The COVID-19 pandemic is a stark example of how converging natural and biological disasters can simultaneously impact communities. Importantly, such disasters make the achievement of the Sustainable Development Goals more challenging. Thus, without addressing the disaster-climate-health nexus, the Asia-Pacific region will be unable to achieve the Sustainable Development Goals, particularly Goal 1, Goal 9, Goal 11, and Goal 13. A siloed approach to disaster risk management is no longer viable, and new approaches to enhance preparedness, strengthen resilience against complex and cascading disaster risks and protect at-risk communities are needed.

Against this background, the Risk and Resilience Portal was launched during this session. It is a joint initiative undertaken by the Asia-Pacific Disaster Resilience Network, ESCAP and the United Nations Satellite Centre (UNITAR-UNOSAT). Capitalizing on this joint partnership, the portal provides regional, subregional, and country level policy analysis for risk-informed decision-making in multiple sectors.

Launch of the Risk and Resilience Portal

This session discussed better understanding of the unique point of view of the ESCAP Risk and Resilience Portal portal, and how it can support the work of policy planners’ decision makers and development researchers.

With the convergence of COVID-19 with natural hazards such as cyclones and floods, we're seeing a riskscape in the Asia Pacific region, that is more complex than ever before, whether from natural or biological hazards, the risk impacts the most vulnerable populations. In addition to this convergence of natural and biological hazards. Climate change is a threat that cannot be ignored. The most recent IPCC Report notes that for every additional 0.5-degree increase amplifies the intensity and frequency of heat waves, heavy precipitation and drought. So, these challenging times call for a reformulation and paradigm shift from a single hazard single structure perspective to a multi hazard multisectoral and systemic risk perspective. To achieve this, we need to build multiple and complex risk scenarios that take converging natures of biological and natural hazard risks into account, and we need to really understand these risks through the lens of climate change. We need actionable risk information that is user friendly and easy to understand and supports policymakers in making risk informed decisions.

The risk and resilience portal provides this actionable and user-friendly information for the Asia Pacific region. It bridges the science and policy gaps that currently exist from the lack of translational science through the integration of data from multiple existing and validated sources. The portal is a one stop shop to ensure that the vast array of scientific information on hazards, climate change, social, economic, and health data can be analyzed in a way that can be used by policymakers, decision makers and development researchers to make efficient risk informed decisions that span across multiple sectors.

The portal helps policymakers answer four key questions. Where are the risk hotspots, what are the current and future economic losses? How much will it cost countries to adapt to this escape? and what are the adaptation priorities? Using data from the Human Development Index, along with hazard data from the Global Assessment Report, the portal shows pockets of vulnerability, which require the greatest attention. The question can now
also be extended to see how can I see where the most vulnerable populations to floods and related diseases are under the future climate scenarios.

The portal shows how and where climate change is impacting the most vulnerable populations, and the infrastructure that serves them. We have this under a moderate climate change scenario of RCP 4.5 and a worst-case scenario of RCP 8.5. The Portal further allows countries to look at their risk profile and compare this to the region and sub regions. So, for example, some hypothetical policy questions can be, what are my country's economic losses? which hazard is producing the most losses? and how does climate change impact these losses? Using probabilistic hazard data and climate change data ESCAP estimates the annual average loss from multiple natural and biological hazards for all countries in the region. Under the current risks, and under two climate change scenarios.

Finally, the Portal provides effective solutions. First, using multiple data sources ESCAP estimates the cost of adaptation from multiple natural and biological hazards for all countries in the region under worst case climate change scenarios, and the portal presents this in a comparable, user friendly charts and graphs. The Global Commission on adaptation has established five key priorities for adapting to the new risky, investing in early warning systems and climate resilient infrastructure, improving dryland agricultural crop production, improving mangrove protection, and better water security. Thus, ESCAP, applied this framework to the five sub regions, and each country, using a series of proxy indicators for each measure. Each country has its own priorities for investing in adaptation, and the portal provides some investment decisions for each of the five adaptation measures. By providing consolidated data to these key four questions. We hope that the portal will be useful for policy planners and decision makers to make risk informed decisions and national development and planning.

ESCAP partnered with UNITAR to provide customized risk and resilience data at the sub national level for five key countries (Papa New Guinea, Myanmar, Pakistan, Mongolia and Armenia) and through the development and building of sub national risk informed index for these countries.

Other key feature of this portal is the Data Explorer, which allows users to interact with more than 200 datasets through friendly visualizations. Second, for the five key countries with sub national decision support system, we developed overall interactive country stories that provide a visual on the story of the risk and resilience for the country. ESCAP hoped that this portal will support the needs of policy and decision makers, as well as development researchers, by bridging the existing gaps in translating scientific information into data that can be used for policymaking.

**Decision Support System**

With the advent of frontier technologies such as big data analytics, data mining, machine learning and artificial intelligence, this huge amount of data are getting transformed into information about the uncover population, natural resources, hazards, etc. by the scientific community. We can synthesize hazard vulnerability and coping capacity factors and present the output through different indicators in a user-friendly manner. Complex geospatial analysis, and composite indicator development happens under the hood, which is not exposed to the users. So, our target users policy and decision makers can just focus on the insights to steer informed actions.

For easy customization and future scaling, UNITAR have utilized open-source methodologies such as INFORM, to create the composite indicators, as well as providing data quality assessment. So, the decision makers can also understand how reliable the data is.

On the Landing page of the decision support system, users can find country profile; or go to a storyboard. Users can also launch the Decision Support System for a specific country. When the decision support system is loaded,
users are presented with the risk profile of different sub national units. If a decision maker wants to know what makes some of these administrative units very risky. They can just click their selected administration. With a single click of a button, they can pull the information about hazard vulnerability and coping capacity factors that contribute to the risk of this administrative view, together with various key indicators, and some climate adaptation priorities.

This feature also enables policymakers at the central government level identify the risk ranking of different administrations that can be done using the rank function in terms of risk exposure to hazard vulnerability, and also lack of coping capacity. A user can compare between these admin units, side by side, and understand how to prioritize the existence. The option to download the indicators is also available. So a national user can download the data and how the opposite indicators were calculated. So, that they can update and modify in the future.

**Expert discussion on the disaster-climate-health riskscape**

*Integrating innovative solutions including the risk and resilience portal into disaster risk management and overall planning to build resilience and prioritize the needs of most vulnerable*

[Col. Carl Wrakonei, Director of the National Disaster Centre, Papua New Guinea]

Disaster will further increase due to impacts of climate change. Covid-19 experience in PNG and of course worldwide for that matter – Papua New Guinea have all eventually gone through the experience and have come out with some ways in which we can do better: to review the level of preparedness and response activity, there must be policies that is according to government of Papua New Guinea, and the need to have policies and planning in place accounting to address other biological hazards that are expected to happen.

The Government needs to work on capacity building, and to have that in place and of course there needs to be awareness and responses. The Government also needs to be collectively prompt in responses, and we need to be aware and provide help with information sharing. The way forward is to identify and compare steps and challenges and make improvement for the future.

Building Innovative solutions is also very important, so that resilience can be improved in PNG and across Asia-Pacific. One solution is best use of specialist agencies, for instance private sectors and partners and use of different technologies. In Papua New Gionea, RIMES has been helping the country to provide well focused reports and lot more information can be derived from that. Other method would be to integrate different technologies to assist with disaster management, for instance GIS based risk identification for earthquake, tsunami and demographics.

The need to prioritize certain technologies in PNG, such as for early warning system, use of Internet facilities to use that to generate more information and give us the right information will help us the country to make decisions and communication, and raising awareness from social media.

PNG also felt that the necessity for innovative solutions to involve the use of such technologies for disaster management such as risk identification, geospatial analysis, risk mitigation and risk reduction and resilient infrastructure, land use planning, community-based disaster risk reduction to build our resilience. For disaster preparedness PNG needs to emphasize on early warning system, water resilience, public outreach and social media, health facilities, data for evidence-based training - we need focus on these to build disaster resilience.

*Scaling up new and innovative solutions to build disaster climate and health resilience and provide support at country level*
Investment is necessary in all areas – health systems, social safety net programs, infrastructure – all this investment can go a long way to helping us mitigate future impact from crisis. To do these and make strategic investments we need to have quality data. Quality datasets are lacking but there is also a lot of quality data in various government agencies and among our partner’s especially private sector part, but we don’t have access. We need to do better job for sharing and having access to these high-quality datasets.

It reiterates the importance of how that information will help us better apply the limited resources in PNG. UNDP needs to make sure the investments by international partners have best and largest impact possible. In the past tools such as inform index and similar portals – provided information on national level and didn’t help to understand the nuances of the differences within diverse country of PNG. In that regard Risk and resilience portal is exceptional tool for PNG and having DSS to help analyse at the provisional, district and eventually local government levels to make decisions, where the vulnerable populations are for certain risks and hazards will help us to be more targeted in our support moving forward.

With Climate change things are moving target, things that we knew from the past are shifting. In PNG that reinforces what we are currently doing, there is already investments in Early warning systems, but we have identified from the Pandemic that we need to invest more in Water sanitation, hygiene and protecting our water sources and providing populations, vulnerable populations greater access to water and sanitation. UNDP has also come to realise over last several years evolving impacts of climate emergency – that we need to provide more investment in Agriculture – in seeds that are flood and Drought resistant – those are two primary hazards that are going to affect us aside of sudden onset impacts. PNG has logistical challenge as well because it is land of Mountains and islands. We need to invest more in disaster preparedness, it’s great to back that up with data, so that when we are appealing to our international partners – we will have solid evidence to support those requests.

Key messages

Investment is necessary in all areas – health systems, social safety net programs, infrastructure. We need to have quality data. We need to do better job of sharing and having access to high-quality datasets, which are currently inaccessible. We need to make sure - the investments by international partners have best and largest impact possible. We also need to provide more investment in Agriculture- in seeds that are flood and Drought resistant – those are two primary hazards that are going to affect us aside of sudden onset impacts.

How will Risk and Resilience Portal help?

In the past Tools such as inform index and similar portals – provided information on national level and was not able to understand the nuances of the differences within diverse country of PNG. In that regard, Risk and Resilience Portal is exceptional tool for PNG and having DSS to help analyse at the provisional, district and eventually local government levels to make decisions, where the vulnerable populations are for certain risks and hazards will help us to be more targeted in our support moving forward.

