June_19_409_004

Good afternoon, everybody. It's nice to see all of you here. This is a session on flood early warning, and we have a rather long title, Tackling the Impossible. I've put impossible in inverted commas because maybe it's possible.

We can have a discussion on that. But the longest part of the title is the long lead time warnings in very fast responding basins in a low capacity context. So in this situation, we've got three big challenges.

There was a very nice session on flash flood forecasting just before lunch. There have been other sessions on early warning systems, and there have been interesting sessions talking about uncertainty.

So those have been all relevant to this and what we're going to talk about today. So we've got three challenges here. Long lead time flood warnings, we'll talk about why we need those longer lead times, and the very fast responding basins, and in certain communities and countries where it's a real challenge to forecast.

So the way we're going to set up this session was to have some information about what we're talking about. And I'm joined by Musa Sadibi from the World Bank. I would like to have been joined by Thomas Leby from the National Disaster Management Agency of Sierra Leone, but Thomas informed us last week.

Unfortunately, he's not able to make it, but I've got some information from Thomas I can present. But would like to also turn it into something of a discussion session in the second half so that we can learn from all of you, because I know there's a lot of knowledge in the room here.

There's a lot of knowledge in the community at this event. Just as a starter for that, I'd be interested if you could raise your hand if you work in meteorology or if you're a meteorologist in any way.

So good, we've got two. Is anyone involved in being a first responder or responding to early warning systems? Not many, OK. Is anyone a developer of an early warning system or early warning systems? OK, so now we have a few.

That's great. And does anyone have experience of being responsible for directly communicating to the community or communities? Some, maybe, yes. OK, right. Well, that's interesting to know, and we'll push on.

Welcome, the rest of you have just joined. So my name is Murray Dale. I work for JBA Consulting. The way we're going to arrange this session is for me to set the scene, explain why tackling the impossible long lead times in very fast responding basins may be impossible.

I'm then going to touch on some of the challenges in Sierra Leone, and we're very pleased to have a representative of Freetown Sierra Leone here with us, Francis Reffel. And then Musa from the World Bank is going to give a short overview of early warning system development, perhaps with an Africa context in particular.

But we'll be keen to look at these two questions and to ask your opinion on these. What solutions may any of you have found that are effective in this situation? And if maybe you haven't, what should the technology and the communication challenges do?

How should those be addressed, the technology and communication? So we're not talking about technology here. We're referring to hydrometeorology, flood forecasting, flood warning, and then communication being also a technological aspect sometimes, but often more a social science and a psychology even challenge about how we communicate effectively, especially uncertain warnings.

So what do we mean by impossible? First responders ideally need good time ahead of flooding to be able to take effective actions, as do those being affected. Ideally, they would like six hours to maybe even three days or five days.

They want information ahead of the event in order to prepare, get ready, mobilize, and be ready to react, or even take preventative actions, clearing drainage systems, for example, mobilizing teams ready to respond.

Even two hours lead time can be useful. You might have ideas about how long people need to react. If we look at places like West Africa, but it's not only West Africa where these issues occur, convection is the dominant rainfall process, whereby there's rapid uplift in the atmosphere and we get extremely intense rainfall coming down, usually localized in extent, and also relatively short -term, so within a few hours.

If we want to look at numbers, maybe 100 millimeters of rain, four inches of rain can fall in one hour or two hours, commonly. And if that falls on Himeji, for example, we will all see a response. There will be something big happening.

So heavy amounts of rain can fall in very short times. If that falls over at 24 hours, it will be much less impactful. So we've got very heavy rainfall. We also need these sufficiently long lead times to take effective action.

Now, in urban areas, when the rain hits the ground, much less of it can soak into the ground. So runoff is fast. We also accelerate the speed at which the rain can become a flood when we have steep basins, steep catchments.

What we find here is that flooding can occur minutes after rainfall, less than an hour, maybe 30 minutes. So is it possible to forecast and take some action with these forms of, these conditions? In a simplistic situation, we might have a flood forecast that's made and issued on the left.

This might go to emergency responders who are alerted and decide on what actions to take in the middle. And on the right, the at -risk populations are warned, the communities

are warned. In some societies, it may be that the left hand can go straight to the right hand side.

Because a flood forecast and an effective warning can be transferred directly to those at risk. But time is of the essence. There isn't much time, especially if we said minutes occur. Now, in an ideal situation, the flood occurs at the end of these three processes.

That's in an ideal situation. In reality, very often the flood is occurring maybe after the forecast has been made, if a forecast has been made. There's no time for emergency responders to do anything.

