

## AS 1 Revision – Rivers.

The following revision plan will help in preparation for both short questions in Section B and long questions in section C of the AS1 paper.

- **Processes and Features in Fluvial environments**

- The drainage basin as an open system

Precipitation falls and gravity draws it to the sea through the drainage basin system.

**Definitions:**

**Drainage Basin, Watershed**

- Know the components of the system – inputs, outputs, stores and flows.
- Know the difference between these components and be able to write about how they link together.

**Past Paper Question:**

*“the drainage basin is an open system” Discuss this statement with reference to inputs, outputs, stores and transfers of water and sediment. [12] June 2011*

- **Factors that affect transfers and stores of matter in a drainage basin.**

- Short question when you are given a choice to pick one or two from a list and explain how they affect storage and stores. Answers must clearly and explicitly refer to both. Question can also deal with changes in landuse and how it affects stores and transfers.

**Past Paper Question:**

*Select **one** factor from the list and explain how it influences the storage and transfer of water within the drainage basin.*

*Geology,*

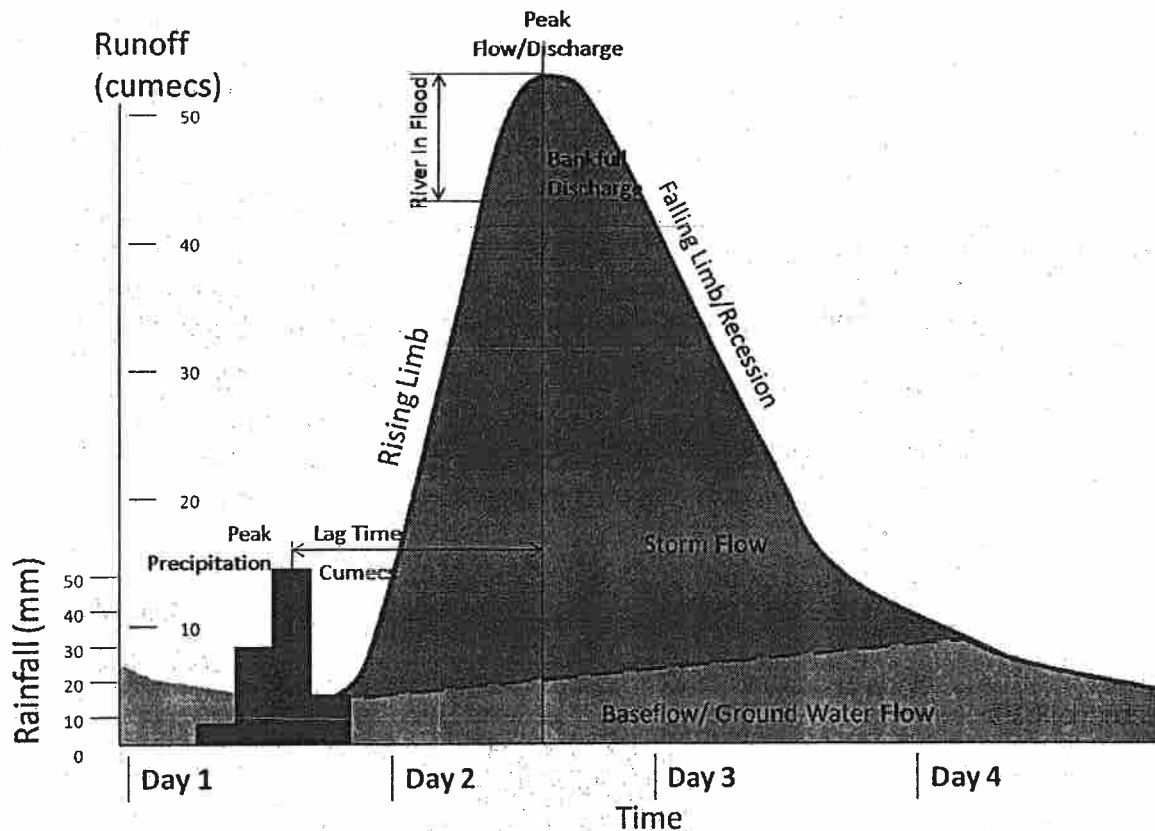
*Soil Type,*

*Relief*

*[6] Jan 2011*

- **Discharge and the storm hydrograph**

- What is discharge?
- Storm Hydrograph – must know the features and be able to talk about them using proper terminology.
  - Peak discharge
  - Lag time
  - Rising limb
  - Falling limb
  - Baseflow



Be able to compare and describe hydrographs using these terms.

