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My name is Cizine Tokar. I'm the lead senior hydromedological hazards and disaster risk reduction advisor at U .S. Agency for International Development, or shortly USAID, Bureau for Humanitarian Assistance.

And I cover issues related to atmospheric, oceanic, and hydrologic hazards in responding to preparing for and reducing risk of those hydrometrological hazards. So I am very lucky today. I am joined by my two distinguished colleagues with me in this session, Dr.

Nishi Kawa and Ms. Lindsay Davids. So let's get started, let me see. I can't, I think I can do that. Okay, what we will do in this session is to explore how models of nature can help us determine probabilities that can inform our anticipatory action.

So we are looking at, this is very basic DRM cycle. I'm sure all of you are very familiar. This is probably a couple decades old. But what I like to indicate in this, cycle is that how our models of nature can help us determine probabilities that can inform our anticipatory and early actions.

What we're seeing here, looking at, knowing that risk is a function of probability and consequence, and looking at the DRM cycle here, starting with mitigation, then we move to preparedness, and then forecast to inform us about our action, anticipatory action just before the event happens.

I'm trying to show that, okay, here is disasters. And then response, and then recovery, and then cycle goes around again. As we travel in this cycle, what I would like to do here, hold on a second, let's do this, here we go.

We see that probability do not remain constant within this cycle. Prevention, mitigation, and preparedness basically reduce the consequences of disasters or hazards, while forecasting provide us a dynamic information on probability.

So including probability in our decision making is extremely important for prioritizing our action, also managing our resources. As you know, no one in Earth has unlimited resources to spend without thinking or prioritizing.

Okay, what we will do today, so welcome to Wheel of Anticipation. We're gonna do a quick exercise. Wow. Sorry, I didn't know this is, I'm talking about uncertainties. We started with a completely different panel for this session, but unfortunately, many of our panelists, due to uncertainty, are changed, but we still ended up with a fantastic panel.

So bear with us. All right, so what we're gonna do, every section we're gonna divide to a community. Assume that you're in a watershed, right? And every section is a community. I'm gonna ask, oh hey, help me, the community so you'll remember your numbers.

You wanna start there, that will be number one. That's the community one. That's community two, community three. He's gonna get his exercise, four and five, excellent, great. So this is our communities.

You see one and two over here are in the green zone. So your national meteorological or hydrological service issued a warning of a flood. So it's saying, oh, it's gonna be a catastrophic flood is predicted.

So we basically, as a disaster management agency, I'm looking at this risk map and I say, oh my God, the red zone requires some assistance. So I'm gonna prioritize my assistance to red zone. So four and five here, you're getting some assistance.

Looking at one on two, community one on two, I say, okay, they are safe, no assistance is needed. And three here, yeah, they're gonna get some impact, but they can handle it. So this is before the event.

So of course, life is full of surprises. And here's what happens. The forecast shown that faintly behind the outcome, right? What happened? Number one, let's see. So we have uncertainties on forecast, obviously.

And then we resulted some incorrect anticipated actions, anticipated events. So section five, this section was given assistance, but they're not affected. So they come out all right, right? They got the assistance, but no impact.

But section four was given assistance. You're the section four or community four, and you got impacted. So you were prepared, you have the assistance, you're okay. But the bad news is for section two, colleagues in section two or villagers in section two was not even warned, and they were affected.

So maybe very shortly, I can ask you, maybe start with section two, four, and five, how did you feel? How does it feel like left out from assistance and not even warned? And also, how would you feel if you're a disaster manager?

Right? Anybody has any feelings against that? I know David said. Tom's done that national met service in really in deep trouble. So I mean, that's a very simple way of describing how forecast can actually, if you don't understand the uncertainties associated with forecast, you can, prioritization of your action of limited resources can be very tricky.

So let's look at it. Okay, what is the bad news, good news, and the bluff? So good news that you can calculate the benefits or actions versus inaction using the probability risk formula, right? As a function, risk is a function of probability and consequence.

The good news is that there are improvements in the forecasting techniques. You all know about UN Secretary General's early warning for all cold. Hopefully by 2027, everyone in Earth is gonna cover with early warnings.

So hopefully community two is gonna have a better forecast to get prepared. And also we're also improving impact -based forecasting. So the bad news, forecast uncertainty is real, significant, and unfortunately it's not going anywhere regardless how much improvement we have in our forecasts and modeling.

Assuming pre -event certain to fail, there are always gonna be a false alarm or missed alarms. So to summarize, we can scale up anticipatory action according to resource savings related to action compared to inaction, right?

These savings can be estimated using known and estimated probabilities for all possible outcomes. So we can weigh our options and prioritize our resources. Of course, communities will be best served understanding forecasts and certainty, estimate their own risk, and preparing for all possible scenarios or outcomes.

