Defusing the ‘Weather Bomb’: The Future of Flood Defence

One of the Environment Agency’s primary duties is to reduce and manage flood risk in England. We do that principally by building and maintaining flood defences, warning and informing people when flooding threatens, and deploying our teams on the ground to protect communities against flooding and help them recover when it happens.

So there are no prizes for guessing what I have spent the last few weeks doing. Like most of the rest of the Environment Agency, I have been focused on the devastating flooding we have seen across the country this winter, and on ensuring we’re doing all we can to protect lives and properties. So I thought I would start with a few personal reflections from the last few weeks.

What we saw after Storms Ciara and Dennis was a stark reminder of just how devastating floods are. They kill people, and tragically that happened again last week. They ruin homes and damage lives. And they destroy livelihoods: some small businesses will not survive this latest blow. Every single flooded home or lost business is a personal tragedy, and my thoughts today are with all of those affected.

But in the worst of times you also see the best of people. I want to pay tribute to all the flood-hit communities where people have pulled together with such spirit to help each other out. I want to praise the emergency services and the local authorities, who have done a remarkable job in hugely difficult circumstances.

And I want to praise too the Environment Agency teams who have been working round the clock to protect lives and livelihoods and support the communities which have been hit. Our staff are incredibly dedicated, highly professional, and very good at what they do. There are people alive today who would not be with us but for the work of Environment Agency staff. And there are thousands more people who are today not going through the agony of a flooded home because of the EA’s work. Environment Agency staff don’t think of themselves as heroes, but they are, and the nation is lucky to have them.

My other main impression from the last few days is the sheer scale of what we witnessed. We have had one of the wettest winters on record. That meant that the torrential downpours from Storm Dennis fell on land that was already saturated and into rivers which were already full. As a result we saw almost all the major rivers in England reach the highest water levels on record. The Severn, Trent, Colne, Ribble, Calder, Aire, Wye, Lugg and Derwent all set new records.

This took us into uncharted territory. With the unprecedented amounts of rainfall we got and the rivers so full, it became harder for our teams to model and predict the effects on water levels – critical for the warnings we

need to get out and the flood defences we need to operate. They managed, but it was a lot more difficult than it has been before.

The amount of water caused other unexpected problems. We have over 1,000 monitors on rivers which give us real time data on what is happening to the water levels. One EA team was anxiously watching the telemetry data from one particular river which was showing an astonishingly rapid rise when the water levels suddenly appeared to stop going up. The team breathed a sigh of relief until they realised that the graph wasn't flatlining because the river had stopped rising. It was flatlining because the river had risen above the electrics running the gauge and overwhelmed the hardware.

So as Dorothy says in The Wizard Of Oz, we aren't in Kansas any more. Welcome to the climate emergency. The patterns of weather we have seen over the last few years – more frequent and more violent storms, much higher rainfall totals, bigger tides on top of rising sea levels, weather bombs like the one that detonated over Wales and the West Midlands last week – these are exactly what the science predicted would happen. Now it is happening and it falls to us to deal with it. How?

Flood defences work

The first point I want to make is this: flood defences work, and we're going to continue to need them.

We can never protect every single household against flooding. But we can and do protect most communities most of the time. So far this winter around 4,000 properties have flooded. But our flood defences have protected another 85,000 homes from the flooding that they too would otherwise have suffered.

The average household size in the UK is 2.4 people. So this winter our defences have saved over 200,000 people from the damage and misery of flooding. And indeed every time there is a heavy rainfall or a high tide, Environment Agency defences quietly and effectively protect thousands of people around the country, most of whom don't even notice or need to notice.

Flood defences also work in another sense: they prevent massive economic damage. The flood damage from Storm Ciara is estimated at £97m. But the economic damage avoided to people, businesses, landowners and infrastructure is 17 times greater than that – at around £1.7bn. Flood defences pay for themselves many times over.

Flood defences are getting better

Second point: not only do flood defences work, they are getting better and better at protecting people.

In 1953, in one of the worst natural disasters ever in this country, over 300 men, women and children died when an East Coast storm surge broke through the rudimentary sea defences and – with no warning – people simply drowned in their beds. Storm surges are the most dangerous of all flooding events. In 2013 we had an even bigger East Coast storm surge than the one in 1953 and this time nobody died. That was down to the much stronger defences we now

have in place along the coast and the much better warnings we now provide.

Our defences today are not just better at keeping people alive. They are better at keeping water out of people's homes and businesses. More and better defences have meant that over the last decade, despite a series of huge rainfall events, we've seen progressively fewer properties flooded. In the floods of summer 2007, 55,000 homes and businesses were flooded. In the 2015/16 floods it was around 20,000 and so far this winter it's been around 2,000. What this shows is that the new flood defences the Environment Agency has built over the last two decades have better protected many more people.

