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COVID 19: Impact, Mitigation, Opportunities and Building Resilience

From Adversity to Serendipity

*Perspectives of global relevance based on
research, experience and successes in
combating COVID-19 in Sri Lanka*

Volume 01

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(edited by)

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Analysing the effectiveness of varied stakeholder segments in preparedness planning for epidemics and pandemics in Sri Lanka: Application of Social Network Analysis (SNA)

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ABSTRACT

The COVID-19 outbreak has caused severe disruptions in health, social, economic, and political sectors highlighting the need for focusing on the dynamic nature of systemic risks. The cascading impacts of the COVID-19 have already evidenced the systemic nature of risks related to biological outbreaks. Therefore, the emulation of a multi-sectoral approach for preparedness planning related to biological hazards has become a global concern. This research aims at outlining major stakeholders in epidemic and pandemic preparedness planning in Sri Lanka including those who are responsible for potential cascading impacts. The process of identifying stakeholders and their roles has drawn on a review of secondary literature and primary data gathered through in-depth interviews conducted with key informants in the disaster management and public health sectors in the country. Social Network Analysis approach was used to visualise and analyse the network of stakeholders. Findings have highlighted that currently, the preparedness planning related to epidemics and pandemics in Sri Lanka is a health sector-led process. There is a pressing need for a unified legal framework and a streamlined system of governance for risk management related to biological hazards in the country. Furthermore, it is important to broaden the scope of stakeholders involved in preparedness planning for biological hazards and to include the private sector, international development agencies, and community-based organisations. Moreover, there is a need to intensify the national focus on building economic and social resilience to address the potential cascading impacts. Key findings of this study will help to enhance the effectiveness of preparedness planning for biological hazards, through a multi-sectoral approach operational under a unified legal framework.

Key words: *Social network analysis, COVID-19, Preparedness planning, Multi-sectoral approach*

1. INTRODUCTION

The COVID-19 pandemic engulfed the whole world during the past year and over 100 million confirmed cases are reported currently with a death toll of over 2 million worldwide (WHO, 2020). Throughout history, infectious diseases such as COVID-19 have had devastating impacts on humankind from time to time

(Jarus, 2020). The COVID-19 pandemic also upended the worldwide healthcare system with increasing rates of hospitalisation (Ornstein & Hixenbaugh, 2020; PAHO, 2020). Apart from the enormous pressure on the health sector, the COVID-19 outbreak has caused severe impacts on socio-economic sectors. Experts anticipated a deep recession in the global economy with a loss of about 5.2% in the global Gross

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Domestic Product [GDP] in 2020 (The World Bank, 2020b). The COVID-19 pandemic unreasonably affected the highly vulnerable communities and has paved the way for a social crisis. The World Bank warned that 150 million people would be pushed to extreme poverty by 2021 and this estimated rise in global poverty would occur for the first time in over 20 years (The World Bank, 2020a).

The COVID-19 outbreak has made it evident that a pandemic can render severe cascading impacts on humankind spreading across various sectors. For instance, labour-intensive industries experienced significant downfalls as thousands of people have lost their sources of income (Parikh & Desai, 2020). The agriculture sector incurred substantial losses since the demand from primary consumers and bulk buyers such as hotels dropped severely. Furthermore, impacts of the pandemic have cascaded across industries such as petroleum, manufacturing, tourism, aviation, education, construction and sports (Dave & Dave, 2020). From a psychological perspective, mental issues have emerged as a significant concern due to prolonged homestay and uncertainties. Additionally, the spread of Coronavirus has created severe problems in the political structures of the majority of the countries as well (Business Standard News, 2020).

These widespread negative impacts of the COVID-19 pandemic have highlighted the need for further improvements in global preparedness for biological outbreaks. Throughout history, gaps have been identified and analysed in preparedness plans for health security and revised based on the lessons learnt from pandemics. For instance, several European countries have proposed and implemented revisions in their preparedness and response plans for pandemics (Droogers et al., 2019). The impacts of biological hazards cannot be addressed through mere response measures. The COVID-19 pandemic has highlighted that these impacts are not limited to the health sector but cascade into other aspects of society too. It highlights the need for a multi-sectoral and multi-hazard approach in managing health crises such as pandemics

(UNDRR, 2020) has been emphasised. Within this context, this research aims to outline and identify key stakeholders involved in epidemic and pandemic preparedness planning in Sri Lanka including those who are required to look into the cascading impacts. Social Network Analysis (SNA) has been considered in this study to identify the network of stakeholders and the behaviour of relationships between the stakeholders. Furthermore, the study attempts to identify the involvement of non-health sector stakeholders in preparedness planning, pertaining to epidemics and pandemics in the country.

