

GREENFUTURES

Lesson 1: Understanding Our Changing Planet: Climate, Environment and Data

Teacher Guide

GreenFutures is a four-lesson Transition Year module on AI, sustainability, climate action and digital transformation, developed by the ADAPT Research Centre in partnership with Huawei and UNESCO. This first lesson introduces students to the science of climate change and shows how digital tools and AI are used to study it.

Time	~55 minutes (flex to a 40-minute class by trimming discussion time and one activity, as noted in the walkthrough below)
Background	There are no prerequisites for this lesson. It assumes only the general climate awareness students will already have from Junior Cycle Science, Geography and CSPE. We strongly encourage the teachers to take a free, 90-minutes course on AI literacy, specifically designed by ADAPT Research Centre for secondary school teachers: https://ailiteracyintheclassroom.ie/course/
Materials Needed	PowerPoint presentation, laptop, screen, internet access (for the data-dashboard activity - a low-bandwidth alternative is provided), timer, printed or digital journal/worksheet for each student.

Curriculum Links

GreenFutures is designed as an NCCA-compliant, cross-curricular Transition Year module (Science, Geography, CSPE, Digital Media). Its interactive and reflective activities build the five key skills central to Transition Year:

- Information processing
- Critical and creative thinking
- Communicating
- Working with others
- Being personally effective

Leaving Certificate subject links: Geography, Politics and Society, Technology, Computer Science, Business, Economics.

Learning Intentions

By the end of this lesson, students will be able to:

- Explain the difference between weather and climate
- Describe the major causes and impacts of climate change, in Ireland and globally
- Understand how scientists collect and interpret climate data and where AI fits in
- Read evidence for themselves in graphs, maps and datasets
- Recognise why reliable data matters for good decisions

Module Overview

Introduction (~3 mins)

Introduce the GreenFutures series and this lesson's goals.

Weather, Climate and Causes (~14 mins)

Establish core vocabulary, then explore the causes of climate change and ground it with Irish examples.

Climate Systems and Data (~19 mins)

Explain how climate data is gathered and why AI is essential to making sense of it, with a hands-on data-exploration activity.

Why This Matters, and Apply (~13 mins)

Connect data to decisions, then have students capture a personal observation in their climate journal.

Recap and Close (~3 mins)

Consolidate learning and preview Lesson 2.



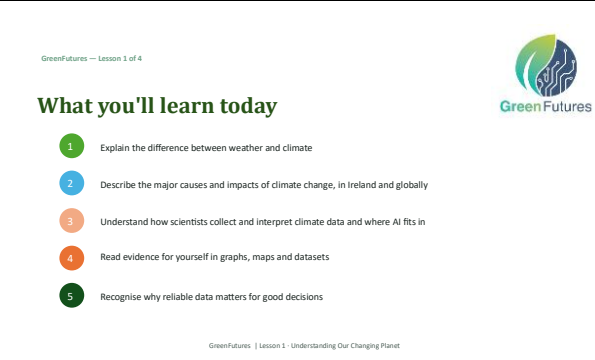
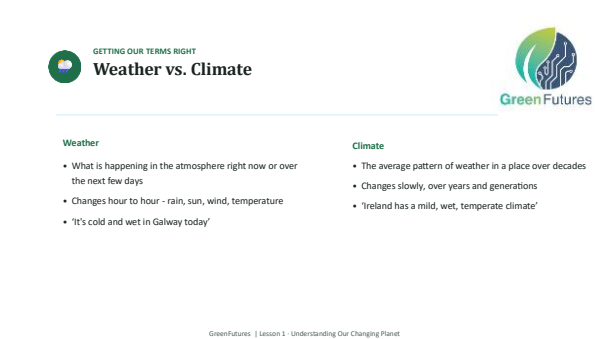
With the support of:



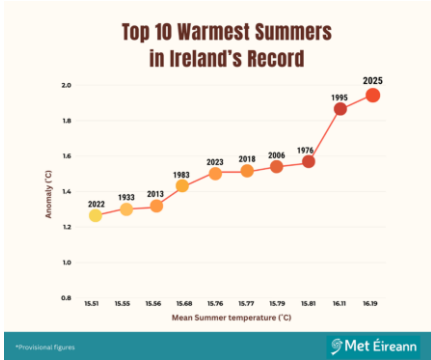
This project is funded within the framework of the UNESCO and Huawei collaboration, 'Digital Futures for a Smart Europe: A Feasibility Study on Digital Transformation and Green Innovation'

Lesson 1 Module Walkthrough

Each row below shows the slide alongside facilitation notes. Timings are approximate and add up to the total above; trim discussion prompts first if running short on time.

