay of Plenty climate expected to change?		
What we know	What we would like to know	What we have learned



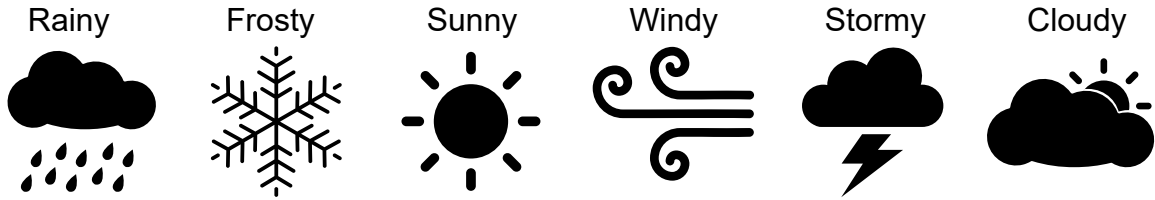
Āhuarangi / Climate and Āhua o te rangi / Weather cards

Āhua o te rangi Weather	Āhuarangi Climate
Temperature and rainfall for a particular time and place. Changes from day to day.	Average temperature and rainfall over a long period of time (like a year) for a region.
Today's temperature in Whakatāne was 14°C.	Coastal Bay of Plenty has an average annual temperature of 14- 15°C.
Tomorrow there is a 100% chance of rain in Tauranga.	The annual average rainfall for Tauranga is approximately 1190mm.
There was a frost in Rotorua this morning.	Bay of Plenty currently experiences on average 7 frost days per year.
Yesterday the temperature was 30°C, which was a hot day for Bay of Plenty town Te Puke!	There are currently annually on average 32 'hot' days (over 25°C) in the Bay of Plenty.
Today's temperature in Rotorua was 11°C.	Inland Bay of Plenty has an average annual temperature of 10-11°C.
Today in Kawerau the wind blew from the west and there were drizzly showers.	In the Bay of Plenty during Spring it tends to be windy and rainy.
Today was a wintery day in Bay of Plenty with temperatures below 5°C and cold southerly winds.	The Bay of Plenty has a temperate, maritime climate, and mild winters.
Tomorrow is expected to be a hot day across Bay of Plenty with many places exceeding 30°C.	The Bay of Plenty has a temperate, maritime climate, with warm humid summers.



My weather record

Task: Keep a record of the weather during your week. Fill each box with one of the following words to best describe the weather:



	Morning (before lunch)	Afternoon (after lunch)	Evening (after school)
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

Count: How many days were...

Rainy	Frosty	Sunny	Windy	Stormy	Cloudy

He pātai / consider this

What was the most common weather condition?

How many times did you record rain?