Now, what I will do, I'm gonna start some of the discussion and uncertainties associated with hydro -metrological hazards. Then we're gonna go to discussions on earthquakes and volcanoes. Bear with me, I have to figure it out.

Here is my other presentation. I'm not familiar with this system, here it is. Okay. All right, I'm gonna briefly talk about hydro -metrological early warning systems and forecast uncertainty. This is what I'm gonna talk about, but I'm gonna buzz through it.

Okay, what I'd like to do, go, this is a very common list of hydro -metrological hazards and there are more. Some of them are very common. We all know the cyclones, hurricanes, typhoons, wherever you are, floods, and droughts, but there are others, many others, hydro -met hazards.

In certain hazards, especially those common hydro -met hazards, we have worked through our early warning systems and forecasting capacities, but certain hazards, we don't have much. Given that last 20 years, over 90% of total number of natural hazards, total number of disasters due to natural hazards are caused by hydro -metrological hazards, and those disasters also affect about 95% of the total number of people affected around the world.

We, as disaster managers, or civil society organizations, or communities, private sector, whoever is involved, which affects all of us, have to do a little bit better on reducing the impact of those disasters.

So let me go directly. I love this quote because all models are wrong, some are useful. So we'll focus on the useful one, but keeping in mind that there's uncertainties associated with those models. So in implementing early warning systems, we go what we call NDN, hydro -metrological early warning system.

The NDN system has many components, and those components link to each other. Failure of one component or the link is gonna cause the failure of the entire system, and the failure of the goal of warning people ahead of the hazards.

So what I'd like to talk about, I actually borrowed this from our colleagues in the U .S. National Weather Service. It explains the uncertainty and the lead times. So in hydro -metrological hazards, we have minutes to almost years in terms of the lead time predicting various hazards for serving various benefits.

But as you see the envelope, as we move further into the future, from minutes, you see the envelope is pretty narrow, and when we move, the forecast uncertainty increases. So I'm gonna give a brief example to talk this forecast uncertainty.

Of course, the hydro -metrological models only simplification of how the nature works, especially the complexity and non -linearity of meteorological, hydrological, and oceanic processes. We obviously can't fail perfectly describing physical processes, which result in a lot of uncertainty.

Thank you. Thank you. that brings the skill and reliability of those models in early warnings. Let's see, okay. And uncertainties in hydromet models can be different causes. I'm gonna list some of them.

I'm sure I'm gonna forget most of them. Initial condition uncertainty that's come from the observation and lack of data or assimilation techniques. Uncertainties in boundary conditions by setting up external boundaries.

Model uncertainty due to model structure and parameterization. Of course, temporal and spatial resolution can also increase uncertainty. This is especially critical for short views, localized events.

Human related uncertainty is a big one, such as expert judgment or interpreting and making decisions, communication uncertainties, and uncertainties due to long term changes such as climate change, land use, and other uncertainties using hazard models to predict impact.

So we are still learning on this one. So we're looking at the tropical cyclone basins around the world. We get about 80 tropical cyclones on an annually, on an average, in a year. Majority of those tropical cyclones don't become a catastrophic disasters.

80, we maybe have a few in a year. So when we look at the path of hurricanes, what I want to do, I'm gonna pass this. Again, I borrowed this graph from our colleagues in the National Hurricane Center in the US.

We're looking at official annual average track errors of tropical storms or hurricanes and hurricanes. Looking at the data from 1970s to nowadays, 2020 plus, you can see red line, basically, those are the track forecast for 24 hour lead time, and the yellow line is 72 hours, which is three days forecast.

And as you can see in the 24 hour lead time, the forecast error is about a little bit, let's say around 100 nautical mile, which is about 180 kilometers. So next 24 hours, basically what they tell us, next 24 hours, our hurricane or tropical cyclone will be making landfall anywhere between that 180 kilometers.

This is not the scale. For three days, it's 700 nautical miles, which is translate to about 1 ,000 kilometers. Just to give you a perspective, distance between Himeji and Tokyo is about 600 kilometers.

So that really increases the uncertainty covering a large, huge area. But good news is that when we look at over the time, last 50 years, we see that forecast errors going down. Especially for 24 hours, it is, I think went down to 45 kilometers, which is fairly, fairly good and manageable.

I'm talking only for the Atlantic hurricanes, not other cyclones or typhoons here. And then three day forecast went to 275 kilometers. So that's pretty good for three days. And then hurricane centers start to issue five day forecast in 2000.

And when you look at the blue line, it's the five day forecast. Now five day forecasts currently give us an uncertainty envelope of about 275 kilometers, right? This is where we started for 24 hour lead time in 70s.

