

Laura Young:

Welcome to the SAGES Climate Science podcast. I'm your host, Laura Young an Environmental Scientist and Science Communicator. Today we are thinking about flooding, and I'm so excited that I'm joined by three wonderful guests. Andrew Tabas, you are a third year PhD student at Heriot-Watt University and you're also Hydro Nation scholar alongside me, so it's great to have you on and you're researching natural flood management and you're exploring upscale natural flood management at the right place with the right people, and how that upstream, downstream cooperation and this bit is always super interesting because you're looking at the ways in which serious games can help bring people together to find solutions, find solution to wicked problems, welcome to the podcast.

Andrew Tabas:

Thank you so much for having me.

Laura Young:

Dr Irena Connon, you are a lecturer in social sciences at the University of Stirling. You're a social anthropologist and transdisciplinary researcher, and you have nearly two decades of experience exploring the human dimension of environmental risk and disaster. Your research focuses upon understanding lived experience of extreme weather, flooding, especially for people in Scotland living with disabilities, you're also the chair of the International Union of Anthropological and Ethnological Sciences Commission on risk and disaster, and the Co-chair of the Society of Applied Social Anthropology topical interest group on risk and disaster. These are all the big words, but it's also great because you are an active member of SAGES. You have been for many years and you co-lead the research team on atmosphere, oceans, climate and the sustainable water futures. For the podcast.

Irena Connon:

Thank you.

Laura Young:

And we also have Dr Rhian Thomas. You're a senior lecturer in physical geography and freshwater science at the School of Geographical and Earth Sciences at the University of Glasgow. You're interested in river processes, the links between fluvial hydrology, geomorphology and ecology, and the environmental and social impacts of extremes, particularly when it comes to public health impacts of flooding and droughts, and you've been involved in a really great piece of research with CREW science policy fellowship, which was examining building public health resilience to flooding in Scotland. It's fantastic to have you all on.

Rhian Thomas:

Thank you very much.

Laura Young:

We are thinking about flooding, but I think to take a step back to begin with, I'm just wondering, maybe Rhian, could you kick off with what are some the trends we are seeing here in Scotland.

Rhian Thomas:

Yeah, so Scotland's climate is changing. We've seen an increase in annual rainfall since the 1970s. Where generally we're seeing milder, wetter winters. And hotter, drier summers. So the last 10 warmest years on record in Scotland have occurred since 1997, but there's a lot of variability with that. So like in Europe, this summer has been the warmest on record, whereas Met Office have just said that for the UK we've had our coolest summer since 2015. So there is some variability, but the general trends are milder, wetter winters, warmer, drier summers. And we're also starting to see an increase in the frequency and intensity of these extreme events. So we're seeing more floods and we're seeing more droughts and it's expected that that trend will continue and intensify. And so also then in terms of sea level change we are seeing, we've seen increases of 1.4 millimetres every year since the start of the 20th century, so that's about 18.5 centimetres sea level rise since the start of the 20th century so. All of that's combining. So and our climate is changing a lot faster than we expected it to.

Laura Young:

And Irena, when we think about flooding, what kind of flooding are we actually seeing? Is it all the same type? Are there different types of floods?

Irena Connon:

There are several different types of floods, and so there's coastal flooding, there is groundwater flooding and river flooding, and surface level flooding as well and different geographic areas are affected by different types of flood.

Laura Young:

And what kind of impacts do these floods have? Are they big? Are they small? You know, what kind of change do we actually see when these occur?

Andrew Tabas:

That's a great question. I think they can have all kinds of different impacts. You can have very local surface flooding that'll just affect a neighbourhood. You could also have massive coastal flooding that would, you know, affect a whole a whole town or a whole community. Along the Coast, river flooding can also be very damaging, depending on the situation, so there's a lot of variability in the severity of these different types of events and in the probability of each type of event happening.

Laura Young:

And Rhian, thinking about Scotland and in particular flooding, are there areas that we are worried about or that are seeing a lot of flooding occurring?

Rhian Thomas:

Yeah, I mean, I guess if you're thinking about coastal flooding, of course, that's obviously going to be more likely on our coast, about 40% of our population live on the coast, so they're particularly vulnerable to coastal flooding. Then in terms of fluvial flooding places on the West, the West Coast and the East Coast I think are vulnerable to flooding, Aberdeenshire, The Borders, Stirling, for example, have experienced floods.

The other extreme droughts, we're seeing more instances of droughts on the eastern coast of Scotland, again, generally sort of Aberdeenshire area.

Laura Young:

And when you see pluvial is that rivers is that them bursting their banks? Is that just inland?