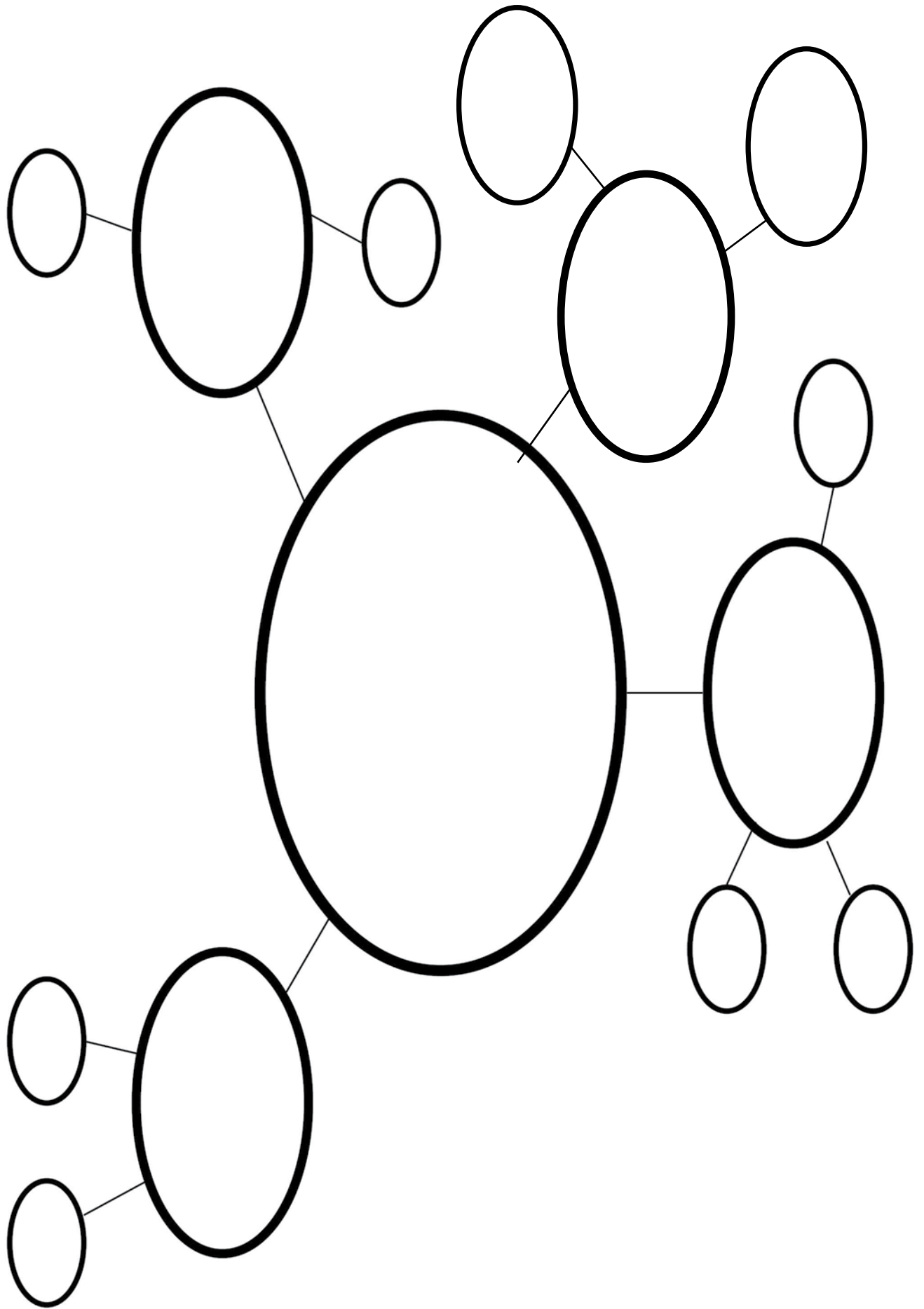
What percentage of time was the weather sunny?

Was there anything that surprised you about the weather that you recorded?

Did everyone record the same weather?
Why / Why not?

