Energy mix

2024年2月19日 18:57

Keywords

- https://quizlet.com/cn/884351942/flash-cards/

Thermal power plant

- Water is heated in a boiler to produce high pressure steam
- Fossil fuel burned to produce heat / uranium atoms release heat energy by nuclear fission
- Generators are turned by the turbines blown round by the steam to generate electricity

Renewable energy sources

- Hydroelectric power
  - Rivers are dammed to create a reservoir
  - Water flows through channels in the dam and turns the turbines which create electricity in the power house
- Geothermal energy
  - In areas where the magma is close to the earth's surface
  - Water can be pumped underground → water turn to steam and the power of the steam is used to turn the turbines to produce electricity
  - The heated water can be used to heat homes in radiators
- Wind power
  - Wind energy is converted into electricity using wind turbines
- Solar energy
  - Photovoltaic cells convert sunlight into electricity
- Biofuel
  - Some plant material can be converted in liquid or gas fuels which can be used to power vehicles
  - e.g. sugar cane is converted into ethanol and oil palm can be processed to produce biodiesel
- Fuelwood
  - 3 billion people worldwide rely on wood for cooking and heating
  - This is considered renewable only if trees are being replanted

Global energy mix

- Fossil fuels: 87%
  - The world relies on fossil fuels for their energy needs
  - Oil 38%, coal 26%, natural gas: 23%
- Nuclear energy: 6%
- HEP: about 6%
- Other renewables: less than 1%

Reasons for variation of energy mix

- Level of development
  - MEDCs
    - High energy demands so they use a lot of fossil fuels which are efficient at creating electricity
    - Also they have high car ownership so a lot of oil is used for petrol
  - LEDCs
    - The energy demand is low and many people cannot afford to pay for electricity so the main energy source is fuelwood
- Physical environment
  - Countries with hot/dry climate e.g. Spain use more solar power
  - Countries which have reliable wind e.g. UK use wind power
  - Iceland uses geothermal because it is located on a plate boundary

©Xinqzhi Lu2024

- Environmental concerns
    - Some countries (MEDCs) choose to reduce their use of fossil fuels which are blamed for releasing carbon dioxide and causing global warming
    - They use nuclear power e.g. France or renewables to supply their energy e.g. Norway: 96% electricity from HEP

Problems with lack of electricity

- Cannot access light and electronics
- Collecting fuel wood causes deforestation
- Collecting fuel woods is a unproductive use of time, children miss out education, cause health + growth problems
- Burning fuel wood cause people to inhale particulate matters and cause respiratory diseases
- Prevents TNCs from building factories in the country as there is no electricity for factories

©Xingzhi Lu 2024

Nuclear + renewable energy sources

2024年2月19日 19:12

Nuclear and non-renewable energy resources comparison

Energy source	Advantages	Disadvantages

Fossil fuels	• Highly efficient at producing electricity
	• Oil is very efficient for powering transport e.g. car, planes
	• Technology for using them to produce energy is highly developed
		• Finite
		  • Coal = 120 year supply
		  • Oil + gas = about 60 years based on known reserves + current technology for extraction
		  • Humans are using oil at a faster rate than finding new oil reserves
		• Environmental damage
		  • Oil spills + deforestation to access oil + coal
		• Climate change
		  • Burning fossil fuels produces CO_2 which is responsible for the Enhanced Greenhouse Effect / global warming
		  • Ice caps melt + sea level rise

Nuclear power	• Cheap to run + reliable + highly efficient electricity source • Uranium reserves will last 1000s of years • No carbon dioxide emissions so it is considered a clean form of energy	• Expensive to build / shut down power stations • Nuclear accidents release radioactive material which is poisonous for humans e.g. Japan 2011 after tsunami • Nuclear waste is poisonous and is a risk to people's health (causing cancer) if not disposed of carefully. It remains radioactive for thousands of years • Nuclear technology is restricted because it can be used to develop weapons. International laws limit the number of countries who are permitted to use this type of energy.

