A Vision Paper

on the Integration of Pandemics into a Multi-Hazard Early Warning (MHEW) Environment for Sri Lanka

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1. Executive summary

Vision
A Multi-Hazard Early Warning System (MHEW) which addresses pandemics, their potential for co-occurrence and complex interactions with other hazards

Mission 01	Mission 02	Mission 03	Mission 04
Pandemics and associated compound hazard scenarios are identified in hazard, risk and vulnerability assessments	Improved detection and monitoring of pandemics and associated compound hazard scenarios	EW messages issued during a pandemic and an associated compound hazard scenario are effective in influencing anticipated behavioural changes and have a higher reach	Improved preparedness and response for pandemics and associated compound hazards
Intervention 1.1 Encourage cross-sectoral collaboration between the health sector, disaster management sector and other sectors	**Intervention 2.1** Integrate technology used in EW systems into detection and monitoring of pandemics and associated compound hazard scenarios	**Intervention 3.1** Establish national level collaboration between health sector and non-health sector stakeholders to design influential and appropriate EW messages	**Intervention 4.1** Update the existing disaster management plans at the sub-national levels to incorporate pandemics
Intervention 1.2 Promote data sharing across sectors and administrative levels by the establishment and maintenance of a central database	**Intervention 2.2** Invest in improving the resilience of critical infrastructure, particularly healthcare facilities to improve testing and detection and vice versa	**Intervention 3.2** Use the existing EW mechanism coordinated by the DMC to disseminate early warning messages pertaining to epidemics and pandemics	**Intervention 4.2** Develop a disaster risk management plan for compound hazards, placing emphasis on identified worst-case scenarios
Intervention 1.3 Identify geographical and socio-demographic risk factors for the most prominent communicable diseases	**Intervention 2.3** Train and deploy volunteer teams to carry out detection and monitoring activities at the ground level	**Intervention 3.3** Establish a rumour monitoring and management mechanism at the local level	**Intervention 4.3** Foster multi-sectoral collaboration in planning
Intervention 1.4 Encourage the use of technological advancements in developing risk knowledge for compound risks	**Intervention 2.4** Empower the community to streamline channels of receiving ground risk information	**Intervention 3.4** Use technological platforms such as social media for EW dissemination and risk communication	**Intervention 4.4** Carry out preparedness activities targeted at communities at risk for pandemics and associated compound hazards
	Intervention 2.5 Undertake staff contingency planning for required activities during pandemics Undertake staff contingency planning for required activities during pandemics		**Intervention 4.5** Encourage prepositioning of resources and capacity building in responsible authorities

2. Introduction to the issue and broad vision

Early warning (EW) systems are an essential component of disaster risk reduction (DRR). An EW system aims at providing timely warnings to people with the objective of minimizing the physical, social and economic losses and damages caused by disasters. The Sendai Framework for Disaster Risk Reduction (SFDRR), the current global framework for DRR, advocates the development of Multi-Hazard Early Warning (MHEW) systems and increasing access to disaster risk information in target (g) of its seven global targets. A MHEWS has the ability to address several hazards and/or impacts of similar or different types in situations where hazardous events may occur alone, simultaneously, cascading or cumulatively over time, and taking into account the potential interrelated effects.

The world had experiences with pandemics such as the Spanish flu, the Asian flu, and the Hong Kong flu in the 20th century. The definition of 'risk' has been extended to incorporate biological hazards in the SFDRR, taking heed of the above and more recent experiences of epidemics such as MERS, SARS and Ebola. Most recently, the world saw the rapid transmission of a Coronavirus (COVID-19) that soon developed into a large scale pandemic, not only causing a myriad of effects that transgressed boundaries, but also interacting with other parallel hazards (e.g. natural hazards) rendering conventional response measures obsolete. This shows that local, national and international EW systems for pandemics are largely underdeveloped, while also indicating pandemic response could significantly benefit from such a system. Existing EW systems tailored to natural hazards, such as floods, earthquakes and landslides, may seemingly lack applicability in contexts of pandemic response because unlike natural hazards that require persons at risk to move away from a crisis point, biological hazards (e.g. epidemics and pandemics) require people to minimize movement to reduce transmission. Nevertheless, MHEWS seek to convey risk, which in the present discourse on DRR means all forms of risk (including biological hazards), in a comprehensible format while also ensuring credibility and transparency.

