

What is Hard Engineering?

Hard Engineering is a term used to describe measures taken to prevent the impact of a hazard (in this case flooding) by means of built, and usually permanent, structures. They are the most common set of methods used, protecting many thousands of people both in the UK and elsewhere.

Technique

Weaknesses

Temporary Barriers

Sand bag walls and portable flood gates provide quick and easy to construct ways of dealing with small floods. Large, water filled inflatable barriers (known as 'aquabarriers') have also been used in towns such as **Shrewsbury** along the **River Severn**.



Sandbags, Morpeth / Ian Britton

These barriers only protect against floods of a small size and should really only be used for those that occur infrequently as they can take some time to deploy and set up. Therefore they rely on the area having a good warning system in place which would allow residents and authorities time to act.

Dams and Barriers

Dams of all sizes are designed to control the flow of a river and with monitoring of rainfall levels can be opened and closed accordingly. Barriers act in a similar way but are only deployed in times of flood, creating no permanent reservoir such as the **Thames Barrier** near **Woolwich**.



Foss Barrier, York / Neil Turner

Whilst they may appear reassuring to local residents the impact of holding back water artificially (and its sediment) can impact on the integrity of damage ecosystems further downstream. Permanent barriers can create reservoirs over farmland and the need to relocate people if they live behind the dam.

Flood Walls

Flood walls are permanent structures that sit alongside the river bank, blocking rising water. They tend to be placed only in front of high value buildings or areas rather than in a wholesale fashion along an entire bank. An example is found in **Morpeth**, along the **River Wansbeck**.



Flood wall, York / Paul Kelly

If designed sensitively, these walls might not be an eye sore for residents but they often block access to the river and restrict people's views of it. Once topped, it can be difficult for flood water to return to the river and a pump would need to be deployed to drain the water away.

Revetments

In order to strengthen them and prevent over topping, gabions (wire cages of rocks), rip rap (piles of rocks) or concrete piling may artificially cover a river bank. They also slow the speed of the water by increasing the bank friction. An example is found along the **Stanford Brook** near **Crawley**.



Gabion bank, Crawley / George Redgrave

Concrete or metal structures can prevent wildlife (such as nesting kingfishers) from using the banks in their normal way and vegetation may not grow to cover the banks in a way that makes them appear natural to river side users. Their building and placement can cause large levels of disruption.

Technique

Weaknesses

Relief Channels

In areas that are particularly built up it can be difficult to put permanent barriers in place next to the river. An alternative is a new channel, in addition to the original one that can take the excess water around the town, re-joining it at a later point, for example the **River Thames** at **Oxford**.



Relief Channel, R.Lea, London / Gordon Joly

In intense floods there is no guarantee that the relief channel itself will not flood, potentially causing an area to become marooned between a river and its relief channel. Channels can also be expensive to build and require a significant change in land use.

Channel Dredging

Over time silt and mud builds up in some parts of a river system, changing the shape of the river banks and bed and reducing the river's capacity. Dredging, by scooping up and removing this build up, reducing the chance of flooding. This has happened on the **River Thames** at **Maidenhead**.



River dredging, Basingstoke /IrBrl

Removing the river's natural silt means that fewer nutrients find their way onto the flood plain during seasonal low level flooding and farm land can suffer lower fertility for this. There is also some evidence that dredging can actually increase the silt build up in other parts of a river, making the process far less effective.

Channel Lining

Lining the river banks, and sometimes the beds with concrete can reduce the friction that exists between the banks and the water, speeding any flood water quickly past built up areas and onto places that hold less land value. An example of this is the **River Brent** in **Brent**, London.



Channel Lining, Brent, London / diamond geezer

Species that nest in the banks of a river are forced to move to other areas and ultimately the natural feel of the river is lost. By reducing the friction and speeding the water through a town, areas further downstream of lining point can become flooded in times of even moderate rainfall.

Channel Straightening

Straightening a river channel increases the speed at which flood water can flow through an area, protecting the built up environment either side of the channel at that point. Most of the UK's main rivers have some degree of straightening, for example the **River Avon** in **Salisbury**.



River Straightening, R.Tone, Somerset / Ian Chilton

Straightening a river channel changes the natural flow of a river and, as with lining a channel, can ironically push a flood problem further downstream. Rivers will naturally try to meander across a flood plain, so unless the banks are lined with a permanent lining a river will revert to its original meanders.

Groynes

Acting as barriers that jut out across the channel, groynes slow down the pace of the river and can temporarily hold flood water back before it enters a part of the river system where land use is more valued. The **River Quaggy** in **Lewisham**, London is an example of a river with these in place.



Groynes, R.Quaggy, Lewisham / alcinababe

In slow running streams the groynes can cause sedimentation in the river channel, which in times of high rainfall can exacerbate the chance of flooding greatly. Groynes also make any navigation of a channel nearly impossible for boats and some wildlife.