Geography – The Challenge of Resource Management **Resource Management Workbook**



Name: ____

Key idea	Specification content	
The changing demand and provision of resources in the UK create opportunities and challenges.	 An overview of resources in relation to the UK. Food: the growing demand for high-value food exports from low income countries and all- year demand for seasonal food and organic produce larger carbon footprints due to the increasing number of 'food miles' travelled, and moves towards local sourcing of food the trend towards agribusiness. 	
management nagement and one from	 Water: the changing demand for water water quality and pollution management matching supply and demand – areas of deficit and surplus the need for transfer to maintain supplies. 	
tion content ificance of food, water and energy to c and social well-being.	 Energy: the changing energy mix – reliance on fossil fuels, growing significance of renewables reduced domestic supplies of coal, gas and 	
iew of global inequalities in the supply sumption of resources.	 oil economic and environmental issues associated with exploitation of energy 	

sources.

3.2.3 Section C: The challenge of resource management

In this section, students are required to study <u>Resource management</u> and **one** from <u>Food</u> or Water or Energy .

3.2.3.1 Resource management

Key idea	Specification content
Food, water and energy are fundamental to human development.	The significance of food, water and energy to economic and social well-being.
	An overview of global inequalities in the supply and consumption of resources.

Key words in Resource Management

Task 1: For each of the definitions match the correct keyword and write it in the correct box. One has been completed for you.

Definition	Keyword
Where supply is greater than demand	Surplus
When demand is greater than supply	Deficit
When availability is insufficient to ensure the good health and livelihood of a population	Insecurity
Difference between poverty and wealth, as well as people's well- being and access to things like jobs, housing and education	Inequality
When there is a limited supply of an available resource	Scarcity
The use of a specific resource	Consumption



What is a resource?

Resources are...

A country's collective means of supporting itself or becoming wealthier, by its reserves of food, water, energy and other natural assets.

Access to resources is important for . . .

Quality of life – the general well-being of people, which includes income, health, education, employment and the environment.

Resources

Task 2: For each of the resources below make a list of the different ways they are used by people and countries in their development

Food

Energy

Water

Food

Your health is affected by how much you eat and the food's nutritional value. The World Health Organisation (WHO) suggests that we need 2000–2400 calories per day to be healthy. Over one billion people in the world fall below this level and are described as *malnourished*.

A further two billion people suffer from **undernutrition** (malnutrition) – a poorly-balanced diet lacking in minerals and vitamins. This can result in a range of illnesses and diseases. It can also have economic effects. People need to be well fed to be productive at work and contribute to the economic development of their country. Obesity (being overweight) is an increasing problem.

Food as a Resource



Food Insecurity: not

having access to sufficient food, or food of an adequate quality, to meet one's basic needs. "more than 800 million people live every day with hunger or food insecurity"

Food Security Promotes National Security



Food insecurity and price shocks can spark violence and political instability.





Urban consumers are less likely than rural consumers to face chronic food insecurity, but they are **more deeply affected by food price volatility** and **have little ability to absorb price shocks**, which can lead to unrest.



When food prices spiked in 2007-2008 and 2010-2011, **28 riots** occurred across Asia and Africa, where there are high rates of urbanization and undernourishment.

Energy as a Resource

Task 4:

- 1. Do poor countries or rich countries use less energy?

- 4. Which region uses the most solar PV as an energy source?





Water as a Resource

Task 5: Compare the water use in the UK (HIC), Nigeria (NEE) and Malawi (LIC).





Task 6: Describe the distribution of the worlds food insecurity.

Food as a Resource

How can we DESCRIBE a distribution map?

Trend – What is the main trend or pattern you can see?

Examples– Name an area and use specific information from the key.

Anomalies – Do any places not fit the trend you have identified?



Task 7: Describe the distribution of the worlds primary energy consumption

Primary energy consumption, 2019

Primary energy consumption is measured in terawatt-hours (TWh).

Energy as a Resource

How can we DESCRIBE a distribution map?

Trend – What is the main trend or pattern you can see?

Examples– Name an area and use specific information from the key.

Anomalies – Do any places not fit the trend you have identified?



Task 8: Describe the distribution of the worlds freshwater availability

Water as a Resource

How can we DESCRIBE a distribution map?

Trend – What is the main trend or pattern you can see?

Examples- Name an area and use specific information from the key.