This paper sets out a vision for the development of **a MHEWS that addresses pandemics and their potential for co-occurrence and complex interactions with other hazards in Sri Lanka.**

3. Integration of pandemics into MHEWS: Current status and gaps

A MHEWS comprises four elements:

- Disaster risk knowledge
- Detection, monitoring, analysis & forecasting of hazards and possible consequences
- Warning dissemination and communication
- Preparedness and response capacity

This section of the paper presents an analysis of the current status and gaps characterising the above four elements with respect to mitigation, preparedness and response to pandemics in Sri Lanka.

3.1 RISK IDENTIFICATION FOR PANDEMICS: CURRENT STATUS AND GAPS

According to the National Disaster Management Plan 2014-2017, health sector authorities, including the Department of Health Services, are responsible for carrying out hazard, risk and vulnerability assessments for biological hazards. At the divisional and local levels, spot maps for communicable diseases outlined in the 'List of notifiable diseases' are developed by the Public Health Inspectors (PHIs) under the supervision of the Medical Officers of Health (MoH). In particular, a daily spot map and a cumulative spot map (reflecting on monthly statistics) for communicable diseases are maintained by the PHI as per the guidelines provided in the PHI manual. In certain MoH areas, situation analyses have been carried out for more common diseases such as Dengue. The analyses have reflected on the disease trends, behaviour of the disease and extent of transmission during the past five years. However, risk identification for pandemics are characterised by the following limitations:

- Whether spot maps developed marking individual cases make up for comprehensive risk assessments is questionable. Social and economic vulnerability aspects have not been taken into consideration in mapping biological hazards.
- Risk assessments have not been undertaken in the country to map areas at risk of multi-hazard scenarios, such as pandemic-natural hazard hybrid scenarios.
- Data regarding exposure to various hazards are maintained in compartmentalized form.

3.2 DETECTION, MONITORING, ANALYSIS & FORECASTING OF PANDEMICS AND THEIR POSSIBLE CONSEQUENCES: CURRENT STATUS AND GAPS

At the national level, the Epidemiology Unit is the focal point for detection and monitoring of an outbreak of diseases. The main mechanism that is used for detection of an outbreak is the disease surveillance system of the country which consists of routine notification of communicable diseases, special surveillance on selected communicable diseases and sentinel site surveillance. The routine surveillance system facilitates a hierarchical flow of information from sub-national level health authorities, such as hospitals, Medical Officers of Health [MOH], Regional Directors of Health Services [RDHS], to national level health authorities that include the Epidemiological Unit, the Deputy Director General of Public Health Services and the Director General of Health Services. Routine surveillance of communicable diseases in the country is supported by a notification system designated to provide notifications on diseases identified in the List of Notifiable Diseases in the country. The Quarantine and Diseases Prevention Ordinance and its subsequent amendments mandate the implementation of said Notification System.

Further, special investigations are carried out on fifteen selected communicable diseases [including Dengue, Cholera, and Leptospirosis] to obtain more information. The Epidemiology Unit sends special investigation forms to the relevant MOH to investigate the cases by the MOH and the team (Field based special investigation) and the Infection Control Nursing Officer (Hospital based special investigation). The forms are to be completed and sent back to the Epidemiology Unit to be entered into a central database. In addition to this, sentinel site surveillance is carried out in specially identified settings and designed to minimise the drawbacks of the routine surveillance system. There are major hospitals in the island assigned as sentinel sites to collect data of Acute Flaccid Paralysis (AFP), Neonatal Tetanus, Measles, Rubella/Congenital Rubella Syndrome and Dengue and Dengue Hemorrhagic Fever. In addition to these, hospitals have been designated for human influenza surveillance which comprises of two components: 1) Influenza like illness (ILI) surveillance and Severe acute respiratory tract infections (SARI) surveillance. The Medical Research Institute (MRI) and the Epidemiology Unit function as the focal points for human influenza surveillance.