Rhian Thomas:

So fluvial is originating from rivers, so the areas that are going to be vulnerable are those close to rivers or low lying areas. Pluvial refers to surface water flooding, so that could be in urban or rural areas, and that's basically where either the ground is so saturated already with water that it can't infiltrate anymore water, so you're going to get surface water flooding or in urban area, say you've got impermeable surfaces like concrete and tarmac, so the ground can't infiltrate any water.

Irena Connon:

Yeah, just to say about, you know, where the risks are from flooding as well. So river flooding actually affects the greatest number of properties in Scotland according to some of the reports that were done in the last couple of years as well. And in terms of I think the number of data zones affected, I think over half are affected by the risk, at least one type of flooding as well, and its surface water flooding that, I think the majority of data zones which are affected by flooding are at risk from too. Also, when talking about the changes to flooding, increasing frequency and intensity, one of the things we're seeing we call increased flood compression. Which is why you get a flood event followed by another flood event, or increasing intensity of storms. Whereas you know in terms of the social impacts, people haven't yet had the chance to recover from one episode of flooding before going into another one. And that's, you know what we call compression, or extreme weather compression. In terms of when your surface flooding as well and you get flooding when the drains can't cope with the capacity to drain away the water as well, you can also get that gets mixed in with soil water that can pose a risk of contamination. And you can have a cascading event then too where there's a lot of risks. With erosion and flooding you have increased risks of landslides as well and then with ground saturation in the soil, if you have areas of soil that are affected by contaminants or pollutants in any way, there's a lot of studies that suggest that when

you have increased flooding, you can get run off of these pollutants, which poses a risk of contamination. Also, some recent studies have suggested that the increased rainfall actually changes the chemical properties of a lot of these contaminants too, which can in some cases can make them less of a risk in some cases more so these are what we call some of the cascading impacts of flooding that can have quite potentially serious consequences for humans and for animals as well. ,

Rhian Thomas:

SEPA, which is the Scottish Environment Protection Agency did a national flood risk assessment in 2018. And they found that 1 in 11 homes and 1 in 7 businesses are at risk of either pluvial, fluvial or coastal flooding across Scotland, so and that's increasing the number of residential places that are experiencing flooding for the first time are increasing.

Andrew Tabas:

I'm glad you mentioned SEPA because they have a really interesting site called the SEPA Flood Risk maps and you can go in, I did this a couple months ago, you type in your address and it actually shows you for each type of flooding whether you're at risk and I think it's a really good way to make these things feel concrete and personal instead of kind of abstract.

Rhian Thomas:

Yeah, I think they show as well, like whether it's high risk, medium or low risk, which is really helpful for you to you know, if you're thinking of moving to an area and you want to know flood risk and yeah.

Andrew Tabas:

Absolutely.

Irena Connon:

And I think as well something that in terms of places that are affected, the places most affected by the greatest flood risk is Falkirk and Stirling, followed by The Borders only in some areas of West Dumbartonshire, but all you know across all the data zones in Scotland are pockets where the risk is substantial, and of course that risk is increasing as the climate is changing as well.

Laura Young:

And I think definitely the social and human aspect of this is something that we are learning a lot more about. Even when you were talking about pollutants, I'd like to swim outside if I can and something that I began to think about is what has been the weather in the last few days and what does that mean? I choose to go or not to know because the water might be full of stuff that I mean, you don't be ingesting.

Rhian Thomas:

Yeah, I think we often think about the environmental and the economic impacts of flooding, which are really complex, but I think we do now more than ever have to start thinking about the health impacts of these extreme events, which you know rising temperatures, is one rising sea levels, but floods, floods and droughts the extreme events are ok.

Laura Young:

I'm wondering about the journey of a raindrop, so rain falls and we get lots of it in Scotland lands somewhere and it might land on a tree on a bit of grass on concrete, where does our water go and how does that lead to some of these impacts, both of flooding and kind of knock on impacts?

Rhian Thomas:

I guess so rainfalls it can land on our surface it might flow directly into our rivers. It might infiltrate and then flow a lot more slowly through our soils and through grass, groundwater flow back into our rivers, but if it falls in urban areas and there's lots of impermeable surfaces, so concrete, tarmac, you know, parking areas, roofs. So there's nowhere for that to go. So a lot of that might will flow into the drainage system which tend to then reach capacity quite quickly and a lot of our urban areas, the sewage

systems and the drainage systems there are pretty old and maybe not designed to cope with such large amounts of water, and we're seeing larger amounts of flows through these systems and gets into our river a lot quicker and it can carry with it than contaminants. So it may carry fertilisers, pesticides from farmland, it might carry other pollutants from urban areas, and then that gets into, through our sewage systems. It's also kind of everything you flush down your loo so, that's not just the sort of not get too grim here, that solid waste, but also what is something to kind of start thinking about is all the pharmaceuticals that were flushing down the loo and that's entering our river. So all kind of painkillers, antibiotics, all hormone pharmaceuticals. You know, they're all then entering our river. So a side of the aside from the sort of impact of flooding you've got all this sort of chemical pollution to deal with as well.