Anomalies – Do any places not fit the trend you have identified?





Food in the UK

Task 9: Complete the table below

Type of Farming	What is it?	Advantages	Disadvantages
Organic Farming			
Aaribusinesses			
Agiibusii lesses			
'Grow your own'			
Urban Farming			
Urban Farming			





NFW QUALITY

New Zealand

Importing Food in the UK

45% of the UK's vegetables are imported. 84% of the UK's fruit is imported, 19% of this comes from Spain. The UK is produces over 80% of its meat, eggs and dairy products. Why does the UK import so much food?

Demand for seasonal food all year round (strawberries, apples)

> UK **climate is unsuitable for the production** of some foods, such as cocoa, tea and bananas

Availability of cheaper food from abroad imported by supermarkets who complete for low prices

THE DE	N D	EUF		
UK-GRO	ŴNF	'00D		
Proportion of food we consume that is produced in Britain				
Food	2000	2011		
Cucumbers	55%	30%		
Tomatoes	29%	19%		
Mushrooms	57%	41%		
Salad onions	62%	22%		
Cauliflower	<mark>64</mark> %	50%		
Brussels sprout	s 95%	89%		
Leeks	83%	74%		
Raspberries	83%	70%		
		SOURCE: NFU		

Task 10: Explain the key trends with food imports in the UK

Demand for greater choice and exotic foods

UK-produced food can be expensive because of poor harvests and the price of animal feed Many LIC's use land as plantations to grow commercial crops to sell to HIC's. This has 2 effects...

Problems with Importing Food

Water is used for irrigation of crops instead of to provide drinking water.

Ecosystems like rainforest are destroyed to give more farm land

Water is taken from lakes, rivers and ground water. This changes the environment and local wildlife may suffer

Instead of growing food to feed themselves, people use land to grow crops to feed HIC's

Britain may become dependent on other countries. This makes us vulnerable.

Food prices are soaring due to increases in price of fuel, which means it is now more expensive to transport food, as well as increased prices for fertilisers and animal feed have added to costs.

Food miles increases our carbon footprint

Food production and transportation creates increased CO2 release.

More fossil fuels are used, leading to energy source depletion.



Task 11

a. Explain how importing food can affect other countries

b. Explain how importing food can affect the UK

There are two key reasons why the UK's energy use has increased over the past 100 years.



Energy in the UK

Task 12: Describe how the UK's energy mix has changed since 1950

Since 2005 the UK has reduced its energy demand due to:

- Industrial demand has decreased by 60%. Less industry is located in the UK and has moved abroad.
- Households use 12% less due to energy efficient appliances and improved insulation meaning less heating required.
- However, there has been a rise of 50% in energy use in the transport sector, due to the number of cars on the road more than 27 million today compared with 10 million in 1970.

Improved energy efficiencies will continue to offset population growth, which means that the UK will use less energy in 2030 than it did in 1970.

Energy in the UK

Task 14: Using the next three slides complete the table below

Type of Energy Production	What is it?	Advantages	Disadvantages
Fracking			
Nuclear Power			
Wind Power			

Fracking

Hydraulic fracturing, or **fracking**, is a technique for recovering gas and oil from shale rock.

It is the process where liquid is pumped deep underground at a high pressure to fracture shale rock as a means of releasing the gas or oil trapped within it.



The UK can only meet 48% of its gas demand from domestic supplies (this would be 54% if it did not export any gas).

A small number of Tory MPs, known as the Net Zero Scrutiny Group, <u>claimed</u> restarting drilling at Cuadrilla's two existing wells could be done quickly, and would provide significant supplies.

Cuadrilla claimed that "just 10%" of the gas from shale deposits in Lancashire and surrounding areas <u>"could supply 50 years' worth of current UK gas</u> demand".



Latest fracking tremor believed to be UK's biggest yet

Houses shake as 2.9-magnitude quake recorded near Cuadrilla's site near Blackpool on Monday



The drilling rig at Cuadrilla's Preston New Road fracking site. Photograph: Dave Thompson/PA A large tremor that caused houses to shake has been triggered by the UK's only active fracking site, amid rising alarm about the controversial practice.

