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What Teachers Need to Know

Ten important answers teachers should read before starting this resource

Centre for Human Rights and Citizenship Education
DCU Institute of Education

EDUCATION for a Just World
An Initiative of Trócaire and the Centre for Human Rights and Citizenship Education, DCU Institute of Education

Trócaire

What Teachers Need to Know: Ten important answers teachers should read before starting this resource

1. What is climate change and what is the greenhouse effect?
2. What is the scientific evidence for climate change?
3. What are the consequences of climate change for people and planet?
4. What has climate change got to do with the ozone layer?
5. How does climate change relate to people's ethical values?
6. What is being done about climate change globally?
7. What can we do to reduce the impact of climate change?
8. What suggestions are there for teaching about climate change?
9. Why do we need leadership for climate change?
10. Where can I get more information?

1. What is climate change, and what is the greenhouse effect?

While climate change has happened in the past as part of a natural cycle, the term is generally used to refer to the rapid changes in Earth's climate currently being brought about by human activities. Since the industrial revolution, fossil fuels (peat, coal, oil and gas) have been burnt in increasing quantities to power factories, heat our homes and provide transport and electricity, amongst other things. Burning fossil fuels emits carbon dioxide into the earth's atmosphere. At the same time forests, which take in carbon dioxide, have been reduced; this also contributes to increased carbon dioxide levels. Other human activities, especially agriculture, release different polluting gases into the atmosphere. With the dramatic growth in human population and changes in the mix of foods we eat, these agriculture-related gases are also having a significant global impact.

Carbon dioxide, along with these other greenhouse gases, acts like a greenhouse around the earth, trapping the heat radiating from the earth's surface. As the concentration of carbon dioxide and other greenhouse gases rises, more heat is retained and the earth warms. This process is called the greenhouse effect. This warming, in turn, causes disruption and change in the long-term patterns of weather – the climate – all over the planet, and that is what we call '(human-caused) climate change'.

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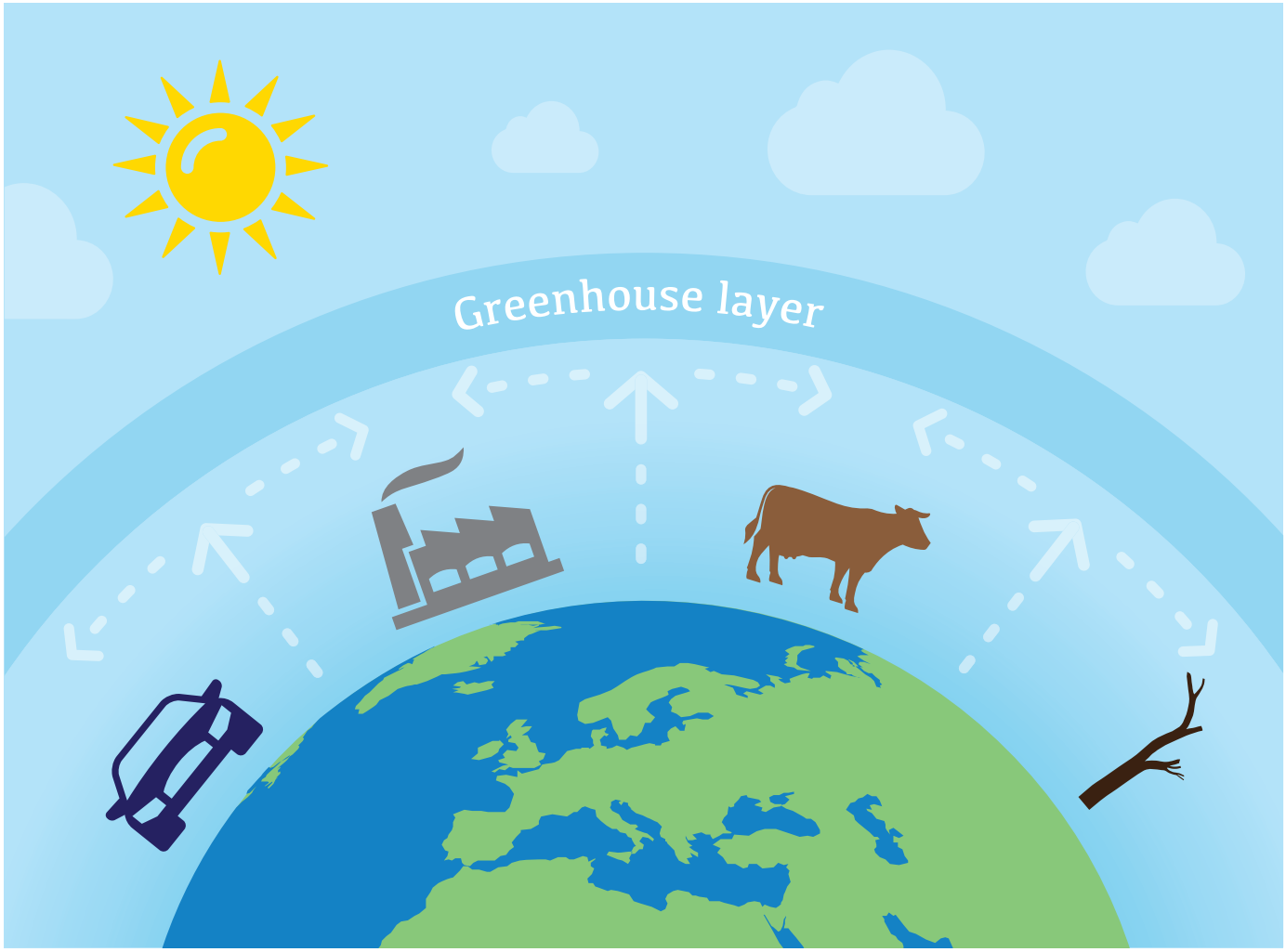

