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He's a climate change adaptation specialist. Nippon Koei, a company limited in Japan, he's now incorporating climate projection into adaptation and risk assessment for the Nippon Koei Engineering Project covering water resources management environmental impact assessment, disaster preparedness and sustainable development.

Mr. Irang Shing Sanjirah, he's a deputy director of water resources planning at the Mahabeli Foundation and he's now studying at the Aichan. Investigating the methodologies for incorporating the climate projection output into decision -making processes for trans -boundary water sharing.

So I'm sorry, I'm Toshiyoko Ike, the director of Aichan. I'm moderating this session. So firstly, I would like to invite Professor Kantosh for his presentation.

Oh, sorry.

Okay.

Thank you very much, Kouiki Sensei, for your introduction. Flash floods are a global concern and are significantly increase affecting our cities in Asia, in Africa, in different parts of the world. But surprisingly, in the arid environment, wadi flash floods are significantly affecting or damage the cities and frequently happening as well.

That evidence by or proved as happened in Oman, in Jordan, I'm not sure, can I? Thank you. as happened in Oman, in Jordan, Saudi Arabia, and the damn failures in Libya last year and the incident of an invitation of Dubai airport this year.

At Kiyot University, we established a network for Wadi Flash flood network where institutions within these almost eight countries in the Middle East, North Africa, with different institutions in Japan and including Vietnam and the Philippine in Asia to support disaster risk reduction and water harvesting over the MENA region.

So, the extreme flash flood occurred frequently in the MENA region and left a large number of loss and economic damage, especially in the coastal Wadi. What is the coastal Wadi? So it's a kind of system that connects between mountainous to the sea and where these rainfall generate erosion of muds and sediment transported to the downstream and most of governor or local government try to manage by constructing a retention dam, recharge dams and this kind of driving factors of climate change and urban expansion and water harvesting for this effort.

Here, the climate or extreme climate pattern are very much changing. Too less water in a very prolonged time and too much water suddenly in a short time. How to manage their system? In Algerian government, they decided to make intra -basin water transfer, constructing several dams and transferring the water, but that generated lots of challenge for artificial flood in the urban area due to the risk communication between different stakeholders.

The natural climate or climate variability and also human impacts because of the design of the dams cause or lead for the main cause for the dam failure, two dam failures in Boum and Sur Dam and the Bela Dam in Wadi Derne, in the flood last year, where the last dam is very little, 100 meters far from the urbanized area.

We conducted a post -flood survey where we found more than 12 meters flood has been reached. Here's the pictures of the flood dam, the failure of the two dams and we can see the second dam has completely flushed away and caused more than 5 ,000 loss of life, 10 ,000 missing and more injured.

Here, you can see the building almost washed away before and after the flood, which was really a very big disaster, second than failure. So we examined the climate change impact, especially and temporarily, current and future, and we found that over the region there are a big difference.

Some areas will receive a very extensive high rainfall with more than 10 times higher. Some other areas are a little bit less ratio. However, this brought us for that we must update the intensity duration freak or duration frequency curve, IDF curve for existing and future infrastructure that will be constructed in the future.

Additional effort we tried to upgrade or propose upgrading for the early warning system, including more accurate rainfall prediction utilizing weather radar or other high technological monitoring system.

So we tried to install a real -time monitoring system technique that was really very unique and the first time to be implemented in Oman, where we have utilized the geophone acoustic for measuring the triggering of the first part of the water with camera and trying to measure the water level flow velocity and the couple with machine learning and artificial intelligence to develop and to support the early warning and also updating the incoming water to the downstream and for the dams.

We tried to develop a kind of approach where structural measures and the non - structured measures are implemented, but additionally also water harvesting because most of this water in the desert. You please imagine harvesting this water are very precious to be utilized for drinking and agricultural water used at the end.

Then we tried to propose this integrated approach where structural measure, non - structured measure and water harvesting approach should be combined. We found that a kind of new energy should be formulated to establish or to make the facilitating the linkage between stakeholders and the local community and as well as science.

