

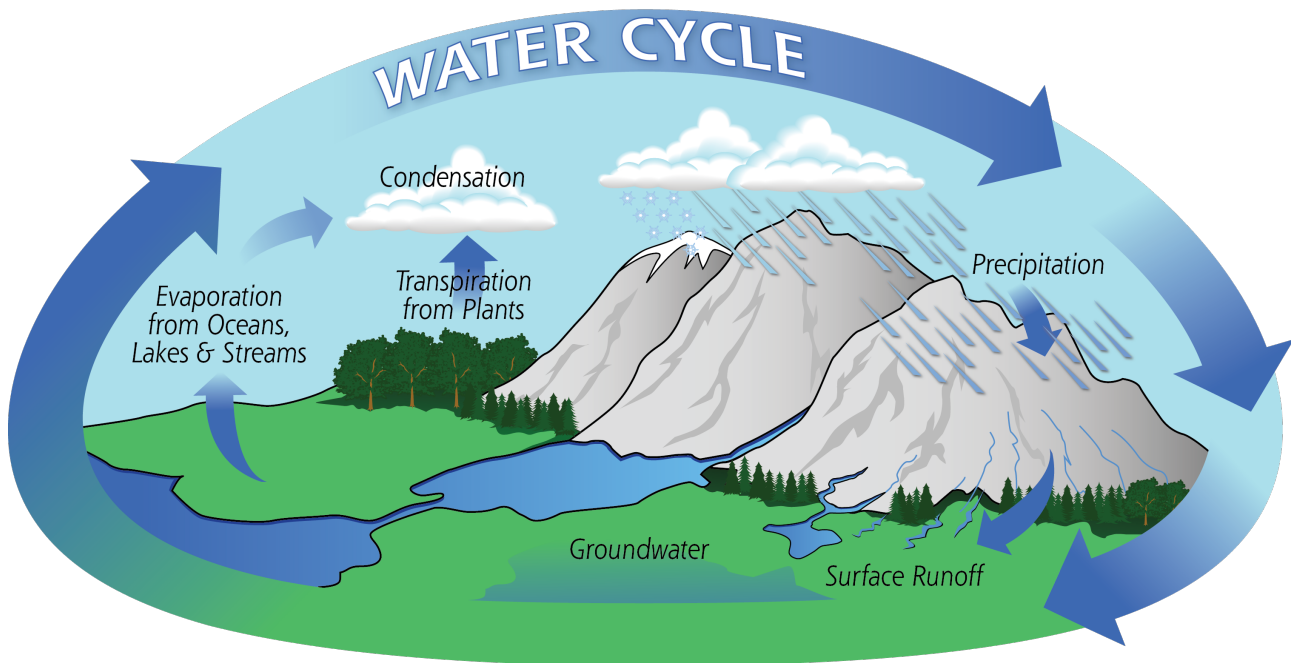


All involved have done what they thought best to stop flooding of properties. The Environment Agency (NRW) have built barriers and flood defences, the Emergency services worked tirelessly to rescue people and get the situation resolved. The issue appears to be we are trying to control flooding rather than manage it.

Warmer global temperatures will mean the air can hold more moisture, but when this air cools it can no longer hold this excess moisture and so we get excessive rainfall. Hills and mountains increase the rainfall rate (orographic rainfall) This year we have seen areas hit time and time again due to position of a high pressure over mainland Europe. This has seen low pressure trail fronts time and time again over same area.

Flood defences build height around rivers, but problem is water is not compressible. The water is running down hill and so when it is pushed into a small area like where a flood defence is positioned it can only slow down, back up and rise. Eventually this will either break out somewhere prior to the defences, or with same amount of water coming down it will rise above barriers. We could build higher and higher barriers but it is not the answer. Dredging helps but only so much. We need to slow the water at source.

To do this we look at rainfall, When it rains a large percentage never makes it to the ground, it evaporates on its downward journey. So what we need is to increase the amount of water that evaporates back to atmosphere. Transpiration is how plants return water vapour back to atmosphere. We also need to hold some of the water and slow its path to rivers.



So step one is a simple natural one, trees, woodlands, a mixture of fast growing pine and slower growing Larch, Oak and Ash trees.

The trees not only take lots of water but also their leaves, pine needles and branches when wet are stopping lots of water reaching the ground. The evaporation/transpiration process is also increased as more wet surfaces are subjected to the air. So we straight away slow and decrease the runoff reaching streams and rivers.