Due to climate change certain parts of countries that were at risk for certain hazards are now at risk from other hazards, new at-risk population are emerging. The predictive and analytical capacities of these types of portals will become more and more critical for us in terms of being able to determine the types and directions of support that we provide. PNG has logistical challenge as well because it is land of Mountains and islands. We need to invest more in disaster preparedness, it’s great to back that up with data, so that when we are appealing to our international partners – we will have solid evidence to support those requests.
Good practices on scaling up innovative solutions to address the disaster, climate and health nexus from the ASEAN perspective

[Mr. Lawrence Anthony Dimailig, Assistant Director for Disaster Monitoring and Analysis, AHA Centre]

The ASEAN region and by extension Asia Pacific region has a growing need for critical analysis and synthesis of data and information, informed policy decisions and disaster management cooperation. To fill this gap, platforms for the sharing of best practices, latest research, and innovations are needed. In this regard, initiatives like the Risk and Resilience Portal are very much welcomed and is a step towards the right direction.

Within the ASEAN, the ASEAN Risk Monitor and Disaster Management Review, or ARMOR is the annual publication that seeks to bridge science and decision-making. The publication received contributions from academics and practitioners, showcasing the work within the region. We launched ARMOR first edition some time in 2018, where we publish article covering wide-range of topics, such as economic cost of disasters, considerable disaster risks, potential threats of climate change to the ASEAN region, snapshots of the region’s early-warning system, emerging risks such as technological disasters triggered by natural hazards, and technological innovations.

In November of this year, AHA Centre will launch ARMOR’s third edition. When disaster and pandemic collide, what does it mean to ASEAN now and into the future. COVID 19 has challenged the norms and pushed humanitarian to rethink the way we do things, especially in terms of provisional assistants and emergency response. Unfortunately, COVID-19 may not be the last pandemic, as permafrost continues to melt due to global warming, and bacteria and viruses. We aim to take a look at potential and observe impacts of pandemic to disaster risks. How the ongoing pandemic situation changes humanitarian actions and how policies and technology could enable the development of innovative solutions to be used for an effective response during pandemic situations. In the next three months, we look forward to contributing more to the ever-growing discussions on disaster, climate and health nexus. And ultimately, we aim to deliver another piece that could contribute to the improvement of disaster management within ASEAN, and by extension, Asia-Pacific region.
The Regional Learning Platform:

Session 1- Policy Coherence

1. Introductory remarks and keynotes

[Thani Thongphakdi, Ministry of Foreign Affairs of the Kingdom of Thailand]
[Ms. Tiziana Bonapace, Director, ICT and Disaster Risk Reduction Division, ESCAP]
[Mr. Marco Toscano-Rivalta, Chief of the Regional Office for Asia and the Pacific, United Nations Office for Disaster Risk Reduction (UNDRR)]

In the wake of the unprecedented collision of COVID-19 pandemic with natural and other biological hazards, there is an urgent need to address the interlinkages between disaster, climate and health, formulate coherent policies and identify systemic gaps for better preparedness from future crises and building resilience. In order to help the governments and stakeholders to better understand the capacity as cascading risk landscape and formulate more coherent policies to achieve the Sustainable Development Goals (SDGs), keeping in mind the far-reaching socio-economic impacts of natural and biological hazards and near-future confrontation with a new climate change reality much sooner than anticipated, strong cooperation at regional and sub-regional level is required with a paradigm shift from single-hazard single-sector approach to a multi-hazard multi-sectoral approach on coherent financing, developing risk governance and vulnerability reduction to address the systemic risks and leave no gaps. There is need to move from managing risks to managing uncertainties and recommended development of available policy tools by factoring in the impact of climate change using the latest promising technologies, utilizing the limited and available economic assets by encouraging collaborations and investing in additional areas like climate adaptation, health adaptation infrastructure and strengthening early warning systems which will help in building back better and enhance prevention as much as preparedness and response.

2. Strengthening Public Health Emergency Management System

[Tanarak Plipat, Inspector General, Department of Disaster Control, Ministry of Public Health, Thailand]

The convergence of the COVID-19 pandemic with natural hazards and the impacts of climate change has created a compounding and cascading risk landscape in the Asia-Pacific region. For better disaster preparedness, there is need to improve the Public Health Emergency Management Systems by accelerating global partnership to handle the converging risks and working under multiple multi-hazard frameworks. Learning from Thailand which was ranked as the most prepared country from pandemic by John Hopkins University in 2019, the governments and stakeholders should take into account the leadership role played by their Ministry of Public Health which has worked closely with the Department of Disaster Prevention and Mitigation, Department of Livestock Development, Office of Atoms for Peace, Department of Industrial Work, Department of Pollution Control and other productive international agency like USCDC, USAID, WHO, FAO, EU and ASEAN with the help of several global, regional and national frameworks like International Health Regulations Joint External Evaluation, International Framework for Public Health Emergency Operation Centres, Global Health Securities...
Agenda Packages, SENDAI framework, Bangkok principles, Disaster Prevention and Mitigation Act and National Disaster Prevention and Mitigation Plan, to continuously improve public health emergency management capacity domestically and regionally and cope with all kinds of hazard. Thailand has also been working with ASEAN countries to initiate ASEAN Emergency Operation Centre network (EOC NET) under ASEAN Health Cluster 2 Program which compliments ASEAN coordinating centre for Humanitarian Assistance on Disaster management which has helped develop the national emergency management capacity very quickly.

3. Strong and Effective Governance
[Ms. Gabrielle Emery, Disaster Law Manager, Asia Pacific, IFRC]

There is also an urgent need to help governments and stakeholders to strengthen legal frameworks and risk governance across all aspects of disaster risk management, better integration of climate change adaptation into frameworks and bringing better coherence between disaster risk management and public health emergencies and biological hazards which requires good effective governance. Governance is the cornerstone of effective mitigation, prevention and response to all types of hazards. Law being a critical part of governance is key to establish who needs to be doing what and when, for establishing coordination mechanisms, for establishing budgetary and funding allocation and for mandating participation across government and non-government entities.

According to a study on international normative framework around public health emergencies and disaster risk which analysed the International Health regulations, the health aspects of Sendai, the SDG, the Bangkok principles, different WHO guidelines, regional arrangements, domestic institutional frameworks and emergency decrees, found out that despite several good practices, there is general lack of legal preparedness for public health emergency events and the laws at present are very old, reactive in nature and limited in implementation of international commitment. The research brought forward three categorizations of public health risk management frameworks which help countries be prepared and respond to public health emergencies. First, is Public Health Emergency Dominant framework, where there is not much synergy with disaster risk management (DRM) approaches. Second is, Disaster Risk Management Dominant framework which has a lot under the public health measures sitting under the established disaster laws and policies. Third is, Hybrid Framework which is predominantly used by most countries and has overarching public health legislation, strategies and policies. This research did not recommend that one approach is better than the other, but it recommended the synergy, better alignment and ensured that the framework worked well and clearly allocated roles and responsibilities between all the systems. The governments should seize the opportunity of Covid-19 to capitalize on disaster risk management approaches and synergies like proactive risk reduction focus, all of society approach, coordination protection/inclusion for public health emergencies and eliminate gaps, conflicts, inconsistencies and unnecessary duplication between powers, roles, responsibilities and other arrangements created by public health emergency and disaster risk management instruments.

4. Expanding Genomic Surveillance
[Ms. Manisha Bhinge, Managing Director for Health Initiative, The Rockefeller Foundation]

The pandemic has exposed existing cracks in the interdependent economic and social systems where the most vulnerable amongst us have been disproportionately affected. It is essential to not only respond to and recover from disasters but also try to prevent, prepare and mitigate them as opposed to ad hoc relief and reconstruction efforts. This requires more systemic, long term, and comprehensive approach. Five years ago, the Sendai Framework advised that UN country teams support investments in multi hazard early warning and early action efforts and link them to risk factors related to social cohesion, disease surveillance and vulnerability to natural
hazards. This would help governments better understand and prepare for eminent hazards including cascading disasters. Due to a push from countries that had experienced Ebola, MERS and SARS, the Sendai Framework also extended the definition of risk to include biological hazards. This multi-dimensional and multi sectoral risk assessments is essential and must capture the full spectrum of risks, including biological hazard and disease outbreaks. There is need to analyse the interconnected and cascading nature to inform our policy decisions, planning, and actions.

The framework called for a substantial number of UN member states to adopt national strategies for disaster risk reduction by the end of this year. However, today, just 40% of countries report having these in place, and many of the existing strategies do not account for biological hazard or health emergencies. All countries need to develop and adopt DRR strategies, and they should make biological hazards, an essential component of those strategies as well as invest in disease surveillance and early warning systems.

While there are current systems that are focused on surveillance, there are significant gaps in early warning capabilities. In order to pre-empt pandemics, there is need of early warning systems to take biological epidemiological and ecological approaches to monitor the spread of existing pathogens and detect emerging ones. The key here is integrating different types of data streams to gain meaningful insights and propel action. We also need data systems to talk to each other and provide a comprehensive picture of what's really going on. That's where challenges still exist across the world, even in the most mature health systems. We have learned that the hard way, which is why this is so critical.

It is essential to sequence and share genomic information and other relevant data rapidly, and from all corners of the globe, that will enable us to identify and understand how viruses evolving and adapt our tools accordingly. Unfortunately, only a dozen or so countries, all of which have developed economies are sequencing, at least 5% of their COVID-19 cases and sharing that data through global databases. So right now, we are in no better position to stop variants from going global, than we were before the pandemic started. The little genomic data we are collecting is not being analysed or shared fast enough to help scientists and public health authorities make informed decisions about public health interventions and adapting treatments, diagnostics, and vaccines. There is need to dramatically expand genomic surveillance by which we could respond to new variants driven surges ad save countless lives and billions of dollars in economic losses.

The Rockefeller Foundation is working with global stakeholders to establish a data driven platform that will help the world anticipate, visualize and respond to outbreaks with increasing precision. The goal of the Rockefeller Foundation's pandemic prevention efforts is to help countries and regions, use advanced analytics and technologies like last mile approach for pandemic early warning systems at the community level and DRR related technologies like spatial and remote sensing for mapping pandemics to predict and prevent future pandemics. They are currently focusing on analysing barriers of concern, interest tracking and quickly identifying new barriers and aligning this data with what we know about vaccination progress and beat this pandemic and prevent future or potential pandemic threat.