However, detection, monitoring, analysis and forecasting of pandemics are characterised by several gaps:

- Delays have been faced in dissemination of information (e.g. on the number of quarantined cases) to non-health sector officers, particularly during the COVID-19 pandemic. This has held up certain functions designated to be carried out by non-health sector officers, such as the distribution of relief.
- The absence of a central database to access data was strongly felt. For example, during the COVID-19 pandemic local level health sector officers received multiple calls from multiple institutions requesting the same set of data. They felt overwhelmed by the number of calls and duplicity of work, which in turn compelled them to ignore the calls.

3.3 WARNING DISSEMINATION AND COMMUNICATION DURING PANDEMICS: CURRENT STATUS AND GAPS

According to the National Disaster Management Plan 2014-2017, the Ministry of Health and the Department of Health Services are the designated technical agencies to issue early warning during a biological hazard. Once the EW is issued, this message is to be disseminated with the involvement of the Disaster Management Centre. However, currently both the issue and dissemination of the EW is carried out by health sector authorities. In accordance with the International Health Regulations (IHR) of 2005, the Epidemiology unit and Quarantine Unit of the Ministry of Health are informed by the World Health Organization (WHO) about diseases that originated in foreign countries. If there is an outbreak in the Sri Lankan context, the mentioned units have been vested with the task of reporting to the WHO and generating the EW message for Sri Lanka. During a pandemic, EW messages are issued by the Director General of Health Services (DGHS) at the national level and subsequently disseminated through the Regional Director of Health Services [RDHS] at the district level, MOH offices at the divisional level, and Public Health Inspectors (PHIs) at the local level to the community. In certain districts however, the District Disaster Management Coordination Units (DDMCUs) have been involved, whereby the EW is given by the MOH to the DDMCU and that is then communicated to the public. Nevertheless, the involvement of the DDMCUs could not be observed in all areas. Further, risk communication is a key aspect of EW dissemination and the Health Promotion Bureau (HPB) of the Ministry of Health functions as the main unit responsible for health education, health promotion, and publicity of health information pertaining to communicable diseases.

Nevertheless, EW dissemination and risk communication for pandemics are characterised by the following limitations:

- The responsiveness of the general public to EW and risk communication messages has been low.
- While there is a high potential for the spread of rumours and misinformation during a pandemic, mechanisms for handling misinformation, particularly at the sub-national level, were minimal during the COVID-19 pandemic.
- During a large scale pandemic, local level public health officers, who play the main role in last mile dissemination of EW, can be overburdened and experience burnout given the large number of tasks that are expected to be performed by them. This may reduce the efficacy of prevention and control activities that are carried out at the ground level.

3.4 PREPAREDNESS AND RESPONSE CAPACITY FOR PANDEMICS: CURRENT STATUS AND GAPS

Awareness raising activities for common epidemics, such as Dengue, have been carried out by the Ministry of Health in collaboration with the DMC, and in certain instances, with other stakeholders, such as NGOs and INGOs. Furthermore, during the COVID-19 pandemic, relevant information, including health guidelines to be followed, updates on positive cases and the nature of the virus, was communicated mainly through the HPB at the national level. At the divisional and local levels, awareness raising activities were mainly carried out by the MOH office with the involvement of the PHIs. However, the response capacity of the public to COVID-19 was challenged due to the following reasons:

- Certain health guidelines, such as those associated with directing first contacts to quarantine centres and cremation of dead bodies, did not align with certain religious norms and beliefs.
- Pre-existing racial and ethnic tensions obstructed the smooth execution of prevention and control measures at the local level.
- Lack of attention has been paid to biological hazards such as epidemics and pandemics in provincial, district, divisional and Grama Niladhari/local level disaster management plans.
- For compound hazards featuring pandemics, there is an absence of disaster risk management plans that guide risk mitigation, preparedness, response and recovery activities.
- The stigma associated with COVID-19 infection resulted in a reluctance among the public to disclose their infection status.