They're reacting to the flood that's outside their window, let alone those being flooded. So this is a bit more like the problem that's facing us and you could even move that red arrow further left still.

So let's bring this to some context about where we've been doing some work. Two countries here, Sierra Leone on the left, west coast of Africa, in particular looking at Freetown. So this is the peninsula that's sticking out into the Atlantic.

We'll look a bit in detail of Freetown in a minute. A larger, bigger country in the Sahel is Niger, where there are related and similar challenges. Now, if we look at one of the urban locations in Niger, We've done some pluvial flood mapping, which means we can determine, or let's say not determine, but estimate where rainfall flooding, direct rainfall flooding may occur.

So this doesn't necessarily involve a river or any water course. This is where the rain comes down onto an urban area, relatively impermeable, and it will fill in low pond points in that urban environment.

Now, you notice one or two of the redder areas lower down. These are areas which, in fact, in this urban location, Tawa, there have been surface water flood storage areas developed in order to manage and cope with some of that water.

We heard earlier about in the flood early warning session just before lunch, one of the questioners, I think he was from Somalia, was talking about the benefits of, co -benefits, if you like, of having storage areas or areas where you can manage surface water.

That can be an amenity if it's safely looked after. But there are ways of managing this urban environment to keep surface water where we want it, if you like, rather than in people's homes. Let's now move across to Sierra Leone, and with the situation there in Niger, we've got lots of urbanized area, very intense rainfall when it does rain.

But one thing that Sierra Leone has got on top of that is very steep slopes. And in Freetown, this is just taken from looking down to the sea, so it's only about five kilometers out to the sea. You can see the steepness of the slopes.

You can also see the density of the population in that valley. So we are experiencing the potential for some challenging management of flooding. If we go down to one of the watercourses, we can see on the left.

So this is the same stream. When you look on the left, you're looking downstream and on the right upstream. You can see it's very steep. You can see that there are community habitation either side of the stream, very close to the watercourse.

And there's things like boulders in that stream. There's lots of potential for some pretty dynamic things when we get flooding. Now, this is what it looks like when it rains hard. Look at the speed of that water.

Look at the color of the water. The fact that the urban properties are either side of the water. So it's racing down here very, very fast, extremely dangerous situation. And this isn't rare in Sierra Leone.

This is happening nearly every year. 2015, maybe a lower impact event, somewhat disruptive. 2017, definitely not a low impact event, a very severe event, causing over a thousand fatalities, sadly, incorporating also a landslide.

And then 2020, another image. So the one I showed before was 2019. There was flooding last year, and we hope they won't be flooding this year, but it's very likely they could. So what do we do? How do we tackle this potentially impossible problem?

Well, here's a solution, which will be good to hear your views on. And this has been something that we've been involved in with the local authorities in Freetown. Now, if you come from a meteorological background, you may know something about numerical weather prediction, which is weather forecasting using computers, supercomputers.

And with numerical weather forecasting, you can make a forecast for how much rain will fall. The problem is knowing how much rain will fall over which area and over what duration is super challenging.

So what we've done here is to make use of a nested model. So we've got a global model. and we've got a small nested model over the Freetown Peninsula operating at two kilometer resolution, and this can give us totals of rain forecast in excess of 100 millimeters, so on the right -hand side of the scale.

This is an actual forecast that was made last July for Freetown with this system. So it is possible to forecast the intensities with the right form of modeling, but what about the uncertainty? Because that's wonderful if that actually happens, but in reality, that may not happen exactly as it's shown to.

So how can we cope with this? Well, this is where ensemble forecasting comes in, and that means running multiple models. So in this case, we're running 40 simulations of a model, and this gives us a range of possible outcomes, and with that ensemble, we can determine a likelihood of exceeding a certain amount of rain.

So that way, we make this probabilistic, and then the last part of the sentence on the left is, can you communicate that probability? Can you communicate that level of risk? If you want to look eagle -eye view onto Freetown Peninsula, you can see the basins are about between two and six kilometers squared in size, very small, relatively.

Some of them very narrow and very steep. We've managed to gauge one of those streams, so we've got some hydrograph to understand how they react. Now, in the previous session before lunch, there was an example of an early warning message, and this is a message format that was developed for the, let's say, the professional partners.

So this is not designed to go to the public. This is designed to go to the National Disaster Management Agency, the NDMA, the Water Agency, and the Meteorology Agency in Sierra Leone. At the bottom are descriptions of high and low -impact flooding.

