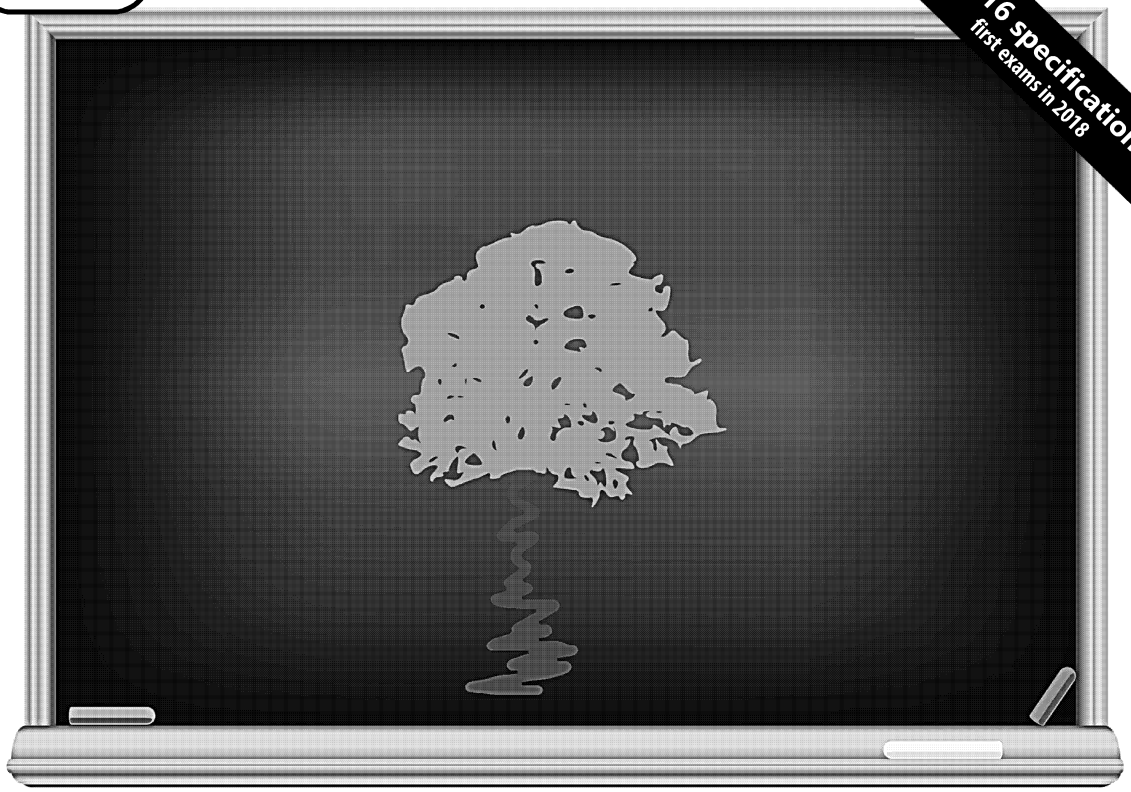
Zig Zag Education

Geography

GCSE

2016 specification
first exams in 2018



GCSE Geography Emergency Cover Lessons

Volume 3

zigzageducation.co.uk

POD 9539

Contents

Teacher's Introduction

As a former Geography teacher and Head of Humanities for many years, I know the value of a ready-to-go resource for GCSE cover lessons! This resource is designed as a 'dip-in', with lessons spread across eight key themes of geography: Hazards, Climate, Ecosystems and UK Landscapes (for the physical elements), and Urbanisation, Development, the UK, and Natural Resources (to cover the human aspects).

A lot of the time, cover lessons unfortunately come down to a revision guide, and the instruction to 'make notes' then answer questions. While revision guides have good diagrammatic information, they don't provide sufficient depth or include any extension, and students know that often no one will find time to mark the work they are doing. With this resource, however, the marking and feedback cycle could be completed within the lesson, while any additional activities can be set for homework.

The resource provides meaningful and stimulating learning during periods of cover, allowing students to apply their knowledge and practise key skills while progressing within the topic area they are studying. For a teacher, being able to decide at the last minute the lesson to be studied – and knowing that their class is on-task during an unplanned absence – is a godsend!

This resource is one part of a set of four volumes which are available in this Emergency Cover Lessons range for GCSE Geography. The full index of lessons for all four volumes is given on the following pages, cross-referencing each lesson to the exam board specifications for which it is suitable. The content within this volume is presented distinctly from that of the others.

Each volume contains lessons in every theme. Broadly, each volume builds upon the foundations and content in previous volumes. With this structure, Volume 1 is perfect for providing cover early on in a topic teaching block, or as consolidation of the basics at a later stage in the topic. Lessons in Volume 4 might be more suitable towards the end of a block of teaching, or to stretch and challenge students in a top set!

The lessons in all volumes have been designed for non-specialist use and independent student study, allowing any cover teacher the opportunity to photocopy the relevant sheets, distribute these to the class, and offer minimal support throughout the lesson. A specialist Geography teacher may, of course, decide to be more hands-on with the delivery of the lesson.

I hope you find this resource, and indeed the full set of volumes, useful in your school!

February 2019

Lesson Index by Volume/Specification – Physical Geography

Lessons	Volume	AQA	Edexcel A	Edexcel B	OCR A
Theme 1: Natural Hazards					
What causes extreme weather? (I)	1	✓	✓	✓	✓
What causes extreme weather? (II)	1	✓	✓	✓	✓
Tropical storms: Formation & Distribution (I)	2	✓	✓	✓	✓
Tropical storms: Formation & Distribution (II)	2	✓	✓	✓	✓
Tropical storms: Impacts & Mitigation (I)	3	✓	✓	✓	✓
Tropical storms: Impacts & Mitigation (II)	3	✓	✓	✓	✓
Extreme weather in the UK (I)	4	✓	✓	✓	✓
Extreme weather in the UK (II)	4	✓	✓	✓	✓
Tectonics: Earth structure and processes (I)	1	✓		✓	
Tectonics: Earth structure and processes (II)	2	✓		✓	
Impacts of earthquakes	3	✓		✓	
Mitigation and prediction of earthquakes	4	✓		✓	
Impacts of volcanoes	3	✓		✓	
Mitigation and prediction of volcanic eruptions	4	✓		✓	
Theme 2: Climate Change					
Natural climate change: Patterns, causes, evidence	1	✓	✓	✓	✓
Human causes of climate change	2	✓	✓	✓	✓
Impacts of climate change	3	✓	✓	✓	✓
Mitigation and adaptations for climate change	4	✓	✓	✓	✓
Theme 3: Ecosystems					
What are ecosystems and biomes? (I)	1	✓	✓	✓	✓
What are ecosystems and biomes? (II)	1	✓	✓	✓	✓
Tropical Rainforest: Structure & characteristics	2	✓	✓	✓	✓
Tropical Rainforests: Deforestation	3	✓	✓	✓	✓
Tropical Rainforests: Sustainable management	4	✓	✓	✓	✓
Theme 4: UK Physical landscapes					
Coastal processes (I)	1	✓	✓	✓	✓
Coastal processes (II)	2	✓	✓	✓	✓
Coastal landforms	3	✓	✓	✓	✓
Human activity and management of coasts	4	✓	✓	✓	✓
River processes	1	✓	✓	✓	✓
River landforms	2	✓	✓	✓	✓
Human activity and management of rivers (I)	3	✓	✓	✓	✓
Human activity and management of rivers (II)	4	✓	✓	✓	✓
Glacial processes and landforms	1	✓	✓		
Human activities in glaciated landscapes	2	✓	✓		

Lesson Index by Volume/Specification – Human Geography

Lessons	Volume	AQA	Edexcel A	Edexcel B	OCR A
Theme 5: Urbanisation					
What is urbanisation?	1	✓	✓	✓	✓
Megacities	2	✓	✓	✓	✓
Lagos: A case study	2	✓	✓	✓	✓
How cities change	3	✓	✓	✓	✓
UK Regeneration: A case study	3	✓	✓	✓	✓
Sustainable living in cities	4	✓	✓	✓	✓
Liuzhou Forest City, China: A case study	4	✓	✓	✓	✓
Theme 6: Development					
What is development?	1	✓	✓	✓	✓
How is development measured?	1	✓	✓	✓	✓
Development theories	2	✓	✓	✓	✓
Uneven development	2	✓	✓	✓	✓
Globalisation and trade (I)	3	✓	✓	✓	✓
Globalisation and trade (II)	3	✓	✓	✓	✓
Development strategies and aid (I)	4	✓	✓	✓	✓
Development strategies and aid (II)	4	✓	✓	✓	✓
Theme 7: The UK					
Physical distinctions of the UK (I)	1	✓	✓	✓	✓
Physical distinctions of the UK (II)	1	✓	✓	✓	✓
Population change & demographics in the UK	2	✓	✓	✓	✓
Migration in the UK	2	✓	✓	✓	✓
Employment change in the UK	3	✓	✓	✓	✓
UK & the wider world (I)	4	✓	✓	✓	✓
UK & the wider world (II)	4	✓	✓	✓	✓
Theme 8: Natural Resources					
What are natural resources? (I)	1	✓	✓	✓	✓
What are natural resources? (II)	2	✓	✓	✓	✓
Food (I)	3	✓			
Food (II)	4	✓			
Energy (I)	3	✓	✓	✓	✓
Energy (II)	4	✓	✓	✓	✓
Water (I)	3	✓	✓		
Water (II)	4	✓	✓		

To order additional volumes call us on 0117 950 3199:

- **Vol 1**: ZZBR/9203 – 15 Lessons
- **Vol 2**: ZZBR/9204 – 15 Lessons
- **Vol 3**: ZZBR/9539 – 16 Lessons
- **Vol 4**: ZZBR/9540 – 17 Lessons

Tropical storms: Impacts & mitigatio

	Description
Task 1	Identify potential primary and secondary effects of tropical sto
Task 2	Report on a tropical storm

In this lesson you will:

- ✓ study photographs to identify its primary and secondary effects)
- ✓ report on the effects of a tropical storm

Task 1

Study the two aerial photographs below. Both were taken above New Jersey befo in 2012. The hurricane brought high winds and rainfall, as you would expect, and a

One photograph shows a residential area, and the other shows a commercial distr

The effects of a tropical storm can be divided into two categories. **Primary effects** occur during the storm and **secondary effects** occur afterwards and are a result of the primary effects.

The effects can also be divided into **social** (affecting people), **economic** (affecting financial systems) and **environmental**.

In this task, you will suggest what the primary and secondary effects might be, and whether each will be social, economic or environmental. Some may fall into several categories – for example, flooding could affect houses (social), businesses (economic) and the environment.

Fill in as much of the table below as you can.

Hazard (e.g. rainfall, high winds, storm surge)	**Primary effects**			
	Social	**Economic**	**Environmental**	

Task 2

The photographs below show the same areas as the two images in Task 1. Study
damage caused by the storm.

Below are four different people. Your task is to suggest their viewpoints to the sto
week after the storm. Think about how they are affected by the storm – their loss

One day after the storm

The news reporter

(reporting generally about the storm)

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The homeowner

(the family members have been evacuated from their home but don't know whether it's been damaged)

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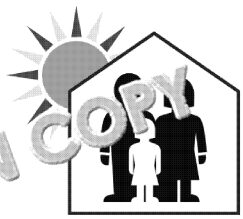

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The business owner

(he ow o tourist attraction)

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The aid worker

(assessing the damage)

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	Description
Task 1	Plan immediate and long-term responses to a tropical storm
Task 2	Suggest how planners could prepare for a tropical storm

In this lesson you will:

- ✓ plan immediate and long-term responses to the storm
- ✓ consider how tropical storms can be prepared for

Task 1

Once a storm has passed, there are lots of things that need to be done to return t

These are called 'responses', and they fall into two categories – immediate and lo

The immediate responses happen in the days after the storm – for example: secur ensuring that citizens are safe; and providing healthcare, food and water.

The long-term responses take place in the months and years after the storm, rebu the next storm!

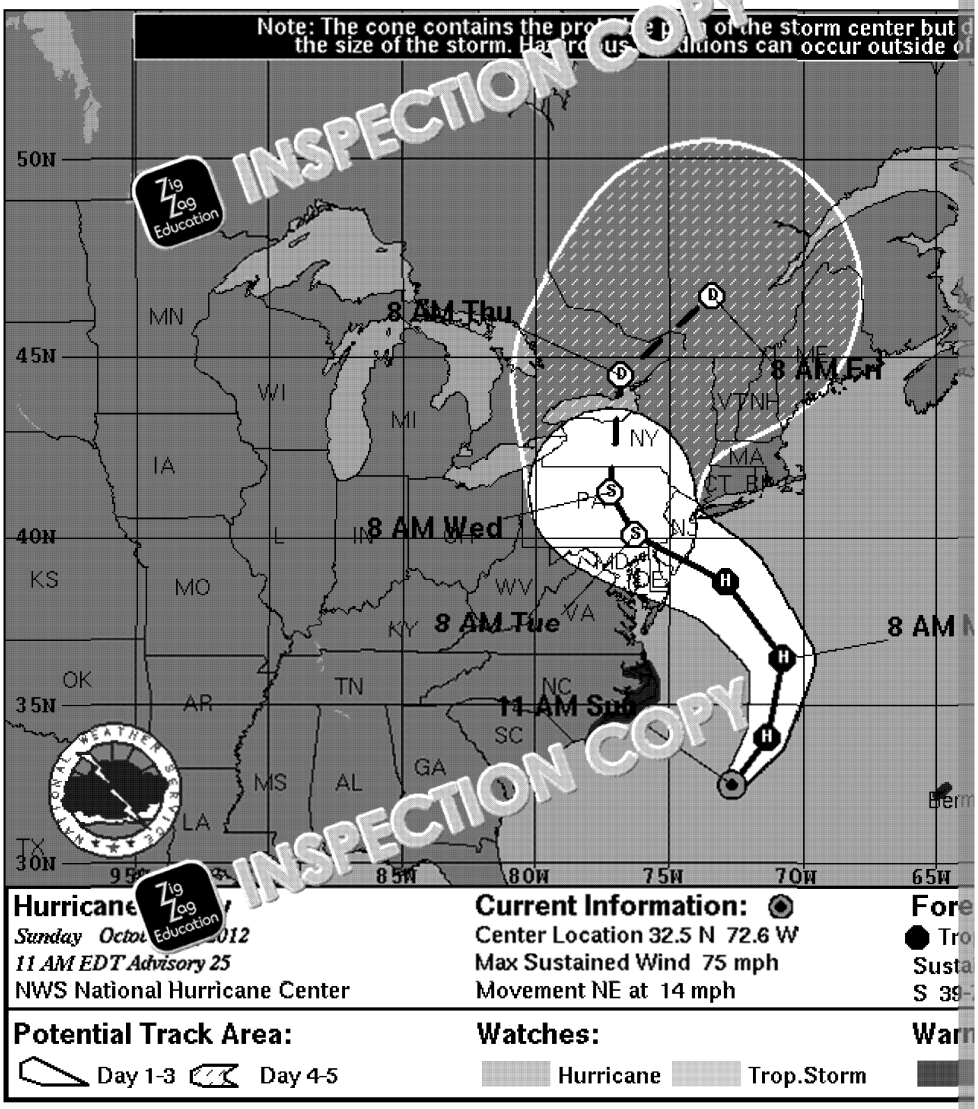
Imagine you are a city planner and you have been given the job of working out wh tropical storm. Write two 'to do' lists – one for the immediate responses, and one For each list, give some detail on how it will be achieved – who will action it (e.g. g emergency services), and where will the money come from (e.g. national, local, a

Immediate Responses

Long-term Responses

Task 2

Tropical storms can be predicted to an extent. We can track a storm's movement landfall will be made – although storms can be unpredictable and there is less cer storm is. This is why the area potentially affected gets larger! Therefore, warning in place to protect an area from a storm. Below is a prediction for Hurricane Sand



Imagine that you are a news reporter. Report to what extent a community could the eastern coast of the United States.

Suggested topics could include:

- Evacuation
- Preparing houses (storm shutters, etc.)
- Food and water supplies
- Telling your family where you are

Friday morning

Monday morn

Impacts of earthquakes

	Description
Task 1	Consider what is a primary effect and what is a secondary effect of
Task 2	Explain why responses are immediate or long-term
Task 3	Assess why the effects of earthquakes vary around the world
Task 4	Assess why people live in hazardous areas

In this lesson you will:

- ✓ explain why different consequences of an earthquake can be classified as pri
- ✓ explain the differences between immediate and long-term effects
- ✓ assess why the effects of earthquakes vary
- ✓ make a decision – would you live in a hazardous area?