Despite these protective countermeasures rolling out slowly, deaths are expected to increase as the virus moves from urban to rural areas. That's why we believe genomic sequencing is one of the key interventions needed to slow the spread of COVID-19 across the region and prepare for future viruses and pathogens.

Our efforts should be towards creating a sustainable and institutionalized surveillance system across countries in Southeast Asia, centred around genomic insights, not only for current pandemics, but also for other high burden diseases, and emerging threats. To prepare for future pandemics, there is need to collaborate at all levels, nationally, regionally, and globally. There is need to ensure our disaster risk reduction and health teams work closely together before, during, and after an emergency, and we must adopt national strategies for disaster
risk reduction that account for biological hazards and invest in robust resilient disease surveillance and early warning systems, by building a capacity today.

5. Strengthening Interventions
[Ruben Samuel, WHO]

The Asia-Pacific region has got several intergovernmental organizations like the SAARC, the BIMSTEC, and many others, and inter government institutions such as BRICS, some of which are functioning well and some of which are not functioning well because many times these partnerships which are inter-governmental are influenced by geopolitical considerations which at any given point in time might not be functioning. During pandemic like situation even for addressing natural hazards which span many countries, you would need such inter-governmental partnerships to be always on the ready, not just to respond, but also to be continually work for preparedness and risk reduction and should not be overcome by the vagaries of geopolitical considerations. We need to look at some of these other partnerships, which do not have such constraints, and which are more technical in nature.

It is immensely important that those countries which are low in resources, low in capacity, which do not have institutions or systems in place, need to be supported and lessons that have been learned and systems that have been built by the well-resourced countries need to be shared. Countries which have low resources need to be supported through these learnings, not just in terms of what can be done but how they can be done with a certain level of hand holding. And this, especially applies when it comes to issues which require ICT innovations, higher level technology which are not very widely spread across the countries of the region.

There is also the need to look at how some of these partnerships can look at not just upstream issues but also downstream issues, so that countries are used to interventions being either top down or bottom up. The COVID pandemic and the climate resilience related issues, has brought to the fore, that it is not necessarily something that is unidimensional that is going to work, but something that is multi-dimensional as well as cross dimensional will also work, because certain hazards, such as COVID 19 pandemic really affects multi dimensionally, and across different sectors in different ways. And just looking at top down or bottom-up approaches or downstream or upstream approaches is not going to work, there is need to really look at multi and cross dimensional approaches and strengthening some of the things that can be done in terms of interventions.

Interventions that can be strengthened through:

1) Much more investment for preparedness: International Health regulation is a multi-sectoral initiative governed by WHO; however, member states asses their position in terms of health security and work on the health security, National action plans of health security should include multi-hazard disasters. DRM and Disaster risk reduction presently focusses much more on natural hazards related emergency but less on biological hazards. We must draw from lessons from the past and learn how to include managing biological hazards and building climate resilience. Support and capacity development at all levels should focus not only on response but also on preparedness and risk reduction – a holistic approach to be adopted

2) Improving public health services and improving personal health services to be prioritized

3) Intersectoral aspects must be taken up and scaled up – these also require resources, for instance, the universal health coverage, which largely focuses on clinical services or essential clinical services need to also be ramped up to support population services which are public goods, such as surveillance and genomic surveillance etc.
4) Hospital safety must be looked into not only with the resilience perspective but also to develop green hospitals.

5) Involvement and inclusion of communities to be prioritized, for example, in early warning, detection and action: For instance, community-based surveillance, event detection and early warning is essential, this is where the interplay between technology and innovations is to be deepened at the community level.

6. Holistic Multihazard Approach

New Zealand has taken a different approach to COVID-19 compared to many places in the world which is to eliminate COVID-19 until most of the population is vaccinated. The Delta outbreak has brought changes to the different aspect of COVID-19. Coordination centres are being replaced with virtual coordination which makes coordinating across agencies a very dynamic environment. The Emergency Management System includes Ministerial partners, communities, regional civil defence and emergency management groups. National Emergency Management Agency (NEMA) has a very specific role in New Zealand which is looking specifically at welfare infrastructure and lifeline utility. This approach supports the Sendai Framework and other regional frameworks that are in place because of looking at it from a holistic and multi hazard approach and plan for concurrent future hazard events. The Sendai is not strictly a natural hazards framework, and it very much incorporates climate change and biohazard, and if governments and stakeholders continue to use the systems that we know and the systems that we've been practicing, the responses to the pandemic will go much smoother. New Zealand goes by a continuous learning model which is an ongoing process where the systems and responses are improving and evolving as the pandemic situation develops in real time which is good because as a new hazard or a new issue appears it can be easily addressed.
The Regional Learning Platform:
Session 2 - Multi-Hazard Integrated Early Warning Systems

The unprecedented challenges from the pandemic have highlighted the need for different and comprehensive approaches to reduce converging and cascading risks from Natural disasters and pandemic.

1. Introductory Remarks and Keynotes

[Ms. Tiziana Bonapace, Director, ICT and Disaster Risk Reduction Division, ESCAP]
[Mr. Ben Churchill, Head, Regional Office for the Asia and South-West Pacific, WMO]
[Mr. SangKwon Lee, Director-General, National Disaster Management Research Institute (NDMI), Republic of Korea]

Many extreme weather events have occurred during pandemic, this has greatly complicated the management of hazards and pandemic situations – as we have witnessed from tropical cyclone Harold that hit Fiji, Solomon Islands, Tonga, and Tuvalu in April 2020 and from Cyclone Amphan and Typhoon Vongfong that devastated Bay of Bengal and Philippines in May last year. In this regard, the 77th session of ESCAP’s commission that was held during 26 to 29 April 2021 adopted a resolution intitled “Building back better from crisis through regional cooperation in Asia and Pacific”, and in the context of this resolution that ESCAP organized this regional learning platform and Disaster resilience week both around the concept of disaster, climate, and health resilience.

The meeting discussed the need and prospects for regional cooperation on integrated multi-hazard, multi-sectoral, transboundary and systemic risk in early warning systems, including through leveraging the Asia-Pacific Disaster Resilience Network and the annual subregional and national climate outlook forums. The session brought together representatives from meteorological and hydrological services, disaster management agencies of member States, regional and international organizations, and other stakeholders to share their expertise and experience. The session discussed the needs and benefits of integrating early warning systems for natural and biological hazards and explore ways to promote regional cooperation. The session was jointly organized with the World Meteorological Organization (WMO) and the National Disaster Management Research Institute (NDMI) of the Republic of Korea.

The ESCAP/WMO Typhoon Committee and the WMO/ESCAP Panel on Tropical Cyclones has also been providing technical support and cooperation across the region. Similarly, the ESCAP partnership with the UK Met Office and RIMES, through the South Asia Climate Outlook Forum and Asia Regional Resilience to a Changing Climate, aims to improve early warning systems in multi-hazard risk hotspots in South Asia. Thus, it is time to capitalize on the network of partnerships and in recent technological advances to integrate health outcomes into weather and climate services.

There is one area which will pay high dividend, if we are able to invest and integrate into multi-hazard early warning system with biological hazards which enable us to prevent risks from cascading sectors. The complexities of the cascading systemic risks are multi sectoral, therefore it is no longer the business of disaster management authorities, but need integrated approaches.
WMO has taken a number of initiatives to make an impact in the region while making the region resilient to extreme weather in a changing climate. WMO has moved towards an annual reporting cycle to capture its work done in each year.

The Republic of Korea NDMI have been making many efforts for disaster risk reduction with UNESCAP member countries in mitigating impacts and risks of typhoon-related disasters by working Group on DRR in UNESCAP/WMO Typhoon Committee. Especially, in times when natural hazards with COVID-19 have produced cascading risks which lead the people in in the Asia-Pacific to face more dangerous situation than ever. The delegate noted that this session would be a good starting point to think the current situation and share opinions and facilitating regional cooperation on Multi-Hazard Early Warning Systems. Like the situation of COVID-19, the risks of hazards are widely connected. Thus, regional cooperation is essential to overcome e this crisis and to achieve sustainable development. Although we are going to through a hard time, NDMI was confident that the cooperative relationships will be stronger than ever through these activities.

The following Panel discussion on regional cooperation experiences on early warning syens and perspectives of integrating biological hazards discussed (a) The expert perspectives in integrating multi-hazard early warning systems including biological hazards? (b) The challenges in and opportunities for integrating biological hazards and applying a multi-hazard, multi-sectoral, transboundary, and systemic risk approach through early warning system initiatives in the Asia-Pacific region, (c) How can we advance understanding of cascading and systemic risk in a gender-sensitive manner through a joint approach, (d) How can we enable multi-hazard, all-media emergency alerting to ensure citizens have access to information and the ability to act, and (e) The ways forward and how can regional cooperation be facilitated to achieve these goals. The session was moderated by Mr. Chihun Lee, Senior Research Officer, NDMI, Republic of Korea and presentations delivered by Thailand, UK MET Office, RIMES and WMO.

2. An integrated approach on disaster and biological hazards early-warning system
[Mr. Somneuk Swatteuk; Specialist on Disaster Warning, National Disaster Warning Center (NDWC), Thailand]

Public health and biological hazards management is crucial, where early warning system is a major tool for strengthening disaster preparedness in advance and enhancing action plan. It was mentioned that Thailand has multi-hazard early warning systems and ministerial mechanism for biological hazards.

The following suggestions for early warning systems have been done: (a) Ability to develop multi-hazards early warning system including biological hazards, (b) Ability to conduct a feasibility study on developing regional early warning system as same as Indian Ocean Tsunami Warning and Mitigation System, which provides services related to tsunami and multi-hazards, and (c) Ability to conduct a feasibility study on possibilities for reducing disasters and raising awareness to the member states. This system has been implemented in the South-East Asian countries such as Vietnam, Indonesia, and Thailand.

3. Challenges and opportunities for multi-hazard and transboundary early warning systems
[Ms. Catrina Johnson, Science Manager, Weather analytics, and Mr. David Corbelli, Senior International Development Manager, UK Met Office]

The Asia Regional Resilience to a Changing Climate (ARRCC) Programme explores the challenges and opportunities for multi-hazard and transboundary early warning in South Asia. Its main objectives are: (a) Enhancing regional collaboration and capability for provision of Weather and Climate Information Services, (b) Supporting development of regional and sub-regional forecasting and early warning systems, and (c) Improving capacity in focus countries to develop and disseminate impact-based forecasts (across multiple timescales) to
vital climate sensitive sectors and communities. It also supports the development of Multi-Hazard Integrated Early Warning which includes the regional cooperation for enhancing forecasting, monitoring and preparedness for Floods and Droughts in South Asia; enhancing capacity for Impact Based Forecasting in focus countries, enhancing services and product under the South Asia Seasonal Climate Outlook Forum, and Climate services to avoid food security threatening crop disease epidemics in South Asia (CIMMYT).