2. A MULTI-SECTORAL APPROACH TOWARDS PANDEMIC PREPAREDNESS

The multitude of unfavourable effects of the COVID-19 pandemic made it evident that a pandemic is much more than a mere health crisis and it triggers failures in most of the aspects related to the socio-economic sector, national security and human rights (United Nations, 2020). The impacts of concurrent hazards amidst the pandemic have highlighted the need for a multi-hazard approach in addressing multiple risks. United Nations has emphasised the paramount importance of emulating a multi-sectoral approach, based on the early lessons of COVID-19 (UNDRR, 2020). This falls in line with the WHO's whole of society approach which aims at enhancing the preparedness beyond the health sector for the challenges of pandemic influenza (WHO, 2021; World Health Organization, 2009).

The International Health Regulations [IHR] 2005 developed by the WHO, act as a guideline that outlines the rights and obligations of member countries in enhancing global health security (World Health Organization, 2019). However, several criticisms have been made about IHR 2005 since they mainly depend on health authorities and fail to address non-health factors for enhancing the preparedness for pandemics (Oppenheim et al., 2018). The International Conference on the Implementation of the Health Aspects of the Sendai Framework for Disaster Risk Reduction

2015-2030 has made several recommendations on measures for the prevention and mitigation of health emergencies (UNISDR, 2016). Cooperation between health authorities and other relevant organisations to strengthen the disaster management mechanisms of countries to address health-related issues and implementation of IHR 2005 is identified as one of the key recommendations (UNDRR, 2020). Effective cooperation between health and disaster management officials is paramount in managing the impacts of pandemics and epidemics.

WHO's Health Emergency and Disaster Risk Management Framework identifies the health authorities as the leading stakeholders in Disaster Management (DM) mechanisms, pertaining to outbreaks of infectious diseases. It advocates that the health authorities collaborate with DM authorities in the country to enhance the effectiveness of prevention and preparedness planning (World Health Organization, 2019). Adapting a multi-sectoral and whole of society approach in preparedness planning for infectious disease outbreaks has the potency of preventing the failure of the entire system. A study conducted in Taiwan has set an example of how traditional government-led approaches failed during SARS and H1N1 pandemics due to lack of resources and low public trust in authorities (Schwartz & Yen, 2016). Integrating biological hazard preparedness into the Disaster Risk Reduction (DRR) planning of a country can therefore be identified as a dire need in the current context

This integrating mechanism needs inputs from a variety of stakeholders. It highlights the importance of advocating a multi-hazard approach in DRR planning (Koivisto, 2014). In this process, there are several issues that need to be addressed at the initial stage and these would include who are the key actors, who could influence the process, what are the outcomes, which groups or organisations need to be involved and whose capacity needs to be enhanced (WHO, 2005). These issues are addressed by performing a stakeholder analysis at the initial stage, where the stakeholders are identified and mapped to evaluate their roles

in the particular process (Koivisto, 2014). Therefore, stakeholder analysis is important in attempting to address the need to integrate biological hazard preparedness into the Disaster Risk Reduction (DRR) Planning in a country.

3. METHODOLOGY

This study was carried out as part of a broader study on integrating epidemic and pandemic preparedness into the Disaster Risk Reduction (DRR) in Sri Lanka. This study addresses the major research question, which is "Who are the major actors that should be involved in effective, multi-stakeholder preparedness planning for epidemics and pandemics, including those involved with potential cascading impacts?". This study was planned in four steps as detailed below.

3.1. Desk study

A review of secondary literature including policy and legal frameworks, national and international reports, scholarly articles, and internet sources was carried out during the desk study. Table 1 summarizes referred policy and legal frameworks under two major categories as shown below.

3.2. Key informant interviews

In parallel with the secondary literature review, a series of in-depth key informant interviews were conducted. Thirteen (13) key informants were selected representing two main sectors and according to the identified key actors involved in epidemic and pandemic preparedness and response planning in Sri Lanka including possible cascading impacts (see Table 2). These interviews were conducted using a structured questionnaire relevant to the following aspects: stakeholders of EWS and risk communication for pandemics, mechanisms for the dissemination of information, EWS, and risk communication during COVID-19, gaps, and suggestions for using existing EW infrastructures for epidemic and pandemics preparedness.