3.2.3.3 Water







Key idea	Specification content
Demand for water resources is rising globally but supply can be insecure, which may lead to conflict.	 Areas of surplus (security) and deficit (insecurity): global patterns of water surplus and deficit reasons for increasing water consumption: economic development, rising population factors affecting water availability: climate.
	geology, pollution of supply, over-abstraction, limited infrastructure, poverty. Impacts of water insecurity – waterborne disease and water pollution, food production, industrial output, potential for conflict where
	demand exceeds supply.

Key idea	Specification content
Different strategies can be used to increase water supply.	 Overview of strategies to increase water supply: diverting supplies and increasing storage, dams and reservoirs, water transfers and desalination an example of a large scale water transfer scheme to show how its development has both advantages and disadvantages. Moving towards a sustainable resource future: water conservation, groundwater management, recycling, 'grey' water an example of a local scheme in an LIC or NEE to increase sustainable supplies of water.

The average person currently uses 150 litres of water every day (the very highest use in the south-east England) – by comparison, someone in Africa uses on average 47 litres a day, while someone in the USA uses on average 578 litres.

Water is mostly used for washing and for flushing the toilet but also for drinking, cooking, washing the car and watering the garden. Only 66% of households owned a washing machine in 1972 but, by 2010, that figure was 94%

The amount of water used per household has risen by 70% over the last 30 years –mainly due to the introduction of appliances that use a lot of water, like washing machines and dishwashers.

Water in the UK

 Task 15: State 4 key facts about water use in the UK

 1.______

 2.______

 3.______

 4.______

Washing up

Clothes washing

Personal washing Showers

Task 16: Describe water use in the averagehome in the UK

the l	UK			
				(
- 18 - 1		 		
- 18 - 1		 		

How you use water in your home

1%
%
%
%
6
6
6
6
1 1 1



Personal washing - Baths

Water in the UK

Water Stress - When the demand for water exceeds supply in a certain period or when poor quality restricts its usage

Task 17: Using the two maps below explain which areas of the UK will experience water stress **Rainfall Amount** Population density Annual Average 5000 + 1981-2010 2500 - 5000 1000 - 2500 500 - 1000 UK 250 - 500 100 - 250 Average Value (mm) population > 3000 2000 to 3000 50 - 100 25 - 50 density 1500 to 2000 0 - 25 1250 to 1500 1000 to 1250 map 800 to 1000 700 to 800 600 to 700 < 600 **UK** rainfall map Synd there is

Crown copyright

Reducing Water Stress

Task 18: Using the next three slides complete the table below

Strategy	How is it managed?	Advantages	Disadvantages
Water Transfer			
Water Quality			
Reduce Water Use			



Water Transfer

Elan Valley reservoirs in Wales have supplied Birmingham since 1904



Using rivers and pipes water can be transferred. Lake Vyrnwy is an example of a reservoir where water is stored (in the Welsh hills, large amount of rain) and transferred to local city of Liverpool (high demand, densely populated).

There is **opposition to large-scale water transfer schemes** because of;

- The effect on the land and wildlife river habitats would need to be protected.
- The high construction and maintenance costs involved
- The transport water requires energy from electricity. Therefore, greenhouse gases are released in the process of pumping water over long distances.



Water Quality

Even though some regions might have enough water, its quality may mean it is unusable without treatment.

Water is polluted by a number of sources: agricultural fertilisers, industrial waste, chemicals from transport and factories.

Education – informing the public about how to dispose of waste materials properly Eg. Engine oil, baby wipes

Waste water treatments – removing suspended solids, bacteria, chemicals to produce clean water for human use.

In the UK the Environment Agency monitors water quality, filters water and adds chlorine to purify water.

Legislation – strict laws ensure that factories and farms are limited in the amount they discharge into rivers. Water companies have very clear regulations and penalties.

Water quality in England and Wales is poor compared with Scotland's

100

90 80

70

60

50 40 30

20

10

Proportion of water bodies* by surface area failing to achieve good ecological status, by river basin district (%, 2015)

Excluding unknown status burce: European Environment Agency

Environmentally friendly strategies such as:

Pollution traps – reedbeds or mussel beds have been established near factories and roads to 'catch' and filter out pollution. They also act as habitats for wildlife.

Green roofs and walls – these also filter out pollution naturally in rainwater. They also reduce flood risk in cities and combat climate change by absorbing carbon dioxide.