Laura Young:

Just to clarify, because actually this is something I learned just few years ago and because when people talk about pharmaceuticals being flushed down the toilet, it's not actually people might be, but it's not people taking pills and flushing them. It's released from us because our body only absorbs what we need and the rest of it comes out.

Rhian Thomas:

Yeah.

Laura Young:

And of course, we know if that service system gets at capacity, we get these combined sewer overflows, which flush everything out.

Rhian Thomas:

I'll avoid that if manure is, you know, spread on fields and that then you know with high rainfall and that get washed gets washed off into our rivers. That's how it enters the system. And you know, there's research starting to be done on how long. Those pharmaceuticals stay active or, you know, we need to understand how that affects. The aquatic organisms in our in our rivers.

Laura Young:

And that is why it's not advisable to go swimming after heavy rainfall.

Rhian Thomas:

Yeah. Especially if the waters brown.

Laura Young:

Yes, you want nice clear water.

Laura Young:

Thinking about flooding, so maybe it's because you've got an urban environment, or because you've got maybe houses in the wrong place, or maybe it's because of the changing climate. How are we deal with flooding. How would we historically dealt with it? What are we doing today, Andrew, maybe you could give some reflections on that.

Andrew Tabas:

Sure. It's a great question. I think the kind of historical approach has been to build large engineered defences. So for example, walls along the sides of rivers or levees can help to hold back the river. And I think this is still a really important, I don't think that that's going anywhere anytime soon and flood schemes are kind of still moving forward in Scotland. Funded, I think it's 80% of the Scottish Government and then 20% by local councils. But in addition to that, there are things we can do upstream of areas that are at risk of flooding that can really help. So for example, if you think of what Scotland looked like 600 years ago, there would have been a lot more forest than there is today. A lot of that's been replaced with either grazing areas or with houses and a lot of rivers have been straightened. So if you think about trying to undo some of those changes re-meandering rivers planting new trees, this sort of thing that can help to slow the flow and kind of help with some of these downstream flooding issues.

Laura Young:



And slowing the flow, I guess for my basic hydrology brain, is if you've got a river that meanders, so wiggles in and out the flow is slower and so it takes longer to reach the bottom. Whereas if we straighten that channel, that water goes from A to B really quickly.

Andrew Tabas:

Exactly. Yeah. And the same is true for flowing over the surface where if you think about water hitting a parking lot that would shoot off very quickly. If you think of water landing on a forest, it gets first intercepted by the leaves and then on the ground, it runs over, and some of it goes into the ground and infiltrates. So there are all these, all these things to kind of slow down water before it kind of picks up speed in the river.

Rhian Thomas:

A lot, a lot of it's about kind of reconnecting the river to its surroundings. So sort of latitudinally so say if the river's been channelized or managed, it's as well as being straightened, maybe it's been raised and the idea is to get that water through as quickly as possible, but it can cause downstream issues. So if you reconnect that river to its floodplain so you allow that river to flood, onto the floodplain that was originally intended to flood. It has that same effect of slowing down, holding the water back. So it's beneficial to downstream communities then.

Laura Young:

Because actually flooding his natural, it's good.

Rhian Thomas:

Absolutely. Yeah.

Laura Young:

It's just flooding in the wrong place. It's not good. So we have had these hard engineers is a lot of the way that people talk about it in big holes, big flood defences and we are moving towards that more natural way of coping. Moving back to I guess what it was

supposed to be. How is that journey been? Maybe Andrew, because I know you are working with this natural flood management. Is that an easy transition to move to something because in my mind big concrete walls and steel sounds quite secure and safe, especially if I'm living somewhere. So how's that transition been?

Andrew Tabas:

Yeah, it's a great question. I think it's been a somewhat slow transition. I think what you've seen so far are pilot projects. So putting in some natural flood management measures. So that can be tree planting, leaky dams, small ponds or reservoirs and trying to measure how well they work. But then there's a gap between kind of the idea of this and then doing it at large scale. I think a lot of people are looking for proof, although the proof is there and it's coming and there's more of it. But before they spend money on it, there are also questions around who owns the land and if you want to build a wall that only takes up a small amount of space alongside a river. If you want to totally change a landscape, you have to start to work with the land owners, get them involved, figure out what incentives they would need to be interested. So yeah, there are all these barriers. And a lot of great papers have been written about, before you get from the idea of large scale natural flood management to then doing it.

Rhian Thomas:

I think what's interesting also is factoring in public perception of the different approaches to flood management as well, because I think sometimes big, you know, big flood Wall is more visible, obvious and sometimes it can instil a bit of a false sense of security. You know, if that flood wall was to fail. Factoring in people's perception of the different approaches as well is a lot to do with whether these approaches are accepted by the public.