Task 1

1. The effects of an earthquake can be divided into two categories – primary an

   Primary effects occur during the earthquake. Secondary effects occur becau therefore, occur afterwards – sometimes after a considerable delay. Someti work out which are the primary effects and which are the secondary effects.

   Your task is to complete the sentences below using the words from the table

secondary	accommodation	gas	prevent	collapse
tsunami	shakes	primary	sparks	food

While the ground ______ _______________, damage occurs; for example, buil

injuring or killing people, or injuring people from falling rubble outside the bu

to a re... may be lost, __________ and water pipes fractured, and infrastru

stoves may be overturned. These are all _____________ effects.

However, there are serious consequences from these effects. These are the

For example, rubble covering the roads can ____________ emergency servi

teams from accessing an affected area.

Further problems may occur where communications and power are lost, ha

Destroyed or damaged homes stop people from returning home – they may

______________ or shelters.

Remember those broken gas pipes? ____________ from damaged power cabl

start from an overturned ____________. Food supplies might have been l

that malnutrition may become a problem, or people might be reliant on supp

effects of a major earthquake might last for ___________ – businesses may

tourists, and families may have problems adjusting to new lives. If the earth

______________ may be triggered. The ______________ of an earthquake

2. The effects can be divided into three categories – social, economic and enviro
see the first two combined into 'socio-economic'.

The social effects impact people, the economic effects impact financial syste
impact… the physical surroundings.

Below are some different effects. You need to decid[illegible]ich are social, which
environmental. Choose a way of indicating e[illegible]of effect – for example
underline them in different colours [illegible] different boxes around them.

Injuries and fatalities

Cost of rebuilding homes, businesses and infrastruct

Flooding from liquefaction

Damaged business premises

Damaged government buildings

Homelessness

Malnutrition

Spread of disease

Landslides

Tsunami damage

Task 2

The responses to earthquakes can eith[illegible]mediate or long-term. Immediate
after an earthquakes occurs.

Below are s[illegible]esponses to earthquakes. Explain why each is either immediate

Immediate

Search and rescue	
Emergency aid and shelter	
Healthcare	

Long-term

Rebuild	
Planning	
Implementation of warning systems	

Task 3

The data below covers two recent earthquakes – affecting countries at different le
effects – for example, the earthquake off the coast of Japan caused a major tsuna
factors that determine the damage caused by an earthquake.

Nepal 11:56 local time on Saturday 25th April 2015 – 7.8 M

International aid:	US$415 million from aid appea
Deaths in Nepal:	8,969
Injured in	17,866
Missing in Nepal:	384
People requiring assistance:	2.8 million
Houses damaged:	284,482
Houses destroyed:	602,592
Economic cost:	US$5 billion

Japan 14:46 local time on Friday 11th March 2011 – M_w and triggered a tsunami

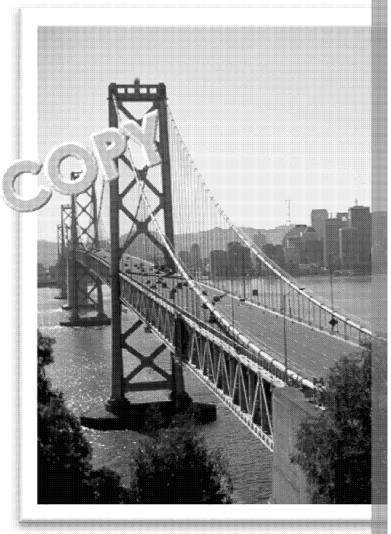
International aid:	Don ffered from 116 co the Japanese Red Cross
Deaths and missing people:	22,000 (unofficial, mainly from
Deaths (offi Ap	15,894
Injured (of April 2015):	6,152
Missing (official, April 2015):	2,562
Number of people evacuated:	465,000
Living in temporary houses:	230,000 (2015 figure)
Houses damaged:	273,000 partially collapsed and
Houses destroyed:	130,000
Economic cost:	Estimates centre around US$30

Using the data above, any knowledge th have, and any available research m
consider how the following might a damage caused by an earthquake:

- Magnitude of the
- Type o / focus depth
- Proxim e epicentre
- The day of the week and the time of day or year
- The economic status of the country
- The quality of the housing / age of housing
- Housing density

Task 4

In 1906, much of the city of San Francisco was destroyed by an earthquake. The city was rebuilt on the ruins of the old city, during a period when there were no major earthquakes in the region. The city has experienced quakes since 1979, shown below.



Year	Magnitude
1979	5.0
1980	5.0
1984	6.3
1989	7.1
2001	5.1
2007	5.6

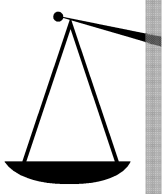
Imagine that you are living in San Francisco. You grew up in the region, and enjoy good job, a nice house, and you and your family are settled in the region.

Draw up a table of the advantages of living in the area – and the risks that you tak disadvantages that you might have if you moved?

Advantages	

Now you must decide whether you wish to remain living in San Francisco. Write side of the scale, depending on your choice.

Give a brief explanation for your choice – which factor swa your decision?



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Impacts of earthquakes answers

Task 1

1. While the ground **shakes**, damage occurs; for example, buildings **collapse** – trapping, injuring people from falling rubble outside the building. Power and phone lines to a pipes fractured, and infrastructure destroyed. Cooking stoves may be overturned. T

   However, there are serious consequences from these effects. These are the **seconda** For example, rubble covering the roads can **prevent** emergency services and search affected area.

   Further problems may occur where communications and power are lost, hampering damaged homes stop people returning home – they may need to be housed in shelters.

   Remember broken gas pipes? **Sparks** from damaged power cables could start overturned **stove**. Food supplies might have been lost in the earthquake, meaning th problem, or people might be reliant on supplies of **food** aid. The effects of a major e businesses may not recover, there may be fewer tourists, and families may have pro earthquake occurred offshore, then a **tsunami** may be triggered. The **cost** of an eart

2. - Injuries and fatalities **(social)**
   - Cost of rebuilding homes, businesses and infrastructure **(economic)**
   - Flooding from liquefaction **(environmental)**
   - Damaged business premises **(economic)**
   - Damaged government buildings **(economic)**
   - Homelessness **(social)**
   - Malnutrition **(social)**
   - Spread of disease **(social)**
   - Landslides **(environmental)**
   - Tsunami damage **(environmental)**

Task 2

Immediate

Search and rescue	Trapped people need rescuing quickly – the longer after the finding anyone alive.
Emergency shelter	People are suddenly homeless and need food and water! Th must be provided immediately.
Healthcare	Injuries need to be treated quickly – both for the well-being further complications.

Long-term

Rebuild	This can take a long time – sometimes years for a major even builders, too!
Planning	After an earthquake, a city can be zoned based on risk, and d for different levels of risk. Building requirements can also be take a long time.
Implementation of warning systems	Planning for the next event – too late for the current earthqu

Task 3

- The greater the magnitude, the greater the potential for damage.
- Deep-focus earthquakes occur at destructive plate boundaries and are often more powe which occur at constructive boundaries. Shallow-focus earthquakes can cause considera
- If a settlement is located close to the epicentre, the damage will be greater than if the
- Day of the week – children may be at school or workers in the workplace, vs at home, than on days. A single collapse of a large building could endanger hundreds of li people more likely to be outside, e.g. during a harvest season.
- Developed countries are likely to have high-quality buildings, which may have been d Countries with older structures might be more at risk.
- Dense, urban areas – especially those with high-rise buildings, may be more at risk th buildings due to the collapse of buildings onto others.
- Allow any inferences from the data provided, based on the economic statuses of the effects of a tsunami can be quite different from those of a standard earthquake.

Impacts of volcanoes

	Description
Task 1	Consider what is a primary effect and what is a secondary effect of a vo
Task 2	Explain why responses are immediate or lo rm
Task 3	Assess why the effects of volcanoes va and the world
Task 4	Assess why people live i haz us areas

In this lesson you will:

- ✓ explain how the consequences of a volcanic eruption can be classified a
- ✓ explain the differences between immediate and long-term effects
- ✓ assess why the effects of volcanoes vary
- ✓ make a decision – would you live in a hazardous area?

Task 1

1. The effects of a volcanic eruption can be divided into two categories – primar effects occur during the eruption. Secondary effects occur because of the pr occur afterwards – sometimes after a considerable delay. Sometimes it can b which are the primary effects and which are the secondary effects.

   Your task is to complete the sentences below, which explain whether the eff

   The effects of a volcanic eruption can be spectacular – but incredibly danger

   _____ effects are easy to see – for example, a flow of red-h volcano, which _____ everything in its path, to high plume from the volcano's crater, which can blanket the surrounding countryside in such as bombs and _____ can be ejected and hurtle throug hazardous pyroclastic flow, where

   _____

   An invisible primary hazard is the release of invisible _____ can suffocate a whole valley.

   There are many secondary effects. The most visible are probably lahars and _____ which can bury houses. They are caused when _____ ash deposits. Sometimes a volcano will erupt with an ice cap on top. The hea ice, which causes _____ (and can also cause lahars). Such Iceland – which is why there is an Icelandic word – jökulhlaup – but we use it

   There are also other secondary effects – the ash falls can cause health proble to _____, kill crops and livestock, and pollute _____ to homes. There is the potential for malnutrition and poor sanitary conditions. impact on the _____ industry.

2. These effects can be divided into three categories – social, economic and env
may see the first two combined into 'socio-economic'.

The social effects impact people, the economic effects impact financial syste
effects impact… the physical surroundings.

Below are some different effects. You need to decid[illegible]ich are social, econ
Choose a way of indicating each type of effe[illegible] for example, you might high
different colours, or draw different [illegible] round them.

Injuries and fatalities

Cost of rebuilding homes, businesses and infrastruct

Flooding from outburst floods

Damaged business premises

Damaged government buildings

Homelessness

Malnutrition

Spread of disease

Landslides

Release of toxic gases

Lahars

Task 2

The responses to volcanic [illegible] can either be immediate or long-term. Imme
soon as the vol[illegible] erupt.

Below are sc[illegible]esponses to volcanic eruptions. Explain why each is either imme

Immediate

Evacuate	
Emergency aid and shelter	
Clear ash	

Long-term

Rebuild	
Planning	
Implementation of warning systems	

Task 3

The data below covers two volcanic eruptions – affecting countries at different le
effects – for example, the Icelandic eruption caused significant disruption to air tr

Eyjafjallajökull, Iceland, March–June 2010

Volcanic Explosivity Index (VEI):	4
Number of deaths:	0
Number c le injured:	0 (other than irritation to respiratory syste
Evacuated:	500
Previous eruption:	1821
Maximum eruption height:	9 km
Cost to aviation:	£1.1 billion
Passengers disrupted:	10 million

Mount Merapi, Indonesia, 26th October to 12th November 2010

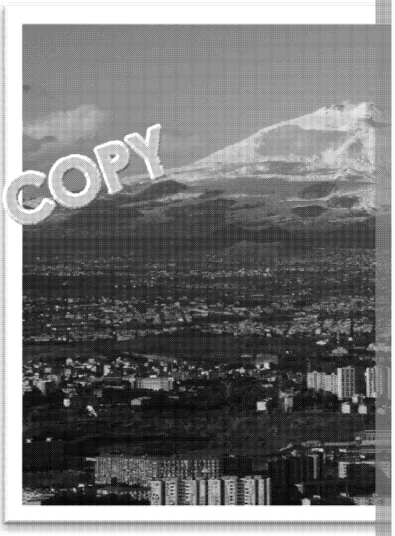
VEI:	4
Number of deaths:	Appr at 379
Number of people injur	Probably between 450 and 600
Houses de d:	At least 2,220
Number of people displaced/evacuated:	400,000 temporarily; over 2,500 moved to n
Previous eruption:	2006
Maximum eruption height:	17 km
Economic cost:	Between $450 million and $600 million

Using the data above, any knowledge that you have, and any available research m
consider how the following might affect the damage caused by a volcanic eruptio

- VEI of the eruption
- Type of plate boundary
- Proximity to the volcano
- The economic status of t ountry
- The quality of th sing

Task 4

The city of Catania in Sicily lies in the shadow of Mount Etna, an active volcano. Etna is a stratovolcano on a destructive plate boundary, and regularly erupts. Most of the eruptions do not affect settlements; however, eruptions in 1928 and 1669 have done so.



Imagine that you are livi[illegible]. You grew up in th[illegible]y living there for its amaz[illegible]itecture and great climate. You[illegible]ve a fun job working as a tour guide, and a nice house, and you and your family are settled in the region. Some of your family work in vineyards on the flanks of Etna.

Draw up a table of the advantages of living in the area – and the risks that you tak[illegible] disadvantages that you might have if you moved?

Advantages	

Now you must decide whether you wish to remain living in Catania.

Give an explanation for your choice – to what extent have the advantages and ris[illegible] have identified above swayed your decision?

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Impacts of volcanoes answers

Task 1

1. The effects of a volcanic eruption can be spectacular – but incredibly dangerous. Ma
to see – for example, a flow of red-hot lava down the side of the volcano, which **burn**
plumes of **ash** from the volcano's crater, which can blanket the surrounding countrys
debris such as bombs and **tephra** can be ejected and hurtle through the air. A very d
flow, where **hot gases (1,000 °C) and ash rush down the side of the volcano at over**
primary hazard is the release of invisible gases such as carbon dioxide, which can su

There are many secondary effects. Th most visible are probably lahars and floods.
can bury houses. Th created when **rainwater** mixes with ash deposits. Sometim
cap on t e r the eruption melts the ice, which causes **flooding** (and car
likely to n Iceland – which is why there is an Icelandic word – jökulhlaup – but

There are also other secondary effects – the ash falls can cause health problems from
collapse, kill crops and livestock, and pollute **water** supplies – leading to homelessne
and poor sanitary conditions. These effects may also have impacts on the **tourist** ind

2.
- Injuries and fatalities **(social)**
- Cost of rebuilding homes, businesses and infrastructure **(economic)**
- Flooding from outburst floods **(environmental)**
- Damaged business premises **(economic)**
- Damaged government buildings **(economic)**
- Homelessness **(social)**
- Malnutrition **(social)**
- Spread of disease **(social)**
- Landslides **(environmental)**
- Release of toxic gases **(social, environmental)**
- Lahars **(social, environmental)**

Task 2

Immediate

Evacuate	ic eruptions can be lengthy and some warning is possible chance to escape the hazard.
Emergency aid and shelter	People are suddenly homeless and need food and water! These must be provided immediately.
Clear ash	Roads may become covered in ash – so they need to be cleared allowing emergency services entry. Roofs must also be swept to

Long-term

Rebuild	This can take a long time – sometimes years for a major event. too!
Planning	After a volcanic eruption, a city can be zoned based on risk, and planned for different levels of risk. Building requirements can al can take a long time.
Implementation of warning systems	Planning for the next event – r the current eruption.

Task 3

- The greater the , the greater the potential for damage.
- Explosi ers s volcanoes at destructive boundaries, versus effusive eruptions
- If a sett is located close to the slopes of the volcano, the damage will be great further away. Some of the effects of a volcano may be spatially limited.
- Developed countries are likely to have high-quality buildings, which may have been roofs. Countries with older structures might be more at risk.
- Allow any inferences from the data provided, based on the economic statuses of the

Impacts of climate change

Learning objective: to understand how climate change will impact humans and th
worldwide.

Task

Read the two newspaper clippings that you have been published today. Use wh
clippings to answer the questions on your note sheet.

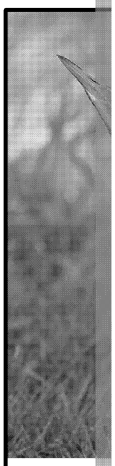
Extensio

Write an article for a new school newspaper for your school. Create a snappy nam
and an eye-catching headline for your article. In your article use your notes from
how climate change will affect the lives of students in your school and the world a
You can use the template provided.

Clipping 1

WORLD CRISIS IN WAIT

Today, the University of Middle England published '**What now? The impact of climate change**' revealing how the scale of destruction and damage that may occur on Earth as a result of our changing climate could result in the displacement of tens of millions of people across the world. Most at risk are the poorest, living in basic conditions and unable to protect themselves from interminable drought, ravaging storms or rising sea levels. Those who depend most on their environment, for fishing, farming or forestry, will be most affected as increasing temperatures and water shortages interrupt food chains and damage ecosystems. Organisms or will need to adapt or face extinction.