Now we can do five days. So that is amazing news. But still there's a lot of uncertainties. So again, looking at those track errors, again, it's important to understand those uncertainties. Because how you warn people, what action you take is gonna be extremely critical.

As I mentioned, most of us don't have unlimited resources and we have to make very difficult decisions like choosing community four and five when we issued warning in our little exercise and leaving community two.

So it's extremely important to invest in disaster risk reduction. That's why we are here for prepareness of hydrometrological and geological hazards rather than reacting to potential impacts. So it's always pays, especially for Sutter onset events.

Well, thank you so much. And what I'm gonna do now, I'm gonna invite my colleagues, Dr. Nishikawa to present forecast messiness probabilities and anticipatory action. And he's gonna talk about earthquakes.

Let me find this. Thank you.

So, good morning. My name is Sator Nishkawa. I'm the senior advisor at JAGA headquarters for disaster reduction strategies. So, let me start. Now we're talking about anticipatory action. How can we take anticipatory action?

Well, first we can take action based on past experiences by looking at historical records or geological surveys. Also, we can take nowadays with scientific knowledge, we can do the scientific assessment.

So, we can appreciate the probabilities of the risk. And what is important is if we can imagine future disaster or tragedy, for example, what if your house collapse? What if your school children's school collapse?

What happens if a bridge fall? Then that issue becomes real to you. On the other hand, now we have knowledge of effective preventive methods nowadays. Then we can take action. And to do this, the cultural prevention must prevail, encourage action for safety and resilience.

I think you all know the name, the Sendai framework. And I'm going to speak about the city of Sendai. Now, we had a terrible earthquake about 30 years ago here in Kobe. And based on that experience, the Japanese government commissioned a group of scientists to identify where are the possible sources of major earthquakes in and around the Japanese archipelago.

And this is the result. The red oval shapes in the ocean are the sources of the tectonic ocean earthquakes. The black lines on the land are the active faults. And this is a result of the report by the group of scientists, and especially the so -called Miyagi -ken Oki earthquake was predicted to happen with a 99% possibility within 30 years.

And that's very close to the city of Sendai. Now, 99%, well, usually people would think that's definite. And the city of Sendai was quite serious about it. And based on this scientific evaluation, the Japanese government made a pre -disaster risk assessment of such Miyagi -ken Oki earthquake.

And the scientists told the government that the most likely the earthquake would be between magnitude 7 .6 or magnitude 8 .2. And the Japanese government came up with a risk assessment in 2006. And, well, these are the figures.

And it said that the casualties might be between 90 to 290. Well, that's quite serious. But what happened in 2011? It was a magnitude 9 earthquake in Tsunami. And as you know, the energy of a magnitude 9 earthquake is approximately 32 times stronger than the magnitude 8 earthquake.

So it generated an enormous tsunami. The earthquake in Tsunami happened as predicted, but the scale was quite different. But what did the city of Sendai do when they heard that there is this 99% possibility?

They took it serious. The Sendai city has a population of approximately one million. And they got this very serious. They found that the risk is imminent. So they took a series of policy and action. They first started in 1999.

They came up with the so -called Sendai City Building Asset Seismic Safety Target. The idea is the Sendai City has some buildings, like schools or their headquarters. So they said that they have to enforce their buildings against earthquakes.

In 2005, they made a massive public awareness campaign for earthquake awareness. And based on this raised awareness in 2008, they made the Sendai City earthquake regime policy and took a series of actions.

This is the big event the Sendai City organized in 2005. Fortunately, I happened to be the director of disaster awareness at the cabinet office at the time. And my office and the Sendai City co -organized this big event in Sendai.

You see the mayor of Sendai, the president of the Japanese Red Cross Society, also the vice minister of the cabinet office, three of us calling to the Sendai citizens that the earthquake will definitely come.

So be prepared. You have to take action. And based on this awareness, the Sendai City took real concrete actions. For example, the Sendai City Hall was a very old building built in 1965. So it was weak.

And they made retrofit works in 2007 and 2008. And they placed these not so beautiful braces against earthquakes in the city hall. But thanks to these efforts, when the earthquake came, no damage to the Sendai City Hall.

Sendai City checked all their school buildings. And some of them were found to be weak. And they also retrofitted the schools. So when the earthquake came, none of the Sendai schools collapsed. Not a single child was killed in the building.

So that's good. The Sendai City also checked all the fire stations because they carefully checked what happened in 1995 here in Kobe. And they found that some of the fire stations, their doors were crooked.

And the fire engines could not start immediately because of the earthquake damage. So the Sendai City checked all the fire stations. And they made the necessary retrofit works. So when the earthquake came, they all started.

