3. Future-proofing the Square Mile

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Smith, Madison 2:25

Good afternoon everybody and welcome to our third session in the City of London Flood Resilience Webinar Series. My name is Maddie Smith and I'm an Emergency Planning and Resilience Officer at the City of London. Over the last four weeks, we've journeyed through London's battle with water,
information and to strengthen collaboration and connexion with our communities around risk and resilience, sharing practical, easy actions to help better protect yourself, your family and your workplace. For those who haven't joined before, there'll be opportunities for question and answers at the end of both presentations. And we encourage you to use the question and answer box throughout the session if you have any questions for our guests today.
Please note that today's session is being recorded and it will be uploaded to the City of London's website for those who are unable to attend live. Your microphones and cameras have been automatically turned off. So if you do experience any technical issues, please use the chat function and we will see how we can help you. I'm delighted to be joined today by our guest speakers who will be discussing what the City of London of Corporation
is doing to protect the square mile against flooding and what other communities around the world are doing to build resilience. Our first presentation will be delivered by Georgia Errington and Melanie Charalambous. Georgia is passionate about building a flood resilient future with nine years of engineering experience.
and a background in hydrology, she designs and delivers sustainable drainage systems, also known as SUDs, helping to deliver urban greening and climate resilient cities. Melanie has worked for the City of London Corporation since 2002. She has delivered a wide variety of projects ranging from area-based strategies
for city districts to new public spaces. So now I'd love to pass it over to you, Georgia and Melanie.

Errington, Georgia 4:39

Wright.
Hopefully everyone can hear me and can see my screen. So we are presenting,

Melanie and I, on the sustainable drainage systems in the square mile. So probably from now on, I'll refer to it as SUDS, which effectively means sustainable drainage systems. We'll be going through three main key parts.
And that's the trying to sort of do a brief introduction into what SUDs are, why they're important specifically in urban environments, and then Melanie will be presenting on some case studies of SUDs in the City of London. So firstly, maybe one of the best ways to sort of
describe and explain what SUDs are is by talking about the philosophy behind it and that's to do with water management. So you may have seen an infographic like this before, often through our sort of education. And this is the urban water cycle and this is sort of shows that what our typical urban water management is.
So through in urbanisation, we have buildings, lots of concrete, roads, pavements, etc. And what that causes is much less water being able to infiltrate into the ground and effectively a lot more runoff. So the water is sort of surface water hits the ground and is running off very quickly.
So in terms of water management within an urban area, we tend to aim to try and take that water away from the area as quickly as possible.
Whereas with suds, what we try and do is mimic the natural drainage. So this sort of refers to the natural water cycle. And what you can see is a main difference is there's a lot more infiltration that happens in that water cycle, but also with increase of vegetation, you've got the evapotranspiration.
and the runoff isn't as high as what we see in urbanization. So the main ways that Suds tried to do that is by slowing the water runoff. And this is through sort of four key ways. We have conveying, which is how we transport the surface water.
infiltrating, which is how we allow the water to soak into the ground, attenuating, and that's providing areas to store water, and then evapotranspiration, which is, as I said, the vegetation. And all of that is trying to slow that water process down.
There's a whole host of ways that SUDs can be done and the techniques. And really, it's important to show that everyone has a part to play in doing this. So this sort of infographic shows that there could be SUDs within a housing development, an office development,
in car parks, in all sorts of places. But one sort of key notes on there, which is relevant to this presentation, is around the civic st, which is effectively our highway, which are like sort of roads and pavements. And there's key techniques and types of subs that we tend to implement in these locations.

and Melanie will be showcasing some case studies from the City of London, specifically around sort of rain gardens and things like that.
So I guess, why is this important? Why do we need to go from that sort of urban water cycle more to a natural one? I think it's predominantly obviously around managing our rainfall, but it's ever more important when you look at the impact of climate change. So these are some projections that have come from the Met Office. And in the summer, we will find that there's an intense tier of heavy summer rainfall events are increasing, and that's despite summers generally being quite dry. And in winter, we've got rainfall increased by 15% by the 2050s. In terms of flash flooding, there's a sort of threshold of an hourly rainfall, which is exceeding 30 millimetres per hour. And that's what sort of triggers your flash flood alerts that you see on weather forecast. And that will be met twice as often by 2017 than it was in 1990. And then we've also got more sort of river flooding becoming common. And that's
really important especially for City of London and London itself with the Thames nearby.
So I'm sort of focusing on summer 2021 to sort of showcase how these climate change effects are already being felt. But what I could have done is actually probably just done a snippet of the news articles that are around today of the past few weeks where the UK has been severely hit.
by flooding. There's been a lot of severe flood weather warnings, also warning of danger to life. So I think it's sort of a case of itself. It's quite exemplary that we are feeling these effects now. But the reason why I'm showing you the summer 2021 floods is because that is where London particularly was severely hit.
So on this two separate occasions, two months of rain fell in two hours, which resulted in surface water flood events heavily affecting London. So in this, over 1500 properties, as well as infrastructure such as hospitals and London underground stations were severely flooded.
And what this video will show is from the BBC, some videos that were sent to them showing the damage that was done. And if you keep an eye on the top right of the videos, you'll see that they give the locations and it really was widespread.
She can see from those videos, it really was widely affected in London and said, sort of see the news at the moment and you'll see a lot of the UK that are struggling.
So how can we build flood resilience specifically in urban environments? And we sort of circle back to the idea of SUDs. So SUDs are
trying to bring back the natural cycle and in doing so slowing that water down and

