



Chapter 13

Earth as a System: Energy, Matter, and Life

“ Earth works as an interconnected system where energy flows and matter cycles through life, land, water, and air.



Observe



Think



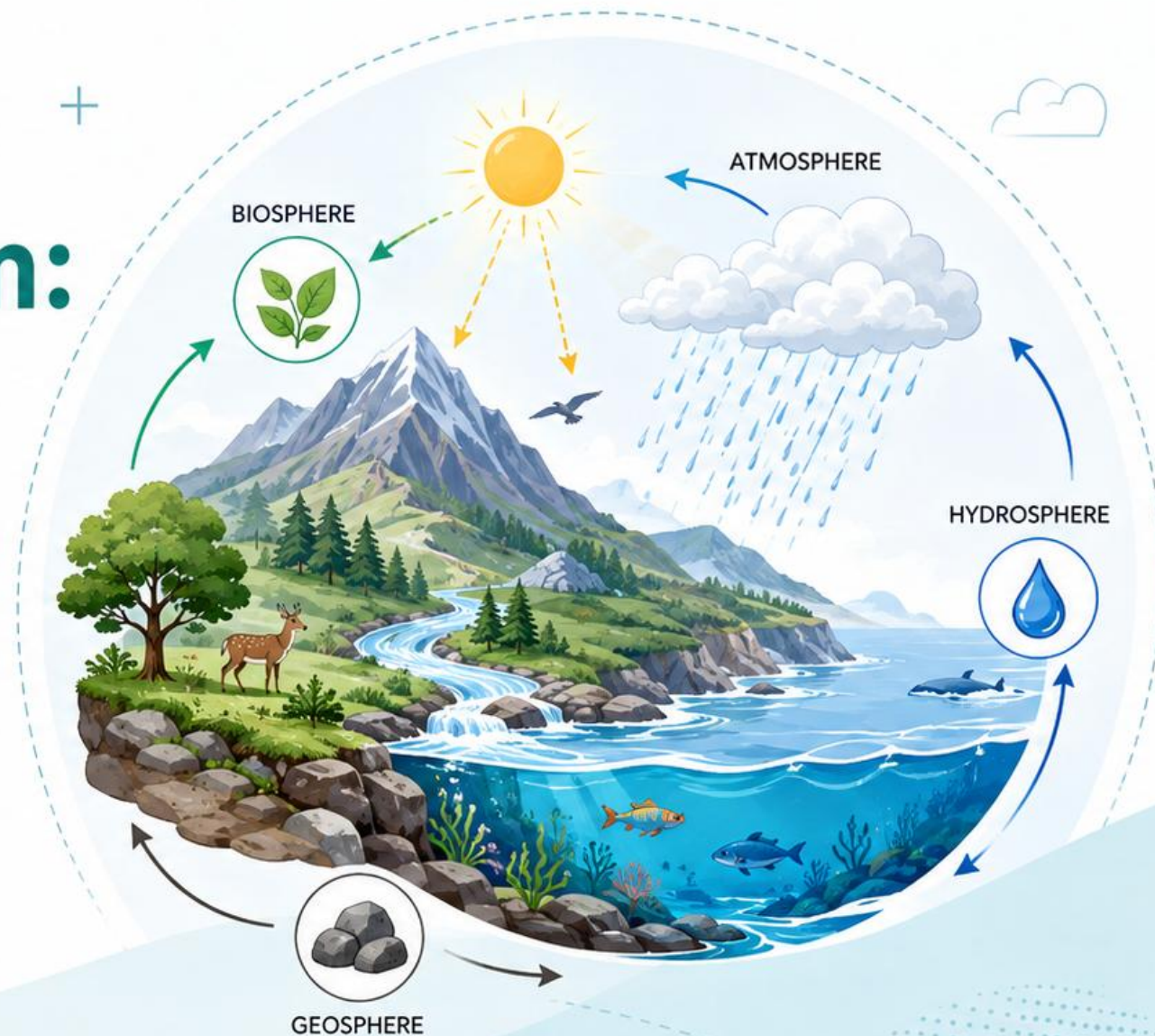
Connect



Explore



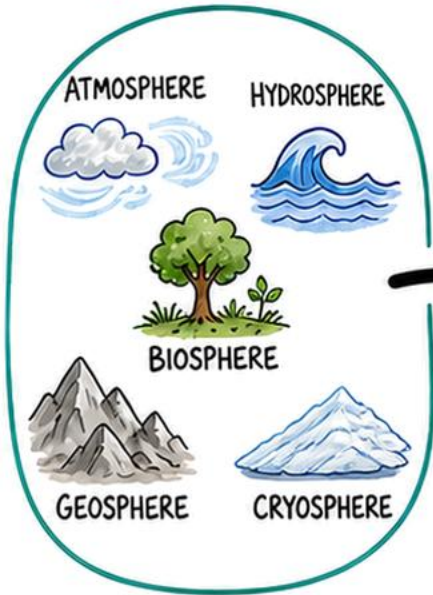
Discover



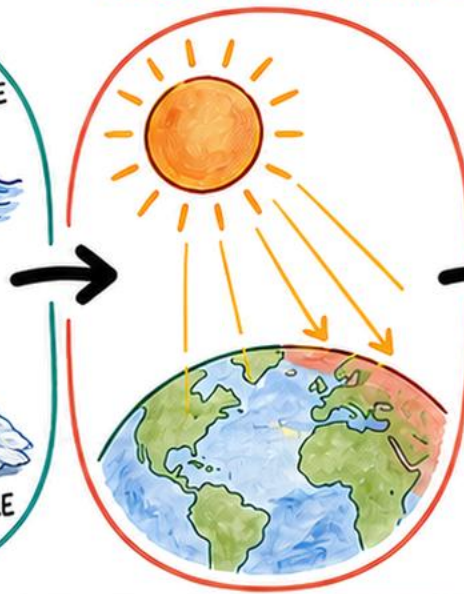
EARTH AS A SYSTEM: ENERGY, MATTER & LIFE

Earth works as one connected system.

