**ACTIVITY: Utilising *Our climate, our biodiversity, our future***

**Activity idea**

In this activity, students use a browser-based storymap to consider the impacts of climate change via the complex interconnections of ki uta ki tai – mountains to the sea. The effects of climate change in one part of the ecosystem can have significant impacts on other parts of te taiao.

By the end of this activity, students should be able to:

* progress through the *Our climate, our biodiversity, our future* storymap
* interact with data used in [Our atmosphere and climate](https://www.sciencelearn.org.nz/resources/3273-our-atmosphere-and-climate-2023) via interactive maps
* use media and text to explore stories about climate and biodiversity
* consider how effects in one part of the environment can have cascading effects due to the complexity of interacting systems
* consider what actions they can take to help mitigate the effects of climate change.

**For teachers**

***Introduction/background***

[Our climate, our biodiversity, our future](https://storymaps.arcgis.com/collections/b02549615f884ab7b564374c3f3fdf3a) is an interactive storymap that uses a collection of stories, arranged to show the interconnectedness of ki uta ki tai – mountains to the sea, which illustrates how the climate is changing, how it impacts our indigenous biodiversity and how our environment can adapt.

The interactive storymap was created by the Ministry for the Environment so users can explore data and findings from the environmental report [Our atmosphere and climate 2023](https://www.sciencelearn.org.nz/resources/3273-our-atmosphere-and-climate-2023).

This activity helps users navigate and deepen engagement with the impacts of climate change on biodiversity and what we can do to slow these impacts. It includes questions to promote understanding of the key ao Māori and science concepts and provides links to resources that can help to extend this learning. It also provides opportunities for students to use multiple science capabilities.

***Key ao Māori and science concepts***

* Ki uta ki tai – from the mountains to the sea reflects the interconnectedness of ecosystems and the life they support.
* When the mauri of the atmosphere and climate is unbalanced, it affects all other systems in te taiao, including people.
* Earth systems are dynamic – changes in one part of a subsystem can cause effects in other parts of the system.
* Rising greenhouse gas concentrations are warming the climate and leading to changes in our terrestrial, freshwater and marine environments.
* Ngā tohu o te taiao are indicators for trends in the state of the climate and atmosphere over time.
* Climate change is causing changes to our native species including:
  + species physiology
  + species distribution
  + population dynamics
  + timing of biological events.
* Indigenous knowledge and processes – proven and sustainable methods based on mātauranga Māori methods and values such as active kaitiakitanga – are being used to help adapt to climate change.
* Reducing warming will take time, but we can take actions to mitigate climate change effects.

***Pedagogical support and planning***

* [Climate change – a wicked problem for classroom inquiry](https://www.sciencelearn.org.nz/resources/2229-climate-change-a-wicked-problem-for-classroom-inquiry) offers ideas on how to use an inquiry approach when teaching about climate change.
* [Climate change – classroom competencies](https://www.sciencelearn.org.nz/resources/3276-climate-change-classroom-competencies) has suggestions for developing student competencies and working toward climate solutions.
* [Evidence of climate change in Aotearoa](https://www.sciencelearn.org.nz/image_maps/129-evidence-of-climate-change-in-aotearoa) uses text from *Our atmosphere and climate 2023* and wrap-around resources to look more closely at some of the key ao Māori and science concepts listed above.
* [Climate change resources – planning pathways](https://www.sciencelearn.org.nz/resources/2639-climate-change-resources-planning-pathways) provides pedagogical advice and links to the New Zealand Curriculum. It includes an interactive planner that groups Hub resources into key science and teaching concepts.