Table 1. Summary of policy and legal frameworks

Category	Referred policy and legal frameworks
Public Health-related	Quarantine and Disease Prevention Ordinance [1897]
	National Influence Preparedness Plan [2012]
	Sri Lanka Preparedness and Response Plan COVID-19 [2020]
	National Action Plan for Health Security of Sri Lanka [2019-2023]
	Public Health Emergency Preparedness and Response Plan for Sea Ports
	Sri Lanka Exotic Disease Emergency Plan
	Manual for the Sri Lanka Public Health Inspector [2010]
DRR related	Strategic Plan for Health Sector Disaster/Emergency Preparedness [2015]
	Disaster Management Act [2005]
	National Policy on Disaster Management [2013]
	Sri Lanka National Emergency Operation Plan [2015]
	Sri Lanka National Disaster Management Plan [2013-2017]
	Regional Disaster Preparedness and Response Plan [2006]
Grama Niladhari Division Level Disaster Preparedness and Response Plan [2006]	

Table 2. Summary of key areas/organizations of key informants

Category	Key areas/ organisation
Public health-related	Health sector disaster preparedness and response
	Disease surveillance
	Broader health security
	Health education and promotion
	Community health
	Special campaigns for disease prevention
	Regional health authorities
Disaster management related	National level disaster management officials
	Subnational level administrative officials
	Subnational disaster management officials
	United Nations Development Programme [UNDP]
	Asia Pacific Alliance for Disaster Management [APAD]
Chamber of Commerce	

3.3. Identification of stakeholders

In order to identify the stakeholders in preparedness and response planning for biological hazards in Sri Lanka recently published action plans and Emergency Operation Procedures (EOPs) were referred. National Emergency Operation Plan (NEOP) [2015] is a recently published national operation plan by the Disaster Management Centre [DMC], Sri Lanka under the guidance of the National Disaster Management Council (NDMC). NEOP defines stakeholders to be involved in carrying out emergency operations in the event of an epidemic (Disaster Management Centre, 2015). Table 3 denotes the identified key stakeholders in carrying out emergency preparedness and response activities immediately before and during an epidemic.

3.4. Application of Social Network

Analysis and visualising the network of stakeholders

Social Network Analysis (SNA) coined by John Barned in 1954 is a tool that maps and measures formal and informal relationships to identify what facilitates or impedes the knowledge flows that bind interacting units (Landherr & Heidemann, 2010; Serrat, 2017). This visualisation technique can be incorporated in developing communication behaviour in a network (National Research Council, 2009). Though history shows that SNA was tightly related to sociology, psychology, mathematics, anthropology, and network science, at present it is at the intersection of multiple sectors (Perez & Germon, 2016). Compared to the other approaches used in visualising network behaviour, SNA has several benefits such as identifying units that

Table 3. Stakeholders involved in emergency preparedness and response activities related to epidemics

Stage of the epidemic	Stakeholders
Before	Disaster Management Centre (DMC), Ministry of Health (MOH), Hospitals (HP), Divisional/ District Secretary (DDS), District Disaster Management Coordination Unit (DDMCU), General Public (GP), Public Media Institutions (PMI), SL Airport, and Aviation Services Pvt. Ltd (SLAAS), Public Health Inspector (PHI), Air Ports (AP), Ministry of Mass Media Information (MMMI), Ministry of Local Government and Provincial Councils (MLGPC), Local Authorities (LA), Grama Niladhari Divisions (GND), SL Army (SLA), SL Police(SLP)
During	Disaster Management Centre (DMC), Ministry of Health (MOH), Hospitals (HP), Divisional/ District Secretary (DDS), District Disaster Management Coordination Unit (DDMCU), General Public (GP), Public Media Institutions (PMI), SL Airport, and Aviation Services Pvt. Ltd (SLAAS), Public Health Inspector (PHI), Air Ports (AP), Ministry of Mass Media Information (MMMI), Ministry of Local Government and Provincial Councils (MLGPC), Local Authorities (LA), Grama Niladhari Divisions (GND), SL Army (SLA), SL Police(SLP), National Water Supply and Drainage Board (NWSDB), Non-governmental organisations (NGOs & INGOs)

play central roles, discerning information breakdowns, bottlenecks, and structural holes, and leveraging peer support (Serrat, 2017).

SNA is frequently used as a tool in disaster-related studies to analyse relationships between different units involved in DM mechanisms. (Rajput et al., 2020) have done a study on temporal network analysis of inter organisation communications on social media during disasters, taking Hurricane Harvey in the city of Houston as a case in point. This study was aimed at analysing communication networks between organisations on social media to characterise the roles of organisations and situational information communication. In this study, online organisational communication networks have been mapped and analysed based on their interactions on Twitter. (Kim & Hastak, 2018) have incorporated SNA for converting emergency social network data into knowledge of a disaster and analysed the aggregated interactions of social media users in the phase of disaster response. Furthermore, a study carried out in Thailand has examined the social network in disaster preparedness for earthquakes at local, provincial, and national levels of the country (Suwanmolee, 2014). In the Sri Lankan context, (Shehara et al., 2019) have utilised SNA to analyze the behaviour communication network of stakeholders at emergency disaster preparedness and response stages. In this study, key stakeholders have been

identified based on the centrality parameters of communication networks.

In SNA, communication networks are visually expressed as a network consisting of nodes connected to each other. The centrality in a social network can be identified as a parameter that indicates the most important or central or influential node in a network (Das et al., 2018). Different centrality parameters are used to illustrate the behaviour of a communication network. As shown in Table 4, four centrality parameters have been identified in this study to evaluate the network of stakeholders who are linked to the integration process of biological hazard preparedness into the Disaster Risk Reduction (DRR) planning in the country.

Table 4. Summary of centrality parameter interpretation (adapted from Landherr and Heidemann, 2010)

Centrality parameter	Description
Degree centrality	Ability of a member in a network to contact the other directly (number of direct contacts)
Closeness centrality	Indicates how closely a member is connected to all other members in the network
Betweenness centrality	Indicates the degree of control a member has over the information flow based on his position in the network
Eigenvector centrality	Measures the node of influence in a network

Since these centrality parameters are used to quantify the interconnectedness of nodes in a network, based on the values obtained for each parameter and accordingly the most significant and powerful actors in the network of stakeholders related to preparedness and response planning for biological hazards can be identified. Furthermore, the values of the centrality parameters imply who are the actors that have more ability to control the flow of information in a network of stakeholders. The manner in which stakeholders are linked with each other needs to be mapped in order to model the network of stakeholders involved in emergency preparedness and response activities pertaining to epidemics. Accordingly, the links between stakeholders were identified using emergency operation procedures and inputs from key informants and the desk study. Actions that have been assigned at each stage of an epidemic were incorporated in identifying the interrelationship between the stakeholders/units [see Table 5 for interrelationships].

Gephi software was used to model the network for stakeholders depending on the directional flow of information since it is an open-source software used for visualizing and analyzing large network graphs. In this model, stakeholders are represented by nodes, and relationship links have been denoted by edges.

4. RESULTS AND DISCUSSION

Results of the study are discussed under four areas namely, governance in preparedness planning for biological hazards, networks of stakeholders pertaining to preparedness and response in the event of an epidemic including cascading impacts, the role of public health authorities in this process, and involvement of the non-health sector stakeholders in preparedness and response planning. Details of findings under these three areas have been discussed in the following sub-sections.

4.1. Governance in preparedness planning for biological hazards

Currently, the Disaster Management Act No. 13 of 2005 is considered as the governing legal framework which makes provisions for Disaster Management (DM) mechanism in Sri Lanka. National Disaster Management Council (NDMC) as the supreme body of DM in Sri Lanka, and the Disaster Management Centre (DMC) as the executing agency of NDMC have been established under the said Act (Siriwardana et al., 2018). DMC has been vested with the power to coordinate and implement the DM mechanism countrywide, with the main Disaster Risk Management (DRM) activities being implemented by the mandated national technical agencies for

Table 5. Interrelationships between stakeholders

Before an epidemic			During an epidemic		
ID	Label	Actors connected with	ID	Label	Actors connected with
1	DMC	2, 4, 5,6,11,12,15,16	1	DMC	2, 5, 6, 11, 12, 15, 16, 17, 18
2	MOH	2, 3, 4, 5, 9, 8, 12	2	MOH	1, 3, 8,9, 11, 12, 17
3	HP	2	3	HP	2
4	DS	1, 2, 5, 13	4	DDS	5, 12, 13
5	DDMCU	1, 2, 4	5	DDMCU	1, 4
6	GP	1, 7, 9, 12, 13, 14, 15, 16	6	GP	1, 7, 9, 14, 15, 16, 17,
7	PMI	6	7	PMI	6
8	SLAAS	10	8	SLAAS	10
9	PHI	6	9	PHI	6
10	AP	8	10	AP	8
11	MMMI	7	11	MMMI	7
12	MLGPC	6, 13	12	MLGPC	4, 13, 18,
13	LA	14	13	LA	4, 12, 14,
14	GN	6	14	GN	6, 13
15	SLA	6	15	SLA	6
16	SLP	6	16	SLP	6
			17	NWS&DB	6
			18	NGO/INGO	1,12

twenty-one hazard types as listed in the said Act. Since epidemics have also been included in these hazards, DMC functions as the legal authority to coordinate DRM activities pertaining to epidemics. Ministry of Health, Sri Lanka (MOHSL) has been legally mandated to implement these DRM activities to mitigate the impacts of epidemics under the Disaster Management Plan which is developed as per the provisions of the said Act (Disaster Management Centre, 2014).

In addition to the Disaster Management Act, No. 13 of 2005, the Quarantine and Prevention of Diseases Ordinance chapter 222, No.3 of 1897 makes provisions for the prevention of the introduction of the plague and all other contagious and infectious diseases into Sri Lanka and the prevention of the spread of said diseases within and outside of Sri Lanka. In most regulations framed under this Ordinance, the Director-General of Health Services has been assigned as the proper authority for facilitating the prevention of the spread of these diseases. However, the Director-General of Health Services has delegated some of his powers to the Medical Officer of Health [MOH] and the Chairman of relevant local authority by way of the government Gazette Notification No. 7481 of 28-08-1925 & 10713 of 17-09-1954 (Epidemiology Unit, 2012;

Ministry of Health, 2010) [see Figure 1 for the organizational structure of Ministry of Health, Sri Lanka].

Accordingly, the public health authorities in the country play a central role in preparedness and response planning pertaining to biological outbreaks such as pandemics and epidemics. Illustrating this, Sri Lankan public health authorities have been playing a key role in mitigating and preventing the risk of dengue, which is a frequent and widespread outbreak in the country (Thalagala et al., 2016). There are specialised units functioning under the purview of MOHSL that act as the focal points for specific aspects and functions related to preparedness planning for epidemics and pandemics which are detailed in. Table 6.

There are also several other health sector-related stakeholders who are either directly involved in decision-making related to preparedness planning for epidemics and pandemics or support the above-mentioned specialised units. They include the Department of Animal Health and Production, College of Community Physicians, and Government Medical Officers’ Association. Furthermore, the findings of this study have highlighted that there is limited involvement of DRR authorities in preparedness and response planning for

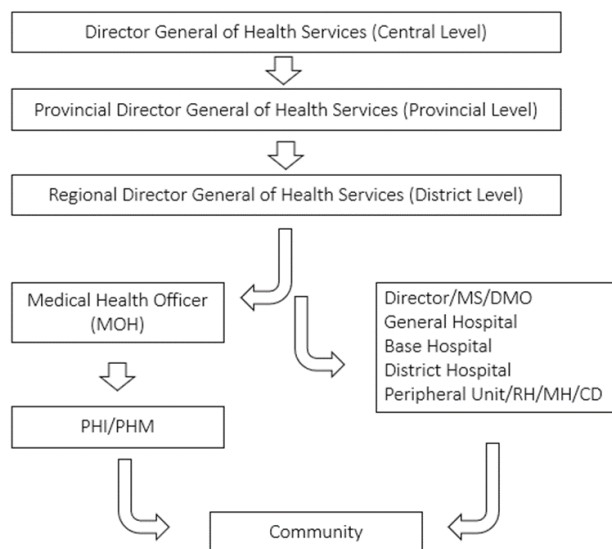


Figure 1. Organizational structure of Ministry of Health, Sri Lanka (adapted from Epidemiology Unit, 2012)

Table 6. MOHSL units responsible for preparedness and response planning for epidemics and pandemics

Specialised unit	Responsibility
Disaster Preparedness and Response Division [DPRD]	The central authority for coordinating health-related activities in disaster situations
Epidemiology Unit	Disease surveillance, risk assessment, and immunisation 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

biological hazards in the country. Biological hazards are not adequately integrated into the disaster management plans developed by DRR authorities, especially at the local level. Therefore, it can be concluded that currently the preparedness planning for biological hazards, particularly epidemics and pandemics is a predominantly health sector-led process.

4.2. Network of stakeholders involved in preparedness and response mechanisms in the event of an epidemic

Figure 2 and Figure 3 represent the communication networks of stakeholders immediately before and during an epidemic that have been modelled using SNA. Stakeholders in the network are represented by nodes in these communication models and ranked based on the degree centrality value being represented by the varying node sizes. Furthermore, stakeholders in both models are ranked based on centrality parameters which have been detailed in Table 4. Further, Table 7 shows the top-ranked stakeholders for each centrality parameter immediately before and during the event of an epidemic.

According to the degree centrality and closeness centrality parameters, Disaster Management Centre [DMC] can be recognised as the key stakeholder being vested with the central role in coordinating and implementing emergency preparedness and response procedures in the event of an epidemic. The DMC has the highest ability to directly contact stakeholders in the network and communicate with stakeholders effectively. Furthermore,

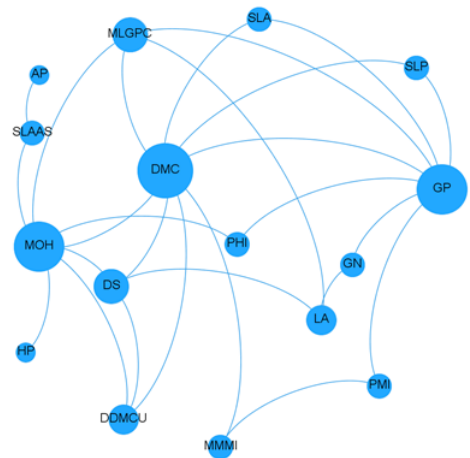


Figure 2. Communication network of stakeholders before an epidemic

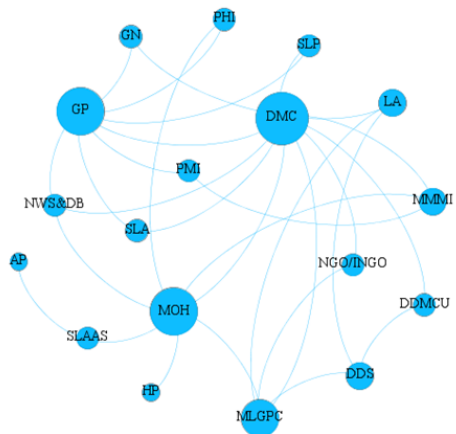


Figure 3. Communication network of stakeholders during an epidemic

Table 7. Top-ranked stakeholders for centrality parameters

Centrality parameter	Before an epidemic	During an epidemic
Degree centrality	Disaster Management Centre	Disaster Management Centre
Closeness centrality	Disaster Management Centre	Disaster Management Centre
Betweenness centrality	Ministry of Health	Ministry of Health
Eigenvector centrality	Disaster Management Centre	Disaster Management Centre

since the Ministry of Health [MOH] has the highest value in betweenness centrality, it implies that MOH has the highest control over the flow of information in the network of stakeholders. Therefore, it is evident that DMC and MOH are the most controlled actors in the network of stakeholders pertaining to emergency preparedness and response operations for epidemics in the country. Therefore, it can be concluded that public health authorities have been vested with a major responsibility in disaster management pertaining to biological hazards in Sri Lanka.

Developed communication network models for epidemics denote the focus on local government authorities and ING/NGOs too since these organizations have the potency of addressing possible cascading events of an epidemic. This highlights the importance of the engagement of relief organisations in the event of an epidemic. However, the exclusion of the National Disaster Relief Services Center (NDRSC) in these network models can be identified as a weakness. Furthermore, several key points can be identified when comparing network diagrams of stakeholders for epidemics with other hazards. Figure 4 shows the communication network model developed with references to emergency operations during tsunamis (Shehara et al., 2019). Shehara et al (2019) highlight that DMC has the highest rank in betweenness centrality parameter for all the selected hazards [Landslides, tsunamis, droughts, and floods]. This situation implies that DMC has a high level of control over the flow of information than the mandated technical agencies for particular hazards. In contrast, the mandated technical agency for epidemics [MOHSL] has the highest control over the flow of information during an event of an epidemic. It indicates that health authorities have become a predominant stakeholder in emergency preparedness and response

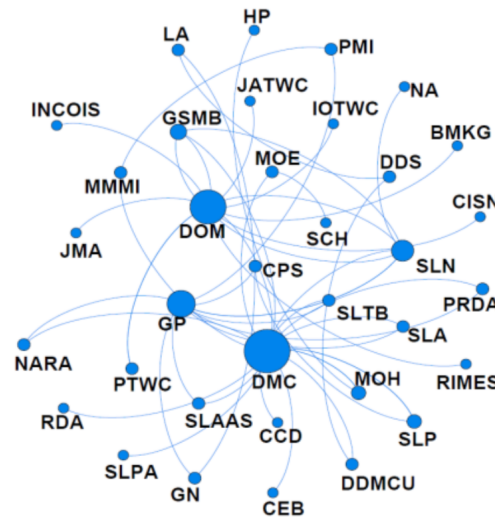


Figure 4. Communication Network for Tsunami Early Warning (Shehara et al., 2019)

planning pertaining to epidemics in Sri Lanka. Furthermore, Shehara et al (2019) have stressed the need for developing Standard Operation Procedures (SOPs) to minimise the complexity of communication networks developed based on emergency operation procedures which are applicable for epidemics as well.

4.3. Role of health authorities in preparedness planning for epidemics and pandemics

Results of the above analysis have highlighted that health authorities play a key role in preparedness and response mechanisms related to biological hazards. This has been further substantiated by the findings from key informant interviews and the review of secondary literature. Elaborating on the predominant role of health authorities in preparedness and response planning for biological hazards in most regulations framed under the Quarantine and Prevention of Disease Ordinance No. 13 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. Under the purview of the Director-General of Health Services, there are several agencies such as the Disaster Preparedness and Response Division, Epidemiology Unit, and Quarantine Unit which play key roles in preparedness and response planning for biological hazards. This section further elaborates the duties performed by public health authorities during the different phases of the disaster management cycle in this regard.

As mentioned earlier in section 4. 1 (Table 6) the Disaster Preparedness and Response Division (DPRD) acts as the central authority coordinating disaster preparedness activities in the event of an epidemic (DPRD, 2018). The Strategic Plan for Health Sector Disaster/ Emergency Preparedness which was published first in 2011 and adapted later in 2015 by DPRD, provides strategic guidance to the health sector in disaster/emergency management including biological hazards. Based on the guidance provided by this plan at national level, health sector preparedness and response plans have been developed at the district level. In most of these district-level plans, Dengue as an outbreak has been listed among the top five priority hazards (RDHS Matara & DPRD, 2018). Taking a step further, institutional disaster preparedness and response planning has been developed in major healthcare institutions under the supervision of the Ministry of Health. These plans include preparedness related to outbreaks since Dengue has become a frequent outbreak in Sri Lanka. Apart from the role of DPRD, the quarantine unit plays a key role in border health security. The Directorate of Quarantine of the Ministry of Health had developed the SOPs to be followed at PoEs for prevention, early warning, and response to public health events.

In the manual of Public Health Inspectors (PHIs), the Ministry of Health, Sri Lanka has recommended preventing the spread of diseases as one of the health interventions to be performed during the disaster response phase. This process involves activities such as providing safe water and food, immunization,

disposal of human excreta, and other waste, burial of the dead, and disease vector control (Ministry of Health, 2010). Furthermore, the aforementioned manual has detailed three types of assessments named rapid reconnaissance, rapid health assessments, and surveys to prevent the spread of diseases (Ministry of Health, 2010). Illustrating the response mechanism of the public health sector during the COVID-19 outbreak, basic guidelines for health authorities have been issued by the central government. However, operational activities are carried out under provincial ministries other than the activities of agencies such as the Epidemiology Unit, Quarantine Unit and DPRD. In accordance with the provisions of the Quarantine and Prevention of Diseases Ordinance chapter 222, No.3 of 1897, the public health authorities in Sri Lanka play the central role in preventing and/or mitigating the risk of biological hazards. Dengue is a frequent outbreak where the Ministry of Health is in partnership with NGOs such as the Sri Lanka Red Cross Society [SLRCS] and World Vision Lanka is actively involved in controlling spread of the epidemic at the onset (International Federation of Red Cross and Red Crescent Societies, 2017).

Furthermore, the country's Disease Surveillance System which comprises of four functional elements namely, data collection, data compilation, analysis and taking action on reports, and feedback, is a key instrument in preventing and/or mitigating biological hazards (Ministry of Health, 2010). The surveillance of communicable diseases is supported by a Notification System designated to provide notifications on diseases identified in the list of Notifiable Diseases in Sri Lanka (Epidemiology Unit, 2020; Ministry of Health, 2010). The Quarantine and Prevention of Diseases Ordinance legally provides consent to the implementation of said Notification System (Ministry of Health, 2010). Furthermore, the National Immunisation Programme of Sri Lanka which functions under the purview of the Epidemiology Unit has achieved several milestones. Eliminating Malaria (2016) and mother-to-child transmission of STD/AIDS are the most prominent achievements. The

Epidemiology Unit has been able to provide 95% coverage of immunisation against thirteen deadly vaccine-preventable diseases (Key informant interviews, 2020),

4.4. Engagement of non-health sector stakeholders for preparedness and response planning for infectious diseases

Epidemics and pandemics need to be seen not as mere health crises and emulation of a multi-sectoral, whole of society approach is recommended for preparedness and response planning for infectious diseases. Limits cannot be imposed on the diversity of stakeholders involved in pandemic preparedness, ranging from macro-level stakeholders such as the Ministry of Health and micro-level stakeholders such as households and individuals. The involvement of local government authorities, tri forces, media institutions, private sector organisations, global development partners, NGOs, INGOs and community-based organisations in preparedness and response planning increases the effectiveness of the process.

As shown in the network diagrams of stakeholders (Figure 2 & Figure 3), the national action plans identify the importance of involving local government authorities, subnational level administrative officials, tri forces, media institutions, and NOGs/INGOs. In Sri Lanka, sub-national administrative officials have actively engaged in addressing cascading impacts of the crisis and activities carried out by these officials include, ensuring access to essential services, supplying food and dry rations to the community, recommendation of curfew passes, maintenance of social order, etc. Furthermore, Sri Lanka's private sector is considered a key provider of employment with about 5 million people being employed. Hence, the role of the private sector in preparedness planning for biological hazards, in particular, deserves more attention.

The private sector can incorporate pandemic and epidemic preparedness into the Business Continuity Plans [BCPs] of the

respective organisations/ institutions. This can enhance the effectiveness of organisations responding proactively rather than reactively, to any future pandemic. Furthermore, there have been attempts to include Corporate Social Responsibility [CSR] and sustainability activities of private sector organisations towards epidemic and pandemic preparedness. Experts have highlighted the need for integrating pandemic and epidemic preparedness into occupational health and safety procedures in the private sector organisations. Currently the Construction Industry Development Authority [CIDA], Sri Lanka has published the Health and Immunity Enhancement guidelines for COVID-19 and Dengue to be followed in the construction field (CIDA, 2020). Furthermore, the Occupational Health Unit of the Directorate of Environmental and Occupational Health in the Ministry of Health, Sri Lanka has produced a set of guidelines for preparedness and response to COVID-19 in work settings.

Apart from the private sector, international development agencies such as the United Nations Development Programme [UNDP], the Asian Development Bank [ADB], and the World Bank play a vital role in the activities of preparedness planning for biological hazards in Sri Lanka. In addition to the private sector and international development agencies, community-based organisations at the grass-root level such as women's organisations, GN level disaster preparedness and response committees and youth organisations should also be involved in preparedness planning for pandemics and epidemics to facilitate a community-based approach to epidemic and pandemic preparedness. Accordingly, it is evident that there is a need for widening the scope of stakeholders involved in preparedness planning for pandemics and epidemics in the country, which will help to address the risks posed by such hazards in a holistic manner.

5. CONCLUSION

Findings of the study which is used as the basis for the development of this research has made it evident that currently the preparedness planning for biological hazards particularly

epidemics and pandemics is predominantly a health sector-led process. The DGHS has the authority to make independent decisions with regard to the mitigation and prevention of risks posed by infectious diseases as per the provisions of the Quarantine and Prevention of Diseases Ordinance chapter 222, No.3 of 1897. However, the provisions of the Sri Lanka Disaster Management (Amendment) Act No.13 of 2005 have confined the role of the DMC to the coordination and facilitation of DRM activities, related to the set of hazards mentioned in the Act, which includes epidemics as well. The provisions of the Disaster Management Act has vested the DMC with the authority to coordinate and implement DRM activities as opposed to the actual planning and implementation of DRM activities related to biological hazards, especially epidemics. Therefore, the absence of a unified legal framework and system of governance for disaster management in the country is evident thus paving the way for bureaucratic inefficiencies such as replication of procedures, limiting the ability to share expertise and resources in preparing for and responding to various hazards, and thereby weakening the overall mechanism in place for disaster management in the country.

Furthermore, while preparedness planning for epidemics and pandemics is a predominantly a health sector driven process in Sri Lanka, it is important to broaden the scope of stakeholders involved and to include the private sector, international development agencies, and community-based organizations so that the risks posed by epidemics and pandemics are addressed at the onset. In relation to the cascading effects of these biological disasters, the central government, sub-national level administrative authorities (e.g. District Secretaries, Divisional Secretaries, and GN officers) and INGOs have to play a leading role in providing relief services to address the unfavourable economic and social impacts of biological outbreaks, in the country. However, mere response measures such as provisions of emergency relief offer only short-term solutions to persistent problems. Therefore, it is important to shift the focus from

response to building the resilience of both the economy and society to minimise the adverse economic and social implications of epidemics and pandemics. In conclusion, the existing gaps identified due to the impacts of the current COVID-19 pandemic accentuates the need for the emulation of a multi-sectoral approach in preparedness planning for pandemics and epidemics in Sri Lanka.

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