So this is what, and these, all these points were co -developed with the Sierra Leonean authorities we work with. So they are talking about mudslides. They're talking about waterborne diseases. So they're specific to the Sierra Leone and Freetown context.

The bit that changes every day is this part. So zoom in on that. Every day, this flood guidance statement, we're calling this, because it's not strictly a flood warning. It's giving you guidance as to what to do.

Using the probabilistic forecast model, we can say there are low, medium, or high chance of low or high -impact flooding. So we define two levels of flooding impact, low and high. I mean, maybe low comes up to your knee, high comes up to your head, for example.

So the high -impact flooding is not going to occur very often, maybe once a year, once every two years. Low -impact flooding in Sierra Leone, it's probably occurring three or four, maybe five times every year.

This forecast from last year was, that's put into the guidance statement, was saying there was a medium chance of the low -impact flooding, but there is a low chance, so it probably won't happen, but it may happen, of getting a high -impact flood event.

So that's okay, but what do you do with that? How are you going to make use of that information? One way is to use some form of risk matrix. Now this uses a form of best practice that's been coming out of, I'd say, the global north perhaps, but is more and more used right across the globe now.

It uses a form of traffic light, color coding. So green means little to no risk, yellow going to amber going to red for the highest level of risk. Now remember that risk is a combination of probability, or chance, we're calling it chance because that was a term that the Sierra Leonean authorities are familiar with.

Some people debate whether you should use the term chance. Anyway, let's say the likelihood or probability is on the left, on the top is the degree of impact. So, if you get a high chance of high impact, you've got the worst level of risk.

You've got a red traffic light. If you get low chance of low impact, you're getting the bottom left. You're getting lower levels of risk. So we need the two things combined to give us the higher levels of risk.

Now, you can just have the traffic lights, but then in order to know what to do, we started populating this with a list of activities that can be carried out by the authorities. When things are calm and there's not much happening, you can just maintain normal levels of vigilance.

As things start to increase on the risk level, you can start to do more. We, in some of the sessions I've been in, which have been great, actually, in the last few days, we've been talking about low regrets and no regrets activities.

I don't know if everyone's familiar with those terms, but when we talk about low regret activities, we mean you can do something and it doesn't matter too much if the flood

doesn't happen. So you get a small chance of a flooding coming along and you pick up the phone to alert your colleagues.

There's not much problem with doing that. It doesn't cost anything, it's a small thing, but it can have a beneficial effect. So that's a low regret activity. As you start moving up the risk level, you can start to move to higher, more complex interventions, which might be cleaning drainage systems, which might even be in the extreme end evacuating communities.

So this is one way of managing it. When we were in Sierra Leone, we worked out with the agencies we are dealing with, in particular with National Disaster Management Agency, that one way of managing those alerts and that communication would be through a flood risk task force.

Another theme through this conference has been collaboration, participation, breaking down silos. The three agencies of meteorology, water resources, and disaster management all sit within different ministries in Sierra Leone.

This creates something of a challenge to overcome, but one way of overcoming such challenges is to have a operational unit, such as this task force, where members of each of those agencies meet on a daily basis through the rainy season.

They take in information, such as the flood guidance statement, and they make decisions to inform what to do. So this is an advisory unit that's been established, and it was developed by the Sierra Leonean authorities, not by anyone else.

It was signed up to by the director general from each of the three agencies, the hydrology, water resources, the meteorology, and the disaster management agencies, and there's a concept note that sets out what the task force is for, what it should do, why it can be effective, and what it shouldn't do, perhaps.

It's not a standard operating procedure, but it can inform SOPs. It's something that can be used to develop these standard operating procedures. Thomas, who is going to be

here with us today, is the director for disaster risk reduction and preparedness at the NDMA.

He's also leader of this flood risk task force, made up of those three agencies, and Thomas has a difficult job in one sense because he's trying to corral all three, but there has been director general support of each of these agencies combining, so we're really grateful that Thomas has stood up to take on this role.

It makes sense that the NDMA is the lead agency in this, as they're taking the final decisions as to what to do. Before we go on to answering those two questions, I'd like, if possible, to introduce Musa Sidibi from the bank to set a little context as to how hydrometan early warning systems are a focal point for the World Bank.

Thank you. Thank you very much, Marie. Good afternoon, everybody. It's a pleasure to see you. And I see many faces from the previous session. So I'll be covering quickly what's the World Bank is doing in terms of floods, but flash floods in general.

So just as a quick introduction, I'm a disaster risk management specialist at the bank, mostly working in GFDRR, but also providing cross support to the bank team. So that's the angle that I will provide in the few slides.