***What you need***

* Access to the articles:
  + [Our atmosphere and climate 2023](https://www.sciencelearn.org.nz/resources/3273-our-atmosphere-and-climate-2023)
  + [Earth systems and climate change](https://www.sciencelearn.org.nz/resources/3274-earth-systems-and-climate-change)
  + [Climate change and impacts on biodiversity](https://www.sciencelearn.org.nz/resources/3275-climate-change-and-impacts-on-biodiversity)
* Access to the storymap [Our climate, our biodiversity, our future](https://storymaps.arcgis.com/collections/b02549615f884ab7b564374c3f3fdf3a)
* Access to supporting online content

***Teaching suggestions***

There are numerous ways to make use of *Our climate, our biodiversity, our future*. Rather than propose a prescriptive pathway, the following notes offer suggestions. It will be helpful for educators to read the Hub articles [Our atmosphere and climate 2023](https://www.sciencelearn.org.nz/resources/3273-our-atmosphere-and-climate-2023), [Earth systems and climate change](https://www.sciencelearn.org.nz/resources/3274-earth-systems-and-climate-change) and [Climate change and impacts on biodiversity](https://www.sciencelearn.org.nz/resources/3275-climate-change-and-impacts-on-biodiversity) to gain some insights regarding the changing state of our atmosphere and climate and its impacts on the biodiversity of Aotearoa.

***What to do***

1. Introduce the activity with the [Our climate, our biodiversity infographic](https://www.sciencelearn.org.nz/images/5281-our-climate-our-biodiversity-infographic). Consider assigning different sections of the infographic to groups of students. Ask them to observe and interpret the text, graphics and use of colour and report their findings to the class. (The article [Understanding infographics](https://www.sciencelearn.org.nz/resources/2964-understanding-infographics) explains the components of an infographic and how they communicate information.)
2. Introduce students to the interactive experience [Our climate, our biodiversity, our future](https://storymaps.arcgis.com/collections/b02549615f884ab7b564374c3f3fdf3a).
3. Use the prompting questions below to analyse the text and media within the storymap. For ease of use, the storymap is divided into five sections.

**Our Climate, Our Biodiversity, Our Future**

Gather and interpret data

* Why do you think the storymap uses stories to show the interconnection of ki uta ki tai – mountains to the sea?
* Why does the storymap begin with glaciers and snowlines?
* What direction does the storymap take to follow the ki uta ki tai model of presenting evidence of climate change impacts?

Interpret representations

* How do the images represent and/or illustrate the text that accompanies them?
* Do you think the images are used to provide evidence of climate change or to elicit a personal response from the people who view them?

Engage with science

* Why do you think the Ministry for the Environment created this storymap?
* What audience does this storymap target?
* Is this audience the same as for the Ministry for the Environment and Stats NZ’s *Our atmosphere and climate 2023* report? Why?
* How can this information influence people’s decisions or actions?

**Glaciers, Snowlines & Biodiversity**

Gather and interpret data

* Why are glaciers an essential indicator of climate change?
* Why do you think the Ministry for the Environment chose Kā Roimata o Hine Hukatere (Franz Josef Glacier), Haupapa (Tasman Glacier), Aoraki (Mount Cook) and Piopiotahi as the chief examples of glacial change?
* What is one of the indigenous species that is directly affected by melting glaciers/changes to alpine ecosystems?

Interpret representations

* How is the loss of glacial ice presented in this storymap?
* How does the media get this information across?
* Do the diagrams have legends to help interpret and understand the information?
* Are there sources to say where the information has come from?

Use evidence

* The storymap makes it clear that Aotearoa is losing its glaciers. How does it use evidence to support these claims?

**Forests & Biodiversity**

Gather and interpret data

* Why might some changes to the forest ecosystem be hard to notice?
* What is the predator plague cycle?
* Why is it important to know when mast events are likely to occur?
* How will warmer temperatures affect native species?

Interpret representations

* Why is there no arrow showing a continuing cycle in the graphic of the predator plague cycle?
* How do the yearly mast event maps of Aotearoa use colour to aid our understanding of the data?
* Are there sources to say where the information has come from?

Engage with science

* What skills might you have to offer to local predator control efforts?

**Ocean & Biodiversity**

Gather and interpret data

* What are three ways that climate change affects our ocean?
* What role does phytoplankton play within marine food webs?
* What are some of the implications of ocean acidification?
* What are some of the implications of warming ocean water:
  + on coastal and marine habitats?
  + on marine food webs?
  + for people?
* What is meant by the phrase ‘coastal squeeze’?
* How is mātauranga Māori and science helping to restore kuku in Ōhiwa Harbour?

