## Climate Change and Youth Social Action

In addition to valuing the diversity in our students, the choice of learning that we get students involved with can also reflect this diversity. Working on a social action project that provides students with new learning outcomes can be a starting point. Generally, the more we move away from a monoculture of learning to create learning opportunities producing a range of outcomes. This enables us to tap into students' interests and skills, giving them a sense of ownership in the work they get involved in.

**If working on a social action project on Climate Change, giving Young people more freedom to choose and lead the work, and letting them see where it takes them, will provide the best outcomes.** In terms of teaching and learning outcomes, it helps teachers develop ways of teaching subject-based skills and knowledge in a much more engaging way, ultimately motivating students even more to learn.

**Below are steps to explain how to use a theme on Diversity to structure the social action project:**

**1** Start with a question that serves as a focal point for the learning that will take place. *e.g: 'Why is diversity essential to the functioning of nature?'*

**2** Provide exploration routes for the students to shape their thinking around the question. This can take the form of a trip, an afternoon exploring resources or watching a documentary.

**3** Get the students to gather up in groups linked to their area of interests around the topics and create opportunities for them to investigate further.

**4** Their investigation may lead to the identification of problems that can open the premisses of a future social action project or the actual knowledge that they develop and will continue to grow.

Through further investigation can be used as educational training for them to build their own action projects in the school/community.

## Background Reading

The following overview provides background knowledge for school staff to feel confident when approaching social action planning in primary schools addressing the problems of climate change and pollution.

In the National Curriculum, the core scientific knowledge that leads to an understanding of climate change is taught from key stage 1 (KS1) to key stage 2 (KS2):

- Learning about the Earth's movements around the Sun and the changes observed through the seasons and the water cycle
- Teaching on the composition of the atmosphere, the effects of carbon dioxide produced by human activities, and the interaction between pollution and the interdependence of biodiversity is covered in Science at key stage 3 building up from KS1-2
- The Geography curriculum teaches knowledge about climate and weather worldwide and gives opportunities to study the local area through fieldwork. Human geography, including types of settlement and land use; Economic activity, including trade links; and the distribution of natural resources, including energy, food, minerals and water
- The statutory requirements of the Science and Geography curriculums provide a framework of core knowledge leading to an understanding of climate change
- Food technology covers the understanding of seasonality and knowing where and how a variety of ingredients are grown, reared, caught and processed

Recent government publications on the Sustainability and Climate change strategy for the education sector set new directions for school systems. Leading excellent educational opportunities for a changing world impacted by climate change will require

- Giving early access to environments created for children that allow them to connect with nature and value its preservation
- Developing education that better understands the evolving facts related to the climate crisis and takes action within schools to reduce direct and indirect emissions on site
- Getting young people to participate in implementing climate adaptation measures (net zero) within schools to develop resilience whilst experiencing the changes in the climate
- Participation in program activities that enhance biodiversity and air quality and empower children to take positive steps to improve their local community, country and planet

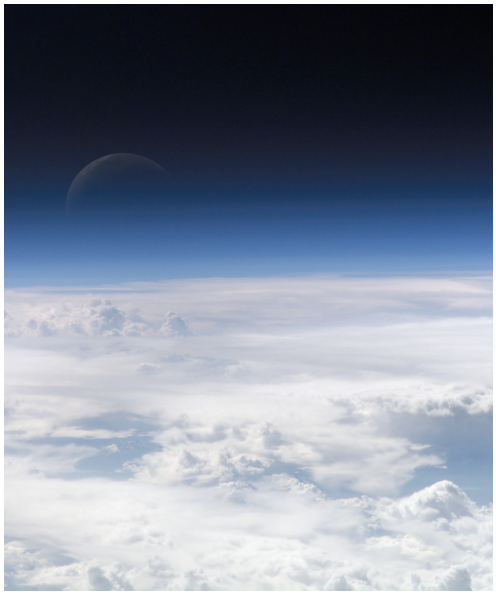
Consequently, any planned social action work on environmental issues and sustainability can be a starting point for schools to develop their curriculum and practice. We also recommend staffing interested in sustainability education to access regular publications by the **Common Worlds Research Collective** and the **UNESCO Futures for Education,** which provide updates on environmental research and directions for global education, as well as **The Harmony Project** in the UK, which is a charity organisation providing the means for schools to adopt a whole-school transition into sustainable education, fully in line with Ofsted requirements. For more information, go to: **https://www.theharmonyproject.org.uk/**

**Understanding Environmental Issues**

The natural environment is the totality of the natural world that humans have inherited. The atmosphere is threatened when external physical conditions affect and influence organisms' growth, development, behaviour, and survival.