So this is the government. There is another good example of a small -medium enterprise in Sendai. This company is called Suzuki Koyo. And they are specialized in waste recycling from hospital garbage.

And nowadays, you cannot just throw away the syringes from the hospitals. They may cause infections. And they were specialized in treating these medical wastes. And the

CEO of this company was learned that there's a 99th possibility of such an earthquake in the near future.

So what he did, at one party, he made a good friend with a similar company in Yamangata. Yamangata is about 50 kilometers away from Sendai, doing the same business. So he and the CEO of the Yamangata company signed an agreement that if one of their company ought to be hit by any disaster, the other will help.

And they signed a treaty beforehand. With the earthquake in Tsunami, his main factory was totally destroyed. But two days after the Tsunami, he collected all the medical waste from the Sendai hospitals and called the Yamangata company and asked for help.

And based on the agreement, he handed the waste to the Yamangata company and asked them to treat them on their behalf. They were successful. So there was no interruption of the services that was so necessary for the hospitals.

When the earthquake happened, many of the children, they ran to the high grounds because they were educated that if there is to be an earthquake in that area, there's a high possibility of a tsunami.

So this is a picture of the junior high school students guiding the nearby elementary school pupils to run to the high grounds, and they were all safe. A massive evacuation was done in this case. Approximately 500 ,000 people were in the tsunami inundated areas.

Most of them escaped, but 20 ,000 did not make it. The mortality rate in the Indian Ocean tsunami of the inundated areas was about 40%. In the case of the Great East Japan earthquake in tsunami, the mortality rate was 4%, and the difference comes from where that area is prepared for a tsunami or not.

But there are various cases. This is a story of a fourth grade pupil. She experienced the earthquake, and she was at her home with her grandma. And when she felt an earthquake, she insisted that they have to evacuate the high grounds.

The grandma said, no, no, no, no, no, there's no need. But she insisted that she should escape, and they ran together to the high grounds, and both of them were safe. So this is a very good case of how preparedness and awareness of school children can save lives.

This is a very tragic story. Now, this is a story of an old lady, and she felt the earthquake, and she was with her young bride. And the young bride said that this earthquake was big, there's a tsunami warning, we should evacuate.

But she refused to evacuate. And as a result, both of them were trapped by the tsunami and were killed. Now, compare these two. The human reaction is quite important. These episodes are taken from the so -called Ichinichi -mai project.

Ichinichi -mai means the day before the disaster. And I started this project to make awareness programs for Japan, and what we do is we interview people who have really experienced a big disaster, imposing the question, what would you do if you were back the one day before the disaster?

And they will start telling you what were their mistakes, how they regret, what was their big difficulties? And this serves as a good material for public awareness campaigns. Now, coming back to anticipatory action.

How can we take anticipatory action despite messiness? Of course, now we have modern science. We have great progress in science, but there are still uncertainties of scientific findings. For example, nowadays, we can now tell when a volcano is going to erupt, but we don't know how long it's going to erupt, and we don't know the volume of the volcanic eruption.

We know when the rainfall is coming, but we don't know the total precipitation right now. We know where would be the possible sources of the earthquakes, but we cannot really tell when it's going to happen or how big the earthquake may be.

The hazard events cannot be precisely determined beforehand. They are usually shown with probabilities. Now, what is the human reaction? Human beings, it's human nature to underestimate the risk that they face.

They always underestimate the risk. In case of the tsunami, many of them question, do I really need to evacuate? Also, especially for long -term predictions. For example, a mayor or a CEO of a company, they may be informed of such risks, but there is always a big obstacle.

He would not like to take action within his term. In his mind, an evil will say, whisper to him, don't worry, nothing will happen during your term. I call this the nut in my term syndrome. And this is sometimes the biggest obstacle for any action.

Now, I just would like to emphasize, don't forget that human beings are lazy, forgetful, and make mistakes. That's human nature. And how can we translate scientific knowledge to urge the human beings to take action?

That's quite important. Thank you very much.

I mean. Thank you. All right, so my name's Lindsay Davis, and I'm a senior geoscience advisor at the U .S. Agency for International Development, and I actually also sit within the Earthquakes Hazards Program at the U .S.

Geological Survey. I am on Cizine's team, as a matter of fact, at USAID, but I'm presenting on behalf of my colleagues who were unable, unfortunately, to be here today, as Cizine mentioned, our panel composition changed a little bit, but Gari Mayberry, who has been a senior geoscience advisor on volcanoes at USAID for the past 15 to 20 years, I'm not sure the exact number, just recently took a position as the Volcano Hazards Program Coordinator at the U .S.

Geological Survey. And so these are her slides, which she graciously shared with me, and I'm going to be talking a little bit about anticipatory action for volcano crises. And so this is from a multi -hat perspective, both USAID and USGS.