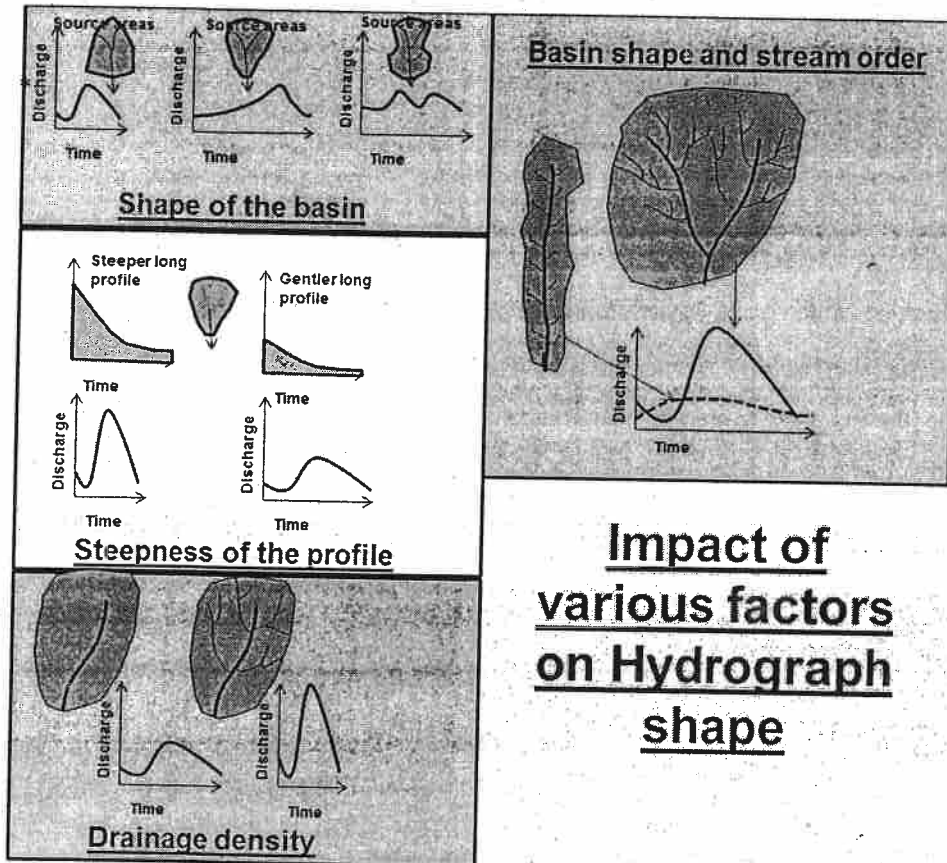
Past Paper Question:

See Jan2009

You **MUST** know factors affecting discharge and the storm hydrograph.

- **Nature of storm** – Rainfall intensity – less infiltration with infiltration rate exceeded.  
Rainfall duration – prolonged rain can saturate soil
- **Nature of basin** – Size – small basin = short lag and steep limb.

- Shape – short/round = flashy  
Long/thin = flatter
- Relief – steeper means water moves quicker to river so short lag and steep limb.



- **Soil type** – clay = small pores so water moves quicker overland  
Sand = larger pores allowing more infiltration
- **Geology** – impermeable rocks eg. Basalt = flashy  
Permeable rocks eg. Chalk allow infiltration = flatter
- **Drainage Density** – higher density (clay) means shorter lag time and steep limb.
- **Landuse – Urbanised or Afforested.**
- Erosion, Transportation and Deposition.

