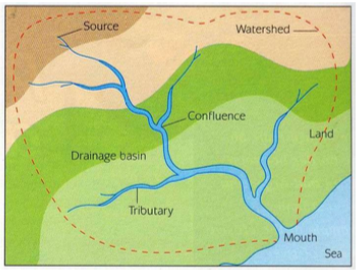
Unit 13: Flooding and flood management

Overflowing water that kills and destroys

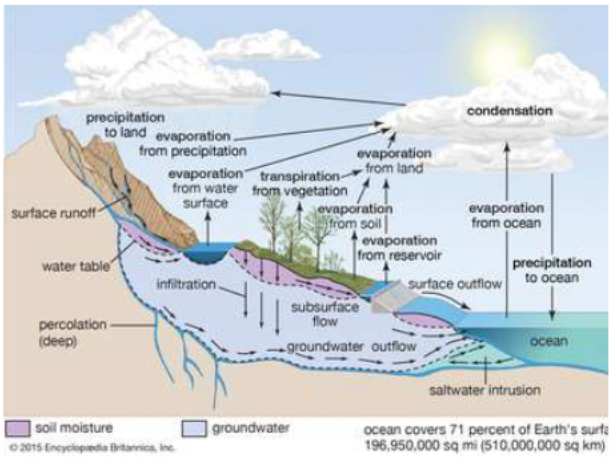
Drainage basin and hydrological cycle

Drainage basin: an area where precipitation collects.
Rivers transport water from one place to another in water cycles or hydrological cycles. Precipitation in the areas highlighted will flow into the drainage basin and areas outside will not.



Hydrological cycle: shows where the water flows over and under ground. The input of the system comes through precipitation. The rain is intercepted by plants or falls to the ground. Water flows and infiltrates through the soil, then flows and percolates through the rocks in the ground. Once in the ground, the water can be stored as groundwater or the water can flow into another water body such as a lake or a river.

Longshore drift: swash at an angle whereas the backswash is perpendicular and washes straight down.



Processes in a river

River flows and landforms surrounding the river vary. This is because of the processes that occur in a river.

1. First process = erosion. Different types of erosion: a. Hydraulic action - the power or energy of the

water takes rocks/stones in the river down the channel.
b. Attrition - When the rocks/stones knock into each other, the bed or the side of the channel, they are broken down and carried away.

c. Abrasion/corrasion - Fine materials (sand) rub against the bed or banks of the river. It acts like sandpaper and wears away the river.

d. Corrosion - The rocks dissolve and are carried away. Happens due to pH of water.

2. Second process = transportation. How the material load is taken down stream. Different ways this happens:
   a. - a large load is rolled downstream by the energy of the water
   b. - a smaller load is carried by the water. It is small so it jumps up and down. c. - sand-like material floats on the river. Makes the river seem dark.
   d. - dissolved load is transported down as solution, like sugar in water.
3. Third process= deposition. When the river does not have enough energy to transport the load, so the load is left.

The nature of each process depends on numerous variables such as position along the course of the river, how fast the river is flowing, the size of the load, the pH of the river, the rock type of the area and the amount flowing in the river.

River flows from source to mouth (check drainage basin diagram). Length of a river course is known as the long profile. It shows how the river gradient changes from the highland of the sources to the lowland areas and the lower course towards the mouth. Bradshaw's model shows how the river changes from source to mouth.

Main elements of coastal change

Destructive waves = destroy or erode land, most cases, beaches. The water that comes up on the beach is called swash, and the one that leaves the beach is backwash. In destructive waves, swash is stronger than backwash. Sediment from the beach is taken away. These waves are higher and closer together than constructive waves due to the high winds.

Constructive waves = opposite to destructive. Swash is stronger and backwash is weaker. Sediment is deposited on the beach. Waves are lower and further apart due to lighter winds. Coastal erosion processes are same as those for rivers but there are more

Erosion in coastal areas:

Weathering: breaking down of rock. It happens because the rock get water into it or it freezes at night or expands. Puts pressure on the rock and makes it break.

Transportation of sediment in coasts:

Same processes as rivers. The sediment is transported by the waves along the coast as a part of a process called longshore drift. The dominant wind blows the waves at an angle to the beach. At an angle, the swash moves the waves up the beach and the backwash removes the sediment.

Coastal landforms:

- Bays and headlands - softer rock erodes more quickly than harder rock.

- Cliff - hydraulic action wave cuts the softer rock under a cliff to produce a wave-cut platform.
- Spits - when sediment is deposited due to a change of direction of the coastline, and the area is sheltered from the wind, so there is very little energy for the sediment to be transported by the wave.
- Bar - a spit but connected to land on both ends.
- Stacks and arch
- Lagoon

Human causes of flooding

- Land-use activities such as urbanization increased run-off volume and rate,
- Occupation of the floodplain obstructing flows,
- Structural flood control measures such as embankments in the upstream,
- Decrease in conveyance of the river channels owing to build up of river debris, restriction of waterways, dumping of mineral, wastes and rubbish, and
- Mining and other industries altering water regimes.

Effects of flooding

Loss of human life, damage to property, destruction of crops, loss of livestock, and deterioration of health conditions owing to waterborne diseases.

Flood Management

Soft Engineering	Advantages	Disadvantages
Afforestation	Less water gets to the river. Ecosystem of the area is protected. Effective method as it helps the environment.	Difficult to plant in urban areas because of space. Takes time to be successful.
Floodplain zoning: urban land use areas are zoned to reduce the flood risk impact	Buildings and land that is expensive to secure is farther away from the river.	Not always possible to develop old urban areas into new zones.

	Next to the river is allowed to flood because it is farmland/green places. Less claims for insurance; houses and businesses not flooded.	People may not approve. Takes time to zone area next to the river. Does not stop the flood.
Flood warning and preparation	People know when to protect houses with methods like sandbags etc. People can have their houses and businesses insured.	Not all people have access to the methods of warning. Not all insurance companies will insure people who have buildings near a known flooded area. Some flash floods can be too quick for the systems to be effective. Does not stop the flood.

Hard engineering	Advantages	Disadvantages
Dams	Can control discharge of river Provides hydroelectric power Reservoir can provide fishing and be a tourist attraction.	Very expensive. Sediment can be pushed downstream and the reservoir holds less water. Farmland loses its natural source of ingredients because of no sediment. People are forced to move due to the flooding of land for the reservoir.
Flood relief channels	Reduces risk of flooding	The flood relief channel may flood. Expensive. There needs to be land next to the river to build; difficult in urban areas.
Embankments: holds back river from banks.	More water can pass through. The banks will not erode, therefore, the land next to the river is protected.	The velocity of the water can increase; the risk of water flooding increases further

	Only needs to be built once and maintained–relatively cheap.	downstream. Looks unnatural.
River straightening and dredging: allow river to pass easier to reduce risk of flooding	Water will go through river quickly, reduces risk of flooding. River channel can hold more water. Dredging is an easy method to reduce flooding in built up areas.	The velocity of the water can increase; the risk of water flooding increases further downstream. Sediment builds up over time, dredging needs to be done more frequently. Can change the ecosystem of the river.
Levees: raised land to make bank side higher	River banks are higher, when the river floods, the areas next to the river are protected. RElatively cheap as soil can be used to make the levees Can be used as walking and cycle paths for tourism	Levees need to be maintained frequently. If the levees breaks, the consequences would be devastating.

Search: mangroves, importance of coral and great barrier reef.