The UK MET Office also supports regional dialogue for flood and drought early warning in south Asia, particularly in reviewing the existing flood forecasting capacities and needs of countries in South Asia, enhancing information sharing and knowledge exchange among the participating nations as well as guiding the establishment of a regional learning platform to sustain engagement and build regional capacity.

To support the dialogue there are some gaps and requirements which need to be addressed, showed on the following table:

<table>
<thead>
<tr>
<th>Data — gaps</th>
<th>Data — requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Scarcely distributed networks</td>
<td>• High resolution mesoscale models applicable for smaller domains (provincial or river basin level)</td>
</tr>
<tr>
<td>• Inconsistency in data recording (missing data)</td>
<td>• Improved quality observed data</td>
</tr>
<tr>
<td>• Unavailability of spatial, topographical data</td>
<td>• Standardization of weather station installation and data recording format</td>
</tr>
<tr>
<td>• Lack of real-time data</td>
<td>• Data sharing — transboundary and national</td>
</tr>
<tr>
<td>• Coarse resolution forecast data</td>
<td></td>
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<tr>
<td>• Data unavailability in transboundary rivers</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication — gaps</th>
<th>System improvement — requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of communication between transboundary nations</td>
<td>• Improved communication — transboundary, national agencies and regional entities</td>
</tr>
<tr>
<td>• Lack of communication between responsible national agencies (Hydrometeorological and Disaster management agencies)</td>
<td>• Hydro met policies</td>
</tr>
<tr>
<td>• Poor data sharing among national agencies</td>
<td>• Preparedness plans and Standard Operation Procedures (SOPs) for floods and droughts</td>
</tr>
<tr>
<td>• Absence of a platform for national and regional hydrometeorological data sharing</td>
<td>• Guidelines for impact assessment</td>
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<table>
<thead>
<tr>
<th>Forecasting tools — gaps</th>
<th>Forecasting tools — requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Coarse resolution forecasts ~ not applicable at river basin level</td>
<td>• Ensemble forecasting systems — probabilistic forecast</td>
</tr>
<tr>
<td>• Unavailability of tools for drought forecasting</td>
<td>• Early Warning Decision Support Systems</td>
</tr>
<tr>
<td>• Poor skill and uncertainty of forecast</td>
<td>• Flood and drought forecasts at sub-national scale</td>
</tr>
<tr>
<td>• Gap between information received and how it is processed</td>
<td>• Quality management and information dissemination mechanisms</td>
</tr>
<tr>
<td>• Insufficient lead-time</td>
<td>• Flood inundation mapping</td>
</tr>
<tr>
<td>• Requirement of impact-based forecasting</td>
<td>• Database management</td>
</tr>
<tr>
<td>• Implementation of Early Warning Systems</td>
<td>• Improved internet connections</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity enhancement - gaps</th>
<th>Capacities — requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Limited knowledge in IT and forecasting</td>
<td>• Usage of available products for seasonal and sub-seasonal forecasting</td>
</tr>
<tr>
<td>• Lack of skilled manpower</td>
<td>• Forecast validation</td>
</tr>
<tr>
<td>• Limited quality control skills</td>
<td>• Risk assessment</td>
</tr>
<tr>
<td>• Limitation in budgets</td>
<td>• Early warning in flash and riverine floods and GLOFs</td>
</tr>
<tr>
<td>• Lack of knowledge on available products and tools</td>
<td>• Hydroclimatic data quality control, process, and database management</td>
</tr>
<tr>
<td></td>
<td>• Dynamic model data and product process.</td>
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</tbody>
</table>
To mitigate these gaps and requirements, the following are the recommendations which can help in tackling the problems outlined above: (1) Platform to interact which contributing to enhance the regional hydro-meteorological data exchange, improving communication between generators of climate hazard information and disaster managers, enhancing systems for hydro-meteorological information sharing, better management of disaster risks through active feedback process between providers and users; (2) Communication practices which are establishing regional cooperation with proper mechanisms, developing awareness of available products, platforms, projects and programmes to avoid duplication and sharing success stories and good examples among other countries in the region for replication; (3) Decision Support Systems for a better visualization of available data as a one platform for data and information from multiple sources, for better mechanisms for dissemination Impact-based forecasting, which undergo continuous improvements to ensure data is relevant for the end-users; and (4) Capacity building in decision support systems for managing disasters such as monitoring of floods and droughts forecasting applications.

There are couple of examples of Impact-Based Forecasting (IBF) Pilots in operation. The first one is in Nepal, which was commenced in June 2021, as a collaboration between NDRRMA and DHM. This IBF Pilot focuses on heavy rainfall hazards and impact landslides. The debris flow from landslides is identified as a potential transboundary issue but no mechanism to share information. The second example is in Bangladesh, which is planned to commence in September 2021, which focuses on tropical cyclone hazard, and link it to Forecast-based Finance (FbF).

The UK MET Office has also been involved in some work to support enhancement of SASCOF in partnership with WMO by trying to integrate forecasting risk information with biological hazards. In partnership with WMO, Regional Climate Centre Pune (IMD), Rimes and the Met Office, the UKMO has been enhancing forecast and application of services and products, while ESCAP has been piloting the development of a special impact outlook for the socio-economic impact in the region by overlapping Climate Hazard information on populations and sectors.

SASCOF-19 featured a special session on seasonal climate outlook implications for the health sector that considered early warning for malaria and dengue. In this regard, biological hazards systematic surveillance data requires to be integrated.

Finally, some learning points which were derived from the project which provided services to avoid food security threatening crop disease epidemics in South Asia, which were aimed to establish early warning systems to inform farmers and key stakeholders on incursion threats of virulent wheat rusts from neighbouring regions into South Asia. First, the importance of a long-terms strategy with phased growth, reach and adaptability of the early-warning systems. Secondly, ensuring flexibility of the system and scope for expansion and application to other diseases through learning process for national partners around the use epidemiological methods and technologies and opportunities to integrate with and improve existing advisory systems. Strong engagement with national partners enabled the utilisation of current systems for advisory dissemination. There have been strong national demand and enthusiasm for engagement, where expert consultation groups have guided the content of advisories and provided forum for cross-regional sharing and learning. Third, the importance of regional level coordinated surveillance, highlighting the interconnectivity of countries in the region. Finally, the demonstrable or early successes of the EWS, for example in the initial phase covered single wheat production season and demonstrated the ability to transfer and test system developed in Ethiopia. It also proved possibility to incorporates new diseases leaf rust very rapidly into the forecast model.
4. Strengthening the Impact-Based Early Warning Systems in the region
[Mr. Cyrille Honoré, Chief, Disaster Risk Reduction and Public Services, WMO]

The WMO shared some perspectives on how to move forward to achieve the targets of the Sendai Framework for Disaster Risk Reduction (SFDRR), keeping in mind the Bangkok Principle for the implementation of the health aspects of the SFDRR. The IPCC assessment report states that climate change is already affecting many weather and climate extremes in every region across the globe, and the evidence of the observed change can be seen in the form of heatwaves, droughts, heavy precipitation and increasing intensity cyclones.

In the coming decade, the changes brought upon by climate change will be increasing. Even in the best-case scenario, countries must be prepared to adapt to more extreme weather events. To alleviate this situation, countries should invest in early-warning systems (EWS) where the availability of data and its exchange play an important factor. The WMO is working on a revised unified data policy to support more free and open data exchange. Since data is key in early-warning services, this will allow better implementation of EWS. In services like Earth observation and natural hazard monitoring, 24/7 real time data is key in tackling certain hazards in certain areas.

Furthermore, other hazards can be forecasted and scenarios can be presented well ahead of time so that preventive measures can be deployed. Forecasting hazards has seen its capability increase manyfold in the past years through the integration of better frontiers technologies, but a new challenge presents itself in this domain. The challenge now is to better communicate, analyse and interpret the data which is generated and how do we communicate the findings to National Disaster Managements Agencies, health agencies and lastly to the people. This will allow the concerned authorities and parties to make better decisions and take early actions.

WMO is working to use a global multi-hazard alert system in the coming years which will serve as resource for warnings and information related to high impact weather. WMO has also established cascading framework to support member countries with the support coming from global centres which provide global datasets, weather predictions and long-range forecasting. Specialized regional centres are also needed to cater to the special needs of each region.

The challenges of data sharing which was mentioned earlier can be alleviated by national policies which would be key in bringing together different organizations and entities. It is not just through forecasting, but impact based forecasting is needed to better frame policies where we have a clear record of damages and losses which in turn will enable us to make better strategic decisions.

5. Enhancing partnerships and regional cooperation in Impact-Based Forecasting and Early Warning Services
[Mr. Ramraj Narasimhan, Chief Program Management, RIMES]

As an intergovernmental institution owned and managed by its member states, RIMES has 48 member and collaborating states. The portfolio of RIMES services is relevant to integrating multi hazards warning systems such as improving data availability, services related to disasters, meteorological and hydrological services to develop their own forecasts and several tools are utilized in the process. Capacity building of users is one of the key areas of our work. For instance, the National Monsson Forum where users meet and provide information to discuss forecast and preparedness measures. Evolution of frames is focused more on changes from provision of hazards information to understanding of risks through decision support systems; to impact based forecasting.
The characteristics of COVID-19 are known but the impacts were not well understood because the spectrum of impacts are extended beyond an individual level across the globe. In Impact Based Forecasting and Early Warning Services, integrated approach is essential where we look at users, data such as exposure and vulnerabilities could lead to functional early detection, early warning of risks (David Rogers et al, 2020). The way forward is needed to advocate for and capacitate national and regional systems in utilising probabilistic forecasting which is ensemble-based.