We established the international organization on climate change adaptation disaster risk reduction management. It's based in Philippine with many different researchers, practitioners in different parts of the world.

So at the end Dawadi propose a multidisciplinary approach where we want to include the innovative approach technological database networking teamwork with existing global

network, national network for disaster risk reduction sediment management, water harvesting, water management to reduce the dam or improve the dam optimization operation, society and the environment and decision making planning.

With this I would like to thank you.

Thank you very much. The Professor Kantosh, the introduction to extreme event, related to another extreme situation, and also the solution there. Thank you very much. Facilitation, toward facilitation, you established the NGO and working together.

Thank you very much. So next, this is also the sediment -related disaster issue, Dr. Qin, the floor is yours.

Okay, nice to meet you all. So I'm Mon Lu -Chien, a research specialist in ICHAM. So this is my topic today. So the background about this study is because in recent years, we saw a lot of sediment flood disaster occurred in Japan.

So the situation is like during the heavy rainfall, before the upstream, there are widely landslide debris flow occurred. Then it produced a large amount of sediment. Then the sediment will be transported by the flood then reached to the downstream.

Then induced a very severe flood and sediment inundation to the plain area. So in order to predict such kind of multi -hazards in a watershed, our team is trying to implement mechanic -based sediment transport theories to our model, make sure our model has a capability to predict the behavior of the sediment and flood response to the extreme rainfall.

So we developed rainfall and sediment runoff model, so -called RSR model. This model is combined basin -scale sediment transport model. So you can see the capability. They can simulate the landslide, debris flow, even driftwood, and also of course the sediment transports through the river.

We combine this model with a rainfall runoff process model. Then based on this structure, RSR model can predict the, of course the flood discharge and sediment, driftwood discharge, and also the sediment size information, distribution information at any location inside of the watersheds.

And even more, we can use such kind of characteristics of the RSR model, even extend our simulation to a very local scale, like two -dimensional or three -dimensional flow and bed -virus simulation, by obtaining the upstream conditions for them from the RSR model.

So based on this process, our methodology actually has a capability to deal with different types, also different scales of the flood and sediments issues in the entire catchment area. So next I will show some case study we applied our method.

The first one is the flood and sediment disaster occurred in Marumori town, 2019, Miyagi prefecture in Japan. Like here during the typhoon, in the mountainous area, widely landslide debris flow occurred, and in the downstream, there are sediments also flooding in the Asian to the plain area.

So we try to use find some observed data to validate our simulation result. But we found actually the quality of the observed data, like the identified landslide area, is varied in the observed data.

Like this one is identified from area photo. And this one is much better. They use the information of the elevation change before and after the disaster occurred. Then we check back our simulation result.

We found actually the landslide only occurred in quite limited area. But if we also plot our debris flows simulation result, we can see it's matched with the observed data quite well. So it implies the observed data also actually includes some incorrect information for the landslide.

It includes a lot of debris flow tracks. So I think our model also can feedback to improve the understanding of what we are measuring. Then also we check the temporal change of the landslide occurrence.

Also check the prediction of the water level around the deck bridge point. And it matched quite well. Then we can say our model actually capable to simulate landslide and debris flow and flood inundation simultaneously during the rainfall processes.

And the next one we also try to check our capability of the model for the large scale flood and sediment inundation. This case is the Agno River basin in Philippines. The disaster occurred in 2009. It's induced by the typhoon.

But the situation is before the typhoon come, those areas already experienced continuous rainfall for three weeks. So when the typhoon come, the dams already flow forward with the water. So they have to release the water.

Even the typhoon is calm to avoid the dam failures. Then it induced a wide sediment and the flood inundation on the plain area. So we try to simulate the detailed flood and sediment inundation process in the plain area in that disaster.

So we use our SR model to get the upstream boundary condition about the inflow of the flow and sediment discharge to the area we are going to conduct the two dimensional analysis. So this is the boundary conditions we get from our SR model.