A bittern returned

But with more climate talks going on at an international level, what does it all mean for the UK? In parts of the UK you would think that agriculture should actually benefit from warmer and drier weather, but Peter Vines of Wines by Vines, based in Somerset, told us, *'warmer temperatures should be great news for grapes but climate change is causing UK weather to become highly unpredictable'*. He went on to explain the impact his company is already experiencing, *'We've experienced frost damage to new shoots in May and vine rot from an entire season's rainfall in one summer month. Farmers of all sorts of crops are experiencing similar problems up and down the country. No one knows what we might be facing next, a heat wave or a hurricane. I worry how British farmers will keep crops and livestock alive and continue producing food for the nation.'*

One of the most devastating impacts of climate change seen in the UK in recent years has been the flooding of lowland areas. Unusual volumes of rain falling in short periods have overpowered existing flood defence systems and caused damage to homes, transport networks and farmland. In coastal areas the threat of sea level rise means that difficult decisions are having to be made about where money should be spent to maintain the existing coastline and where the sea should be allowed to reclaim the land.

In areas of the country levels of rainfall per pe extreme rainfall actual We will wait longer for destruction and dama from the local council *'Without careful planni experience severe wate environment having to wetland restoration wo to East Anglia it would between them and us.'*

Soaring summer temp problems, especially fo less able to regulate th cool. Warmer winters bacteria can survive a All in all, we could find well as our environme done to prepare for th

Clipping 2

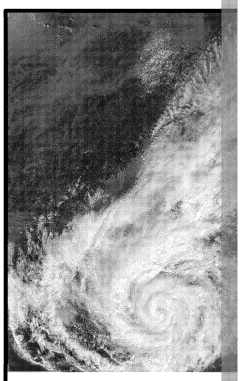
LUCKY US?

It is difficult to imagine in our cold, wet British climate that the warming of the Earth's atmosphere could bring anything worse than long summer [illegible] the beach and a steady diet of ice cream. But the truth is that while we might wrestle with a case of sunburn, millions of people across the world will see their lives destroyed by the impacts of climate change.

For some it will be less dramatic. The slow encroachment of the sea into once-desirable tourist destinations and the long-term decline of once-profitable industries will cause people to migrate in search of better employment opportunities. Some low-lying areas will disappear completely under the sea unless public money is spent defending them from rising sea levels. Warming sea waters will also cause changes to the chemistry of the ocean, affecting the ecosystem and reducing fish stocks and diversity. On land, increasing temperatures will enable the spread of insect-borne diseases such as malaria, and declining rainfall will spread drought, turning once-fertile land into desert (desertification) and once-peaceful people into communities willing to fight for water. These changes won't happen overnight.

Extreme weather events, on the other hand, do happen overnight (or in a day!). A hurricane hitting the UK would cost us the price of repairing buildings, roads and power lines. Trees would be felled, houses damaged and roads blocked, resulting in rising insurance costs and inconvenience. We are unlikely to experience the complete devastation seen in tropical regions of the world from cyclones, typhoons and hurricanes.

That's because in de
in coastal and island
makeshift buildings
and waves. Here, flo
supplies, bringing a
disaster through the
such as cholera, dys



Tropical storms

So should we count
ones, especially sinc
much from develop
of fossil fuels and pr
that have speeded u
atmosphere?

How will the poor of
to protect themselv
role do we play in he
the impacts of clima
the questions forem
minister as she mee
summit tomorrow.

Newspaper template

Student name:

Newspaper name

Your headline

Start by writing a controversial introduction to capture your readers' attention!

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Outline the ways students' lives will be affected by climate change.

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Say how changes to the wider world will influence their lives in future.

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Can you suggest anything that they should do about it?

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The impacts of climate change note sheet

Student:

	UK	
Environmental impact	What environmental impacts is the UK likely to face as a result of climate change? Describe what will happen.	What are the v… will happen.
Direct impact on humans	How many of the environmental impacts of climate change will affect humans? How will temperatures be affected? How will food production be affected? How will public health be affected? How will the economy be affected?	What risks will… change? Descr… Warming ocea… Increased freq… Loss of biodive… Low and infrec… Increasing tem… Explain what t…

Impacts of climate change answers

	UK	
Environmental impact	**What environmental impacts is the UK likely to face as a result of climate change? List what will happen.** Students could consider how all of the following points from the articles: • Floc • Sea l • Unpredictable and extreme weather	**What are the wi** Students could id • Flooding • Sea level ris • More and se • Warming oc • Change to oc • Increased pr
Direct impact on humans	**How many of the environmental impacts of climate change will affect humans?** All affect humans in some way – either directly through loss of live, livelihood or possessions or by creating conditions that will impact on human health, access to resources (especially clean water) or the economy. **How will water supplies be affected?** They are likely to be reduced in some areas, and in other rain will be less predictable and extreme, making it difficult to supplies to cover long periods of drought. **How will food production** There could productivity and of different crops; however, it is likely that unpredi and e me weather could also make it difficult to grow crops or keep livestock. ould be more pests because of the warmer climate. **How will public health be affected?** • Warmer climates could make diseases such as malaria prevalent in the UK. • Heatwaves cause the elderly and very young to overheat and can lead to high death rates. • Also, milder winters may lead to flu epidemics as viruses spread faster in milder weather. • Together these will place a greater strain on the health sy ak g it harder to care for the sick. **How will the economy be affected?** Higher temperatures and higher of i s may lead to lower productivity. Sectors of the economy that rely t may struggle. Others may flourish (e.g. warmer we m ourism).	**What risks will p** **Describe what wi** **Warming oceans** • People in lo countries, ar • Those with li temperature **Increased freque** • Destruction without poss • Pollution of cholera and **Loss of biodiversi** • Could cause • Loss of livel **Low and infreque** • Creates drou infrastructur • May lead to **Increasing tempe** Increased threat **Explain what the** Death or displace conditions will m or that are better those areas and

Tropical rainforests: Deforestatio

	Description
Task 1	Plot a graph of deforestation and explain the trends
Task 2	List reasons for deforestation
Task 3	Consider the impacts of defor[illegible]
Task 4	Imagine that they ar[illegible]ging a supermarket and must deci[illegible] products co[illegible]ing palm oil
Task 5	Co[illegible] th[illegible] indirect threat to rainforests from climate chang[illegible]

In this lesso[illegible] will:

- ✓ plot a g[illegible] of rainforest deforestation
- ✓ think of reasons for deforestation
- ✓ consider what the impacts of deforestation are
- ✓ assess the advantages and disadvantages of palm oil production
- ✓ distinguish between direct and indirect threats to rainforests, with a focus o[illegible]

Task 1

1. Using the data below, plot a graph of deforestation in the Brazilian Amazon r[illegible]

Year	Annual forest loss (sq. km)
1999	17,259
2001	18,165
2003	25,396
2005	19,014
2007	11,651
2009	7,464
2011	6,418
2013	5,891
2015	[illegible]
2017	[illegible],624

2. Give reasons for the trends sho[illegible]

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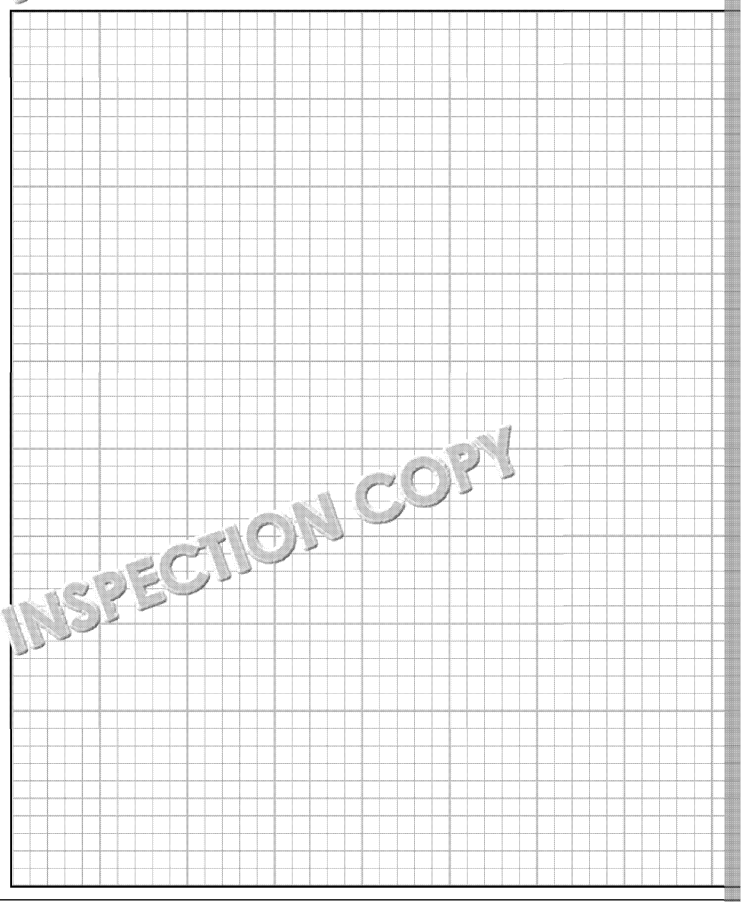

Task 2

Rainforests are deforested for lots of reasons. Can you think of five?

1. .....

2. .....

3. .....

4. .....

5. .....

Task 3

What are the consequences of deforestation in rainforests? Use the images below

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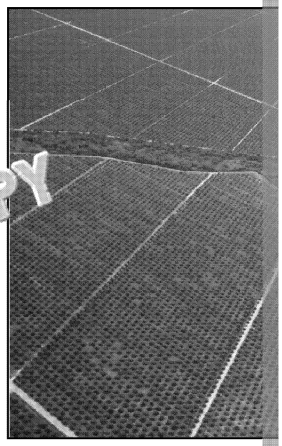
Task 4



A palm

Imagine that you are responsible for purchasing decisions for a major supermarket. Your task is to decide whether or not to allow products containing palm oil to be sold, or to ensure that all of your suppliers use sustainable sources of oil. Your decision will be hard to make because palm oil is used in a l[illegible] products. While you might be able to ens[illegible] your own-brand products are free of p[illegible] might have to make an exception for b[illegible] products.

So what is t[illegible] with palm oil? Palm oil is derived from palm tr[illegible], as the name suggests. It is used in the same way as vegetable oil – in lots of products, including biscuits, baked goods (including some breads), chocolate and confectionery, peanut butter, ice cream, margarines and even soap not the product will contain palm oil is down to the manufacturer and their recipe

The demand for palm oil has greatly increased in recent years. The palm trees are South East Asia, especially in Indonesia and Malaysia. However, plantations are st including South America. The development of palm plantations can be a cause of quality from burning, leading to the exclusion of native species and wildlife and th habitat. There has been a lot of press coverage in recent years over its threat to c on a small scale or on large monoculture plantations. The exports of oil can great by reducing debt, providing an income, or reducing a country's reliance on a limite

For this activity, use your own knowledge and an[illegible]es you might have to ha access to the Internet, you could use it.

Stages of the Task

1. Define[illegible]ob[illegible]m – how much of a problem do you perceive palm oil to be
2. How ar[illegible]going to undertake market research (e.g. surveys/questionnaire
3. What are the advantages and disadvantages of using palm oil in products?
4. What are your possible options?
5. What is your final decision?

Task 5

Threats to the rainforest can be direct or indirect (although direct effects can influ
indirect effects!).

1. Which of the following do you think is indirect? Circle the answer that you th

Mining	[illegible] change	

2. Explain your choice.

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3. Climate change might cause areas of rainforest to convert into grassland call
could cause a drought in tropical areas, meaning they are not wet enough to
climate change might be increased through deforestation.

   a) Think of one reason why deforestation might cause increased conversio

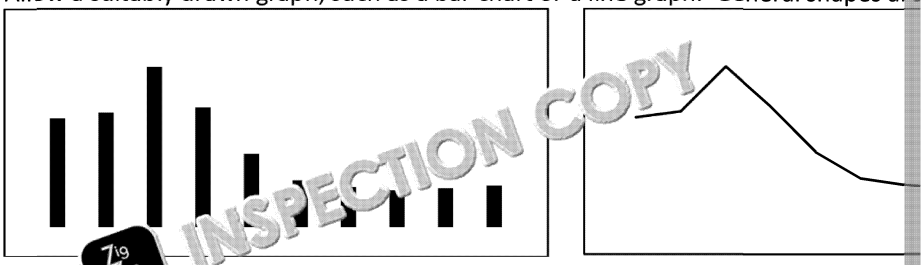
   b) Think of one problem that the conversion to savanna might have on bio

      Aim to spend one minute on each.

Tropical rainforests: Deforestation answers

Task 1

1. Allow a suitably drawn graph, such as a bar chart or a line graph. General shapes are



2. Allow any suitable suggestions, e.g. change in government policy and stance, enforce actions of other countries and NGOs.

Task 2

Allow any suitable suggestions:

- Agriculture (subsistence, e.g. slash and burn, resettlement programmes), commercia
- Timber
- Fuels – timber and biofuels
- Mineral extraction
- Energy extraction

Task 3

Allow any suitable suggestions, such as:

- Climate change (global warming) from the addition of greenhouse gases
- Changes in rainfall patterns
- Increase in run-off and soil erosion (pollute
- Damage to the environment fro , such as spills and CO_2 emissions
- Removal of vegetation fr
- Pollution of rivers from increased silt and metal pollution from mining
- Any other suitable suggestions

Task 5

1. Climate change

2. Because the effects are not direct to the forest, i.e. the forest is not being destroyed climate change is a large-scale change caused by human activity elsewhere, or intern

3. a) Deforestation may reduce transpiration and increase run-off, adding to the issu change.

   b) Tropical rainforests have incredibly high biodiversity, far exceeding that of sava biodiversity will decrease.

Coastal landforms

	Description
Task 1	Identify landforms from their descriptions
Task 2	Timeline of erosional features
Task 3	Q&A on spits
Task 4	Study a map, and produce a fact sheet on the features shown on the

In this lesson you will:

- ✓ identify landforms from their descriptions
- ✓ order the development of landforms
- ✓ answer questions about a spit
- ✓ identify features on a map

Task 1

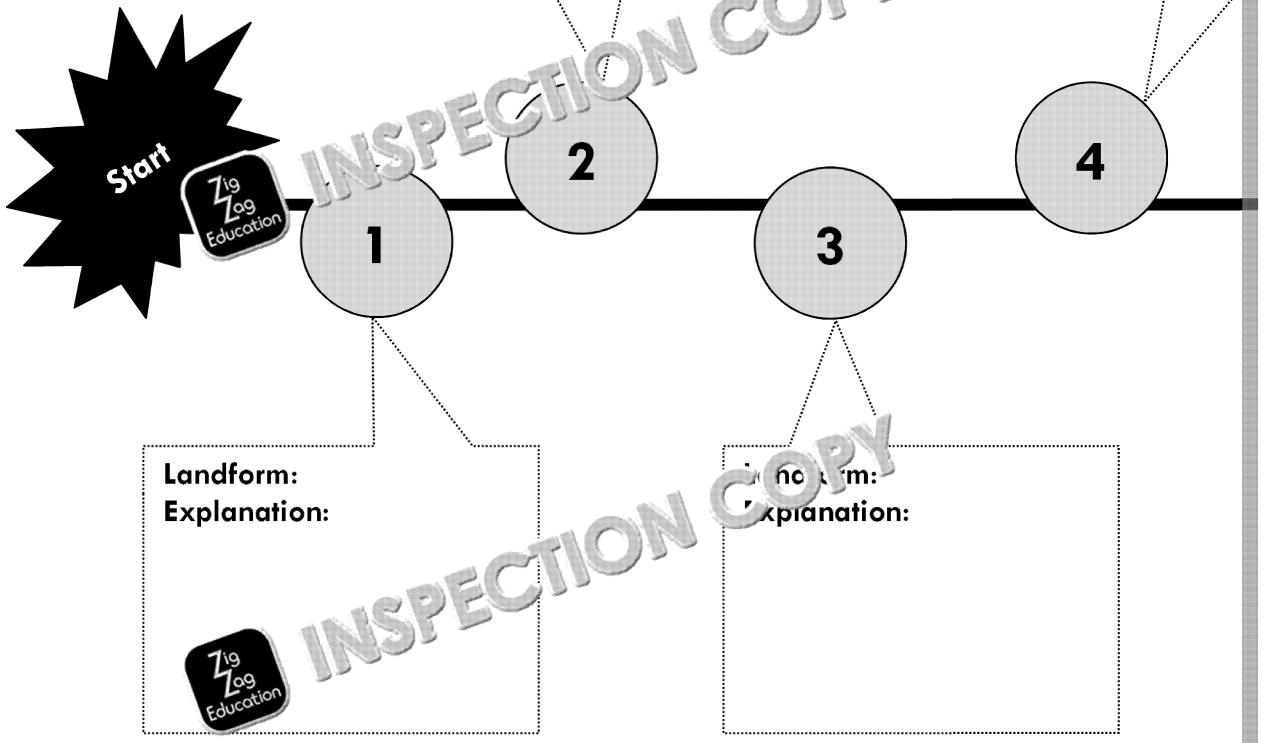
Below are some descriptions of landforms. Identify each landform.