Yes, so yeah, basically, the global facility for disaster reduction and recovery is a multi - donor trust fund managed by the World Bank, which is also which has different teams. So the teams look at the different aspects of the early warning value chain.

So this is really the areas that are covered by the global program for early warning and hydromet services. So basically, this team works with the countries in general and the clients, but we all know the challenges.

So there is really a need for hydromet information. We learned from the previous session that flash floods are one of the most lethal hazards which occur. And there is evidence from the WMO that this leads to around 5 ,000 fatalities annually.

So this really plays a critical role in the development agenda of the bank. So our team and the global program for hydromet and early warning system is mostly working with the public sector first, so the national metrological and hydrological services, which we consider to be the backbone of this system.

So they are the custodian of this information and they have to work, issue the warning, but work together with the disaster risk management institutions. In this, there is significant obstacle, but there is also capacity gap in terms of technology, in terms of observation networks, and there is still a lot of fatalities.

So yeah, the global program for hydromet was established like a decade ago, and really the pillars of activities organized into supporting capacity building for early warning investment, analytical support in terms of capacity building, and also partnership coordination.

Because in this space, partnership is really what will drive the sustainability of the investment. And just to share with you the approach, so from, yeah, there was a conventional approach of which the focus was really on the national metrological, hydrological system.

So the interaction of the country level would focus on the private sector, try to modernize the infrastructure and also facilitate the different arrangement just for service delivery. But nowadays, after hundreds of millions of investment, billions, I would say, from the development partners, there are still gaps and the problems are not solved.

So there is a, the approach has constantly evolved where we are now focusing on national hydromet and early warning value chain. So looking at the value chain, where can we make the best investment to achieve the better results?

And this comes through highlighting some vehicles of investment throughout the agricultural sector, throughout the disaster reduction, and this kind of sectors, but also importantly, bridge the last mile, which is critically, which is the main gap.

So yeah, so there has been a change in our approach. Yeah, so basically, I also wanted to add that from the bank's perspective, the floods, as I said, are central to the development agenda and early warning systems in general.

This is touched upon in general through the global practice, urban resilience and land. So as part of all the project, there is a systematic assessment of what is the flood risk, what are the population at risk.

And also, as Murray has alluded to, we have the focus, what do we do next? So there is also a battery of investment looking at strategic investment plan, but also measures what can be implemented, store and delay through green and green infrastructure and this kind of investment.

So yeah, the bank really remains committed to tackle these issues, and particularly from the West African region from which I am from. We also noticed that there are compounded challenges, climate change, encroachments, so there is a need to provide more systematic solutions where the populations are really, or how to say it, people - centered solutions to tackling this impossible, if I might say.

So thank you very much for your time.

Thank you, thank you very much, Musa. Right. There are a couple more slides there, but we can go on then. So, enough of me talking. Let's give you the opportunity to reflect, perhaps. I think with a lot of these sessions, I always feel I've got burning questions.

Maybe I've bored you all senseless, but hopefully not. And it would be great to get some interaction from you about, just to focus some of this discussion, two questions, although the second one is perhaps split into two.

So firstly, have you examples that you can touch on, that you can draw on, that you've found to be effective in this space? And secondly, if we look at technology and then the communication as separate strands, how should we take these things forward?

So, I don't know if anyone would like to start on this. I've also pre -prepared a small board here, which my colleague John has kindly offered to help me with, so that we can write up any of your good ideas, really.

So, does anyone want to kick off on this? Perhaps the first question, has anyone got any examples of how this has happened in any country that they had involvement in? And are there any lessons that they'd like to share?

First, if I may, I'd just like to reflect on what you've said, because, and in a way, it's reverse engineering of the problem. We found problems that you may have solved. So we have a specific example working in the other SLs, Sri Lanka.

So it's a much bigger economy. It's a bit more sophisticated, but it's faced with exactly the same kinds of problems in terms of getting agencies to work together, mandates, all these things that we talk about a lot.

And I just wanted to reflect on the way that in Sierra Leone, we managed to create a task force, which kind of, I know the country has very limited human resources. The fact that they're able to do that shows a degree of ingenuity, which is actually something we all could learn from, because with the much bigger economies, we still find massive stovepipes between agencies and huge difficulties in getting things to work.