Interpret representations

* How are the challenges posed by climate change presented in the storymap?
* How do the diagrams and interactive maps get this information across?
* How is colour used to present information in the interactive maps?
* What local information can you gather from the interactive maps?
* Do the charts, diagrams and maps say where the information has come from?

Use evidence

* How does the storymap use examples from the marine food web to demonstrate:
  + the interconnections and energy balances?
  + the impacts and changes caused by climate change?

**Extreme Weather Events**

Gather and interpret data

* What are some of the impacts extreme weather events have had – and will continue to have – on Aotearoa?
* How does global warming influence extreme weather?
* How does the information in this storymap show the connections between te taiao and people?
* How does the information in this storymap show the connections within te taiao – for example, between heatwaves and marine species?
* What are some of the ways in which biodiversity is impacted by wildfires?

Interpret representations

* How are the challenges posed by climate change presented in the storymap?
* How do the diagrams and interactive maps get this information across?
* What local information can you gather from the interactive maps?

Engage with science

* Are there nature-based solutions/restoration projects taking place in your local community?
* How can you find out about them?
* What assistance might you be able to offer them?

***Extension ideas***

The following resources support further learning of key science and ao Māori concepts. The articles contain media – images and/or video – that may be useful for generating discussions.

| **Concept** | **Resources** |
| --- | --- |
| Ki uta ki tai reflects the interconnectedness of ecosystems – Earth systems are interconnected and dynamic | * [Earth systems and climate change](https://www.sciencelearn.org.nz/resources/3274-earth-systems-and-climate-change) – article * [Earth system](https://www.sciencelearn.org.nz/resources/720-earth-system) – article * [What is the Earth system?](https://www.sciencelearn.org.nz/resources/1256-what-is-the-earth-system) – article * [The ocean and the carbon cycle](https://www.sciencelearn.org.nz/resources/689-the-ocean-and-the-carbon-cycle) – article * [The ocean and Earth’s systems and cycles](https://www.sciencelearn.org.nz/resources/690-the-ocean-and-earth-s-systems-and-cycles) – article * [Climate models](https://www.sciencelearn.org.nz/resources/2232-climate-models) – article * [Ki uta ki tai](https://www.sciencelearn.org.nz/videos/1939-ki-uta-ki-tai) – video and resource collection |
| When the mauri of the atmosphere and climate is unbalanced, it affects all other systems in te taiao, including people | * [Māori ways of knowing – weather and climate](https://www.sciencelearn.org.nz/resources/2961-maori-ways-of-knowing-weather-and-climate) – article * [Climate connections – why climate change matters](https://www.sciencelearn.org.nz/resources/2955-climate-connections-why-climate-change-matters) – article * [Why climate change matters to Māori](https://www.sciencelearn.org.nz/resources/2960-why-climate-change-matters-to-maori) – article * [Maramataka](https://www.sciencelearn.org.nz/resources/3257-maramataka) – article * [Extreme weather](https://www.sciencelearn.org.nz/resources/2188-extreme-weather) – article |
| Rising greenhouse gas concentrations are warming the climate and leading to changes in our terrestrial, freshwater and marine environments | * [Evidence of climate change in Aotearoa](https://www.sciencelearn.org.nz/resources/2957-evidence-of-climate-change-in-aotearoa) – article * [Temperature anomalies](https://www.sciencelearn.org.nz/images/4392-temperature-anomalies) – infographic * [Climate change – a warming world](https://www.sciencelearn.org.nz/videos/1990-climate-change-a-warming-world) – video * [New Zealand’s annual temperature is rising](https://www.sciencelearn.org.nz/images/4391-new-zealand-s-annual-temperature-is-rising) – image * [Interpreting representations