1.	Sometimes steep, vertical and made of rock, or low and slumping sands or gravel – these features separate the coast from the land.	
2.	A smooth(ish!) and gently sloping rocky shore, caused by coastal retreat and polished by abrasion.	
3.	A cliff, jutting out into the sea – often an area of harder rock.	
4.	An inlet containing sand between two headlands.	
5.	An inlet on a concordant coastline.	
6.	If you looked into one, it would be dark and you would hear an echo. It may have a blowhole in its roof.	
7.	A tall column of rock, often surrounded by the sea.	
8.	This was once a cave or tunnel, but the roof has collapsed and you can now walk through it.	
9.	A ridge of sand deposited across a bay – there may be a lagoon behind it.	
10.	A sandy continuation of the land out to sea. It might have a hook on the end.	

Task 2

Using the timeline, order the following landforms in the sequence in which they form. Explain your choi

Arch • Cave • Headland • Stump • St



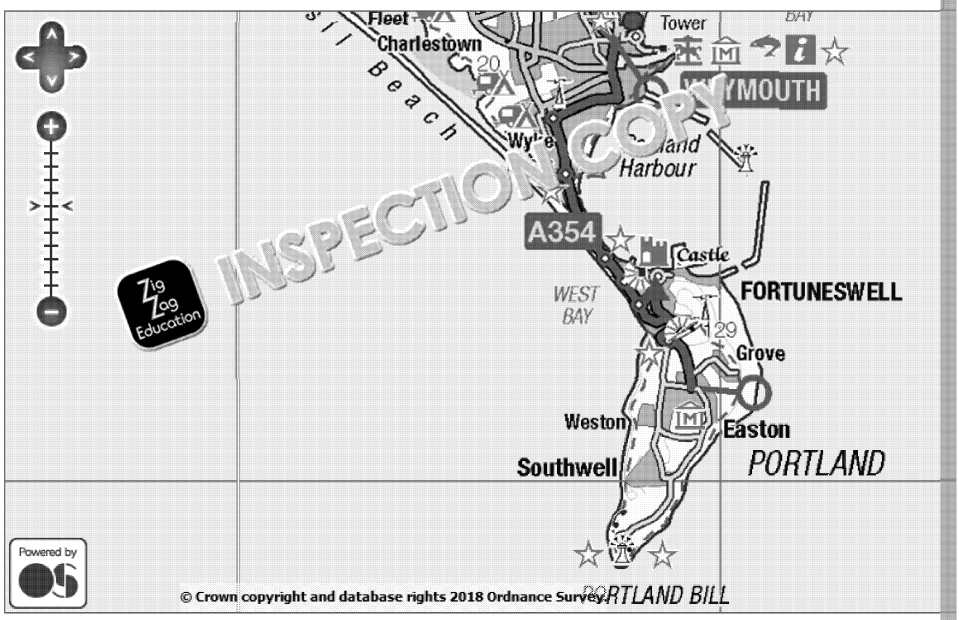
Task 3

Study the photograph of a spit and answer the following questions.

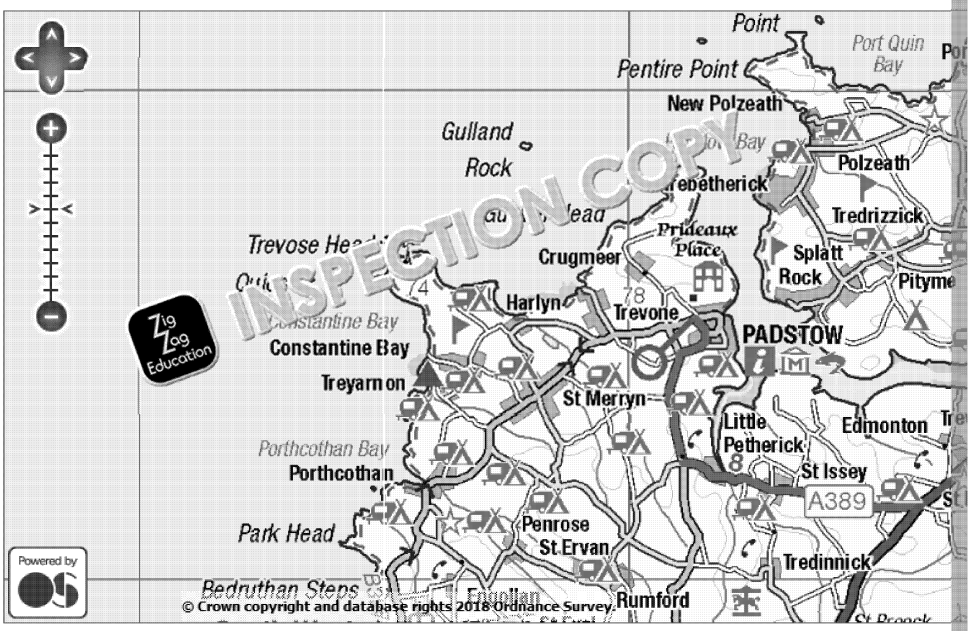
1	On which side is the sea?	
2	What is the body of water on the other side?	
3	Why are there marsh plants on this side?	
4	Is this an erosional or a depositional landform?	
5	How did the spit form?	
6	Is the spit vulnerable to erosion?	
7	What are the artificial features on the right-hand side of the photograph?	
8	How do these features work?	
9	Is this in a high- or low-energy environment?	
10	Why might a spit have a curved end?	

Task 4

Take a look at the maps below.



Map is showing 1:250 000 Scale Colour Raster



Choose one of the maps and write a fact sheet to include:

- the morphology of the coastline
- the 'energy' of the coastline
- a description of the erosional features shown on the map
- a description of the depositional features shown on the map
- the development of one landform that already covered in this lesson, such as a
- how the coastal landscape could change in future

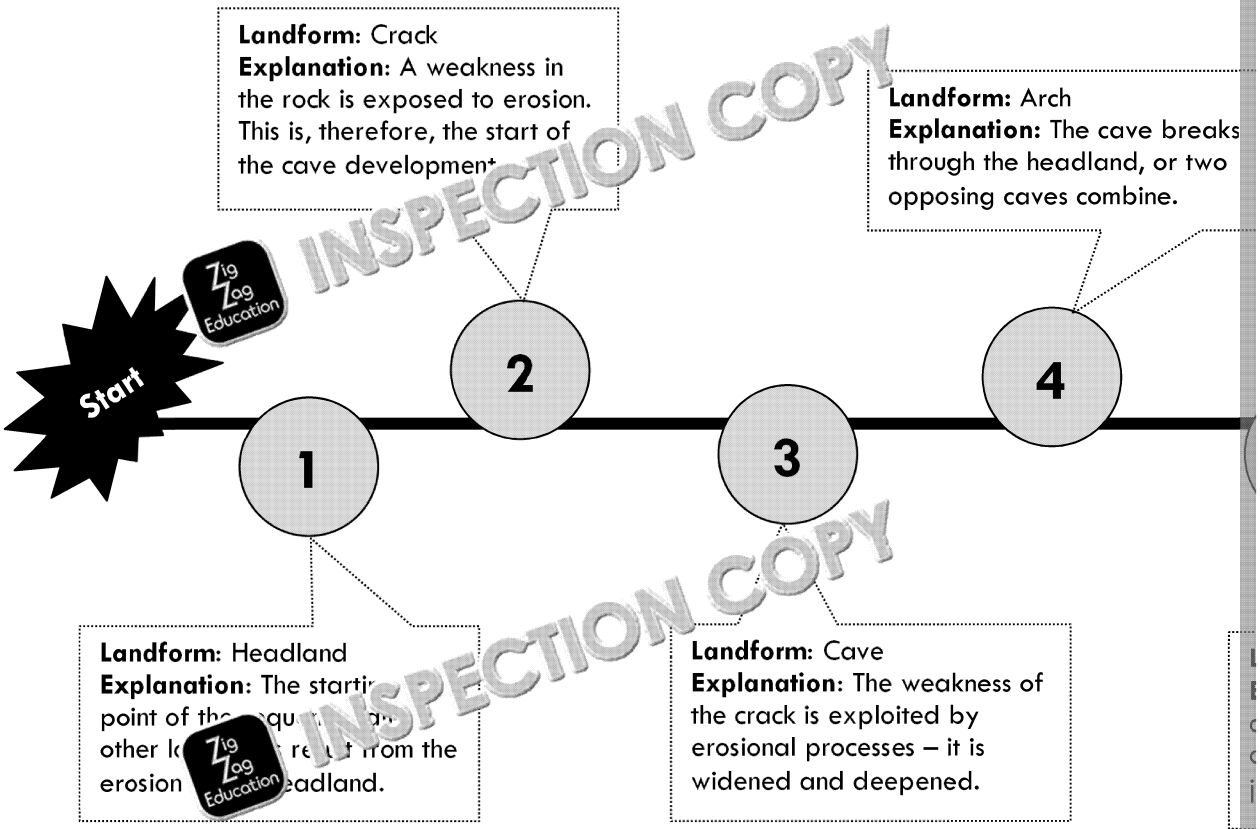
Aim for one side of A4 paper – there is a lot to fit in, so make sure that you are co
diagram to show the development of your chosen landform.

Lesson 2 Answers

Task 1

1. Cliffs
2. Wave-cut platform
3. Headland
4. Bay
5. Cove
6. Cave
7. Stack
8. Arch
9. Bar
10. Spit

Task 2



Task 3

1	On which side is the sea?	Right
2	What is the body of water on the other side?	Probably an estuary (allow lagoon)
3	Why are there marsh plants on this side?	The water speed is likely to be slow, allowing deposited.
4	Is this an erosional or a depositional landform?	Depositional
5	How did the spit form?	Longshore drift will have moved sediment alo coastline will have changed direction, but the remained in the same direction, building up a
6	Is the spit vulnerable to erosion?	Yes – from [illegible] waves
7	What are the artificial features on the right hand side of the photograph?	Ri[illegible]s of stones that are designed to work lik
8	How do these features wo[illegible]	They trap sediment as it moves along the coa
9	Is this in a high-[illegible]nergy environment?	Low-energy
10	Why might a spit have a curved end?	Waves and prevailing wind might change dire

Human activity and management of ri

	Description
Task 1	Assess which human activities will increase or decrease the risk
Task 2	Complete a graph showing strea flow
Task 3	Identify the costs and b of flood engineering

In this lesson you will:

- ✓ assess m causes of flooding
- ✓ comple aph
- ✓ assess the costs and benefits of different types of engineering

Task 1

Humans can affect the risk of flooding through changes to land use and through t channel.

Look at the following statements and suggest whether the change will increase or

Statement
Deforestation or the harvesting of trees
Farmers set aside land and plant trees
Artificial straightening of a river (effect d reach)
Down-slope ploughing of a fi period of the year when there are no standing
Urbanisati the increase of urban surfaces
Restoration of the floodplain or allowing the river to flood naturally (effect down

Task 2

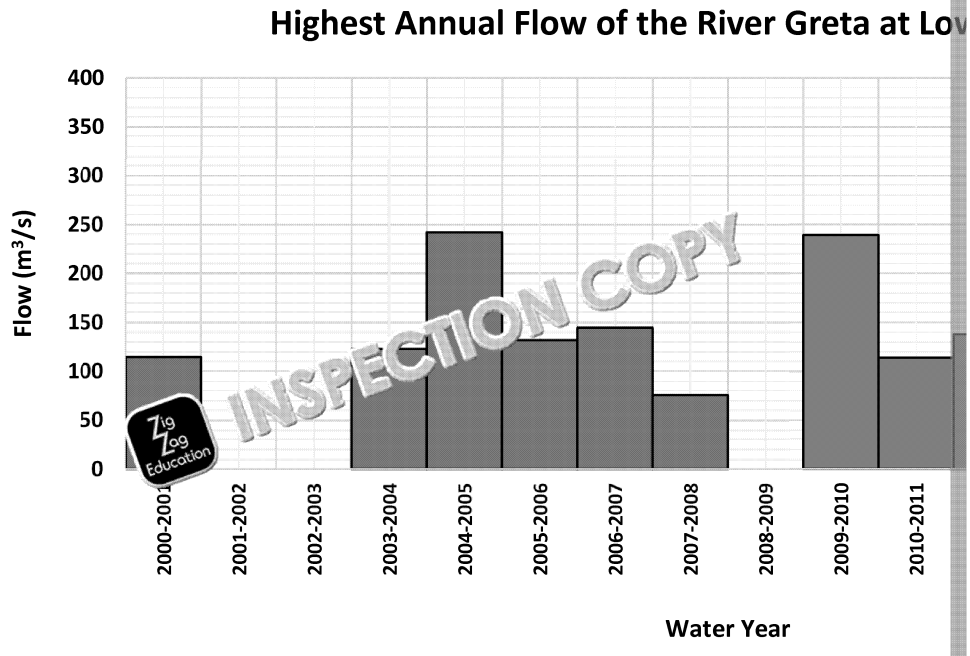
Throughout the UK there is a network of gauging stations which record river flow. data in real time, and a large data catalogue is available via the Internet.

The data table below shows recent data for a gauging station on the River Greta, English Lake District.

- Stage is the height above a set point – this is o... fr... the riverbed and is, th
- Highest annual flow is the maximum fl... te... the river in a given water yea from calendar years – they o... fr... 1st October to 30th September. This

Water '	...tage (m)	Highest Annual Flow (m^3/s)
2000–2001	1.91	115
2001–2002	2.07	**144**
2002–2003	1.59	**68**
2003–2004	1.96	123
2004–2005	2.60	242
2005–2006	2.01	132
2006–2007	2.08	145
2007–2008	1.65	76
2008–2009	1.83	**102**
2009–2010	2.59	239
2010–2011	1.91	114
2011–2012	2.04	
2012–2013	1.89	**111**
2013–201...	...	104
2014–2...	1.71	84
2015–2016	3.09	340

Using the data above, complete the missing years on the graph.



Task 3

There are lots of different ways in which humans can reduce the risk of flooding. Th
divided into two forms – hard and soft. Hard forms involve building structures, ofte
engineering approaches include restoration of the modified channel towards a natu
management techniques designed to allow rivers to flood naturally, but reducing th

The table below shows five examples of engineeri[illegible] There are also 10 statement
example. Half of them are costs, and the other [illegible] benefits. You need to write t
places in the table.