SAMPLE RESIDENTIAL GRAYWATER SYSTEMS



Reducing Water Use

Grey water - the relatively clean waste water from baths, sinks, washing machines, and other kitchen appliances

Improved technology – new technology is becoming more energy efficient and water efficient

Reducing leakage -

Some leaks in water pipes are inevitable as pipes can wear out or be damaged by freezing weather or the weight of traffic on roads.

The sector will cut leakage by 16% by 2025. This will save enough water to meet the needs of everyone in Cardiff, Birmingham, Leeds, Bristol, Sheffield and Liverpool.

Lower leakage levels will also result in less stress on the environment through a reduction in the volume of water that needs to be taken from rivers.

Water companies have committed to delivering a 50% reduction in leakage from 2017-18 levels by 2050.

Causes of Water Insecurity

Food production

70% of global water supply is used for agriculture. Especially in areas of water stress, drier regions are more at risk. Even in HIC's like Australia, water supply is crucial to food production. The USA grows 30% of the world's wheat, maize and rice. Droughts and water shortages are serious issues that can have global impacts on food supply.

Waterbourne diseases and pollution

The River Ganges – is 2520km and flows through Northern India and Bangladesh. It is the most polluted river in the world.

Where there is poor infrastructure like open sewers high levels of water pollution are common place. This can lead to contaminated water supplies leading to diseases such as cholera and dysentery.

Task 19: Explain the main causes of water insecurity across the world

Countries begin to experience **water stress** when less than 1700m³ is available per person per year. Below 1000m³ water stress may damage economic development, human health and well being.

Water conflict

Water sources such as rivers and groundwater aquifers, cross national and political borders. Many of the world's rivers flow through several countries. Issues such as dam construction and pollution can affect more than one country. By 2030 Chinese industry and power stations will use 33% of the country's available water supply.

The River Nile, the longest in the world is also facing issues amongst the countries it passes through.

Egypt's population of 100 million rely on the River Nile for its water. 80% of the countries water supply is used in agriculture but this is expected to decrease by 30% over the next 30 years. Egypt currently has to import 60% of its food.

LIC's upstream like Ethiopia, Uganda and South Sudan are starting developing rapidly and so is there demand for water and energy. This creates great tension across the region.

Lesotho Highland Water Project



Task 20:

a. Describe location of Lesotho

b. Why is Lesotho suitable for a large-scale water transfer?

Lesotho is a highland country in Southern Africa and is landlocked. This has resulted in high levels of poverty and few resources available to feed its growing population. Despite food insecurity, Lesotho has a water surplus due to high rainfall and low demand.

> The project involves damming some of Lesotho's major rivers – most of which flow south into the Senqu (known to South Africans as the Orange River). This damming process has created large artificial lakes. The water from the lakes is then diverted north (through tunnels under the mountains) to South African rivers. These rivers lead to the Vaal Dam, which supplies the densely populated, urban and industrial region around Johannesburg and Pretoria.



Why was Lesotho chosen for the project?

- The mountains of Lesotho have an average annual rainfall of over 1000 millimetre. This means that about 50% of the water flowing down the Senqu/Orange River falls as rain in Lesotho. Lesotho's water resources far exceed its possible future requirements, even allowing for possible future irrigation projects and improving living standards.
- The water originating in the mountains has good chemical quality and low sediment content.
- The project's dams have strong foundations on either the basalt (Katse, Mohale, Matsoku Dams) or the underlying hard sandstone.
- Deep, steep-sided valleys provide excellent dam sites.
- Local dolerite and basalt rocks can be crushed to produce good concrete for dam construction.
- The project is located in an area of low earthquake risk. One earthquake occurred in 1996, during the filling up of the Katse Dam at Mapeleng.

Lesotho Highland Water Project



Advantages for Lesotho

Task 21: What is the most significant advantage for Lesotho? Give reasons.

Task 22: What is the most significant advantage for South Africa? Give reasons.