Laura Young:

That brings in nicely, I guess this topic of people because flooding is natural and it's fine if that area is meant to flood and there's nobody there. But we have put people across Scotland in different areas, and we know that flooding impacts people, Irena, your work has surrounded how flooding and people coexist. I would just love to hear some reflections from you about that area of research that you're in and the reality for people.

Irena Connon:

This also relates to what Andrew was saying before as well about how floods have been traditionally or flooding has been traditionally managed in areas as well in terms that impact it has for people in people's lives. The flood adaptation and responses are about damage limitation and you know trying to prevent the trauma or the damage and the loss that flooding can have for people and their lives, a lot of disruption. And it can be very, very traumatic. You can have a physical health impacts also a lot of mental health impacts, which are increasingly being acknowledged more and more as well in the research. And in terms of the responses as well, the official response is very much a coordinated response as well with all various institutions throughout Scotland and supported also by their voluntary sector as well and by communities. Now traditionally when there's been a flood or weather event. In the small communities, particularly in rural communities, and the responses relied on informal networks and formal social networks to help support one another. So much you know, the local community level also relying on local knowledge. Knowledge of which areas are going to flood, knowledge of which roads are most likely to get blocked, and knowledge of who lives at the other end of the road, who may be in need of help as well. So very much an informal but based on local knowledge that is embedded in place as well. And increasingly, and through the community resilience initiatives, for example, we have had almost like a formalisation of these informal networks where this local knowledge has been used to create plans and to help support the emergency services. And to manage the impacts of flooding and reduce some of the risks that it has for people in these areas too. In terms of supporting people who be considered vulnerable, so it could be through age or through disability or through being more marginalised in society, not having the connections or in some cases local knowledge of you to turn to for support. We've got more emphasis being given to prioritising those who may be in need to help coordinate support as well and also identifying areas where there is a higher risk of exposure combined with higher levels of social vulnerability, which is a flood disadvantage mapping. So looking at these areas to identify where resources would be most likely required for that, yeah.

Laura Young:

And I think. Yeah, so important to understand how flooding interacts with people, even in my own research, I'm looking at transient populations, people who don't always have that deep rooted sense of community, and they don't know where to go for information, or how to find out what to do in the event of a flood. And I think also what you said about

you know a flood is not also a one day event, right flooding impacts us long term. I've got friends who are only now getting plastering done and they were impacted by a flood a year ago because actually first of all you're thinking well, we need to wait for the house to dry out, we need to wait for things to get back together, we need to hope it doesn't happen. There's a hesitancy in the back of their mind that this actually might happen again and sometime soon.

Rhian Thomas:

I think a lot of research has shown that the physical health impacts tend to be much shorter term than the mental health impacts, and those can be direct sort of link to post traumatic stress from experience in the trauma of a flood. But also indirect, just knowledge of somebody else flooding friends and family flooding and just that sort of feelings uncertainty. And you know, I can that can be linked to things like anxiety and depression and. You know, and to the extreme in terms of an increase in thoughts of suicidal behaviour and things like that. There's also a sort of psychosocial impact of flooding as well, which is sort of linked more to communities and thinking about concepts like eco anxiety, which are sort of newer emerging concepts.

Irena Connon:

Linked to the mental health impacts of this idea that there is a more indirect as well as direct impact as of the drama. One of the things that keeps coming out in the research you've been doing as well for especially for people who are living in areas who are exposed to either flooding at a much greater intensity than previously, or people who are new to an area and have experienced a flood for the first time. Is that that constant memory of the threat keeps, you know, coming back at the slightly. Elsewhere, report that there's a flood. It's very triggering for people, but also, and this actually has a name, and it's a big name. It's called ontological insecurity. And what this means is about where people, their assumptions or their values or their sense of place, and how their identities are linked to places are threatened by floods, and by that what I mean is that where you have people who are have always wanted to live in the countryside, have felt being you know, part of the countryside or, you know, this is where they want to be, no longer trusting the environment or no longer trusting in many cases that they'll get the help and support that previously they took for granted. So it's like a disruption to assumptions that we have about each other and about the environment that we do take for granted.

Rhian Thomas:

There's lots of secondary stresses as well that can contribute to our mental health impacts like or issues sorting, insurance, and if access to healthcare is disrupted, there's a whole list of other secondary stressors that can add to add to these.