To enhance the partnerships and regional cooperation, RIMES has been working on several key activities. First, the observations and monitoring are that every member state puts. Currently we have excellent partnership with WMO and ECMWF which provides advanced and improved forecasting and modelling products. Secondly, the transformation of data into usable information through decision support system which is partnering with ESCAP, World Bank and WMO. The creation of user interface mechanisms has a role for transforming data into usable information and it is partnering with ESCAP, WB and UKMO/FCDO. Community and societal application are partnering with ESCAP, World Bank and USAID. All of these happened when we have integrated multi-hazards and all-time-scales approach which encompass data, users and impacts of hazards, vulnerabilities, and exposure. ESCAP and RIMES are putting up a unit in South-West Asia which is focusing on evidential analytics and potential impacts on SDGs. RIMES has South Asian Seasonal Climate Outlook Forum (SASCOF) and South Asia Hydro-met Forum (SAHF) in collaboration with ESCAP, FCDO, WMO and World Bank. RIMES is looking at strengthening existing partnership with WMO thorough expansion and co-design of tools to all RIMES member states through sub-hubs.
The Regional Learning Platform:

Session 3- Climate Change Adaptation and Resilience

In the midst of the COVID-19 pandemic, countries in the Asia-Pacific region also experienced cyclones, floods, landslides, and locust infestations. This convergence, witnessed in 2020 and 2021, has created a complex, compounding, and cascading risk landscape in the region. To address these multiple hazards, an integrated approach to climate change adaptation and resilience building and policy coherence is critical. In 2016, the implementation of the Sendai Framework was reinforced by the ‘Bangkok Principles’ for the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015-2030, which recommended measures to prevent, and/or reduce the risk of health emergencies, such as pandemics. It called for the promotion of policy coherence and further development of local and national policies and strategies, legal frameworks, regulations, and institutional arrangements by creating an enabling environment to implement strategies of the Sendai Framework for DRR, SDGs, climate change adaptation and other relevant instruments.

1. Introductory Remarks and Keynotes
[Mr. Ganbold Baasanjav, Head, Subregional Office for East and North-East Asia, ESCAP]
[Ms. Riyanti Djalante, Head of Disaster Management and Humanitarian Assistance Division, ASEAN Secretariat]

Climate change is making the disaster risks increasingly unstable and stronger. Global temperatures are expected to reach or exceed 1.5°C past pre-industrial levels, making climate and disaster resilience critical. The adaptation to the evolving risks is multi-faceted and requires regional cooperation. There is need to increase scientific capabilities to adapt to the expanding risks and predict when and where the next extreme climate disaster will happen. Learning by doing and sharing best practices is very important in adapting to the new disaster risk landscape. It is also important for Asia-Pacific countries and particularly subregions to work together in assessing and addressing the common challenges, mostly when faced with transboundary risks. Countries, subregion, and the Asia-pacific region need to identify the clear priorities for adaptation such as infrastructure development that match their needs and develop new technological and resilient infrastructure.

The ASEAN region is facing increasingly complex risk landscape, climate change is increasing the intensity and severity of disasters and COVID 19 infection has demonstrated the devastating impact of major public health emergency on our life. So, we need to prepare for when multiple disasters, natural or human induced can occur at the same times or one after another. The likelihood of these occurrences can increase in the future just due to climate change. So, ASEAN do not only have to deal with fast onset disasters like earthquake and tsunami, but also increasingly slow onset disasters such as droughts, which are mainly contributed by climate change. In recognition of the evolving risk landscape, exacerbated by extreme weather events. ASEAN must likewise evolve and adapt to stay abreast with the risk. We need regional cooperation, which integrate climate change adaptation and resilience into development planning process that is in line with SDG 2030 and the Paris climate agreement. Regional corporation is critical to mitigate losses and build coherent response to community preparedness. As climate change intensifies, the risks associated with slow-onset climate-related hazards are increasing. It is
therefore important for ASEAN to adapt and stay up to date with the changing risk landscape. ASEAN is working in partnership with ESCAP to become global leaders in climate adaptation by 2025 and work on multiple projects such as the ASEAN declaration on drought and the joint study Ready for Drought Years to improve drought risk management.

2. AP-Plat: Information platform on climate change
[Mr. Masutomi Yuji, Section Head of Center of Climate Change Adaptation]

AP-Plat is platform designed to build a bridge between stakeholders and scientist, ensuring that adaptation solutions are science-based. The provision of scientific data to support adaptation planning is vital and that is why AP-PLAT provides a solution that ensures the governments, the private sector and academic institutions are making impact assessments based on scientific data. AP-PLAT arose from the National Adaptation act endorsed in December 2019 with the goal of developing an international system for sharing of information on climate change. Although the platform is already operational it is undergoing changes to make it even more user friendly. Two key tools of AP-PLAT are (a) CMIP6 Climate Viewer: ClimoCast, which is state of the art climate data viewer, providing users with climate projections data to see the impact on different segments of society, while also providing geographical data disaggregated to the township level to allow users to geographically compare the climate risks faced by their townships, districts, provinces, or countries. It has availability of both map visualization and time-series visualization, allowing users to understand the geography of risk and visualize the projections for the future under 10 GCMs and 4 SSPs. All data can be downloaded to CSV format, allowing users to customize their experience. (b) Climate impact viewer, which compliments the CIMP6 climate viewer by providing a climate change impact projection based on scientific results. The climate impact viewer helps policymakers understand the importance of adaptation by showing the sectoral impact of climate change with and without adaptation. AP-PLAT provides Asia-Pacific an information-based assessment of the risks being faced and the cost-benefit of investing in adaptation, ultimately promoting climate resilience.

3. Subregional context of climate vulnerabilities
[Mr. Sangmin Nam, Deputy Head, Subregional Office for East and North-Est Asia, ESCAP/Representative of NEASPEC]

NEASPEC is programme established in 1993 by six member states. It is not just platform for government but also for many other stakeholders. NEA is jointly sharing 1/3 of global GHG emissions. Especially China, Japan and Korea are major countries contributing GHG emissions. They all announced carbon neutrality by mid-century. Each country has distinctive feature of climate vulnerabilities like China has a feature that it does not only have high concentration of people and economic activities, but also large scale of economic stocks exposed to the impacts of climate change. DPRK has a food security challenge. During last 10 years there are direct impact by drought, flood on cereal production. There is direct relationship between food security and climate change impact in DPRK. In Mongolia, there are chains of extreme weather events, livestock loss, migration, poverty and air pollution. The temperature was increased in Mongolia twice than global temperature increase. This resulted in extreme weather events including harsh winter. For example, in 2000, increasing Dzud was brought to extremely cold winter and heavy loss of livestock. Those people are becoming poor, and they are immigrating to urban area. As a result, they are becoming urban poor. There is a direct relationship between climate change, internal migration, rural poor and air pollution. For Russian Federation, in this year there was forest fires in Siberia. And the smokes reached till Sakar and Canada as well. For Northeast Asian countries, while mitigation is a priority, there are intensifying climate adaptation plan. When it comes to NEASPEC, NEASPEC has been working on desertification and land degradation from 2003. Initially it was focused on...
capacity building but now member states decide to address interlinkage of climate change and land degradation. Also, we are currently studying on these 2 topics – ‘Desertification and Land Degradation’, ‘Interlinkage of Climate Change and Land’.

4. Role of ASEAN in Development Planning and Contributing to Disaster-Health-Climate Resilience

[Ms. Riyanti Djalante, Head of Disaster Management and Humanitarian Assistance Division, ASEAN Secretariat]

ASEAN is a regional organization comprising 10 Southeast Asian nations that promotes economic growth, social progress, cultural development, and cooperation in the region. The ASEAN Vision 2020 agreed on a shared vision of ASEAN as a concert of Southeast Asian nations, outward looking, living in peace, stability and prosperity, bonded together in partnership.

AADMER is a regional framework to promote regional cooperation for disaster resilient community. AADMER set in place regional policy to operational and logistical mechanism to enable member states to extend system in terms of disaster and carry out collaboration on disaster assessment, monitoring, prevention, preparation, recovery and rehabilitation. This is implemented in 5-year work plan. AADMER Work Programme 2021-2025 promotes a region of disaster-resilient nations, mutually assisting and complementing one another, sharing a common bond in minimising adverse effects of disasters in pursuit of safer communities and sustainable development. The current mission is to enhance and support ASEAN’s disaster risk reduction and disaster management capabilities through inter-sectoral cooperation, capacity building, scalable innovation, resource mobilisation, new partnerships, and stronger coordination among ASEAN member states. One of the AADMER Work Programme approach is a Multi-Hazards Approach which assesses, mitigates, prepares for and respond to a wider range of hazards and disaster risks including biological, natural and technological hazards. In more detail, AADMER has outputs that they are related to ‘Regional programmes on DRR-CCA’ suggesting work plan for strengthening institutional policy framework on DRR and CCA integration. Also, it is related to enhanced knowledge and capacity on resilience of key infrastructure.

ASEAN’s initiatives on Disaster-Health-Climate Resilience have been broadened as some of the current programme of ASEAN’s initiatives on Disaster-Health-Climate Resilience includes ASEAN Comprehensive Recovery Framework, ASEAN Socio-Cultural Community Blueprint, ASEAN Guidelines on Disaster Responsive Social Protection, ASEAN Declaration on Drought, Project for Strengthening the ASEAN Regional Capacity on Disaster Health Management (ARCH Project).

ASEAN Comprehensive Recovery Framework, 2020 serves as an ASEAN community wide strategy to COVID-19. It recognizes multi-hazards impacts of pandemics to work together through the recovery, reopening, rebuilding and long-term resilience. There are 5 strategies of ASEAN Comprehensive Recovery Framework, 2020: (a) Enhancing health systems, (b) Strengthening human security, (c) Maximising the potential of Intra-ASEAN market and broader economic integration, (d) Accelerating inclusive digital transformation, (e) Advancing towards a more sustainable and resilience future.

ASEAN Socio-Cultural Community Blueprint, 2025 is a commitment to live quality of life through cooperative activities that people oriented, environmentally friendly. We have two particular outputs related to health and climate change and disasters. A safer ASEAN that is able to respond to all Health-related Hazards including Biological, Chemical, and Radiological nuclear, and Emerging Threats. Climate Adaptive ASEAN with Enhanced Institutional and Human Capacities to adapt to the Impacts of Climate Change.

ASEAN Guidelines on Disaster Responsive Social Protection is guidelines regarding access to basic social services such as health, disaster shocks.
The Declaration on the Strengthening of Adaptation to Drought is used to provide assistance for mitigation and adaptation to drought systems. There is nexus on Food, Water, Energy, Land, Environment with Drought and COVID-19 impacts.

