

Student activity:

Complete the following table to help you analyse the pattern of carbon dioxide emissions.

Country	Questions
China	<p>Describe the pattern of China's emissions:</p> <p>Explain why China's carbon emissions have grown since 1970.</p> <p>Explain why China's emissions have started to fall since 2015.</p>
USA	<p>Describe the pattern of the USA's emissions:</p> <p>Explain why the USA's carbon emissions have fallen since 2000.</p>
India	<p>Describe the pattern of India's emissions:</p> <p>Explain why India's carbon emissions are continuing to rise.</p>
The EU	<p>Describe the pattern of the EU's emissions:</p> <p>Explain why the EU's carbon emissions have continued to fall since the 1980's.</p>

Teacher notes:

The responses below could be used as a guide for class discussions of the questions on the PowerPoint presentation:

Slide 3:

Discuss the view that an international agreement is just the first step in the process of mitigating the causes of climate change.

An international agreement is a good place to start and it commits countries to reducing their carbon emissions. The financial help given to poorer countries to help mitigate the impacts also motivates them to achieve their targets. More developed countries, e.g. USA are reluctant to adopt all the measures agreed as they impact on their economic growth.

Explain why it is important for all countries to agree to reduce their carbon emissions.

If all countries work together, then there is more motivation for all countries to implement the agreed strategies. If some countries are not involved, their emissions can affect other countries.

Slides 4 and 5

Explain why there have been four international agreements in 20 years.

Each agreement has improved on the previous one. As more countries experience extreme weather events, then there is more call for all countries to reduce their emissions.

Slide 6:

To what extent are international agreements effective?

The international agreements have only been partially effective. Climate change is still occurring but some countries are seeing falls in their carbon emissions.

Slide 9:

Students could independently research each of the countries/regions to come up with explanations to support the patterns they have identified from the graph drawn. This could be completed in class or as a research task for homework.

China:

China's emissions grew steadily between 1970 and 2000 and then grew rapidly until 2015. China is now the world's biggest emitter of CO₂, responsible for 29% of global emissions in 2015, twice as much as the USA (the next biggest emitter). Emissions rose 5% per year 2000 - 2010.

The period of rapid growth in emissions was due to industrialisation and urbanisation. Changing energy use in China led to a fall of 0.5% in domestic carbon emissions in 2016 because of the decline in the use of coal (emissions down 1.8%) although emissions from oil (4%), natural gas (7.2%) and cement production (2.6%) rose.

A useful article on China's reduced use of coal can be found here:

www.carbonbrief.org/decrease-in-chinas-coal-use-sees-global-emissions-fall-in-2015

USA:

The USA's emissions grew between 1970 and 2000 but have fallen since 2000. The USA is the second biggest emitter, responsible for 15% of global emissions in 2015.

Burning more oil and gas, but less coal, saw the US's emissions fall 2.6% in 2015 and they are projected to fall a further 1.7% in 2016.

India:

India's carbon emissions started from a low base in 1970, 219197 kton (Gg), but have grown steadily since then. India's emissions in 2015 stood at 2454968 kton (Gg). Economic growth in India is accelerating in an effort to lift its 1.3 billion people out of poverty. As a result India is relying on its large reserves of coal as a cheap source of energy.

The EU:

The EU has seen carbon emissions fall every year since 1980, 4776968 kton (Gg), down to 3469671 kton (Gg). This fall is mainly due to the changing energy mix and far greater use of renewables in favour of fossil fuels.

Slide 10 - 12:

Describe the pattern of carbon emissions in the UK.

Since 1970, UK emissions have fallen fairly steadily and are now 31.5% below 1990 levels. The UK's CO₂ emissions fell by 4.3% in 2015.

Explain why carbon emissions have fallen in the UK.

UK emissions have fallen because of the fall in coal use which is at its lowest level since the start of the industrial revolution. Coal (a fossil fuel) consumption in 2015 was 22% lower than in 2014, falling to 38m tonnes. UK coal use is now down 41% in three years. The fall in coal consumption since 2012 is a result of several factors:

- A number of ageing coal-fired power stations have closed.
- Drax, the UK's largest coal-fired power station, has been converted to burn wood pellets instead of coal.
- Coal plants' profitability has fallen as a result of falling wholesale electricity prices and the rising carbon floor price, the UK's top-up carbon tax.
- Coal use at steelworks also fell in 2015 because of cheap Chinese exports flooding the market.

Useful link:

www.carbonbrief.org/analysis-uk-emissions-fall-again-after-record-drop-in-coal-use-in-2015

Suggest why the UK has achieved its carbon emissions target earlier than expected.

The UK has achieved its carbon emissions target earlier than expected because it has changed its energy mix, away from burning fossil fuels towards using more renewable energy. The switch from burning coal towards wind power has made a significant difference.

Useful link:

www.legislation.gov.uk/ukpga/2008/27/section/1