Quite detailed. Then finally we achieved successfully predict the deck bridge point. And also we can show the very detailed behavior of the sediments movement during the flood. And more importantly, our model can actually identify the large sediments deposited on the very wide land area.

So my conclusion, our model actually is effectively to predict the flow and sediment transport behavior in response to the extreme rainfall. And also can help understanding the measurement. But the last point I want to post here is before we apply our model to the real flood prediction, I would like to ask the cooperation with the government, also the public authority to build a fundamental data measurement for ensure our models in initial condition is proper.

And the last message is linked to our today's topic. Our method can contribute to bridge the gap between the science community and the society on disaster risk reduction decision making on the individual action by improving the high quality and also the high resolution of the flood and sediments hazard.

So thank you.

Thank you very much Dr. Chien -Dae. You are the introduction to the interaction between water and sediment and cause a clarified mechanism and estimate damage due to this kind of event. And as you mentioned, how to convey this science to the society.

Next, we would like to invite Dr. Marchin Gomez. He is working to develop the interface from the climate science for the application to the society. If you like the words.

Okay, thank you, Professor Koike. I'm going to talk to you a more general topic about the contributions of the private sector to informed decision making in the context of climate change. I work for the Climate Change and Sustainable Development Team of Nipponkoi, which is a Japanese civil engineering and consultant company.

We actually have a booth on the first floor. Make sure to check it out. And I collaborate and lead projects related to water resources management, climate change adaptation, and disaster risk assessment.

And besides project management, the company lets me engage in other activities, which keywords are research and tool development, knowledge management, and capacity building. These activities, these other activities are aimed at contributing to informed decision making.

Here we have two diagrams. One is the cycle of disaster risk management, and the other one is the initial stage of climate change adaptation, which is impact modeling. In both fields, it's very important.

It's essential to know how the frequency and the intensity of extreme events, natural hazards, are going to change in the future. So at Nipponkoi, I try to be the person who translates climate science and makes climate information usable and accessible to other engineers and consultants to support decision making.

When conducting capacity building, one of my objectives is to expand climate literacy. And I usually try to explain basic concepts to first -time users of climate information. For example, here I have the figures that I will usually use to explain the difference between weather and climate, and also what climate models are and what information we can actually get from climate models.

Having an understanding of these basic concepts gives a new perspective to end users of climate information and helps them think about how to adequately use, depending on their needs, projections of future climate.

I'm going to talk to you a little bit about the research I conducted in Pongkoe. Here I have one about the quantification of uncertainty in climate models. So due to recent disclosure obligations and regulatory mandates, there has been an increase in the demand of climate risk information from the private sector.

And this is a business opportunity and it led to the emergence of the climate service providers or CSPs. And the competition amongst CSPs led to the delivery of overly precise climate risk information and all of this without the scrutiny of the scientific community.

And actually the CSPs overlook the limitations of climate models and in climate projections and this gives sometimes a false security to stakeholders and investors and can lead to potentially ill informed decisions and maladaptation.

So in a recent survey of the UN environment program transparency came out as the most important factor at the time of deciding a CSP and yet CSPs failed to disclosure the uncertainty attached to future climate information.

So with a colleague of the insurance sector who I think is here today, we are trying to develop a new approach to determine the uncertainty of climate projections that is based on the consideration of how to address the nature of the different sources of uncertainty in climate models.

And also I did some research about bias correction of climate models. Bias correction basically is you compare observations and simulated climate and you determine systematic biases and you use that those systematic biases to correct projections of future climate.

And this is basically essentially a math problem. And recent approaches, they do a very good job at using computing power to solve these mathematical problems. However, they can be extremely invasive and unwillingly modified some characteristics that took a lot of effort for scientists to accomplish like climate sign -all and internal variability.

And so a few years ago with the cooperation of a colleague from the National Institute of Environment Studies of Japan, I developed a method of bias correction which is more comprehensive and tries to preserve the climate sign -all and address internal variability in other issues of previous methods.