So volcano hazards occur at both a local and a global scale, and different volcano hazards require different types of decisions related to societal impacts. And the ability of geoscientists and atmospheric scientists to monitor model forecast volcano eruptions has greatly improved over the past few decades, as Dr.

Inishi Kawo is alluding to in his presentation. But there's still some gaps, and there's still a lot of uncertainty that exists around these topics. And as was described by my two esteemed colleagues, there's also a very important transition between the scientific information and societal action that needs to be addressed in order for successful scientific and probabilistic estimates to be communicated and acted upon in a way that's meaningful enough to save lives.

So I'm going to focus in a little bit on the specifics of anticipatory action, that specific place between when we know an event has begun and when the events actually have fully played out from geologic hazards in this presentation, and really looking at that interface between volcano research and monitoring, and between societal response before, during, and after an eruption.

Thank you. In order to talk about this, I did want to mention the Volcano Disaster Assistance Program, which is a bilateral activity that USAID and USGS have had ongoing now for about 40 years. This team was developed in response to the eruption of the Nevada del Ruiz volcano in November of 1985.

In that situation, hazards were identified, warnings were issued, but the communication to the public failed, and unfortunately, 25 ,000 people were killed in a volcanic lahar or mud or debris flow that reached the city of Amaro.

As a result of that, a business case was made to USAID at the time, it was the Office of Foreign Disaster Assistance, now it's the Bureau for Humanitarian Assistance, to form a joint program with the US Geological Survey to provide proactive response to volcanic unrest and to prevent emergencies from becoming disaster.

And so VDAP works in the background to support international counterparts and to provide information to the USAID humanitarian community related to volcano crises. Since then, we now also have teams that focus on both earthquakes and landslides, so I actually manage the team that focuses on earthquakes, and we have one other colleague who focuses on landslides, and the volcano team has, I said, been around about 40 years,

the earthquake team about 10 to 12, and the landslide team about four to five. So really diving into the terminology behind anticipatory and early action, it's It's the act of essentially thinking about the predicted hazardous event and what can be done to prevent or reduce the acute humanitarian impacts before they fully unfold.

And so some of these terms are used interchangeably, anticipatory action, early action, forecast based financing and action can be linked directly to some of these things. But there are generally three criteria that define early or anticipatory action.

And that includes action that is predicted on a forecast or collective risk analysis, action that takes place before impact of a hazard hits or fully unfolds, and action that aims to mitigate or reduce the impact of said hazards.

So the practice of doing this can be a lot more challenging than it seems. And in general, although there's interest from myriad partners in scaling up anticipatory action, financing, including collaboration between finance communities and humanitarian and DRR communities, still has a lot of structural barriers around that that need to be worked out long term.

So I did want to mention a case study here from Bagana Volcano in Papua New Guinea. So an eruption beginning in early July, 2023 prompted the evacuation of approximately 10 ,000 people and the distribution of relief supplies.

This was ahead of anticipated larger eruptions that were to occur later in the month in an anticipated form. And so knowing that this volcanic crisis was ongoing, usually scientists think about the area within approximately five to 10 kilometers around a volcano as being exposed to different potential hazards.

And those hazards can look different depending on which volcano is actually in question. There are a lot of differences in terms of the type of volcano and variables. And that, as Dr. Nishikawa alluded to as well, the frequency recurrence of eruptions, the duration, the magnitude.

And so everything from asphalt to pyroclastic flows, lahars, lava flows, volcanic gas, and other hazards can change how action needs to be taken depending on individual volcanoes. And there are different scientific groups that tend to monitor these hazards through volcano observatories.

Groups focus on things like geology, deformation, or changes to the surface that might indicate movement of magma below the surface, seismology. Some volcanoes even have special seismic signatures that are related to the types of eruptions that might be expected.

And gas geochemistry, which gases are exalving, can indicate how close to the surface magma is and other factors about a potential impending eruption. So going back to Bagana, our team believes that providing these supplies counted as anticipatory action because of the situation at hand.

But there's still uncertainty in the community about what constitutes anticipatory action. And so that is still a question, and it's a question that I think also applies to earthquakes, whether or not resources are provided to individuals in these periods of uncertainty, and how the provision of these resources, whether it be cash or relief supplies, evacuation, et cetera, can really impact how events unfold,

as we saw during the game at the beginning of this session. Some people can be left out, and that has huge implications for recovery, for wealth distribution, and other factors within a given society.

So it's really necessary to continue to think about whether volcanoes and other geo - hazards are a good candidate for anticipatory action and the provisions that are associated with that and resources that may be distributed as a result.

