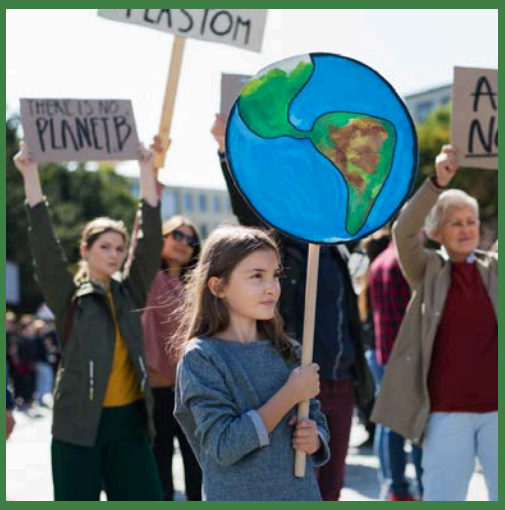
SDG13 Climate Change Engage Game Design



SDG13 Climate Change Engage Game Design

Lesson 2: What is Climate Change?

Subjects: Design, Environmental Science, Game Design, Geography, Science, Technology

Lesson Title and Summary: What is Climate Change?

In this lesson, learners are introduced to the foundational concepts of Climate Change. This will enable them to understand more about Climate Change and its impacts and gain knowledge that they can include within their game design.

Learners will be introduced to the difference between weather and climate, begin to understand the changes in patterns and recognise the impacts that this can have.

Vocabulary: Average Conditions; Climate Change; Extreme Weather Events; Weather

In this lesson, the learner will:

- learn foundational concepts of climate change
- understand the difference between weather and climate
- gain insight into changing weather patterns over time
- understand the scale of the problem of climate change
- understand the importance of keeping climate warming at 1.5 degrees C
- understand the impact of 2 degrees C warming

Materials

- Video: What is climate change? Part 1 and 2
- Worksheet: Activity Question
- Worksheet: Discussion Questions and Infographic: Impact of 2C vs 1.5C
- Lesson 2-4 Teachers' Guide
- Internet access
- Pens, pencils
- paper
- Blackboard / Whiteboard

SDG13 Climate Change Engage Game Design
L2: What is Climate Change?

Activity Instructions

Activity 1 Understanding Climate Change (20 mins)

1. Ask learners if they can describe the difference between weather and climate. They can share ideas with a partner before a whole class share.
2. Put the following questions on the board and read through as a whole class.
    - How would you describe climate?
    - How would you describe climate change?
    - How do you think climate has changed in Ireland?
    - How would you describe weather?
    - What is an extreme weather event?
    - How are extreme weather events related to climate change, what are the impacts?
    - Have you recently experienced an extreme weather event? What were the impacts on houses, streets, agriculture, etc.? How was human health affected?
3. Play the Video: What is climate change? (Part 1), asking learners add to their answers.
4. Divide learners into pairs to share answers before discussing as a whole class.

Activity 2 How hot is the new climate? (20 mins)

1. Watch Video: What is climate change? (Part 2) and make notes under the following headings:
    - Global climate changes
    - Changes in nature (melting ice - species migration - species disruption)
    - Paris Agreement
2. Working in the same groups, compare notes and use the Infographic to discuss the worksheet questions.

Activity 3 What are you willing to do? (10 mins)

1. In pairs, discuss what you would be willing to do to keep the temperature from reaching 2 degrees Celsius). Would you eat less meat? Would you not fly for vacation? Would you buy less clothing/ second-hand clothing? Would you turn down the heat in your home?

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks
- Two things they found most interesting and would like to explore more
- One opinion they have about the activities, what did they like or how they would improve them

Use Post-its or a mentimeter survey - www.mentimeter.com to gather reflections

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EXTENSION / REDUCTION ACTIVITIES

Reduction: for a shorter lesson, only complete Activity 1 & 3.

Extension: For a longer lesson, ask learners to reflect on how a changing climate makes them feel. Discuss what someone can do to handle fear of something that seems out of one's control. Refer to the Force of Nature discussion guide on eco-anxiety- see Media Box.

Option B: Brainstorming for game design - In small groups, brainstorm things that will be more difficult to access as it gets warmer - how might this inform their game design?Share ideas as a whole class.