Location of thermal power stations

- Near source of raw materials e.g. near a coal mine or at a port to import the fossil fuel
- Next to river to provide a source of fresh water to produce the steam and cool the machines
- Large area of flat land with room for expansion
- Labour: near a settlement to provide the workers
- Not within a settlement (in open space) to avoid people protesting about the building of the power station because it is unsightly, noisy and causes pollution

Location of nuclear power stations

- Large source of water for cooling the reactor which is often sea water (coastal location)
- Coastal location for the safe transportation of nuclear waste
- Hard rock to build a solid foundation and ideally not in an earthquake zone
- Isolated area away from large centres of population for safety from risk of radiation leaking and to avoid protests when it is being constructed
- Labour: near a small settlement to provide the workers required

Renewable energy sources

Energy source	Advantages	Disadvantages
HEP	• Low running cost • Most efficient renewable energy source for electricity production • Technology fully developed	• Expensive to build • Land flooded behind dam → loss of natural habitats and people displaced • Dams may collapse and cause devastating

	• Dams help control flooding and reservoirs provide water storage for domestic use and irrigation of farmland • Reservoirs can be used for recreational use / tourism / fishing	floods • Droughts result in not enough water to create electricity
Climate based renewables e.g. wind / solar	• Renewable and pollution free • Cheap once the turbines or photovoltaic cells installed • Can be used in isolated areas where it would be too expensive to build a network of electricity lines	• Expensive to set up wind turbines and photovoltaic cells • Weather is not reliable + so electricity supply is not dependable and you need a backup source • Not as efficient at producing electricity as fossil fuels, nuclear or HEP • Technology not fully developed yet – cannot store the electricity so supply is intermittent

Fuelwood	• Cheap
	• Renewable if replanted
	• Carbon neutral
		• Deforestation
		  • Demand for fuelwood increases and trees are cut down faster than being planted
		  • Causes habitat destruction
		• Increased soil erosion / landslides when hillside are cleared
		• People (mostly women + children) waste hours of time and effort collecting wood
		  • Bad for their health + they could be using their time more productively, children miss out school
		• Health problems e.g. lung disease caused by continuously breathing smoke filled air in homes

<u>Location of hydroelectric power station</u>

- On a river with a large and reliable discharge (flow)
- Steep sided and narrow valley to make it easier to build the dam across the river
- Impermeable rock to provide a solid foundation to build the dam + prevent water leaking
- Sparsely populated area up stream: a large area is flooded to create the reservoir, if it is sparsely populated there are fewer people to move

© Mingzhi Lu 2024

Water uses and methods of supply

2024年2月19日 23:36

Keywords
https://quizlet.com/cn/884848474/flash-cards/

Reservoirs + dams

- Rivers are dammed to flood the land behind the dam and create a manmade lake / reservoir
- HEP turbines are often built into the dam so that electricity is produced as well as creating water storage
- Water is transferred to urban or agricultural areas through pipelines

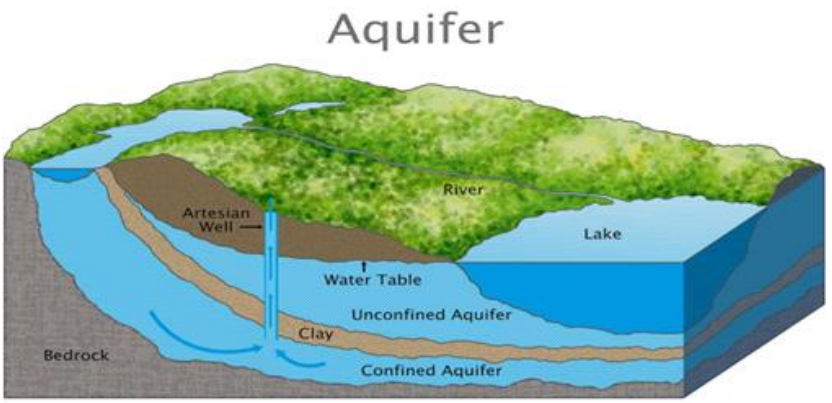
Reservoirs + dams pros and cons

- Advantages
  - Large water supply
  - Constant / reliable supply of water
  - Stores water from the wetter season for drier seasons
  - Multi-purpose scheme: creates hydroelectric power + leisure activities and possible tourism development
- Disadvantages
  - High cost
  - Large area of land flooded upstream → people displaced + habitat destruction
  - Water loss from evaporation during summer

