

Natural Environment: Renewable and Low Carbon Energy

OUTLINE

- Why do we need alternative forms of energy?
- Renewable and non-renewable energy sources
- Conclusions

WHY DO WE NEED ALTERNATIVE FORMS OF ENERGY?

- Since the industrial revolution, atmospheric CO₂ has increased by 38% (Met Office, 2014).
- This increase in CO₂ is understood to be the cause of climate change which has resulted in a number of environmental issues

ACTIVITY 1

IMPLICATIONS OF CLIMATE CHANGE

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ENVIRONMENTAL ISSUES

- Higher temperatures
 - The planet's average surface temperatures has risen by 0.89°C between 1901 and 2012
 - This rate of increase was not seen before the industrial revolution
- Changing rainfall
 - Data suggests changes in precipitation
 - In the UK, winter rainfall is increasing; summer rainfall is decreasing
 - North America – heavy rainfall events have become more intensive
- Changes in nature
 - Altered temperatures has led to changes in the seasons
 - Causes issues for wildlife
 - Spring starting earlier in the UK leads to butterflies appearing earlier and birds changing their migration patterns

ENVIRONMENTAL ISSUES

- Sea Ice
 - Melting sea ice does not cause sea level rise as it is already on the sea
 - Does have effects on the climate
 - Sea ice helps to keep the polar regions cool and its bright surface reflects 80% of sunlight back into space
 - If this ice melts, the exposed ocean instead absorbs 90% of sunlight and can cause a further rise in sea temperatures (NSIDC, 2015)

ENVIRONMENTAL ISSUES

If the world fails to act, temperatures could rise by over 4°C. A rise of 2°C would cause severe effects, a higher increase could be catastrophic (Wicks, 2008).

NON-RENEWABLE ENERGY SOURCES

- Currently, the UK burns fossil fuels to meet its energy demands
 - Coal, petroleum and natural gas
 - Release pollutants and greenhouse gases when burnt and contribute to climate change
- Referred to as “non-renewable energy sources” as they will eventually run out

ACTIVITY 2

**NUCLEAR POWER AND FRACKING:
SOLUTIONS TO ENERGY DEFICIT OR DISASTERS
WAITING TO HAPPEN?**

NON-RENEWABLE ENERGY SOURCES

- Coal
 - Formed by fossilised plants
 - Mined from seams of coal found between rock layers in the earth
 - Burnt to provide heat or electricity
 - Expected to last 250 years
 - Generates pollutants and greenhouse gases (CO₂)
- Oil
 - Carbon-based liquid formed from fossilised animals
 - Pumped out from reservoirs between seams of rock in the earth
 - Widely used in industry and transport
 - Expected to last 50 years
 - Generates pollutants and greenhouse gases (CO₂)

NON-RENEWABLE ENERGY SOURCES

- Natural Gas
 - A hydrocarbon gas primarily containing methane and other gases
 - Released through pipes sunk into the seams of rock where it is trapped
 - Often used for heating
 - Expected to last 70 years
 - Generates pollutants and greenhouse gases (CO₂)
- Biomass (can be renewable **or** non-renewable)
 - Generated from decaying plant or animal waste
 - Chemicals can be used for fuel in diesel engines or organic material can be burned for heat and electricity
 - Can be renewable if crops are replanted, but if they are not replaced then biomass is a non-renewable energy source
 - Generates pollutants and greenhouse gases (CO₂)

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NON-RENEWABLE ENERGY SOURCES

- Wood (can be renewable **or** non-renewable)
 - Obtained from felling trees
 - Burnt to provide heat or light
 - Can be renewable if trees are replanted, but if they are not replaced then it is a non-renewable energy sources
 - Generates pollutants and greenhouse gases (CO₂)
- Nuclear
 - Generated from mined radioactive minerals, such as uranium
 - Used to generate energy by splitting atoms in these minerals in nuclear reactors (nuclear fission)
 - A small amount of radioactive material can produce a lot of energy
 - Does not generate atmospheric pollutants or greenhouse gases
 - Nuclear waste is highly toxic and must be safely stored for hundreds or thousands of years
 - Leakages and accidents can be devastating to people and the environment (e.g. Chernobyl, 1986)

RENEWABLE ENERGY SOURCES

- By 2020, the UK aims to provide 15% of all energy demand from renewable sources
- Renewable energy sources are naturally replenished and should not run out

RENEWABLE ENERGY SOURCES

- Solar Energy
 - Photovoltaic/solar cells convert sunlight into electricity
 - Solar power plants capture heat from the sun to produce steam and power electric generators
 - No air or water pollution is produced from solar energy
 - Energy is “free”
 - Can cause damage to the ecosystem if not managed correctly
- Wind Power
 - Located in areas with strong and constant wind (offshore and at high altitude)
 - No air or water pollution is produced, but there may be some pollution produced during manufacturing processes
 - Energy is “free”
 - Large windfarms are needed to produce electricity on a large scale

RENEWABLE ENERGY SOURCES

- Tidal Power
 - The movement of tides drives turbines to generate energy
 - Water is forced through gaps in a tidal barrage, build across an estuary
 - Barrages can help prevent flooding and double as bridges
 - Not all estuaries are suitable
 - Can have a negative impact on wildlife and may impede flow of sewage out to sea
- Wave power
 - Movement of seawater compresses trapped air in a cavity on the shore and drives a turbine to produce energy
 - Usually undertaken on a local scale

RENEWABLE ENERGY SOURCES

- **Geothermal**
 - The natural head of the earth can be used to generate steam which can be used to power turbines and generate electricity
 - Only works in areas of volcanic activity
 - Dangerous elements found underground must be disposed of carefully
- **Hydroelectric power (HEP)**
 - The movement of water through rivers, lakes and dams is used to produce energy
 - Can cause flooding of the surrounding areas
 - Damns have major ecological impacts on local hydrology

ACTIVITY 3

A LOW CARBON FUTURE

CONCLUSIONS

- Introduced renewable and non-renewable energy sources
- Assessed how these fit into the climate change debate
- Assessed the advantages and disadvantages of different sources
- Understood the implications of using sources that produce greenhouse gases