Option C: Mini research task, research the effects of climate change on local flora and fauna.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Activity 1 Video: What is Climate Change? Part 1 https://youtu.be/t4csCQuzDf0

Activity 1 Video: What is Climate Change? Part 2 https://youtu.be/0NbmJOhKpMY

Infographic: Comparing 2C to 1.5C https://www.climatecouncil.org.au/resources/infographic-the-difference-between-1-5-and-2-degrees-warming/

Force of Nature Discussion Guide https://www.forceofnature.xyz/discussion-guide

Walsh, S. (2012). A summary of climate averages for Ireland, 1981-2010. Climatological note no. 14. Met Éireann. Retrieved from http://hdl.handle.net/2262/70490

Met Éireann's role in climate change https://www.met.ie/climate/climate-change

Before the Flood Documentary (95:00min) https://www.youtube.com/watch?v=zbEnOYtsXHA

Local Trip / Expertise / Additional Work and Assessments

Ask learners to calculate the average temperature/ rainfall from their nearest weather station. You could also discuss extreme weather events that recently have happened locally/ elsewhereL Weather Observation Website: https://wow.met.ie/

Find out and organise a visit and talk to your local weather station, or invite them to link with the learners.

CCE L2 - 4: TEACHERS' GUIDE

LESSONS 2 - 4 ARE THREE INTERLINKED LESSONS AROUND THE FUNDAMENTAL CONCEPTS OF CLIMATE CHANGE :

- **WHAT IS CLIMATE CHANGE?**
- **THE CAUSE OF CURRENT CLIMATE CHANGE**
- **CLIMATE ACTION: ADAPTATION AND MITIGATION**

LESSON 2 - WHAT IS CLIMATE CHANGE?

Climate is the long-term average weather conditions over time and their variation. When we change the climate, we are changing this average weather pattern. With current climate change, the earth is getting rapidly warmer.

We are experiencing sea level rise, higher, more intense rainfall, and more extreme weather events like heat waves, droughts, flooding, wildfires and storms with high winds. These events make it more difficult to farm, which may impact food supplies.

Changing the climate displaces plants and animals from places that they used to live in and may expose them to novel disease. The adverse effects of climate change can make us anxious as we are not sure what is to come and how we will deal with these changes. Talking about these feelings and finding community in living through and adapting to the change is very important.

The media box resources also contains a link to the film 'Before the Flood' which is a useful background summary. This is available for renting so maybe something that is integrated into TY as a general all pupil activity it looks at the sources, techniques, media and impact with a mostly American perspective but does include China, India, Indonesia, and the Pacific islands.

LESSON 3 - WHAT IS THE CAUSE OF CURRENT CLIMATE CHANGE?

The climate is driven by the amount of energy that drives the climate system. Energy is transported from the sun mainly in the form of visible light, whereas once this energy is absorbed at the Earth's surface it is transported from object to object in the form of infrared radiation.

The climate can be changed for two reasons; either there is more solar radiation received on Earth and/or there are more greenhouse gases in the atmosphere that keep infrared radiation in the atmosphere.

Changes in greenhouse gas concentrations in the atmosphere are due to human activities such as burning of fossil fuels, but also land use changes such as deforestation, soil degradation, draining of peatlands, and livestock agriculture as well as natural processes such as volcanic eruptions and meteorite impacts.

Changes in solar radiation are mostly due to changes in the distance of the earth to the sun, which happens on a geologic time scale. However, some variation is due to changes in solar activity and now the melting of snow and ice on Earth, as this decreases the amount of sunlight reflected.

CCE L2 - 4: TEACHERS' GUIDE

LESSON 4 - CLIMATE ACTION- MITIGATION AND ADAPTATION?

Climate action is twofold, we have to reduce greenhouse gas emissions but we also have to adapt to the new climate that we have created by our greenhouse gas emissions. Our greenhouse gas emissions per person are higher in Ireland than elsewhere in the EU and much higher than elsewhere in the world. We are emitting more than our fair share. We are emitting more than our fair share. To cut our greenhouse gas emissions we need to measure our carbon footprint, so we know what activities emit them.

Generally, everybody can help reduce greenhouse gas emissions by organising for climate action, choosing green transport, saving energy consuming less, helping nature and eating less meat and dairy products. This lesson introduces learners to the concepts of mitigation and adaptation, as well as encouraging climate action.

