**Running Water 3** Name:

Unit 3: Gradation Unit Period:

Geography 12

**Old Age Stage Stage Continued…**

**Delta**

* When an old river reaches the sea, the current is too slow to carry its load 🡪 builds a series of islands at the mouth.
* Islands and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ break up the stream to form channels and the formation of a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
* Where freshwater from rivers and streams meets and mixes with salt water from the ocean 🡪 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**



**Arcuate Delta**

* Most common type of river delta
* Symmetrical shape
* Little tide + gentle east-west current
* **Example:**



**Bird’s Foot Delta**

* Little tide + strong current
* Deposits will be pulled with current
* **Example:**



**Estuarine Delta**

* Forms when river sediment is deposited in a submerged river mouth.
* Long and narrow estuary.

**River flooding and management issues**

The likelihood of a river bursting its banks and flooding is determined by factors in the surrounding landscape, such as steepness of the river valley, the amount of vegetation and the prevailing rock-type. The short-term impact of floods can be catastrophic, but they can have positive long-term effects as well.

**Causes of flooding**

A flood occurs when a river bursts its banks and the water spills onto the **floodplain**. Flooding tends to be caused by heavy rain: the faster the rainwater reaches the *river channel*, the more likely it is to flood. The nature of the landscape around a river will influence how quickly rainwater reaches the channel.

The following factors may encourage flooding:

* **A steep-sided channel** - a river channel surrounded by steep slopes causes fast *surface run-off*.
* **A lack of vegetation or woodland** - trees and plants intercept precipitation (ie they catch or drink water). If there is little vegetation in the drainage basin then surface run-off will be high.
* A *drainage basin*, consisting of mainly *impermeable* rock - this will mean that water cannot **percolate** through the rock layer, and so will run faster over the surface.
* **A drainage basin in an urban area** - these consist largely of impermeable concrete, which encourages overland flow. Drains and sewers take water quickly and directly to the river channel. Houses with sloping roofs further increase the amount of run-off.

Flood management techniques include river engineering, *afforestation* and planning controls to restrict urban development on floodplains.

# The impact of flooding

Floods can cause damage to homes and possessions as well as disruption to communications. However, flooding can also have positive impacts on an area.

Flooding deposits fine silt (alluvium) onto the floodplain, making it very fertile and excellent for agriculture. People living on or near floodplains may rely upon regular flooding to help support their farming and therefore provide food.

*LEDCs* tend to be affected more than *MEDCs* by the effects of flooding. This is partly because LEDCs have more farms, and farming communities are attracted to fertile flood plains. LEDCs often do not have the resources to prevent flooding or deal with the aftermath of flooding.

# MEDC case study: causes and effects of flooding in Boscastle, UK (2004)

## Causes

* Over 60 mm of rainfall (typically a month's rainfall) fell in two hours.
* The ground was already saturated due to the previous two weeks of above average rainfall.
* The drainage basin has many steep slopes, and has areas of *impermeable*slate causing rapid *surface run-off*.
* Boscastle is at the confluence (where tributaries meet) of three rivers - Valency, Jordan, and Paradise. A large quantity of water all arrived within a short space of time causing the rivers to overflow.
* The flooding coincided with a high tide, making the impact worse.

## Effects

* Homes, businesses and cars belonging to more than 1,000 people were swept away.
* Income from tourism was lost. This had an impact on livelihoods and the local economy.
* There were vast numbers of subsequent insurance claims.
* No lives were lost, partly due to the rapid response of the emergency services.

# LEDC case study: causes and effects of flooding in Mozambique (2000)

The Mozambique floods of 2000 show that what happens in one country can very often affect another.

The flooding was triggered by exceptionally heavy rain in South Africa, lasting for five weeks in early 2000. Botswana was particularly badly hit, receiving 75 per cent of its yearly rainfall in three days. On 22 February, Cyclone Eline hit, bringing more heavy rainfall. The rain from Botswana and other Southern African countries ran into the Limpopo, Zambezi and other rivers which flow through Mozambique to the sea. These rivers eventually burst their banks, causing severe flooding in Mozambique.

In addition, the loss of grassland and draining of marshland for farms contributed to more rapid *surface run-off*.

The results were disastrous: services were cut off and many people were stranded, homeless or had died through drowning or disease. Urbanisation in South Africa may have contributed to the large quantities of surface water run-off swelling the rivers.

# River management

Steps can be taken to manage flooding. Often these steps involve trying to lengthen the amount of time it takes for water to reach the river channel, thereby increasing the lag time. Flood management techniques can be divided into **hard-** and **soft-**engineering options.

Hard options tend to be more expensive and have a greater impact on the river and the surrounding landscape.

Soft options are more ecologically sensitive. The tables summarise the main flood management techniques.

## Hard-engineering options

|  |  |
| --- | --- |
| **Dam construction** | * Dams are often built along the course of a river in order to control the amount of discharge. Water is held back by the dam and released in a controlled way. This controls flooding.
* Water is usually stored in a reservoir behind the dam. This water can then be used to generate hydroelectric power or for recreation purposes.
* Building a dam can be very expensive.
* Sediment is often trapped behind the wall of the dam, leading to erosion further downstream.
* Settlements and agricultural land may be lost when the river valley is flooded to form a reservoir.
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| **River engineering** | * The river channel may be widened or deepened allowing it to carry more water. A river channel may be straightened so that water can travel faster along the course. The channel course of the river can also be altered, diverting floodwaters away from settlements.
* Altering the river channel may lead to a greater risk of flooding downstream, as the water is carried there faster.
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## Soft-engineering options

|  |  |
| --- | --- |
| **Afforestation** | * Trees are planted near to the river. This means greater interception of rainwater and lower river discharge. This is a relatively low cost option, which enhances the environmental quality of the drainage basin.
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| **Managed flooding** (also called ecological flooding) | * The river is allowed to flood naturally in places, to prevent flooding in other areas - for example, near settlements.
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| **Planning** | * Local authorities and the national government introduce policies to control urban development close to or on the floodplain. This reduces the chance of flooding and the risk of damage to property.
* There can be resistance to development restrictions in areas where there is a shortage of housing. Enforcing planning regulations and controls may be harder in LEDCs.
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Different interest groups have different views about flood management techniques:

* Governments and developers often favour large hard engineering options, such as dam building. Building a dam and a reservoir can generate income. Profits can be made from generating electricity or leisure revenue.
* Environmental groups and local residents often prefer softer options, such as planting trees. Soft options cause little damage to the environment and do not involve the resettlement of communities.
* Effective flood management strategies should be economically, environmentally and socially sustainable. Sustainable strategies allow management without compromising the needs of future generations.

## How can the risk of flooding be reduced?

Bangladesh is an LEDC and therefore does not have money to implement large schemes.

It is always going to be threatened with flooding, so the focus is on reducing the impact.

The Flood Action Plan is funded by the world bank. It funds projects to monitor flood levels and construct flood banks/artificial *levees*.

More sustainable ways of reducing the flooding include building coastal flood shelters on stilts and early-warning systems.

Questions:

1. Compare and contrast the causes and impacts of flowing that occurred in Boscastle, UK and Mozambique.

2. Why do you think floods impact LEDC’s more severely?

3. What are the solutions to manage floods for MEDC’s versus LEDC’s?

4. Despite the risk of floods, why do people settle along river delta’s?