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"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen."

2. What is the scientific evidence for human-caused climate change?

The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) in 1988. It has three working groups:

- Working group one looks at the scientific basis for climate change;
- Working group two looks at the impact of climate change and how we might adapt;
- Working group three looks at how we can reduce the extent of climate change.

These working groups assess all the published research globally in their relevant areas and combine the findings into reports. By looking across the research they are able to assess the evidence and the level of agreement amongst researchers. Based on the weight of the evidence and the degree of consent, they express their level of confidence in the various findings.

In 2007, the IPCC released its fourth assessment report on the science of climate change, stating that it was 'very likely' that human activity had caused most of the increase in global temperatures since the middle of the 20th century, and that it was 'unequivocal' that the earth's climate is warming. The IPCC produced an updated analysis in 2013-14; this fifth assessment went a step further, concluding that humanity's role in causing global warming is 'clear' and that global temperatures are likely to rise significantly by the end of the century. According to the IPCC, climate change is expected to have major negative consequences, such as by undermining food security and increasing the risk of violent conflicts.

The IPCC, drawing on diverse published scientific research, concludes: 'Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.'

Scientific Evidence

- **Experiments and measurements**, both in laboratories and using satellites, show that carbon dioxide and other gases emitted from human activities do block certain kinds of heat radiation and thus necessarily cause a significant 'greenhouse' heating effect.
- **Observations of temperatures** and other aspects of the weather on a global scale have been available since around 1850. Since the 1950s onwards, these observations have been more comprehensive and diverse.
- **Information stored in rocks, ice sheets, tree rings, coral, shells**, etc. provides a general understanding of the climate and climate change, extending back to millions of years ago.
- **Climate models** are used to estimate how Earth will respond to change in the future. These models are improving all the time, and describe how the atmosphere, oceans, land, living things, ice, and energy from the sun affect each other and the Earth's climate.

"Climate change has been described as a disaster amplifier."

3. What are the consequences of climate change for people and planet?

The impacts of climate change are already being felt and vary greatly from place to place. In general, climate change can be said to make weather patterns more erratic and increase the number and ferocity of extreme weather events like typhoons, droughts, storms and floods. In fact, the number of weather disasters has significantly increased over the last ten years.

The worst climatic impacts are currently being felt most by the world's poorest people. Climate change has been described as a disaster amplifier, presenting further challenges to those people already vulnerable to drought, flooding, poverty and famine. It can also be linked to other critical global challenges like conflict and migration. Changes in the climate can undermine people's livelihoods, increase demand for and pressure on natural resources and necessitate migration. In turn, these factors fuel social instability and contribute to the outbreak of violent conflict.

The consequences of climate change for humanity in the future depend not only on the extent to which we continue to release greenhouse gases and the consequent changes in the climate, but also our ability to adapt to these changes. There is strong evidence that human health will be affected by increased extreme weather events. The extent to which climate change impacts on our ability to grow food varies from place to place, but overall there is strong evidence that climate change will impact negatively on this ability to grow food. The impact of climate change on food production will also be determined by how well we can adapt the way we grow food to respond to climate change.