Type	Benefits	Costs
Warnings and sand bags to residents		
River straightening and dredging		
Building embankments / flood walls		
Building dams		
Planting trees		

Water is moved downstream quickly, reducing the flood risk	[illegible]ddition to controlling [illegible]water supplies can be obt
Valuable land may have to be set aside for [illegible] [illegible]restation	Properties may still be flo
Regular disturbance to the channel and [illegible] meanders are removed	Natural flow regime is alt and fish migration
Many may a[illegible] tha[illegible]ification is visually obtrusive: natural ban[illegible]ned with concrete	In addition to reducing ov are created
Residents a[illegible]ven time to make preparations to their homes and evacuate	The channel's capacity is i engineering can give conf

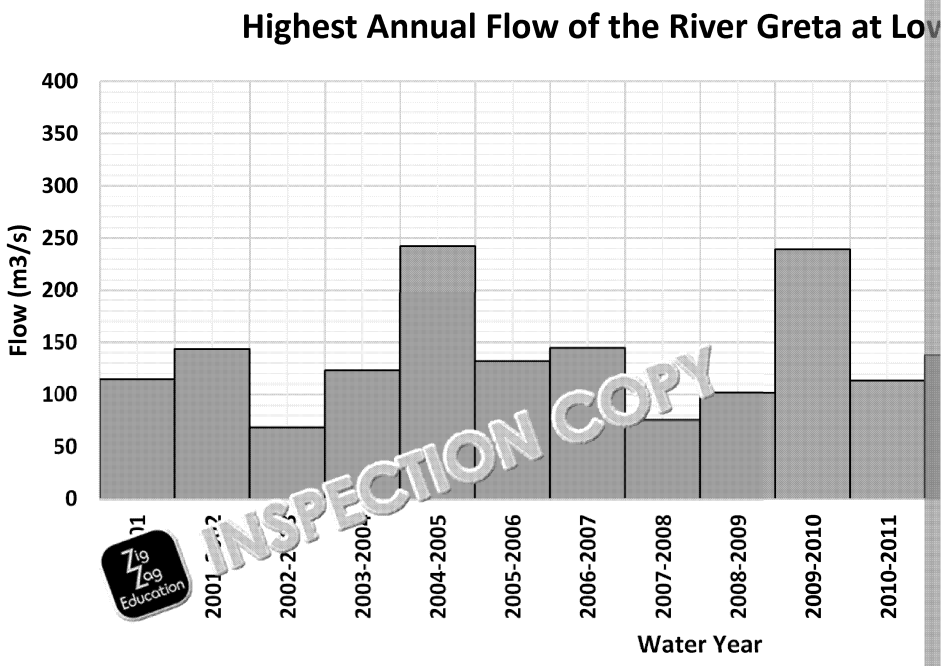
Now identify which are types of hard engineering by writing 'yes' in the third colu

Human activity and management of rivers (I) answers

Task 1

Statement
Deforestation or the harvesting of trees
Farmers set aside land and plant trees
Artificial straightening of a river (effect [illegible] ream)
Down-slope ploughing of a fi[illegible] period of the year when there are no standing
Urbanisation [illegible] increase of urban surfaces
Restoratio[illegible] floodplain or allowing the river to flood naturally (effect down

Task 2



Task 3

Type	Benefits	Costs
Warnings and sand bags to residents	Residents are given time to make preparations to their homes and evacuate	Properties may still be fl
River straightening and dredging	Water is moved downstream quickly, reducing the flood risk	Regular disturbance to t channel and natural mea moved
Building embankments / flood walls	The channel's capacity is increased and th[illegible]e engines[illegible]e confidence [illegible]	Many may argue that the modification is visually ob natural banks are lined w concrete
Building da[illegible]	In addition to controlling the flow of water in the river, water supplies can be obtained	Natural flow regime is al be disruptive to wildlife migration
Planting trees	In addition to reducing overland flow, important habitats are created	Valuable land may have aside for the afforestati

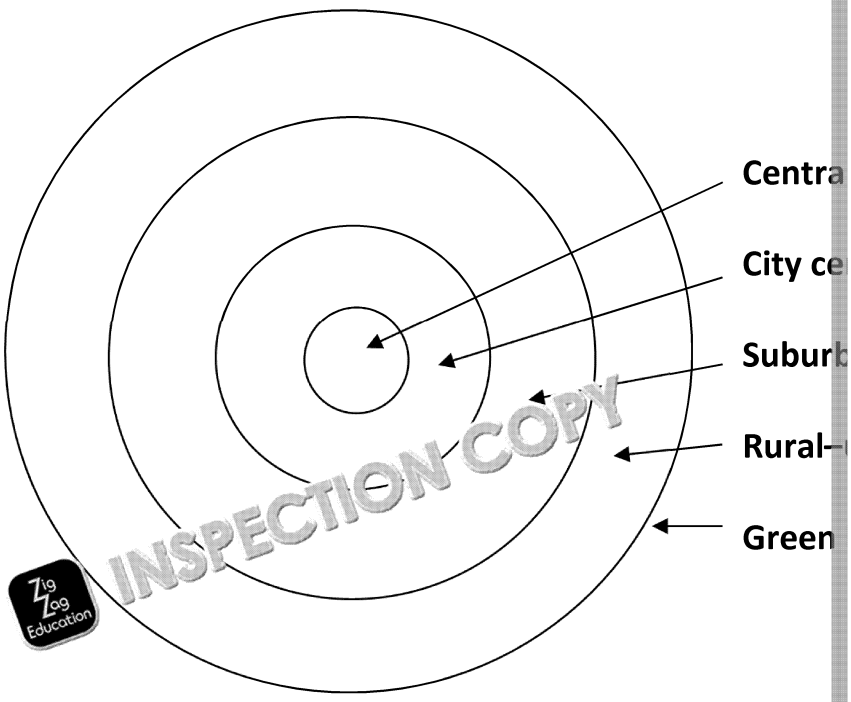
How cities change

	Description
Task 1	Urban sprawl
Task 2	The urban cycle

In this lesson you will:

- ✓ Learn about the th[illegible] urban sprawl
- ✓ Learn [illegible] the [illegible] cycle and how it changes a city

Task 1



1. Add the annotations to the diagram above by writing the corresponding lett[illegible] correct city area.

   A. Many houses. Houses are larger than city-centre flats. Some have garde[illegible]

   B. Countryside, trees and other plantations, and open spaces. Developers [illegible] building in this area.

   C. High level of economic activity, including fin[illegible] services, business offi[illegible]

   D. High-rise buildings, flats / ap[illegible] housing, public transport, highstre[illegible] some recreational fa[illegible]ies.

   E. W[illegible] he[illegible]ty meets the countryside. Houses here are large, usually wi[illegible] m[illegible]national heritage buildings or parks. Buildings become more spr[illegible] noticeably more green space.

2. Why do you think the CBD is important to a city?

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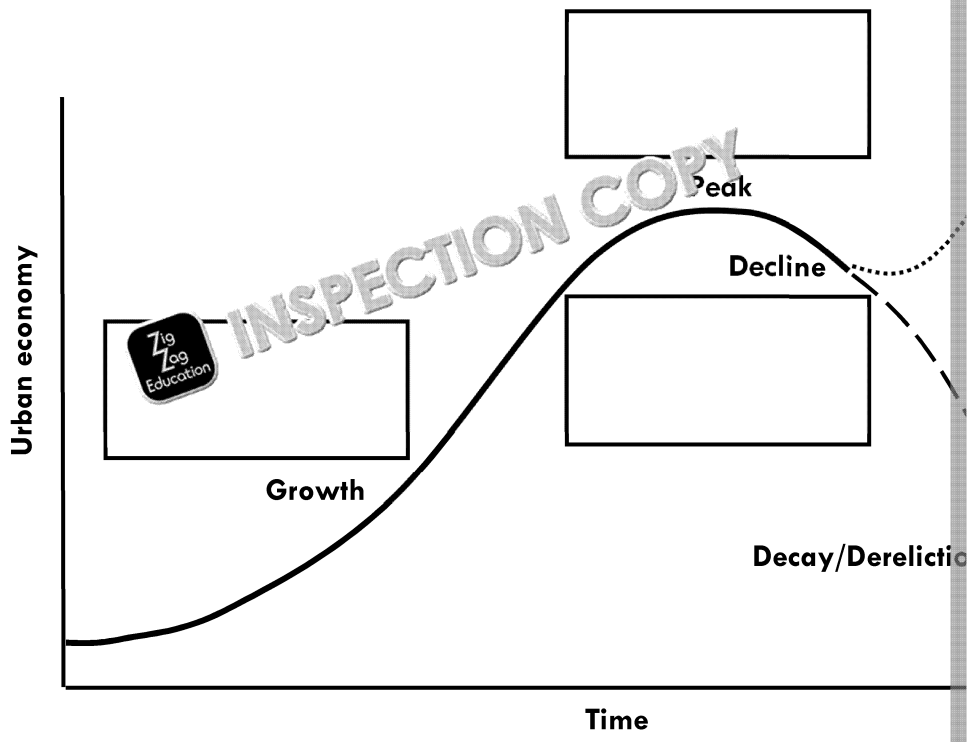
Urban sprawl is the name given to the concept of cities expanding physically outwards into the rural–urban fringe. Eventually, the suburbs will become enclosed within the city, and the old rural–urban fringe and the new rural–urban fringe will begin to take over the old. City/county/regional authorities (such as local governments and councils) will purposefully stop building on the green belt to stop urban sprawl.

3. Carefully read the following situations relating to urban sprawl and explain why in bullet point lists in the boxes on the right.

Situation	W
The Carter family is a young family living in the suburbs. The city they live in is growing rapidly, and urban sprawl has meant that the suburbs are becoming enclosed within the city centre. Traffic and congestion have been building up for the last few years. Public transport prices have increased as well as council tax rates. The Carters are likely to increase on their house taxes. The family relies on public transport to get to work and school. Being a low-income family they may not be able to afford the increase in rent and council tax.	
Kayden is an environmentalist. He regularly volunteers at the local park to help keep it clean so people can socialise or exercise, children can play and people can walk their dogs. The park is situated on the green belt, a 15-minute drive away from the city centre. Developers have put in a bid to buy the land and want to build a new business park in the area, but this means that half of the park will be built over and the other half will probably become privatised. Kayden thinks this is a bad idea for people and the environment despite the economic input the new complex will gain.	
Maria is a business executive at a financial company in the CBD of a large city. She lives in a small flat in the city centre as it is close to her work. Maria suffers from asthma and other breathing issues, which are made worse by the air pollution in the city centre. She is thinking of moving to the suburbs, where the air quality will be better. However, due to urban sprawl the suburbs are now over an hour's and a half commute to work by car due to congestion.	

Task 2



1. The model above shows the cycle of urbanisation. Describe the trends of the the boxes provided.

2. What do the trends of the graph tell you about the urban economic cycle?

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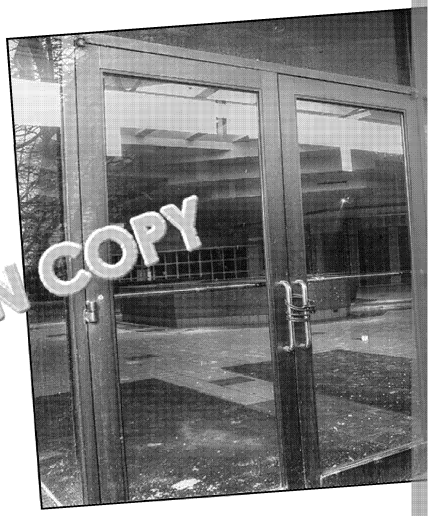
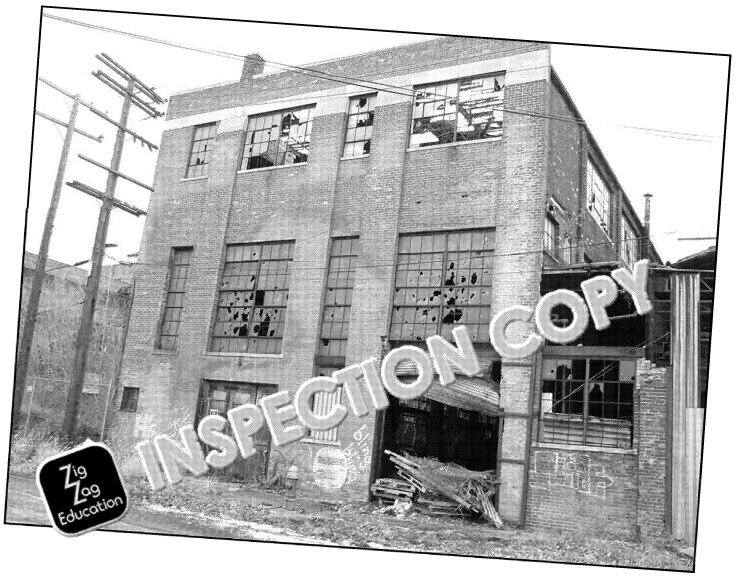
3. Detroit is a city in Michigan, USA. It was once the centre of famous car manuf
was highly industrialised until it began to fall into decline. Many of the city's b
Look closely at the photographs below and annotate them to show some of th





How cities change answers

Task 1

1. A – suburbs, B – greenbelt, C – CBD, D – city centre, E – rural–urban fringe

2. Import to economy as CBD contains financial industries; allows economic flow / 'running'

3.

Situation	Why
The Carter family is a young family living in the suburbs. The city they live in is growing rapidly, and urban sprawl has meant that the suburbs are becoming enclosed within the city centre. Traffic and congestion have been building up for the last few years. Public transport prices have increased as well as council tax rates, and the rent is likely to increase on their house too. The family relies on public transport to get to work and school. Being a low-income family means they may not be able to afford the increase in rent and council tax.	• Public transport p… public transport; … work/school, or m… food shop / water… • Council tax/rent i… income, may not b… • May have to move… (also increasing co… may be increased)
Kayden is an environmentalist. He regularly volunteers at the local park to help keep it clean so people can socialise or exercise, children can play and people can walk their dogs. The park is situated on the green belt, a 15-minute drive away from the city centre. Developers have put in a bid to buy the land and want to build a new business park in the area, but this means that half of the park will be built over and the other half will probably become privatised. Kayden thinks this is a bad idea for people and the environment despite the economic input the new complex will gain.	• Loss of public ope… use it for recreatio… • Building over gree… consequences, e.g… impermeable surfa… of flash flooding), … ecosystems
Maria is a business executive at a financial company in the CBD of a large city. She lives in a small flat in the city centre close to her work. Maria suffers from asthma and other breathing issues, which are made worse by the air pollution in the city centre. She is thinking of moving to the suburbs, where the air quality will be better. However, due to urban sprawl the suburbs are now over an hour and a half's commute to work by car due to congestion.	• Long commute • If congestion cont… affect her asthma

Task 2

1. Growth – increase; Peak – flattening at the height of the curve; Decline – dec… decrease; Regeneration – increase after turnaround

2. Urban economies grow to reach a peak but then begin to fall into decline. Th… continued decline leading to dereliction, or regeneration to boost the urban … growth process again.

3. Derelict/abandoned buildings, nature taking over, windows smashed – antiso… measures, plastered, abandoned, unsafe

UK Regeneration: A case study

	Description
Task 1	Counter-urbanisation
Task 2	UK case study: Liverpool

In this lesson you will:

- ✓ Learn about the concept of counter-urbanisation and its effects
- ✓ Learn a case study of a regeneration project in the UK city of Liverpool

Task 1

Counter-urbanisation is the name given to the movement of people from an urba smaller suburb area on the rural–urban fringe).

Urbanisation

Counter-urbanisation

Counter-urbanisation occurs for many reasons although it is more common in de as HICs and ACs). This is largely due to the fact that rural areas in developed coun livelihoods and needs.

1. Think of as many reasons as you can for developed countries (HICs/ACs) havi urbanisation than developed countries (LICs/LIDCs). Put down your ideas on example has been done for you.

e.g. Develop have clean, areas for d

Counter-urbanisation is not just people moving from urban to rural areas, but peo
to the suburbs and the edge of the rural–urban fringe. This effect is called suburb
reasons for this, including a perceived better quality of life, more green or open sp
community feel and better air quality. However, it can also be argued that this is c
the trend for counter-urbanisation also increases demand for housing in the subur

2. Explain, in your own words, why suburbanisation ma d to urban sprawl.

3. Spend five minutes thinking about where you live, and think about the quest
supervisor allows you, you may wish to discuss your thoughts with the perso
   - Do you live in a rural, urban or suburban area?
   - Where would you like to live in 5/10/20 years' time and why?
   - Do you think the place you live in is being affected by urbanisation/subu
     urbanisation, and why?

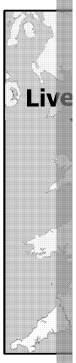
Task 2

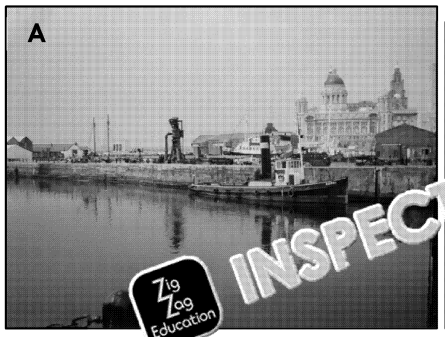
Spend a few minutes reading the case study on Liverpool before answering the q

UK Urban Regeneration Case Stud

When a city falls into decline, one of the options is to regenerate the city. Regeneration is cycle to keep the city relevant and boost the local economy. A post-industrialised econ in manufacturing industries and see an economic shift from the secondary sector (manuf and quaternary (research and innovation) sectors. Cities that fall into decline often see de the local economy and increased violent crime rates. Regeneration aims to improve a city before a predicted/inevitable decline. This may include redeveloping certain areas of the buildings, such as old disused warehouses into multi-facility complexes or housing d an urban regeneration project in the UK can be seen through the northern city of Liverpo

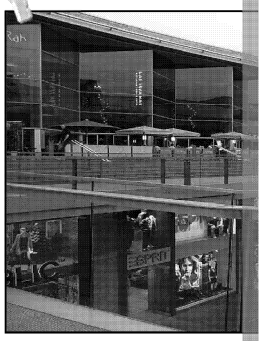
Liverpool may be famous for its music scene, especially The Beatles, its football clubs, Liverpool F.C. and Everton F.C. and being voted the European Capital of Culture in 2008, but the city was once a hub of global trade and industrialisation. The city lies within the Merseyside county (highlighted on the map opposite). Liverpool's position close to the Irish Sea made it a prime location for trading docks and a port. The port was used in a number of historical global trades, including the slave trade. The city became a popular destination for Irish migrants following the great famine in the 1840s and 1850s. These factors, along with modern-day migration, make Liverpool one of the most ethnically and culturally diverse cities in the UK.