And the other thing, so it's not another answer to the solutions, but it's reflecting that I think what's been going on in Sierra Leone is actually very interesting and useful. The other is your approach to the sort of, we'll call it hyper -local forecasting, using sconfection permitting modeling embedded in a non -subtle system is also something which I think is the way forward, and it's obviously,

it sort of works. It's something that we all recognize from certainly more advanced countries to be able to apply this in Sierra Leone is really very, very good. The kind of question is to what extent the conveying this uncertainty, which is really important in terms of not necessarily into the community, but even within the meteorological service, the acceptance of, you're dealing with a stochastic atmosphere.

You really have to accept the fact that it is uncertain, and therefore you've really got to convey uncertainty. How difficult do you find that in communicating with counterparts, because we certainly find that very difficult with counterparts in other countries, and the challenges that we face in trying to get them to really say, we're not waiting for you to have a high chance of a high impact.

You've got to convey exactly what you have here. There's a low chance of high impacts. That could be totally fatal, and when you don't take this into account, you're missing one of the more fundamental things of a meteorologist today in terms of forecasting.

They really have to be able to convey this. My very last point, and I'm sorry to go on a little bit, the last point is I know how this Sierra Leone project was essentially set up, and it's antecedent in the bank.

There was a slide of Musas, which he skipped over, but there's a document called the Power of Partnership, and it recognized in that low -income countries may have such poor capabilities in terms of their meteorological services.

They needed something to get them going, and in a way, your presence in Sierra Leone was to jumpstart. It's called jumpstarting in the context of that document. That is a way of really ... The things you've talked about potentially can take the Sierra Leone Met from a very low level of capability to a quite high level because you're there.

The question then is about the sustainability of that model, of that process, and so if you don't mind reflecting a little bit on that in this context.

Yes, thank you, David. So three parts there, the flood risk task force, the technology, and then the sort of capacity building element, I guess. And yes, a lot of what we're doing is driven by the Power Partnership Report, which is recommend highly to anyone who hasn't seen it.

I want to allow other people to have their views as well. But just briefly, you asked about reflections on that last point. I think the SL Met is the name of the meteorology service there, faces enormous challenges.

It's getting our staff disappearing a lot because it's difficult for them to retain staff. It's got all sorts of aspects that make that really difficult. And while we'd love to have a more sustainable model by which they take on the forecasting system, they run it and refine it, improve it, at the moment, that's just not possible because of their status.

So I think one of the key things with any of it, before getting involved in any of these assignments and writing terms of reference is to get a really thorough understanding of the level of capacity of these services, which is often not necessarily what's on paper.

It requires visits to go there, see them. What are they doing? Could they operate this? What's their skill base and their IT? I mean, they're facing power cuts all the time. Someone mentioned internet connectivity from the Pakistan question in the last session.

That's a fundamental problem for SL Met. They don't have internet capacity a lot of the time. They can't even bring in their forecast. So these are enormous challenges which need solutions which may require third party intervention to jumpstart things, to get things moving.

But anyway, are there any other points to bring up? Mark, yeah.

Thank you, Mark Harvey from Resurgence. Yeah, I think it is a real achievement that you've made in the light of clearly the capacity constraints of Sierra Leone Met, and particularly the interagency cooperation and the modeling that you've created there for the forecasting.

In East Africa, meantime, my organization, we've been working with Met Office under the WISER program and the National Weather Agencies, and I think we have some partial solutions to some of these challenges and other challenges.

We've, first of all, not just focused on early warning and high impact weather events, but really focused on the capacity of the Met agency to produce normal daily or weekly, very often initially it's weekly, forecasts of normal weather.

And the value of that has been that it's built the trust of communities and a degree of adoption and a degree of tolerance as to when things aren't perfect in terms of a forecast. But before that, we worked really hard to bring key actors, community leaders, media representatives the City Hall, the Red Cross, all the key actors in the system into the room, not to do the modeling and the forecasting,

but to really look hard at issues such as the format of the forecasts, the channels that could be used, which very often the preferred channels of the communities were very different from the official channels.

And to look at zoning areas of the city so that the communities could see their areas on the zone of the forecast and issues of language. So generating ownership that way of a forecast that may be a weekly one initially, that at times would be a high impact weather forecast.

But building this tolerance is one thing. And I think we step back a little bit from, it's valuable the hydromet value chain in the power of partnerships. But it does look at things from the perspective of the hydromet agencies.

So the area we were primarily working on was forecasting and products and services. But actually, if you look at it from the perspective of users, the products and services don't really cover the dynamics of access, trust, adoption, use and action on forecasts.

So we've somewhat reversed engineered the process. And I think that has generated adoption and use and trust. And I think it's also built this sense of tolerance. Lastly, on this issue of when does an evolving high impact weather event trigger an early warning?