sort of maybe even holding it back in certain situations. I think this is a map, a live map from the GLA and what it shows is how highway authorities within London have been implementing SUDs in all different ways. I think the key thing to note is there's not, you can't just do it on your own. You can't be one authority that's trying to build in that resilience. It is done by everyone taking part. And that's also because rivers and water sort of works in catchments. So something that someone can do upstream will affect those that are downstream. So in terms of the suds that have been implemented so far on the highway, the GLA said there's 353 highway sud schemes that are on this map. And that's a total catchment area of nearly 18 hectares. So that's really positive. And it shows
that we're slowly sort of building up the momentum of designing these techniques. But with sort of building resilience in terms of trying to stop the flooding, high quality SUDs can also deliver a multitude of benefits. And that's what's called sort of the four pillars of SUDs. So when it's designed really well, not only do we benefit in terms of the water quantity side, so looking at the flooding, but there's also the water quality. So
Inside you can use natural filtration and that can remove pollutants like oils and heavy metals before they reach our watercourses. We've got the biodiversity. So if you can design green infrastructure as part of your science, that supports local wildlife habitats and increases sort of the biodiversity in cities. So
We're also looking at potentially biodiversity resilience as well. And then you've got the amenities. So in urban environments, it's really important to try and hit the amenity. So creating attractive, multifunctional public spaces that improve the quality of life for residents and businesses. But of course,
There are challenges with retrofitting, which is what we specifically find in the highway. And the reason is, in London, a lot of our roads, our pavements have already been built. So we're dealing with how can we get suds into those confined spaces. So this is just a Google Street View of an example in the City of London of Carter Lane. And what it shows is how we're
especially in the City of London, we do deal with some very tight streets. So there's a challenge of how can we find the space to fit these sustainable drainage. But also there is a challenge in terms of underground. So this is just an image from American case study. But what it shows is underground infrastructure of utilities. There is a whole host of utilities underneath the ground. Not only that, we also have basements, we have London Underground. So there are so many challenges trying to

locate spaces where suds can go.
But when we do find them, sort of coming back to the four pillars and ensuring that the design is done to a high quality is really important. So I'll hand over now to Melanie, who will showcase some of the City of London sub schemes.

Charalambous, Melanie 16:17
Thanks, Georgia. Yeah, so I've just got a few slides to share with you of some examples of schemes we've been delivering in the city. I think before I go through them, it's important to point out we haven't been doing it very long in the city. It's quite new for us and we're kind of catching up with some other London boroughs that are ahead of us.
It was also a bit of a battle to get the whole SUDS agenda and climate action agenda through and better understood by members and officers. So we had to overcome quite a few barriers. But we do now have adopted our climate action strategy in 2020.
A key deliverable from that is our Cool Streets and Greening programme. So the projects that I'm going to show you today are a part of that programme. So it's been going now for four years. We're in our fourth phase and we've just got approval for a fifth phase because it's actually been really successful.
and surprisingly so, we didn't expect to have so much success and also buy in from members and from occupiers and residents and office workers, because everyone loves greening. And what we've come to the conclusion is that, you know, if we're doing a scheme, we don't want to just deliver the suds, we want to deliver the public realm benefits, the seating.
the greening and the new public space at the same time. So it all kind of joins together into an enhanced environment for everyone. So this first scheme is one of our first SUD schemes at Bevis Marks, which is in Houndstitch near the big cluster of tall buildings in the city.
So we chose this site because there was existing brick built planters from the 60s with bedding plants, which was, you know, quite typical for the city, lots of bedding plants. So we thought this would be a great case study or pilot project. When we came to do the radar survey, we did find a lot of utilities under here, surprisingly so. We thought there'd be less because of the existing planters, but no, they're everywhere. So that meant that we had to adapt our designs. So we wanted to do a couple of infiltration suds, planters, rain gardens, but in the end we had one