An economic shift hit the UK, and the city of Liverpool, in the late twentieth and early t outsourcing and overseas manufacturing becoming more popular and more easily acc One of the city's waterfront regions, along the Albert Docks (photo C) and Pier Head (p area of disused warehouses after the trading and manufacturing industry fell into decli regeneration project was devised by developers. The disused warehouses were repurp and leisure facilities such as comedy clubs and bars. Set on a prime waterfront location regeneration was said to be a success, bringing in money to the local economy and job the Pier Head, site of the famous 'Three Graces' buildings (Liver Building, Port of Liverp Building), was used as a site for a multi-million-pound development project featuring a Museum of Liverpool, which showcases the city's history and hosts regular art exhibitio can be seen in photo A in the 1990s, with the Museum of Liverpool building in the fore construction caused some controversy as some people thought the modern building v Renaissance and Edwardian Baroque style buildings of the Three Graces. In 2017 the m just over 730,000 visitors.

Alongside the Pier Head and Albert Docks regeneration the construction of a new multi-facility complex, Liverpool One, was finished in May 2008 (photo opposite). The complex is estimated to have cost around £920 million to £1 billion. The complex includes shops, restaurants, office space, commercial buildings, apartments, a hotel, and leisure facilities such as a cinema and lawn terrace roof complete with 'pop-up' style tennis courts. Opponents of the complex have suggested that it removes the public right-of-way (although the city council says it is still accessible) and that the many TNC-owned shops take business away from local businesses.



1. What is meant by 'regeneration'?

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2. Why did Liverpool's location make it a prime location for global trade?

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3. Why did the city fall into decline at the end of the twentieth century and the century?

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4. Name two locations of regeneration in Liverpool.

1. .....

2. .....

5. Fill in the table below the pros and cons of the regeneration scheme in Liverpool economic, social and environmental factors.

Pros	

UK Regeneration: A case study answers

Task 1

1. Answers include but are not limited to: developed countries tend to have mo that links rural areas to urban areas; rural areas in developed countries tend connections than developing countries, so people are able to work from hom food security is more common in rural areas of developed countries than dev

2. Answers will differ between students but the following should be referred to: su live due to perceived better quality of life; therefore, people move, increasing d This leads to urban sprawl as suburbs often become enclosed within the centre

3. Answers will differ between students.

Task 2

1. Regeneration, in this case, is when a city undergoes redevelopment or repur area that has fallen into decline.

2. Liverpool is on the coast; it has access to the sea, which in the eighteenth an important, as most global trade was delivered by ships.

3. Post-industrialised economy: economic shift from secondary to tertiary and c meant manufacturing was easier and cheaper to outsource overseas.

4. Albert Docks, Pier Head (Museum of Liverpool), Liverpool One.

5.

• Boosts local economy (tourists, locals, business) • [illegible] jobs (socio-economic pro, also increases positive multiplier effect) • Reverses decline in the area • European Capital of Culture – worldwide recognition • Increases investments in other projects for the city • The museum shows local history, which is important to the city's culture and community – educates people (socially sustainable) • Mixed-facility buildings – inclusive and 'something for everyone' • Apartments/flats provide housing for people	• Controversy surro buildings with the • Some concern ove • Apartments are lik the city centre – s afford them and t people from elsew socially exclusive • Shops and restaur prices out local bu which usually goe local businesses • The entire regene redevelopments w have been better s shelters)?

Globalisation and trade (I)

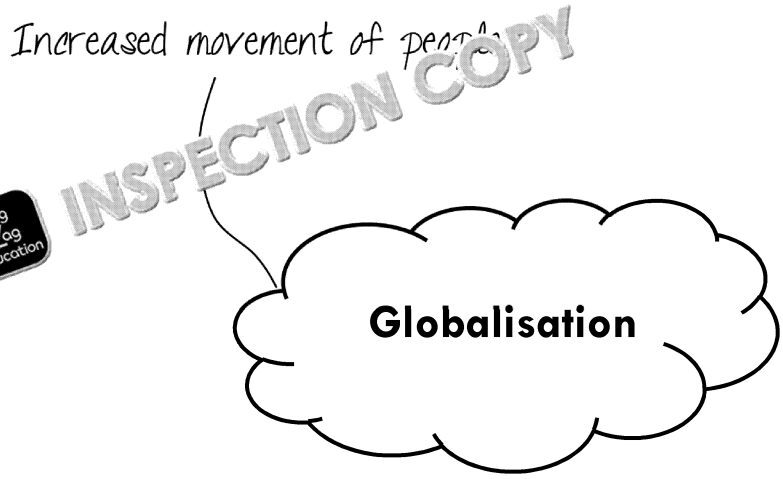
	Description
Task 1	What is globalisation, and how does it affect development?
Task 2	Case study: TNCs in Kenya

In this lesson you will:

- ✓ learn about how globalisation affects development
- ✓ learn about FDI through TNCs in developing countries – Kenya case study

Task 1

1. Complete the mind map to show what you think globalisation is. An example



2. Pick a few of the factors you have outlined on the previous page and suggest w
development.

Remember that 'impacts' includes both positive and negative impacts.

Factor	How th[illegible]actor might impact

Task 2

Kenya Case Study

Tea being harvest

Kenya's main exports are agriculture-based resources such as tea, coffee, cut flowers and legumes. Kenya also exports refined petroleum. Kenya's climate is varied, from tropical rainforest and savanna to cooler mountainous regions. The hot, humid tropical rainforest climate makes Kenya the perfect place for growing tea and coffee. Kenya's economy is growing rapidly, with some arguing that Kenya is quickly becoming an emerging country. One of the main reasons behind Kenya's growth is foreign direct investment (FDI).

FDI in Kenya includes the involvement of transnational corporations (TNCs). TNC and more often than not utilise developing and emerging countries' cheaper pro Kenya is the TNC Finlays. Finlays is a British-based tea and coffee company which

Advantages of Kenya having TNCs such as Finlays operating in the country inclu for local people. This creates a positive multiplier effect where people can earn income to spend within the local economy and contribute to economic growth. between countries, as each country has a vested interested in the other. This m situation between the countries, which can encourage political stability and enc in the developing or emerging country.

On the other hand, critics of TNC involvement in developing and emerging coun businesses have to compete with large TNCs, making it difficult to establish ther can hinder local socio-economic development by pricing locals out of the marke and businesses. Another critique of TNC involvement in developing and emergi the profit from the TNC goes back into the company (usually based in a develop developing or emerging country.

1. Read the case study above.

2. What are the pros and cons of TNC involvement in developing and emerging

Pros	

3.
- Imagine you are a young person living in rural Kenya where the tea plan
- You have the choice of working for a TNC, such as Finlays, or setting up y business.
- Weigh up the pros and cons of each option, and state what you would r

Option	Pros	
Work for TNC		
Set up own business		
Decision:		

Globalisation and trade (I) answers

Task 1

1. Answers include but are not limited to: increased movement of goods and products, m
increasing connectivity of Internet and Internet-based platforms, increased and improv

2. Answers will differ between students, although ea[illegible] ac[illegible] they chose from their mi
discussed regarding how it can positively a[illegible] eg[illegible]ely impact development. For ex
brain drain in some areas, which c[illegible] ra[illegible]ly impact economies, especially in deve
hand, countries may positi[illegible] xpa[illegible]ence development through brain gain, where sk
immigrate for wo[illegible] el[illegible]igh-value work to the economy.

Task 2

1. –

2. **Pros** (include but are not limited to):
   - job opportunities
   - can benefit the local economy through the positive multiplier effect
   - encourages political stability and improved geopolitical relations

   Cons:
   - can price local businesses out of the market
   - most of the profits will return to the company / developed country

3. Answers will differ between students, although consideration of both options should
decision should be justified in relation to students' reasons for/against their preferre

	Description
Task 1	Case study: Tourism in Grenada

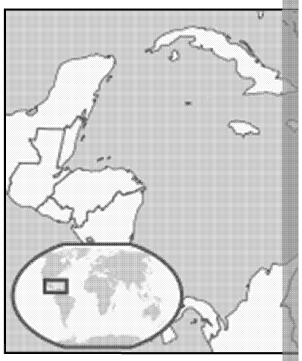
In this lesson you will:

✓ learn how tourism affects developing countries – Grenada case study

Task 1

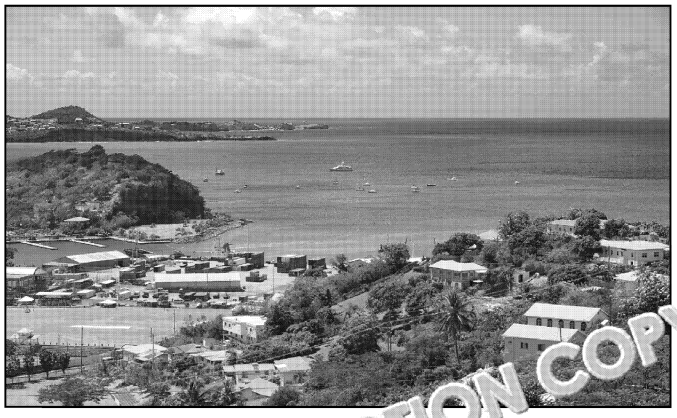
Grenada Case Study

Grenada is a small island in the Caribbean, to the north of South America. The country is said to be developing. Grenada has a number of white, sandy beaches – a common feature of popular tourist destinations. Grenada has been developing its tourism industry, especially over the last few years. Tourism can bring in money and can improve economic growth.



Grenada is a small island in South A

In 2004 a hurricane brought widespread devastation to the island. Houses and and many locals were displaced. Since then, the Grenadian government has be industry to try to regain economic growth and build back the island. Since 200 resorts and activities have been built in Grenada. Before tourism, the co income through the agriculture industry. In particular, nutmeg (a spice use over the island, with many local famers relying on its harvest to make a living. tourism industry as it delivers more job opportunities and a wider range of job stable sector than farming (which can be unreliable due to low yields and is at



Grenada is becoming a popular tourist destination

However, there ha the environmental tourism industry w island consists of m it is a home for leat endangered Grena have raised their co the environment th industry would hav resorts would mea are an important p as negatively impac

1. Read the case study on the previous page.
2. Give three reasons why Grenada may want to develop its tourism industry.

   1. .....

      .....

      .....

   2. .....

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   3. .....

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3. Design a plan for a (sustainable) tourist attraction that would fit with the thr
   question 2.

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'Increasing the economy is more importa
environmental impacts of tourism in

4. Do you agree with the statement above? Explain your answer.

Globalisation and trade (II) answers

Task 1

2.
- rebuild the island after the hurricane
- economic growth
- diversify job opportunities (and increase job stability)

3. Answer will depend on the suggestions [illegible] question 2.

4. Answers will differ bet[illegible]ts, although students should consider the followi
- The i[illegible]ort[illegible]economic growth to the island and the corresponding positiv
- Th[illegible]onmental impacts of tourism and the corresponding negative impacts wi[illegible]vironment
- Whether or not the economic pros of tourism outweigh the environmental con
- An alternative solution, e.g. ecotourism or sustainable development
- A justified conclusion relating to their analysis of the statement

Employment change in the UK

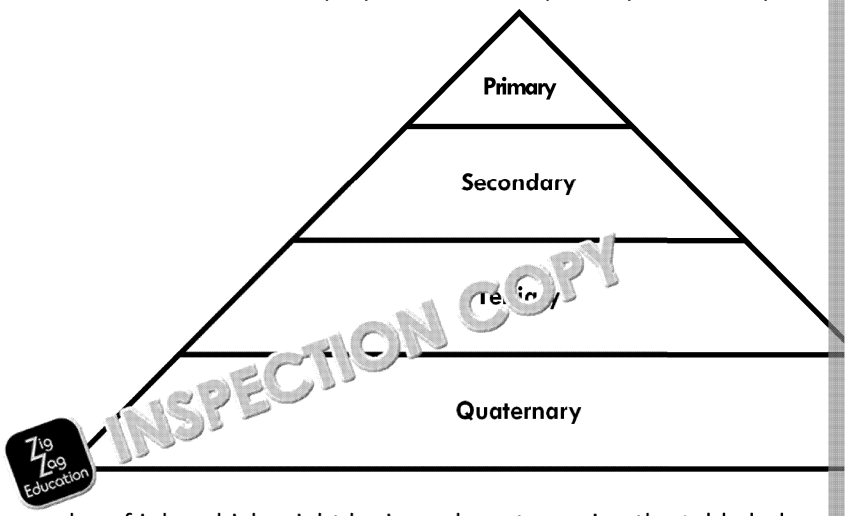
	Description
Task 1	Introduction to the employment structure
Task 2	Employment structure shifts in the UK
Task 3	Causes and effects of employment shifts with UK case studies

In this lesson you will:

- ✓ be introduced to employment structures
- ✓ learn about the UK's employment structure
- ✓ learn about differences in rural and urban employment structures though UK
- ✓ learn about the cause and effects of employment shifts

Task 1

The triangle below shows the four employment sectors: primary, secondary, tertiary, quaternary



1. Give examples of jobs which might be in each sector, using the table below.

Sector	Description	
Primary	Agricultural based, or a job that gains material(s) from the natural environment.	
Secondary	Manufacturing based. A job which takes materials and makes them into something else.	
Tertiary	Service industries. Includes public and private sectors.	
Quaternary	Research and development based. Includes technological development.	

As countries industrialise, the employment structure shifts from a primary-sector-
secondary-sector-heavy structure. The UK is said to be in a post-industrial society
country has been industrialised and many parts of the country are becoming dein
manufacturing abroad for cheaper costs). This leads to an employment structure
heavy to tertiary-sector-heavy. As technology advances and many services becom
checkout tills), more people become employed in the quaternary sector, which re
development (often called R & D).

2. Spend a few minutes thinking about the type of job you would like to do in th
the following questions:
   - What sector is this job in?
   - Why do you want to do this job?
   - Do you think many other people want to do the same job as you?
   - What do you think the most common employment sector in the UK is?
   - Do you think that the sector your desired job is in is typical of employme

3. Think about your local area. Using the sentence starters, describe the employ
and explain, where you can, any changes in the structure that you may have no

My local area is

.....

I think the main employment sector in my local area is

.....

However, a lot of people are employed in other sectors, such as

.....

.....

I think there has / has not been a shift in the employment structure over rece

.....

.....

.....

.....

Task 2

In 2017, according to the ONS, in the UK there were 64,000 farm workers, compar
were also 19,000 fishing-related occupations in 2017 compared to 33,000 in 2001
designers rose to 104,000 in 2017 from 89,000 in 2001. The number of scientific a
rose, to 355,000 in 2017 from 264,000 in 2001.

1. Do you think there has been an employment shift in the UK over recent years
paragraph above to explain your answer.

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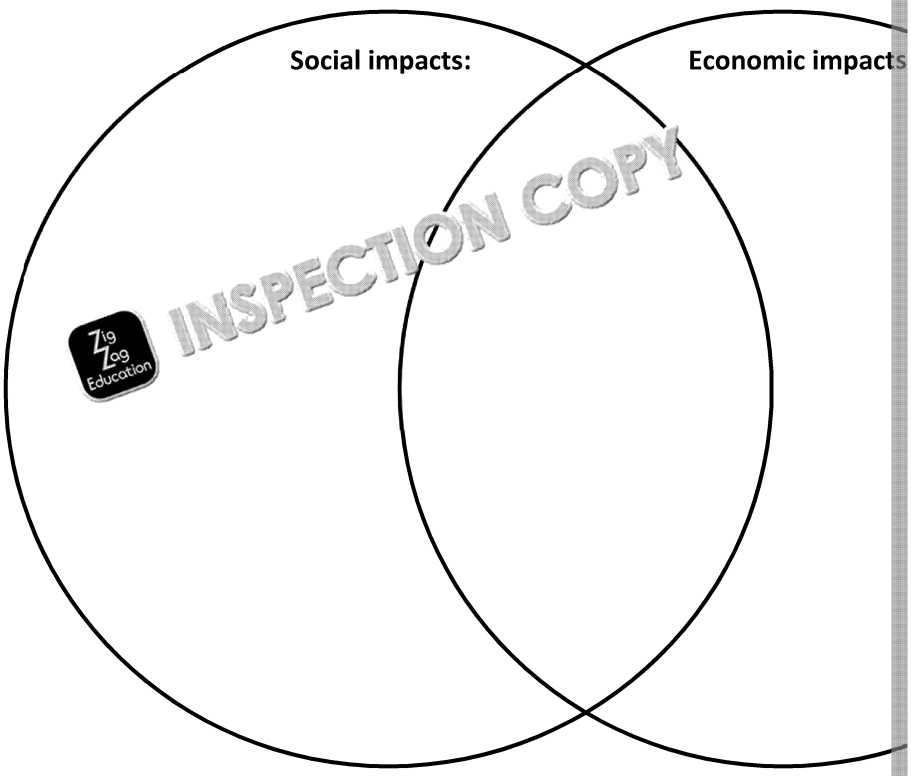
2. Fill in the Venn diagram to show how employment structure shifts affects pe



Task 3

Urban areas end to have a higher proportion of the population working in the ter
Rural areas have a higher proportion of the population working in the primary sec
economies grow and people move from rural to urban areas for more employmer
occurs and the rural population declines. However, some rural areas in the UK ha
population growth, something called counter-urbanisation. This is where people
areas, usually for a quieter environment and better quality of life. Due to the rise
people in rural areas can work from home and still be connected to 'economic hu
there are a lot of businesses that make a lot of money). This also means that rura
sector shift, from primary to tertiary and quaternary. Some rural areas in the UK,
economically benefiting from the sector shift, particularly in the tourism industry
as it provides services).