**A. Earth, Atmosphere and Water**

Planet Earth is the only planet in our solar system able to support life. This life is made possible through the presence of **water, breathable air, a climate conducive to life, and solar energy.**



The **Earth's atmosphere** is made of layers of different gases that protect life on Earth by shielding ultraviolet radiation from the Sun. This layer insulates the planet to maintain the climate and prevents extreme differences between daytime and night-time temperatures when Earth does not face the Sun. Between the Earth's surface and the atmosphere occurs a greenhouse phenomenon.

**The Greenhouse effect** (named after the role of glass in maintaining temperature in a greenhouse) is a natural process thanks to which the temperature brought by the warmth of the sunlight remains at an average around the Earth's surface; maintaining this way a temperature that is compatible with the presence of water and life as we know it.

This occurs when sun radiations enter the atmosphere, reach and warm up the Earth's surface and are reflected into the sky. Some of this heat will return into space while some remains trapped in the atmosphere.

The natural process of trapping some of the heat occurs through heat absorption by water vapour ($H_2O$) and cloud formation, whilst some happen through other heat-trapping gases, also called greenhouse gases.

To be a greenhouse gas, the gas must be able to absorb and emit longwave radiation in a planetary atmosphere. So the action of these gases in high concentration is that they prevent radiations from going back into space and contribute to the natural greenhouse effect responsible for maintaining the climate. One of these heat-trapping gases is carbon dioxide ($CO_2$), which is essential for plant life to be sustained in small quantities. This carbon dioxide is naturally emitted through decomposition, ocean release and respiration.

**Nature and Biodiversity**

Nature is a complex network of elements and living organisms that interact. The diversity of species of plants and organisms found in nature is essential to support life on Earth, including human life.

Each species possess a genetic heritage providing for the defence of biodiversity and going beyond to preserve the genetic origin of the planet. If one species disappear, it is a genetic library that disappears. If the wide diversity of animals, plants, and microorganisms disappeared, we would not have healthy ecosystems providing us with the air we breathe and our food. Each element has a specific role to play in sustaining the natural system.

**The Impact of Human Activities on The Environment**

**A. Climate Crisis**

Over time the increase of heat-trapping gases in the atmosphere due to human activities increase the greenhouse effect. These gases include an expansion of Carbon dioxide emissions ($CO_2$) due to burning fossil fuels, deforestation, and industrial processes. Methane ($CH_4$) comes from the energy, agriculture and waste sector. Nitrous oxide ($N_2O$) and Fluorinated gases are emitted through refrigerators, air-conditioners, foams and aerosol cans.

These rising temperatures produce changes in precipitation patterns and severity of storms and cause glacier melting, leading to sea level augmentation. The glaciers spread around the globe are responsible for climate regulation because they reflect 95% of the sunlight into the sky through their white appearance. This allows them to maintain low temperatures in their surrounding environment and viable temperatures around the planet. The climate of our world has always functioned in this way..

The rising sea level directly affects the total mass of Earth we have access to. We can only live on 30% of the mass of the Earth, and we need this land to thrive. The rising sea level causes erosion, damage to coastal areas, loss of land, and floods. The increasing sea level pushes hurricanes and tropical cyclones to move farther inland. Combined with the higher temperatures, it increases the severity of these storms and their frequency. Warmer temperatures intensify evaporation in regions with drier seasons, reducing surface water and drying soil and vegetation. Periods of precipitations are low, which engenders droughts. Climate change is also altering the timing of water availability: warmer winter temperatures are causing fewer precipitations to fall as snow in regions like the Northern Hemisphere. It changes the variations of rainfalls, which increases the alternation between periods of extreme rain and droughts.

Warming of the climate and oceans also impacts the lives of living organisms and animals. The new field of studies on the effects of a warming environment on animals found an impact on the migration and movements of groups of animals. Warming waters affect the spawning of certain fish species and disorientate underwater displacement. Both underwater and on land, the warming climate increases the population of certain parasites that can be harmful to certain species. The warming of the climate affects the landscape, which for species that need camouflage for their survival will cause a decline in their population. The warming environment also affects access to food sources for animals and, in some cases, already a complete loss of habitat like polar bears in the Arctic.

**Pollution**

As well as the effects of heat-trapping gases, pollution has a devastating impact on the quality of air, water and soil, of which preservation is necessary for our health and that of the ecosystems. As for greenhouse gas emissions, pollution is linked to human activities. Air pollution happens when solid and liquid particles, called aerosols, get stuck in the air. This is often related to human activities by releasing particles from factories and truck exhausts. Gases can also cause air pollution. For example, Ozone (O3) is a gas essential to shield sun radiation in the outer part of the atmosphere.