Irena Connon:

I think as well there's a strong gender dynamic to that as well and especially where in Scotland and you could see in many cases it's part of people will refer to it as being part of their identity, especially in some of the more remote areas of being able to cope with extreme weather events and having the knowledge to do so. And there is strong and you can say gendered dynamic in that very much part of traditional sort of masculine culture as well. Then when because of climate change impacts, it's almost like the environment is no longer, people are not able to understand it in the same way or become overwhelmed by it. It feels like a threat to them, especially in some areas where in the past and often it was done tongue in cheek as well, one way to jokes that were made one way to differentiate local people from others as well was about how well people could handle the weather. And when people are no longer handling the weather, people start to question well, wait a minute here, you know women as well, because women in society have more of an the more in many cases more involved in that informal care provision, where if they you know, that becomes disrupted or somebody is struggling because of a flood or because they can't get to the struggle quite more often with guilt from that as well. So there is a strong sort of cultured engendered dynamic in that as well.

Rhian Thomas:

Scotland has a few other sort of public health related challenges like the population is ageing. And there's quite high proportion of poor health. And so I think all those with the populations remote, a lot of populations are remote and rural as you mentioned. So I think all those combining make you know particular issues for Scotland dealing with these extreme events.

Irena Connon:

Yeah. I mean, I think there's demographic change as well for ageing population. More people living with chronic conditions and disabilities as well. More people acquiring disabilities in, you know, advancing age as well and having to cope with that change in their life plus flooding as well and also changing as I said before, changing dynamics surrounding community and also what community means for people as well. People are more transient and people are less likely to leave new extended families as well. And young people in particular young adults we found often, well, traditionally, have been associated with those who would be able to are becoming associated with increased vulnerability because of how they receive the information because they're more transient might be in urban areas where community is based on shared activities in the community. And of course, that also requires being able to access these or having the funds to do so. So when it comes to vulnerabilities, well, the social impacts and we have what's known as intersectional factors, so the more factors associated with this advantage, the more disadvantage or vulnerable people can be.

Laura Young:

I know traditionally I think when talking about vulnerability we would get out our SEPA flood maps and those are very useful, we would sort of put all these maps on top of one another. We would drop a pin and just go what's the number. You know what grading do we give it? And that would be based on your physical environment where your postcode is. Rather than the extra factors to take into consideration. I guess one thing I'm also interested in is we've had a discussion now about when people are impacted by flooding, but there's also lots of people who aren't impacted by flooding but are part of the solution. And Andrew, I know that your research. Is this upstream downstream where downstream so because rivers flow up to down? There might be a flooding impact nearby, and actually the solution could be something that's needed upstream where people don't necessarily see that impact. What are you seeing play out in that dynamic there?

Andrew Tabas:

Yeah, absolutely. I think this is a really interesting example of the ways that local councils can and should and sometimes do work together. If you have a downstream area with a flood risk upstream, there are all kinds of actions you can do. So like we talked about before, natural flood management, maybe some bigger things like building new reservoirs or ponds, all these kinds of changes you can make. But you need

coordination between the two and you need people who live upstream to be willing to change their behaviour, recognise that they can be part of the solution in a way. I think it's like a lot of environment or climate change type debates. Like with flying, for example, if everybody flew less, it would be a big benefit, but people need to kind of recognise that need. And I think with natural flood management or flood management in general, it's the same way where if you can get people to do something in a coordinated way. You know, turf gardens is another good one, when you turf over your garden, that will increase runoff. So kind of if there could be a more coordinated way to replace that with more natural services, that could also have a benefit at a larger scale.

Laura Young:

Actually, at the different skills with the different types of flooding that can play out really well, because if you've got a catchment, so all of the tributaries, all the little streams that flow into the river, that huge area. You may need an upstream downstream collaboration, but if you've got a street that's heavily impacted by surface flooding, actually it does matter what your neighbours doing and what their neighbours doing and what their neighbours doing, because all of you on that little street are like a mini catchment and so you do need that collaboration to say, well, if you do that, that puts the problem further down and that's going to impact whoever it is at the bottom of the street. And that's not always easy. And with your research, you're using serious games to, I guess, investigate. This because traditionally when we talk about consultation, we may think of an online Scottish Government consultation form or we might think of Council doing a pop up something at a local town hall. What is a serious game and how are you using it to engage some of the communities.

Andrew Tabas:

Yeah, thanks. That's a great question. A serious game is a game, so imagine a board game or a computer game that uses the environment of the game and of playing it to explore a real issue. There's a lot of great research that's been done in this area by the Red Cross Climate Centre by a bunch of Scottish researchers, by researchers around the world about trying to bring people together, have them design a game together. And I think the design process can be a way that you learn a lot about how the system works and about how people connect to each other and what the different roles are and who the different stakeholders are. And then design this game and then you can actually go out and play it. And there's a book, try it at game design that talks about reality, meaning

and play as being the three things you need to include in a serious game, so it needs to reflect the actual problem it needs to have a purpose so that can be either education or it can be a negotiation, if you get stakeholders together in the room and actually have them play the game. And then the last bit is, is kind of the fun and the play element of the game that kind of keeps people coming back for more. So I'm going to be designing one of these over the next year and the hope is that it will help to kind of bring some of these upstream and downstream people into the same room, have them talking, have them learning about each other's perspectives and maybe start to shift the conversation around how to manage flooding in these areas.