1. Read the paragraph above and fill in the table with definitions of the chosen

Keyword	Definition
Urbanisation	
Counter-urbanisation	
Economic hub	

Case Study 1: Cornwall

Cornwall is the most south-westerly county in the UK. It is a rural county with only one city, Truro (which is still surrounded by countryside). Cornwall is a popular tourist destination, as it has long, sandy beaches, rugged coastlines and many open green spaces. Because of this, lots of people are moving to the county from big cities to live. This has led to the population of Cornwall increasing in some areas. This has had a knock-on effect on housing. Housing demand has increased in certain areas of Cornwall, which has not only pushed up the prices of existing houses on the market but also led to more houses being built in the rural areas.

Case Study 2: S

The South Wales V
surprisingly situat
for mining and ma
seen a population
deindustrialisation
to find jobs (mainl
There are plans fo
especially in the B
region also is repo
house prices per s
England and Wale

Case Stud irmingham

Birmingham is a large city in the UK with a population of well over a million. It is consid
UK. Birmingham used to be a manufacturing hub, although now the main employmen
sector, with the quaternary sector on the rise. Birmingham has strong transport links to
Despite being an economic hub, Birmingham has one of the largest levels of economic
regions in the city are considered deprived, and unemployment is an issue for many. T
competition for jobs, mainly from urbanisation and high levels of immigration to the c
skills and education, something which is needed for most tertiary and quaternary jobs

2. Spend a few minutes carefully reading the three case studies above before an

   a) Which case study area(s) has/have been affected by urbanisation?

   .....

   b) Which case study area(s) has/have been affected by counter-urbanisatio

   .....

   c) Which case study area(s) has/have been considered to be an economic hub in the

   .....

   d) Fi table to show the causes and effects of population shift and em
   study area. (Remember that the cause is the reason why something has
   result of the cause happening.) An example has been done for you.

Case study area	Population or employment shift?	Causes	
Cornwall	*Population increase*	*Counter-urbanisation*	*A c*

Employment change in the UK answers

Task 1

1.

Sector	Description	
Primary	Agriculturally based, or a job that gains materials from the natural environment.	e.g. farmer, fish
Secondary	Manufacturing based job which takes materials and makes them into something else.	e.g. factory wo
Tertiary	Service sector – this includes public and private services.	e.g. doctor, nur flight attendant
Quaternary	Research and development based. Includes technological development.	e.g. scientist, s

2. and 3. Answers will differ between students.

Task 2

1. UK employment sector shift – farming and fishing jobs (primary sector) have declined by 2,000 in 16 years so not a significant decline to show a true employment shift). G technicians (tertiary and quaternary) have risen significantly – most likely as a result

2.
- **Social impacts** – tertiary and quaternary jobs tend to be higher paid than prima disposable income so better standard of living and maybe better quality of life, manufacturing jobs become automated; people with lack of skills or education competition increases as more and more people gain qualifications.
- **Economic impacts** – tertiary and quaternary jobs tend to create more money fo secondary; if primary sector declines, economies rely on imports for food – bec
- **Socio-economic impacts** – people may lose their job which affects their liveliho income so no positive multiplier effect as they are money back into the economy (

Task 3

1.

	Definition
Urbanisation	The expansion of towns and cities as people move from r
Counter-urbanisation	When people move from urban areas (towns and cities) t
Economic hub	An area, usually urban, that plays a significant role in the flow and benefits the economy

2. a) Birmingham (as people move to the city) and South Wales Valleys (as people ha
b) Cornwall
c) Birmingham
d)

Case study area	Population or employment shift?	Causes
Cornwall	*Population increase*	*Counter-urbanisation*
Birmingham	Population increase	Urbanisation, immigration
South Wales Valleys	Population decrease	Urbanisation, deindustrialisation
Cornwall	Employment shift	Tourism increase leads to increase in tertiary sector jobs
Birmingham	Employment shift	Manufacturing decline to tertiary and quaternary increase
South Wales Valleys	Employment shift	Deindustrialisation

Food (I)

	Description
Task 1	The Global Hunger Index
Task 2	Food production and food waste

In this lesson you will:

- ✓ learn about the Global Hunger Index
- ✓ learn about food waste

Task 1

The recommended average daily intake of calories stands at 2,000 for women and recommendation is often contested as it is very generalised and does not take int of physical activity. Nonetheless, daily calorie intake can be used as a measure fo inequality among countries regarding food consumption. However, a far more co hunger patterns is the Global Hunger Index (GHI). The GHI takes into considerati wasting (low weight for respective height of children under five years old), child st under five years old) and child mortality (death rate for children under five years o from 0 (no hunger) to 100 (most hunger).

1. Study the two world maps on the next two pages. In the space below, descri stating which counties have a high hunger rate and which counties have low

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2. What can be said about the relationship between the patterns of global hung development?

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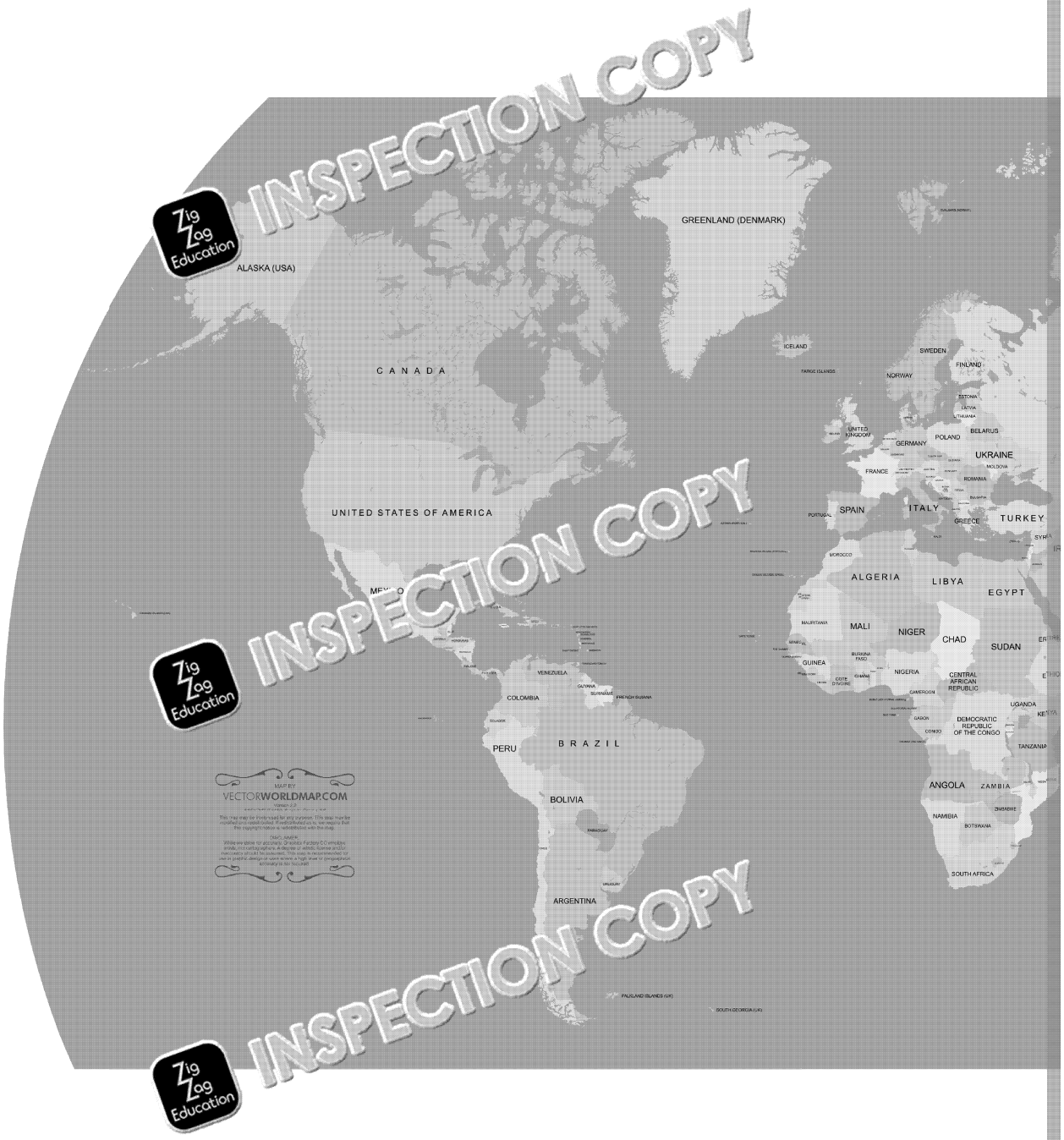
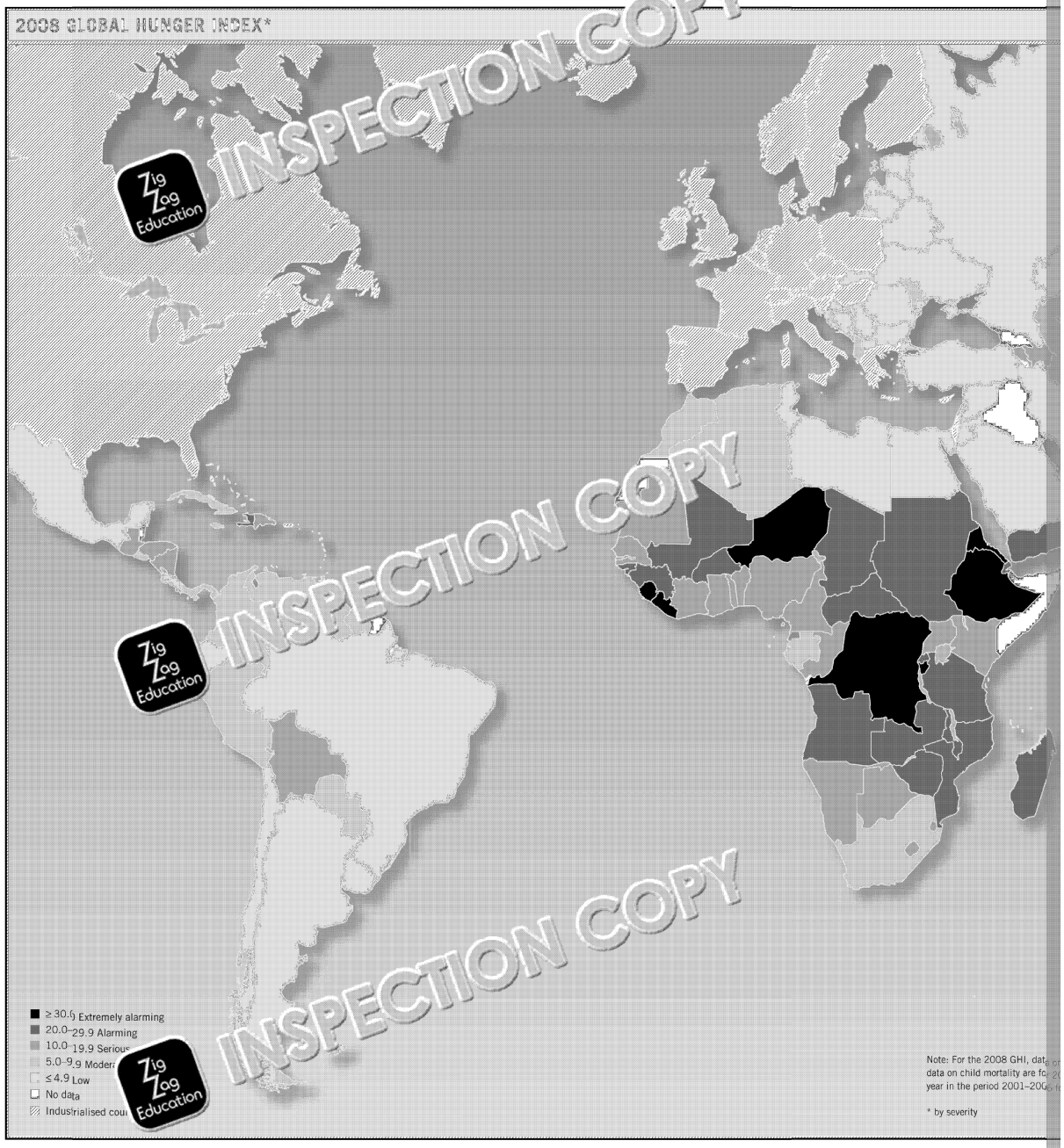




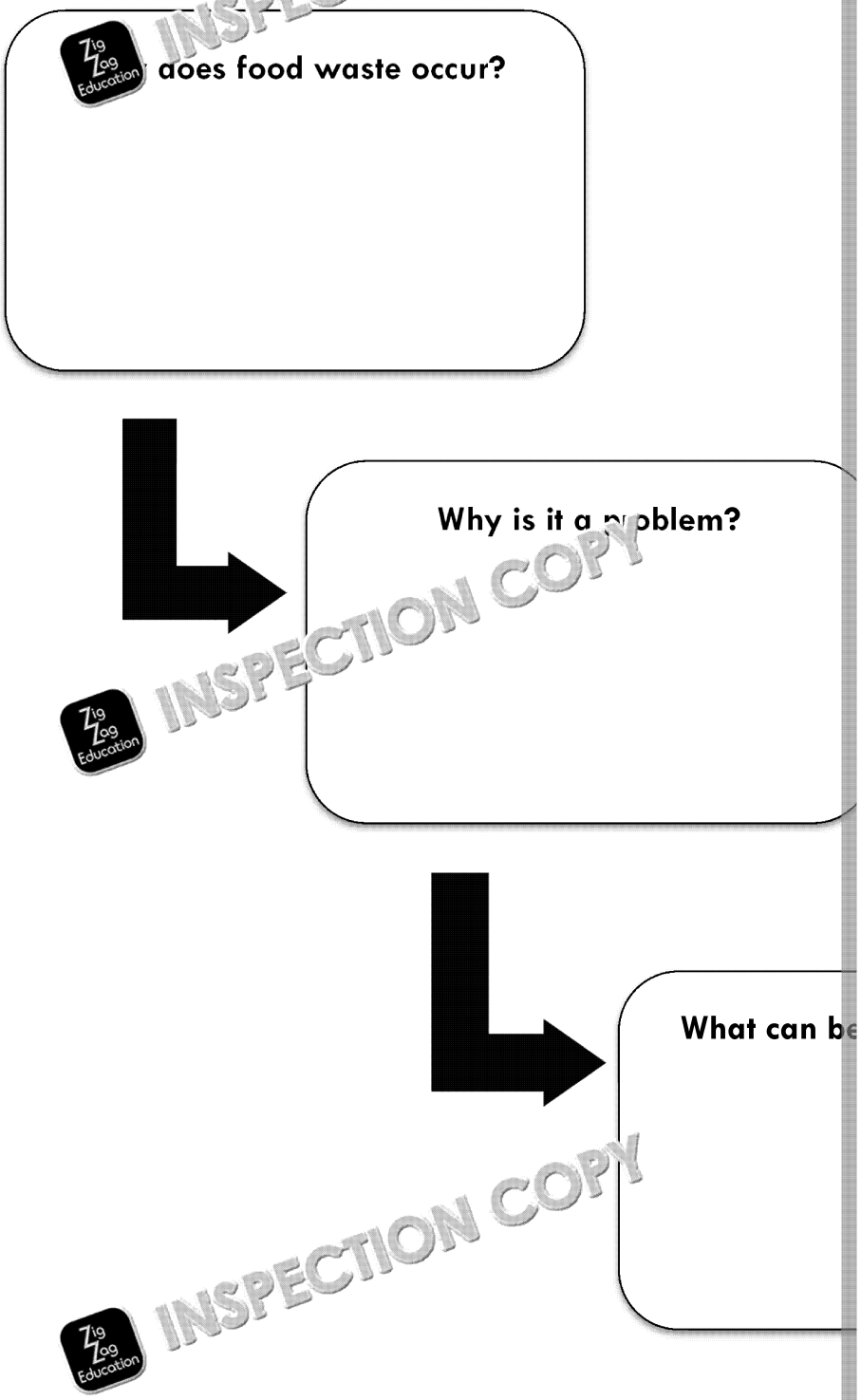
Task 2

1. Fill in the boxes with a list of bullet points for reasons why a country produci
producing too little food can cause problems.