infiltration bed and one
you know, sealed bed as well. So there wasn't enough space. We had to kind of adapt the design and work around. Also here, we're on top of a scheduled ancient monument. Under here is part of the Roman wall. So we had to get additional approvals and we had to do a watching brief with our archaeologist.
But the outcome has been successful. We re-leveled the whole pavement around so the water then flows into these two or three new suds beds, new trees, and an area of permeable paving in the middle. And this scheme, it's quite simplistic, but it's actually also quite a low-cost way of achieving.
and you'll see similar schemes across the whole of London and elsewhere with the granite curbs and the hit and miss gaps. We did get feedback from our City Gardens team that they're like the raised edge on the curb and that's to mostly stop litter. So I think that's another important thing
to bear in mind maintenance costs. Maintenance in the city is not just watering occasionally in drought. In summer, it's also litter picking, which is a huge amount of our costs. We can go on to the next one, Georgia, please.
Yeah, so Little Trinity Lane. This is near the river in the city, just on the north side. So a really sunny spot. And this is one of our largest rain garden suds beds. Here was actually we had a lot less issues with utilities. There weren't as many.
But it's on mid ground, which much of the city is. So when we were excavating, we found lots of rubbish in the ground, so lots of bits of metal and rubble and other things that had to be extracted. And this scheme, again, has been really successful. just finished in the summer and the planting I think has been particularly good. We got a landscape architect to design this really high quality planting. So I definitely recommend that if you've got a particular site where you need a higher quality then pay the extra for
a landscape architect to design it, one with experience. And here we've also got the path through, which actually is a maintenance path, but also I think looks quite good because the gardeners needed the access through to be able to maintain the plants and do the litter picking. But it turned out to be a nice outcome aesthetically as well.
Next one.
Gubilee Gardens, another tricky site. Well, they're all tricky. This one is above a UKPN substation. So it's effectively a green roof. So here, there was previously a garden space with brick-built planters again. Not much greenery, not much seems to grow here. It's actually quite

a shady spot. But again, we appointed architects and landscape architects. So in this case, it's Studio Weave and Tom Massey who designed this and they have a lot of expertise. And that really helped us to develop this design.
So underground here, we've got a crate system, which we use to not only provide the suds element, but also support the paving. And we haven't done that before. That was something completely new for us. We were able to do it here because there's less utilities under this space. It's all kind of empty, which is a great benefit.
but very constrained. We also on this site introduced a mulch, which is the crushed brick. And we found through other experiments elsewhere that that type of mulch helps to retain the moisture particularly well. And that's what we need for a site like this, where you get really hot, sunny days.
in the summer and it's a really harsh environment. So this was finished again in last spring, May time, and has been really successful, well used. And I think another thing about the high quality planting is the landscape architects picked
different plants that work at different times of the year. So you'll come in autumn, you'll see different flowers. Yeah, everyone really loves to spend time here. So I think this is a really good example of how you can adapt the design. We also reused a lot of the paving materials and elements from the previous schemes, so they weren't. Thrown away, they were reused. Next one, Georgia.
Here at Moorgate on a corner of London Wall, it's kind of one of our typical schemes that we're starting to develop now. So we've got a lot of projects now with this core 10 edge around the edge of the planter because that's quite a low cost and sustainable solution.
And I'm showing this one because of the path really, because previously this site was a lawn, but because of the nearby pubs, the lawn just got trashed every year. So it spent most of the time as a mud pit really. So we had a bit of a battle with the pubs to get the scheme through.
So again, a lot of variety of planting and a permeable path through the middle, which is a resin bound permeable paving, which we've used a few times and has worked pretty well. It's quite hard wearing. Slightly higher costs than some others, but I think it's worth the investment.
for something that's more robust and it needs a lot of footfall, a lot of harsh environments in the city. Next one, Georgia, please.
Similarly, at Finsbury Circus, this is, I think, still the largest public space in the city, and it needed to be completely re-landscaped following Crossrail Elizabeth Line. It

was used as an access tunnel. So when it was re-landscaped, we took the opportunity to introduce some subs where there wasn't before.
So the whole of the central lawn has now got a sub system underneath. And then around the edge of the lawn, we've got these beds, which are again core 10 still, but with gaps for the water to run in. And again, this kind of showcases the benefits of a really high quality planting scheme.
and also maintenance. It's worth bearing in mind in the City, we always include our maintenance costs in the project budget. Sometimes that can be up to a further the project budget because we try to allow costs for 20 years. So it looks good for the long term.
Next one, Georgia, please.
This is the final scheme. So this is one of our church shards. We've got about 40 church shards across the city. And this is a particularly constrained and shady site. It was in really poor condition before. It's only just been finished, which is why this is a CGI view. So here we did something a little bit different. So we captured the rainwater from the church roof.
quite a lot of water because it's a fairly big church. And then that then gets captured from the downpipes into what you can see in the background there is a metal planter, like a tank, which attenuates and holds the water and then the water is dispersed
to the other planters around the site. Here we've also got some permeable paving, but it's in the form of a joint. So it's like a felt joint material, which is a product that we trialled here. But we've tested it and it seems to work really well.
I think it's probably better for use on something like a low footfall churchyard where you don't have a lot of digging up and things like that. But it's a really effective solution where you want to keep the historic paving, which is the York stone. You can just add that permeable joint.
and then the water just flows through. Yeah, so that's the last of our examples. We've got several others, as I mentioned, we're in the middle of the fourth phase. So altogether around 40 projects have been delivered. We've got another 10 on the way. And as Georgia mentioned there,
They can be quite small scale dotted around, but when they're seen in, you know, in the view of the whole, it's quite a big impact. And we're aiming to hopefully, off the back of the success, get some additional funding in the future to continue the work.
Thank you.