Wells and bore holes

- Drilled into an aquifer below ground
- An aquifer is a created when the rock below the surface is permeable e.g. chalk which mean it has pores (holes) or joints (cracks) in the rock and water can collect in these spaces
- The top level of the water is called the water table
- The depth of the water table will vary depending on the amount of rainfall and the amount of water that has been exstracted
- Water can be exstracted by drilling a bore hole down into the rock below the water table and building a well
- An artesian well can be drilled and water will be forced up due to the pressure gradient
- (+ water pipe take water to people's home)

Yingxi Lu 2024

- 

Wells and bore holes pros and cons

- Advantages
  - Water can be accessed in regions with low rainfall
  - Cheap access to clean water, technology available in LEDCs
- Disadvantages
  - Rainfall may not refill the aquifer if overused so wells / boreholes need to be dug deeper

- Deep aquifer water can be poisonous as it contains minerals e.g. lead

Desalination plants

- Most common method is desalination
  - Heat up water
  - Water evaporates into water vapour but salt left behind
  - Water vapour condenses to fresh water
  - This is used commonly in the Middle East where there is a plentiful source of energy
- This method is expensive using current technology in comparison with normal water sources
  - It requires a large amount of energy to boil the water
  - There are environmental concerns about the disposal of the saline (salt) waste
- Reverse osmosis
  - A pressure gradient created
  - Fresh water move from high to low pressure through a partially permeable membrane as they have smaller molecules
  - Salt molecules is too large to pass through
  - Fresh water is collected in the lower pressure side
- (+ water pipe take water to people's home)

Desalination plants pros and cons

- Advantages
  - Reliable + continuous supply of fresh water
  - Endless supply of salt water
- Disadvantages
  - High cost to build
  - Only available in coastal areas
  - Produces saline waste which damages marine life when disposed in the ocean
  - Requires energy → high cost + create CO_2 emissions

How water is used

- Domestic use
  - In households for drinking, washing and sanitation purposes
  - 10% of global water use
- Industrial use
  - As a raw material, for cleaning + cooling machines
  - 20% of global water use
- Agricultural use
  - For irrigating (watering) the crops when rainfall is not sufficient
  - 70% of global water use

Reasons for variation of water mix

- Level of development
  - LEDCs
    - Use a higher % of their water on agriculture as their economies are focussed on farming and most of their population are subsistence farmers
  - NICs
    - Large proportion on industry due to industralisation
    - Still a large rural population so a large amount of agricultural use
    - More domestic use as standard of living increases
  - MEDCs
    - Will use a higher % of their water supply on industry because they have a larger industrial sector of the economy
- Climate
  - Countries with low rainfalls (tropical desert environment)
    - May use a higher % of their water supply for agriculture to irrigate their farmland as lots of water lost from evaporation + not enough rainfall for crops
  - Countries with reliable rainfall (temperate)

©Xingzhi Liu 2024

- May use a lower % of their water supply for agriculture because their farming will be rain fed

©Xingzhi Lu 2024

Water shortages

2024年2月19日 23:39

Water consumption patterns

- Water consumption across the world is not equal
- People in MEDCs consume much more water than those in LEDCs
- 1 billion people are without safe drinking water and 2.5 billion people have no sanitation facilities

Types of water shortages

- Physical water scarcity
  - Demand for water is higher than what the natural environment can supply because of low precipitation and high demand
- Economic water scarcity
  - Lack of investment in infrastructure so people cannot access sufficient water supplies / poverty so people cannot afford to buy water