Problems with countries producing too much food:	Problems with too little food:

One of the biggest issues with food production is waste. It is estimated that arou
wasted every year (about 1.3 billion tonnes) across the globe.

2. Fill in the flow chart to show why food waste occurs and why it is a problem,
how it can be reduced.



Food (I) answers

Task 1

1. Countries with a low GHI include but are not limited to: Russia, Brazil and many East
with the highest GHI include: DRC, Liberia, Sierra Leone, Niger, Ethiopia and Eritrea.

2. Most countries with a high GHI are developing (LIC/LDC countries, whereas countri
Advanced countries (HICs/ACs) are excluded from the data on map.

Task 2

1. Problems in countries producing too much food:
   - Overproduction
   - Wastage
   - May lead to overeating – obesity / type 2 diabetes and cardiovascular disease
   - Supermarkets often form oligopolies where food is mass-produced

   Problems with countries producing too little food:
   - Famine
   - Hunger
   - Food insecurity
   - Malnourishment
   - Diseases and illnesses
   - Hindered development
   - Stuck in a poverty cycle

2. Food waste occurs when there is overproduction and not food is not evenly distribut
scales, from commercial to household and personal. Personal food waste is caused b
going off before it can be eaten, among other reasons. Commercial food waste is oft
regulations regarding food hygiene standards, in particular 'sell by' dates.

It is a p as there is already unequal food distribution globally and nationally.
water a ergy. People are starving and severely malnourished while food is bein
waste harms the economy, society and the environment.

For example: Food waste can be reduced on a personal/household level by only buyi
common sense with regard to telling whether fruit and vegetables are no longer edi
best before dates. Commercial food waste may be reduced by donating excess food
people, food banks and other people who may not be able to afford food.

Energy (I)

	Description
Task 1	Physical geography and the global distribution of energy produc
Task 2	Global distribution of oil supply and de
Task 3	Environmental impacts of n

In this lesson you will:

- ✓ learn about how p
- ✓ learn a
- ✓ learn a

Task 1

1. Match the energy types to the physical factors that are needed to produce th

Specific geological conditions are needed for this type of energy resource. Organic plant materials that have decomposed and have been crushed by immense pressure and heat over millions of years form the basis of this type of energy.
This types of energy resource is also found under specific geological conditions. Petroleum hydrocarbons from decomposed marine material are trapped between layers of rock beneath the Earth's surface formed millions of years ago. This resource is not solid or liquid. There is a high demand for exploration of this resou
High levels of tectonic acti are required for this type of energy. The from moving plates beneath the Earth's surface produces heat which utilised to form this renewable source.
Climate conditions influence how suitable this type of renewable energy resource will be for a specific area. High levels of sunshine for a prolonged period of time are required to make this resource viable.
Specific climate conditions influence the viability of this renewable energy source. Wind speed is one factor, as well as having a prolonged period of windy conditions which allow turbines to turn to create energy.
Geology, climate and topography affect the distribution of this energy resource. Mountainous areas are a good location for this resource, due to the high levels of relief rainfall, where dams can be built to harness the power of water used in this resource.
Physical geography the viability of this energy rc a large tidal range.
This ty energy resource is found under specific geological conditions. Petroleum hydrocarbons from decomposed marine material are found in liquid form between layers of rock beneath the Earth's surface formed millions of years ago.

Task 2

The global distribution of energy consumption and energy resource production is produce lots of oil but may have a small energy demand; in this case they sell the with a much higher energy demand. This is called the global oil trade. Below are and supply (per nation) of six countries, including the UK.

Country	Oil production (million tonnes) (2016)	Oil co
USA	543.0	
	199.7	
Saudi Arabia	585.7	
Russia	554.3	
UK	47.5	
Denmark	6.9	

BP statistical review of world energy (2017)

1. a) Study the data in the table before filling in the answers in the grid below

Questions	
Which country produces the most oil?	
Which country consumes the most oil?	
Which country has the largest difference between oil production and oil consumption?	

b) Why do you think countries with a higher demand than supply of oil do

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c) China is an emerging country (or NEE), whereas Denmark is a developed co and explain why you think there is such a big difference between the oil de

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2. As economies grow and more countries rapidly develop, the need for a highe
One option is resource exploration. This usually refers to exploration of oil a
energy resources. However, it is quite a controversial topic as these resource
create issues for the natural environment.

Aside from the environmental impacts caused by the release of emissions fro
exploration and extraction of the resources also have negative consequences

Keywords

Exploration: finding ... ces of energy; usually refers to oil, gas and m

Extraction: t... cess of obtaining the mineral or energy resource from the

Exploitation refers to humans utilising (or often overutilising) the natural lands

Fill in the grid to show the environmental impacts of oil and gas exploration.
climate change and the associated impacts.

Environmental impact	Example	Wh
Land scarring		
Oil		
Carbon emissions		
Deforestation		

Energy (I) answers

Task 1

1. Coal
2. Natural gas
3. Geothermal
4. Solar power
5. Wind power
6. Hydroelectric
7. Tidal power
8. Natural oil

Task 2

1. a)

Questions	Ans
Which country produces the most oil?	Saudi Arabia
Which country consumes the most oil?	USA
Which country has the largest difference between oil production and oil consumption?	Saudi Arabia

b) Import oil from oil-rich countries, e.g. China may import from Saudi Arabia

c) China is emerging – it has a high energy demand in order to develop and indust
population (the highest of any country in the wo[illegible]is will be likely to impact
already developed and has a smaller population. Denmark may also have a larg
coming from other energy sources such as renewable energy (in fact, Denmark
power in its energy mix).

2. **Land sc[illegible]** – d[illegible] the natural environment through artificial erosion; damage
habitat[illegible]pacts biodiversity. Land becomes degraded and it very difficult to res
most cas[illegible]nearly impossible).

Oil spills – severe damage to the ecosystem (poisoning of fish and other marine life,
to clean up, making an oil spill a high-risk impact; seabirds become covered in oil and

Carbon emissions – enhanced greenhouse effect leading to global warming and clim
(photochemical pollution) becomes an issue for humans (respiratory diseases) and a

Deforestation – reduces the carbon sink (so there is less filtration of carbon dioxide
scarring, 'slash and burn' techniques commonly used in deforestation creates an incr
enhanced greenhouse effect), damages and loss of wildlife and habitats.

Water (I)

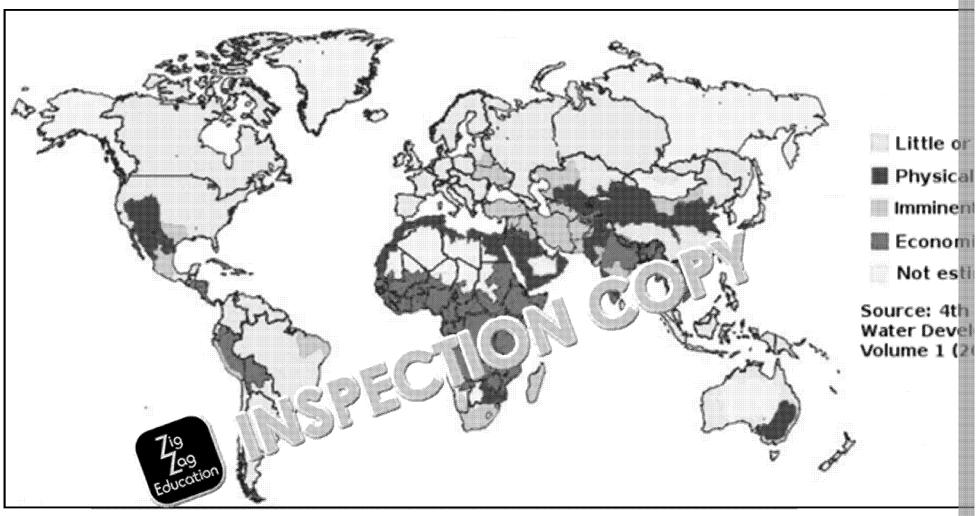
	Description
Task 1	Water scarcity and the associated impacts
Task 2	Increasing water supply and water conservation

In this lesson you will:

- ✓ learn about patterns of water scarcity and associated impacts
- ✓ learn about ways to increase water supply

Task 1

As a country develops and its population increases, that country's water demand
some areas have water scarcity (limited water available) while some have an abu
in terms of physical scarcity (there is a limited natural supply) or economic scarci
supply infrastructure despite the natural resource being available).

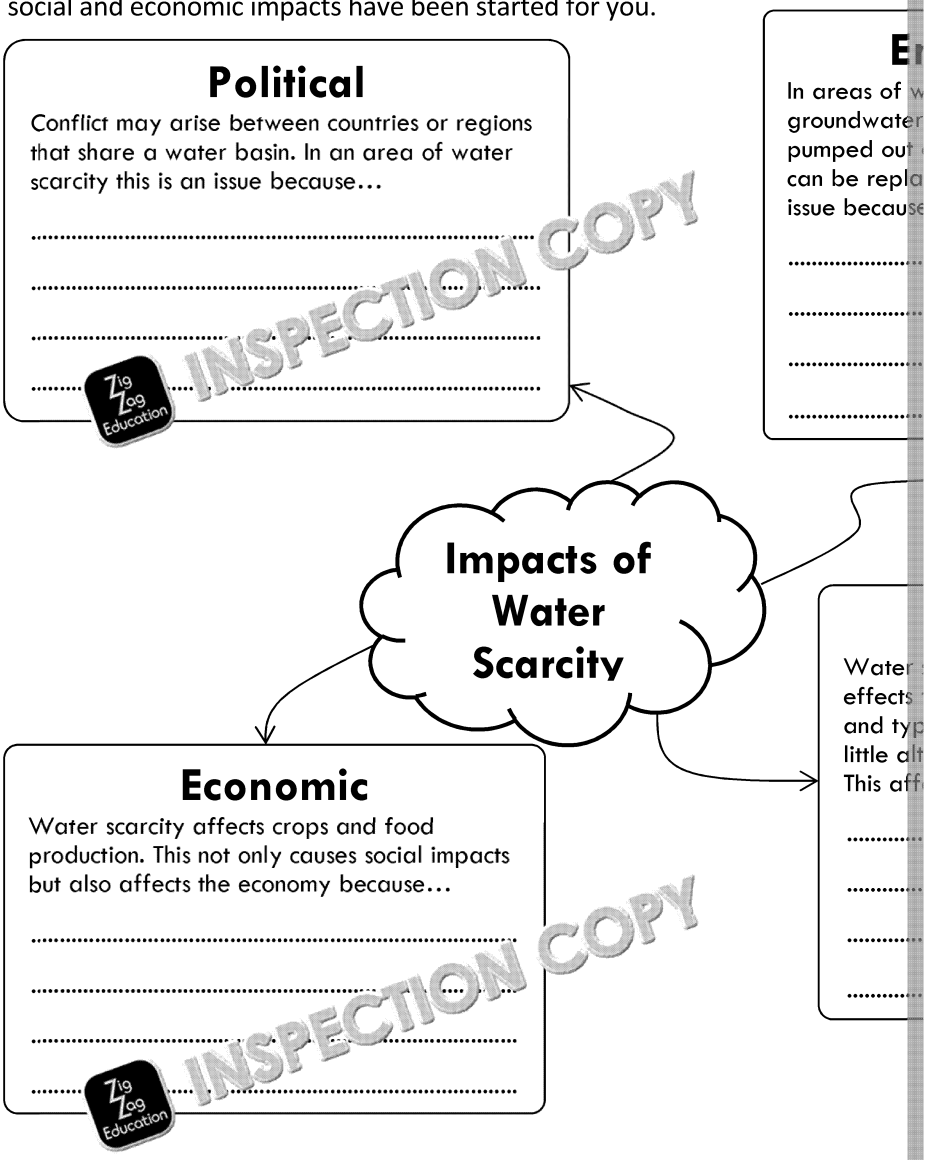


1. Study the map above and in the box below describe the location of overall w

2. What do you notice about the pattern of economic water scarcity around the

3. What do you notice about the pattern of physical water scarcity?

4. Complete the mind map below to show the impacts of water scarcity. The the social and economic impacts have been started for you.



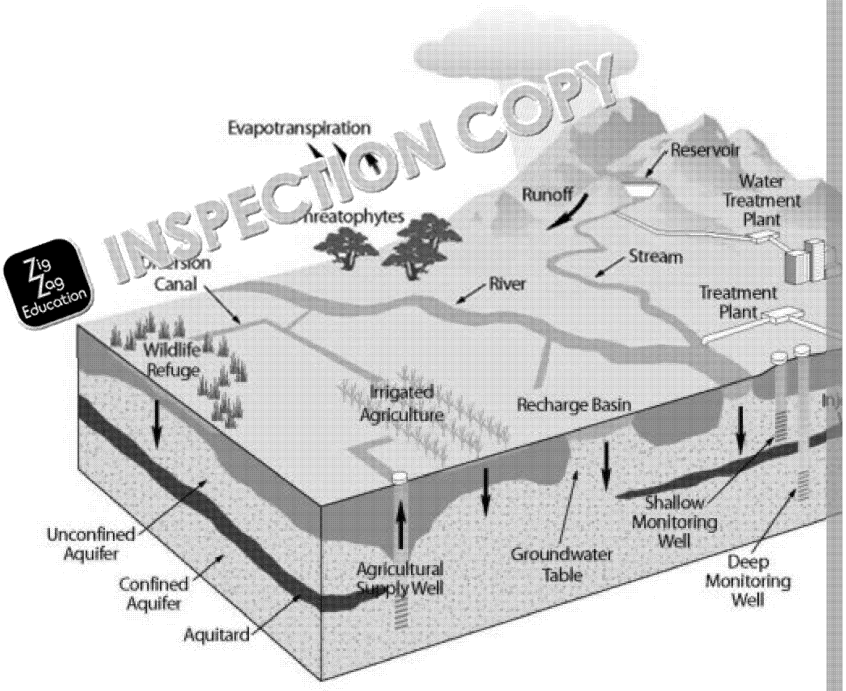
Task 2

1. Match the description to the scheme aimed at increasing water supply.

Scheme	
Desalination	a) This is a co… storage. In… rainfall into… collected a… by pipes to…
Transfer	b) Salt water, u… removed fr… process and… option in LIC…
Dams… …rvoirs	c) This is wher… place to an… rechannelle…
Diversion	d) Water from… surplus) is t… water scarci… scale infrast…

Aside from increasing water supply, there is also the option of water conservation security. This includes groundwater management and grey water recycling.

This diagram shows groundwater management, or 'aquifer recharging'.



In aquifer recharge, water is artifically pumped back into the ground faster than it (through percolation of rainwater through permeable rock).

2. Do you think groundwater management is a good method of water conservation?

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'Grey water' is water than been used by humans for everyday household activitie
laundry and cooking. This water can be 'recycled' by using it to water plants and i

3. What do you think are the pros and cons of grey water recycling?

Pros	

Water (I) answers

Task 1

1. Water scarcity is largely located in the tropics and subtropics. There is little water sca and parts of northern and eastern Asia.

2. Economic water scarcity is prominent in sub-Saharan Africa, parts of South America, These areas contain countries that are generally classified as LICs.

3. Physical water scarcity is slightly more widely spread than economic water scarcity, v regions being located at the edges of the subtropics. Unlike with economic water sca of physical water scarcity are HICs (such as USA and Australia), and others are NEEs (

4. Answers will differ between students but should include:
   - **Political** – war or conflict can cause fatalities, serious injury or widespread displ
   - **Environmental** – it affects the natural water table, which causes an unstable en cycle and ecosystem.
   - **Economic** – people will become malnourished, affecting the workforce. It will a may be low in yield so will damage the economy and cause countries to depend dependency.
   - **Social** – diseases can be harmful and may even cause fatalities. Diseases and m biggest causes of infant mortality. Unclean water is also one of the biggest hind

Task 2

1. Desalination – b, Transfer – d, Dams and reservoirs – a, Diversion – c.

2. Answers will differ between students, but the following should be recognised:
   - Explanation of advantages, such as replacing the groundwater so that the wate
   - Explanation of disadvantages, such as hard engineering to the natural environm negative effects on the natural water cycle; there is a risk of flooding if there is
   - A reasonable and justified conclusion

3. - **Pros** – include but are not limited to: conserves fresh water, which is a valuable reso drinking and the plants and gardens do not need fresh water all the time and
   - **Cons** – include but are not limited to: some grey water recycling systems may b always practical to collect grey water without sufficient systems; harsh chemica may become mixed up in grey water and can kill plants.