Smith, Madison 28:03
Thanks, Georgia and Melanie. That was really interesting. I never realised the challenges of developing SUDs, like archaeology, graves, rubble, utilities, train lines. So definitely keen to hear how the projects have developed in the past year or so, once they've been finished. We'll return to questions at the end of the session, but if you do have any reflections from
that presentation, please put them in the Q&A box. Next up, I'm pleased to introduce Gareth Byatt from the Risk Insight Consulting. Gareth is an independent consultant working in urban resilience, risk and resilience for various industries and business sectors and disaster risk. He is an ambassador for the Institute of Risk Management and regularly undertakes
research work independently and with academic institutes across the world. Over to you, Gareth.

Gareth Byatt 29:06
Bear with me just a second. Just needed to turn my microphone on. Can everyone hear me okay?
Great. Okay, thanks very much. Thanks, Maddie. And very interesting to see those examples in the city that Melanie and Georgia outlined. And perhaps I'll draw a few links to those through this session here, which is looking at examples of urban flood management from other parts of the world.
And a few thoughts on business continuity as well. So they're the two main points to this particular presentation. As you mentioned, Maddie, and thanks for just outlining a very brief overview of what I do. I undertake work in the urban environment, including liaising with different organisations.
large and small, on cities, towns, developments and the like. I'm also a researcher into disaster risk reduction and how to avoid disasters in particular. So some of those are about disasters that can be avoided that are of a flood related nature.
And I also carry out activities in the private sector, different industries, businesses and the like. And hopefully the second part of my presentation will provide a few useful thoughts for people around business continuity management, which is part of business resilience and risk management. But to start with,
I would just like to be able to talk through a few examples from around the world that I've seen and I've talked with people about regarding urban flood management,

particularly dealing with surface water flood management. And I think of, as I mentioned just now, a few linkages really to the interesting examples from the city. that were shown just now. So I'm going to start just by saying that I appreciate Maddie.

Smith, Madison 31:02
Gary, sorry, would you be able to? Can you share your slides, please? I don't think they've been shared yet.

Gareth Byatt 31:08
Oh, are they not being shared? I do apologize. I thought that I had been sharing my slides. Here we go.

Smith, Madison 31:11
Thanks.
Perfect. Thank you very much.

Gareth Byatt 31:19
Okay, great. Thank you for pointing that out, Maddie. So, I'm going to start just by mentioning that, of course, London has a surface water strategy. I'm not going to talk about that in a lot of detail, but I know, Maddie, you're going to be talking about or providing some information for people as a result of the
the whole series here. So it's great to be able to see that this particular water strategy is in place and it's being pursued across Greater London. I'm just going to flip across to the Netherlands now to give you a couple of examples from Rotterdam in particular. I'll start by saying that Rotterdam and its resilient Rotterdam strategy is a very comprehensive strategy and piece of work and has an awful lot of linkages to what we call systems thinking there, about how everything can link up when we're looking at how to be able to tackle different types of challenges.
One such example within the strategy here, which is linked into an EU wide initiative, is multi-roofs. And I remember the example just now from Jubilee Gardens, talking about the example of a roof over a particular piece of infrastructure. And of course, roofs can be of varying degrees and levels.
But one of the aspects being pursued here is what is known as blue roofs. So different types of drainage solutions to be able to support flood management along