Mitigation: Mitigation: In order to reduce greenhouse gas emissions, we need to become aware as to where these emissions come from. The most abundant greenhouse gas that is contributing the most to global heating is carbon dioxide (CO2). CO2 is a gas we breathe out after we produce metabolic energy in our bodies. It is produced when we burn wood or fossil fuels, like oil, coal and gas, so it is produced when heating our homes and in transport and energy systems. Drained (and harvested) peatlands also emit large amounts of CO2. Methane (CH4) is the second most abundant greenhouse gas. It is an important contributor to greenhouse gas emissions in Ireland as livestock agriculture produces a lot of methane (CH4) through digestion (cows burping it out of their stomach) and from manure.

Adaptation: we need to live with higher sea levels and more extreme weather events, so we need to prepare for this. Ideally, we would do so by helping nature to help us, e.g. giving more space for nature in coastal ecosystems or flood plains.

Lesson 4 Case Study support:

Case study 1: Seagrass: restoring seagrass in Kilmore Quay, County Wexford (interview with a 7-year old boy and other participants in seagrass restoration project by Coastwatch (the Irish Coastal Environmental Group): https://fb.watch/eb---r3uy7/ (RTE news, September 2021).

In this project, volunteers removed the invasive seaweed Sargassum muticum from seagrass meadows to allow light onto the seagrass). Coastwatch relies on volunteers to survey the coasts for seagrass presence, for seagrass restoration and for picking up litter around the coast. Benefits in terms of climate mitigation: seagrass is very efficient at capturing CO2 from the atmosphere. Benefits in terms of climate adaptation: seagrass slows the action of waves and reduces coastal erosion.

Case study 2: Coastal dune: the Inchydoney Dune Conservation Project, Cork is educating the public about the impact of walking in the dunes can lead to erosion of the dunes. They are taking measures to recover eroded dunes and protect existing dunes from further erosion and organising beach clean ups. Benefits in terms of climate mitigation: some

carbon capture by dune grass. Benefits in terms of climate adaptation: dunes provide a natural barrier against coastal flooding and erosion.

- https://www.southernstar.ie/news/our-dunes-are-dying-but-if-we-move-quickly-we-can-save-them-4218106
- https://www.facebook.com/Inchydoney-Dunes-Conservation-Group-101291461965770/

References:

Blondel, J. (2019). How do birds adapt to a changing climate? Encyclopedia of the Environment. Institute de France, Académie des Sciences, University Grenoble Alpes. This webpage https://www.encyclopedie-environnement.org/en/life/how-birds-adapt-changing-climate/ explains in detail how birds will be affected by climate change. Last accessed: June 2022.

Climate change post (2022). Ireland. https://www.climatechangepost.com/ireland/
The Ireland page contains links to footages of floods in Ireland on YouTube. There is also a specific write-up of coastal flood risks: https://www.climatechangepost.com/ireland/coastal-floods/

Devictor, V., Van Swaay, C., Brereton, T., Brotons, L. s., Chamberlain, D., Heliölä, J., . . . Jiguet, F. (2012). Differences in the climatic debts of birds and butterflies at a continental scale. Nature Climate Change, 2(2), 121-124. doi:10.1038/nclimate1347

Friedlander, B. (2021). Seven years of agricultural productivity growth lost due to climate change. Stanford Woods Institute for the Environment adapted from Cornell Chronicle. This website https://woods.stanford.edu/news/seven-years-agricultural-productivity-growth-lost-due-climate-change summarises the agriculture losses observed over the period 1961-2020 Last accessed: June 2022.

Maynooth University (2022). Press release: https://www.maynoothuniversity.ie/news-events/maynooth-university-research-confirms-elevated-rates-sea-level-rise-dublin

NOAA (2021). How does climate change affect coral reefs? National Ocean Service website, This website https://oceanservice.noaa.gov/facts/coralreef-climate.html contains an infographic that explains the impact of climate change and other human activities on coral reefs. Last accessed: June 2022.

Ortiz-Bobea, A., Ault, T. R., Carrillo, C. M., Chambers, R. G., & Lobell, D. B. (2021). Anthropogenic climate change has slowed global agricultural productivity growth. Nature Climate Change, 11(4), 306-312. There is also a short video where Ariel Ortiz-Bobea explains his research https://news.cornell.edu/stories/2021/04/climate-change-has-cost-7-years-ag-productivity-growth

Walsh, S. (2012). A summary of climate averages for Ireland, 1981-2010. Climatological note no. 14. Met Éireann. Retrieved from http://hdl.handle.net/2262/70490

CCE L2WS: ACTIVITY 2 DISCUSSION QUESTIONS

As you watch the video: 'What is Climate Change?' (Part 2), make notes here or in your notebooks under the following headings:

- **Global climate changes**

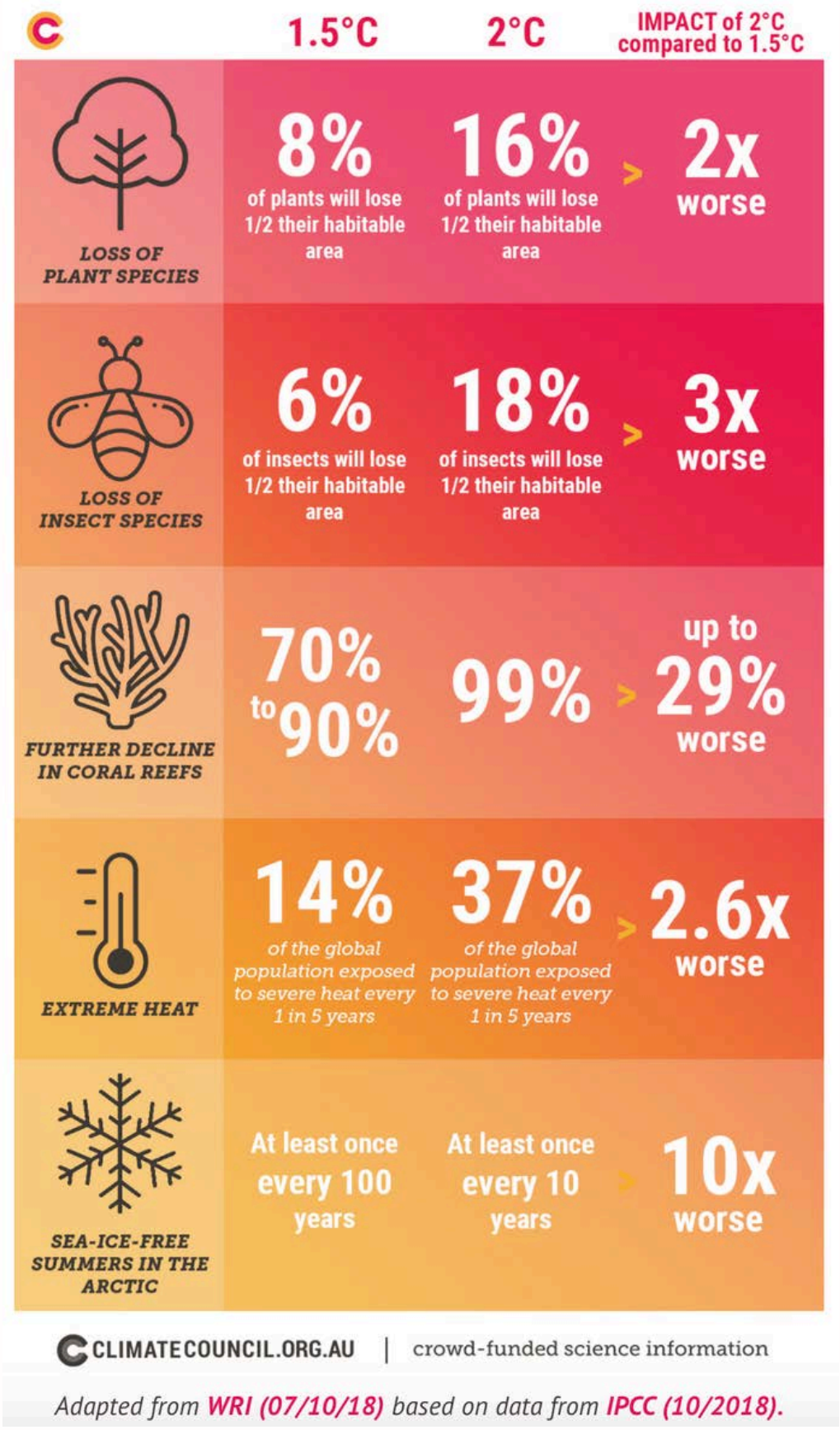
- **Changes in nature**
  - **melting ice**
  - **species migration**
  - **species disruption**

- **Paris Agreement**

Use the Infographic on the next page to discuss and answer the following questions below:

- **What does it mean to lose more plant and insect species?**
- **What happens to these species?**
- **Why are coral reefs so badly affected by climate change?**
- **Why is it a problem to lose more ice?**

CCE L2WS: ACTIVITY 2 DISCUSSION QUESTIONS



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