In contrast, when Ozone is created above the Earth’s surface through the sunlight reaction to certain chemicals coming from sources of fossil fuels, it makes a type of air pollution called 'smog’. Long exposure to air pollution is associated with heart and lung diseases and some cancers. The increase in wildfires linked to climate change also adds to air pollution. Industrial waste in the form of toxic chemical pollutants from agricultural sites contributes to water pollution.

This is because, in some cases, waste needs to be treated properly. This type of pollution can also occur from sewage and wastewater. When chemical waste joins natural water currents, it pollutes one body of water to another until it reaches the sea, endangering human health and living organisms. In parallel, due to the increase of carbon dioxide in the air, ocean acidification occurs in the top layer of the ocean, where algae and zooplankton absorb carbon dioxide. This acidity causes some animals to have difficulties making and keeping their shells.

**Soil pollution** largely occurs through food and farming activities and the introduction of pesticides and herbicides into the ground. Whatever their use, they cannot be broken down in nature as they are artificially made. Consequently, they seep into the ground, stripping away soil fertility and harming the ecosystems. Industrial activity also damages soil when waste is not properly disposed off.

Intensive farming activities such as intensive agriculture and livestock farming for meat have the largest role in biodiversity loss. Intensive farming pollutes air, water, and land altogether. It is responsible for countless other damages to carry these production activities: deforestation, use of chemicals in agriculture, development of zoonotic diseases, the release of CO2 emissions, and the disposal of slurry. The treatment of waste, not only gases but other human waste, is also a major contributor to the degradation of ecosystems.

**Plastic pollution**, for example, devastates the ocean's ecosystems and the life of marine animals. Many marine animals, like turtles, seabirds, fish, and mammals, have been reported ingesting or entangling in plastic debris, leading to impaired movement, reduced reproduction, acerations, ulcers, and death. This is a common problem in certain species since plastic often looks like food to these animals.

For instance, 95% of fulmar seabirds that wash ashore dead in the North Sea have plastic in their guts. One area of concern is microplastics, which are tiny fragments of plastic. They can be especially dangerous for animals since they absorb toxins and look like food, causing many marine animals to eat them. Unfortunately, microplastics are extremely hard to remove and can be present in everyday items like toothpaste.

## Solutions and Sustainability

The interlinks between human activities and the problems of climate change and pollution show that solving these problems cannot be solved by isolating them and dealing with them.

### Solution 1: Preserving and Restoring Nature's Ecosystems

One of the first threats to biodiversity and the destruction of habitats is soil and water pollution. The Zoological Society of London (ZSL) estimated in 2008 that 40% of species could disappear within the next fifty years. In 2019, the European Commission estimated that 59% of freshwater molluscs, 58% of endemic trees, 40 % of freshwater fish, 23% of amphibians, 20% of reptiles and 17% of mammals were threatened with becoming extinct.

Preserving natural habitats is an indispensable condition for developing animals and plant species. Firstly, around agricultural lands, the preservation of plants is vital to the survival of animals. Trees, hedges, copses and water streams that separate fields are pools to maintain biodiversity. These landscape elements also compete for better storage of underground water that protects reliefs against erosion and limits leakage of phytosanitary products in water streams. They assist the soil culture by providing shelter to predators that feed on pests without chemical interventions and allowing pollinating species to fertilise cultivated plants. Secondly, woodlands must be protected as they preserve plant species, trees and wildlife. New tree planting projects and undertaken initiatives compensate for carbon emissions but are not the sole solution.

Reinforced protection of oceans has to become a priority. Beyond 250 000 animal species and millions of plants are greatly threatened. Beyond the uncountable species we have to protect, the oceans' resources allow us to feed at least 3 billion people, absorb 25% of CO2 and generate 50% of the planet's oxygen. We can not underestimate their role.

Since non-recycled and incinerated waste ends up in the ocean, all of the pollutants that are threatening it are not counted anymore: plastic waste creating continents, algae and other i

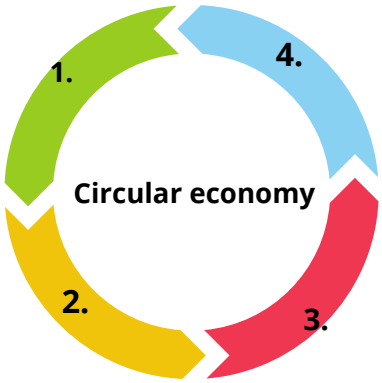
invasive species proliferation, chemical and oil pollution, acidification of water, dust clouds created by underwater mining, mangrove and coral reefs destructions (20% have already disappeared and 70 to 90% are threatened to disappear before 20 years.) Massive action to reduce plastic waste must be undertaken (150 million tonnes of plastic pollute the oceans today, and 9.5 million are added annually).

