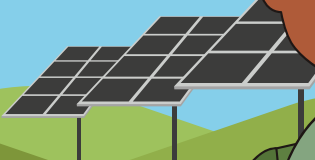
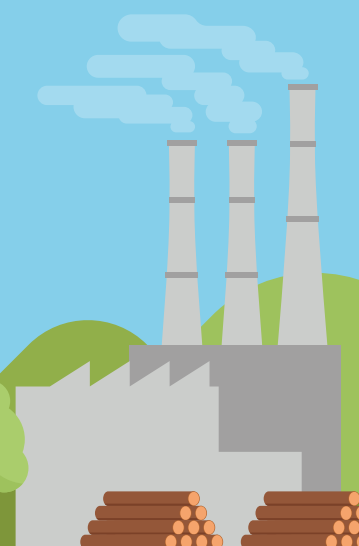
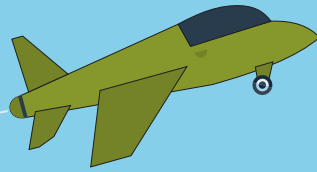




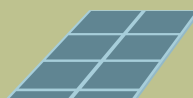
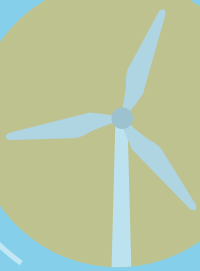
Net Zero

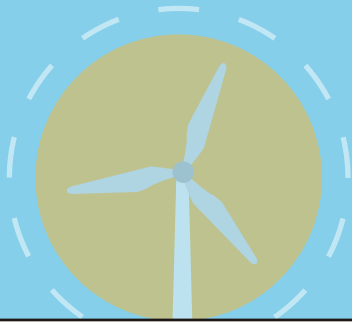
Activity Book Key Stage 2





Net Zero



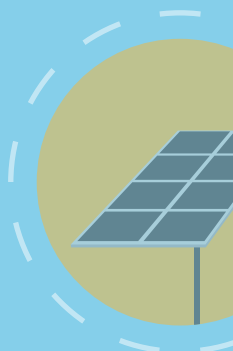


Net Zero means achieving balance between the amount of greenhouse gas released into the atmosphere and the amount removed.

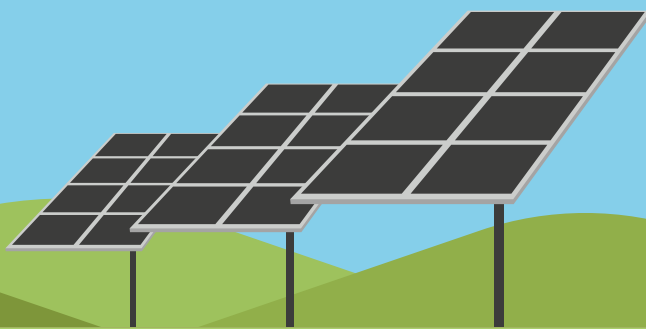
Burning fossil fuels releases these greenhouse gases into our atmosphere causing climate change, the planet to get warmer and extreme weather. Fossil fuels like coal and gas are formed from dead animals and plants that have been buried for millions of years, and stocks of fossil fuels are getting smaller and smaller. We can remove polluting gases by planting trees that capture the gases.

Scientists say we need to reach Net Zero emissions by using new, greener technology.

There are three main ways in which the world is aiming for Net Zero. These are solar power, wind power and biofuels. You can learn all about these in this book.



Solar Power



Solar Power is the conversion of energy from sunlight into electricity.

There are two main methods. **Photovoltaics** is where the sun is absorbed through cells in the solar panel. **Concentrated solar** power is where a lens or mirror is used to concentrate a lot of sunlight into a small beam.

Solar power is one of the best alternative power sources and can also save money in the long-term. It can be used to provide remote places with electricity.

Solar power is sustainable and does not pollute the planet. It is weather dependent though. More sun means more power.



Solar Codes

Using the information about solar power that you have just read, can you solve the code and find all these words which are related to solar power. Each number represents a different letter. Only these 10 letters of the alphabet are used:

A E G L N P R S T Y

We have given you few letters to start you off.

1	2	3	4	5
N	E	L		
6	7	8	9	10

9	5	1	2	3
		N	E	L

9	3	5	1	2	10

3	2	1	7

2	1	2	8	4	6

Solar Power

Solar power is the conversion of energy from sunlight into electricity.

One method of converting energy from sunlight is called photovoltaics. This is where the sun is absorbed through cells in a solar panel. Solar panels can be put onto rooftops to catch the sun.

It takes an average of 15 solar panels to power a small house. It takes an average of 1,000 solar panels to power a school. Can you calculate how many solar panels would be needed to power the following:

1 school and 4 houses: _____



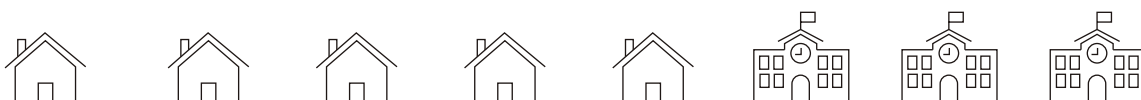
4 schools and 3 houses: _____



2 schools and 6 houses: _____

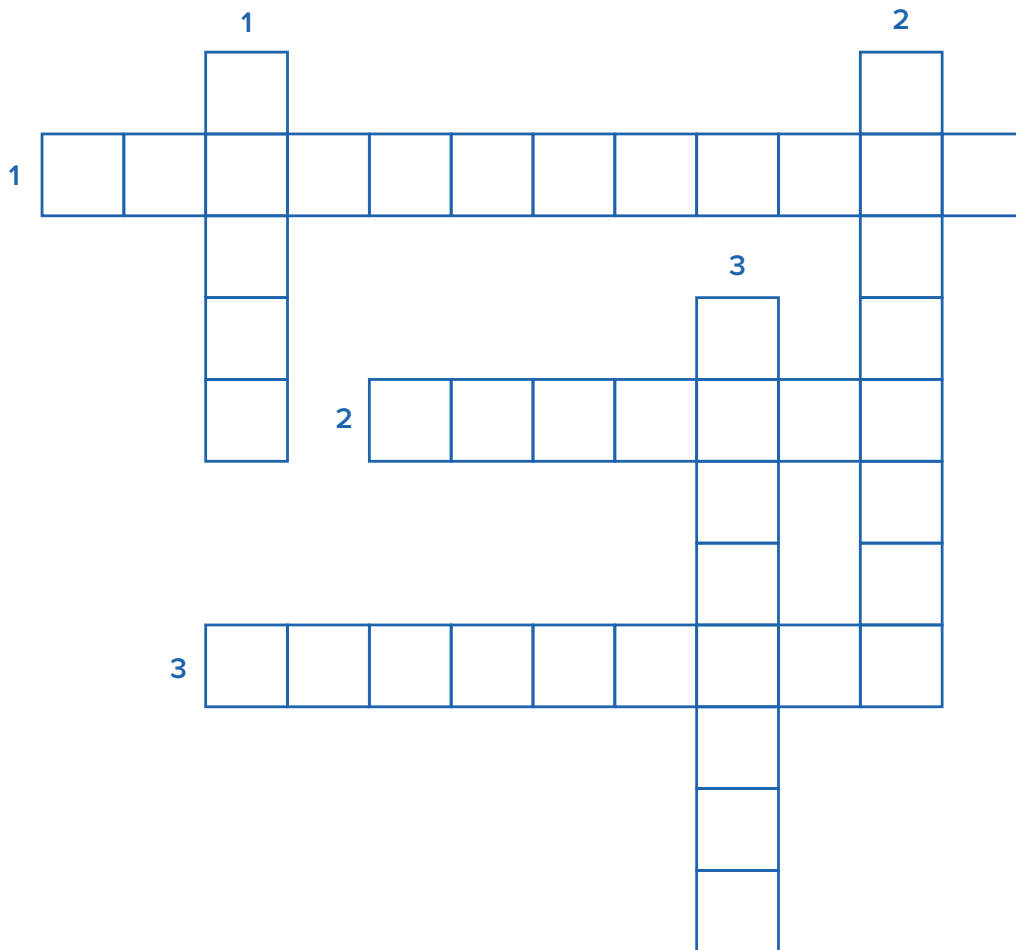


5 houses and 3 schools: _____



Solar Power Crossword

Can you solve the crossword relating to solar power?