I saw a vivid example of the difference a good flood defence makes last week at Upton on Severn. The defences there were built in 2007. Last week, as the Severn rose to record heights, they were tested to the limit. They passed the test: they did not breach, and while the river rose to just a few inches below the top of the defences, it did not exceed them. The relief in the town was palpable.

But the risks are rising

But while the water did not come over the defences at Upton last week, it was desperately close, there and elsewhere. And the dangers are rising, as the climate emergency brings more extreme weather, more frequent storms, more rain and more flood risk. Unless we act now, more communities will flood more often and more seriously.

The right answer is a twin track approach

So we need a new approach. First, we must continue to do what we have been doing for some years now: building and maintaining strong defences to reduce the risk of communities being flooded.

But in the face of the climate emergency, we now need a second, parallel, track: making our communities more resilient to flooding so that when it does happen it poses much less risk to people, does much less damage, and life can get back to normal much quicker. The best way to defuse the weather bomb is better protection and stronger resilience. We need both.

As George Eustice, the Secretary of State for the Environment has rightly said:

> Climate change is making the UK warmer and wetter, and we will be visited by extreme weather more frequently in the future. So we need to shift gears, to ensure we adapt and become more resilient. Now, as an independent nation, committed to net zero and nature recovery, we have a huge opportunity to make nature's power part of the solutions we need so urgently.

Better flood defences….

Track one of shifting gears is better protection. We are spending £2.6bn over

six years (2015-2021) to build new flood defences that will better protect 300,000 properties and over £1bn to maintain our existing defences. Over 200,000 properties have already benefited.

We aim to protect as many people as we can. So we are protecting coastal areas as well as those who live near rivers. Of that £2.6bn, 55% is going to reduce flood risk from rivers and 45% is reducing risk on the coast. We aren't just protecting homes: the present investment programme will also better protect over 300 miles of railway, nearly 6,000 miles of motorways and local roads, and over 700,000 acres of farmland.

We are building new defences all over the country: over the last 10 years, the investment has been almost equally split three ways, between the South, North and Midlands. And we are delivering good value for money: every £1 invested in a flood defence scheme saves nearly £5 in property damages.

The government has pledged a further £4bn for flood defence over the coming years: that will be the biggest single investment ever. So we are stepping up.

And for all those who cherish the myth that the Environment Agency is a bunch of crazed ecozealots who don't dredge rivers because we care more about newts than people, let me just say this: reducing flood risk will also involve dredging. We already do it where it makes a real difference; we have never stopped doing it, and we will carry on doing it.

….and enhanced resilience

But trying to prevent flooding is only half the battle. Critically, we also need to make our communities more resilient to flooding so that when it does happen it does less damage and we can get back to normal quicker.

The EA Flood Strategy

This thinking is at the heart of the Environment Agency's new Flood and Coast Strategy that we have worked up with all the key stakeholders: local communities, businesses, farmers, drainage boards, the emergency services and local authorities.

The Strategy argues that:

- The climate emergency is a game changer. We should no longer plan for a maximum temperature rise of 2° by 2100, which we know will bring more violent weather and higher seas, but for 4°, and the even more severe impacts that will cause.

- In the face of this challenge we need to move from a narrow concept of protection – building walls round things we want to protect – to a broader one of resilience.

The strategy is clear that we must still build and maintain the best possible hard flood defences to protect people and property. Example – the Thames Barrier, which protects millions of people and £200bn worth of assets. We are already planning its successor for some time after 2070.

But we are also clear that our future focus should not be on simply pouring more and more concrete to build ever higher flood defences: it should be about reducing the risks of flooding happening in the first place and on reducing the damage and recovery time when it does happen through measures to enhance resilience.

Nature-based solutions

So while hard defences will continue to play a vital role in helping to keep people and places safe, even more important for reducing flood risk in future is managing the flow of water through the environment. And the best way to do that – as George Eustice has also argued – is through natural methods – planting trees to retain water when it rains, restoring artificially straightened rivers to their natural curves to slow the flow of water, making space on land for water to collect there rather than flood communities, creating wetland habitats that hold water and enhance biodiversity.

Greater resilience

We can never be flood proof – immune to all flooding. But we can be flood friendly – safe and resilient when it happens. What sort of resilience measures should we be taking?

First, we need to make the right decisions on land use that reflect what we know will happen in terms of future flooding and coastal change.

That means avoiding the wrong kind of development in the floodplain.

We cannot realistically ban all development in the flood plain: it is where most of our towns and cities are, and because our country has so many rivers much of England is a flood plain. So as the population grows, we are likely to see the number of properties in the flood plain almost double over the next 50 years.

But the clue is in the name: flood plain. So we can and should insist that development only happens there if there is no real alternative, that any such development doesn't increase other people's flood risk – which means insisting on things like sustainable drainage – and that properties built on the flood plain are flood resilient, for example with the garages on the ground floor and the people higher up.

