

Year 13 Geography | Term 4

Key Question: How can the carbon and water cycles be studied as systems? How can the pressures of modern day cities be managed on a sustainable scale?

Topic Overview: In this topic, students will study the global water cycle and how it is driven by complex processes and interactions at a variety of scales. They will understand that the cycling of water has obvious and significant implications for the health and prosperity of society. In addition, students will recognise that the availability and quantity of water helps to tie together the Earth's lands, oceans and atmosphere into an integrated physical system. Students will also explore the carbon cycle and its role in regulating the Earth's global temperature and climate by controlling the amount of carbon dioxide in the atmosphere.

Students will begin this topic by studying global patterns of urbanisation and urban growth. With the population levels rising in cities, students will then assess the range of social, economic and environmental issues associated with urban growth. In addition, they will explore the impact of the urban environment on local climate, weather and drainage. To complete the unit, students will investigate the features of sustainable urban growth using examples.

	Lesson Exploration	Lesson Experience(s)	Knowledge and Skills	Key Words
Week 1: Lesson 1	How can data be analysed effectively?	Students will experience analysing their graphs, statistical testing and secondary data and link this to their sub-questions.	<p>Some stages of the investigation must be carried out independently. Other parts of the investigation may be carried out collaboratively, either as a class, group or pair.</p> <p>Independence is compulsory in the following stages of the investigation:</p> <ul style="list-style-type: none"> defining and developing a question or issue to address aims, questions and/or hypotheses relating to any aspect of the specification drawing on research, including field data and if relevant, secondary data which must be sourced by the student contextualising, analysing and summarising findings and data presenting data and drawing conclusions. 	Water and carbon cycle: Flow/ transfer Input Store/ component System Dynamic equilibrium Positive/ negative feedback Cascading system Atmospheric water Cryospheric water Hydrosphere Oceanic water Terrestrial water

Week 1: Lesson 2	What are the components of the systems that make up the carbon and water cycles?	Students will experience demonstrating positive and negative feedback in a system	Systems in physical geography: systems concepts and their application to the water and carbon cycles inputs – outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium.	Permafrost Groundwater Evaporation Condensation Drainage basin Evapotranspiration Infiltration Interception Overland flow Percolation Run-off Stemflow Throughfall Throughflow Transpiration Water balance Channel flow Recharge Surplus/ deficit Regime Bankfull Base flow Discharge Lag time Peak discharge Storm flow Hydrograph Abstraction Anthropogenic Biosphere Carbon sequestration Carbon sink Lithosphere Weathering
Week 1: Lesson 3	What are the stores of water that flow through the water cycle?	Students will experience presenting a range of water stores to their peers.	Global distribution and size of major stores of water – lithosphere, hydrosphere, cryosphere and atmosphere. Processes driving change in the magnitude of these stores over time and space, including flows and transfers: evaporation, condensation, cloud formation, causes of precipitation and cryospheric processes at hill slope, drainage basin and global scales with reference to varying timescales involved.	
Week 1: Lesson 4	Which factors drive the changes in water stores?	Students will experience constructing and annotating a diagram to explain how water stores flow through the water cycle.		
Week 2: Lesson 1	NEA conclusion and evaluation	Students will experience drawing conclusions from their data analysis and evaluating their geographical investigation.	Some stages of the investigation must be carried out independently. Other parts of the investigation may be carried out collaboratively, either as a class, group or pair. Independence is compulsory in the following stages of the investigation: <ul style="list-style-type: none"> defining and developing a question or issue to address aims, questions and/or hypotheses relating to any aspect of the specification drawing on research, including field data and if relevant, secondary data which must be sourced by the student contextualising, analysing and summarising findings and data presenting data and drawing conclusions. 	
Week 2: Lesson	How is water transferred in a drainage basin?	Students will experience building a human version of how water moves in a drainage basin.	Drainage basins as open systems – inputs and outputs, to include precipitation, evapo-transpiration and runoff; stores and flows, to include interception, surface, soil water,	