Across

1. What name is given to solar cells, made up from the words photons and volts?
2. The flow of an electrical current creates a what?
3. What do we call the collection of substances in the environment with harmful effects?

Down

1. What is the latin word for sun?
2. Which famous scientist won a Nobel Prize in 1921 for his research into solar power?
3. What does the earth receive enough of in just one hour to power the world for a full year?

Solar Power Wordsearch

Can you find the words in the list that are all to do with solar power? The words can read across, down or diagonally.

B	W	B	I	N	T	C	W	X	H	O	J	T	V	E
D	G	T	V	G	U	Q	M	Z	Q	P	L	D	F	E
D	W	C	H	T	V	E	D	Q	H	O	J	J	K	R
H	O	J	S	E	B	N	T	C	V	G	U	Q	M	G
G	U	S	T	O	R	A	G	E	N	T	C	D	C	W
F	V	U	U	Q	M	M	B	R	J	G	T	C	W	X
C	W	N	G	G	U	V	A	S	I	E	C	N	T	C
T	V	E	R	T	C	W	X	L	F	D	O	G	R	G
N	T	C	O	O	U	Q	M	E	P	F	N	C	W	E
A	B	S	O	R	B	C	W	N	C	W	V	O	N	Q
T	E	J	F	H	O	J	A	S	N	E	E	E	N	H
C	A	T	T	G	U	E	L	E	C	T	R	I	C	R
E	M	G	O	C	W	W	I	S	S	G	T	U	Q	M
U	Q	M	P	A	N	E	L	C	Y	G	U	H	O	J
B	V	G	U	Q	M	A	B	B	W	A	T	V	E	D
G	E	N	E	R	A	T	E	J	T	C	W	X	V	J
U	Q	M	N	T	C	H	H	O	J	V	G	U	Q	M
Z	H	O	J	T	R	E	M	O	T	E	S	B	B	W
I	T	C	W	X	H	R	Z	X	T	V	E	G	U	B

Thermal
Storage
Lenses
Electric

Remote
Convert
Weather
Beam

Generate
Energy
Panel
Grid

Rooftop
Absorb
Sun

Wind Power



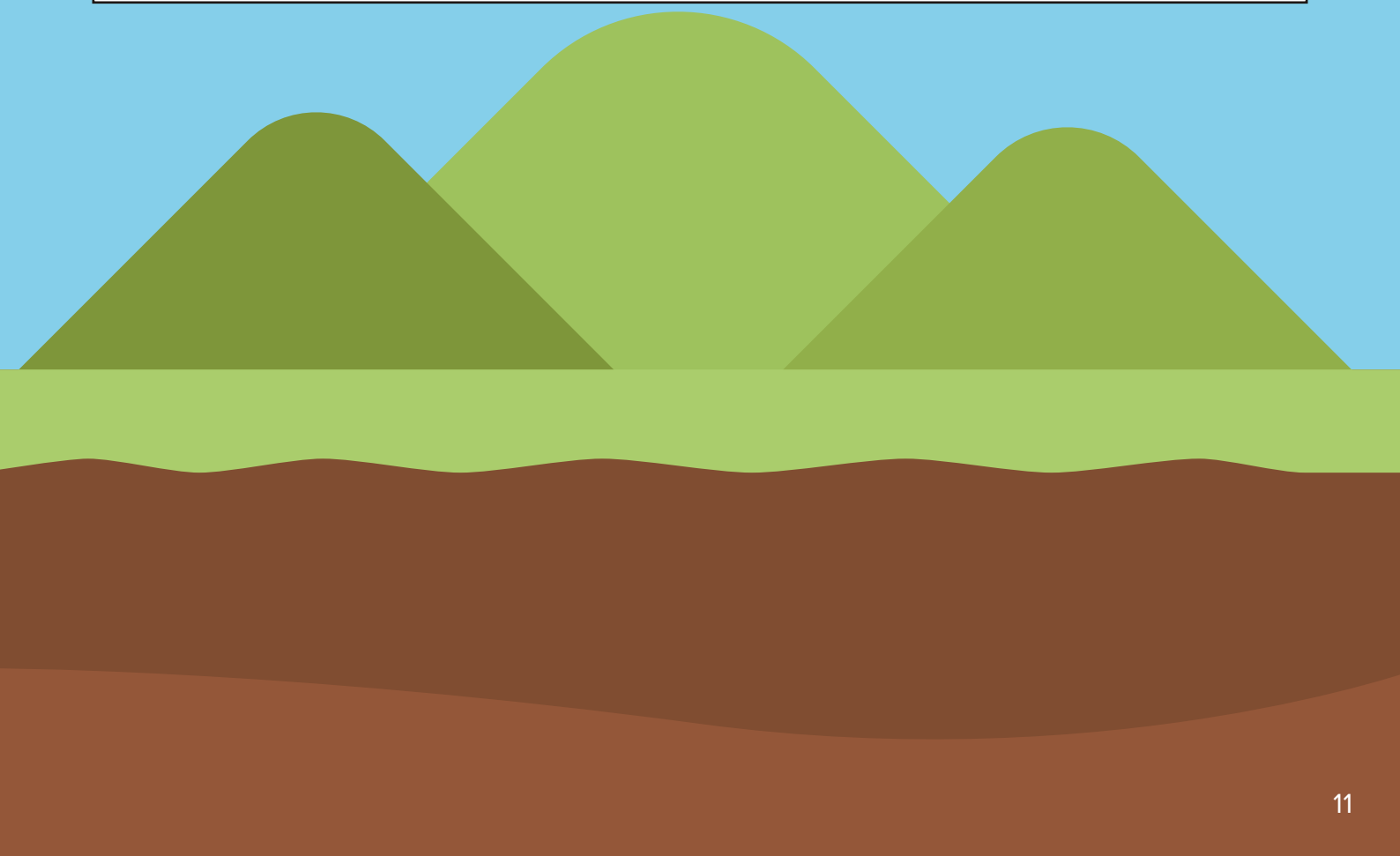
Wind power is power that is channelled by a wind turbine. A wind turbine is a high tower with blades that rotate when it is windy.

The wind turns the shaft and powers a machine called a generator, which produces electricity.

To generate lots of electricity we have wind farms where there are lots of wind turbines together. There are onshore and offshore wind farms.

The first windmills were built over 1,000 years ago. People used them to grind grain and to drain water from land.


Wind power is sustainable and does not pollute the planet. It is weather dependent though. More wind means more power.