However like all flood prevention this is not enough on its own.

So now we look at controlling the water levels. We look at a reverse feature of this in action today, The Cardiff Bay Barrage. Cardiff frequently got flooded in the past, until the barrage was built.

Now when rivers are high they release large amounts of water during low tide and when high tide comes, they close barrage and the bay refills from a low level until tide subsides and they release it again.

We need same principle at dams, lakes and other large water catchments but in reversal.

A controlled release of water prior to heavy rainfall that presents a risk, taking rivers to spate condition, but not to flood level. As rainfall increases river height from sources downstream, the rate of water released from dam is lowered. This stops a lot of excess water reaching the river at critical times, This water being held back refilling the dam or lake.

Then as water levels downstream drop the dam can release more water in a controlled manner to make room for next rainfall.

A controlled water management scheme.

Some areas have no gates to release water, This is not a huge issue as huge pumps could have a play on this to remove the water, in fact I have a non mechanical design that would release huge amounts of water through syphon process making this economically viable.

Mean while, as we wait for this infrastructure to be put in place we use High Volume pumps to do the work prior to rainfall, Proactive not reactive

So now we slowed the rainfall reaching water course using nature (trees)

we also control flow at source using water management

We now need a third part of insurance, that is a flood plain

Prior to a risk area we choose rural low lying agricultural ground that will be allowed to flood and put a barrier in place to stop excess water moving downstream and hold it back to flood this unoccupied land. This would come into play only when everything else has passed capacity.

We still require dredging and flood barriers but if we need a longterm solution this has to be considered.

I hear the calls that Govt cut back on spending on flood barriers and that infrastructure is old. This may be true but its not really the issue here. flood defences are only so good to a point. How high do you want a wall around a river? 10ft? 20ft we need a different approach.

I have studied this for years, but i am a nobody in the eyes of the the powers to be. Hopefully someone will finally listen and at least talk to me about this and investigate it.

I have been saying this for 10 years now and just maybe many people today, would not have had their christmas ruined and homes flooded.

I don't want to get into a political argument but i also think the Emergency services are a huge asset of this Country, They are your biggest insurance policy. You pay about £1 a week to have a fire service, They don't just put out fires, they go to traffic accidents, medical emergencies, river and flooding incidents, terrorist attacks chemicals and much more, i hope you never need them but if you do you will think best £1 a week you ever paid.

The many Emergency services have spent their Christmas helping the people effected by flooding, Long cold wet hours helping those that need it. Too many different organisations to name but for our nation these people are the ones that give everything to make a difference. They are a credit to us all.

The Current Govt and previous Govt's have spent millions on flood defence, i believe they have acted with a desire to stop this from being an issue. The EA and NRW have also acted in the best interests of the public and i have full support for all involved, What is disappointing is that because i am not a known Professional in the field, what i have been saying for years has never been listened too.



Does building barriers work? dredging? Yes they all work to some extent. They try to hold and control flood water. We should now consider managing the watercourse at catchments.

Our Emergency services have responded quickly and effectively to these situations working tirelessly in difficult situations to resolve the situation. They are reacting to a situation and so far a proactive approach is missing. I hope we do not get caught out because of a lack of forward planning.

A plan should be made for every area of what could get flooded and in what situation. Include a dam collapse,

Areas of safety and evacuation planned for any such event and what would be used to accommodate large crowds of evacuated people and pets.

In addition emergency crews need to be in a place of risk prior to flood. We know it likely and yet we evacuate people through water and close roads when cars submerged. Close these areas before flooding. The best service to run this, who have the resources and ability is the Fire and rescue service.

One scenario we do not want to face is a dam failure

The two weather related scenarios are

1 In flow greater than Maximum out flow.

This would be where water from the catchment is greater than the maximum output from static sluice. The level could rise until over topping the dam bringing the structure under huge stress. This would be of great danger to any areas down stream. In addition a large landslide due to saturated ground into the lake could have a similar out come.

I strongly believe that controlling these structures is paramount, but also Emergency Evacuation procedures should be explored on where to move people to safety and resources available to do so should be considered. The best agency for planning this with assistance of the EA is the Fire Service. Strategically placed, and multiple resources who are familiar with local topography.