with things such as the green roofs. And you can see a few different colour examples there.
There's more information on the Rotterdam website and I can provide a few other links afterwards, but some very interesting uses of roofs that are being pursued in the city. Linked to that as well, in the Climate Change Adaptation Strategy that published by Rotterdam,
And I'll make a little link here to what was discussed by Melanie just now. There's a lot of work ongoing in terms of the design. And again, I'll link back to systems thinking here of different parts of the city. This happens to be an example of one of the inner ****
urban districts in Rotterdam, where they're using collective gardens, small things such as water butts, as well as being able to use roofs to be able to help with managing the surface water and the runoff that is collected. So
The next slide here just shows an example of how these kinds of places are looking with those kinds of strategies in place. Clearly a lot of linkage with greenery here and just to go back to the point mentioned earlier about people feeling
at ease and greenery being able to improve people's environments within the urban infrastructure in its entirety. Another example from Rotterdam is a square that actually changes purpose, though Benfield Planning here.
It harnesses rainwater. It's got a structure in place for basins to collect rainwater. And depending on how much rainwater is received in periods of intense rainfall, it actually fills up and it creates a feature. When there isn't a rain, a lot of rainfall in a dry period, the area becomes a social space. So it's a dynamic type of infrastructure that is being used there. Quite interesting. If I move further afield now to Singapore, and I've got a couple of other examples of Asia coming up here. Singapore is in the tropics, of course, and certain times of the year, they have
particularly heavy rainfall, and the Singapore Public Utilities Board, the PUB, they have a strategy in place to be able to make sure that they can manage that rainfall properly with their drainage systems. That includes things such as the right kind of building regulations, so that any kind of development undertaken, new
and refurbishments, that they've got those measures in place. And I know of course that the City of London's got the regulations that can help to be able to manage that too. There's a lot of use of technology, appropriate type of technology for drainage planning and flood protection. So
You'll see here there are different types of sensors and there's a use of CCTV, which is

used for monitoring and also teams to be able to be activated if and when they need to, to be able to support certain things during those heavy rainfall periods. And crucially, there's also a valuable part here in terms of the community involvement and making sure that
the public is kept fully aware and they can interact with things, know when there are risks of severe flooding occurring and the like. Just a couple of examples here, photos that I've taken. The one on the left is simple drainage channel and you can see a few little leaves there, but the whole process of the maintenance, which was mentioned earlier in terms of factoring that into costs,
The maintenance of the drainage network is certainly very well kept up in Singapore. And on the right hand side, this is an example of a flood channel after a very intense period of rain. You can see some of the natural solutions that are in there to be able to break up the water and the discharge.
To the left on that particular photo is a large housing development. To the right is part of the transport infrastructure. So again, it's a way of linking things together. And on that point, I'll just mention as well that in Singapore, there's an example of a particular park, Bishop Nang Mo Kio Park, that used to be
a stormwater channel, a large stormwater channel. And a few years ago, it was completely changed to a large nature-based solution. And whilst I appreciate that we can't just undertake these kinds of large nature-based solutions everywhere, context is always key. This has proven to be very successful on a number of fronts, you can imagine.
the biodiversity that is there. It's A parkland area. It's also a little bit cooler than where this particular micro area was as well, thanks to this type of area. And the photo you're seeing there is after an intense period of rain where the rainfall is coming through, there's natural flooding in place. So it's a larger scale version in many ways of the kind of SUDS initiatives that we saw just now.
Smaller version here from Taipei, but still effective. The streets as well as the drainage channels. Taipei is a city that can receive heavy amounts of rainfall sometimes. But they also have these small circular or conical drilled parts along the streets.
to be able to help manage the rainfall, particularly when it's very intense. They also have some very high tech things taking place in Taipei. And as an example of that, there's an AI solution that is being worked on to be able to improve the city's resilience to flood management. So an example here from Taipei and Taiwan of something very, really quite simple, and also some more advanced drug

management taking place.
One more example from Asia, East Asia, that people may find of interest, and certainly if you do have the opportunity to visit the very large City of Tokyo, Tokyo itself has a resilience project, which includes how it manages its water risks and its flooding risks. Part of this very large project is actually what's nicknamed the Underground Cathedral, the Metropolitan Area Outer Underground Discharge Channel, or by its nickname, the Underground Cathedral. And you can actually visit this particular site. So if anyone happens to be visiting Tokyo at some point in time, If this might be of interest, then you might be able to actually have a tour of it. So with that in mind, I'm just going to circle right back to the Netherlands again, just to give an example of, in Utlet, a motorway that actually used to be a canal and in the 70s was turned into a motorway.
And then it was transformed again back to or into an urban waterway. And I think it's an example of going full circle, if you like, from using waterways for commerce, for business, transforming it into a different type of infrastructure.
that was deemed appropriate at the time, and then actually turning it back into a water feature and part and parcel of the city as it exists today. So there were just a few examples for you from cities around the world. I just thought I'd put up this particular image here, just to be able to say that
I've seen some cities carry out what we call city selfies, so they engage all of society, citizens, different people from businesses, about what are the priorities, what's required, and using different systems type of approaches to come up with an overall picture, of which water management, flood resilience is part of
of climate resilience and as part of urban wellbeing overall can be part. So there's lots of different learnings that exist across different cities and towns and municipalities.
Now, I've just got a few thoughts on business continuity management for people. I carry out business continuity management with different clients, and certainly when it comes to managing the risk of impacts and disruption through floods,
and water related problems. I've got three main points here about knowing the flood risk. And of course, there's some good information, whether it's from London Fire Brigade or other types of sources about how to be able to do that and how to actually be prepared. And then something which I see often with
with businesses is that the creation and the upkeep and the maintenance of a business continuity plan. So business continuity plans can incorporate aspects of how