4. Missions and interventions

4.1 MISSION 01: PANDEMICS AND ASSOCIATED COMPOUND HAZARD SCENARIOS ARE IDENTIFIED IN HAZARD, RISK AND VULNERABILITY ASSESSMENTS

a) Encourage cross-sectoral collaboration between the health, disaster management and other sectors

An accurate and comprehensive assessment of the pandemic risk should be supported by the understanding that 'risk' cannot be measured based on mere exposure to a hazard. Risk is a combination of both exposure and vulnerability. Hence, various dimensions of vulnerability, including social and economic vulnerability of households, should be considered when assessing risk. Neither does risk materialize in a siloed manner. Therefore, efforts to assess pandemic risk should account for the complexity of risk, i.e. the potential for hazards to interact, cascade into and co-occur with another hazard. There is an urgent need to develop composite risk matrices to identify communities that are at risk of pandemics as well as other hazards (e.g. floods, landslides) that may concur with a pandemic. Such broad conceptions of risk can only be developed, supported and put into action through cross-sectoral collaboration among health, disaster management and other sectors as relevant, such as Local Authorities, the private sector and NGOs.

b) Promote data sharing across sectors and administrative levels by the establishment and maintenance of a central database

There is no doubt on the need for emulating multi sectoral approaches for DRR in a multi hazard context. In this regard, flow of data and information among stakeholders plays a significant role, especially for proactive measures. Even among public health sector authorities, data sharing and information flow stand paramount in analysing possible risks related to pandemics and associated compound hazards. Although there are several e-based platforms containing data on notifiable diseases, these platforms need to be integrated to one central database. Furthermore, paper based reporting systems are still used by the public health sector of the country and these systems need to be integrated into the central database. This will provide both health sector and non-health sector stakeholders with access to data which are needed for the development of risk knowledge pertaining to pandemics and associated multi hazard contexts. Furthermore, the impacts of pandemics and possible compound hazards can affect the process of feeding data into the central database. In this regard, it is essential to develop capacities at data feeding points and establish designated units/personnel for this task.

c) Identify geographical and socio-demographic risk factors for the most prominent communicable diseases

The risk of a disaster can vary based on various factors. In relation to pandemics, although there are risk identification systems in place, these systems do not adequately incorporate geographical and socio-demographic risk factors. For instance, the presence of ageing population needs to be identified as a risk factor, especially for pandemics. It should be considered in taking decisions for containment measures since there can be cascading impacts, for example, mobility restrictions imposed may exacerbate the vulnerability of the aging population by restricting their access to essential medical supplies and treatments. This could in turn impair their overall health and sustenance. Furthermore, geographical variations play a significant role in the identification of possible compound risks, especially in relation to hydrogeological hazards that concur with a pandemic. Therefore, there is a need for considering both geographical and socio-demographic risk factors in assessing the risk of communicable diseases of pandemic potential.

d) Encourage the use of technological advancements in developing risk knowledge for compound risks [impacts, vulnerabilities, capacities]

Extensive use of technological advancements has facilitated the quantification of disaster risk. For instance, developing computational powers, forecasting models, and emergence of catastrophe modelling methods have constructed a trustworthy platform for disaster risk assessment globally. There is room to improve existing methods of disaster risk assessment in the country by leveraging technological advancement to maximize benefits. For instance, improvements in data processing and analysis can be utilized for generating a large numbers of hazard scenarios, especially during a pandemic. These advancements can greatly improve our ability to study risk and probability related to possible compound hazard events amidst a pandemic. The use of technological advancements can fill gaps in risk assessments that have been carried out through traditional measures. For instance, these techniques provide stakeholders with a platform to integrate different data sources on the natural and built environments, and to incorporate socio-demographic and geographical factors in risk assessments.