Introduction (~3 mins)	
	LECTURE (~1 min) Introduce GreenFutures: a four-lesson Transition Year module on AI and sustainability developed by the ADAPT Research Centre with Huawei and UNESCO. Tell students this first lesson looks at how scientists study a changing climate, and why good data, including AI, is central to that work.
	LECTURE (~2 mins) Walk through the five learning outcomes on screen so students know what to expect from the session. Consider a very short pre-learning check here if running Lesson 1 as the pilot's opening session - a one-question sentiment check ('how do you feel about climate change right now?') gives a useful baseline to revisit at the end of Lesson 4.
	LECTURE (~4 mins) Present the weather vs. climate distinction. Use the two example sentences on the slide as a quick check for understanding before moving on.

Quick check <i>Is this weather, or climate? 'It rained almost every day in Dublin last October.'</i> Discuss as a class, then reveal: it depends - one wet October is weather. A trend of wetter Octobers over 30 years is climate. GreenFutures Lesson 1 - Understanding Our Changing Planet	DISCUSSION (~3 mins) Pose the discussion question and take a few answers before revealing the explanation. Keep this brief and light. It's a warm-up, not a debate.
WHY IS THE CLIMATE CHANGING? Causes of Climate Change • The greenhouse effect: certain gases trap heat in the atmosphere - this is natural and keeps Earth livable • Burning fossil fuels (coal, oil, gas) releases extra carbon emissions, thickening that blanket of gas • More trapped heat = a warmer planet, changing rainfall, storms, seasons and sea levels • The scientific evidence for this link is very strong - but scientists still debate the exact pace and local detail, which is a normal part of how science works GreenFutures Lesson 1 - Understanding Our Changing Planet	LECTURE (~4 mins) Cover the greenhouse effect, carbon emissions and fossil fuels as the core causes of climate change. Be explicit that near-total scientific consensus exists on the core cause, even though some detail (pace, local impact) is still actively researched. This distinction matters and comes up again later in the lesson.
Irish Example Climate Change, Closer to Home • Shannon flooding: repeated severe flooding along the River Shannon has damaged homes, farms and roads in recent years • The 2018 drought and fodder crisis: an extreme dry summer left many Irish farmers without enough feed for livestock • More frequent heatwaves are being recorded across Ireland, alongside wetter winters Sources: Met Éireann; OPW flood risk data GreenFutures Lesson 1 - Understanding Our Changing Planet	LECTURE (~4 mins) Present the Irish examples of climate impact: Shannon flooding, the 2018 drought and fodder crisis, and increasing heatwave frequency. These are specific Met Éireann/OPW flood data or trend figures so students see real numbers, not just anecdote. HEATWAVES - https://www.met.ie/new-study-shows-impact-of-climate-change-on-record-breaking-summer “Summer 2025 was provisionally the warmest summer on record nationally with a mean temperature of 16.19°C”