And the projects at Nippon Coe used this bias correction data, and sometimes the request for bias correction information was overwhelming, so the company agreed to fund the rollout and maintenance of NK KlimVolt, which is a free access, online portal that I developed, which is a database of projected climate trends and weather extremes,

and has the objective of facilitating rapid access to global projections of climate under different climate change scenarios.

And because I'm the data collector and processor and web designer and maintainer, it takes me a little bit of time to update it, but please check it out. And also I collaborate with other projects of the company, like the so -called Water Security Compass, which is under development, and it's based on a state of the art global hydrological model developed also at the National Institute for Environment Studies of Japan, and it's aimed to supporting the reporting of water -related risks and impacts to the water cycle.

And this is a joint effort of Nipponkoe and also Sanctuary Holdings, which is one of Japan's largest bottling companies, under the guidance of the University of Tokyo, with the support of the data integration and analysis system, Dias, which is an effort that saw the light more than a decade ago, thanks to Professor Koike.

Finally, I want to talk to you about a topic that I'm not an expert yet, but I'm trying to learn every day about it. It's how to communicate climate science and risks and the importance of understanding human behavior.

On the left, you have a figure that you would usually find in scientific reports of future precipitation under different climate scenarios, and maybe you can generate from this information flood levels for different scenarios, and maybe it makes sense for us.

But humans have the difficulty responding rationally to risks from events that are outside their experience. And because of that, we need to think about other approaches of how we communicate risk and race and the related awareness.

There are two examples of how risk is communicated based on past local experiences. And I have some final remarks, but I will save them for later. Thank you.

Thank you very much, Martin. The principle and the capacity and the tools and the system and raising awareness. It's a very important point. Thank you very much. So the last but not least, we would like to invite Mr.

Ilang Shing, the Sanjeev. He's now really a final stage of the PHE program. Tomorrow, the final defense. I would like to invite him and ask him to introduce his research but his application, the science, to the decision making.

Thank you very much and say. I'm Sanjeev Lankas Singh from Sri Lanka. Today I'm going to talk about the holistic framework for utilization of existing motor resources of interbasin system for tackling the climate change.

There are new natural disaster in the world. Floods, earthquake, landslide, and droughts are a few prominent ones. The climate change and local weather affect all human endeavors. Society will face new challenges from 21st century climate change projections.

According to the recent report, over 19% rates of impact are water related in 2023. So figure one shows the impact of climate change, highlighting countries with the largest population exposed to the even small inundation, affecting millions.

And figure two illustrates the global drought risk with 1 fifth of the large cities facing high or very high risk of drought. According to figure three, the world population is increasing rapidly, adding 1 billion people every 12 years, increasing the demand for basic needs.

The extreme floods are caused by climate change impact, like irregular rainfall. And water resources vary by regions. The growing population increases, disaster risk by raising demand for land and necessities.

The five global agenda, sustainable development goal, Paris Agreement, Sendai Framework for Disaster Reduction and Comorado Declaration 2022, and Water

Conference 2023 contribute to holistic framework for addressing about complex challenges.

My research talk at that respond to this international framework to build a sustainable society by strengthening disaster resilience. It is crucial to identify the disaster risk, including the level of danger, vulnerability, capability, and exposure to the people, property, and environment.

Climate services use projected future climate variables for various purposes. However, there are gaps in applying science and technology to disaster risk reduction policies. To address the above gaps, I introduce novel five principles using global climate model output in decision making on climate variability at first.

The climate model used for the decision making should be accurately represent the current regional climate. When using GCM at regional or local scale, downscale and bias correction should be implement.

And the climate sensitivity of climate model should be identified. And the disparities in outcome among climate model should be understood. And the climate model should be able to address diverse environment.

Then I introduce the novel five guiding principles aimed at addressing gaps in hydrature analysis for analyzing the influence of climate change on water availability. Utilize a reliable GCM output as an input for two hydrological model and a seamless capable hydrological model.

And climate change features identification using various hydrological indices and the record is key climate change phenomena and diverse environment capability. And based on these principles, I developed framework.