4.2 MISSION 02: IMPROVED DETECTION AND MONITORING OF PANDEMICS AND ASSOCIATED COMPOUND HAZARD SCENARIOS

a) Integrate technology used in EW systems into detection and monitoring of pandemics and associated compound hazard scenarios

There's potential for improvements in technology to be leveraged in detecting and monitoring of pandemics and associated compound hazards. For instance, the possibility of using the GPS navigation system, which is generally used in EW systems for hydrometeorological hazards, also for contact tracing during pandemics has been recently discussed by academics and practitioners. Further, mobile technology and the Internet of Things can be deployed to introduce an online system for surveillance, coupled with a central database that allows for data sharing across sectors. The central database may contain PHI area wise data on the incidence, mortality and socio-economic conditions of households that is accessible by both health and non-heath sector stakeholders. Integration of technology, particularly

those that are used in EW systems, into detection and monitoring activities, would be crucial in overcoming delays associated with surveillance, data transfers and taking preventive actions. For example, such technical developments could reduce paperwork, increase convenience and improve the reliability of data.

b) Invest in improving the resilience of critical infrastructure, particularly healthcare facilities to improve testing and detection and vice versa

Measures should be taken to enhance the resilience of healthcare facilities, such as hospitals, to other hazards that may occur in parallel with a pandemic. This will ensure that in the event of such a compound hazard scenario, critical infrastructure systems will resume their functions as quickly as possible. The extent to which critical functions such as testing for positive cases are halted would be low. Building resilience of critical infrastructure to compound hazard scenarios may call for measures such as developing hospital preparedness plans and carrying out preparedness drills tailored to such scenarios.

On the other hand, steps should be taken to enhance capacities for testing through, for example, maintaining adequate stocks of PCR test kits and other equipment, such as pharmacological refrigerators and reagents. Adequate testing capacity, accompanied by effective contact tracing and timely implementation of quarantine measures, will ensure that hospitals and other healthcare facilities are not overwhelmed by a surge in positive cases.

c) Train and deploy volunteer teams to carry out detection and monitoring activities at the ground level

According to the National Disaster Management Plan 2014-2017, local level stakeholders, including the Grama Niladhari officer, Community Based Organizations, volunteers and community members, are to play an active role in the last mile dissemination of EW messages. Volunteers often constitute members of the community whose local knowledge, rapport with the community and leadership can be leveraged in EW systems. There is potential for community members who hold membership in village level disaster management committees to be trained to carry out testing and monitoring activities during a pandemic. This will help to ensure that local level public health officers are not overburdened and have adequate time and space to carry out routine prevention and control activities for other communicable diseases (e.g. Dengue). Delegation of detection and monitoring activities to volunteer teams at the local level will also help overcome the challenges faced by local level public health officers in a scenario where another disease outbreak occurs alongside a pandemic.

d) Empower the community to streamline channels of receiving ground risk information

Community empowerment in disaster management is the process of developing capacities in the community for them to actively make decisions and act in managing disasters. It is important that the community realize their vulnerabilities and capacities, and help to reduce impacts from hazard events. In Sri Lanka, several community empowerment strategies have been proposed and carried out. For instance, the Disaster Management Act and the National Disaster Management Plan set provisions for the establishment of village level disaster management committees. However, the extent to which this has been practiced at the ground level is questionable. Furthermore, several DDMCUs have conducted community awareness raising campaigns and promoted self-evacuation in areas with a high risk of landslides. These communities are provided with rain gauges to measure the rainfall and advised on rainfall limits for taking necessary response measures. Such strategies can be used for biological hazards as well. The community should be aware and capable of identifying possible risks of outbreaks and taking necessary preventive measures.

e) Undertake staff contingency planning for required activities during pandemics

During the COVID-19 pandemic it was evident that taking response measures for a rapidly spreading outbreak demands the deployment of staff efficiently. Therefore, staff contingency planning stands pivotal in detection and monitoring of possible biological outbreaks. These plans should cover different aspects, such as emergency financing, routine management, safety and welfare of workforce, skills development, etc. In relation to the health sector, staff contingency planning should focus on the adequacy of staff capacity to capture rapid ongoing outbreaks and associated health impacts on communities. In addition to that, contingency planning within technical agencies should ensure that these agencies are able to continue hazard detection, monitoring and forecasting activities under the impacts of a pandemic. In this regard, the health sector has a responsibility in assisting the relevant agencies to develop their staff contingency plans to incorporate the possible impacts of pandemics.