## Developing and Sustaining a Cyclical Economy

According to the UN, the consumption of primary resources will have tripled by 2050 to reach a level unbearable for the planet. A circular **or cyclical economy** is defined as an economic system of exchange and production that, at all levels of the cycle of life of the products (goods and services), aims at increasing the efficiency and use of resources, reducing then its impact on the environment whilst developing the well being of individuals. The aim is to disconnect the production and service of natural resources through reuse and recycling. This loop can be summarised by the following cycle:

1. The conception of an environmentally responsible product*
2. Production from recycled materials
3. Consumption
4. Recycling and production of a new product made from recycled materials.

*a good or a service




## Develop an Energetic Model That Reduces CO2 Emissions.

Industrialised countries agreeing to reduce their CO2 emissions have adopted a **mixed energy strategy** by reducing energy production that releases CO2 emissions by allocating a part of the energy production to clean energy sources. Whilst this has allowed some countries to reduce their emissions, it is not meeting the need for a drastic reduction of CO2.

Regarding climate change, net zero is a term established to restore the balance of greenhouse gases in the atmosphere. Regarding the responsibility of human activities for heat-trapping emissions, it does not account for differences in the origins of gases responsible for increasing the greenhouse effect or pollution.

It is approached as a response to counterbalance emissions by activities that have a negating effect. For example, some industries operate with higher fuel consumption as long as other activities and initiatives negate these. On the next page is a list of the different energies used today.

**Types of Sources of Energy**

**Fossil Fuel Energies**

Fossil fuels were formed from animals and plants that have been buried and fossilised over the space of millions of years. They have an extremely high carbon content, perfect for creating energy. People started to use fossil fuels to generate power in the 1880s when coal was first used to give electricity to homes and factories. They were essential in the Industrial Revolution. Below is a list of the different fossil fuel energies:

| | |
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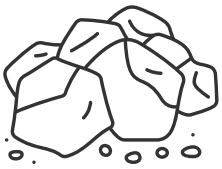
| **Natural gas**  | Natural Gas is a non-toxic hydrocarbon that is highly flammable, odourless, and colourless. It can be a gas or liquid. |
| ***Oil (or petroleum)***  | ***Oil (or petroleum)*** – a liquid once extracted from reservoirs below land or ocean floor can then be converted into car and aeroplane fuel, among other things. |
|  | ***Coal*** – is possibly the most harmful to the environment. Coal is a combustible carbon-based black rock that we burn to gain energy. |

**Renewable Energies**

Renewable energies are also known as flow resources, natural resources that can renew despite consumption. This can be achieved through biological reproduction or other repeating processes. This allows us to use energy without worrying about finite resources because they regenerate.

| | |
|---|---|
| **Wind**  | *Wind* – the motion is used to generate electricity. Simply put, the wind is created by the sun's heat and the Earth's rotation, something called the Coriolis Force. A wind turbine is used to draw energy from air currents. |

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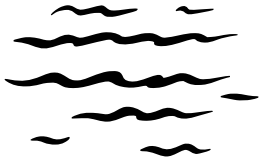
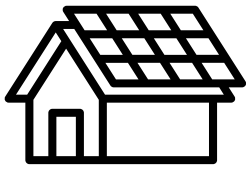
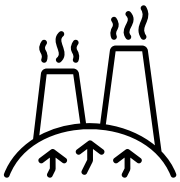
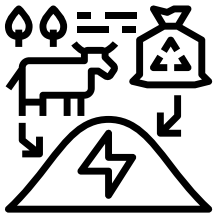
|---|---|
| **Ocean**<br>  | *Ocean* - The rising and fall of the tide can be harnessed to generate electricity. A tidal current turbine (like a wind turbine) or tidal stream generator collects the energy from the water currents. |
| Hydro Power<br>  | *Hydropower* - similar to the ocean, uses water's motion to produce electricity. Still, the key difference is that any wetness can be used, so a tidal current turbine does not need to be used. |
| Solar<br>  | Solar – energy can be collected from the sun's heat through solar panels to generate electricity, heating, and lighting. |
| **Geothermal**<br>  | Geothermal – generates electricity by using heat from underground trapped in the Earth. |
| **Biomass Energy**<br>  | Biomass – this is the most versatile and reliable renewable energy source. Biomass refers to animal and plant materials such as wood chips, food waste, or other organic matter. Once energy is extracted from biomass, it can be used for chemicals, fuel to power vehicles, heating, and electricity |