Laura Young:

And I think that is a really helpful way to put yourself in somebody else's shoes. Obviously, you can't fully do that, but actually to play it. To see it and to try something new, because I think there is tension when it comes to community engagement when it comes to people who are impacted, people who are not, especially sometimes with costs are associated. People are thinking well you know these big pots of all of our money are getting spent on separate things. Rhian, your work, you've done a lot of that kind of community engagement, people, public health, you you've kind of thought about how this impacts. How are you seeing the kind of landscape change as we navigate flooding and people and try to do better when we are kind of putting different policies in practise.

Rhian Thomas:

Yeah, I think so Scotland's developing its first flood resilience strategy and you've kind of you've mentioned already like the three main pillars that it's focusing all its work around now. So the people, places and process, Taking a place based approach.

Laura Young:

What is a placebased approach?

Rhian Thomas:

I guess the idea that every place is individual and it's not a one-size-fits-all for and so you have to think about the a place in terms of geography, its topography, its people,



you know, all the socio economic demographic, you know, public health, all those factors. So it's yeah, you focus on a place, a place based and so I think what we've seen is that there's perhaps a need to then maybe try and link together a lot of the polls, because there's lots of great policies out there. You know, they deal with like flood risk management and lots of public health policies, but it's maybe trying to get them to talk to each other a little bit more and incorporate some public health aspects into flood warning for example or like the Public Health Scotland are doing already thinking about, they've just published their adverse weather and health plan. You know the links together very much these extreme events. The health impact. So yeah, I think it's all about collaboration. And having this this sort of cross sectoral collaborations working together on things, taking catchments approaches like you've said, rather than focusing on one small reach of a river, you know you need to think about the whole river from source to sea and over longer time frames as well.

Laura Young:

Because there are some rivers that flow across things like local council boundaries.

Irena Connon:

I was just thinking there about this idea of an integrated approach that you that you were mentioning there. As well, and I think this is what's you know what's different was really encouraging about the flood resilient strategy. You know, it's got this government and you know what was really encouraging about it is that it's focusing on a coordinated response as well, because if you think about the risks from flooding, it's not just about exposure, we have that social element as well and. That is, you know, the result of social factors. One in particular is about, you can say lack of integration or lack of access opportunities or resources amongst certain communities in certain areas. So I think too in terms of improving how people adapt to that or respond and how we reduce the risk as well. We also have to look at how do we reduce social vulnerability as well and look at ways of. One of the responses looking other ways about how we can work to build communities and because you could say any activity. For example, I have a student who's working in a project looking at ways of addressing food insecurity in Glasgow as well, and she's talking about, you know, gardening projects as well, but how that creates a sense of community which helps people, should they become food insecure as well and struggle to. So any activity that actually builds connections between people and builds that community. I think it's actually very helpful. Without

having the resources there without the policies to help to create community or to create and reduce inequalities. And that's why any of this is strategy as well. Is underpinned by the idea of creating fair and just societies, as well as looking at, you know, green approaches for managing floods.

Rhian Thomas:

The importance of communities and how in community groups, and I think that is kept because they have the local knowledge, but they also need the support and the resources to help to fund some of these community based groups, whether that's a flood Action Group or flood warning group, but I think a lot of really interesting research is starting to happen thinking about the Co benefits you're just referring to some of those, but the Co benefits of having things like natural flood management, like you mentioned in earlier, which is good for flooding processes, but also provides these blue-green spaces that are really good for health and well-being. So there's a lot of work in China to sort of quantify all the Co benefits of some of these measures.

Andrew Tabas:

Also biodiversity benefits carbon storage benefits all of these different things when you add them together, it starts to. It starts to kind of really build up and show the impact of some of these projects. Yeah. And I should mention that there are really great organisations out there that are kind of implementing these projects in Scotland. I don't know if we're supposed to name specific ones yet. OK, great. So like a shout out to Forth Rivers trust, for example, for being one that does a lot of on the ground implementation of natural flood management with these other benefits in mind, yeah.

Laura Young:

And for people who don't know what kind of bit of Scotland is that?

Andrew Tabas:

So the Forth catchment kind of encompasses all of the land that drains to the Firth of Forth. So for example on the Allan Water catchment, they're doing a lot of cool leaky dams and tree planting and wetland creation.