using climate data](https://www.sciencelearn.org.nz/resources/2970-interpreting-representations-using-climate-data) – activity * [Regional weather data](https://www.sciencelearn.org.nz/image_maps/95-regional-weather-data) – interactive * [Using weather data](https://www.sciencelearn.org.nz/resources/2968-using-weather-data) – activity * [Disappearing glaciers](https://www.sciencelearn.org.nz/resources/2213-disappearing-glaciers) – article * [Climate change, melting ice and sea level rise](https://www.sciencelearn.org.nz/resources/2277-climate-change-melting-ice-and-sea-level-rise) – article * R[ising seas](https://www.sciencelearn.org.nz/resources/2796-rising-seas) – *Connected* article * [Investigating sea level rise](https://www.sciencelearn.org.nz/resources/2278-investigating-sea-level-rise) – activity * [Invasive weeds and wildfires](https://www.sciencelearn.org.nz/resources/2657-invasive-weeds-and-wildfires) – article * [Wildfire](https://www.sciencelearn.org.nz/resources/3048-wildfire) – *Connected* article |
| Ngā tohu o te taiao are biophysical indicators | * [Māori ways of knowing – weather and climate](https://www.sciencelearn.org.nz/resources/2961-maori-ways-of-knowing-weather-and-climate) – article * [Aotearoa’s climate connections](https://www.sciencelearn.org.nz/images/4390-aotearoa-s-climate-connections) – infographic * [Why climate change matters to Māori](https://www.sciencelearn.org.nz/videos/2005-why-climate-change-matters-to-maori) – video * [Ngā tohu mō ngā rawa ā-iwi](https://www.sciencelearn.org.nz/resources/2945-nga-tohu-mo-nga-rawa-a-iwi) – article * [Ngā tohu ā-iwi me te repo](https://www.sciencelearn.org.nz/resources/2946-nga-tohu-a-iwi-me-te-repo) – article * [Cultural indicators for repo](https://www.sciencelearn.org.nz/resources/2992-cultural-indicators-for-repo) – article |
| Climate change is causing changes to species physiology, distribution, population dynamics and timing of biological events | * [Climate change and impacts on biodiversity](https://www.sciencelearn.org.nz/resources/3275-climate-change-and-impacts-on-biodiversity) – article * [Mast years](https://www.sciencelearn.org.nz/resources/2776-mast-years) – article * [Population biology](https://www.sciencelearn.org.nz/resources/2706-population-biology) – article * [Marine food webs](https://www.sciencelearn.org.nz/resources/143-marine-food-webs) – article * [Phytoplankton](https://www.sciencelearn.org.nz/videos/1015-phytoplankton) – video * [Bryozoans and ocean acidification](https://www.sciencelearn.org.nz/resources/135-bryozoans-and-ocean-acidification) – article * [Ocean acidification and eggshells](https://www.sciencelearn.org.nz/resources/159-ocean-acidification-and-eggshells) – activity |
| Mātauranga Māori methods and values offer solutions to environmental issues | * [Understanding kaitiakitanga](https://www.sciencelearn.org.nz/resources/2544-understanding-kaitiakitanga) – article * [Awhi mai awhi atu – kuku restoration](https://www.sciencelearn.org.nz/resources/3102-awhi-mai-awhi-atu-kuku-restoration) – article * [Āwhinahia ngā ika nei!](https://www.sciencelearn.org.nz/resources/2574-awhinahia-nga-ika-nei) – article * [Ngāti Hauā Mahi Trust](https://www.sciencelearn.org.nz/resources/2880-ngati-haua-mahi-trust) – article * [Listening to the land](https://www.sciencelearn.org.nz/resources/2940-listening-to-the-land) – *Connected* article |
| Taking action can help to mitigate climate change impacts and increase agency and hope | * [Climate change – classroom competencies](https://www.sciencelearn.org.nz/resources/3276-climate-change-classroom-competencies) – PLD article * [Climate change – a wicked problem for classroom inquiry](https://www.sciencelearn.org.nz/resources/2229-climate-change-a-wicked-problem-for-classroom-inquiry) – PLD article * [Thinking about science education for the future](https://www.sciencelearn.org.nz/resources/2890-thinking-about-science-education-for-the-future) – PLD article * [The challenge of turning intent into action](https://www.sciencelearn.org.nz/resources/2862-the-challenge-of-turning-intent-into-action) – article |