Why some areas have water shortages

- Human
  - High population density means greater demand in a small area, so water deficit is more likely.
  - War / conflict causing displacement of people to refugee camps with poor water supplies
  - As the level of development increases demand for water in industry and leisure will increase, thus making it more likely to exceed supply.
  - As the level of technology in agriculture increases the demand for water will increase. Moreover if large numbers of the population are involved in crop farming the water used in irrigation will be very high causing demand to exceed supply
  - Insufficient investment in water infrastructure e.g. dams/ reservoirs and pipelines
  - Pollution of rivers and ground water due to urbanisation causing increased industrial waste and untreated sewage being dumped in rivers or infiltrating into ground water
- Physical (supply)
  - High temperatures = lots of evaporation, reduces supply of easily accessible water
  - Low rainfall / drought can cause long term water shortage, so supply is lower than usual demand
  - Natural disaster e.g. earthquake destroys water infrastructure e.g. dams and pipelines

Why do most MEDCs NOT experience water shortages

- Government can afford to build water infrastructure e.g. dams/ reservoirs and pipeline
- In MEDCs which have semi-arid climates the government can afford to build and run desalinisation plants
- Government can pay for the import of water during a drought

Impact of lack of clean water on local people

- Dehydration which can lead to death
- Illnesses and even death from polluted water spreading water borne diseases e.g. cholera and dysentery. 10% global disease is caused by unclean water
- Contaminated food supplies: polluted water is being used to irrigate crops and so these foods can become unhealthy
- Insufficient water for irrigation and watering animals so there is a food shortage leading to malnutrition
- Energy + time wasted collecting/carrying water from further away
- High cost of buying water from tankers/bottled water
- Poor hygiene due to lack of water for cleaning which can lead to illnesses

Methods to use water more sustainably

- Provide emergency water supplies

© Xinzhi Liu 2024

    - e.g. using bottled water and water trucks
- Digging boreholes and wells to access groundwater in aquifers
- Building desalinisation plants
- Recycle water
    - Grey water can be treated and then used for some purposes that do not have to be the same standard of cleanliness as drinking water
    - It can be used to irrigate gardens/ golf courses or flush toilets
- Reduce water loss
    - Mend leaking pipes
    - Ensure less water is lost from evaporation by reducing the amount of water stored outside in hot climates
- Reduce water subsidies
    - In some countries e.g. US governments make the cost of water cheaper to make it more affordable for farmers and domestic use → this encourages farmers to use more water and not look for ways to farm more efficiently
- Crop choice
    - Grow more drought resistant crops e.g. millet which do not require so much water
- Education
    - Encourage population to use less water
- Farming techniques
    - Use more water efficient techniques which prevent water runoff e.g. contour ploughing and terracing

©Xingzhi Lu 2024

The environmental risks of development

2024年3月4日 8:52

Desertification

- The process by which an area of land to become a desert. It could be caused by physical or human factors

Causes of desertification

- Physical causes of desertification:
  - Low rainfall/ drought so:
    - Soils become dry
    - Water sources dry up
    - Vegetation dies and crops fail
- Human causes of desertification:
  - Population increases so:
    - More crops are grown causing over-cultivation and soil fertility decreases
    - More animals are kept causing over-grazing so plants do not regrow fast enough
    - Trees are cut down for fuelwood
    - Increased use of water so water sources dry up
- So there is less vegetation to protect the soil so the topsoil is blown away by the wind, causing dust storms and reduction in plant growth
- Desert is formed