North, East, South and West Puzzle

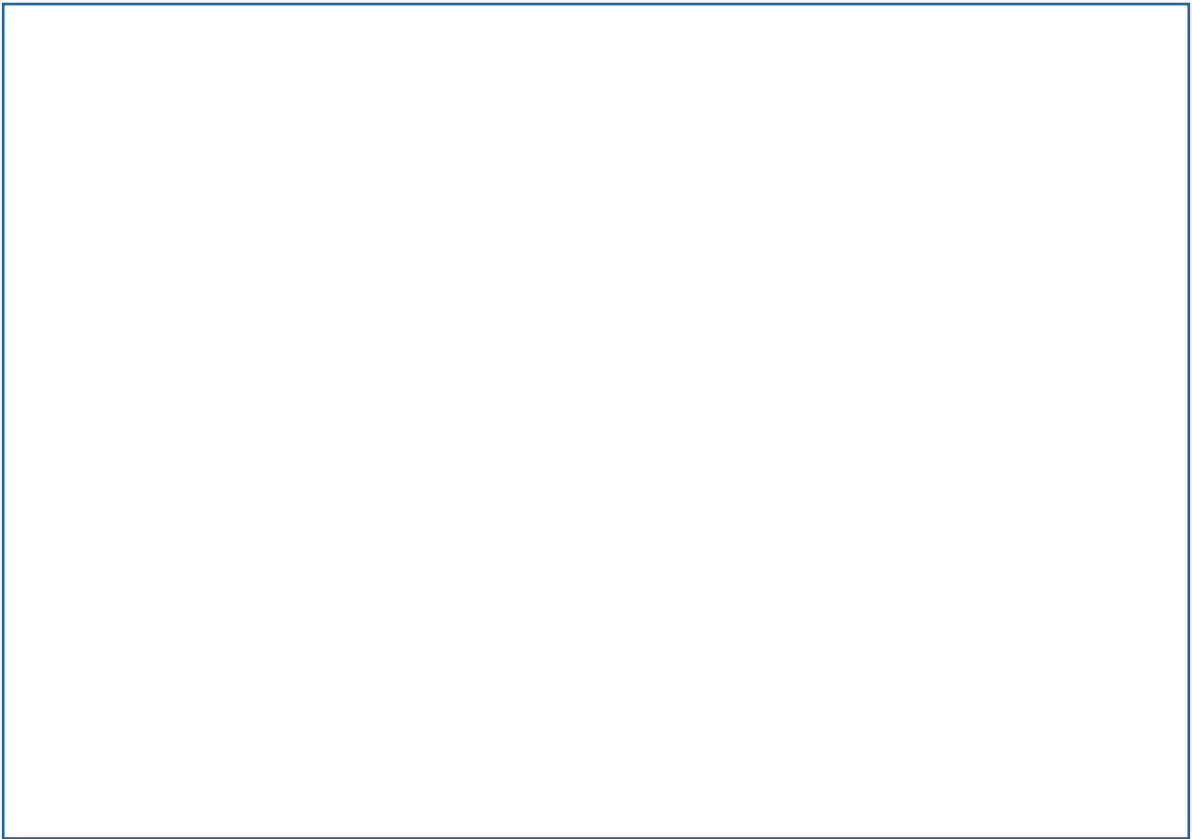
Can you follow the flight of this paper plane that has been blown by the wind? Try to guess which shape it will land on before you start.

Follow the changing wind direction below to chase the paper plane. The wind blows the plane south for 6 squares. Then it changes direction. It blows the plane east for 2 squares. Then it changes direction again. The wind blows the plane north for 2 squares before changing direction. It blows the plane east for 1 square. It changes direction again. The wind blows the plane north for 2 squares. Then finally, the wind blows the plane west for 2 squares. And this is where you catch it. Which shape had the paper plane landed on? Did you guess right?

 →							
Start	○						
				△			
		☆					
					+		

Design a Wind Farm

Can you design a wind farm? Think about wind power and what is needed. Where would you build it? What would it power? Add some notes to describe your design. You can colour it in too.



Write about your wind farm below.

Wind Power Kriss Cross

Can you fit these words about wind power into this grid? A few letters are in place to start you off.

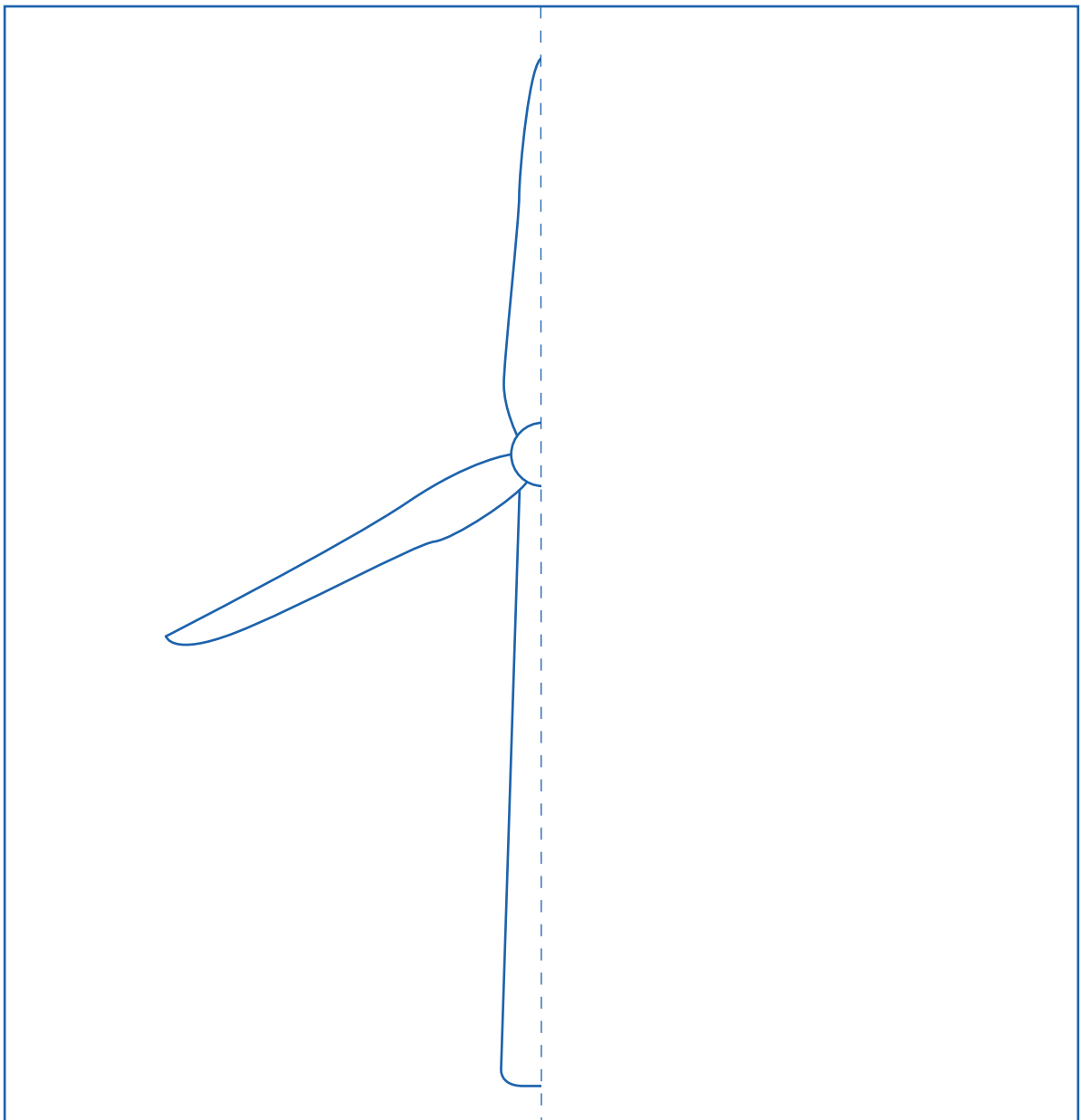
- Energy
- Tower
- Offshore
- Shaft
- Onshore
- Mechanical
- Machine
- Wind Power
- Blade
- Windmill
- Turbine
- Farm

The crossword puzzle grid consists of 12 rows and 10 columns. The pre-filled letters are as follows:

- Row 2, Column 1: U
- Row 4, Column 4: D
- Row 4, Column 8: F
- Row 6, Column 6: H
- Row 7, Column 2: C
- Row 10, Column 1: E

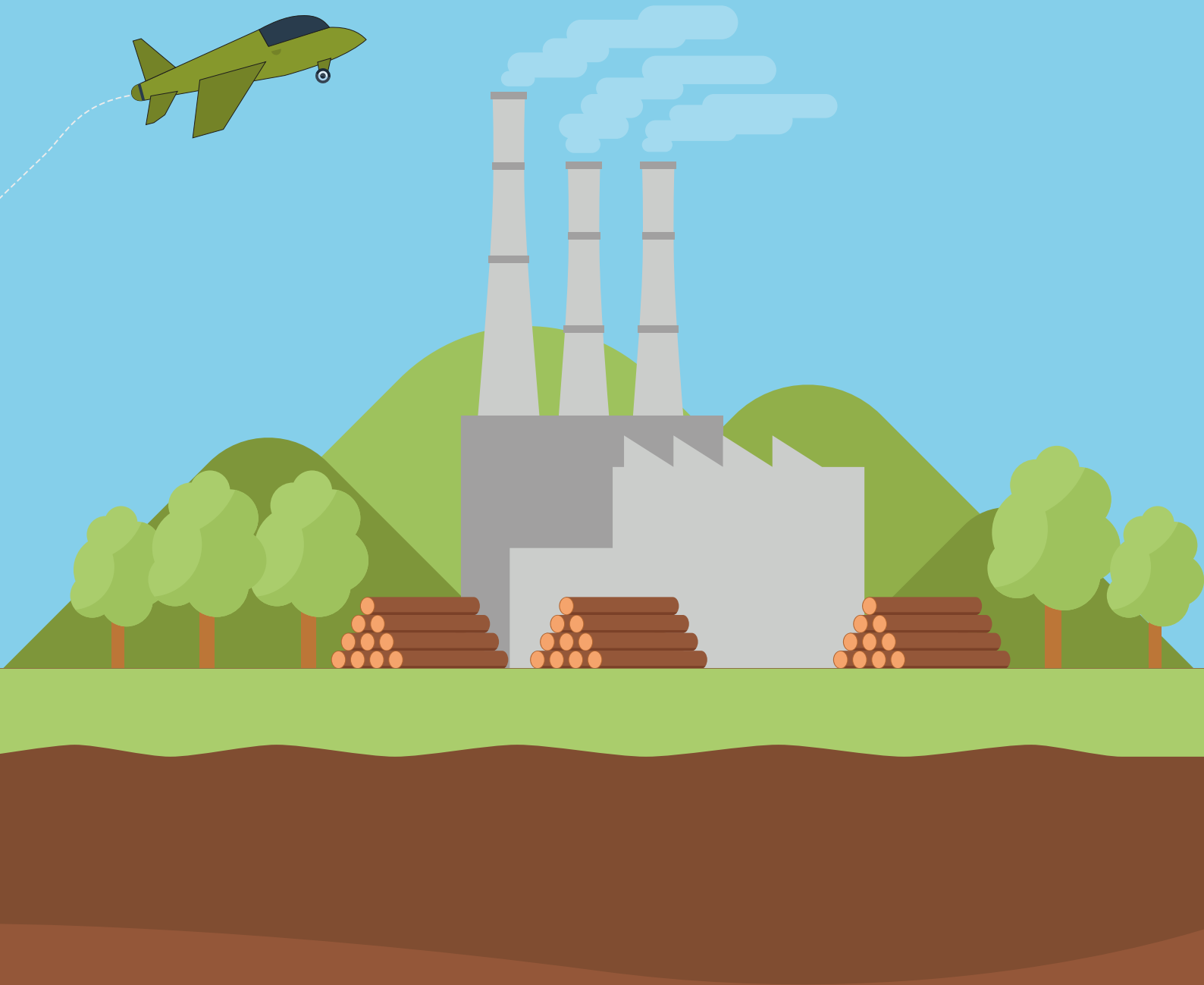
Symmetry – Wind Power

A picture or thing has symmetry when it is the same on both sides. Can you complete the other side of this image to match and complete the wind turbine and the motor shaft?



Biofuels

and other alternatives



Biofuels are used to produce power.

Biofuel is fuel from recently lifeless or living biological material. They are renewable and good substitutes to fossil fuels which are from long dead biological material. Burning fossil fuels is harmful to the environment.

Some biofuels are produced from plants, from waste processes and recycled material.


Ethanol is made from harvested crops. The crops are mixed with liquid and bacteria and left to ferment (or brew) together. Crops can also be used to make biogas.

Biodiesel is made from vegetable oils and liquid animal fats. These oils and fats are mixed with alcohol to make biodiesel.

Biogas is made from methane. Methane is the gas that is released when cows and other animals poo. The animal poo is collected then left to rot in a big container and then the gas is collected.

Picture Rebus

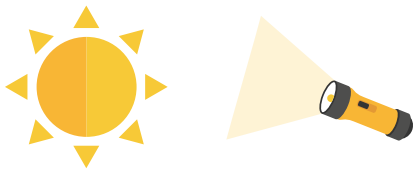
Here is a puzzle to get you thinking. A rebus is a puzzle made up of pictures or symbols. Can you work out what each rebus is?



Greenhouse-gas



4. _____



1. _____



5. _____



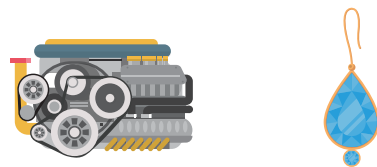
2. _____



6. _____




3. _____



7. _____

Colour by Numbers

Biofuels are part of the solution to the problems of climate change. They can be used to provide energy by harvesting crops, trees and agricultural waste. We can use all of these things to generate heat and electricity or to fuel transport. Can you colour this picture of a field of crops being grown to produce biofuel? Use the colour key as your guide.

- | | | | |
|--|------------------|--|------------------|
|  | 1. Brown |  | 2. Green |
|  | 3. Yellow |  | 4. Orange |
|  | 5. Red |  | 6. Blue |



Break the Net Zero Code

Use the codes to spell out these words.

A	B	C	D	E	F	G	H	I	J
1	2	3	4	5	6	7	8	9	10
K	L	M	N	O	P	Q	R	S	T
11	12	13	14	15	16	17	18	19	20
U	V	W	X	Y	Z				
21	22	23	24	25	26				

-10 = 13	+1 = 10	-4 = 10	=8 = 12
W	I	N	D

-1 = 1	+10 = 19	-7 = 8	-2 = 5	+8 = 9	+4 = 23

+5 = 10	-14 = 6	+4 = 12	+16 = 17	-7 = 7	+2 = 17	-6 = 6

-4 = 15	+11 = 26	+7 = 19	+4 = 5	+2 = 20

How much fuel do we Need?

Can you work out how much fuel is required below?

$$\text{Cow} + \text{Corn} + \text{Fuel Pump} = 15$$

$$\text{Cow} + \text{Corn} = 8$$

$$\text{Cow} + \text{Fuel Pump} =$$

$$\text{Corn} = 3$$

Biofuels Journey

Some biofuels are produced from harvesting plants and used to fuel transport. They are an environmentally friendly substitute for petrol and diesel.

a) Read this story and add up how many litres of biofuel I will use on my journey today. It takes 1 litre of biofuel to travel 10 miles.

It's time to set off for work. From home to work = **10 miles**.
It's lunchtime. From work to café for lunch = **5 miles**. Time to go back to work. From café to work = **5 miles**. Time for some exercise. From work to swimming pool = **5 miles**. Ready for home. From swimming pool to home = **15 miles**.

How many litres of biofuel have I used today? _____

b) Now, read this story and add up how many litres of biofuel I will use on my journey tomorrow. Remember, it takes 1 litre of biofuel to travel 10 miles.

It's going to be a nice day for a picnic. From home to bakery = **2.5 miles**. It will be nice to feed the ducks. From bakery to the park for lunch = **5 miles**. It will be nice to sit and read a book. From park to the library = **2.5 miles**. Even nicer to read in the sunshine. From library back to park = **2.5 miles**. Time for some gardening. From park to home = **7.5 miles**.