you would deal with flood risk. This is a relatively simple way of conceptualising how to be able to
create a business continuity plan, really about thinking about what you do, your key processes and what's critical, going through what we call business impact analysis, which includes understanding your risks to be able to understand what's critical. And that could be in terms of your people, your supplies,
the building and the infrastructure, what's in the actual areas where you operate and how you get things in and out, all those types of things, and use that information to be able to create one or maybe more BCPs along with understanding what your tasks and actions would be, the teams to be able to.
form them and the like. I find that a plan, do, check, act approach can help with this type of activity, thinking about using the plan part of it to be able to create those plans based on a team working together and then carrying out checks, both small and large,
small frequent ones and also larger tests when appropriate. Of course, responding to actual disruption when it occurs. And then the cheque and the act part, cheque and the act part about understanding how we're actually doing and making improvements to those things. So learning as we go.
As A continuous improvement target process.
One example of a tool that can help people sometimes, depends on the context of course, but there's a tool that I see used in certain types of situations called the bow tie. And it looks like a bow tie, and it's really about understanding what's a particular risk or challenge that we face.
The causes you can see on the left there and controls, proactive or preventative controls to either stop it occurring or certainly reduce the impact of the cause. And then the consequences and the reactive controls on the right about if it does actually occur.
making sure that we can respond in an effective way and minimise the impact of those things occurring. So that's a simple little tool, can be used in greater level of detail, but an example there of a simple tool. And I think, Maddie, I'll just finish off with this example here of
Floods that occurred a couple of years ago in Italy. Obviously, we saw the example of 2021 in London, and we're aware of flood alerts at the moment in the UK. But a couple of years ago in Italy, a major flooding event occurred in the northern part of the country.

And there's a case study available from the BCI, the Business Continuity Institute here, about how a BPER banker, an Italian bank, use their business continuity management to be able to respond in a purposeful way, maintain operations for their customers as well as
with themselves. So just an example, they are trying to show the value of undertaking business continuity management. So with that in mind, Maddie, over to you.

Smith, Madison 45:34
Thanks, Gareth. Got some good travel tips from that presentation and really enjoyed seeing the mix of traditional and modern solutions. And I think that's quite reflective of what London aims to do. Yeah, please put any questions in the chat box. We've got two already and I'll throw them at Georgia and Melanie.
Can you first quickly explain what the difference is between infiltration beds and crates when it comes to suds?

Errington, Georgia 46:05
I don't mind taking that one. So one of the main differences between sort of an infiltration, say rain garden and a crate system, infiltration tends to use gravel, which has voids in it that allows the water to sort of have some storage capacity in there, but it effectively is about infiltrating into the ground, the water.
Whereas what crates do, they have a lot more sort of storage capacity. And as Melanie mentioned in one of the case studies, it attenuates, so it stores water. So it has a lot more capacity to do so. One of the key challenges is crates can't go everywhere due to the underground infrastructure that we mentioned in the challenges. So if there's
too many utilities or things like that, that's where crates can be quite difficult to implement. So there's definitely a place for both approaches to be used in SUDs.

Smith, Madison 47:03
Awesome. And in terms of, I think this is more aimed at the Moorgate example, but what is the process that the city has to go through when the schemes are being done on or close to commercial property? So how do we engage in the businesses to make sure that we can still deliver suds in the city?

Charalambous, Melanie 47:24

Yeah, it's kind of a difficult example, that one, because we had a lot of opposition. Generally, what we find when we do our consultation, we do it at an early stage. So we make sure we get buy-in from local occupiers or, you know, adapt the design to suit them.

Smith, Madison 47:27
Lighted.

Charalambous, Melanie 47:44
We tend to normally get a lot of support. A scheme we're working on at the moment and near the temples in the south of the city, we've done an early consultation. One of the occupiers has come back and said, actually, we need to get a vehicle in this particular part of the site. So can you
allow some space for that. So we're going to go away, we're going to adapt the design, and then we're going to go back again. Moorgate was a trickier one because I think the pubs didn't want anything to change. And so we had to go out to a slightly wider consultation, get the views from a wider number of people.
and then make the case through our committee reports at committees with members to get the approval despite the objections, because really it didn't inconvenience them. They just lost a space that they used to use for a few months in the summer for people drinking and that's actually damaging.
to the public realm and the tree roots. So I think it was a good clear argument, but it did delay the project and we did have to go through a few rounds of toing and froing because of it, but it's just, it's part of the process.