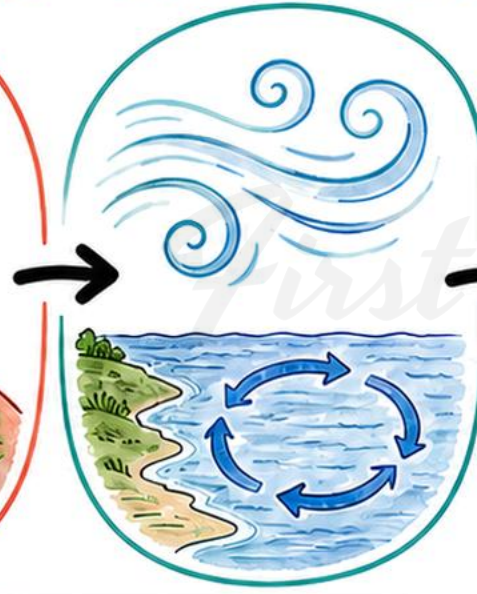
FIVE SPHERES



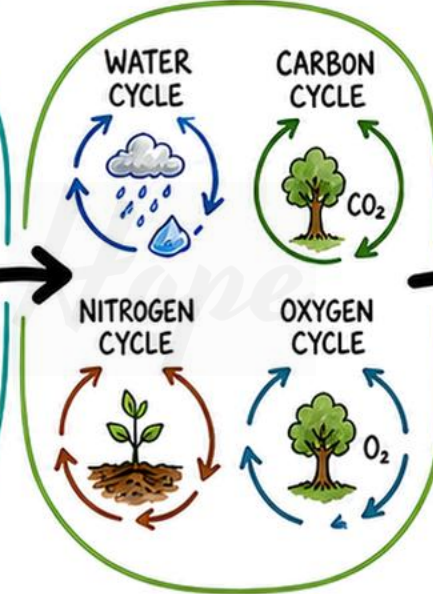
SUNLIGHT & UNEVEN HEATING



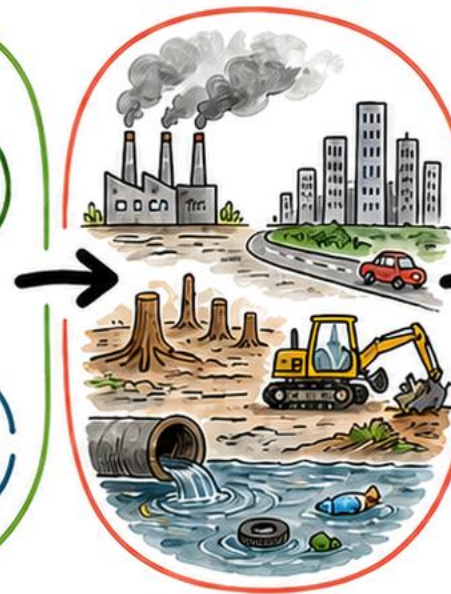
WINDS & OCEAN CURRENTS



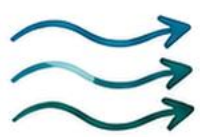
MATTER CYCLES



HUMAN IMPACTS



SOLUTIONS



ENERGY: flows through the system and leaves as heat.



MATTER: cycles through air, water, rocks, soil and life.



KEY IDEA: A change in one part can affect many other parts.

THE FIVE SPHERES OF EARTH

CRYOSPHERE

Frozen water - snow, glaciers, ice sheets, and sea ice.

HYDROSPHERE

Liquid water - oceans, rivers, lakes, and groundwater.

ATMOSPHERE

The layer of gases around Earth.

BIOSPHERE

All living organisms and the places where they live.

GEOSPHERE

Rocks, soil, landforms, and Earth's interior.



KEY IDEA: One place can contain parts of several spheres.