How many litres of biofuel have I used today? _____

Tackling Climate Change

Lots of world leaders are committed to working together to agree to a plan to stop climate change by reducing greenhouse gas emissions. This is really important because climate change is damaging our planet.

How many smaller words can you make from the letters in climate change? We have given you three to start you off.

C L I M A T E C H A N G E

<u>AT</u>	<u>THE</u>	<u>HANG</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total number of 2 letter words, 3 letter words, 4+ letter words.



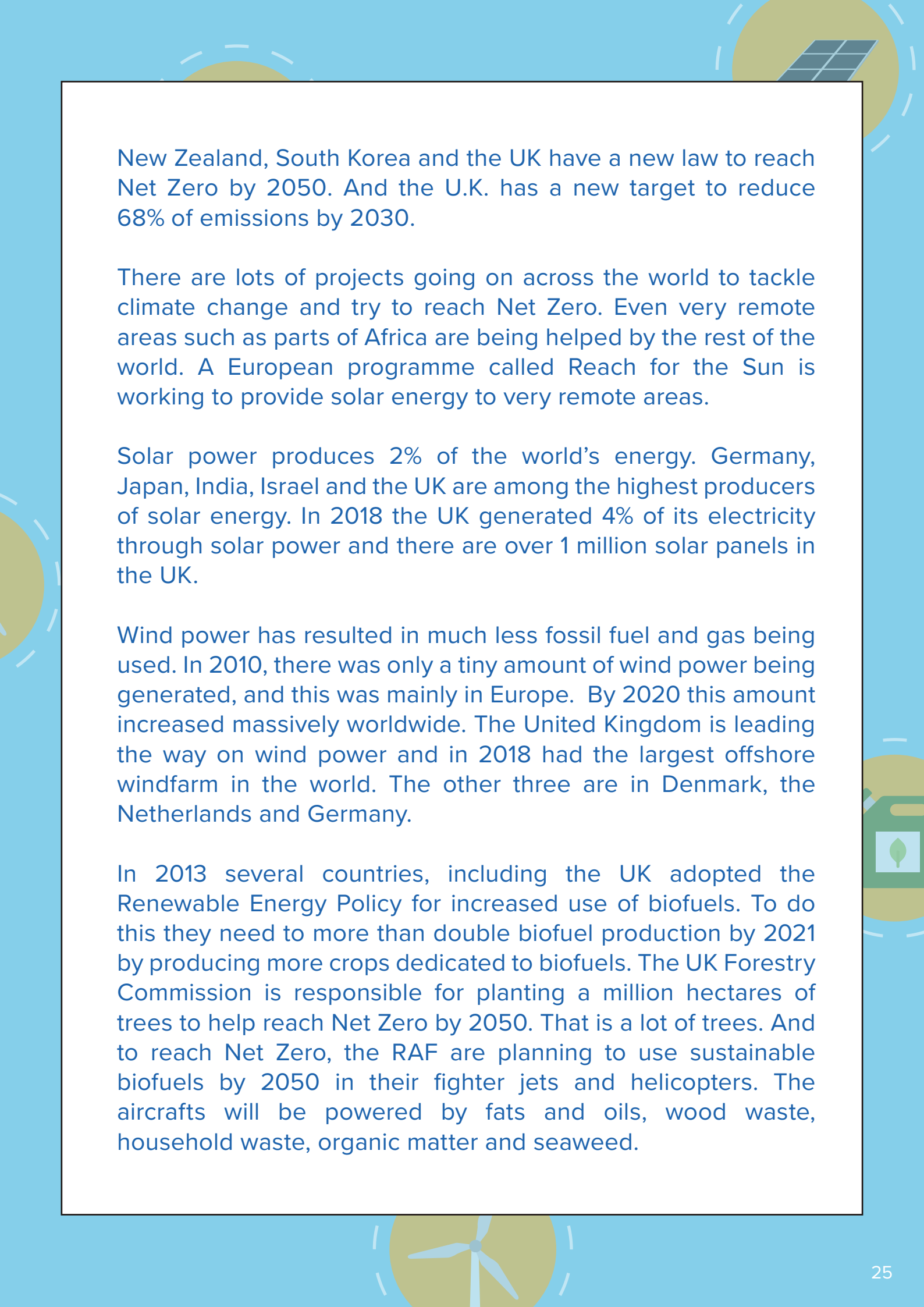
World approach to Net Zero

The Earth has warmed up by 1 degree since the 1700's.

This climate change is damaging our planet. It is creating heat waves, ruining our crops, causing extreme weather and raising sea levels.

COP21 is a meeting of world leaders. They are working together to agree to a plan to stop climate change by reducing greenhouse gas emissions.

In 2020 most countries signed the Paris Climate Agreement to tackle climate change. Several countries, including Europe,



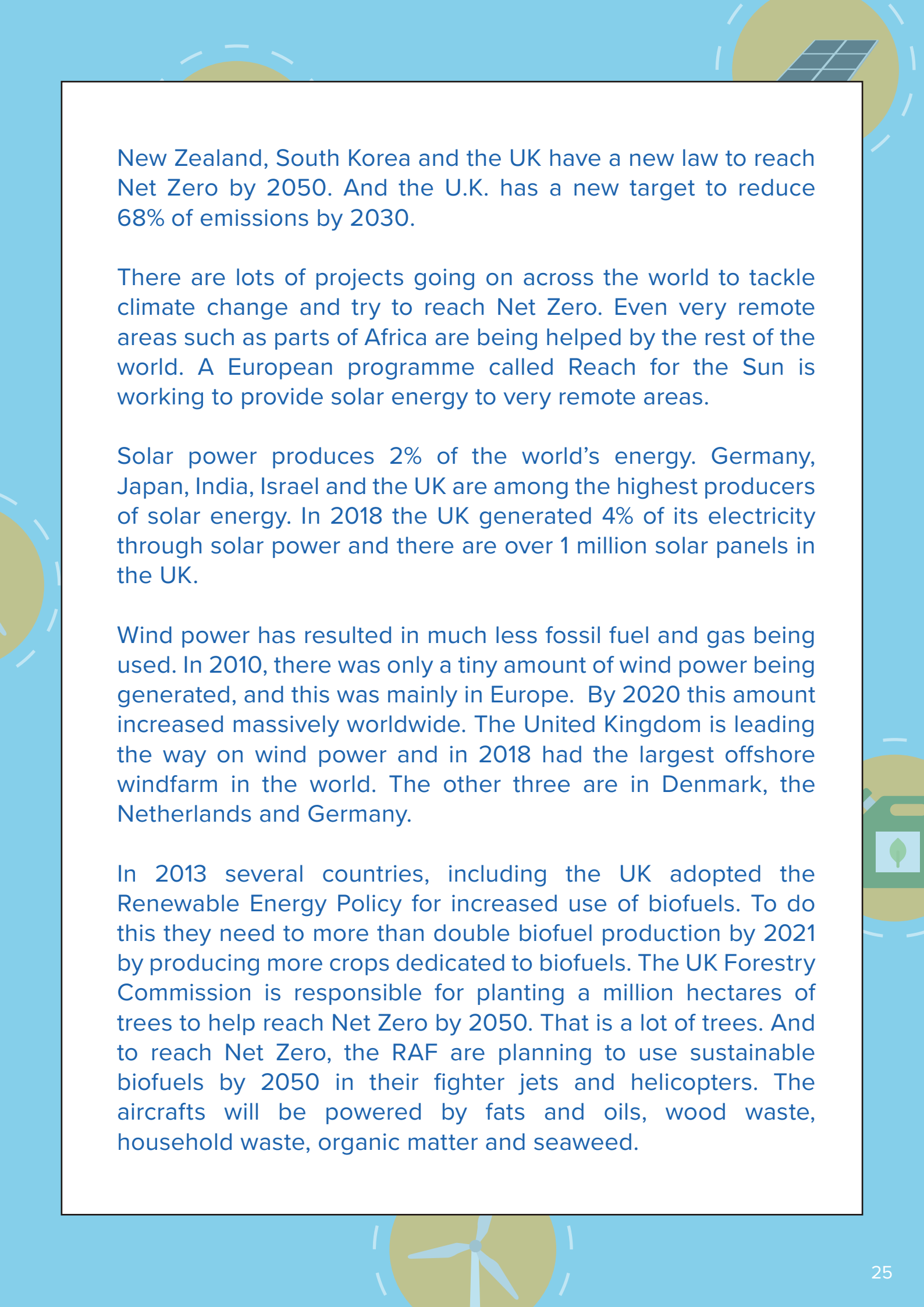
New Zealand, South Korea and the UK have a new law to reach Net Zero by 2050. And the U.K. has a new target to reduce 68% of emissions by 2030.