Smith, Madison 49:00
Thank you. Gareth, you mentioned systems approach a few times, particularly around the work that was being done in the Netherlands. Do you reckon you could just explain that a little bit more and how that is tied in to flood mitigation measures?

Gareth Byatt 49:16
Yeah, sure. Thanks for that question. So the urban system, if you like, is a way to be able to think about all aspects of an urban area. Some people group it, bearing in mind all of these things are interlinked, but effectively you've got the
physical built environment that we build. And that includes our infrastructure, the

hard infrastructure that we create, linking into and working with the ecological environment. Some people call it the biosphere. And you have the very important social and socioeconomic side of things and how they link together.
with governance helping to bind them together like glue, if you like. And when I was talking about the example of Rotterdam, and if you look at their strategies, they talk about those aspects and they've got some colour coding in their version of their system.
And systems thinking, Maddie, is a way to be able to think about all aspects that may occur and also to engage lots of people about it, just like Melanie was mentioning just there. If we engage lots of people, then we get lots of different views.
and it requires lots of different considerations. And when we do it early, it means we can take those things into account rather than seeing that we might need to make some changes afterwards. And also, one of the key values I see with systems thinking is it's a way to be able to, as well as getting lots of different views in there,
you can get a really efficient outcome in lots of different ways. So some of the examples from Rotterdam and those coloured roof examples, if you like, they were linking into some funding from the EU and they're one of the lead cities for a multi-roof programme for a few years. But it's really stitched into how the city overall is moving forward.

Smith, Madison 51:21
Well, that's interesting. And I wonder if we've embedded systems thinking into our own processes. So definitely something to take away. A question's been asked about the quantitative work on SUDs and how do we measure the impact they have and what
do we understand what the tipping point is in terms of how much rain can the systems absorb before the areas get flooded? And do you have a future plan that is looking at the amount of rain that we might get in the future versus the amount of suds that the city should have?

Errington, Georgia 51:58
Yeah, sure. So I'll put that on. So before we actually go through to implementing SUDs, there is a whole design, detailed design process. And one of the things we make sure we do is we will not put in a sustainable drainage, like a rain garden into a system without knowing that it can deal with the catchment area that it can take the

water from.
So there is sort of a calculation without going into too much technical detail, which is sort of suggested by a company called Syria. And they, if you want to go and have a look at it, they've got a whole host of sort of technical information on SUDs and how to design them.
But effectively, you look at the catchment area that your rain gardens, for example, might fall into, and you work out how much water, rainfall would fall into that area and go into your rain garden. And then depending on the size of the rain garden and things like that, and also really importantly, the depth. So that sort of comes back to are saying about the challenges of underground infrastructure, it really can impact the sustainable drainage that you put in and also impact the amount of water that they can take. So after doing all the calculations, you can work out at what point or what size of the rain garden means that it will function within that space.
And there's also in terms of sort of future, we add in sort of a climate change factor. So where we know what the rainfall is now for sort of different design events, we add in a climate change factor. So it still has like a, exacerbates the numbers, say about 30%. So you're dealing with
the factor of what if the rainfall is worse in 20 years time than it is now. So sort of all within the calculations without sort of going into too much detail.

Smith, Madison 53:56
Have you have you seen any biodiversity improvements since putting in the suds?

Charalambous, Melanie 54:07
Yeah, I can take that one. Definitely, yeah. We've got some volunteers that we work with in Friends of City Gardens that do some surveys and they've seen some extra mosy insects, bees, wasps in the spaces. So yeah, definitely. I think it is a gradual thing.
One of the things with biodiversity is linking up spaces. So for instance, in that Moorgate example, we're trying to link it. So we've got Finsbury Circus, we've got the Western arm of Finsbury Circus that's been pedestrianised and green. Then we've got Moorgate, then we've got a few other. So it's like creating that green chain, which I think is really helpful.
for biodiversity plus the roof spaces as well, which are often private for the bees, etc.

So yeah, it's about linking it up. A colleague of mine works in that team and has done some further research that we can share.

Smith, Madison 55:09
Amazing, and what do you have any future schemes on the radar in terms of building up that linkage that you just mentioned?

Charalambous, Melanie 55:20
Yeah, the biggest one actually that we've got going on, it's under construction at the moment, is at St Paul's. So it's a brand new square called Greyfriars Square that we're creating out of former carriageway space. So we've closed a road. And that I think will be massive scale.
But one of the key elements of it not only was greening, but was also suds and also climate resilient planting. So we're actually contract growing the plants so that they will adapt the environment and the sandy soil so that they won't die as soon as they're kind of shocked into the new environment.
So those plants have been contract grown for about a year. And that is due to be completed, I think, towards the end of 27, but it's on site now under construction. I think that's our biggest one at the moment. Elsewhere, we've got lots of smaller schemes, so small rain gardens dotted around. But yeah, I think we're trying to make it more of a business as usual approach, but

Smith, Madison 56:15
Mm.