Joint Task Force to Promote Synergy with Other Relevant ASEAN Bodies on Humanitarian Assistance and Disaster Relief (JTF on HADR) is an initiative for disaster responsive approach. This project is for strengthening the ASEAN Regional Capacity on Disaster Health Management (ARCH Project).

ASEAN Risk Monitor and Disaster Management Review (ARMOR) 3rd Edition is the first regular publication to showcase best practices, trends, and innovations in disaster management in ASEAN.

ASEAN Agreement on Disaster Management and Emergency Response (AADMER) vision create enabling environment for building resilience to create safer community and sustainable development. Multi-hazard consideration in the (AADMER) and AADMER Work Programme 2021-2025 allow for integration of Disaster-Health-Climate Resilience in project planning and implementation. Multi-sectoral cooperation allows for larger/ASEAN-wide implementation of Disaster-Health-Climate Resilience.

5. Actions of Turkmenistan for disaster risk reduction
[Representative of Turkmenistan, Ministry of Defence]

For Turkmenistan, the Sendai framework is the main tool of action for work on disaster risk reduction. The terrain in the country varies from mountainous systems, deserts, steppes and Central Asia and Turkmenistan are prone to flooding, droughts, avalanches, earthquakes. Heavy flooding and water related disruptions are a major concern in the Caspian Sea. Depletion of Aral Sea has an impact on the entire region; the volume of water has decreased substantially; water levels have been affected; salty dust is taken from the sea and emitted into the region. Turkmenistan participates in all international discussions on this topic. Turkmenistan has developed a National Strategy for climate change - which focusses among other topics on agriculture and developing/improving the irrigation systems. There are also several national programs against climate change like the nation-wide tree planting campaign wherein thousands of trees have been planted across the country. Seismological risks and durability against earthquakes are also being in new buildings and constructions.

6. Building blocks of climate compatible development
[Giriraj Amarnath, PhD, International Water Management Institute]

Adaptation and Mitigation nexus to be focused on sustainability, building climate resilience, co-benefits, low emissions development. Key areas of work or important building blocks of climate compatible development to enhance resilience to climate change and disasters which include strengthening disaster preparedness, response and recovery, low carbon development and strengthening integrated frameworks.

Work-fields include Systemic risks and managing cascading risks, flood mitigation and improved irrigation infrastructure, knowledge development, inclusive action, energy efficiency. UNESCAP is leading some work on flood mitigation that must be carried out in order to accelerate transformation. Index based flood insurance is needed to develop a bottom-up approach, need to self-supporting commercial approach, subsidized system managed and guaranteed by government. Data is an essential first step for making flood insurance universally accessible among marginal smallholder farmers. In case of India, the government’s aim is on doubling farmer’s income for which IWMI developed a farmer’s cooperative: Irrigation Solar Pump Irrigator’s Cooperative in Dhundi Village which linked farmer’s solar irrigation pumps to electricity grid with the choice of selling the surplus power- the cooperative won recognition of the Indian government.
Training program seeks to develop scientific understanding of Disaster Risk Management among the students and means of capacity development in the field. The objective is to instil the necessary interdisciplinary capacities in people on the front lines of disaster response and preparedness. The courses take a multi-disciplinary approach along with interlinkages with multiple industries. Key highlights and research areas include climate hazards and Early Warning Systems, disaster governance, policy and risk management, remote sensing and GIS for disaster mitigation, community-based disaster risk reduction and management, floods and droughts and multi-hazard vulnerability and risk assessment. As part of the program the steps in the direction of capacity building in Disaster and Climate Science include Academic programs, projects, research, fellowships, symposium, publications and trainings. Education disruption due to the COVID-19 revealed the huge digital divide and systematic problems. The 2nd International Symposium on Disaster Resilience and Sustainable Development was successfully held from 24-25 June 2021. AIT envisions its role as a hub where resources and works from various organizations can be come together and the gap between partners is bridged. For resilience building from cascading risks, there is need of regional cooperation through Risk and Resilience Research and Education, Systemic risk reduction through informed decision making, Governance capacity development through disaster education, Polycentric governance approach for cascading risk reduction, Integrated platform to bridge the gaps between disaster risk knowledge discourse and practitioners
The intersection of the COVID-19 pandemic with extreme climate events is a reminder of the urgency to build infrastructure that can withstand, respond to, and recover rapidly from cascading and overlapping disruptions. The pandemic demonstrates that the convergence of both natural and biological hazards disrupt critical infrastructure in ways that impact the most vulnerable populations. Recognizing the deep intersections between disasters and health and to strengthen post-COVID-19 infrastructure resilience and disaster preparedness in the region, ESCAP member States adopted resolution (77/1) requesting ESCAP to promote “…discussions on the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015–2030, including by taking note of the Bangkok Principles for the implementation of the health aspects of the Sendai Framework and other relevant regional and subregional frameworks and initiatives…” . Under Global Target D, The Sendai Framework for Disaster Risk Reduction 2015-2030 aims to “substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030”.

1. Introductory Remarks and Keynotes

[Ms. Tiziana Bonapace, Director, ICT and Disaster Risk Reduction Division, ESCAP]

In the light of the cascading disasters that we are facing in the region from COVID-19 and other disasters, the theme building disaster and climate resilient infrastructure, particularly to support the most vulnerable populations takes centre stage. This session was an opportunity to virtually launch the IBC Knowledge Product – Climate and disaster resilient infrastructure: Building resilience to future uncertainties and shocks1.

[Mr. Sandeep Poundrik, Director General, CDRI]

This forum on “Investing in disaster and climate resilient infrastructure for better preparedness” comes at a timely moment. The urgency of risk informed investing and decisive disaster and climate actions has never been more urgent. As countries face the impacts of climate change and extreme events, the people, vital infrastructure, economy, and future development are exposed to various risks. The pandemic has led to an unprecedented impact on infrastructure sectors worldwide. This is only a reminder of the need for investing in disaster and climate resilient infrastructure. The recent IPCC report also focuses on this urgency again, and the urgent need for immediate action.

*Infrastructure investments for global recovery from COVID-19 pandemic*

COVID has exposed systemic risks across various infrastructure sectors - underlying drivers of poverty, lack of health systems, insufficient social welfare schemes that perpetuated these risks, has surfaced. The cross

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sectoral risk has brought out the importance of understanding to address these systemic and cascading risks and fragilities. Aimed at restarting Economic activities, Infrastructure investments are now being looked at as an essential part of fiscal stimulus packages as part of COVID-19 global recovery. This pandemic has been pivotal in opening the way for collaborative opportunities as well, it has offered an opportunity to build resilient health systems packed with an agile supply chain system.

**Suggestions for investment in infrastructure**

Multi sectoral and whole of society approach will be crucial in coming up with innovative solutions that are effective and affordable and to continue the work on disaster, resilience, predictable mechanisms for systematically assessing damages and losses to financing. Infrastructure recovery is essential. Reconstruction and recovery in infrastructure sectors must not only follow the build back better principal for multiple hazards but also build forward with the principles of resilience and sustainability. As countries work on their investment in infrastructure, there is a need to consider resilience in their mechanisms. Governments need to adopt risk financing frameworks. Now more than ever before, there is need to work together and promote a whole of government approach and whole of society approach, and at the same time there is working towards strengthening infrastructure governance and building partnerships for immediate action.

Bangkok principles for implementation of the health aspects of the Sendai framework for Disaster Risk Reduction are crucial and will hasten the pace of achieving resilience of health infrastructure. In CDRI’s health Infrastructure Resilience Program and incoming CDRI projects, the preliminary landscape analysis found evident gaps in the resilience of health infrastructure in most parts of the world. This has led towards developing the CDRI’s health Infrastructure Resilience Program, which aims to develop resilient health infrastructure at all levels from primary to secondary to tertiary for efficient delivery of health services. The interventions for health sector infrastructure program will be structured around CDRI’s strategic priorities on Technical Support, capacity development, research and knowledge management and advocacy and partnerships. CDRI has released a working paper on preparing for surgery requirement of medical oxygen and hospital beds for management of COVID-19. The paper presents recommendations for future preparedness on two major challenges in relation to COVID-19 response - availability of medical oxygen and ICU beds. It highlights the minimum preparedness comprising minimum actions required to be self-sufficient and the surge response comprising actions to be taken up for demand surge and maybe anticipated about 15 to 20 days in advance, using a more real time forecast model like SUTRA, In case of India. The delivery mechanism of the same can be achieved only through multi stakeholder partnerships and cross sectoral dialogues.

There are two immediate projects that CDRI will be initiating in coming months: “The risk assessment of health infrastructure to identify priority interventions in identifying CDRI member countries”, the other will be on “Learning from disasters - Case study on COVID field hospitals”, which will undertake a comprehensive and scientific case study of field hospitals in various countries of COVID-19. This will enable key stakeholders to prioritize building resilience into the health systems. CDRI's interventions will be an integral call in bridging the gaps and constraints with the larger endeavor of promoting a resilient future.

**Conclusion**

CDRI looks forward to insights from the IPCC report Climate and disaster resilient infrastructure, building, resilience to future uncertainties and shops and how the related infrastructure will be crucial in making people and economies resilient. CDRI was sure that this session will set the stage for reflection on the processes and instruments of risk, informed investing, and the role it could play in integrating the resilience - in short, medium, and long term. CDRI also urged city governments private sectors, civil society organizations and individuals to
adopt various approaches and improved programs for maintenance of infrastructure and contribute to a resilient future.

**Key Messages of the IBC Knowledge Product – Climate and disaster resilient infrastructure: Building resilience to future uncertainties and shocks**

[Mr. Marco Toscano-Rivalta, Chief of the Regional Office for Asia and the Pacific, United Nations Office for Disaster Risk Reduction (UNDRR) and Mr. Christophe Bahuet, Deputy Regional Director for Asia and the Pacific and Director of the Bangkok Regional Hub, UNDP]

Infrastructure is a manifestation of development. Infrastructure can be seen both as a explicit goal and as an implicit means to achieve the SDG and this shows the synergies between sendai and SDG. The events of recent times have exposed systemic gaps in infrastructure not only in healthcare but also in transport and telecommunication. This infrastructure was put into considerable strain with the onset of the pandemic and in many cases failed as it was compounded with natural hazards.

To ensure that these facilities and services are available when needed the most, countries and service providers must integrate the priorities of the sendai framework into their infrastructure development. This includes understanding cascading risks from multiple hazards and how it will impact infrastructure. Addressing this risk requires strengthening inclusive risk governance to ensure the needs of vulnerable groups are considered. It also requires adopting decision-making that incorporates science and evidence to capture the complex risk scenarios.