	 https://www.met.ie/cms/assets/uploads/2023/10/A4_heatsheet_updated.pdf - Shows trends of hotter weather in Ireland Summer Centre - Heatwaves “5 consecutive days of pf +25C in the shade” there were heatwaves in Ireland May, June, July 2026!
 THE BIG PICTURE Climate Systems Work Together • Atmosphere - the air around Earth, where weather happens • Oceans - absorb huge amounts of heat and carbon; currents move that heat around the planet • Biosphere - all living things, from forests to plankton, which absorb and release carbon • These systems are deeply connected: change one, and the effects ripple through the others GreenFutures Lesson 1 - Understanding Our Changing Planet	LECTURE (~3 mins) Briefly cover the three climate systems (atmosphere, oceans, biosphere) and how they interact. Keep this short, it's context for the data section that follows.
 SEEING THE EVIDENCE How is Climate Data Collected? • Satellites - track temperature, ice cover, sea level and more from space • Ground sensors and weather stations - measure temperature, rainfall and wind in real time • Historical records - decades (sometimes centuries) of measurements reveal long-term trends • AI and machine learning models increasingly help scientists combine millions of these data points into weather and climate forecasts, from short-term flood warnings to long-range climate projections • How AI/ML models turn raw data into a usable forecast: Advancing flood forecasting technologies to prevent damage and mitigate risk Success Stories Research Ireland GreenFutures Lesson 1 - Understanding Our Changing Planet	LECTURE (~4 mins) Cover the three traditional data sources (satellites, sensors, historical records), then introduce AI/ML's growing role in combining them into forecasts. This is the natural home for weather-prediction examples. Flooding, frost and heat-event forecasting, and the idea that data has ‘5 Vs’ (volume being a key one). Here is an example: https://www.farmersjournal.ie/news/news/early-warning-system-for-flooding-in-ireland-being-developed-802858



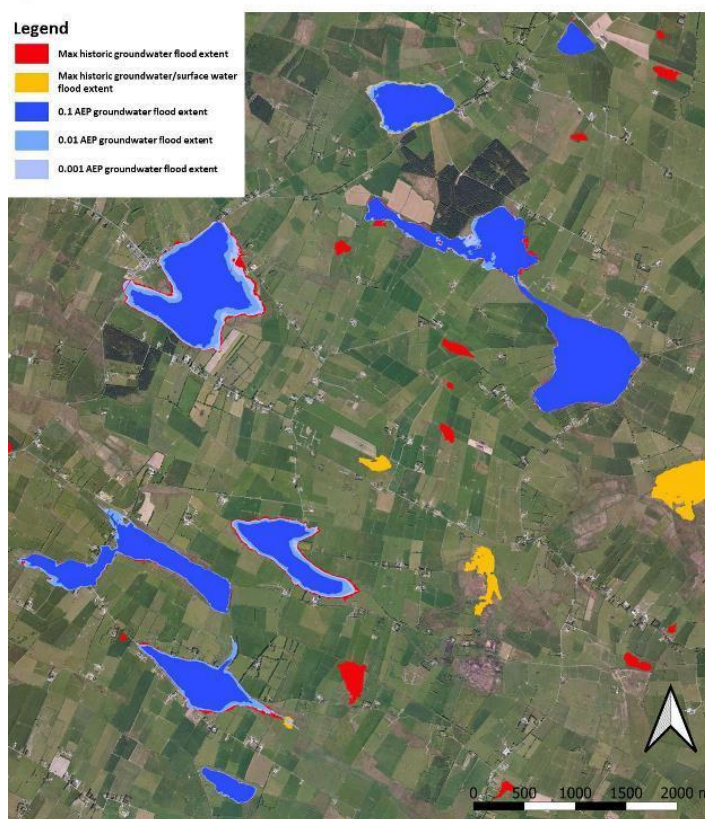
The maps were fed into an artificial intelligence model designed to predict the extent of future flooding events in these areas, which researchers say is accurate up to approximately 20 metres.



Predictive and Historic Groundwater Flood Maps Rathcroghan, Co. Roscommon

Legend

- Max historic groundwater flood extent
- Max historic groundwater/surface water flood extent
- 0.1 AEP groundwater flood extent
- 0.01 AEP groundwater flood extent
- 0.001 AEP groundwater flood extent



Predicted groundwater flood extent, Rathcroghan, Co. Roscommon. Satellite observations from Copernicus Sentinel-1 were combined with field measurements and hydrological modelling to estimate flood extents for different probabilities.

Source: Geological Survey Ireland, GWFlood.