4.3 MISSION 03: EARLY WARNING MESSAGES ISSUED DURING A PANDEMIC AND AN ASSOCIATED COMPOUND HAZARD SCENARIO ARE EFFECTIVE IN INFLUENCING ANTICIPATED BEHAVIOUR CHANGES AND HAVE A HIGHER REACH

a) Establish national level collaboration between health sector and non-health sector stakeholders to design influential and appropriate EW messages

EW should be aimed at promoting appropriate preparedness and response measures within the targeted community. Unlike in the case of a natural hazard, a pandemic demands durable changes in behaviour to minimize transmission. Therefore, communication should not only seek to inform and raise awareness of the public but be designed to influence behaviour. Expected behavioural changes are difficult to achieve as behaviours are rooted in the social and cultural realities of communities. It is important that EW and risk communication messages are sensitized to these realities to achieve the desired behavioural changes. This requires collaboration of health sector authorities with non-health sector stakeholders (e.g. marketers and sociologists) who have expertise in social behaviour in designing EW and risk communication messages for pandemics. Further, in the event of a compound scenario, the issue of appropriate EW messages requires collaboration between relevant technical agencies. For example, in a scenario where a flood occurs amidst a pandemic, coordination and collaboration may have to be established between relevant officers at the Ministry of Health, the technical agency for biological hazards, and the Department of Irrigation, the technical agency for river floods. This is because the content of EW messages may have to be designed to cater to the changes to flood response caused by the pandemic.

b) Use the existing EW mechanism coordinated by the DMC to disseminate early warning messages pertaining to epidemics and pandemics

The DMC has an established EW system for disasters. The Emergency Operations Centre (EOC) of the DMC functions as the focal point of this system. The EOC coordinates with relevant technical agencies, technical committees and international and regional warning centres to receive EW for impending disasters and facilitate the dissemination of EW to the local level. EW messages are mainly disseminated through radio communication systems, police and military communication systems, multi-hazard early warning towers, media and normal telephone lines. Further, various methods are used for last mile dissemination of EW such as alarms, sirens, local announcements through loud speakers, public announcements etc. The EOC is also responsible for guiding the DDMCUs in implementing EW dissemination activities at sub-national levels. This system can be adapted to disseminate EW for pandemics and compound hazard scenarios featuring pandemics. There is potential for adapting the system and existing infrastructure to support an 'Alert Level System' for pandemics. Utilizing the existing EW system to disseminate EW messages may also be helpful in reducing the responsibilities vested with public health officials and prevent burnout during a pandemic.

c) Establish a rumour monitoring and management mechanism at the local level

Misinformation shared during an outbreak can cause various consequences such as confusion among people, damaged trust on authorities, unnecessary tension, and disruptions to containment measures. These consequences can adversely impact the overall public health response mechanism during an outbreak. Currently, at the national level, a rumour monitoring system that is managed by the health sector is in place for social media channels and it functions effectively. However, the country lacks efficient rumour monitoring and management systems at the local level. In this context, the possibility of spreading rumours among the general public is high, especially in remote areas. Therefore, it is the duty of the local level officials to establish and maintain a system to monitor and manage misinformation shared within their territories. Furthermore, it is important to note that these systems should comprise of cross sectoral representation. Mass media including local newspapers and local TV and radio stations have a crucial role to play in ensuring that the information presented during a pandemic has been verified by technical experts and is reliable and effective towards achieving expected behavioural changes. For example, exaggeration of news (e.g. regarding the symptoms of the disease, economic consequences of the pandemic) during a pandemic could be perceived by media stations as pervasive and attention grabbing. However, they can create unnecessary panic among the public leading people to adapt inappropriate behaviours such as blaming marginalized groups for spreading the disease and panic buying.

d) Use technological platforms such as social media for EW dissemination and risk communication