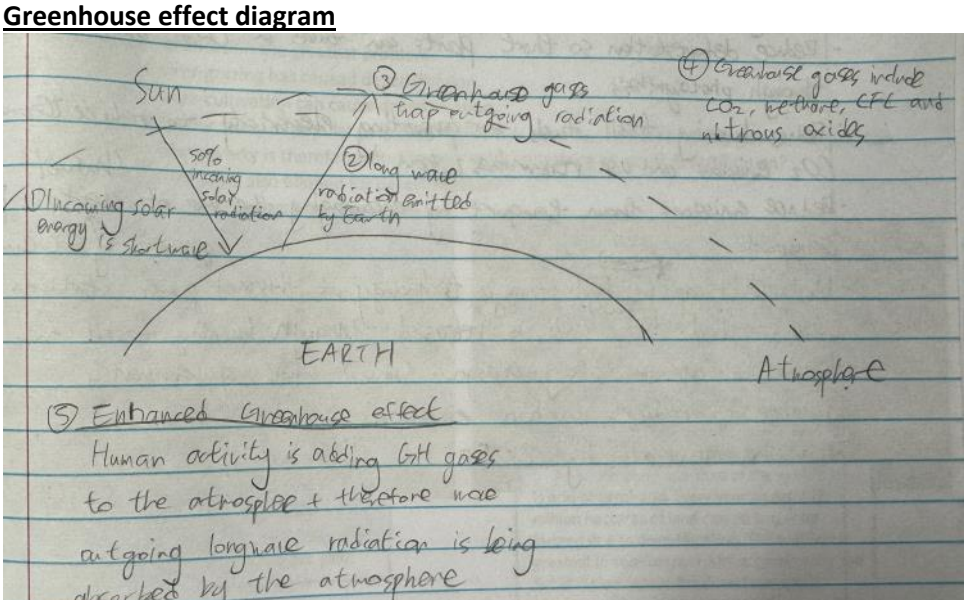
Impacts of desertification

- Food and water shortage leading to malnutrition, famine and high death rates
- Large numbers of people become dependent on food aid programmes
- People migrate away from area to refugee camps or slums in the cities → over population of refugee camps and cities

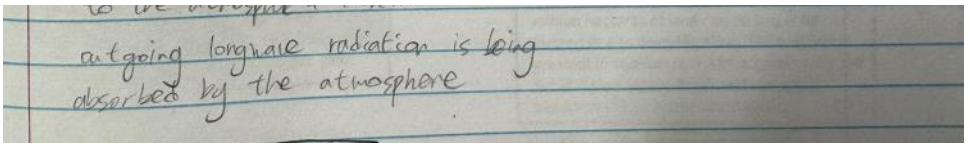
Solutions to desertification

- Provide food aid and water supplies in refugees camps
- Encourage local population to conserve water in small scale schemes e.g. building low stone walls
- Improve farming methods to grow drought resistant crops e.g. millet
- Replanting trees to reduce erosion e.g. acacia trees
- Reduce population growth through anti natal schemes and investment in education and health care
- Improve long term water supplies through building dams/ reservoirs and drilling deeper wells
- International action to reduce climate change to reduce droughts

Greenhouse effect diagram

- 

© Angzhi Lu 2024



Cause of enhanced global warming

- Human activity has increased the amount of greenhouse gases e.g. CO_2, methane and nitrous oxides in the atmosphere
- These gases trap long wave radiation given off by the Earth and cause the temperatures to rise
- CO_2 mostly comes from burning fossil fuels for energy production and vehicles + cement production + the burning of forests from 'slash and burn' techniques
- Methane comes from cattle ranching (cows emit methane) and rice paddy fields and landfill sites
- Nitrous oxides come from vehicles and factories burning oil

Impacts of climate change

- The average surface temperature of the earth has increased by 0.8 C since the industrial revolution
    - Rise in temperatures varies globally with higher temperature rises in Antarctica and Arctics
- Ice sheets are melting
    - Causing sea levels to rise and coastal flooding of low-lying islands e.g. Tuvalu
- Permafrost is melting in the Arctic
    - Causing more methane to be released
- Changing rainfall patterns
    - Some areas becoming much drier and experiencing droughts e.g. Australia
    - This is increasing spread of wildfires
- Increasing acidity in the oceans
    - Causes bleaching of coral reefs
- Warming temperature and loss of ice in Arctic
    - Causing loss of habitat for animals e.g. polar bears

