Quadrant II – Transcript and Related Materials

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Module Name: River Moulded Landforms

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Notes

River Moulded Landform: Introduction

A river is a large natural stream of water flowing in a channel to the sea, a lake, or another river. Running water is involved in continuous erosion, transportation, and deposition of materials on the surface of the Earth. The landforms formed by progressive removal of rock mass are known as **Erosional Landforms**. Landforms formed by deposition of different eroded materials are known as **Depositional landforms.**

Fluvial Erosion

The erosional work of the river depends upon the channel gradient, volume of water, velocity of flow, kinetic energy of the river. The erosion is also dependent upon the size of erosional tools known a river load. River is mainly involved in three types of erosion: Vertical Erosion, Lateral Erosion and Headward Erosion

Erosional Landforms of Fluvial Processes (River)

1. **V-Shaped Valley**
   Found in the upper course of the river. The river has the greatest gravitational potential energy and has the greatest potential to erode vertically. Deep and Narrow with steep sides that look like a letter V when a cross section of them is taken. V-shaped valleys are the result of accelerated rate of down-cutting (vertical erosion or valley deepening). The valleys are gradually widening due to lateral erosion with the advancement of the stage of cycle of erosion. They become quite broad with flat valley floor and uniform valley side slopes

during mature stage or valley development and fluvial cycle of erosion. They are further transformed into very broad and shallow valleys having concave valley side slope of very gentle gradient during old stage. **V- shaped valleys are divided into two types:** (i) Gorges (ii) Canyons.

2. **Gorge**
   Formed due to active downcutting of the valleys. Through the mechanism of pothole drilling during juvenile (youth) stage of the fluvial cycle of erosion. Also formed due to recession of waterfalls. Most of the Himalayan Rivers have carved out deep and narrow gorges.
3. **Canyon**
   Extended form of Gorges. Represent very deep, narrow but long valleys. The steepness of the valley sides depends on the nature of the rocks. Relatively resistant rocks support steep valley sides. Resistant rocks alternated by soft rocks give birth to undulating valley sides.
4. **Rapids**
   Most characteristics feature in the upper course of the river. Sections of a river where the gradient of the riverbed is relatively steep resulting in an increase in the river's turbulence and velocity. The occurrence of the band of the hard rock along the path of the river makes it jump over or rail downward. This leads to the formation of rapids at places where the valley bottom offers greater resistance to erosion than the strips above and below.
5. **Waterfall**
   Caused due to sudden descents or abrupt breaks in the longitudinal course of the rivers. Defined as a vertical drop of water of enormous volume from a great height in the long profiles of the rivers. Rapids are of much smaller dimension than waterfalls. Found upstream from the main falls but they are also found independently. Develop when a change of lithology takes place along the river's course resulting in differential erosion.
6. **Hanging Valley**
   A smaller side valley left 'hanging' above the main U-shaped valley formed by a tributary glacier. Elevated above another valley with one end open to the valley below. There may be a cliff or steep formation where they meet. A river or stream may run through a hanging valley, forming a waterfall that enters the lower valley. Valley may be U-shaped if created by glacier activity.

7. **Potholes and Plunge Pools**
   Potholes are either mechanically or chemically formed. The mechanical ones can form in all types of rock. The chemical type forms in soluble rocks like limestone, marble and dolomite. Mechanical potholes are produced by the grinding of moving rocks against bedrock. A pothole is usually defined as a round cavity in bedrock carved by the grinding action of stones in the stream's currents.

Fluvial Deposition

These are the landforms of river erosion and deposition. The factors responsible for river deposition and its landforms: Decreasing channel gradient**,** decrease in velocity**,** Spreading of streams over a large area**,** Obstruction in channel flow, Decrease in discharge of river

Depositional Landforms of Fluvial Processes (River)

1. **Meanders**

Bends in a river form as a river's sinuosity increases. A sinuosity of a river is a measurement of how much a river varies from a straight line. Ratio between the channel length and displacement between two points. Sinuosity= Channel Length/Displacement. A sinuosity of 1 = channel is perfectly straight. A sinuosity greater than 1 = the river meanders. The outer bank of the river is eroded due to lateral erosion and a steep clip is formed. The inner bank has depositional features.

2. **Ox-Bow Lake**

An evolution of meanders that undergo extensive deposition and erosion. Strong erosion takes place on the outside bend of a meander while deposition takes place on the inside bend. As a result, the neck of a meander narrows. During extremely high discharge (flood), it's more efficient for a river to flow across the neck of a meander rather than around it. When discharge returns to normal levels, the river continues to follow this new course. The meander is left connected to the channel as a *cutoff*. Deposition eventually separates the cutoff from the main channel leaving behind an *oxbow lake*.

3. **Alluvial Fans and Cones**

Formed where heavily laden streams reach the plain. It is widening and much of its load is deposited. The depositional sediments spread out as an alluvial fan. Deposition results from the sudden decreases in velocity as the stream emerges from the steep slopes of the upland and flows across the adjacent basin with its gentle gradient. An alluvial cone is a type of alluvial fan but one in which the slope angles ae steeper and the deposited material is generally coarser and thicker.

4. **Flood Plain**

Large, flat expanses of land that form on either side of a river. The area that a river floods onto when it's experiencing high discharge. When a river floods, its efficiency decreases rapidly because of an increase in friction, reducing the river's velocity and forcing it to deposit its load. The load is deposited across the floodplain as *alluvium*. The alluvium is very fertile, so floodplains are often used as farmland. An area of marsh and numerous lakes – crescent shaped – Ox-bow lakes.

5. **Natural Levees**

Formed along the bank of large rivers. Low, linear, and parallel ridges of coarse deposits along the banks of the rivers. Natural embankments are produced when a river floods. When a river floods, it deposits its load over the flood plain due to a dramatic drop in the river's velocity as friction increases greatly. The largest & heaviest load is deposited first and closest to the riverbank, often on the very edge, forming raised mounds. The finer material is deposited further away from the banks causing the mounds to appear to taper off.

6. Braided Streams

Sediment load exceeds carrying capacity. As carrying capacity decreases, sediment is deposited on channel bed. River forced to carve a new path, creating an interwoven network of channels. Islands between the braided channels are ephemeral and dynamic. Sediments are continually remobilized, transported, and deposited. Occur downstream of areas with high sediment loads. Composition varies from silts, sands, and gravels

7. Delta

Deltas are depositional landforms found at the mouth of a river where the river meets a body of water with a lower velocity than the river. For a delta to develop, the body of water needs to be relatively quiet with a low tidal range so that deposited sediment isn't washed away and has time to accumulate. When a river meets a stationary body of water, its velocity falls causing any material being transported by the river to be deposited. Deltas can take on many different shapes. The three primary shapes of delta are cuspate, arcuate and bird's foot.

i. Arcuate Deltas are shaped like a triangle. Form when a river meets a sea with alternating current directions that shape the delta so that it looks like a triangle. E.g., The Nile Delta, Egypt.

ii. Cuspate Deltas are vaguely shaped like a V with curved sides. Cuspate deltas form when a river flows into a sea with waves that hit it head on, spreading the deposited sediment out. E.g., Ebro Delta, Spain.

iii. Bird's foot deltas are shaped like as the name suggests a bird's foot. They extend reasonably far into a body of water. From when the river's current is stronger than the sea's waves. Bird's foot deltas are uncommon because there are very few areas where a sea's waves are weaker than a river's current. E.g., The Mississippi Delta.

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