Greater resilience also means designing new places, buildings and infrastructure so that they are built to cope with flooding. It means building back better after a flood, not simply replacing what we had before, so that homes, businesses and infrastructure are more resilient to future events. And it means accepting the hard truth that in a few places, the scale of coastal erosion and the risk of flooding from rivers or the sea will become so big that it may be better for communities to choose to relocate out

of harm's way. So not only do we need to build back better. Sometimes we will need to build back in better places.

Resilience also means encouraging those home owners and businesses which are at flood risk to install their own property flood resilience measures, such as flood doors, raised electrics or sealed floors. They work, and when a flood happens they can make the difference between being out of your house for a year or getting back to normal in a day. A few days ago in the vulnerable Calder Valley, hit again by torrential flooding this month, I saw a bookshop with property protection that was underwater on the day of the last flood and back in business the day after.

The Strategy also argues that:

- We need all our national infrastructure to be resilient, not just flood and coastal infrastructure. While only one in six properties in England are directly at flood risk, over two-thirds of properties and most of the population are at indirect risk, because the infrastructure on which they all depend – electricity sub-stations, water treatment plants, mobile communication hubs, hospitals, shops, schools, roads, railways etc – are located in, or dependent on other infrastructure located in, areas which are at risk of flooding.

- We will need to spend more money. We think at least £1bn a year for the next 50 years to build and maintain the traditional hard flooding and coastal change infrastructure the country will continue to need. And much more than that to invest in the resilient infrastructure, houses and cities we also need, and in some of the softer measures like natural flood management. This doesn't all have to come from the government: much of the investment needed can come from the private sector, local community groups and individual householders. And all of this will more than pay for itself, because it will drive growth and innovation, and because the cost of making ourselves resilient to flooding is about a tenth of the cost of repairing things if we don't.

Resilience is not just about what we build, where we build it and how much it costs. It's just as much about the people. Everyone needs to know their flood risk and take some responsibility for managing it. That's why we are working with local community groups and volunteers to ensure that the people who live in our cities, towns, villages and countryside are all better prepared to cope with flooding, know what to do when it happens, how to stay safe and reduce the risks to their homes. This is one of the Big Ideas in the Strategy: what we call creating a nation of climate champions.

Resilience standards

There is one other Big Idea in the Strategy. This is that we should consider setting a common standard of resilience for the whole country that would reduce both the likelihood and consequences of flooding, and make that a very high standard.

Full disclosure: this isn't the Environment Agency's idea. The National Infrastructure Commission have recommended we develop resilience standards to ensure that no community in the country would have a greater than 0.5% chance of flooding in any given year – what we used to call a one in two hundred year event.

The Commission argues that an even higher standard of resilience should be provided for our largest cities – to all but the most extreme flood events, with no more than a 0.1% likelihood of happening in any given year – a so-called one in a thousand year event. The Commission's argument for even higher standards in the cities is that they provide a range of economic and social services to their whole region which everyone has an interest in protecting, and that there is a much lower cost per property for protecting densely populated areas.

We support this idea, and so do most of those who responded to our consultation on the Strategy last year. Flood resilience standards are achievable if we give ourselves enough time: the Commission has proposed 2050 as the target date. They are affordable: done right, the investment will both pay for itself and help create more growth and better places. And ensuring that everyone, wherever they live, has a minimum common standard of resilience to flooding would be a great example of what the government wants to do across the board: unite the country and level up.

A call to arms

So what does this all mean for you here today? A lot, I hope. You are all here because you all play a leading role in the world of water – you are the innovators, the providers of technology and equipment, the water suppliers, the engineers and consultants, the policy makers, the regulators and all the others who make a difference.

So today I want to issue a call to arms to all of you. Each of you here today and the organisations you represent can play a central part in designing and delivering the kind of future I have laid out.

If we are to tackle the climate emergency successfully we need willingness to think different: you can help. We will, for example, need technology that has not yet been invented, like building materials, water pumps and vehicles that don't rely on carbon: the solution may be somewhere in this room.

If we are to make the country safer in the face of future floods, we need your knowledge, skills and technical expertise to help us further improve our forecasting, modelling, warning, asset maintenance and operations.

And if we are to tackle the other big challenge the country faces, the flipside of flooding, the risk that in 20 years the demand for water in this country will exceed supply – what I have called the Jaws of Death – we need you too, as innovators, investors and partners.

Conclusion

There's a lot here to worry about: the Jaws of Death, the Floods of Doom, the

Climate Crisis.

It’s easy to be daunted by the scale of the challenge. Don’t be. If putting our own existence at risk by altering the world’s climate was the stupidest thing we humans have ever done, our defining characteristic is that we’re smart. Humans caused this crisis and humans can fix it.

The right policies, the right innovation, the right attitude, the right lifestyle – all of these are in our gift. And that means that we can make our country resilient to flooding, we can avoid water shortages, we can end the climate emergency, and we can make this world an even better place to live.

Let’s do it.