Impact on Ireland

Climate change is affecting and will continue to affect Ireland. In Ireland, December 2015 was the warmest December in six decades and the majority of weather stations also reported their wettest December on record. Much depends on whether global greenhouse gas emissions can be quickly and drastically reduced. While the effects will vary depending on the region and year in question, these impacts are not expected to ease. Analysis indicates that Ireland will see sea level rises, more intense storms, more rain, increased flooding, water shortages in the summer (particularly in the east of Ireland), and worsening impacts on indigenous plants and animals.

Impact on Ecosystems

Biodiversity is the variation of living things, and it includes diversity within species, between species and of ecosystems. We know that the current rapid climate change is having an impact on the earth's ecosystems and on the plants and animal species that live within them. Both on land and in the seas, species are becoming endangered and are at risk of extinction as a result of climate change. The extent of global warming is expected to determine how much biodiversity is lost as a consequence. From a human perspective, biodiversity loss impacts on our ability to grow food, but also reduces species on which we depend.

4. What has climate change got to do with the ozone layer?

Children regularly confuse the hole in the ozone layer and climate change. This is understandable because they both involve human-caused pollution of the atmosphere, with negative effects on a world-wide scale. However, the specific types of pollution, the variety and severity of effects, and the actions or responses needed, are all very different. The two phenomena do interrelate in particular and complex ways, but are probably still best thought of and taught as two distinct issues.

"People living in developed countries have released a great deal more carbon dioxide than those living in developing countries. For example, the average Irish person uses about 15 times the energy of an average person living in Bangladesh. Yet vulnerable people living in developing countries, like Bangladesh, are most affected by climate change."

5. How does climate change relate to people's ethical values?

Environmental Values
Climate change impacts people, plants and animals. Plants and animals are valued by people for different reasons. Some people value living things for their importance to the economy and society. They recognise plants and animals as vital, or instrumental, to human life and existence. Others see plants and animals as having intrinsic value. How we view plants and animals is likely to impact on decisions we make about climate change and how we respond to this challenge.

Climate Justice
The impact of climate change on people is often highlighted as being particularly unjust. People living in developed countries have released a great deal more carbon dioxide than those living in developing countries. For example, the average Irish person uses about 15 times the energy of an average person living in Bangladesh. Yet vulnerable people living in developing countries, like Bangladesh, are most affected by climate change. The term climate justice is often used to acknowledge the injustice of climate change and the relationship between climate change and human rights.

Future Generations
Furthermore, climate change gives rise to concern for the rights of future generations. People living in the future, who have had no involvement in creating climate change, are likely to be the ones who suffer the worst consequences.

"The Agreement contains a commitment to limit the global temperature rise to 'well below two degrees celsius'."

6. What is being done about climate change globally?

International political action on climate change began at the Earth Summit in Rio de Janeiro in 1992. Here countries joined the United Nations Framework Convention on Climate Change (UNFCCC), with the aim of limiting climate change and responding to its consequences. The Conference of Parties (COP) to the UNFCCC meets annually to review implementation of the Convention. In 1997 the parties concluded the Kyoto Protocol, by which they committed to reducing their greenhouse gas emissions.

In late 2015, COP21 took place in Paris. This conference resulted in the historic Paris Agreement, which puts in place a range of measures aimed at reducing greenhouse gas emissions, supporting adaptation to climate change, raising funds to support responses to climate change, and developing technologies which reduce the impact of climate change. Significantly, the Agreement contains a commitment to limit the global temperature rise to 'well below two degrees celsius'. This requires a hard limit on the total maximum amount of carbon dioxide that can be released into the atmosphere (the global carbon budget) that cannot be exceeded and should be fairly shared. It is estimated that this carbon budget will be used up in the next 20 to 40 years.

While the deal represents a significant diplomatic achievement, the eventual success of the Agreement will be determined by whether subsequent action by governments truly works for the world's poorest, protecting human rights in already vulnerable communities.

The Global Carbon Budget

To understand the global carbon budget, think of a birthday cake. At the conference in Paris everyone agreed that there really was only a certain amount of carbon dioxide that could be emitted without very serious dangers arising, and that half of this amount had already been released. In terms of our analogy, they agreed that there was only one cake and it was already half gone; the remaining half should be shared out fairly, after which everyone would have to learn to live without cake.