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Week 2: Lesson 3	How is the balance between inputs and outputs restored in a drainage basin?	Students will experience constructing and analysing a soil water budget graph.		
Week 2: Lesson 4	What is a hydrograph?	Students will experience constructing a hydrograph and will annotate key terminology. They will also adapt the hydrograph to reflect differences in drainage basins.	Runoff variation and the flood hydrograph.	
Week 3: Lesson 1	How can land use changes affect the water cycle?	Students will experience mindmapping the various ways in which changing land uses can affect the water cycle.	Changes in the water cycle over time to include natural variation including storm events, seasonal changes and human impact including farming practices, land use change and water abstraction.	
Week 3: Lesson 2	Why is there a need for water abstraction in the UK?	Students will experience analysing a cross section showing the chalk aquifer of the London Basin.		
Week 3: Lesson 3	Where are the stores of carbon?	Students will experience researching the different carbon stores that exist in the lithosphere, hydrosphere, biosphere and atmosphere.	Global distribution, and size of major stores of carbon – lithosphere, hydrosphere, cryosphere biosphere, atmosphere.	
Week 3: Lesson 4	How is carbon moved from one store to another?	Students will experience exploring the different ways that carbon is transferred from one store to another.		
Week 4: Lesson 1	What are the effects of a changing carbon budget?	Students will experience presenting one change each to the rest of the class.	Factors driving change in the magnitude of these stores over time and space, including flows and transfers at plant, sere and continental scales. Photosynthesis, respiration,	

			<p>decomposition, combustion, carbon sequestration in oceans and sediments, weathering.</p> <p>The carbon budget and the impact of the carbon cycle upon land, ocean and atmosphere, including global climate.</p>	
Week 4: Lesson 2	How can we mitigate against climate change?	Students will experience evaluating a range of mitigation strategies for climate change and their appropriateness for countries as differing levels of development.	<p>Changes in the carbon cycle over time, to include natural variation (including wild fires, volcanic activity) and human impact (including hydrocarbon fuel extraction and burning, farming practices, deforestation, land use changes).</p> <p>The carbon budget and the impact of the carbon cycle upon land, ocean and atmosphere, including global climate.</p> <p>Human interventions in the carbon cycle designed to influence carbon transfers and mitigate the impacts of climate change.</p>	
Week 4: Lesson 3	How are water and carbon stores changing in the Amazon rainforest?	Students will experience building a case study profile for the Amazon	<p>The key role of the carbon and water stores and cycles in supporting life on Earth with particular reference to climate. The relationship between the water cycle and carbon cycle in the atmosphere. The role of feedbacks within and between cycles and their link to climate change and implications for life on Earth.</p> <p>Case study of a tropical rainforest setting to illustrate and analyse key themes in water and carbon cycles and their relationship to environmental change and human activity.</p>	
Week 4: Lesson 4	What is the river regime like on the River Brock?	Students will experience compiling a report on the regime of the River Brock using graphs and statistical techniques.	Case study of a river catchment(s) at a local scale to illustrate and analyse the key themes above, engage with field data and consider the impact of precipitation upon drainage basin stores and transfers and implications for sustainable water supply and/or flooding.	
Week 5: Lesson	Assessment			

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Week 5: Lesson 2	How has urbanisation changed since 1945?	Students will experience comparing world maps showing the percentage of urban population and city size over time.	Urbanisation and its importance in human affairs. Global patterns of urbanisation since 1945. Urbanisation, suburbanisation, counter-urbanisation, urban resurgence. The emergence of megacities and world cities and their role in global and regional economies.	
Week 5: Lesson 3	What are the different urban processes that have shaped our towns and cities?	Students will experience exploring the processes of counter-urbanisation, suburbanisation and urban resurgence.		
Week 5: Lesson 4	How have changes in the economy in the UK affected urban areas?	Students will experience categorising impacts of de-industrialisation into social, economic and environmental groupings.	Economic, social, technological, political and demographic processes associated with urbanisation and urban growth.	
Week 6: Lesson 1	Try Now	Students will experience try now activities to help close gaps in knowledge and skills identified in WK5 assessment.		
Week 6: Lesson 2	How has urban land use changed over time?	Students will experience evaluating different urban land use models and their application to cities across the world.	Urban change: deindustrialisation, decentralisation, rise of service economy. Urban policy and regeneration in Britain since 1979.	
Week 6: Lesson 3	Where are the world's megacities and world cities?	Students will experience using atlases to plot megacities onto a world map and analysing the distribution.	Contemporary characteristics of mega/world cities. Urban characteristics in contrasting settings. Physical and human factors in urban forms. Spatial patterns of land use, economic inequality, social segregation and cultural diversity in contrasting urban areas, and the factors that influence them.	

Week 6: Lesson 4	What are the features of the new urban landscape?	Students will experience presenting features of new urban landscapes such as cultural and heritage quarters.	New urban landscapes: town centre mixed developments, cultural and heritage quarters, fortress developments, gentrified areas, edge cities. The concept of the post-modern western city.	
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