It include rainfall projection and then develop hydrological parameters and then solutions by transversing water sharing and the conclusion. This figure shows that the climate analogy analysis result for three long context.

And this is the annual case and this is the seasonal case and near future, middle future and far future. Red color shows the increasing and green color shows the decreasing. For example, the annual cases it shows the increasing precipitation.

However, in the in the monsoon one cases, it showed the decreasing precipitation for some basins. And finally, I aggregate the result of all climate change projection into the single decision making matrix known as color coding climate change matrix which eventually assisted decision making.

And it include the climate change at a past climate data and the future climate projections results. For example, in the past cases, south -west monsoon rainfall decreases. However, in the future it's so increasing.

That's been climate change signal. And this see for a climate change matrix over cover relevant all important details to climate change effect on rainfall for initial decision making. I integrated all hydromanic indexes such as SPI, SSI and soil moisture index and standard hyper -transfusion index and developed holistic wet and dry conditions for future projections.

This projection for wet conditions showed clear trend. However, the tendency vary by basin and especially near future, middle future and far future time slot. For dry conditions, the summary figure shows that the many areas are uncertainties, indicating inconsistent result moving different models.

Consequently, we cannot draw a definite conclusion about dry conditions as we can for wet conditions. It's clear. So the results show the wet conditions are clear than the drought conditions. So drought projection, friends show uncertainty in indicates output resulting in lack of overall clarity about drought condition.

This slide shows the sensitivity for the trend of the future projection for proper maximum paddy damage area for the basins and the near future, middle future and far future. For high sensitivity for paddy damage can be experienced in the future.

And the flood damage on paddy will be increased. We can experience increase. So this figure shows the demand side coverages for the past and the future without diversion and with diversion cases. So for example, the past cases without diversion, it getting worse in the future.

However, with the diversion, we can tackle the future cases. It covered 20, 100% coverages. This is a summary without diversion, all demand side getting worse without diversion. However, with diversion, it show that all demand side can cover 100% coverage for yellow and ma season.

So this now conclusion, the GCM sensitivity vary especially and temporarily and more flood damages on paddy in the future. And drought projection involve more uncertainty especially in agricultural drought and simple detail climate and this chart is better communicate scientific message to the scientific community as well as the public decision makers.

The socio -economic benefit for the water sharing and the climate change impact can be mitigated by water sharing. So this prove that the water sharing system can enhance societal problems even under the climate change scenario.

To effectively manage water resources in face of climate change, we recommend the following policies. Develop a holistic system that consider water demand and available resource as interconnected and using them as a whole system for sustainable management.

Each basin has its own unique features and resources which can be utilized in conjunction with the other basins to tackle climate change without harming existing basins systems and also establish a strength in integrated basin management authority and also enhance climate present infrastructure and also promote international

cooperation, foster cooperation between country to share knowledge, resource and strategies for managing transmodern water resources and addressing climate change impact collectively.

Thank you very much.

Thank you very much Mr. Hiragashi for your holistic approach, the introduction to holistic approach. So we would like to invite all speakers to the front desk, the front seat. And thank you very much for your cooperation.

We have three or four minutes to the question and answer. And after that I would ask the all speakers to respond to my question. So do you have any questions or comments? Do you have a microphone?

Alex from Marsh Advisory. Thank you very much to all the presenters for sharing your knowledge. I have one question in particular for Martin, son, about climate service providers. So as you know, this industry of climate service providers is very big.

It's a multi -billion dollar business. And all around the world, stress tests, climate disclosures are relying on climate service providers. So question to you is, how do we police these climate service providers to ensure that the information is scientifically robust, and whose job is it to do that?

Hello, okay, so thank you for such a difficult question. I think the scientific community made a lot of effort to make this information freely available for anyone to use. So I think before the application of this data gets accepted, it should be regulated, maybe by the government, that the providers of this information disclose all the uncertainty that is related or is actually associated to climate data.

There have been some ideas of how to do that proposed by the scientific community, but suddenly there is so much they can do without the support from local governments.