There are lots of projects going on across the world to tackle climate change and try to reach Net Zero. Even very remote areas such as parts of Africa are being helped by the rest of the world. A European programme called Reach for the Sun is working to provide solar energy to very remote areas.

Solar power produces 2% of the world's energy. Germany, Japan, India, Israel and the UK are among the highest producers of solar energy. In 2018 the UK generated 4% of its electricity through solar power and there are over 1 million solar panels in the UK.

Wind power has resulted in much less fossil fuel and gas being used. In 2010, there was only a tiny amount of wind power being generated, and this was mainly in Europe. By 2020 this amount increased massively worldwide. The United Kingdom is leading the way on wind power and in 2018 had the largest offshore windfarm in the world. The other three are in Denmark, the Netherlands and Germany.

In 2013 several countries, including the UK adopted the Renewable Energy Policy for increased use of biofuels. To do this they need to more than double biofuel production by 2021 by producing more crops dedicated to biofuels. The UK Forestry Commission is responsible for planting a million hectares of trees to help reach Net Zero by 2050. That is a lot of trees. And to reach Net Zero, the RAF are planning to use sustainable biofuels by 2050 in their fighter jets and helicopters. The aircrafts will be powered by fats and oils, wood waste, household waste, organic matter and seaweed.



Log it and Bin it!

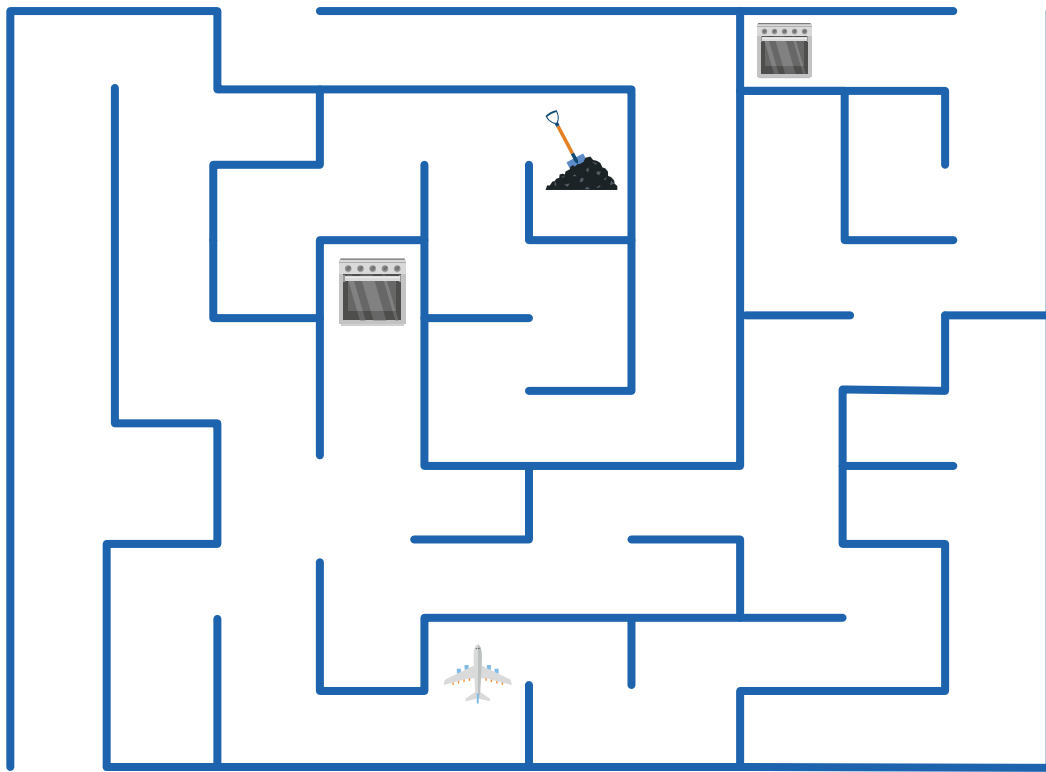
Can you help our planet and make a difference to climate change? Keep a tally record of all the items you recycle one week. You could get your family involved too.

Item	Mon	Tues	Weds	Thurs	Fri	Sat
Plastic Bottle						
Glass Bottle						
Magazine/ Comic						
Newspaper						
Plastic Bag						
Plastic Container						
Food Item						
Cardboard Box						
Tin Can						
Total number of items						

You can keep a list of any other items you have recycled this week too:

Working Together

The world needs to work together as a team to stop climate change. But it is quite difficult. Can you join the team by finding your way out of this maze of problems?



Matching Words

Our carbon footprint is the total amount of greenhouse gases caused by our actions. There are five words beginning with the letter 'R' that we can use to help us to remember the ways to reduce our carbon footprint. These are known as the 5-R's. Can you match the word to the correct definition?

Refuse

Keep your things in great condition and repair or upcycle it when it breaks.

Reduce

Say no thank you to single-use plastics.

Reuse

Set up a compost heap for your food scraps or put them in the food recycle bin.

Rot

Just buy what you really need.

Recycle

Repurpose any plastic, paper, glass or metal.

Can you work out these cryptic clues to find which of the the 5-R's we are describing? Did you know, a cryptic clue is very different to a normal clue. It plays with the sounds and meanings of words.

Here is an example:

PILOT – Yummy *pasty dish*, a *large amount* of it will fly high.

(PIE)

(LOT)

CLUE: It is all about a bike, isn't it? **ANSWER:** _____

CLUE: A colourful fruity drink? **ANSWER:** _____

CLUE: We need to weld this back together again. **ANSWER:** _____

Missing Words

Oh no! Some of the words have been removed from this news report. Can you put each word back in its right place?

NEWS FLASH!

Word List:

road	helicopter	produced	farmers
arrived	vehicle	pollution	electric
planet	friendly	household	

The RAF are helping to save the _____ by reaching for Net Zero.

By 2050 the RAF will replace half their _____ fuel and jet fuel with sustainable sources including biofuels. These include fats, wood waste, alcohol, sugars, biomass and _____ waste.

Biogas will be _____ at RAF Marham using local crops to provide 95% of their energy needs. And the waste will then be used by local _____ as fertiliser for more crops.

A fleet of environmentally _____ vehicles have _____ at RAF

Leeming and RAF Wittering, a fantastic start to their Ultra Low Emissions _____ programme.

RAF Leeming is the first RAF station with rapid charging pods. They are at the forefront of reducing _____ by removing diesel vehicles from the _____.

The Ministry of Defence, including the RAF has set a target to have _____ vehicles making up 25% of its non-military vehicles. Further news updates will be announced later.





What can I do?

We know there are lots of things that contribute to climate change. And you may ask yourself how you can help. It feels like a mountain to climb. But if everybody does something, we can pull together as a team and reach our goal of stopping climate change. Here are a few of the problems linked to climate change. Can you come up with some ideas for each of these problems that you can do?



Throwing away all our rubbish _____

Burning of fossil fuels _____

Cutting down trees _____

Driving petrol and diesel cars _____

Making and using plastics _____

Tangles

There are lots of projects happening across the world to try to stop climate change.