So volcanoes are a promising candidate for anticipatory action, but additional evaluation is needed. The START network is one group that has tried to evaluate some of this, and in one study they conducted, they analyzed 14 funded projects from 13 anticipation contexts.

And unfortunately, no instances of volcano forecasts resulted in the expected impact in that particular study, but that also highlights the high possibility of uncertainty that still remains related to volcanoes despite the improvements in eruption forecasting.

So just to summarize some of the achievements and challenges and some of the opportunities that exist, VDAP has supported anticipatory action by assisting with the development of early warning systems, by providing technical advice to counterparts and stakeholders for eruption forecasting and impact evaluation, and then counterparts are able to take anticipatory action that has led to evacuation and closure of key infrastructure and assets that may be at risk for interruption.

And additional aspects of anticipatory action that still warrant evaluation and exploration include whether or not anticipatory action related to volcanoes is truly effective, given this uncertainty that still exists, the triggers for action that might be the most suited to this particular geohazard, and then sustainability and localization of anticipatory action.

And as we heard from my colleagues, really the risk communication component of this and the culture of preparedness, the infrastructure that exists and whether things are set to a place where providing resources to a community is actually gonna make a meaningful difference, and the psychology aspects are really important.

So making sure just from a risk communication standpoint that that scientific information provided to communities is consistent and that it's coming from multiple trusted sources so people are able to act on that information and use what they know from their culture of preparedness to make informed decisions to secure their own safety and the safety of their property is where we're headed with this.

So I'm looking forward to the discussion here and especially related to kind of bringing it full circle back to earthquakes since that's my forte. I think understanding new scientific tools is also something that I'm interested in.

So operational aftershock forecasting, for example, once an actual earthquake occurs, one in 20 earthquakes are followed by a larger earthquake. So whether there's action that should be taken in that time, whether earthquakes which are almost invariably followed by aftershocks, whether resources that are provided during that time and information provided during that time qualifies anticipatory action is the question that I think our team is thinking a lot about at USAID and be curious to hear the perspective of everyone in the room and Dr.

Nishikawa has an earthquake expert as well. Thank you very much. Appreciate the opportunity.

Okay, I'm gonna try this. Oh, it's working. Now I'm gonna invite Lindsay and Dr. Nishikawa to the panel, and we are here to answer any of the questions you might have. And Kohei is gonna help me with the microphone.

Do you want this? I think he has the microphone for no questions. I think, oh, whoa. We'll start with community four. Maybe we'll go with the lady with the blue sweater. Oh, okay, we'll just go there.

That's fine, that's fine. We have time. Thank you.

My name is Murray Dale from JBA. Professor Nishikawa, thank you very much for the presentations. They're extremely interesting. Professor Nishikawa left us with a question in his presentation about, at the end, how do we get people to take action on these probabilistic uncertain warnings?

And I was hoping he was going to then answer that question, but he stopped and left it for all of us. But I'm interested to hear what Professor Nishikawa and anyone else thinks

about that. What techniques are there for people to take action on these uncertain forecasts and warnings?

Okay, thank you for the question. Well, I always try to figure out what are the possible tools. And one of my answers is, human beings, if they have empathy to similar cases, they would take action. That's my idea of bringing up the day before project.

Another thing is, how can they really accept the possible, I would say, damage to themselves? Then they can take action. Well, I'm always telling people that maybe 40 years ago, when we drove a car, we did not wear seat belts.

But nowadays, everybody wears seat belts. Because we don't want to be killed in accidents, and that's definite. So it's, I would say, it's a repeated risk communication by the safety authorities, which has resulted in the seat belts.

And I guess we need to take a similar approach to disasters as well. But the problem is, we see the news of traffic accidents every day. But we do not see the real cases of disasters every day. And that may be the difficulty.

I'm sure I'm not question, my answer is not perfect, but that's my answer for the time.

I actually could take a stab at that as well. I worked for a sociologist at the Natural Hazard Center, which is the clearinghouse for disaster information in the US prior to joining the US government.

And it's interesting because I think there are a lot of sociological, anthropological studies that can inform that question. And so a lot of what I've heard is related to, first of all, from a scientific community, protective actions need to be provided as part of the information related to scientific information.

And scientists need to be perceived as both approachable and credible, which is a kind of hard combination to achieve. And people take the information and the protective action and engage in what is called milling.

So they wanna talk to all of the other people in their lives and see what other people are planning to do. And only after they're convinced that the other people in their social network are taking action, that's when they're actually gonna act.

And I've actually experienced this myself. I was in Hawaii when the emergency notification system message came in that there wasn't, it was a miscommunication, but it was, we were told to take protective action for a possible event.

And people took action, but I went down and asked my family, did anybody hear about this before I did anything as somebody that works in a scientific and emergency management community? I didn't immediately take the action that was suggested.