Abrasion

Suspension

If asked to expand deposition, write about

Attrition

Saltation

where it happens – meanders, floodplains,

Solution

Solution

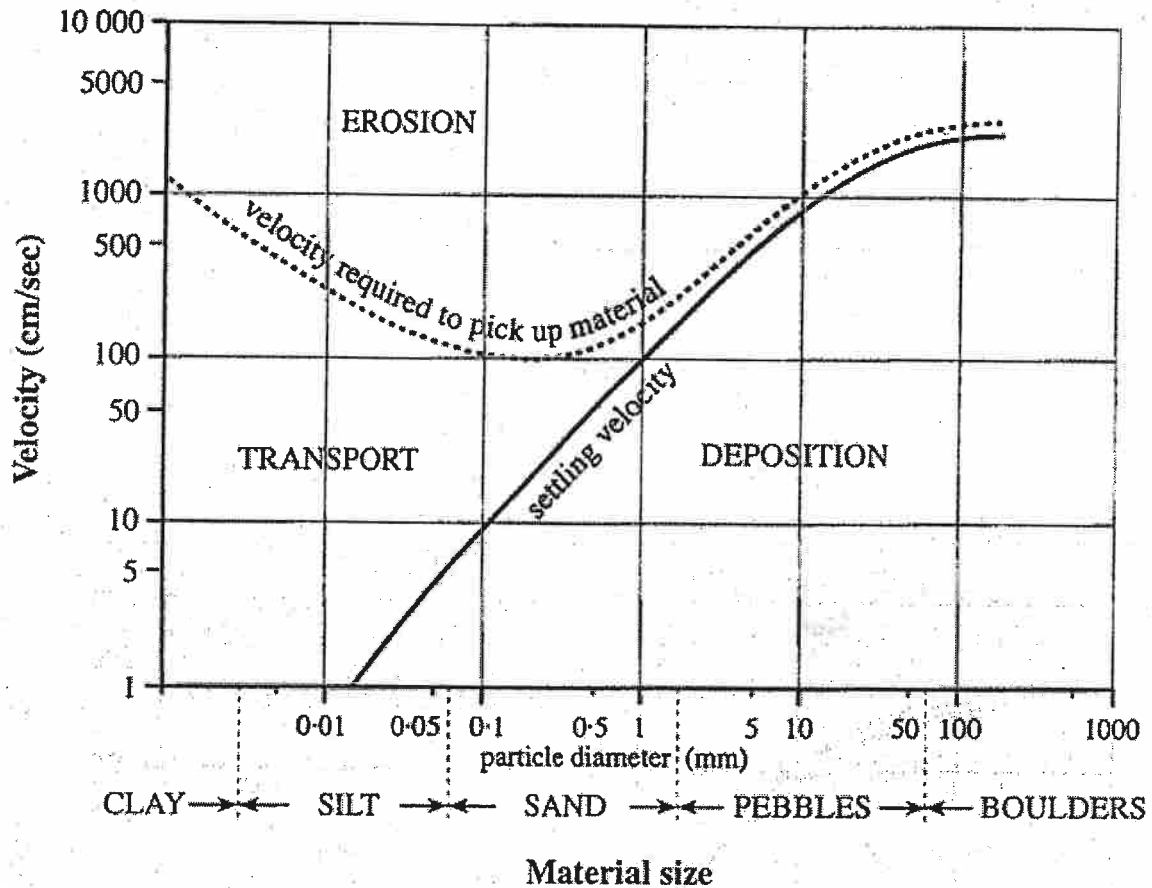
deltas.

Hydraulic Action

Traction

## Hjulstrom Curve

Understand how it works and what the lines mean.



Past Paper Question:

See Jan2009 Q. 2b (i&ii)

## • Formation of River Landforms

Know the following landforms with an annotated diagram, an example and a full explanation.

- Waterfall eg. Gullfoss waterfall, Iceland
- Pools and Riffles/ Meanders eg. Mississippi
- Oxbow lakes eg. Mississippi
- Floodplains and levees eg Mississippi
- Deltas
  - o Arcuate – Nile
  - o Birds Foot – Mississippi

Short Question will be one landform for 6 marks and a long question will be 2 landforms for 12 marks.

**Past Paper Question:**

*See Jan2010 Section C Q. 5 (long question waterfall and one type of delta.)*

*See June 2010 Section B Q2b (short question oxbow lake or levees)*

- **Human interaction with the Fluvial Environment**

Usually the essay question in section C question 5 and is worth 12 marks. The question will cover one of two topics:

- Human and physical causes of flooding
- Benefits and detrimental effects of flooding

**FACTS / FIGURES** need to be used from the case study of Bangladesh.

## Unit 1 Fluvial Systems Case Study – Physical and Human Causes of Flooding in Bangladesh

There are 2 reasons that flooding occurs in Bangladesh. They are Physical and Human causes.