Are you okay? So I think there are two kinds. The bias which can be corrected based on our scientific understanding, but in some bias, at this moment we cannot correct. So in that case, we identify the range of the bias, or quantified bias, but this cannot be corrected, but we need to share such a kind of bias with society for their decision making.

I think that is one of the idea. Do you agree? Okay. Oh, one more please.

Hello. My name is Fani from Dutch Research Institute of the Netherlands. And I would like to ask a similar question because you mentioned about the data sources, so it's decision making under uncertainty.

But I'm wondering whether, or maybe in general in Aicham, you also address under deep uncertainties, for example, human behavior on the climate. Because that's very happening research in the Netherlands.

I'm wondering if you already have methodology for that. Thank you.

Anyone? Okay.

So I think one of the most widely used methodologies was one developed both in collaboration, World Bank and the TARDIS I think, which is decision making and their deep uncertainty, the consideration of different scenarios, different solutions, and making a kind of solution.

And I think it's a really good approach. It includes the solutions that can be provided by society, but also other variables like climate and economical factors. However, I've seen that lately there has been an emerging a bottom up approach that it's very interesting, that relies on the experience of local people.

And the scenarios are built based on their experiences. And because the scenarios are built on their experiences, they are more likely to not only react, but decide how their resources are going to be used to either reduce their exposure or vulnerability to these hazards.

How about Professor Kantosh today? Do you have any comment on that?

Yeah, thank you. So I think the most of available provided data or global climate data are very useful, but sometimes we are also in need for some station or gauging information. And only relying on the available satellite data is very good because we have some engaged basin or engaged area.

However, only this is not sufficient. Please try to rely and combine. Sometimes bias correction is good, but should be watched how, which area, is it mountainous area or more flat areas. This is very much different in the basin scale.

Okay. My second major is psychology, so I want to discuss with you deeply. Okay. But I would ask the two questions. You know the professor Kantosh, they get a bachelor in Egypt and a master in Japan and a PhD in Switzerland.

And Dr. Chin gets a bachelor master PhD in Japan and Dr. Marching the get a bachelor in Bolivia and master and PhD in Japan. And the Mr. Sriyanka, the bachelor master in Sriyanka and master in Netherlands.

And he's now going to get a PhD in Japan. And they are now working all over the world, of course in Japan and all over the world. So my question is, first question, what do you think is the most important lesson you have learned from Japan regarding the Jirai school reduction?

Professor Kantosh?

Thank you very much. I think Japan has several unique things. First, proactive approach. Proactive approach for planning, education, local residents, and also a kind of very accurate, early warning system, very on time.

It depends on the multi -hazard issue. An important part also is, I am expert for them, engineering, the upgrading approach, which has been taken as a fighting climate variability and extremes are really very unique in Japan.

It's one of the leading countries for drilling the existing infrastructure, adding new bottom outlet, adding spillway, and upgrading the operation rule, the dams and the infrastructures, which is very unique.

But I think there are still things to be done. Thank you.

Thank you very much. Dr. Chen, the same question.

Okay, so actually I have a very long time experience living in Japan. Also my academic background from the college is from totally in Japan. Actually I think the most important lesson I learned from the Japan risk reduction compared to the very advanced technology or the knowledge about for the disaster.

I would give the credit for the ordinary preparation and also the emergency drill practice. Even in school, also in the company, even in the community, they do reduce the same practice every year multiple times in the same time.

It's not, it's why it's important for me. I feel I don't think it will educate people become very expert as a disaster evacuation expert. But in a really emergency situation compared to you totally have no knowledge about where you need to evacuate and what you need to do.

But through the ordinary practice, we somehow know what should we do. And I really also did the same things when I was in Japan, just arrived in Japan the first year. The very big earthquake 2011 occurred in Japan.

And also back to China, I also experienced the biggest earthquake in China. But in China, in that time, I totally panicked and I don't know what to do. And all the people in our society don't know what to do the whole city for a few days.

So I think that's the most important lesson I learned from Japan.