I wanted to know what other people in my social circle felt before I did that. So just thinking through the sociology of it is really important as well.

Yeah, maybe a small thing to add, as Lindsay said, people believe their families, friends, neighbors, and colleagues more than they believe sometimes they authorize entities. So I think it's extremely important to leverage that circle of friends or families to communicate that impact and warnings.

I think as Dr. Nikeshiawa also, Nishikawa also illustrated the little children, you know, the grandma basically convinced by a grandchild to take action. So those are extremely important. I think in U .S.

National Weather Service, they did a lot of studies and focus groups to understand how can we communicate warnings to people. And through that program, the Weather Redinations, which is an impact -based program born, has little, what program has is called ambassadors.

A beauty parlor in a community can be an ambassador and warning or informing their clients has significant power to take action. So I'll stop there. Thank you. Thank you.

Do you want to go first? I did want to continue on this question. Slowly getting to you. Thank you. And I'm Michalena from IHE Delft in the Netherlands. And I want to actually continue this discussion.

And thanks, Professor Nishikawa, for this wonderful concept of not in my term, which I thought was a very nice concept. And I was wondering, also coming on this discussion, of how people take decisions on multiple knowledges.

I mean, I think we always assume that it's just a scientific knowledge, which obviously it's not. It's in a triangulation with your community, your peers, and leaders. But I was also questioning, and I think Japan is an excellent example of establishing a culture of risk.

I mean, I come from the Netherlands. And you would think the Netherlands has a good culture of risk. And I work in floods. I would actually say we have a very poor culture of risk. Because we think that the risk is assumed by the Netherlands government.

So my question is, how do you establish such a culture of risk? And maybe a little bit more complex. How does that work for different types of hazards? For example, I work in droughts. And because it's such a long -term event, is the culture of risk very different than, for example, an earthquake, where people have a very different relationship?

Yes, well, that's a difficult question, I must say. But I would like to emphasize that after disaster, all the headlines speak or highlight failures. But in order to spread the culture of prevention, we must highlight success stories.

For example, I showed you the example of the Sendai city. This was totally not highlighted in the news because it's not so attractive for the media. Failures are so attractive. But the success stories are often under, I would say, it's always hidden.

But we must praise the people who have took anticipatory action and have made successes. Otherwise, there is no way to really spread the culture of prevention. Yeah, that's my one answer.

I think you touched on something that is really important in this conversation, and that is a multi -hazard approach. I feel like scientists often are very siloed in their thinking, and I actually raised this topic during a session yesterday, but I think that it's understanding how to think about hazards as a collective risk portfolio is something that needs to happen a lot more than it is currently,

and so I think that's kind of one branch of that, and once people understand how to do risk assessments inherently in an individualized way, I think they'll be able to see – yeah, I see you nodding. I'd love to hear your reaction after, but I think they're able to make some of those assessments in a way that they might not be otherwise, and I think that includes climate change, right?

There are things that people are grappling with that are not necessarily based in historical scenarios of things that their family members may have had to deal with or the like, and so trying to think about ways to encourage people to think in a really long -term scale rather than just acute crises that might be happening on a more regular basis is important, and I also think from the implementation of some of these strategies,

as Dr. Nishikawa mentioned, children are a great avenue, and so disaster committees in schools I've seen as a really effective way because then all of those students are excited and energized by each other, but then also take those lessons home.

Yeah, maybe a quick thing to add. You have to work at all levels. I mean, great examples of children, but also examples of municipalities getting ready for it or providing the policies, bringing all the enabling environment, not just drills at schools, but getting the plans and priorities, policies in place is gonna help.

Of course, it's gonna take time. It might be a little bit easy for the frequent disasters because if you witness that, you can believe, as Dr. Nikeshava mentioned, that that will

happen to you. Like in terms of hydromet hazards, floods, cyclones, we see devastating pictures.

It occurs pretty frequently compared to a volcano or maybe even large earthquake and tsunami. So I think those, I remember when Haiti earthquake happened in 2010, I hear that we basically at the USAID, we get a lot of requests from many countries to be prepared for earthquake.

That scale of earthquake was a wake -up call for most countries, so there's a lot of plans and policies to develop based on that. So I guess empathy kind of work. I know denial. I guess we're all humans and we deny on anything bad can happen to us.

One of the scariest thing with the climate change, we are seeing emerging hazards on places that people are not experienced. So we have to somewhat start working, raising awareness. We see tornadoes in places, would never happen, wildfires and other events.

So it's gonna be a little bit challenging to build that culture of risk plus getting raising awareness in the emerging risks. Now Mike is yours.

