

# What are the problems affecting the habitability of Mars?

## Rich Task 2 Activity 2

### Introduction:

Our planet is in a seemingly unique position of supporting life. Many of us wonder why Earth is such a habitable environment while other worlds in our solar system are harsh and unforgiving. The question of habitability is pertinent today when we think of the climate crisis and the Earth we are leaving to future generations.

There are also many upcoming and ongoing ESA and NASA missions exploring Mars as a potential planet that Humans could colonise. There are many problems to overcome if we wish to colonise another planet like Mars. This Rich Task is designed to encourage students to think about the reasons why Earth is habitable in comparison to Mars, and to reflect on why the climate crisis poses such a danger to life on this planet. The activities in this Rich Task have been planned to support the teaching of E & S LO 5.

This activity provides an opportunity for students to begin investigating the question of habitability on Mars. This activity acts as the next stage of the ISLE process: students investigate their hypothesis. This activity scaffolds the next ([Rich Task 2 Activity 3](#)), which explores the Earth's water cycle.

Preparation Required: Printing

Downloadable Materials:

- [Worksheet 2.2](#)
- [Expected Student Responses Worksheet 2.2](#)

Relevant Junior Cycle Learning Outcomes:

Students should be able to...

**BW LO 8:** Explain how matter and energy flow through ecosystems.

**BW LO 7:** Describe respiration and photosynthesis as both chemical and biological processes; investigate factors that affect respiration and photosynthesis

**E & S LO 5:** Describe the cycling of matter, including that of carbon and water, associating it with biological and atmospheric phenomena.

**E & S LO 7:** Illustrate how earth processes and human factors influence Earth's climate, evaluate effects of climate change and initiatives that attempt to address those effects

## Teacher Resource

**NOS LO 10:** Appreciate the role of science in society; and its personal, social, and global importance; and how society influences scientific research.

**NOS LO 2:** Recognise questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses.

**NOS LO 4:** Produce and select data (qualitatively/quantitatively), critically analyse data to identify patterns and relationships, identify anomalous observations, draw and justify conclusions.

**NOS LO 9:** Research and present information on the contribution that scientists make to scientific discovery and invention, and its impact on society

### Learning Intentions:

Students will be able to...

- Make a food chain and identify the main necessary conditions for life.
- Outline the Carbon cycle on Earth.
- Identify the effects of varying amounts of Carbon Dioxide on a food chain.
- Understand the need for the presence of carbon to sustain life.
- Identify sources of Carbon and Carbon sinks.
- Design a simple experiment to demonstrate the water cycle on Earth.
- Communicate their ideas in a small group and whole-class setting.

### Prior Knowledge/Horizon Content Knowledge:

- Food chains
- Photosynthesis
- Respiration
- Climate change:
  - Increasing levels of carbon dioxide in the atmosphere
  - Impact of Humanity on the environment
- Water cycle (from Junior Cycle Geography)
- Designing an experiment
- Noticing patterns or anomalies in data

### Differentiation and Accessibility Suggestions:

This activity requires some prior knowledge of the topic or can be used to teach other topics in tandem (see above). Students can decide the depth of questioning and discussion.

The activity could be conducted remotely, if necessary, as students can use Jamboards to draw food chains.

## Teacher Resource

The activity can be completed in small groups, pairs or individually.

Students could use “Show Me” boards for drawing and sharing food chains with the class, or teacher.

The students could design a PowerPoint presentation to communicate their simple experiment to show how the water cycle works on Earth. This could also be used as an extension task. The students could be given the opportunity to conduct their experiments (Q.3) and use them to teach each other about the water cycle.

### Activity Outline:

<b>Activity Name</b>	Exploring the Carbon cycle and water cycle on Earth
<b>Alignment to ISLE investigation</b>	Investigating hypothesis
<b>Rationale</b>	To allow students to investigate their hypothesis - in particular, to revise food chains and necessary conditions for life. To prompt discussion of the Carbon cycle on Earth and the role Carbon Dioxide plays in the climate crisis.
<b>Activity Description</b>	<p><i>(please see downloadable materials for the resources for this activity)</i></p> <p><i>(Q1. worksheet 2.2)</i> Students make food chains and note necessary conditions for life.</p> <p><i>(Q2. worksheet 2.2)</i> The question prompts students to reflect on the key role Carbon plays in photosynthesis. Students are asked to reflect on what would happen to life on Earth if Carbon Dioxide levels increased or decreased. Students are directed to <a href="#">Global Carbon Atlas website</a> to investigate the sources and sinks of Carbon.</p> <p><i>(Q3. worksheet 2.2)</i> Students are asked to design a simple experiment to demonstrate the water cycle on Earth. There is an emphasis on the communication of ideas in science with those outside the science community.</p>
<b>Link to other activities</b>	Scaffold for <a href="#">Rich Task 3 Activities 3 and 4</a>
<b>Link to current research in DIAS Dunsink</b>	DIAS Dunsink Observatory has many PhD

<p><b>Observatory</b></p>	<p>students, postdocs and professors who study different aspects of Astronomy and Astrophysics, including solar physics and planetary science.</p> <p>More information on specific projects can be found here:  <a href="https://www.dias.ie/cosmicphysics/astrophysics/">https://www.dias.ie/cosmicphysics/astrophysics/</a></p>
<p><b>Related DIAS Dunsink Observatory Podcast</b></p>	<p><u>Podcast Description:</u></p> <p>An interview with Dr Áine Flood who is a science communicator and the current Education and Public Engagement Manager, at I-LOFAR, Birr. The podcast offers insight for students on the reason why clear communication in science is important and how it is possible to move from one area of STEM to another, because of the versatility of STEM degrees. (physics → science communication)</p> <p><u>Podcast episode:</u></p> <p>Coming soon!</p>