Solutions to enhanced global warming

- International agreements e.g. Paris 2015 with targets for richer countries to reduce the greenhouse gas emissions
- Increase recycling so that less energy is used to extract new materials
- Encourage people to use less energy in their homes by using energy saving machines and light bulbs
- Improve public transport to encourage people to use their cars less and encourage walking/cycling
- Increase the use of renewable energy sources + use electric cars instead of petrol/diesel (if electricity source is renewable)
- Increase afforestation so that trees could take in more CO_2 by photosynthesis and discourage deforestation
- Adapt to the new climate conditions e.g. use drought resistant crops like millet

Atmospheric pollution

- Sulphur dioxide and carbon dioxide produced by burning fossil fuels in vehicles and industry.
- SO_2 causes acid rain and CO_2 contributes to enhanced global warming
- Vehicles also produce nitrogen oxides which cause respiratory problems for humans and wildlife + acid rain
- These types of can be controlled by reducing traffic e.g. improving public transport and by encouraging the use of 'scrubbers' on factory chimneys to remove harmful gases

Water pollution

- Raw sewage dumped in rivers
    - Pollutes the water and causes water borne diseases e.g. cholera
    - This can be solved by treating sewage and building proper sanitation systems
- Industrial waste discharged into rivers and accidental leaks e.g. from oil pipes and oil tankers
    - These chemicals poison the water and are toxic for animals and fish
    - The solution is strict laws on industry to prevent waste dumps in rivers and having methods to deal with oil spills e.g. skimmers to collect the oil from the surface.

© Anzhi Lu 2024

- Chemical fertilizers from farming can be washed into streams and rivers
    - Eutrophication: encourage algae to grow which block out sunlight and oxygen for marine ecosystems - kills water plants and animals
    - This can be solved by organic farming (not using chemicals)

Visual / light pollution

- Caused by industrial developments looking unattractive e.g. power stations, factories, waste heaps from mining
- Light pollution from urbanisation and tourism resorts can disturb wildlife and excessive artificial light at night time can impact on human health by causing loss of sleep and fatigue

Noise pollution

- In industry this is caused by the use of large machinery or explosions using dynamite in mining
- In urban areas this is caused by traffic, trains, aircraft or loud music
- Noise seriously disrupts wildlife and noise can cause ill health and high blood pressure in humans
- This can be solved by strict laws on permitted noise levels.

©Xingzhi Lu 2024

Sustainable development and resource conservation

2024年3月4日 8:52

Sustainable development

- Means meeting the needs of the present generation without compromising the needs of future generations to meet their needs

3 pillars of a sustainable tourism development

- Economic: provide job opportunities for the local population now and ensure that there will be jobs for the future people too
- Social: respect the local culture and traditions and make sure that the tourism activity does not cause problems for the local community
- Environment: preserve the natural landscape + animals, minimise pollution and limit use of fossil fuels

Resource conservation

- The protection and rational use of natural resources
- This may include encouraging a reduction in demand for a resource by encouraging people to change their lifestyle
    - e.g. to reduce the use of energy people are encouraged to use public transport, walk and cycle more or use energy saving lightbulbs and 'switch off' lights
- To conserve metals, glass and plastic: people and businesses are encouraged to reuse and recycle these materials

©Xingzhi Lu 2024

Dubai energy mix

2024年2月19日 23:39

Energy consumption

- 8,000 kg of oil equivalent per person which is more than double the amount used in the UK

Why is energy use so high?

- Dubai is a highly developed city with a wealthy population and high number of wealthy tourists
  - A high demand for domestic + industrial electricity
- High car ownership encourages high use of petrol/diesel
- Dubai is energy rich and has its own fossil fuel reserves + it can buy oil cheaply from neighbouring Abu Dhabi
  - This means that the energy costs are relatively cheap
- Hot desert climates with high temperatures in summer
  - Encourages use of air conditioning which uses a lot of electricity
- Low rainfall and lack of sufficient underground water supplies
  - Encouraged the use of desalinisation plants which use huge amounts of energy