### **Physical:**

#### Monsoon Rain:

- Intense heavy rain exceeds the rate at which soil infiltrates water, so excess flows quickly into channels.
- Prolonged rain causes pores to fill and soil saturation leading to surface storage and overland flow to rivers.
- SE Monsoon in Bangladesh between June-September prolonged and intense. Sheer volume of water leads to rainfall flooding.
- Nov-April (winter) 300-400mm of rainfall compared to 1250-1850mm in summer monsoon (6 months). Northern Ireland only has between 900-1,350mm distributed throughout the whole year.

#### Spring Snowmelt:

- The peaks of the Himalayas are 6km high and precipitation falls as snow. In the warmer spring months of April/May massive volumes of melt water and silt enter the main river channels.
- High mountains means wet climates.
- Rivers flood and water and fertile alluvial sediment for rice and wheat is deposited on floodplains – Bengal the Golden.

### **Human :**

#### Deforestation:

- Over last 30 years population of Nepal has increased = larger scale clearance on slopes of Himalayas at annual rate of 1.7%. Increased quantity of water and sediment entering the rivers Ganges and Brahmaputra. This sediment reduces capacity of rivers.
- Bangladesh itself has an annual clearance rate of 3.3%.
- Research shows significant link between deforestation and flooding in Meghalaya Hills.

#### Climate Change:

Global warming is causing water in the sea to heat up and thermal expansion is causing the sea level to rise. 1°C rise in sea levels could raise sea levels by 1.5m and Bangladesh coastline is only 1m above sea level.

### **Poor River Management:**

- Management techniques such as concreting channels and straightening channels can often only move the problem further downstream.
- In India, the Farraka Dam withholds water in the dry season and releases huge amounts in the wet season to avoid overflow, but this water flows to Bangladesh who cannot deal with it.
- The raising of levees in Bangladesh has actually only prevented flood water entering channels and stagnant pools build up beside them for several months.

### **Urbanisation:**

- 2008 population =146million. One of most densely populated areas (1,045people/km<sup>2</sup>).
- Rapid urbanisation especially Dhaka. Permeable surfaces replaced by concrete and tarmac (impermeable)
- Artificial drainage replaces natural processes. Speeds it up too.
- Growing rural population increases water demand. More wells sunk, lowering water table leading to subsidence and deep water flooding greater.

---

## **Unit 1 Fluvial Systems Case Study – Benefits and Detrimental Effects of Flooding in Bangladesh.**

### **Beneficial Effects:**

#### **Agriculture:**

- Fertilised Soils: Alluvial deposits fertilise fields.
- Along with rabi crops Wheat and rice) in the dry season, 2 high yielding kharif crops (Aman rice) can be harvested in the wet season due to the flooding. Keeps everyone fed in a rapidly growing population.

#### **Fishing:**

- 3 main types of fish, especially Hilsa, provide 75% of the dietary protein in Bangladesh. Flooding extends the aquatic system, creating breeding ponds and economic opportunity.
- Near the coast, prawn fishing creates employment for school children, who collect hatchlings to stock fish farms to sell to the Asian Market.

#### **Groundwater:**

- Replenish aquifers for drinking water and for irrigation in the dry season.
- Cleans out toxins eg. Salt build up near the coast.

## Detrimental Effects:

These occurred during the 1998 Bonna Floods in Bangladesh.

### People:

- 2 million forced to flee from the capital, Dhaka.
- 30 million affected nationally.
- 1300 people died from water-borne diseases- mainly young and old. Fear of Cholera and typhoid epidemics averted.
- 800 died drowning, mudflows and building collapse.

### Property:

- 300,000 homes destroyed, many in Dhaka (2m under water)
- 11,000km of road and many bridges washed away.
- Kharif crop almost completely destroyed – Emergency food relief needed for millions.
- 1/2 million cattle and poultry were lost.
- Economic Impact £1billion

### Land:

- 65% of land covered.
- Flood water polluted by sewage system.

The flooding caused contamination of crops and animals and unclean water resulted in cholera and typhoid outbreaks. Few hospitals were functional because of damage from the flooding and those that were had too many patients, resulting in everyday injuries becoming fatal due to lack of treatment. 700,000 hectares of crops were destroyed,<sup>[2]</sup> 400 factories were forced to close, and there was a 20% decrease in economic production. Communication within the country also became difficult.