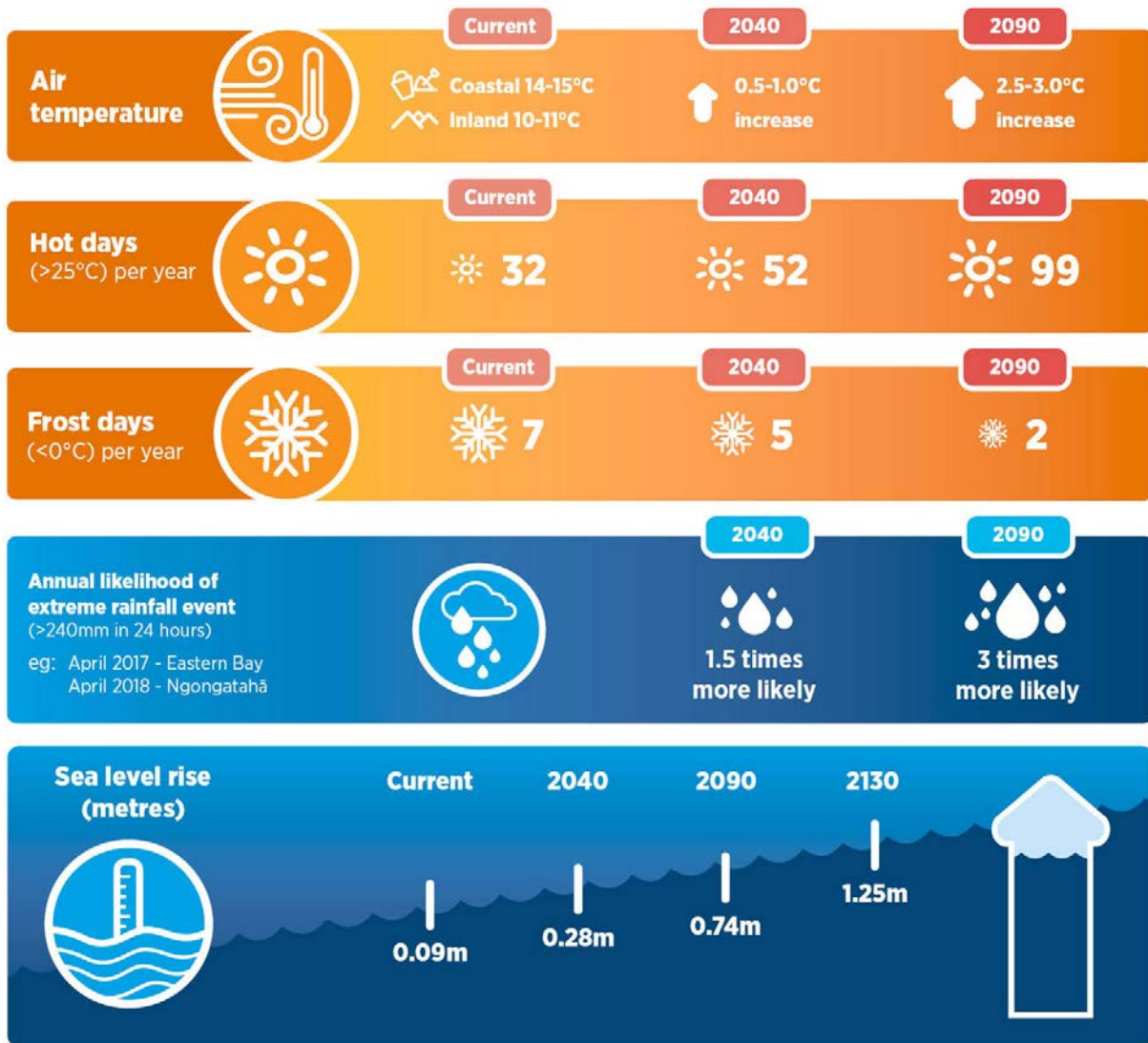


Mind map



Kōrero pukapuka / read

How is the Bay of Plenty climate expected to change?



Bay of Plenty Regional Council

Impacts by season By 2090, the region could expect*:

Spring	<ul style="list-style-type: none">0.6°C to 2.8°C temperature rise1 to 11 per cent less rainfall in Tauranga
Summer	<ul style="list-style-type: none">0.7°C to 3.3°C temperature rise1 to 7 per cent more rainfall in Tauranga
Autumn	<ul style="list-style-type: none">0.7°C to 3.2°C temperature rise2 to 4 per cent more rainfall in Tauranga
Winter	<ul style="list-style-type: none">0.7°C to 3.1°C temperature rise1 per cent less to 2 per cent more rainfall in Tauranga

*Projected changes are relative to 1995 levels. The values provided capture the range across all scenarios. They are based on scenario estimates and should not be taken as definitive. For more information, see the full report on climate projections. Sourced from: Ministry for the Environment



Mahi / activity

PMI (Plus Minus Interesting) Chart

Plus <i>What is great about this is...</i>	Minus <i>What is NOT great about this is...</i>	Interesting <i>What is interesting... / I wonder...</i>



Summary quiz questions - Climate change in the Bay of Plenty


QUESTIONS

1. True or False? The future Bay of Plenty climate is expected to have warmer air temperatures?
2. By the year 2090 in the Bay of Plenty what air temperature change is expected?
3. There are currently around 32 'hot days' (temperatures over 25 degrees) each year in the Bay of Plenty. How many hot days are expected per year by 2040?
4. How many hot days are expected in the Bay of Plenty by 2090?
5. Do we expect more or less frosts in the Bay of Plenty?
6. Extreme rainfall events occur where more than 240mm of rain falls in 24 hours. Will there be more or less extreme rainfall events?
7. By 2090 how much is sea level expected to rise?
8. By the year 2090 in the Bay of Plenty, which season is likely to experience less rainfall?
9. By the year 2090 in the Bay of Plenty, which season is likely to have the smallest rise in temperature?
10. By the year 2090 in the Bay of Plenty, in which season will we likely have the biggest rise in temperature?

ANSWERS

1. True
2. Increase of 2.5-3 degrees
3. 52 days
4. 99 days
5. Less
6. More
7. 0.74m
8. Spring
9. Spring
10. Summer

This summary quiz is available online as a Kahoot quiz:

 [Climate Change in the Bay of Plenty.](#)