WHEN ONE SPHERE CHANGES, OTHERS RESPOND



LESS SNOWFALL



LESS SUMMER MELTWATER



LOWER LAKE LEVEL



LESS GRASS



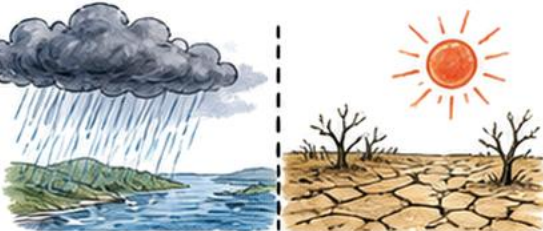
WARMER ARABIAN SEA



MORE EVAPORATION



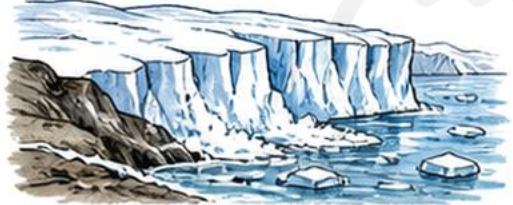
CHANGED MOISTURE SUPPLY



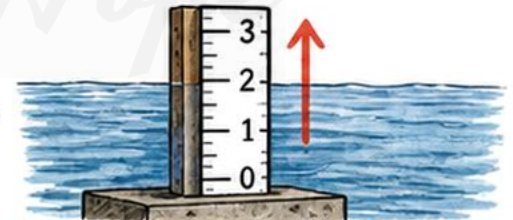
MORE VARIABLE MONSOON RAIN



WARMING



LAND ICE MELTS



SEA LEVEL RISES



COASTS AT RISK



FOREST CLEARING



MORE RUNOFF & EROSION



MUDDIER RIVERS

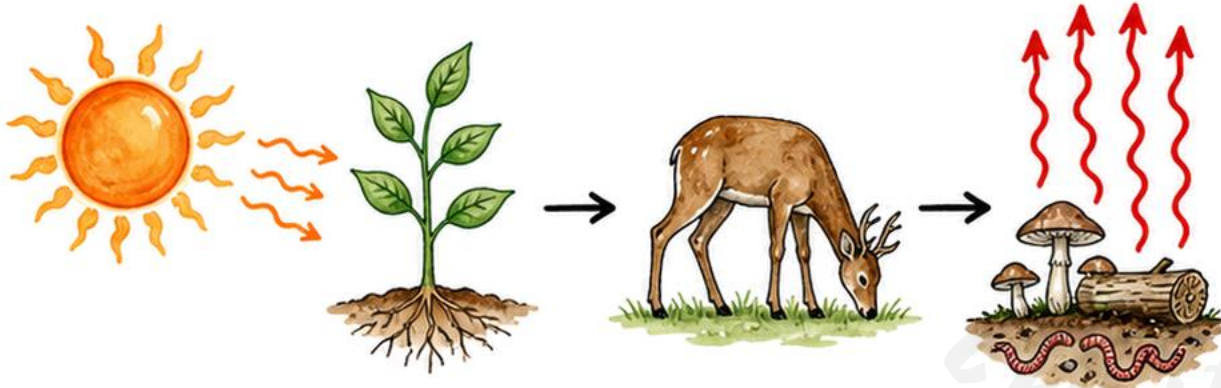


HABITAT LOSS

KEY IDEA: Effects can spread through a chain.