2. Is the failure of a dam from normal wear and tear, this has occurred many times in the UK but thankfully without catastrophic consequences. Every time a defect has been found the authorities have dealt with it. Including a dam in South Wales where high volume pumps were used to remove water to take pressure off the structure so repairs could be undertaken.

So there we are flooding can be managed and we could be more proactive in future to not only limit flooding but to also pre plan for emergency evacuations. I also find it strange that we mobilise fire crews from other areas after the flooding has occurred. This means that they are not in place at critical time and that they have difficult access due to flooding of roads and dangerous bridges. Surely a national resource should be moved prior to flooding when we know its likely, paid for my Emergency central budget.

So will i ever get any credit for this? No  
does it matter ...no?

What matters is these technical infrastructure and flood management ideas are implemented to help the people in future and to save lives.

However i am happy to discuss this at any time with any organisation to explain and clarify how it works best, i do not charge anything to do so.

If you need me to travel to you, train fare would be appreciated thou.

Colin Pritchard  
Floodwarn

NEXT PAGES EXPLAIN THE DYNAMICS ON THIS FLOOD PREVENTION



## The Dynamics



**Trees can be used take some of the rainfall, studies have been completed on this.  
The interception of rainfall is by evaporation and water held in the canopy of the trees**

"Of the rain falling annually on a forest, the proportion that is intercepted at leaf and stem surfaces and evaporated from them (the interception loss) is commonly between 20 and 40% in conifers and between 10 and 20% in hardwoods (ZINKE, 1967). Since the total annual evaporation (including transpiration) must normally be less than the annual rainfall, it is clear that evaporation of intercepted water is a considerable proportion of total evaporation."

Dam release

This is not a new concept, its been used in other countries before

"Owners and operators of reservoirs statewide should check their dams today, and through the next few days, for possible problems caused by heavy rainfall expected to begin late Sunday, according to the S.C. Department of Health and Environmental Control." and....

"Owners of reservoirs should take the appropriate steps to safely lower the water level in their reservoir if additional storage for the anticipated rainfall is needed," said Chuck Gorman with DHEC's dam safety program. "If there is a dam downstream of your dam and you are lowering your water level, please call the owner of that dam and advise him or her about what you are doing."

In the UK we have done this for years, lets look at a local water management structure in my home City

### **Cardiff bay barrage**

Cardiff has historically been flooded by River Taff, river Ely and High Spring tides form Bristol Channel.

The risk has been reduced hugely by releasing huge amounts of water at low tide and if required they can close sluice gates at high tide even at times of high river levels. So during flood risk rainfall they can lower the level of the Bay and then at a time that they can not release water ( due to high tide) the bay refill from the rivers.

Same principle can be applied to lakes and other water catchments, Release some water prior to rainfall, continue to maintain low level during rainfall. When rivers rise due to rainfall from other catchment areas you close the sluices. You now have a considerable amount not flowing into the river and so limit amount passing at risk towns and cities downstream. You manage this and during any respite in rainfall / river level control some flow from sluice to keep level in catchment at a level that can absorb the excess.

### **Next the controlled flooding**

All ready used in UK, Choose an area of last resort for agricultural or rural land that will be used to absorb some of the flow from travelling down stream.

Of course dredging and barriers will always be valid, but we can not continue to plow money into the same concepts to build higher walls.

### **Can we guard against all types of flooding? No !**

If you want to guarantee that somewhere could never get flooded for get it

Nature can shock you and we can look at some feasible situations that we could never protect against. Like a small asteroid lands in the Atlantic ocean causing a 70ft tsunami. Unlikely but

possible. You can not protect everywhere for an unlikely but possible event like that.



**Time line to flooding latest flooding** ( notice rainfall totals later were less but due to full catchments and high water table the situation became worse.

**5 December:** Storm Desmond brings more than a month's rain to parts of Cumbria, leading to flooding in Carlisle and other areas

**12 December:** River levels remain high and more than 70 flood warnings are issued amid more heavy rain

**22 December:** Communities in Cumbria flood again - some for the third time in less than a month

**25 December:** More than 100 flood alerts and warnings are issued across England and Wales as Storm Eva brings torrential rain

**26 December:** Residents in West Yorkshire and Lancashire are evacuated from their homes and flooding hits Leeds, Greater Manchester and York

**27 December:** Police in York advise hundreds of people to evacuate their homes as 24 severe flood warnings remain in place in the north east of England