If resilient infrastructure is approached as a system should go beyond asset resilience and should be built on addressing social economic vulnerabilities. In the absence of such measures infrastructure development projects may fail to consider local and gender differentiated needs and may become vulnerable to disaster risk and may even exacerbate or create new risks. To avoid this, Disaster Risk Reduction must be embedded in all development projects especially in infrastructure. Protecting lives, livelihood, social services and assets requires a substantial increase in funding dedicated to climate change adaptation and risk reduction measures. Funding could help, especially for the less developed countries to protect their infrastructure investment and development gains from disasters.

By integrating risk reduction and climate adaptation into COVID-19 recovery packages such as investing in nature based solutions countries can really stimulate their economic growth while building their resilience and reducing vulnerabilities. An examples of nature based solutions include use of green and blue infrastructure such as mangroves for coastal defense or constructive wetlands to prevent floods.

**Four key aspects of climate resilient infrastructure**

a) Promoting Disaster Risk Reduction as a public good: Disaster risk reduction should be accepted as such by public and policy makers. There are evidences that during the pandemic months, disaster risk reductions strategies have protected people’s lives and livelihoods and minimized the associated recovery cost.

b) Taking “Build back better” from rhetoric to reality: Experience from past disasters have shown that it is imperative to build back better, so that development is risk-informed and can withstand future hazards. It is not only hard infrastructure (bridges and roads) but also connectivity. It is also learnt during the pandemic that it is important to have these such infrastructure. It needs to both blend public and private partnerships.
3. The paradigm shift in infrastructure development for resilience
[Mr. Sanjay Mathur, Director, Asia Region at UNOPS]

Infrastructure is a foundation of our society which enables and drives development. From the supply of energy and water and treatment of waste to the provision of effective health care and education services, infrastructure enables our communities to function effectively and to grow and prosper. In the current global landscape, where climate change and global health challenges like COVID have such significant impact on our lives, it is clear that quality infrastructure is a key part of the solution if we are to achieve a sustainable and resilient future. A World Bank report estimates that 97 trillion U.S. dollars investment is required in infrastructure by 2040. Globally, much of this is for lower and middle income countries. The life cycle of most infrastructure is 2550 years or more. So, our planning now affects decades of development and we can't afford to keep getting it wrong.

The devastating impact of the 7.2 magnitude Earthquake on 21 Aug in Haiti exposed the poor quality of infrastructure and the failure of related services. When we compare this with similar size earthquakes in Japan for example, we see much less impact on lives, livelihoods and development and this is entirely down to the quality of infrastructure and related services which we rely on, especially in the aftermath of disasters. Thus, we require a paradigm shift in our approach to infrastructure, focusing on high-quality climate mitigation and adaptation technologies made of locally sourced and sustainable materials, more energy-efficient technologies, better integrated planning, and prioritising investment in power structures that have long-term development implications while also ensuring sustainable access to essential services.

4. The opportunities in emerging technology and innovations that can support people centric investments in critical infrastructure, particularly public health infrastructure
[Ms. Saini Yang, Director International Centre for Collaborative Research on Disaster Risk Reduction, Academy of Disaster Reduction and Emergency Management, Ministry of Emergency Management, Ministry of Education, The State Key Laboratory of Earth Surface Processes and Resource Ecology, Beijing Normal University, China]

People-oriented Resilience Building

People-oriented resilience building can be found at the individual level, community, including disaster preparedness, early warning, response and recovery. Critical infrastructure such as the use of UAV, new materials, and because of the pandemic we have remote diagnosis platform for the medical services. There are needs for scientific evidence for resilience buildings, especially the needs for cost and benefit analysis. Scientific evidence can also support the resilience building. As an example, by using actual heatwave in Shanghai on different population groups. It was found that different from existing consensus, it is not always children and elderly are the most affected groups, but mid-ages males and females were also highly impacted by heatwaves
due to outdoor exposure. This type of research reveals that for individual and better, we need more tailored
early warning standard for specific population groups. This will also induce higher socio-economic cost.

Community-based disaster reduction
In one of the delegate’s research, data were collected from more than 11,000 demonstration communities, such
as in preparedness, risk mappings, risk communications, evacuation drills, as well as self-rescue skills. It was
found that regions with demonstrative communities are tend to build more demonstrative communities in their
neighborhood. In prefectures with more demonstrated communities, they have about 50% lower disaster loss
ratio. This provides concrete evidence of community-based for DRR.

Sectoral collaboration in China
Through the collaboration of Ministry of Transport and CMA, National highway weather early warning system to
strengthen the resilience the transport system in the context of climate change. By using dynamic data, dynamic
deployment of facilities and human resources. We collected weather related road data at national levels. For
example, traffic congestion and delay. For better disaster preparedness and emergency responses. The loss
reduction is about 5 times of the investment of this early warning system itself. And indirect loss is even higher.
These types of Cost and Benefit Analysis, really provides value, it can better convince the stakeholders for a
resilience infrastructure.

5. The challenges and opportunities to promote investments in disaster and climate resilient public
health infrastructure
[Ms. Darnelle Worswick, Director, Bureau of Health Administration & Support Services, Republic of Palau]

Introduction to Palau –Challenges, current situation, and condition of Heath Infrastructures
Palau is a small island nation with an estimated population of around 17,000. There are 16 states and of those
16 states, we still need to travel by water to 5 states. The main source of economies in our environment
which is, mainly tourist industry. Although a very small island states are spread out with farthest island in north
that takes about 45 minutes to an hour travel by car and the farthest by shift southwest islands – which takes a
day. We have one hospital that serves all of Palau and 9 community health centers that are strategically
located throughout. As well as four private clinics located in the central quarter where most of the population are
residing and most of the businesses are located.

However, with the current climate changes in global climate issues not to disregard, the COVID-19 pandemic,
Palau is also experiencing increasing typhoons, drastic weather conditions, rising seas, unpredictable weather
conditions that affects our ability in maintaining our facilities and ensuring uninterrupted health service. Of
the 9 Community health centers, there are two other operating in full capacity, meaning that we have a
laboratory, radiology emergency room. all the ancillary services and doctors, nurses - so it's full capacity. The
facilities in the 9 community health centers, including our one hospital is about 30 years old built with funding
assistance from the United States and regular maintenance is a constant challenge, especially with all the
weather conditions.

UNOPS projects in Palau
In 2019, UNOPS assisted and provided a comprehensive assessment of the facilities and our community health
centers, including the ability to provide long term, improved services, even in the face of extreme weather. This
included looking at relocating one of our facilities away from the coast, and in one another facility we looked at
adding another story to provide refuge and care during flooding - as the whole island was at risk of flooding and there was no double Story building, we learned about this during Bopha typhoon. One of the main issues is an unreliable power supply, especially during bad weather, which makes it very hard to store important drugs which need to be kept cool and hard to communicate during emergencies. Backup power using a combination of solar, and generators was used, and backup communications using mobile, satellite and radio are being introduced. All the materials being used are more durable and resistant to rust and provides insulation for more energy efficient and comfortable internal environment.

**Ongoing UNOPS projects on the island - WCHC**

Few UNOPS project are currently going on in Palau, one is to to replace roofing of the Community Health Center located in one of the island outlines. The other UNOPS that is currently ongoing is another community health centers, which is located on the far north of islands, this were still ongoing. Palau hoped to improve at least six other Community health centers in the original plan, but the funding made available was only enough to make improvements to two and half centers, the project is scheduled to be completed in 2020, but due to the COVID-19 pandemic was extended and it impacted our schedule and availability of materials.

**Why is it important and why are we interested in this?**

These facilities are not only clinics to serve regular health services, but they are our only backup in the event of natural disasters or pandemics. They serve as an avenue to redirect services and decentralize to minimize concentration to the hospital; we require the resilient infrastructure in place to accommodate migration. These facilities have served as a shelter - the only infrastructure Standing as we learned from Typhoon Bopha last year. Palau acknowledged the UNOPS’ commitment to provide high quality infrastructure and procurement services under ordinary circumstances and in times of crisis. These improvements to Palau infrastructure provide accessibility, availability, affordable care, effective health service to our population and efficiency. UNOPS has brought resilient infrastructure designs and engineering, in an added bonus, UNOPS personnel were able to provide critical training to our maintenance personnel, our contractors to ensure continued maintenance after works are completed. Palau also encouraged organizations to continue engaging with small island developing States (SIDS) and vulnerable countries. Palau looked forward to deepening our cooperation with the UNOPS to accelerate progress towards addressing, identifying, and providing remedy for gaps and hopefully attain resiliency.

**6. Harnessing the existing regional and subregional co-operation mechanisms to promote investment in disaster and climate resilient infrastructure, from a small island developing state perspective**

[Mr. Hisan Hassan, Chief Executive, National Disaster Management Authority, Maldives]

The rise in global temperature over the last several decades is of great concern, especially to countries like Maldives. Damages due to sea surges, extreme flooding in coastal erosion has increased its intensity over the years. Changes in weather patterns have extended the dry season, resulting in rain water shortage in majority of the islands. All these things indicate that due to the climate emergency, urgent actions are required while we still have time. By being prepared to support and adapt climate change mitigation, we can still reduce the loss incurred due to climate change and sustained critical services.

Investing in the DRR saves lives and reduces economic loss. Besides minimizing disaster losses, investments in DRR also boosts economic, social and environmental benefits that enhance the wellbeing and resilience of countries and communities. Investing in DRR also increases resilience of communities and countries. Economic investments become viable. This is specially important for small island states with their limited natural resources and economic activities. Hence nature based solutions should be promoted and protecting the main groups of the island reefs should be of highest priority. Investing in DRR also generates development core benefits. In the
case of small island states like Maldives, shore protection measures designed to reduce impact of erosion can be designed to protect from and limit flooding.

The 2030 agenda for Sustainable development identifies and reforms the urgent need to focus on disaster reduction in stress events and the need for development planning to be risk informed. The vulnerability of communities puts them at more risk of loss. The effects of degradation, social economic status, and disease outbreaks injures the economic status of the Community. By investing in mitigation and preparing countries, communities will save money and resources by placing DRR as a trend setter for sustainable development, 2030 and open doors to integrate DRR on international as well as local level. It will also enable legislation policies and strategies to integrate DRR.