Charalambous, Melanie 56:26
Understanding that that does cost money, ultimately, yeah.

Smith, Madison 56:30
Absolutely, yeah. We have a question about are there any incentive programmes in the city for building owners to invest in above ground suds and storage with perhaps rainwater recycling to reduce peak flows? So do we encourage businesses to take on responsibility to help with suds?

Charalambous, Melanie 56:54

Georgia and I just deal with the public highway, so our schemes are kind of partly connected. So in the last slide we had the scheme with the church and the church had to be fully on board and they are helping to look after that site.
There is a new sustainability SPD that's just been published as part of our local plan, and that's got a lot more in it about how buildings can contribute. But honestly, it's not my area of expertise. But yeah, maybe that's for another session.

Smith, Madison 57:26
Yeah.

Errington, Georgia 57:30
Yeah, I can add a little bit to that just to say that there is legislation in sort of a planning aspect that developments over a certain size do have to look into suds and how they don't just discharge surface water onto the highway and or onto the sewer system itself. So yeah, it's like
We work in highways, but there's a whole host of things within a local authority function in terms of planning and things like that, where we all try and work together to try and get as many subs in as possible.

Smith, Madison 58:07
Gary, with your international understanding, are there any other cities that are going about suds in a similar way to London? And if there's any differences, do you know what the main differences are?

Gareth Byatt 58:21
Yeah, that's a good question. I'll start. It's actually a good way of pointing out that context is always key, of course. You know, the local context is always crucial to these things. Across Europe, there are lots of good examples. Paris is doing some interesting things, for example.
but also smaller cities and towns are doing some interesting things too. In the UK also, I hasten to add. I think that what I could perhaps do, Maddie, as some follow up, if it may be of use, would be able to provide people with a few links to some further information about different things going on around the world. Like I say, I do think context is always, always key. There's definitely some good work being done in Europe, in Asia, in the Americas as well.

Smith, Madison 59:19
Thanks, Gary.
I think we have one final question for the SUDS group. In terms of projects, do you prefer to try infiltration? So in acknowledging the constraints of the utilities over sewage drainage systems, E.g. engineering drainage. So how do we balance pushing the water into the sewerage system versus using it for plants and other aspects.

Errington, Georgia 59:53
Yeah, I don't mind taking this one. So I would say that in what we're trying to do is any designs or projects that are coming up that we are looking at SUDs in all schemes, seeing where they are possible. And generally, what we try and do is sort of there's a hierarchy when it comes to SUDs designs. So not only are you looking at those four pillars that we mentioned to make
like a really good design, but you're also looking at sort of the top one is can you infiltrate? Because that is one of the best ways to deal with water management within an urban area. So we sort of work through those hierarchies. If you can't infiltrate, what's the next best option and what's the next best option from that point?
But as we said, with all the challenges that we do have, there are sometimes schemes where unfortunately we have to rule out suds. But as we said, we are trying to have that as part of our thought process in each project. I don't know if Melanie, you wanted to add anything.

Charalambous, Melanie 1:00:55
Yeah, I think you covered it well, George. I'd say that we're still learning as well. So all of these schemes that are going in, we're trying to monitor them as best we can to see what works, what doesn't for the city, because it's kind of a unique urban environment.

Smith, Madison 1:01:14
Thanks, both. I think that's it for the question and answer today. Thank you for all your questions. If anything else comes to mind after the session, please do feel free to get in touch and our contact details will be shared after the webinar. Before we finish, I want to briefly summarise this week's Flood Resilience Toolkit takeaways.

the actions that you can follow after today's session to help you improve your flood resilience. And these actions are to cheque and clear drains regularly to make sure that the water can flow and ensure that valuables are off the floor in case flooding does occur. Consider having business continuity plans in place. And if you're a business or a community group,
within the square mile, please reach out to the City Corporation because we can help you and provide you advice on those plans. And lastly, get connected. So if you are a business, please join the London Business Network for Resilience and stay in touch with your business improvement districts because they will have some fantastic information events.
and actions that you can take to stay resilient.
Looking ahead, we have our final session, High Water, High Cost, on the 25th of February, and this will focus on the financial impact of flooding, how climate modelling can help with future risks. We'll be joined by Marcus Cree from FIS Global and Kristina Volhan from Fathom, and they will share their thoughts on financial modelling and climate risk.
Thank you again for joining us and for taking the time to be part of the Flood Resilience webinar series. We hope to see you at our next session and we hope you can join us soon. Thank you all.

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