- ✓ Will provide 75% of its GDP
- ✓ Water supply will reach 90% of the capital cities population
- \checkmark Sanitation coverage will increase from 15% to 20%
- Income will help development and improve standard of living
- ✓ Hydro-electric power will provide clean electricity
- Improved national infrastructure

Disadvantages for Lesotho

- x The first two dams built displaced 30,000 people
- X A wetland ecosystem was destroyed by controlling the flow of the river
- X The Polihali Dam will destroy 17 villages and destroy agricultural land
- X Corruption has prevented money from reaching those affected by the scheme

Advantages for South Africa

- Will provide water to areas with regular droughts
- ✓ Will provide safe water to 10% of the population
- Fresh water will reduce the contamination of reservoirs by other industries like gold mining

Disadvantages for South Africa

- x Costs will reach US\$4 billion
- X 40% of water is lost through leakages
- x Corruption has plagued the whole project
- X Increased water rates to pay for the scheme are too high for the poorest people to pay

Strategies for Managing Water Supply

Task 23: Using your case study of Lesotho and the next page to complete the table below

Strategy	What is it? How does it work?	Advantages	Disadvantages
Large-scale Water Transfer (Lesotho Highland Water Project)			
Dams and Reservoirs			
Desalination			

Dams and Reservoirs

Dams control water flow in rivers by storing water in reservoirs.

Rainfall can be collected and stored when it is plentiful and then released gradually during drier periods.

Disadvantages

- Expensive (Three Gorges, China \$37 billion)
- Can displace large amounts of people.
- May reduce water flow downstream.
- In hot areas large dams lose water through evaporation.

Desalination

Desalination involves removing salt from seawater to produce fresh water. It is a very expensive process and is used only where there is a serious shortage of water with few alternatives to increase supply.

Both Saudi Arabia and the UAE have developed desalination plants. An estimate in 2018 found that "18,426 desalination plants are in operation in over 150 countries. They produce 87 million cubic meters of clean water each day and supply over 300 million people.

The largest in the world is the Ras Al Khair desalination and power facility on Saudi Arabia's east coast which cost more than \$7bn to build. The plant serves the capital of Riyadh (7 million people) and eastern parts of the kingdom. It produces 1.05 million cubic meters of desalinated water per day and 2.65 gigawatts of power. The plant has created 3,500 direct and indirect jobs.

Advantages

- Allows water to be used for irrigation to grow food, used in industry
- Prevents flooding
- Hydro-electric power is clean energy



There are several issues linked with the process of desalination.

- 1. Environmental impacts on ecosystems when waste salt is dumped back into the sea.
- 2. The vast amount of energy required, adding to carbon emissions.
- 3. The high cost of transporting the desalinated water to inland areas via pipelines.

Sustainable Water Supply

- A sustainable water supply means that the water supply will be available for future generations to come.
- This means that abstraction of the water cannot be greater than the recharge.
- It suggests that all within communities can benefit, including the poorest people.
- It suggests that other communities and the environment will not be negatively affected by the use of this water supply.



Task 24: a. Define the term Sustainability

b. Define the term appropriate technology

Technology that is suitable for the social and economic conditions of the area.

Overall: Simple technology, that benefits the most people for the least amount of money.

So it needs to:

- use local materials.
- □ be affordable for the people who are using it.
- be maintained by the people who are using it.

Rajasthan has been described as the poorest and driest part of India. 10 of 69 million live in extreme poverty.

Task 25: Referring to the statement above why does Rajasthan need sustainable supplies using appropriate technology?

Wakel River Basin Project

Task 26:

a. Describe location of Rajasthan

b. Why does this region need a sustainable water supply?

c. How do they plan to increase water supply?

• The project is located in NW India, in the state of Rajasthan. It is the driest and poorest part of India and largely covered by the Thar Desert.

- Temperatures can reach 53°C and rainfall is under 250mm per year, falling mostly in July and August, which quickly evaporates on the surface.
- Water management in the region has been poor and many water sources have been overexploited for agriculture and domestic use.



Funded by the Global Water for Sustainability Program. This NGO (non-governmental organisation) has worked with local people.

Its main aims are:

- Increase water supply and storage using appropriate technology
- Education is used to make people aware of water issues such as soil erosion, groundwater pollution and desertification in the hope that more sustainable decisions will be made.

Wakel River Basin Project



Pats – irrigation channels that transfer water to fields. Villagers take turns diverting the water supply and are responsible for maintaining the channels Johed – small earth dams to capture rainwater. They can raise the water table higher than previously and has meant that once seasonal rivers now flow all year





Taankas – underground storage systems about 3m in diameter and 3-4 m deep. They collect water from roofs and once underground they can hold 20,000 litres of water, enough for a family for several months.

Task 27:

a. Which of these strategies is the most sustainable? Give reasons.

b. Which of these strategies is the most appropriate technology? Give reasons.