

FLOODS

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Winter 2014 was unusually stormy and was the wettest winter in the UK for over a century. The floods it caused are unlikely to be the last. Everyone agrees that something needs to be done... but what do we spend the money on? To help decide that, first of all we need to try and understand how and why flooding like this occurs.

So I've made myself a model of a river in its catchment area. This is sometimes called the 'drainage basin'. Now this, up here, represents my upland area, which is covered with natural vegetation, trees, bushes, grass, that kind of thing. I'm just using a sponge.

Then downstream in the lowland area I've got a town...and further downstream I've got two smaller villages.

Running down the middle is the river channel, which is draining out towards the sea.

Now let's take a look at what happens if we get a heavy rainfall in the upper part of my catchment area...because this is a natural landscape, a lot of the water is being absorbed by the soil and vegetation, but some is also sinking through the soil and it's draining out into the river.

And it's draining down the river and you can see from the absorbent paper that it's starting to flood out onto the lowlands. And that's exactly what should happen because a river and its catchment area are an integral system and that's the problem with building on floodplains – you're bound to get flooding.

But that's not the only problem - if the rainfall is heavy and persistent, over time, bits of the natural landscape will get washed into the river channel, silting it up and narrowing the river.

Now let's look at what happens if we decide to alter the landscape in a much more radical way. Let's say we've decided to build a big industrial complex on this nice bit of land upstream. That means covering the soil with buildings, concrete and tarmac which I've represented using this ceramic tile. Now I'm going to conjure up another rainstorm.

This time none of the water is sinking in. It's running off very rapidly into the river channel and it's caused catastrophic flooding. So what's to be done? Well there's no way the buildings are coming down and the tarmac's being dug up.

And what happens is, typically, when a town is repeatedly and badly flooded, they invest in flood defence mechanisms – in my case plasticine! And I've built a flood wall round my town.

So, let's see what happens now when I initiate another downpour. Well the water's channelling nicely past my flood defences. My town is staying dry but I'm afraid that the poor folks downstream in the villages have been completely flooded out.

What this shows us is it's not just the amount of rain that falls at any given time, it's how well the landscape can cope with the volume of water. It's all about absorption versus rapid run off. And that's the crux of the problem. The water has to go somewhere. If you go ahead and make changes in one place, it will inevitably impact somewhere else.

So is that it? Surely something more can be done – short of raising the river banks all the way to the sea. The cities are there to stay but there are already materials that we can use instead of concrete that will allow more of the water to soak in rather than run off.

If you do decide to build a model like this you could try out some different materials. Compare them and see which works the best. You

could try things like sand, gravel, and peat...but do send us your results so we can share them online.