Managing flooding by working with nature

The government announced £15m for natural flood management initiatives in the 2016 Autumn Statement. To tell us more about what these methods are, we spoke to Professor Louise Bracken at Durham University, Dr Paul Quinn at Newcastle University and their colleagues from the Environment Agency – Michael Norbury and Alex Nicholson.

Over five million UK properties are currently at risk of flooding, according to the Environment Agency. Traditional, large concrete and steel flood defences such as flood walls, flood gates and dams reduce flood risk where people live. But to meet the challenges of climate change and changes in land use, these may only ever be part of a solution. In some areas they might not be feasible at all.

As part of the range of measures we can use to lessen or delay flood risk to property downstream, natural flood management (NFM) initiatives can reduce the height of flood waters at their peak. They can also help improve water quality.

But rather than 'defending' towns where floodwater might hit, NFM is about holding water further upstream and in the landscape. These measures are built in numerous locations along the river, its catchment area and the surrounding landscape. This slows the release of water down and into the river, giving people more time to prepare and helping keep its highest level, or 'peak flow', manageable as it flows towards places where people live.

NFM measures can also help improve water quality and reduce erosion by protecting and restoring riverbanks.

Most measures can be built using locally-sourced, natural materials, which also helps to reduce their carbon footprint and helps wildlife habitats to thrive. NFM measures will need replacing more

Leaky dams

A dam made of wood or other natural material catches water flowing overland, later releasing it slowly into the river. The leaky dam in Belford, Northumberland can hold approximately 750m^3.

Offline ponds

A series of connected ponds at field margins and the river edge to slow down surface water running into the river.

Online ponds

Closer to the river, 'online' ponds allow a river to overflow its banks in a controlled way via shallow inlets allowing high flows to spill into the pond.

Engineered Log Jams (ELJs)

Secured tree trunks encased in living saplings such as willow thickets laid across the top of a river and floodplain. ELJs force high flows of water onto floodplains, reducing the amount of water flowing down the river and temporarily holding it back. The saplings can also filter out pollutants such as phosphate that may come from sewage and farming runoff.

Ditch barriers

Barriers in ditches or drains at field boundaries allow water to flow in normal conditions, but collect higher water levels behind them during floods. They can be built using local materials such as willow.

Reconnecting old channels and oxbow lakes

Over centuries, the courses of many rivers have been straightened or changed to save space. By reconnecting old channels to a river's present route, high flows can spill into them.

Leaky dams in India

Natural water management techniques can also be used to protect stocks of water in areas of low rainfall. For example, a type of leaky dam called a johad is a traditional tool for water management in India that stops the flow of water downhill, storing it for year-round use. Indian campaigner Rajendra Singh spearheaded efforts to reintroduce johads and Rajasthan State now has 1,500 of them. Singh won the Stockholm Water Prize for bringing water to 1,000 villages.

Natural flood management in action

The Belford Burn catchment in Northumberland covers fewer than three square miles but has caused the town of Belford a long history of flooding. In July 1997, the East Coast Mainline was temporarily shut down when the tracks around Belford Burn flooded. Paul Quinn's team and the Environment Agency used a range of NFM techniques in 45 locations around the river so the catchment could hold an additional 12,000m^3 of water in the landscape – that's the size of five Olympic-sized swimming pools.

regularly than structures made of concrete or steel but using local materials, such as willow, also means that these measures are fairly low cost.

Slowing the flow

NFM is about all the measures that can slow a raindrop down as soon it falls from the sky and starts to travel across the land. Here, we outline just a few of them. In the countryside techniques include managing the land and in towns it can mean using permeable materials for paving.

There are a huge range of factors to take into account and each measure must be tailored to the landscape where it's being used. Traditional defences may be the best option in certain places but often a combination will be appropriate. Since 2004, 154 different NFM initiatives have been introduced in the UK. But given that these have mainly been used in smaller river areas, we don't yet have enough data to predict how effective they will be in any given catchment. To improve our understanding, NERC has launched a four-year, £4m programme to find out more about their suitability and effectiveness for a range of flood risk scenarios.

These authors have been involved in various natural flood management initiatives, including some part-funded by NERC, and Paul recently served as special advisor to the government's Future Flood Prevention Inquiry. See a map of UK NFM techniques in practice at http://bit.ly/UKNFMmap and find out more about johads here www.theflowpartnership.org

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Images: Mark Wilkinson, Michael Norbury, Mini Jain.