Laura Young:

Amazing and I think showcasing examples helps everybody understand a bit more what can sometimes be a bit of an abstract conversation about flooding and natural flood management, blue-green spaces. I have loved to see even in the work that I've done, the Co benefits. And one example is there's some great work happening in Dundee looking at the High Street and the local paper is doing some data journalism on how can we make the High Street a better place for people to use. And we all know that the High Street's changed for a variety of reasons. Part of that time, online shopping, it's the environment, but it's interesting that alongside monitoring vacancy rates in terms of shops that have been left empty, they also did a huge survey thinking about do you use the High Street and a huge number of people said, well, it's just not a very nice place. You know, it's not got much greenery. It's not got much place to sit. You know, there's not much nature. And on the other hand, you've also got bits of Dundee trying to tackle flooding, trying to tackle surface flooding, trying to think about, you know, how we have a water resilient Dundee and it's nice that we're having this conversation to say, well, we're trying to do two things that actually we could do together and have Co benefits. We could bring people back to a bit of the city that doesn't have a lot of football, could increase, but biodiversity and help put in some of these nature based solutions. These kind of small interventions of these blue and green infrastructures that actually make it a much more resilient place.

Rhian Thomas:

I think the COVID pandemic showed everybody how much we value our natural spaces and you know this, this links in really nicely.

Laura Young:

And then thinking moving forward. We know a bit about what we want to make places more climate resilient. Particularly think about flooding and you know some drought as well. And we know there's some of that that well there's so much around the social aspect as well I guess to end I would love to ask you know what can people do though because at the end of the day like people live in different communities. What can individual people do to become more flood aware? We've mentioned a few things, I guess that might be new to people or to maybe even mitigate some of the impacts.

Rhian Thomas:

Well, I think raising awareness initially is the one thing and linking the fact that there can be health impacts to flooding. I think I've just been aware of that. It's a start. But there's things like the SEPA Flood hazard maps that are accessible on SEPA's website. I think it's a good thing there's flood the Scottish flood forecast has warnings you can sign up to floodline for flood warnings. Specific to your to your local area, places like the Scottish Flood Forum so that they have a website full of information for communities that maybe want to develop and start their own flood Action Group. There's lots of things that individuals and communities can do.

Irena Connon:

I think one of the things that people are speaking to quite recently and my research was saying was really helpful was live real time updates as well, which are very helpful. However there is an argument to say that they also impose new risks because, for example, if it's flooding on a road or a risk of flooding, and it doesn't happen, people like it doesn't happen. I don't, you know, necessarily trust what's coming in or they say I can't see it. So I'm going to drive ahead and, you know, 10 minutes later and, you know, the reality of flooding is often a lot more unpredictable. I think it's about awareness about how to use the, how to use this information that is available as well to reduce these risks to in terms of preparedness, it's about having a plan having a back up plan because they said floods, you know can be very uncertain what happens and this is something which in terms of one of came out in some my early research that I did with a colleague. Which was around people with disabilities and during extreme weather, where emotionally a lot of people, including quite significant disabilities were able to cope emotionally and withstand all of the uncertainty during consecutive periods of flooding. And they were saying that in their lives as well, to be able to navigate the city and, you know, environments because where environments have been designed, especially in the past haven't been accessible. So for people with disabilities, they've been designed with others in mind, and as a result of that, they have to constantly cope and deal with uncertainty and haven't changed their plans in their lives as well. So they were, you know, again able to cope better as well during the floods again, it's having a plan, so if you get cut off for a few days, what can you do and making sure you can access resources and not being afraid to ask for help, if you need to. And again, that's for everyone. I think now something we've seen maybe over the last 10-15 years is moving towards this idea that anybody can be vulnerable at that particular moment in

time. It's not necessarily about having a characteristic or being part of a particular demographic group necessarily, we can all be vulnerable at that given moment in time and again recognising how that can vary. For example, if your family members who are working away at that point. And if you get stuck having the resources to be able. And able to do that in terms of action as well. So one of the really strong points about community resilience groups as well is that to be able to get that sort of local demographic knowledge does take work to get to know who's in the area in your community to build those relationships to. That's always helpful as well. And you know, these organisations rely on volunteers in the third sectors as well and you know it's great work was seen especially in the last year. Including near where I live as well, where we had a lot of people who were volunteering. And putting in a lot of effort to help support others as well and getting returning on that now again, one of the things there is there is a balance between how much can we depend or rely on volunteers to fill the gap you could say caused by lack of funding at centralised level, but you know get involved because one of the things that and again it's in the new flood resilient strategies well everybody's got a part to play whether you're a planner and whether you are a student in your community, whether your farmer, everybody's got part to play.

Rhian Thomas:

I do think we have to think about maybe the responsibility of some of planners and developers. Do you know when you're thinking of where you're building new houses to not build them in areas that we know of, the flood? We've talked about flooding as a natural process and floodplains being natural, you know? We shouldn't have houses built on flood plains. Places that are already prone to flooding. There are various things like property flood that you can install in your house which are like things like raising the level of your electric sockets up higher so they're not affected so much when and if you do flood.