We've tried to decentralize that and not get too hung up on the official early warning. And that might not be terribly orthodox. But what we discovered was that actually three or four hours of moderate rain, if that was forecast, that might not sort of hit the scale of an official early warning, would generate flooding in certain areas.

So we worked with intermediaries who knew those areas who would interpret a forecast of four or five hours of moderate rain and they would relay an alert outside the official system to the community saying, actually, this means.

that there's likely to be flooding in these areas. So I think there's something important about the threshold design and trying to decentralize it where possible. But you can't actually leave all of that to the Met Agency.

And that's why I think you do need these intermediary actors to get as close to the communities as possible, whether you're dealing with flooding or whether you're dealing with extreme heat, where again, very often the observation infrastructure is near the airports.

And there's a huge temperature differential. You can manage that actually by having intermediates saying, actually, they're forecasting 38 degrees. That probably means 39 or 40. It's going to be hotter where these communities, where our communities are.

So I think we've got some partial solutions to offer you. But I think we're learning a lot from what you've been doing in Freetown in terms of those challenges, the capacity challenges with Sierra Leone Met.

How do you build up their capacity, but at the same time encourage them to offer a service? And that is challenging. But yeah, congratulations on what you have been doing. Thank you.

up that's great just two little things from that then that if I can pick that you mentioned so working bottom -up so to speak in other words having those using the warnings and alerts driving and dictating what the system should be is I guess where you're coming from I agree with that but I believe it's somewhat iterative in that you you do that then you see what's possible then you go back and say we can't do that we can do this okay that's kind of useful but can you do this oh okay we might be able to do that and then you go back and forward and an iterative process to actually home in on the requirement maybe that's an option but it's a great point and then your other point about low severity flooding so that's partly why we came up with this low impact and high impact so that people could get a feel for there being a range and yes I take the point that if you're talking to the communities you might find that it's it's low level rainfall over 12 -24 hours that's the problem and if you just think oh it's it's highly intense one -hour stuff and you've missed what the requirement is so talking to the communities is got to be a vital element of it we'd love to do more of that any other points sorry there's two here

Thank you very much, Marie. So I'd like to share my experience in developing solutions in Sri Lanka, for example. So I applied this technique to a living lab where how can we bring different national organizations, local councils, and the community to work together to develop solutions and then try it out on real conditions and then iteratively further develop that, right?

So I think from that particular experience, what we have done is in terms of, you know, first thing is about understanding your local risk. When the flood comes, how the flood is going to be affected in different sectors like schools, health organizations, businesses, and so on.

So the first things what we've done is creating a risk impact assessment module where for different scenarios we can really see before it happens what sort of communities, infrastructures in danger. So then how can we really build certain programs around that with the community to make sure that awareness of risk is raised.

So obviously this is the starting point of a long journey, but that's what started. That's the first thing. Second thing is about, we found out obviously when you communicate information from the cement office to the irrigation department to then other organizations downstream, the communication is gone as PDF files rather than digitally.

So as a result, you cannot really bring this kind of digital innovations to make sure, how do I get, let's say you are forecasting, whether forecasting data to feed into flood simulation. How do you then use that information to do impact assessment?

Then how do you then manage the authorization process of sending early morning messages because that also needs to be authorized from one organization or another before it goes to a range of multiple actors and to the community.

So that means you also need to bring some workflow engine to really authorize that process. And then the last one is about, then how do you send the message to the communities? So the community, so that mobile app was developed in collaboration with the community to really see what sort of things they would like to see in that app.

So with that, we identified, okay, some people don't have smartphones, how to use SMS WhatsApp, some people are more used to kind of getting message from WhatsApp and then mobile app give you much more detailed information, so that's the first one.

And also they would like to be a part of the whole process. First thing is about how can we bring the community as not just a consumer producer of intelligence. So it could be about helping to collect rainfall data.

At the same time, recording or reporting certain incidents to the organization so that they can also be an active participant in the whole process. So the mobile app allows you to provide that information to the organization as well.

And also they can see the river level, right? For example, how the river is behaving. So if you have been alerted, there's a possibility that could be floods during the next two days. And then you're worried if you're a family, a young family, right?

So the parents can really watch from that mobile app how the river is, you know, whether it's green, yellow, amber, or red or something, so we can have more anticipated reaction before that hits red, for example.

So I think there are certain things that we have kind of experimental platforms we're trialing in Sri Lanka with World Bank and so it's a happy to share that experience.