ENERGY FLOWS - MATTER CYCLES

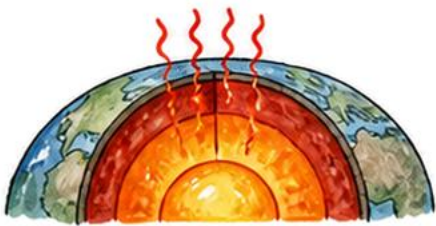
ENERGY FLOW



SUN → PLANTS → ANIMALS & DECOMPOSERS → HEAT TO SPACE

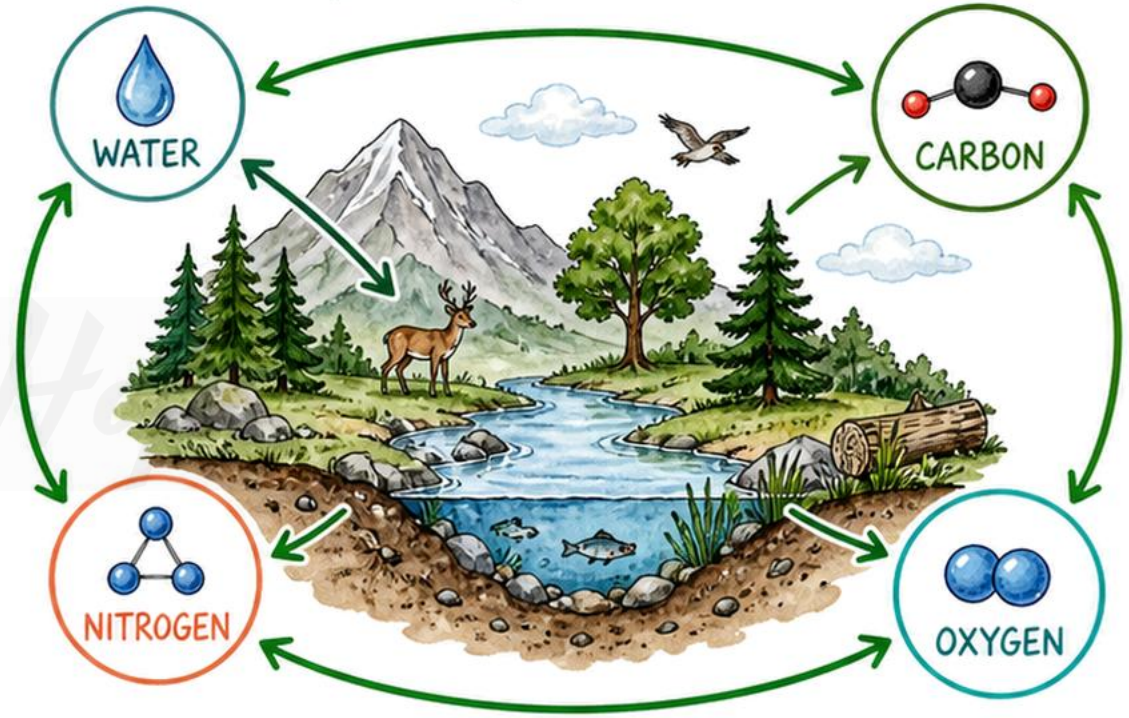
Energy is transferred, but not recycled.

Other sources: Earth's hot interior
and chemical reactions.



MATTER CYCLES

WATER, CARBON, NITROGEN & OXYGEN



Atoms move through air, water, soil,
rocks and life.

Atoms are reused.

———— KEY IDEA: Energy flow drives many matter cycles. ————



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