Dubai's energy mix for electricity production

- An electricity generation system 98% powered by natural gas power plants in 2010
  - 50% domestically produced + 48% imported
  - Large amount of natural gas reserves → plentiful supply available
  - Natural gas is the cleanest fossil fuel with least greenhouse gases emissions + plentiful supply available
  - Oil us used as an emergency backup
- Transition to a future with 100% powered by nuclear, solar and other renewable energies
  - They do not want to rely on Abu Dhabi for their future energy supplies
  - They want to substantially reduce their carbon emissions.
- By 2030
  - 25% solar, 7% nuclear, 7% coal and 61% gas
  - Solar because Dubai has reliable sunshine all year round + mature technology + low cost
  - The nuclear power will mainly come from the Barakah Power Plant in Abu Dhabi, generate 5.6GW of electricity
  - Potential of another smaller plant built in Dubai
  - Solar is from the Mohammed bin Rashid Al Maktoum Solar park, generate 13MW of electricity
  - The clean coal power will come from the Hassyan plant in Dubai

Energy mix explanation

- Dubai has not diversified their energy mix because the UAE has large reserves of oil and natural gas
  - The UAE is the world's 7th largest energy producer and has enough oil and natural gas to last 100 years
  - Dubai uses the natural gas for electricity generation and the oil for transport.
- Problems with the energy mix
  - Use of oil and natural gas is increasing steadily at 4% per year.
  - Dubai is the 6th highest producer of CO_2 per capita in the world: high contributor to climate change
  - The reserves of natural gas are running out and Dubai has become a net importer of natural gas from its neighbour Abu Dhabi
  - Dubai energy is too reliant on fossil fuels + oil and natural gas reserves are running out
  - Electricity production is causing air pollution over the city because the gas thermal power stations are close to the city

©YiziLu2024

Dubai water supply

2024年2月19日 23:39

Dubai's water use

- Highest per capita water consumption in the world at 550 litres per person per day
  - Dubai is a highly developed city with a wealthy population and high number of wealthy tourists → a high demand for domestic water supplies
  - Hot desert climates with high temperatures in summer encourages use of air conditioning which uses a lot of water
- 67% of water used in agriculture
  - Farmers are growing crops in hot, arid climate → dependent on irrigation
  - Dubai grows the fresh fruit and vegetables to be sold in the other Emirates
  - Irrigation is inefficient with 30% lost to evaporation when the water is sprayed on crops
- 9% of water used for industry
  - To cool and clean machines
  - There is only limited industry located in Dubai
- 24% of water used for tourism
  - Hotels have high demand due to air conditioning + swimming pools
  - Sites: Atlantis Aqua adventure, Dubai mall aquarium, irrigating golf courses

Methods to obtain water (explain how boreholes / wells + desalination plants work)

- 72% groundwater from the 2 freshwater aquifers
- 21% from 8 desalinisation plants e.g. Jebel Ali Power Plant and Desalination Complex: supplies all drinking water
- 7% retreated or recycled water
  - 20 waste treatment works
  - Sewage plants
    - Solid filtered first, then chlorine added to kill harmful bacteria
  - Water only used for agriculture + irrigating green spaces
- Wadis
  - Flat river valleys in desert areas, which have empty riverbeds in dry season then rivers when wet
  - Dams placed on wadis so water is collected in wet seasons
- Pipe network to pipe water to people's houses

Problems with the water

- Dubai is highest per capita water consumer in the world BUT fresh water is scarce
  - Rainfall is less than 250mm per year and there is no surface water e.g. river or reservoir
- Underground aquifer is running out
- Desalinisation requires a lot of energy and is damaging to the environment
- Population and number of tourists is growing rapidly so there is increasing demand for food and water
- Misuse of limited water supply for gardens + fountains etc.
- Water infrastructure is ageing and the pipelines are corroded/ leaking which wastes water
- Currently not enough water is recycled. However there are plans to use new techniques to irrigate agriculture using drip irrigation and to plant crops which require less water

©Xingzhi Lu 2024