Andrew Tabas:

Sorry, I was just going to add another thing, thinking more about what people can do kind of with their hands. A lot of these things don't take a lot of funding and they don't take a tonne of space either. Building a rain garden on your home or at the local library or the school. Also, planting trees. These are things that are fairly easy to do, fairly low cost, and I think they really it can, it can be nice to feel that you're making a difference physically, even if it's on a small scale.

Laura Young:

And it can, and even things like water butts. You know, disconnecting our homes that you know, we have way too much water.

Andrew Tabas:

Absolutely.

Laura Young:

And I think all of these things are super important and there's even some things that we haven't really even touched on, things like managed retreat, which is a hard conversation, but that is really understanding that we have built places in completely the wrong place.

Rhian Thomas:

Yeah. I guess just thinking about the ethics of, you know, if people have to temporarily display be displaced out to their homes. You know what the ethics and about moving them back in. Do you know once the they've cleaned up and recovered and you know and just. Yeah, yeah. Perhaps leaving them to be exposed to another. Another episode of flooding for people.

Laura Young:

Who maybe don't know what a rain garden is. What? What does that look like? What would it mean to turn your garden or business? You know, bit of land outside of your work, into a rain garden.

Andrew Tabas:

Yeah, that's a great question. I actually built one of these a few years ago, so got a good sense of it. So if you imagine a driveway or really any impervious surface, maybe it's a rooftop. What you can do is instead of channelling water from that kind of into the pipes

directly, that that eventually lead to a sewer, you can instead direct them have over your lawn into a specific section of the garden that you designate as your rain garden. And what you do in this kind of area is you dig out the current soil that's there to maybe, maybe a metre and a half deep. Then you start to fill it in with kind of a mixture of regular soil but also some sand to make sure that the water can drain through really well. And then on the top you put plants that really like wet environments, so irises for example are a flower that really thrives in these environments. Also like lots of long grasses and things. And there are plenty of websites out there that will list all the different plants that you can use and then mulch on top and then the final result ends up being a bit lower than the rest of the area around it, so that water does drain to it and you can have little rocky channels that lead to it as well. And so the result of all this is that it's an area for water to gather during storms and then it will drain after the rain stops within 24 hours or so, it's also really great for pollinators. A lot of these flowers attract them. It can be kind of a nice small scale win win solution and you're right, not just in peoples homes but also outside of businesses. These can be really useful. You don't have to pay anyone to mow the grass if you put one in instead. So there are all kinds of benefits to these.

Laura Young:

Yeah. And I've seen some of schools and businesses putting these in place. And I also there's an activity that me and my supervisor have done before teaching kids about what kind of nature based solutions are green roofs and these types of things. And we have Swedish furniture brand dolls house, and we've put a sort of makeshift mini rain garden and a big patch of grass, and we've got. And on the other side, it's just what you would imagine, it's just half a dolls house and we get the kids to pour over the water and obviously on the side with nothing. It's rolling straight off the roof into the pipes, the little drain pipes, and then into the bucket and you can see the water coming up really quickly and on the other side, it's obviously landing on the grass on the moss, on the little flowers and it's taking ages to fill the little bucket up at the bottom. And it goes back to that point you made about slowing the flow. Actually all of these small measures help slow the flow. And as you say, bring those Co benefits, it looks pretty. I think weeds look beautiful. I feel we need to get more people thinking they look good, but actually seeing this wild nature is great and helps with biodiversity.

Andrew Tabas:

Absolutely. I have one more thing, which is about the maintenance of rain gardens, because I think this is a good space for some of the Community things that you've been talking about. If you can inspire people and get them interested in these issues. And then they create something together and the regular maintenance can kind of keep people involved thinking about flooding, contributing to the streets or to the school or whatever the case is.

Laura Young:

Well, thank you so much. I think that's been really interesting to hear how Scotland's climate is changing and how water is a huge part of that. And flooding is a particularly massive part because we are seeing these three different types, the surface, the river, and the coastal and to know the journey they were on moving, not necessarily away from hard engineering, but embracing natural flood management, nature based solutions and understanding the way the world was actually quite good at managing these environments and we need to kind of embrace that a little bit more. But I think particularly it's been great to hear more about the social aspects, And understanding that flooding doesn't impact places. It impacts people and places and communities are a huge part of that, both in terms of the vulnerability and some of the groups as well that that need to be highlighted, but also their role and resilience and how they can be contributing, changing, designing, actually how places operate and I think it was great as well to end on those helpful tips. You know actually working out how can you go and see where your postcode is impacted and what can you do to your back garden or how can you build that community stuff. Thank you so much for joining us. Andrew Tabas, Dr Irena Connon and Doctor Rhian Thomas for being on the SAGES Climate Science podcast. Thank you very much.