Thank you very much. Dr. Maching, good luck.

So to build a society that is resilient to natural disasters, I think Japan's approach integrates very well application, implementation of technology, comprehensive education, and involvement of communities.

And much has been talked about the technology of Japan, but I think it's worth highlighting how important are the nationwide drills and public awareness campaigns that are made here in Japan. Children know very well how to react in case of earthquakes, fires, and floods.

Because of the drills, they carry out at schools every year. And also, I think there is a fostering of a culture of continuous learning and adaptation. And I think this highlights the fact that it's more important to be prepared than to only focus on post -recovery, post -disaster recovery.

Thank you very much. Mr. Ilang Singu, please.

Thank you. Thank you, sensei. I have been living in Japan for three years now, and one thing I have learned from Japan is they are exceptional preparedness for disaster or

anything. The nation educate its citizen about preparedness from childhood to through the old age.

I believe this continuous education and regular updates on preparedness are the best way to tackle any kind of disaster. So Japanese, I saw that the parents give the basic training for their kids, and also the head of the department also give their servants for their basic preparedness for disaster, as Dr.

Shin told. In Sri Lankan case, actually, we didn't have such preparedness. I remember that 2004, when tsunami hit our country, 2004, by that time we didn't know the meaning of the tsunami. And because of our un -nehaveness and also the unpreparedness, it lost more than 30 ,000 lives.

So I think in Japan, they are exceptional preparedness for any type of thing, especially for disaster.

Thank you. Oh, let me summarize. I think there's several key words, wide, long, continuous, from ordinary to emergency, and updating. Such kind of the attitude, maybe one of the aspects of Japan. Okay, thank you very much.

Next, please suggest issues that Japan should address now or in the future to reduce the risk. But the time is now, the... One word. One word. One phrase. Okay?

I think community -based management strategy is missing in Japan. Severe drought, planning, severe heat waves, and nature -based solution to be included more for flood management, giving more space in the river for flood reduction.

Thank you.

Thank you very much. So Dr. Chin.

Okay, so I just want to... Based on my experience, I think the cooperation, even among the engineers in Japan, like for my field, the sediment disaster, river engineers and the stubble engineers, they are not collaborating in Japan.

They need to collaborate. Yeah. That's a big issue.

This is a really weak point of Japan. Okay, next please.

Okay, so after a disaster, the ones that have to react and be prepared are people. So I think the words I will offer will be mental health and well -being. you

Thank you very much. So Dr. Ilan Mashiq, please.

I noticed some infrastructure. Japan has so many infrastructure. I saw some infrastructures getting old, getting aged. So I suggest to check those infrastructure strength. Because usually those exposed to the earthquakes and flood and heat waves, so getting deteriorated continuously.

So need to check those old structures.

Okay, thank you very much. They identified the key words, so I don't need to summarize. They, I myself, fully understood those points. Thank you very much. So let me summarize the discussion. The, in this session, the climate change, the information can be, used as input into hydrological model, including sediment and various component.

And that should be connected to the social component, the environment, the socioeconomic and cultural history. And then, based on the holistic impact assessment, the adaptation measure can be considered and decision will be made.

And implementation. And as all of the presenter mentioned, and also, as we discussed, uncertainty for the decision making, that is very important. So, in this case, from the end, cutting edge science and local action, should be connected.

So, end to end approach is necessary. To realize this one, as Professor Kantor should have mentioned, facilitation, and also the, the Dr. Martin Gomez -Garuscio introduced the capacity building. So, how are the, sorry, how to build the capacity of the community and the society.

So, that the facilitation may be necessary. And then, the integrated knowledge, yeah, from the mountain crops to the, based on the transport and then accumulation, and then the flat occult. So, and also the, such information to the social component.

So, the knowledge integration is also important. And then, integrated knowledge can be shared through the function of the facilitation. And then, we will be able to fill the gap between the science and the society.

So, key up, end to end approach, facilitator, you all. And knowledge integration. So, this is our conclusion. Thank you very much for your attention.