Can you follow the blue/thin lines to find the pairs? And can you follow the yellow/thick lines to see where they all lead?



Wordsearch

Can you find the words in the list that are all related to this. The words can read across, down or diagonally.

N	E	C	V	C	O	N	T	I	N	E	N	T	S
A	P	E	B	H	J	T	P	D	N	Y	W	U	N
D	R	U	S	L	E	A	D	E	R	S	M	H	O
W	O	R	L	D	H	D	Q	K	A	M	B	H	I
C	G	O	P	K	A	A	T	S	I	E	C	S	S
C	R	P	C	O	M	M	I	T	M	E	N	T	S
B	A	E	Q	R	E	A	W	L	N	T	P	A	I
G	M	D	N	B	R	I	T	A	I	N	F	R	M
T	M	V	A	E	I	S	O	B	G	E	R	G	E
E	E	R	T	D	C	G	Y	O	M	M	Y	E	V
A	F	R	I	C	A	Y	Z	L	Q	E	U	T	T
A	D	W	O	C	P	R	O	G	R	E	S	S	G
M	D	H	N	L	W	Q	T	H	I	R	A	S	E
T	A	E	S	J	I	C	H	A	N	G	E	E	A
H	B	H	J	T	P	E	N	Y	M	A	X	W	Y

Europe Summit Commitment Global Emissions Africa
 Asia Progress Nations Britain Continents
 America Programme Target Leaders Change

Word Wise

Can you match these words with their definitions? Draw a line to connect the pairs.

Sustainable Fuel

A fuel supply that is able to be kept at a certain level

Solar power

The distance food is transported

Wind power

To reuse something for a better purpose

Net Zero

The conversion of energy from sunlight to electricity

Recycle

To use again for the same or a different purpose

Emissions

Fuel from recently lifeless or living biological material

Food miles

Energy that is generated directly from the wind.

Upcycle

The total amount of greenhouse gases caused by our actions.

Carbon footprint

The production and flow out of gases

Biofuel

The balance between the amount of greenhouse gas emitted into the atmosphere and the amount removed

Net Zero Quiz

Using everything you now know about Net Zero can you have a go at our quiz. See how many you get right.

1. Can glass bottles be recycled?

- a) Yes
- b) No
- c) Only in cities
- d) Only brown glass

2. What goes into a kitchen waste bin?

- a) Plastic packaging
- b) Tins
- c) Food waste
- d) Paper

3. What does the word biofuel mean?

- a) A fuel made from living or recently living biological matter
- b) Two fuels mixed together
- c) Biological washing powder
- d) Any household fuel

4. What chemical is contributing to climate change?

- a) Carbon dioxide
- b) Oxygen
- c) Helium
- d) Nitrogen

5. What do we mean by Net Zero?

- a) No goals scored
- b) Reaching the balance between greenhouse gas emitted and gas removed
- c) The name of an RAF jet
- d) No fish caught

6. What is solar power?

- a) Energy created by capturing the sun's rays
- b) Another name for a light bulb
- c) Energy created by capturing the moonlight
- d) A single use battery

7. What is wind power?

- a) Wind created by a fan
- b) Energy created using the wind
- c) Clockwork energy
- d) Warm air used to dry laundry

8. By when does the UK want to achieve Net Zero?

- a) 2050
- b) 2025
- c) 2035
- d) 2060

9. How long can a TV be powered by a recycled aluminium pop can?

- a) 90 minutes
- b) 3 hours
- c) 20 minutes
- d) 5 hours

**10. How many trees are saved by recycling 1 ton of paper?
(Did you know, a small car weighs 1 ton?)**

- a) 17
- b) 4
- c) 53
- d) 21

11. How many degrees has the Earth warmed up since the 1700's?

- a) 2 degrees
- b) 1 degrees
- c) 0.5 degrees
- d) 0.2 degrees

12. The RAF is aiming to replace how much of its aircraft fuel by 2050?

- a) Quarter
- b) Half
- c) Third
- d) Three-quarters

Our Beautiful Planet









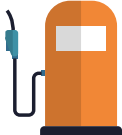







We live on a beautiful planet, and we want it to stay that way. Decorate this map of the world, use your imagination to make it as attractive as you can.



Cut Out and Keep Bookmarks

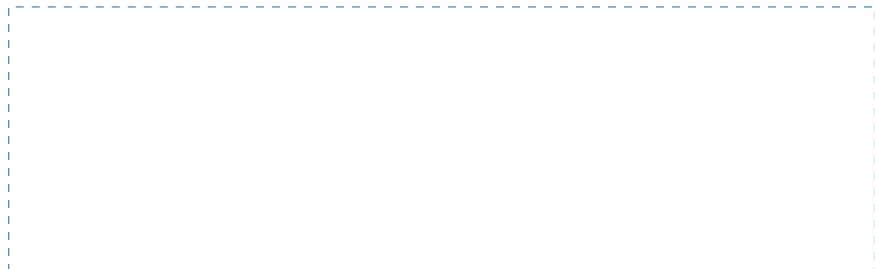
Here are some bookmarks for you to cut out and colour. There is a space for you to design your own too.

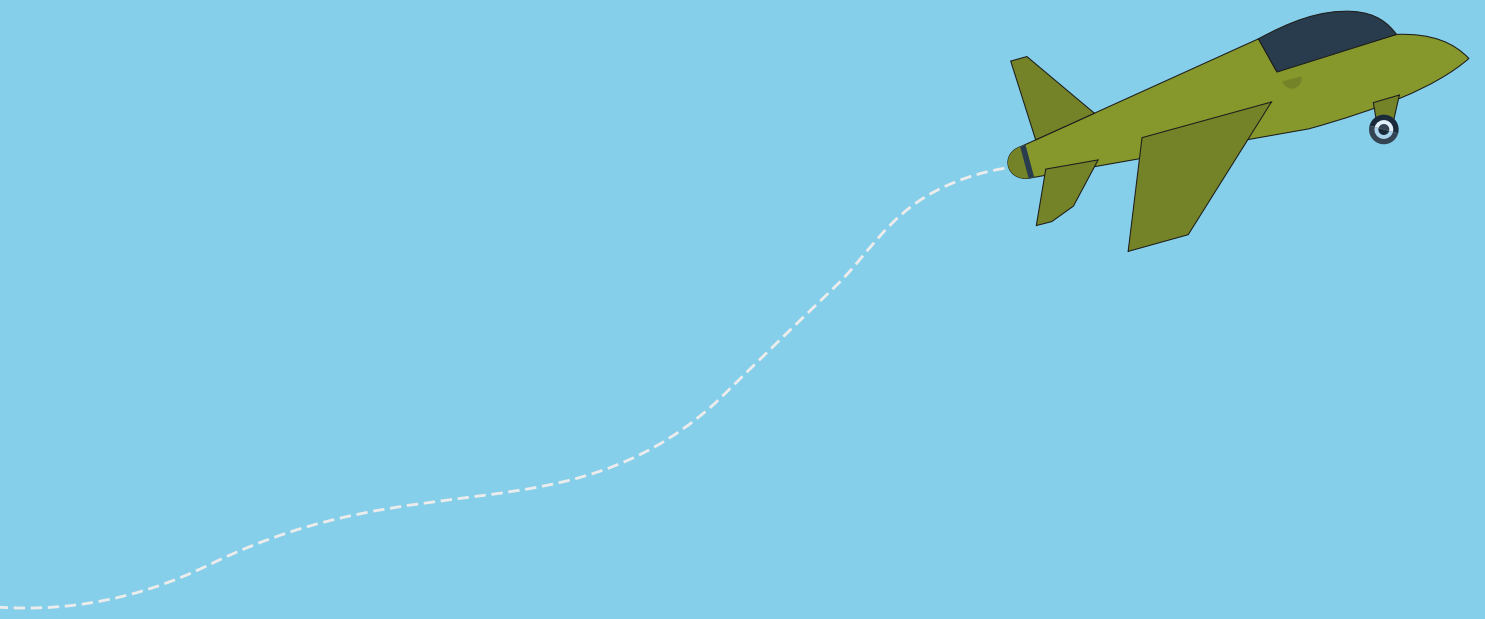


POLLUTION	SOLAR POWER	BIOFUELS	WIND POWER
			
			
			
			



**Design
your own!**







**Certificate of
completion awarded to
a Net Zero expert**

Awarded to:

.....

