

Think Piece

Teaching A Level Geography

Resource Sheet 5: Balloon debate

Flooding options – a balloon debate!

Where human activity competes with flooding, everyone accepts that there is a problem! But which is the best way to manage flooding? Arguments fall into two camps –

- a) hard engineering solutions that provide structural protection
- b) 'soft' approaches to basin management that tries to reduce the risk in the first place.

This exercise is about possible solutions to flood problems through a **balloon debate**. There are many different solutions to the flood problem; some are better than others. A balloon debate involves a number of people who have to arguing their case to stay in a hypothetical balloon which is losing height. Somehow the balloon must stay in the air, which it does by losing people. People stay in the balloon by the strength of their arguments. It works as follows:

1. Nine speakers are allocated roles and viewpoints, as shown below.
2. Each speaker must defend their viewpoint as best they can.
3. Each speaker has ONE minute to put across their viewpoint.
4. When everybody has presented their view, the audience votes to eject one viewpoint from the balloon.
5. The remaining people ask and answer questions of each other in two-minute rounds to find out the strength of each case.
6. At the end of each round, the audience must eject one more viewpoint.
7. At the end, the most persuasive viewpoint wins.

A. Structural protection and engineering solutions

1. Embankments, or levees, and flood walls

Person:

These are designed to restrict flooding to defined limits on the flood plain and to allow controlled flooding of certain areas. They are a relatively cheap form of flood protection and operate to design standards if well maintained. Ideally, flood walls should be located as far away from the river as possible. However, flood walls and embankments can increase flooding both upstream and downstream; upstream because they may constrict flow, or downstream because they may discharge water more quickly into an area less able to absorb it.

2. Channel improvements

Person:

Channel improvements are designed to confine floodwaters to the river channel. There are two main ways in which this can be done;

- a) Channel roughness can be reduced by clearing vegetation and other obstacles or by lining the channel with a smooth surface such as concrete. This reduces friction and allows discharge to pass more quickly. River beds strewn with stones and boulders increase friction, slowing the river down and reducing channel capacity. The wall dividing the river from the road is much smoother, and enables water to flow more quickly. Measures like this help to discharge water quickly, and reduce the risk of a flood.
- b) The channel can be widened or deepened by dredging. This increases the capacity of the channel.

3. Relief Channels

Person:

The channel can be shortened by cutting meander loops and steepening the gradient in order to allow water to discharge away from the area at risk. These schemes are initially very attractive and widely used, but have their disadvantages. Faster discharge may increase the likelihood of flooding downstream. In addition, straightening the channel may be self-defeating, as the river reverts back to its natural state of dynamic equilibrium, explained in the theory box below. This means that costly maintenance work is frequently needed.

4. Flood storage reservoirs

Person:

These work by storing excess water in the upper part of the catchment, which is gradually released. Because of the high costs involved, reservoirs have never been built in the UK for the sole purpose of flood alleviation, though some have contributed to flood control. In the UK, only upper river courses offer suitable sites away from lowland areas where most flooding occurs, and therefore have minimal effects downstream. Downstream, increased velocity away from the dams may result in greater rates of erosion.

5. Flood interception schemes

Person:

These involve changing the course of the river, and work in three different ways;

1. The river is re-routed to by-pass settlements under threat;
2. New channels can be used in addition to the natural channel to store water;
3. Flood embankments help to contain flood water well away from places under threat.

River Basin Management

River basin management means reducing the harmful effects of a flood, while accepting that a flood may happen. Four methods are well tried;

- a) flood abatement
- b) flood proofing
- c) flood plain zoning
- d) flood prediction and warning.

6. Flood abatement

Person:

Flood abatement aims to reduce flooding downstream by changing land use upstream. The most frequently used is afforestation, or planting additional trees. The passage of water into river channels is delayed through increased interception, and increasing losses of water through evapotranspiration. This can prove effective, but requires large areas of land, and time for forests to become established. On the slopes of Ingleborough and Wharfedale in the Yorkshire Dales National Park, channels dug for plantations before tree planting actually caused a short-term increase in run-off and flooding in the initial stages. It is not feasible in all catchments, therefore.

7. Flood proofing

Person:

Flood proofing involves designing new buildings or altering existing ones to reduce damage that would be caused by flooding. These measures may be of a temporary or permanent nature. It can involve raising building levels; having steps up to doors; or sandbagging. Flood proofing tends to be less effective in high level, fast-flowing floods of a longer duration. Buildings may be protected by walls around above the river level to protect them against a flood, such as those used in York.

8. Flood plain zoning

Person:

This is a management strategy whose aim is to reduce flood plain development. It suggests that flood plains are divided into zones; e.g.

Zone 1 The Prohibitive zone where no further development is allowed except for essential waterfront facilities.

Zone 2 The restrictive zone, where only essential development and recreational facilities are permitted. All buildings should be flood proofed.

Zone 3 The warning zone, where inhabitants receive warnings of impending floods and are reminded regularly of the flood hazard.

9. Flood prediction and warning

Person:

River and precipitation levels are carefully monitored by the Environment Agency on the basis of data provided by the Meteorological Office. In this way, accurate predictions of flood events can be made in time to reduce damage caused by flooding. Flood warnings are issued by the Environment Agency, local borough councils and the Police. This makes evacuation or removal of possessions possible where necessary. It also enables residents and businesses to put temporary flood-proofing measures into practice.