Promoting DRR should not be ad hoc, improving coordination skills and competencies among regional or subregional levels and to share knowledge and experience at these levels are important. Harnessing regional and sub regional cooperation mechanisms to promote DRR investments are believed to have several positive outcomes, there are several elements of regional and subregional mechanisms that can be used to promote investments in disaster resilient infrastructure.

The one important lesson we can learn from disasters is that amending and reviewing central plans and strategies to integrate DRR to provide finance and resources required for implementation of risk reduction can never be done by a single agency or ministry. It's everyone's business. And it's very important to enhance cooperation between sectors and to strengthen countries' capacity for disaster management. Investment in DRR can never be sustainable if it is not accepted by the public, hence it is essential to stimulate and foster people centered public and private investment.

7. How can existing global frameworks support the building of disaster and climate resilient health infrastructure in Bangladesh

[Ms. Nurun Nahar, Joint Chief (Joint Secretary), Planning Commission, Ministry of Planning, Bangladesh]

Bangladesh has to deal every year in a recurrent basis such as Drought, cyclone, storm surges, floods, water logging and riverbank erosion, which are mentioned clearly in the national planning document. Bangladesh wants resilient infrastructure, transport system, education facilities, towns and villages. There are more infrastructure we need in the coming years, and Bangladesh target is to be a middle-income country by 2041. These 2 years during the pandemic has showed us the pandemic issues and the infrastructure deals with our preparedness for any disasters, and how they are colliding and conflicting. Bangladesh learnt from the cases, but also needed to make sure that all their infrastructures are strong and resilient to the hazards. Bangladesh wants to properly allocate the resilience of buildings such as shelter and hospitals, so that these will not be washed away.

The population living in rural areas are facing the havoc of climate change. Especially those living in wetlands. The Government is developing resilient households at rural level, several thousands, especially related to cyclone and storm surges. Cyclone Yaas triggered storms and tidal surges – 6,000 homes flooded (Koyra, Khulna), 2,700 houses damaged in Coxzbazaar 727 km rad damaged in Patuakhali.

Ministries of Bangladesh execute National Plans. Key-ministries have disaster-reduction sensitive investments, and it is all over Bangladesh, especially in the coastal areas. Bangladesh feels the urge to design them better, and to be more aware of the current knowledge of the hazards, impact of the hazards due to the climate change.

The Global Framework such as – SDGs, the Sendai Framework and Paris agreement have been incorporated in Bangladesh National Plans. In the Long-term Plans, one of the key feature is Bangladesh Delta Plan. The National plan has considered climate change up to 2100 and divided the countries into hotspots, these will be
used to design infrastructures related to the potential of the rivers, of being cyclone shelters, with consideration of the hotspots.

Bangladesh also developed National Plan for the Disaster Management with guidelines for the ministries. Natural and biological hazards have been recognized in this document, in order to mainstream the Risk-Informed Development in our development planning for infrastructure, especially for the health infrastructure. This requires the whole of society approaches.

A good example during Cyclone Amphan, when the rescue and evacuation took place, it was successful because Bangladesh took both of the COVID-19 pandemic issue and knowledge on risk and operational for cyclone. So these could lead the country to some successful ways of evacuation, leading to a very minimal number of deaths. Managing Cyclone Amphan in 2020 set the lessons on how the country evacuate 2.4 million people in more than 14,000 shelters. The informal institute turned into to cyclone shelter with existing 4,100 shelters. Maintain physical distance, with hygiene practice keep the infection minimum of COVID-19. This has been recognized as best practice in managing cascading disasters amid pandemic Link with Community Risk Assessment (RA) for local Risk Reduction Actional Plan for building resilience.

Bangladesh felt the need of more knowledge, more preparation, so that multiple hazard linkages and the cascading risks can be understood better. And all the departments involved to be more aware and prepared. More investment in these areas was also needed. Bangladesh have been trying to include the disaster issues from the knowledge of climate changes, to ensure that disaster issues is finalized in the project document. The DIA (Disaster Impact Assessment) consists of hazard assessment, cost analysis for a risk-informed planning and projects.

8. Discussion

*What is the key principle of people centric infrastructure and how should we operationalize this?*
Sometimes we tend to equate lives with monetary value, but the people centric resilience should prioritize people’s risk and benefits. People’s lives cannot be put on the same dimension with monetary savings and benefit and this is a key issue especially in the current pandemic situation.

*Are there any mechanisms that can support financing and resourcing required for DRR activities in the Maldives?*
Maldives Ministry of Finance under the cabinet that works in relation with the financing. This has happened during the COVID-19 situation. There are still internally some coordination level things that we need to do among the agencies, which would clear the roles in how we could request other country members and agencies to support in this system.

*How do you see the demands for infrastructure changing in the post COVID and climate change reality?*
For Palau, it is extremely high. Just considering or looking at the hospital or the health sector alone, we are being challenged - on separating regular operations from COVID-19 operations and so improvement or additional expansions of our infrastructure is necessary, but we also require expertise for assessment as well.

Closing remarks and the recommendation to create enabling environment to stimulate people-centred public and private investment in public health emergency and disaster risk reduction including through the Issue Based Coalition on Building Resilience and the Coalition for Disaster Resilient Infrastructure (CDRI).
The Thematic Expert Meeting on Building Disaster, Climate and Health Resilience:

Thematic Session Recommendations

The onset of the COVID-19 pandemic has accentuated cascading risks emanating from the convergence of multiple natural and biological disasters in the Asia-Pacific region. The impacts of such disasters are exacerbated by climate change, reshaping and expanding the contours of the region’s riskscape.

Thus, against the backdrop of the third ESCAP Disaster Resilience Week, a Thematic Expert Meeting was convened on 24 August 2021 in response to ESCAP Commission resolution (77/1) which encourages member States to work regionally with the support of the Executive Secretary, and in cooperation with other concerned United Nations bodies and relevant stakeholders to “promote discussions on the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015–2030, including by taking note of the Bangkok Principles for the implementation of the health aspects of the Sendai Framework and other relevant regional and subregional frameworks and initiatives, by convening a thematic meeting in conjunction with the seventh session of the Committee on Disaster Risk Reduction and reporting on its outcomes at that session of the Committee, with a view to strengthening post-COVID-19 resilience and disaster preparedness in the region”.

The meeting benefited from the series of thematic discussion sessions of the disaster resilience week that deliberated on various pathways to build systemic resilience to address multi-hazard risks from both natural and biological hazards. Underscoring the outcomes of these discussions, the member States at the Thematic Expert Meeting made the recommendations noted below. The recommendations were reported to the Committee on DRR at its seventh session, under agenda item 4: Review of work of the secretariat and UN system at the regional level.

Recommendations

Within ESCAP’s overall mandate of promoting regional cooperation in disaster risk reduction and in cooperation with other concerned United Nations’ bodies and relevant stakeholders, the Meeting made the following recommendations:

Recommendation 1

Draft a regional strategy on building back better with disaster, climate and health resilience to manage cascading risks and help operationalize implementation of the Bangkok Principles and other relevant regional and subregional frameworks and initiatives.

Recommendation 2

Leverage existing regional cooperation mechanisms and sub-regional initiatives, including the Asia-Pacific Disaster Resilience Network established by the Committee on DRR at its sixth session.

Recommendation 3

Build a longer-term, holistic, and more strategic approach in alignment with the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction and the Paris Agreement and with four inter-related work streams that include i) policy coherence, ii) integrated multi-hazard early warning systems, iii) climate adaptation and resilience, and iv) investing in disaster and climate resilient infrastructure for better health preparedness.
Recommendation 4

Promote policy coherence for integrating disaster and public health risk management policies as well disaster and pandemic preparedness capitalizing on the experiences from disaster management, health, and planning agencies of member States, concerned United Nations bodies, regional and subregional organizations, and relevant stakeholders.

Recommendation 5

Scale up regional/sub-cooperation for integrating biological hazards and applying a multi-hazard, multi-sectoral, transboundary, and systemic risk approach through strengthened early warning system initiatives.

Recommendation 6

Promote climate adaptation and resilience into post-COVID recovery efforts and disaster risk reduction, learning from the region’s vast and diverse experiences including from the North-East Asian Subregional Programme for Environmental Cooperation (NEASPEC), and the Association of Southeast Asian Nations (ASEAN);

Recommendation 7

Create an enabling environment for enhanced people-centred public and private investment in public health emergency and disaster risk reduction including through the United Nations Issue Based Coalition on Building Resilience and the Coalition for Disaster Resilient Infrastructure (CDRI).
The outcomes and recommendations from the Regional Learning Platform enriched the discussions of the seventh session of the Committee on Disaster Risk Reduction which was held from 25 to 27 August 2021. The Committee addressed the following issues: (a) emergence of cascading risks and extension of the disaster riskscape; (b) scaling-up multisectoral cooperation frameworks to manage cascading risks; and (c) status of regional co-operation efforts.

Noting the discussions of the Regional Learning Platform, the Committee on Disaster Risk Reduction recommended (1) a scale-up of regional and subregional cooperation strategies that integrate disasters, including climate-related disasters, and associated health perspectives, to complement national efforts to implement the 2030 Agenda for Sustainable Development, (2) further capacity-building activities to manage and mitigate cascading risks using innovative technology tools and (3) increased technical advice and capacity-building support on the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015–2030, including by taking note of the Bangkok Principles for the implementation of the health aspects of the Sendai Framework for Disaster Risk Reduction 2015–2030 and other relevant regional and subregional frameworks and initiatives.

Specifically, the Committee noted the need to operationalize resilience to all types of disasters, including those intensifying due to climate change, by implementing the Sendai Framework for Disaster Risk Reduction 2015–2030 which served as a foundational mechanism and the global architecture of international cooperation for disaster risk reduction. In addition, the Committee recommended that the secretariat continue its activities to promote multi-hazard early warning systems, including through the impact-based forecasting approach for the detection of hazards with reasonable lead time, promoting an emergency cooperation mechanism for natural disaster prevention, contributing to effective reduction of cascading disaster risks and developing assessments of socioeconomic exposure to dynamic hazards using an integrated approach to formulate proper intervention measures. Finally, The Committee commended the launch of the thematic online portal on disasters (ESCAP Risk and Resilience Portal) and expressed its appreciation for the support that it would provide in implementing the 2030 Agenda for Sustainable Development in the region. In that regard, the Committee recommended that the portal be used as a key tool to facilitate risk-informed policy decisions for development and investments in Asia and the Pacific and noted that it provided an effective platform for analysing the regional riskscape and risk geography.