7. What can we do to reduce the impact of climate change?

While as individuals we can reduce our contribution to climate change, the scale of the challenge also requires us to act collectively. Responding to climate change is not just about the personal lifestyle choices we make, but also involves working with others, in our schools and communities and at a national and international level, to ensure that 'business as usual' doesn't continue. Leadership and cooperation are needed to enable us to properly respond to, and mitigate, climate change. Actions in schools might include reviewing energy and transport use and the foods eaten, but it might also involve contacting environmental organisations, businesses, local authorities and politicians to show your concern for climate change.

"Teaching and learning about climate change should include not only scientific knowledge and understanding, but also a more holistic citizenship-based education."

8. What suggestions are there for teaching about climate change?

Climate change has traditionally been taught as a topic within the science and geography curriculum. Given the urgency and complexity of the climate change problem, however, there is a need for climate change to be foregrounded in education and approached from different perspectives across the curriculum. Research suggests that teaching and learning about climate change should include not only scientific knowledge and understanding, but also a more holistic citizenship-based education. Climate change concerns personal values and requires collective action, systemic reform and innovation. Climate change education therefore involves developing learners' skills and aptitudes to enable critique, solidarity, political engagement, ingenuity and openness to change.

The enormity of the climate change challenge can turn people off engaging with it, creating a 'head-in-the-sand' reaction. Exploring learners' feelings and acknowledging their fears and emotions is therefore an essential element of effective climate change education. Such education needs to empower learners to take action and support decisions which minimise the catastrophic effects of climate change. Knowledge, skills, values, feelings and actions are all key components in teaching and learning on climate change.

Most of the activities in this resource support discussion. Nearly all of the activities have no right answer. Instead the activities support children in engaging with the complexity, challenges and implications of climate change. While learning about the issue, they also explore their own feelings and attitudes as well as those of others in their class.

These lessons will be particularly effective if they form part of a wider class and whole-school response to climate change. Integrating the lessons into a whole-school initiative like the Green Schools programme (www.greenschoolsireland.org) will enable children to make links between their learning and possible local actions.

"Political, institutional and individual leadership is going to be necessary to tackle climate change."

9. Why do we need leadership for climate change, and what does it mean?

It is now over 40 years since we became aware of the threat of climate change. Despite growing awareness and recognition of the severity of the problem, greenhouse gas emissions continue to rise and a 'business as usual' policy continues to operate.

Our global failure to respond properly to climate change points to a lack of effective leadership. We can see many examples in history, from Nelson Mandela to the suffragettes to Rosa Parks, of people and groups who have brought about social change through bold and determined acts of leadership. Political, institutional and individual leadership is going to be necessary to tackle climate change.

Leadership in relation to climate change could:

- be at a personal level, making changes to support the environment;
- be within a school or community group, working with others to bring about changes for the better; or
- involve campaigning and advocacy, including with local politicians and decision-makers, to bring about national or international action against climate change.

Characteristics associated with leadership, in the area of climate change and the environment, include holistic thinking, a caring attitude, an awareness of different values and cultures, being inclusive of different people, being innovative and radical, having a long-term perspective and having a vision for bringing about positive change.

French President François Hollande during the conference on Solar Alliance at the Paris COP21, United Nations conference on climate change.

10. Where can I get more information and ideas?

Intergovernmental Panel on Climate Change
www.ipcc.ch

United Nations Framework Convention on Climate Change
www.unfccc.int

Climate change in Ireland
www.change.ie

Trócaire
www.trocaire.org

Resources for teaching about climate change

Resource	Contents	Available at:
Eco Detectives Published by Department of the Environment, Heritage and Local Government, 2010	Resource for primary school teachers on climate change.	www.askaboutireland.ie/aai-files/assets/Environment/Environment%20for%20Kids/Eco%20Detectives/Eco%20Detectives%20interface/~interface.swf
Trócaire educational materials	Resources for primary and secondary teachers looking at climate change and other development issues.	www.trocaire.org/getinvolved/education
The Story of Energy and Climate Change Published by SEAI	Resource for children providing a simple explanation of climate change, with a quiz.	www.seai.ie/Schools/Primary_Schools/Resources_Available/Books/
Exploring Our Energy Published by SEAI	Resources for primary school teachers including lessons, interactive whiteboard resources, photocopiable masters looking at energy, and a PowerPoint on climate change.	www.seai.ie/Schools/Primary_Schools/Exploring_Our_Energy_Primary_Programme/
Climate Change: Earth's Giant Game of Tetris by Joss Fong	A short TED animation (under 3 minutes) describing climate change.	www.youtube.com/watch?v=ztWHqUFJRTs