Those are great examples of connecting with communities to tailor your services to their requirements. So that's super. In Sierra Leone, Francis, you said 50% to 60% have smartphones. The WhatsApp is so universally used in Africa, there's the potential to be contacting the community disaster management committees, the CDMCs in Freetown through WhatsApp, as long as they're given the information that's useful and valuable,

not like evacuate tomorrow type thing. We don't need to be careful how it's done. It'd be good to hear maybe your experiences. I know, Mika, you had a question. But Francis, if you want to comment on your knowledge of the community in Sierra Leone.

Yes, thank you very much. Of course, community -based disaster management committees is a community of people that have been mobilized and serving as first responders and also involved in a range of awareness raising campaigns to create consciousness around disasters, whether prior or post to disasters.

Incidentally, there is an effort already where they receive particularly weather forecasts, you know, where more or less generic weather forecasts about the city, you know, and so the reality is that they are using a combination of their own knowledge, you know, and that of what comes from SMET.

There is already a kind of sensitivity, you know. They know, for example, when it's the rainy season, there's a possibility of flooding, especially those that are along coastal areas, so there's a possibility of flooding, and so when it's the rainy season, they use that kind of knowledge to actually talk around issues of potential flooding within their respective.

So the feedback or messaging from Australian Met is an additional source of that. So combinational all of that actually push them to engage with communities and so. However, the experience with SMET scenario is, as I said, is usually a generic messaging.

So, for example, there will be, let's say, rain at 3, for example, PM, and that is for Freetown. So it's limited of, if you like, localised, you know, kind of messaging. So Freetown is extensive, so some part might definitely experience 3 o 'clock rainfall, others, other part may not.

And so there is this thinking around communities that can we keep trusting this messaging from SMET, because they said it will rain this time, but then that part did not receive. So there is also that kind of consciousness to say, okay, there is a need, you know, for a more localised kind of messaging that speak in specific neighbourhoods.

And so it recreates. But by and large also, just trying to give, you know, the realities and the perspective of communities is that, you know, there is much more to be done, you know, around how do they utilise this data to make decisions and so on.

And as I was speaking with Maury on this, that across the board, it's not just about communities, even among professionals, that are they really using that information to take, you know, day by day decisions, you know.

So it's still something that has to be taken further in that respect to, you know, so that, but at community level, those that are taking decisions to look at that data as a useful, you know, tool, you know, to make day to day decisions.

So for example, a family could use that to say, okay, there is potential flooding. So I'll keep my children from going to school, you know, which is mostly, I mean, people are more dependent on, you know, their hunch and probably very religious people that, okay, we trust God, that yes, it may flood, it may not, you know, so go to school, you know.

So I think there is a lot to be done around that. So that brings to mind that in spite of the effort of SL Met, the utilisation of their efforts, you know, the data they share or the information they gave out, you know, has to be utilised more to make them look really very effective and efficient in that space.

So I think that's also part of what has to be considered.

Thank you very much, Francis. Mika, you've been patiently waiting.

Thanks. Thanks, Murray. Yes, I'm Micho Werner from IHE Delft. I just wanted to share maybe also building on some of what the previous speakers have said, sharing experience from working with Red Cross and Malawi Med Services in North Lake Malawi, where this question of, you know, sometimes I think we also, and I'm a hydrologist, so I'm a metrologist, I'm not really sure.

I'm an hydrologist, but I think what metrologists always do, we always try to go to downscale, let's say, like that house that you just showed, which is a pretty impossible thing. And then we're trying to, let's say, make me look at the community perspective and try to upscale their knowledge.

And the experience I'd like to share was that we did various activities, like walking with the community through the districts and the neighbourhoods to get the understanding of flash flooding. But I thought what was particularly interesting was to understand what sort of weather patterns they saw, because there was no hope for a, let's say, a high - resolution metrological model.

So the question was, can you see what people see in the clouds, essentially, in terms of when there are flash floods? And what was very surprising is that from speaking with the community, we found that there's quite different types of flash floods across the rainy season in Malawi, driven by different patterns, metrological patterns, which we would never have thought of looking at before, because we would always,

you know, the original thought of the Red Cross was to, I'm not knocking them in any way, to predict the water level of flash flood. Well, there's no hope in doing that. So the thought there is also, OK, look at, you know, how people recognize flash floods and use that as a starting point in communication.

So if we see certain patterns in our metrological models, rather than saying, and I please set your message, you know, like the flash flooding, but, you know, this is the pattern that we're seeing in the clouds.

