A Level Geography

Specification and PLC (Personal Learning Checklist)

AREA OF STUDY: 3 -Physical Systems and Sustainability Topic 5: The Water Cycle and Water Insecurity
Autumn Term Y13

Overview: Water plays a key role in supporting life on earth. The water cycle operates at a variety of spatial scales and at short- and long-term timescales, from global to local. Physical processes control the circulation of water between the stores on land, in the oceans, in the cryosphere, and the atmosphere. Changes to the most important stores of water are a result of both physical and human processes. Water insecurity is becoming a global issue with serious consequences and there is a range of different approaches to managing water supply.

What do I need to know?		☺	😐	☹
EQ1: What are the processes operating within the hydrological cycle from global to local scale?				
5.1 The global hydrological cycle is of enormous importance to life on earth	Explain how the global hydrological cycle operates as a closed system (inputs, outputs, stores and flows) and is driven by solar energy and gravitational potential energy.			
	Explain the relative importance and size of the water stores (oceans, atmosphere, biosphere, cryosphere, groundwater and surface water) and annual fluxes between atmosphere, ocean and land.			
	Explain how the global water budget limits water available for human use and water stores have different residence times; some stores are non-renewable (fossil water or cryosphere losses).			
5.2 The drainage basin is an open system within the global hydrological cycle	Explain how the hydrological cycle is a system of linked processes; inputs (including precipitation patterns and types; orographic, frontal, convectional) flows (infiltration, direct run-off, saturated overland flow, throughflow, percolation, groundwater flow) and outputs (evaporation, transpiration and channel flow).			
	Explain how physical factors within the drainage basin determine the relative importance of inputs, flows and outputs (climate, soils, vegetation, geology, relief).			
	Explain how humans can disrupt the drainage basin cycle by accelerating processes (deforestation, changing land use) and creating new water storage reservoirs or by abstracting water eg Amazonia.			
5.3 The hydrological cycle influences water budgets and river systems at a local scale	Explain how water budgets show the annual balance between inputs and outputs and their impact on soil water availability and are influenced by climate type eg Barrow, Alaska (polar), Cairo, Egypt (hot desert) and Southern England (temperate).			
	Explain how river regimes indicate the annual variation of discharge of a river and result from the impact of climate, geology and soils as shown in regimes from contrasting river basins. Eg Yukon, Indus, Amazon.			

	Explain how a storm hydrograph's shape depends on physical features of drainage basins (size, shape, drainage density, rock type, soil, relief and vegetation) as well as human factors (land use and urbanisation).			

EQ2: What factors influence the hydrological system over short- and long-term scales?				
5.4 Deficits within the hydrological cycle results from physical processes but can have significant impacts	Explain the causes of drought, both meteorological (short-term precipitation deficit, longer trends ENSO cycles) and hydrological.			
	Explain the contribution that human activity makes to the risk of drought: over abstraction of surface water resources and ground water aquifers eg Sahelian drought and Australian.			
	Explain the impacts of drought on ecosystem functioning (wetlands, forest stress) and the resilience of these ecosystems.			
5.5 Surpluses within the hydrological cycle can lead to flooding, with significant impacts for people	Explain the meteorological causes of flooding, including intense storms leading to flash flooding, unusually heavy or prolonged rainfall, extreme monsoonal rainfall, and snowmelt.			
	Explain how human actions can exacerbate flood risk (changing land use within the river catchment, mismanagement of rivers using hard engineering systems)			
	Explain how damage from flooding has both environmental impacts (soils and ecosystems) and socio-economic impacts (economic activity, infrastructure, and settlement) e.g. UK flood events of 2012.			
5.6 Climate change may have significant impacts on the hydrological cycle globally and locally	Explain how climate change affects inputs and outputs within the hydrological cycle: trends in precipitation and evaporation.			
	Explain how climate change affects stores and flows, size of snow and glacier mass, reservoirs, lakes, amount of permafrost, soil moisture levels as well as rates of runoff and stream flow.			
	Explain how climate change resulting from short-term oscillations (ENSO cycles) and global warming increase the uncertainty in the system; this causes concerns over the security of water supplies. Including projections of future drought and flood risk.			
EQ3: How does water insecurity occur and why is it becoming such a global issues for the 21st century?				
5.7 There are physical causes and human causes of water insecurity	Explain how the growing mismatch between water supply and demand has led to a global pattern of water stress and scarcity.			
	Explain that the causes of water insecurity are physical (e.g. climate variability, salt water encroachment at the coast) as well as human (e.g. over abstraction from rivers, lakes and groundwater aquifers, water contamination from agriculture, industrial water pollution).			

	Explain that the finite water resource is facing pressure from rising demand due to increasing population, improving living standards, industrialisation and agriculture. Understand that this is increasingly serious in some locations and is leading to increasing risk of water insecurity.			
5.8 There are consequences and risks associated with water insecurity	Explain the causes of and global pattern of physical water scarcity and economic scarcity and why the price of water varies globally.			
	Explain the importance of water supply for economic development (industry, energy supply, agriculture) and human wellbeing (sanitation, health, and food preparation); the environmental and economic problems resulting from inadequate water.			
	Explain the potential for conflicts to occur between users within a country, and internationally over local and transboundary water sources e.g. Nile and Mekong.			
5.9 There are different approaches to managing water supply, some more sustainable than others	Explain the pros and cons of the techno-fix of hard engineering schemes to include water transfers, mega dams and desalination plants. E.g. water transfers in China.			
	Analyse the value of more sustainable schemes of restoration of water supplies and water conservation (smart irrigation, recycling of water) e.g. Singapore.			
	Assess the role of different players in reducing water conflict risk through integrated drainage basin management schemes for large rivers and water sharing treaties and frameworks e.g. UNECE Water Convention, Helsinki Rules, Berlin Rules.			
Geographical Skills for Topic 5				
1. Use of diagrams showing proportional flows within systems				
2. Comparative analysis of river regime annual discharge				
3. Analysis and construction of Water Budget graphs				
4. Using comparative data, labelling of features of storm hydrographs				
5. Use of large database to study the pattern of trends in floods and droughts worldwide				
6. Interpretation of synoptic charts and weather patterns, leading to droughts and floods				
7. Use of global map to analyse world water stress and scarcity				
8. Interpretation of water poverty indexes using diamond diagrams for countries at different levels of development 9.				
10. Identify seasonal variations in the regime of international rivers, such as the Nile and the Mekong and asses impact of existing and potential dams				

NOTES/CASE STUDY INFORMATION: