Position paper on

The integration of epidemic and pandemic preparedness in disaster risk reduction planning in Sri Lanka

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1. Introduction

The COVID-19 pandemic that has been engulfing the world for the past year has forced lives to come to a halt and created a new definition of the 'normal'. The pandemic has portrayed the systemic nature of risk compelling most states to take sudden and spontaneous decisions in response. These decisions have curtailed the spread of the virus in the short run. Even though most states have been shocked and perplexed by the disastrous effects of COVID-19, it's worth noting that infectious disease outbreaks are not a new phenomenon. Before the advent of the Corona virus, the world has been plagued by a number of outbreaks such as the Spanish flu of 1918 and the Asian flu of 1957. On 9th May 2020, the New York Times reported that the world should anticipate these types of outbreaks in future and therefore investing in preparedness for, rather than mere response to such outbreaks is crucial. The COVID-19 outbreak has also justified the need for paying significant attention to the enormity and complexity of risks associated with pandemics and the effective mitigation of such risks.

This position paper **examines the current status of epidemic and pandemic preparedness in Sri Lanka, based on the experiences from its response to Covid-19. The analysis identifies gaps and priorities for better integrating epidemic and pandemic preparedness into Sri Lanka's national and local disaster risk reduction policies and plans.** It further:

- Defines key concepts including epidemic and preparedness planning, disaster risk reduction
- Describes the background to Covid-19 in Sri Lanka
- Briefly describes related studies and papers on epidemic and pandemic preparedness
- Presents the methodology underpinning the position paper
- Summarises the gaps and priorities in promoting the systematic integration of epidemic and pandemic preparedness into Sri Lanka's national and local disaster risk reduction policies and plans.

1.1. Background to the Study

After originating in Wuhan, China in late December 2019, the Coronavirus, widely known as COVID-19, has engulfed almost all the countries in the world. The virus has infected more than 60 million people worldwide with a death toll of over 1.4 million [1]. Throughout the world's history, infectious diseases have rendered its bleak effects on mankind [2]. Not deviating from history, COVID-19 has caused severe impacts on multiple aspects of life. The pandemic has already upended the healthcare facilities with increasing rates of hospitalization [3]. Extending beyond a health crisis, devastating impacts of the pandemic have cascaded into socio-economic aspects as well [4], [5]. COVID-19 has made evident that pandemics dismantle not discrete parts of the society but lends to failure of the whole system. These widespread effects have already challenged global health security measures and most of the countries have been struggling to manage the outbreak effectively [6]. The World Health Organization [WHO] has defined global health security [indicating epidemic and pandemic preparedness] as the prevention, detection, and response to naturally emerging accidental and deliberate biological threats [7]. Further, the WHO has outlined the areas which should be strengthened under each of aforementioned three pillars of global health security. This includes: 1] national legislation policy and financing 2] International Health Regulations [IHR] coordination, communication and advocacy 3] Antimicrobial resistance 4] Zoonotic disease 5] Food safety 6] Biosafety and biosecurity, and 7] Immunization. Cumulatively these would contribute to strengthened 'prevention' [8].

Given the devastating implications they carry, epidemics and pandemics conform to the definition of a 'disaster': *"a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts"* [9]. The Sendai Framework for Disaster Risk Reduction [SFDRR], which is the contemporary global guideline for disaster management, has shifted the focus from disaster response to disaster preparedness and management of disaster risk [10]. Accordingly, epidemic and pandemic scenarios cannot be effectively dealt with through mere response measures. Mitigation of disaster risks associated with epidemics and pandemics through Disaster Risk Reduction [DRR] planning for such scenarios is vital [11]. DRR is *"a policy perspective to prevent new and*

reduce existing disaster risk, and manage residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development" [9].

1.2. A Brief Overview of COVID-19 in Sri Lanka

Sri Lanka is an island that implemented major improvements in the country's DM planning after the 2004 Indian Ocean Tsunami [12]. The country's first COVID-19 case was reported in late January 2020. Being the responsible technical agency for mitigating risks related to biological hazards in Sri Lanka, the Ministry of Health, Nutrition, and Indigenous Medicine [MOHSL] initiated the provisions of response to COVID-19, by appointing a 22-member National Action Committee for COVID-19 to control the spread of the virus in the country [13]. After 10 months of the first reported COVID-19 case, over 20,000 cases have been reported in Sri Lanka with a death toll of over 100 [14]. The Government of Sri Lanka [GoSL] took several stringent measures in response to the pandemic. Mandatory quarantine processes, inland travel restrictions, closure of the point of entries, and bans on public gatherings were among them. Sri Lanka published the Preparedness and Response Plan COVID-19 in April 2020 in accordance with the four Lines of Operations [LOOs] implemented by the GoSL [13]. The health sector has been vested with the major responsibility of responding to the outbreak. Furthermore, tri forces, police, local authorities, and community-level organizations have been playing key roles in assisting the GoSL, and the health sector, especially in addressing the key issues that have arisen due to stringent control measures.

1.3. Epidemic and Pandemic Preparedness: State of the Art of Global Developments

The risk of infectious diseases has been increasing owing to several factors including: globalization which has intensified cross-border travel and trade; growth in livestock husbandry; and, an increase in human population density and dynamic interactions between humans and wild animals [15], [16]. For instance, a study that analysed a 33 year data set [1980-2013] of 12102 outbreaks of 215 human infectious diseases portrayed that the number of outbreaks and the disease richness has increased significantly with time since the 1980s [17]. This justifies the need to enhance global and national preparedness for epidemics and pandemics by strengthening capacities to effectively respond to such threats of public health. Epidemic and/or pandemic preparedness *"reflects the capacity of institutions—public health authorities, health systems and emergency response bodies—to detect, report and respond to outbreaks"* [18].

The 2005 International Health Regulations [IHR] formulated by the WHO outline a country's rights and obligations in managing public health emergencies and thus, measures a country's capacities in relation to preparedness for epidemics and pandemics [19]. However, the 2005 International Health Regulations have been subject to criticism for their tendency to hinge on public health competencies and failure to address non-health factors including institutional, infrastructural and financial capacities in gauging a country's preparedness for epidemics and pandemics [18]. Further, the 2005 IHR has provided guidelines in advocacy of international cooperation towards effective pandemic and epidemic preparedness and response. Countries have also made substantial investments in technical solutions like state-of-the-art technology and medical tools, physician care and immunization [20], [21]. Nevertheless, recent outbreaks such as COVID-19 have overwhelmed domestic pandemic preparedness and response infrastructures and institutions. Neither international cooperation nor investments in medical infrastructure are adequate to effectively prepare for and consequently respond to potential infectious disease outbreaks [21]. A domestic preparedness and response system that allows for and promotes systematic collaboration among stakeholders in various sectors [including the state, the private sector, non-government and philanthropic organizations, the civil society etc.] and multiple levels [including national to sub-national levels] stands paramount [22]. For instance, a recent study that discusses Taiwan's experiences from SARS and H1N1 outbreaks shows that while the state and health authorities act as the front line of defence during an infectious disease outbreak, traditional state led approaches often fail due to insufficient resources and a low level of public trust in the state [21]. Learning from these experiences, Taiwan has taken steps to improve central-local government cooperation and state-hospital cooperation by six communicable disease control networks, each of which are supervised at a regional level. This has been complemented with state-private sector cooperation by developing collaborative relationships between the Centres for Disease Control and hotels while designating hotels as checkpoints for foreigners entering the country during the containment phase of an outbreak, and state-society collaboration deploying wardens appointed for each locality to engage local communities in managing pandemics [21].

Furthermore, emphasising on the importance of risk reduction entailing preparedness, prevention and mitigation, as opposed to mere response in the context of health related emergencies, the SFDRR presents a comprehensive approach to cope with disaster risks associated with not only environmental and technological hazards but also biological hazards [10]. Further, Sustainable Development Goal 3 enunciates the global steering towards 'good health and wellbeing' placing emphasis on 'early warning, disaster risk reduction and management of national and global health risks [23]. Further, the Health Emergency and Disaster Risk Management Framework adopted by the WHO in 2019 calls for the systematic analysis and management of health risks, posed by emergencies and disasters, through a combination of (1) hazard and vulnerability reduction to prevent and mitigate risks, (2) preparedness, (3) response and (4) recovery measure [19]. Drawing on said global developments, the UNDRR's (2020) COVID-19 Engagement strategy recommends the incorporation of biological hazards into a country's Disaster Risk Reduction [DRR] efforts [e.g., in carrying out risk and vulnerability assessments] and strengthened collaboration between DRR and health authorities. In this context, regard, researchers point out the potential for using disaster risk assessments including hazard and vulnerability assessments and community-based DRM for COVID-19 risk assessments [24]. They also suggest a last mile approach in disaster EWS for pandemic EWS at the community level and DRR related technology like spatial and remote sensing in mapping pandemics and existing regional tsunami early warning systems [e.g., the Pacific Tsunami Warning Centre] for health-related emergencies. They too assert that effective mitigation of the devastating economic impacts of pandemics requires 'disaster literate economic policy' that makes space for building economic resilience [24].

The relevance of DRR strategies in pandemic and epidemic contexts could be questioned on the basis that the nature and rescue and evacuation procedures of other hazards, such as earthquakes, floods and volcanic eruptions, drastically differ from those of pandemics and epidemics. Elaborating on this, unlike other disasters, epidemics and pandemics are transmissible within the vulnerable population [25]. While in the event of a natural hazard, people are required to move away from the crisis point, outbreaks of infectious diseases require people to remain immobile or reduce mobility as much as possible to curtail the spread of the disease. Nevertheless, onsets of epidemics and pandemics involve dealing with the same industries, government organisations and public as environmental hazards [26]. Moreover, the transmissible nature of such outbreaks itself calls for the necessity of specific DRR infrastructure such as Early Warning Systems (EWS) to provide timely warnings to target populations so that the behaviours required can be immediately adopted. Such DRR measures are capable of largely mitigating the losses in development gains caused by epidemic and pandemic disasters [26]. A timely example is New Zealand's relative success in responding COVID-19 and the dominant role played by the New Zealand COVID-19 Alert Level System in such response. This system comprises of four colour coded alert levels – prepare, reduce, restrict and lockdown – each of which specify a separate set of behavioural guidelines pertaining to aspects such as public health, gathering, travel and public venues [26].

It is against this background that this position paper **provides an overview of the current status and gaps pertaining to epidemic and pandemic preparedness in Sri Lanka,** particularly focusing on four aspects:

1. Major actors in effective, multi-stakeholder preparedness planning for epidemics and pandemics, including potential cascading impacts;
2. Position of epidemic and pandemic preparedness within existing DRR planning in Sri Lanka;
3. Role of public health authorities in current DRR planning, and
4. Early warning and risk communication for epidemics and pandemics in Sri Lanka.

1.4. Methodology

This study has been conducted by examining the current status and gaps pertaining to preparedness planning for biological hazards in Sri Lanka, with a particular focus on integrating such hazards into overall DRR strategies of the country. This study has drawn on secondary data gathered through a thorough review of secondary literature including policy and legal documents, national and international reports, scholarly articles and other relevant internet sources. Further, primary data was collected through in-depth interviews conducted with nineteen purposively selected key informants representing disaster management and health sectors in Sri Lanka. Key informants from the disaster management sector constituted representatives from: the Preparedness Planning Division of the Disaster Management Centre [DMC]; District Disaster Management Coordinating Units [DDMCUs] in the districts of Ratnapura, Badulla,

Trincomalee and Kilinochchi; United Nations Development Program [UNDP], Asia Pacific Alliance for Disaster Management- Sri Lanka Country; World Vision-Sri Lanka; Ceylon Chamber of Commerce; District Secretariat of Polonnaruwa; Divisional Secretariat of Polonnaruwa; and, Medical Officer of Health [MOH] office, Thamankaduwa. Key informants from the health sector involved representatives from: the Disaster Preparedness and Response Division [DPRD]; Quarantine Unit; Health Promotion Bureau; and, College of Community Physicians and the Dengue Prevention Unit. The interviews were conducted using a semi-structured interview schedule that addressed the above four key aspects being studied. This included the stakeholders involved in preparedness planning for epidemics and pandemics in Sri Lanka, the representation of biological hazards such as epidemics and pandemics in Sri Lanka's DRR planning and implementation efforts, the extent of collaboration between disaster management and health authorities, existing EWS and risk communication systems for epidemics and pandemics in Sri Lanka as well as how Early Warning infrastructure could be used to strengthen preparedness planning for epidemics and pandemics.

2. Epidemic and Pandemic Preparedness Planning in Sri Lanka

2.1. Major actors in effective, multi-stakeholder preparedness planning for epidemics and pandemics, including potential cascading impacts

Biological hazards such as epidemics have been identified as one of the twenty one hazard types by the existing legal framework for Disaster Management (DM) in Sri Lanka, the Disaster Management Act. No. 13 of 2005. Further, the Sri Lankan Disaster Management plan has classified epidemics as a disaster with a high frequency of occurrence and high impact, and losses on the population [27]. Thus, necessary legal provisions have been provided for biological hazards to be included in the DM mechanism that is implemented countrywide by the relevant authorities. Currently, preparedness and response planning for biological hazards is a predominantly health sector-led process. The Quarantine and Disease Prevention Ordinance chapter 222, No 3 of 1897, which provides legal provisions for the prevention of introduction and spread of infectious diseases in Sri Lanka, has assigned the Director-General of Health Services as the proper authority for facilitating objectives of said Ordinance. Accordingly, the public health authorities in the country, including the Disaster Preparedness and Response Division [DPRD] at the Ministry of Health, Sri Lanka [MOHSL], play the central role in preventing and/or mitigating the risk of biological hazards, particularly pandemics and epidemics [28]. Table 01 details the units functioning under the MOHSL that have been vested with the responsibility of key aspects of preparedness and response planning pertaining to pandemics and epidemics:

Table 1. Ministry of Health, Sri Lanka [MOHSL] Units Responsible for Preparedness and Response Planning for Epidemics and Pandemics

Disaster Preparedness and Response Division [DPRD]	The central authority for coordinating health-related activities in disaster situations
Epidemiology Unit	Disease surveillance, risk assessment, and Immunization A co-focal point of IHR [2005] in Sri Lanka
Quarantine Unit	Responsible for border health security A co-focal point of IHR [2005] in Sri Lanka
Medical Research Institute [MRI]	Functioning as the main laboratory for testing and reporting
Health Promotion Bureau [HPB]	Responsible for risk communication related to health issues
Special Campaigns for Disease Surveillance	Ex; National Dengue Prevention Unit, Anti-Malaria Campaign

Furthermore, there are several other health sector-related stakeholders, such as the College of Community Physicians and Government Medical Officers' Association, who support the above-mentioned actors. Apart from these, the Department of Animal Production and Health plays a pivotal role in animal disease surveillance. Coordination between these actors has been maintained through national-level committees such as the National Technical Committee on Avian/Pandemic Influenza Preparedness.

Moreover, the Sri Lanka Disaster Management Act No. 13 of 2005 has vested authority with the Disaster Management Centre [DMC] to coordinate countrywide DM mechanisms, including early warning dissemination and risk assessment related to biological hazards. MOHSL has been identified as the relevant technical agency which assists the DMC by implementing necessary activities. Furthermore, the National Emergency Operational Plan [NEOP] developed by the DMC has identified stakeholders to be involved in carrying out emergency operations in the event of an epidemic. As per said plan, the group of stakeholders who are responsible for emergency preparedness and response for epidemics consists of health authorities, local government authorities, tri forces, media institutes, police, utility providers,

NGOs, and INGOs, etc. Especially, local government authorities and tri-forces have been vested with the responsibility of addressing cascading impacts during an outbreak [29].

The key insights of the study highlighted that the existing legal frameworks **have provoked preparedness planning for biological hazards to be undertaken in isolation and with almost the exclusive involvement of health authorities, rather than facilitating multi-sectoral cooperation.** The UNDRR, in 2020, in its 'COVID-19 Engagement Strategy Interim Report' has enunciated the importance of a multi-sectoral, 'whole of society' approach to managing health-related hazards. Accordingly, there must be no limits on the diversity of stakeholders involved in pandemic preparedness, ranging from macro-level stakeholders like the Ministry of Health and micro-level stakeholders like households and individuals. In this context, the country's private sector deserves attention because around 5 million people are employed in this sector.

One of the ways in which the private sector can contribute to preparedness planning for biological hazards is to incorporate such preparedness into their Business Continuity Plans [BCPs] so that organisations are able to respond proactively rather than reactively to a future onset of a pandemic or epidemic. Furthermore, in order to strengthen preparedness for biological hazards, it is an imperative to include into the Occupational Safety and Health Administration [OSHA] regulations of all private sector organizations some of the guidelines published by health authorities in responding to COVID-19. Apart from private sector involvement, several international development agencies have a vital role to play in a country's preparedness and response planning for biological hazards. For instance, the involvement of these agencies has been crucial for processes like health waste management. Last but not least, community-based organizations, such as women's organizations, have the potency of engaging the grass roots in preparedness and response planning. It is evident that there is a need to widen the spectrum of stakeholders involved in preparedness and response planning for biological hazards to foster a 'whole of society' approach.

2.2. Position of Epidemic and Pandemic Preparedness within Existing DRR Planning in Sri Lanka

The Sri Lanka Disaster Management Act No.13 of 2005 provides the legal framework for Disaster Risk Management [DRM] in the country. As per the provisions of said Act, the National Council for Disaster Management [NCDM] has been established as the supreme governing body for disaster management in the country. Major decisions regarding disaster management in the country are taken by the Ministry of Disaster Management in consultation with the NCDM. The Disaster Management Centre [DMC] functions as the executing agency of NCDM and coordinates the country wide DRM program while the main DRM activities are implemented by the mandated technical agencies. While the DMC is the overall coordinating authority, District Disaster Management Coordinating Units [DDMCUs] act as the focal point for coordinating at provincial, district, divisional, Grama Niladhari [GN] and Local Authority [LA] Levels [30]. The Sri Lanka Disaster Management Act No.13 of 2005 also provides for the establishment of provincial, district, divisional and GN level DM plans and DM committees, which indicates a de-concentrated approach to DRM in the country.

Complying with the proposals of SFDRR, epidemics and pandemics have been taken into account in national level planning and policing for DRM in the country. For instance, Section 25 of the Sri Lanka Disaster Management (Amendment) Act No.13 of 2005 recognizes particularly epidemics as one of the hazard types for which provisions made in said Act are applicable. Further, the National Disaster Management Plan has categorised epidemics as a disaster occurring at an intermediate level. Apart from this, said plan demonstrates the importance of taking into consideration man-made and technological hazards including biological hazards [in general] in performing hazard, vulnerability and risk assessments. 'The Strategy of DMC for Disaster Mitigation for Risk Reduction and Mainstreaming in Development' in the National Disaster Management Plan also sets out the importance of reducing vulnerabilities caused by biological hazards like epidemics and pandemics [27].

Although a considerable level of emphasis has been placed in national DRM plans on taking into account biological hazards such as epidemics and pandemics in disaster mitigation and prevention efforts, including performing risk and vulnerability assessments, there is no evidence to support that this has been implemented in the country to a significant level. Further, biological hazards have not been adequately addressed in sub-national level DM plans. In these plans, emphasis has been placed on preparedness for and response to natural hazards. In terms of the activities of sub-national level DM committees and DDMCUs, the findings of this study show that these authorities have played a pivotal coordinating role in preparedness planning for Dengue while the technical inputs have been provided by

sub-national level health authorities. However, in certain districts, separate Dengue committees have been established at district, divisional and GN levels. These committees function directly under the Ministry of Health, Nutrition and Indigenous Medicine. Sub-national level DM authorities have played a similar role [i.e. of coordination] in executing response measures during the COVID-19 pandemic. The activation of separate Dengue committees when sub-national level DM committees could be tailored to prepare for and respond to Dengue outbreaks implies that biological hazards have not been mainstreamed into the activities of sub-national level DM committees.

Lack of technical knowledge related to epidemics and pandemics among sub-national level DM authorities acts as a barrier to effective coordination of preparedness and response mechanisms that target biological hazards. In addition to this, collaboration between sub-national level DM and health authorities currently occurs at an operational level [as opposed to a planning/decision making level]. However, collaboration between authorities of said sectors at a planning/decision making level could be necessary in preparedness planning for compound events [e.g., the occurrence of floods during the COVID-19 pandemic with the onset of the Southwest monsoon]. **A multi-hazard approach to pandemic and epidemic preparedness stands as the backbone of such collaboration. The country requires a legal and policy framework that advocates a multi-hazard approach and thus, facilitates collaboration between DM and health authorities, not only at a field/operational level, but also at a planning/ decision making level.**

2.3. Role of public health authorities in current Disaster Risk Reduction (DRR) planning

The governing legal framework of Sri Lanka's Disaster Management mechanisms, the Disaster Management Act No. 13 of 2005, has recognised the governing institution of health in the country, the Ministry of Health, Sri Lanka (MOHSL), as being pivotal in the context of the country's DRR planning. Furthermore, said Act has provided provisions for public health authorities such as Department of Health, Epidemiology Unit, and Medical Research Institute to function as technical agencies to assist the Disaster Management Centre [DMC] of the country for its countrywide Disaster Management [DM] mechanisms. Currently, the Disaster Preparedness and Response Division [DPRD], within the purview of MOHSL, functions as the central authority for coordinating health-related activities in Sri Lankan DM mechanisms. This unit aims at minimizing human suffering caused by any disaster [28].

Public health services in Sri Lanka can be identified under two categories: community and curative health services. Hospitals ranging from the National Hospitals to primary care units function as the main providers of curative health services while agencies like epidemiology unit, family health bureau and non-communicable disease unit, which focus on preventive health facilities, are categorized under community health services [31] Furthermore, the responsible health units for both types of health services have been decentralized from the central government to the provincial governments. Starting from the Minster of Health, the organizational hierarchy of MOHSL continues until the Public Health Inspector [PHI] at the grass-root level. Elaborating more on the responsibilities of health authorities at the grass-root level, PHIs have been vested with major responsibilities: the collection, evaluation, and dissemination of information; cooperation and collaboration with other disciplines; prevention of disease; and continuity of care [32].

2.4. Role of the public health authorities in Disaster Risk Management [DRM]

The role played by public health authorities in Disaster Risk Management [DRM] can be categorised under four major themes as described below.

(a) In relation to disaster preparedness

Elaborating on the role of public health authorities in relation to disaster preparedness, Disaster Preparedness and Response Division of the Ministry of Health [DPRD] plays a major role in improving the functions of the health sector in the context of disaster management. The National strategic plan for Health Sector Disaster/ Emergency Preparedness, which was published first in 2011 and adopted later in 2015 by DPRD, provides strategic guidance to the health sector in disaster/emergency management [33]. Under the guidance of the national strategic plan, disaster/emergency plans at district levels have been developed based on the hazard profiles. Furthermore, several healthcare facilities have devised their institutional disaster management plans. These plans have been tested under the supervision of MOHSL.

In addition to DPRD, the quarantine unit also plays a pivotal role in preparedness pertaining to infectious diseases. This unit has developed Standard Operating Procedures [SOPs] to be followed at Point of Entries [PoEs] during a Public Health Emergency of International Concern [PHEIC] [18].

(b) In relation to disaster response

Interventions during the disaster response phase are broadly categorized into two categories:

1. Providing medical care [mass casualty management, first aid, prehospital care, post-care follow-up]; and
2. Preventing the spread of diseases [disease vector control, immunization].

At the disaster response stage, public health authorities have been vested with the responsibility of conducting various assessments such as rapid reconnaissance, rapid health assessment, and surveys in a bottom-up approach [34]. It is evidenced that public health authorities' responsibility for disaster response has been decentralized to sub-national public health administration levels. Furthermore, public health authorities have been vested with the responsibility to train personnel from tri forces, fire brigades, and other organizations on activities such as extracting victims and transporting them safely [32]. However, the Emergency Medical Services [EMS] system, which consists of multiple stakeholders, is still very immature in the sense that certain components of the system are yet to be fully developed [35].

(c) In relation to disaster recovery

Elaborating on the role of the public health sector in relation to disaster recovery, several agencies function under MOHSL play key roles in recovering from medium-term and long-term consequences of disasters [ex; Mental Health Unit of MOHSL]. The Manual for the Sri Lanka Public Health Inspector [PHI] works as a guideline for medium-term and long-term health considerations to be addressed during the disaster recovery process. Some medium-term health considerations identified involve contamination of food and water supplies, emotional stress, spread of epidemic diseases like measles and diarrhoea, spread of endemic diseases like Chicken Pox. Long term health concerns to be addressed during the disaster recovery phase include impacts of a disaster event on the psychological wellbeing of disaster-affected persons. These interventions also include gender-related health issues like family planning and reproductive health, safety of women and children, gender-based discrimination, and inclusion of women in reconstruction planning.

(d) In relation to disaster mitigation and prevention

Disaster prevention and mitigation efforts are informed by risk and vulnerability assessments. In terms of disaster prevention and mitigation, public health authorities have been vested with the main responsibility for preventing and mitigating the impacts of infectious diseases. In regulations framed under the Quarantine and Disease Prevention Ordinance chapter 222, No. 3 of 1897, the Director-General of Health Services has been assigned as the proper authority for facilitating the prevention of the spread of said diseases. Disease surveillance and immunization, which are governed by the epidemiology unit, can be identified as key areas in disaster mitigation and prevention. In this regard, Sri Lanka has a disease surveillance system and notification system for communicable diseases, and these have been legally mandated by said Ordinance. Further, MOHSL works collaboratively with NGOs and INGOs to control the onset and spread of epidemics [e.g. Dengue]. The quarantine unit of MOHSL plays a vital role in disease prevention activities at PoEs. Apart from this, the epidemiology unit has established the National Immunization Program, which consists of a review system and a cold chain system in relation to prevention and mitigation of infectious diseases [36] (Key informant interviews, 2020).

2.5. Early Warning and Risk Communication for Epidemics and Pandemics in Sri Lanka

This section provides an overview of the current Early Warning [EW] system of Sri Lanka, the process of disseminating EW for epidemics and pandemics in the country and the current status and gaps pertaining to pandemic and epidemic outbreaks in Sri Lanka. **The Emergency Operations Centre [EOC] of the Disaster Management Centre [DMC] is the focal point in the national level coordination of early warning and in ensuring its last mile dissemination in collaboration with relevant technical agencies and committees.** As per the Sri Lanka Disaster Management Act No. 13 of 2005, various technical agencies are responsible for forecasting and issuing early warning messages on the respective hazards to the DMC.

In Sri Lanka, there's a comprehensive EW system to ensure that EW messages reach the grass roots. This system disseminates warnings on impending hazards in four stages that include national, district, divisional and Grama Niladhari [GN] levels.

As stipulated in the National Disaster Management Plan, the Department of Health Services and the Ministry of Health are the technical agencies responsible for forecasting and issuing Early Warning messages pertaining to biological hazards like epidemics and pandemics in the country [27]. The nation-wide Emergency Communication System has been designed to provide information on various hazards including epidemics [27], [37]. Nevertheless, dissemination of EW pertaining to biological hazards in the country is a predominantly health sector-led process. Elaborating on this process, the epidemiology unit and quarantine unit are informed by the WHO about diseases that have originated in foreign countries. If there is an outbreak in the Sri Lankan context, said units have the responsibility to report to the WHO and generate EW for Sri Lanka. The EW messages are disseminated through the DGHS at the national level to the relevant stakeholders. At the District level, the Regional Director of Health Services [RDHS] receives EW messages disseminated by said national level institutions. In this way, the RDHS acts as the focal point for disseminating EW to hospitals and the Medical Officer of Health [MOH] offices. The EW messages received by the MOH are disseminated to the community via the Public Health Inspectors [PHIs] of the relevant PHI areas [38], [39].

Although the dissemination of EW related to epidemics and pandemics in the country is a health-sector led process that involves national level and sub-national level health authorities within the public health institutional infrastructure of the country, the possibility of using tools that are used to disseminate EW for other hazards in the event of a pandemic or an epidemic has been stressed during this research study. Most key informants had the view that tools that are generally used to disseminate EW for other hazards, including mass media, EW network attuned systems and SMS based platforms, could also be employed in the context of biological hazards. The applicability of relatively new developments in EW infrastructures [e.g., a recent UNDP initiative to provide targeted EW messages to households in floods prone areas] for last mile dissemination of EW during epidemic or pandemic situations was also highlighted. In this case, **it can be deduced that the ability to use existing EW infrastructure in the context of preparedness planning for pandemics and epidemics points towards the need for effective integration of pandemic and epidemic preparedness into the overall Disaster Risk Reduction framework in the country.**

Apart from EW, risk communication plays a vital role during epidemic and pandemic situations. The Health Promotion Bureau [HPB] of the Ministry of Health acts as the focal point for risk communication pertaining to national health security in Sri Lanka. In the outcomes of the WHO supported Joint External Evaluation [JEE] that was conducted in 2017, **having a multi-level and multi faced risk communication capacity for state authorities was highly recommended.** According to the scores allocated in the JEE, the subcomponent: "risk communication systems" obtained the lowest scores in the evaluation. Recently, Ministry of Health has developed and published an alert level system to grade the risk of COVID-19 in the country. This system has been used as a tool to make the public aware of the guidelines on permitted functions as per the prevailing level of risk in the country.

Based on information collected through key informant interviews and a review of secondary literature, several gaps within risk communication and early warning pertaining to epidemics and pandemics have been identified:

1. the absence of a national risk communication plan;
2. the absence of a methodological risk communication system;
3. lack of an emergency fund for risk communication;
4. lack of resources within overall risk communication system [e.g., lack of health authorities and personnel at the divisional level] and conflicting targets of stakeholders in different sectors.

Having outlined the mentioned gaps, the need for strengthening the existing EW and risk communication systems was repeatedly emphasised during the key informant interviews. In this regard, several recommendations are provided:

1. The development of the national risk communication plan;
2. Embedding the overall risk communication component into the national disaster preparedness and response mechanism;
3. Developing a pre-planned mechanism for addressing vulnerable groups;
4. Improving capacity building within relevant agencies [particularly the HPB] ;
5. Providing staff training for health staff at the local level and
6. Fostering cross-sectoral collaboration in risk communication so that messages reach all administrative levels.

3. Conclusion - Gaps and priorities for integrating epidemic and pandemic preparedness into national and local disaster risk reduction policies and plans

This study examined the status of epidemic and pandemic preparedness in Sri Lanka. **The findings reveal that preparedness planning for epidemics and pandemics in the country is a health-sector led process, the legal provisions for which are provided by the Quarantine and Disease Prevention Ordinance of 1897.** Although the National Emergency Operations Plan sets out the roles and the responsibilities of diverse stakeholders for executing emergency operations during an epidemic, there is minimal involvement of non-health sector stakeholders in preparedness activities targeting biological hazards. **Further, even though the significance of epidemic and pandemic preparedness has been acknowledged in DRR planning and policing in the country, there's lack of evidence to confirm that relevant activities have been implemented in the country, such as performing risk mapping and vulnerability assessments for epidemics and pandemics. The findings also reveal that epidemics and pandemics have not been adequately considered in the preparation of sub-national level disaster preparedness and response plans.**

In addition to this and in complying with the proposals of WHO's health EDRM and the UNDRR's COVID-19 engagement strategy, **there is notable collaboration between health authorities and disaster management authorities in preparing for epidemics like Dengue outbreaks and in response to the recent COVID-19 outbreak. Nevertheless, such collaboration takes place at a field/operational level rather than a planning/decision making level.** Collaboration among said authorities in planning and decision making would be necessary in devising preparedness plans and undertaking preparedness activities for compound events. An early warning and risk communication system for epidemics and pandemics has not been fully developed, although the availability of such a system remains critical. Existing EW infrastructures that are currently used for other hazards [mainly natural hazards] could be deployed to strengthen early warning and risk communication for epidemics and pandemics in the country.

The efficacy and the efficiency of preparedness planning for epidemics and pandemics in Sri Lanka can be enhanced through the systematic integration of epidemic and pandemic preparedness into DRR planning and activities. Such integration requires the consolidation of DRR related legal documents towards promoting both collaborative governance and a multi-hazard [as opposed to a siloed] approach to DRR. While collaborative governance aims at leveraging networking and cooperation across diverse sectors and levels, a multi-hazard approach provides a holistic understanding of risk and facilitates the exchange of resources, expertise and lessons learned between various hazard contexts, thereby promising improved efficacy and efficiency in preparedness planning and response for biological hazards in particular and all hazards in general.

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