Currently, communication modes such as dedicated mobile applications and social media have become the most efficient and popular in terms of disaster information-sharing platforms globally. However, at present the use of these modern communication channels for disaster communication is low in Sri Lanka, especially at the village level. Although social media platforms have been used during COVID-19 for EW dissemination and risk communication, those approaches were not adequately organized. Therefore, several measures have to be implemented to increase the use of modern communication modes such as social media for risk communication purposes. In this regard, it is necessary to improve the accuracy and timeliness of disaster information distributed via social media. Having dedicated staff to quell rumours and misinformation, strict law enforcement and the use of ethics in communications can be recommended in this regard. Furthermore, creating internet platforms with easy access for disaster communication, developing user-friendly and informative interfaces in mobile applications, and avoiding complexity in messages disseminated through social media, are some of the possible actions to better manage social media and other technologies for EW dissemation and risk communication.

4.4 MISSION 04: IMPROVED PREPAREDNESS AND RESPONSE FOR PANDEMICS AND ASSOCIATED COMPOUND HAZARDS.

a) Update the existing disaster management plans at the sub-national levels to incorporate pandemics

While the National Disaster Management Plan 2014-2017 uses the term 'disaster epidemics' to refer to epidemics that grow into disaster proportions, and broadly addresses the need to consider such threats in risk management activities, existing provincial, district, divisional and Grama Niladhari level plans have largely overlooked biological hazards. It is important that these plans are updated to include pandemics so that they serve as a guideline for improving the preparedness and response capacity of institutions and communities.

b) Develop a disaster risk management plan for compound hazards, placing emphasis on identified worst-case scenarios

When disparate hazards co-occur, for instance biological and natural hazards, response measures should be rethought. The COVID-19 pandemic has prompted authorities to rethink traditional response measures for natural hazards. For example, evacuation to safety centres is one of the most common responses to a flood or landslide scenario. However, the operation of safety centres was complicated by the social distancing guidelines imposed by the pandemic, which meant that alternative evacuation measures had to be adopted. It is important that the preparedness and response capacities of communities are improved to effectively respond to such compound risk scenarios. The basis for this can be provided through the development of a disaster risk management plan for compound events, placing emphasis on identified worst-case scenarios. The development of such a plan evidently requires cross sectoral collaboration between health, disaster management and other relevant sectors.

c) Foster multi-sectoral collaboration in planning

Pandemics should not be perceived merely as a health issue. The cascading impacts of COVID-19 and concurrent hazards have made it evident that planning for pandemics requires multi-sectoral collaboration. In this regard, coordination between relevant stakeholders plays a significant role. Especially, the planning process should be collaborative and ensure the involvement of several sectors, such as disaster management authorities, local authorities, military services, central government ministries, non-government organizations, donor agencies, private sector organizations, etc. Especially, addressing the socio-economic impacts of pandemics necessitates the participation of professionals such as community medicine experts, disaster management officials, sociologists, engineers, businessmen, entrepreneurs, etc. who represent a set of widespread sectors.

d) Carry out preparedness activities (e.g. preparedness drills) targeted at communities for pandemics and associated compound hazards

As explained above, community empowerment plays a key role in responding to pandemics and associated compound hazards. Based on experiences gathered during the COVID-19 pandemic, the community lacks the required knowledge and skills in how to respond to a concurrent hazard amidst a pandemic. Due to this deficiency, response teams and relief services have faced several challenges during immediate response and shelter management stages. Therefore, communities should be skilled enough to understand the possible dual impacts of compound hazard events and minimise synergized damages as much as possible. In this regard, it is the responsibility of the officials to conduct preparedness drills at the community level with the participation of actors such as health officials, non-government organizations, tri-forces, emergency response teams, etc.

e) Encourage prepositioning of resources and capacity building in responsible authorities

COVID-19 was revealing for authorities in terms of how to mitigate the impacts of a pandemic and associated compound hazard events. During the COVID-19 outbreak, response mechanisms were hindered by travel restrictions, lack of resources, infected officials, supply chain disruptions, the establishment of ad-hoc structures, etc. Most of these issues can be addressed with the pre-positioning of resources and building capacities of responsible authorities that is backed up by proper planning.