Pupil at:

.....

Dated:

.....

Page 23 Tackling Climate Change

2 letter words:

- AN
- IN
- AT
- IT

3 letter words:

- GET
- MAT
- HAT
- LEG
- TEA

4+ letter words:

- MECHANICAL
- CHIN
- CALM
- METAL
- ANGEL
- CLAM
- TECHNICAL
- MEGA TECHNICAL
- CLAIM
- MAGICAL
- MAGNET
- NIGHT

Page 28 Matching Words

REFUSE - Say no thank you to single-use plastics.

REDUCE - Just buy what you really need.

REUSE - Keep your things in great condition and repair or upcycle it when it breaks.

ROT - Set up a compost heap for your food scraps or put them in the food recycle bin.

RECYCLE - Repurpose any plastic, paper, glass or metal.

Cryptic:

Recycle – It is all about a bike, isn't it?
Reduce – A colourful fruity drink?

Refuse – We need to weld this back together again.

Page 29 Missing Words

THE RAF ARE HELPING TO SAVE THE PLANET BY REACHING FOR NET ZERO

By 2050 the RAF will replace half their **HELICOPTER** fuel and jet fuel with sustainable sources including biofuels. These include fats, wood waste, alcohol, sugars, biomass and **HOUSEHOLD** waste.

Biogas will be **PRODUCED** at RAF Marham using local crops to provide 95% of their energy needs. And the waste will then be used by local **FARMERS** as fertiliser for more crops.

A fleet of environmentally **FRIENDLY** vehicles have **ARRIVED** at RAF Leeming and RAF Wittering, a fantastic start to their Ultra Low Emissions **VEHICLE** programme.

RAF Leeming is the first RAF station with rapid charging pods. They are at the forefront of reducing **POLLUTION** by removing diesel vehicles from the **ROAD**.

The Ministry of Defence, including the RAF has set a target to have **ELECTRIC** vehicles making up 25% of its non-military vehicles.

Further news updates will be announced later.

Page 30 What Can I Do?

Some examples:

- Throwing away rubbish
- Separate into correct recycle bins
- Do the 5 R's
- Burning of fossil fuels
- Use environmentally friendly fuels
- Walk more
- Cutting down trees
- Plant more trees
- Use less paper
- Driving petrol and diesel cars
- Change to electric vehicles
- Use bio friendly public transport

Making and using plastics
 - Recycle old plastic
 - Don't buy single use plastic

The balance between the amount of greenhouse gas emitted into the atmosphere and the amount removed – Net Zero

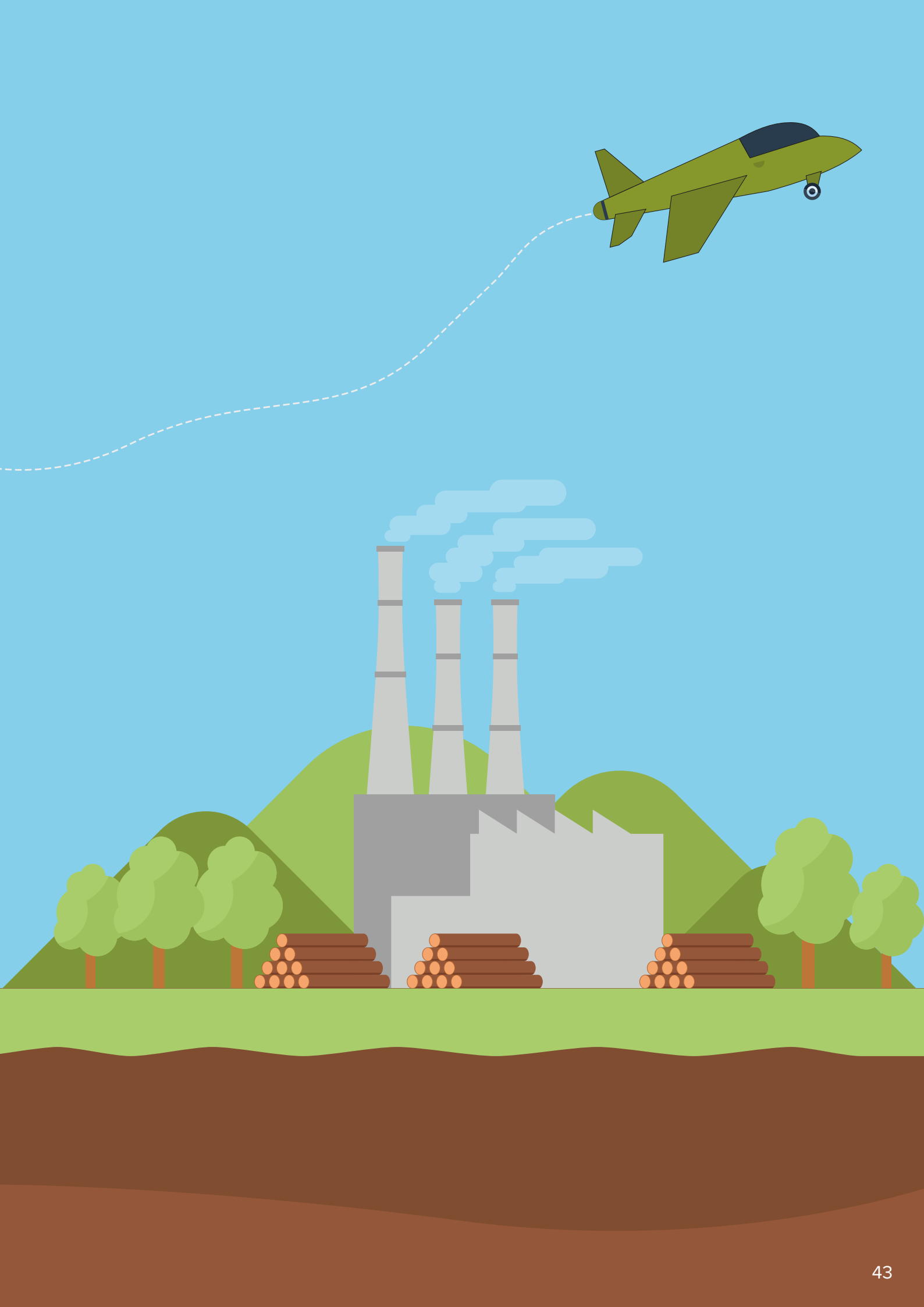
Page 32 Wordsearch

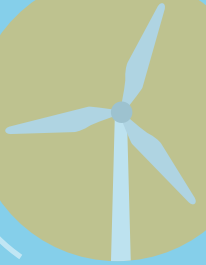
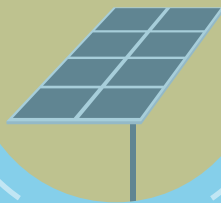
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- 5. b
- 6. a
- 7. b
- 8. a
- 9. b
- 10. a
- 11. b
- 12. b

Page 34 Net Zero Quiz

A fuel supply that is able to be kept at a certain level – Sustainable fuel
 The distance food is transported – Food miles
 To reuse something for a better purpose - Upcycle
 The conversion of energy from sunlight into electricity – Solar power
 To use again for the same or a different purpose - Recycle
 Fuel from recently lifeless or living biological material – Biofuel
 Energy that is generated directly from the wind – Wind power
 The total amount of greenhouse gases caused by our actions – Carbon footprint
 The production and flow out of gases - Emissions





Net Zero

Activity Book