Yeah, thanks a lot, Evelyn Wilhoefest with Metrological Office, impact -based forecasting. Thanks a lot for these really interesting presentations. And I actually, I think my case is a bit related to the Dutch case, but I was thinking on both scales.

So the Japan case was very compelling because in a third year period, you had basically a 99% chance of something happening that is also extremely severe in its consequences. So it seems a bit like a no -brainer if you have the monetary resources to do something.

Now, in many other cases, like in Switzerland, for instance, where you don't have such hazards, luckily, a lot of the events are less severe, much more uncertain, and on a much more local scale. So when we talk to first responders, very often they say, unless you're 90% sure, which for a very local phenomenon, you basically never are.

They don't really, yeah, let's say, they don't care, it's maybe too harshly said, so if you have different phenomena at more local scales, I find it very hard to get this risk culture or awareness. But then I was also thinking the other scale on the UN -based weather for all warnings and so on, where maybe you have a much larger portfolio and suddenly you look at a whole continent, and if you have to plan anticipatory actions on such a scale,

that's again maybe not possible. So how do you deal, it's a very open question, but how do you deal with different scales, different probabilities, uncertainties, and so on, if it's not so clear or compelling the case?

Yeah, that's a great question and comment. As I mentioned, temporal or spatial resolution is critical in terms of forecast accuracy and uncertainty. Very localized events like flash floods, for example, is a little bit difficult to predict in longer time scales.

We work around the world with, we're working with almost 74 countries on increasing their capacity on flash flood guidance rather than early warnings because they can happen in less than six hours. But it is, as I mentioned, the resources is a very important component.

However, one of the things we see in the community, and this was actually came up very clearly in the Sandai framework of action, Sandai framework for DRR, is that small and frequent scale disasters actually cost more and more damages.

Maybe the communication has to come up with that, giving the uncertainty of prediction of those events fairly high, but investment is pretty high, especially those small scale events in terms of loss of life is critical.

So.

I think volcanoes might actually be a really great hazard to consider because there are certainly some volcanoes that erupt on a very regular basis, but others where there are

people all over the world that live in cities that are under the shadow of a volcano and the majority of the population has absolutely no idea that they're in an area of risk for a volcanic eruption.

And so I would say scientists really advocating for incorporation of that material into school curriculum and things like that so that people just know, these black swan events are the things that actually change people's lives in a drastic way.

And so those low probability, but very high consequence events are things that even if you plant that seed, people may be more likely to have that in the back of their mind than in case something does actually occur further down the road.

At least they know what's happening and time to potentially take action.

Maybe the point is how to translate the scientific findings into human beings' real life. For example, volcanic ashes. If you wear the contact glasses, the volcanic ashes, if they go into your eyes, you're going to use a sight.

Such, I would say, personal consequences. If they are explained, then the people might take real action. Thank you.

I think we are coming to end of our session is 10 .30. We can stay there. I don't think anybody's outside waiting for the next session. Next session presenters are here. We'll take maybe one more question.

Thank you for the great session. I'm Takamasa from JMA, Japan Meteorological Agency. I want to talk about different type of hazards that is heavy rain. Heavy rain occurs pretty much every week rather than the earthquake that happens every decade.

So that is quite difficult because heavy rain occurs so frequently, frequently people kind of get fed up with warnings. I am a parent and I receive email from local government

saying that tomorrow heavy rain will occur so your children might come back to your home earlier.

But that message, I receive pretty much every week. So what can I do? So that's, so I want to probably, I ask you about how should we take anti -spice action towards a disaster that can happen so often that people find difficult to take action.

That's a hard question. Yeah, I think that we call it use the fatigue of warnings and too many warnings cause ignorance of the warnings. Unfortunately, it's a very dangerous thing. The balancing, of course, with the losses versus the consequences versus the warning is going to be an important thing.

But I think, again, I'm coming to Dr. Nishikawa's empathy and building culture to act upon the information with the no -regret strategies. I think that's one thing we need to emphasize and seek for. I know we are not there yet, so I'm going to start.

I think the more interactive tools that people have access to and the better they can use those, the more they're able to kind of locate themselves within a larger scale body of information. And so I think I'm hearing more throughout this conference about places that people can go to look at their individual house in terms of different types of hazard events that could impact them.

And I think that encouraging that culture of, yes, there may be warnings for heavy rain or other hazards that are happening, but the more they can feel like there's ownership and they can go and find sources of information related to that hazard that are really specific to them, I think the more that they're able to take that ownership and see the individual consequences as Dr.

Nishikawa articulated.

I would like to emphasize that there are solutions. You have to emphasize that, of course, you get warnings, but every day you get warnings, and then you get paralyzed with these warnings. But there are solutions.

And if people know the solutions, they can take action. Thank you.

Yeah, very much.