This is the wind direction, because when people take decisions, they triangulate with different, you know, as you're saying, you know, what knowledge do you usually use? It could be your trust in your faith in God.

It could be local knowledge. It could be scientific knowledge. You start to combine and triangulate these. But you have to speak in a language that you can triangulate. And I think that's and I appreciate it was still more a research effort.

So we haven't gone through and made an operational forecast in that point. But sort of giving the opportunity to triangulate is, I think, very, very important.

Thank you very much, Mikheil, it's great. So another example of talking to communities to find out what they really need. So back to Mark's point. There's a question here, also from Sierra Leone, I believe.

Thank you very much. I'm working with National Action for Social Commission, a World Bank project on shock response in Sierra Leone. We work with the NDMA, we partner with them, with other agencies. I'm part of the WASAP group for the weather alert, the early warning system from the Sierra Leone met, where I can see profound gaps in the alert they are sending out, because basically, like you said,

they are not giving us flawed guidance, they are giving, telling us low chances of rain, medium, high chances of rain. And this, to me, is not enough to really determine flooding. Of course, we have trash holes of raining, you know, that can trigger floods.

That information is not being delivered. Where in we have particular hours, that information is not part of the alert giving up, because if you can say we will have continuous rain in two hours, we expect flooding in Freetown, but it's more or less low chances of rain, medium chances.

I think one of the challenges here, thank you, that's a great point, thank you. One of the challenges is that the SL Met service is producing one product, that's it. One product, a daily weather forecast, is trying to cover the weather in all the aspects of the weather for the whole of Sierra Leone, not just Freetown, and it's not a flood forecast, it's not trying to do that.

It's trying to give some information in the different regions about what the weather in general should be, so wet or dry, heavy rain, light rain. This is a very different system which is designed specifically for those three agencies who have been trained how to interpret it and use it, but as things evolve, this is experimental, as this evolves, we would very much hope that it does start to become something that's communicated wider and through into communities.

I'd like to put my colleague behind me from Metro Suisse on the spot in the moment, if I may. What you just said is really, really important. And it's universal. There's a problem in meteorology. And that's why I would like to put my colleague on the spot.

Because many meteorological services, even quite advanced ones, are stuck with this mindset of it's above average. It'll be a bit more than this. We've just had this situation in Sri Lanka where it was 100% above average for the monsoon season.

And it caused massive flooding. And 33 people lost their lives. And 200 ,000 people were affected. Because people don't know what to do. What do we do with that? What do any of us, even from the profession, what do we do when somebody simply tells you it's above average?

It's useless, frankly, from a point of view of decision making. And the point you're making is well taken. But can I ask, if I may? Please.

Yeah, no, I fully agree with it, piggybacking a bit on that, I'm not so sure how the population reacts to like probability, yeah, to communicating probabilistic information because especially if you have like high variability, you always have kind of a low chance of a high impact.

Maybe not always, but you very often have a low chance of a high impact event. How do you deal with that? I mean, people get really desensitized with that and also becomes

It's fundamental and it's affecting every part of the world, every part of the world. It's probably why it's difficult because there's nothing here yet. But how do you communicate low chance of high impact?

Well I mean here's one way is through matrices like this because you've got a route through. So this gives you some form of audit trail so you can say well we did the orange thing because you told us it was medium chance of high.

So we did those things so we've met the requirement. Now it may well turn out that that forecast did turn out to be less severe or more severe but you've got some form of decision support. So decision support is the key to turning probabilistic forecasts into deterministic action.

So for those not familiar with these terms probabilistic is it might happen. Deterministic is it will or it won't happen. So at every point people taking actions need to make deterministic decisions.

We need to evacuate this community. We need to make a call. Are we going to do it or not? Are we going to raise this flood defense or not? So those things are yes no considerations. At some point those people who are making those decisions have to have been given the information that tells them the range of likely things that might happen and they're making a call.

It may not be the right call but they're making a call. And to make a call you need some some form of decision support I would argue. So but you're right it is an enormous challenge. And yeah. So I think we talked about this.

before also a lot of actors just will not respond to a low probability event like actors are really waiting for kind of like a minimum threshold of

We spoke about one, I said there was one council in the UK that has 70% requirement for every single variable. Exactly, the same in Switzerland. They'll only do something if they get 70%. Well, with the flood, I'm afraid you know if they're gonna get 70, it's often gonna be 10 or 20.

So we've got Mark, we've got Mika, we've got, we've run out of time. Yes, just so we're having fun. Oh well, I don't know how much, are we allowed to carry on or we need to stop? We need to stop, I'm told.