	StopFlood project video is useful Advancing flood forecasting technologies to prevent damage and mitigate risk Success Stories Research Ireland https://www.youtube.com/watch?v=gtqW1-ccb1c
ACTIVITY  ~8 minutes  GreenFutures Explore Real Irish Climate Data 1. In pairs, open one of these dashboards on a phone, tablet or laptop: Met Éireann's climate pages, Climate Ireland, or the Copernicus Climate Change Service 2. Find one piece of data about Ireland, a temperature trend, a rainfall record, or a recent extreme event 3. Note down: what does the data show, and over what time period? 4. Be ready to share one interesting finding with the class Low bandwidth option: teacher displays one dashboard on the class screen and talks through it together. GreenFutures Lesson 1 - Understanding Our Changing Planet	ACTIVITY (~8 mins) Pairs open one of: Met Éireann's climate pages, Climate Ireland, or the Copernicus Climate Change Service, and find one Irish data point (temperature trend, rainfall record, or extreme event). Low-bandwidth option: display one dashboard on the class screen and walk through it together rather than pairs working independently. Circulate and prompt pairs to note the time period covered by their data point. This reinforces the weather-vs-climate distinction from earlier.
 WHERE AI COMES IN? Why Climate Science Need AI and Digital Tools  GreenFutures • Climate science depends on huge datasets. This is sometimes described using data's "5 Vs": Volume, Velocity, Variety, Veracity and Value • No human could read millions of satellite images or sensor readings by hand. AI models are trained to spot patterns in this data far faster • Digital technologies such as sensors, communication networks, cloud computing are what make continuous environmental monitoring possible • Data accuracy matters: a model is only as reliable as the data that feeds it GreenFutures Lesson 1 - Understanding Our Changing Planet	LECTURE (~4 mins) Explain why AI is essential at this scale. No human team could review this volume of data by hand. Introduce the idea of data accuracy as a live issue (evaluating the reliability of climate data), which previews Lesson 2's discussion of AI limitations and bias.
Reflection  <i>Why might scientists sometimes agree and sometimes disagree?</i> Prompt: disagreement about detail (exact timing, local impact) is normal in science. Near-total agreement exists on the core cause of climate change. GreenFutures Lesson 1 - Understanding Our Changing Planet	DISCUSSION (~3 mins) Ask why scientists sometimes agree or disagree. Steer toward: disagreement about detail is a normal, healthy part of the scientific process, not evidence that the underlying science is shaky.

 WHY THIS MATTERS Reliable Data, Better Decisions - Good climate data helps governments plan flood defences, farmers plan for drought, and communities prepare for extreme weather - Poor or biased data can lead to poor decisions. We'll explore this risk directly in Lesson 2, when we look at AI and its limitations - Everyone has a role: individuals, communities, businesses and governments all act on the evidence in different ways GreenFutures Lesson 1: Understanding Our Changing Planet	LECTURE (~3 mins) Connect good data to good decisions: flood defences, drought planning, community preparedness. Flag explicitly that Lesson 2 will look at what happens when data or AI systems go wrong.
 ACTIVITY ⌚ ~7 minutes Spot the Climate Signal Where You Live Think about your own town, county or family stories. Has anyone you know mentioned a change in weather patterns - wetter winters, hotter summers, more flooding, changed growing seasons? Note down one local change and, if you can, one piece of evidence or data that might support it. How they show their work: Students write 3-4 sentences in their journal/worksheet, which they'll revisit at the end of the module. GreenFutures Lesson 1: Understanding Our Changing Planet	APPLY (INDIVIDUAL, CAPTURED) (~7 mins) Students write 3-4 sentences noting one change in weather patterns they, or someone they know, has observed locally, with evidence if possible. This is the first entry in a running 'climate journal' that continues through all four lessons and feeds into the Lesson 4 climate action proposal. Keep it, don't let it be a one-off worksheet that gets lost.
 What have we learned? ✓ We can explain the difference between weather and climate ✓ We understand the main causes and impacts of climate change, including examples close to home ✓ We know how scientists collect and use climate data and where AI fits in ✓ We've started our own climate journal, spotting change where we live GreenFutures Lesson 1: Understanding Our Changing Planet	LECTURE (~2 mins) Revisit the five learning outcomes and confirm the class can speak to each one.
 See you in Lesson 2: Artificial Intelligence, Ethics and Climate Solutions Developed by the ADAPT Research Centre in partnership with Huawei and UNESCO. GreenFutures Lesson 1: Understanding Our Changing Planet	LECTURE (~1 min) Preview Lesson 2: Artificial Intelligence, Ethics and Climate Solutions.