IFMSA Policy Document
Disaster and Emergency Management

Proposed by Team of Officials
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Policy Statement

Introduction:

Disasters significantly impact the health of individuals and communities worldwide, and due to human activity, their frequency and intensity are alarmingly increasing. Disaster and emergency management is a highly demanding discipline in the modern era, intending to efficiently tackle disasters and emergencies to ensure a brighter future. It underscores the vital significance of prevention, preparedness, response, and recovery to minimise the aftermath, preserve lives, and safeguard the well-being of affected communities during and after a disaster. Medical students can play an active role by learning about disaster and emergency management strategies, taking trainings on basic life support to vulnerable populations, offering psychological support to affected individuals, and raising awareness about disaster-related challenges in their local communities.

IFMSA position:

The International Federation of Medical Students Associations (IFMSA) recognises the global burden of disasters and emergencies and calls for comprehensive strategies to promote risk reduction and management. The IFMSA firmly believes that global action is needed, along with future healthcare professionals, and calls for collective efforts and support in facilitating an adequate response, aiming to decrease the adverse social, economic, and health repercussions at local, national, and global levels by promoting heightened awareness, active youth involvement, and collaborative initiatives in managing disasters and emergencies. Furthermore, the IFMSA recognises the importance of disaster and emergency management and demands close cooperation and coordination between the stakeholders to improve disaster resilience.

Call to Action:

Therefore, IFMSA calls on:

Governments to
- Implement the Sendai Framework for Disaster Risk Reduction (SFDRR);
- Create national coordination clusters and policies with collaboration across all sectors for people-centred disaster and emergency management;
- Adopt inclusive and sustainable disaster management plans, including capacity-building programmes, in collaboration with other stakeholders;
- Invest in research and development of technologies and strategies to mitigate the consequences of disasters and emergencies;
- Prioritise rapid funding for post-disaster research;
- Work with youth and healthcare workers to develop and implement policies, legal frameworks, and strategies relevant to disaster and emergency management at all levels.

International organisations and non-governmental organisations (NGOs) to
- Promote the implementation of national disaster risk reduction programmes and plans from a whole-of-society approach;
- Supervise the enforcement and full respect of the International Human Rights Law during all phases of disaster management;
- Commit to the Fundamental Humanitarian Principles and the Core Humanitarian Standards;
- Conduct research and invest in research on the impact of emergencies and disasters on public health and health systems from an inclusive approach;
- Collaborate with researchers to identify key areas that require further studies in terms of

emergencies and disasters and develop research proposals that aim to improve emergency management strategies;

- Encourage knowledge sharing between researchers and research institutions, and aim to translate findings in different languages.

The health sector and medical schools to

- Continue to educate and train medical students and health professionals based on the most recent developments in Disaster Risk Reduction;
- Develop emergency/disaster preparedness plans at every level of the health system, including but not limited to community health workers, primary health centers, district hospitals, and tertiary hospitals;
- Promote systematic integration of health into national and sub-national disaster risk reduction policies and plans and the inclusion of emergency and disaster risk management programmes in national and sub-national health strategies;
- Strengthen the functional integrity of health facilities and measure their capacity, safety and preparedness during health emergencies and disasters;
- To adopt community-based health approaches in disaster preparedness and health emergency management in collaboration with medical schools;
- Develop a standardised curriculum for medical students on Disaster Medicine and health emergency based on the most recent developments in Disaster Risk Reduction to be incorporated into their undergraduate studies;
- Prepare and implement adaptive plans to continue the delivery of medical education during potential emergencies/disasters;
- Develop an action plan for clinical-year students for effective deployment, if needed, to avoid compromising their medical education.

IFMSA National Member Organisations (NMOs) and medical students to

- Raise awareness of the importance of disaster and emergency preparedness and response; invest time and resources into projects, research and activities;
- Enroll activities under the IFMSA Emergencies, Disaster Risk and Humanitarian Actions Program;
- Collaborate with other NMOs on activities, projects, advocacy plans, and best practices that advance the implementation of the Sendai Framework for Disaster Risk Reduction;
- Join international campaigns and advocacy initiatives organised by IFMSA or external partners of IFMSA;
- Advocate for the inclusion of disaster medicine into medical schools' curricula;
- Provide avenues for medical students to engage in volunteer work, advocacy and research into disaster medicine and health emergency management;
- Advocate to policymakers, medical schools, and other stakeholders to adopt risk reduction strategies with the promotion of meaningful youth inclusion from decision-making to relief actions;
- Invest in capacity building and peer-to-peer education as a way of broadening the knowledge and shaping the skills of the future health workforce;
- Host capacity-building workshops related to disasters, such as the ITDM (International Training on Disaster Medicine) and encourage the members' active involvement and participation in disaster training;
- Increase awareness of the mental health impact of disasters, mainly focusing on medical students, youth, and vulnerable groups, while promoting peer-support systems;
- Interact with NGOs, institutions, and organisations involved in disaster management to network and execute new strategies with these organisations.

Position Paper

Background information:

A **disaster** is a "severe 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." While **emergency** is sometimes used interchangeably with the term disaster, for example, in the context of biological and technological hazards or health emergencies, it can also relate to hazardous events that do not result in the severe disruption of the functioning of a community or society.[1]

Disaster and emergency management is "the organization, planning and application of measures preparing for, responding to and recovering from disasters and emergencies." The disaster management cycle includes four phases:

- **Response** consists of "the actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected";
- **Recovery** is the phase of "restoring or improving livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and "build back better," to avoid or reduce future disaster risk";
- **Mitigation** includes the efforts to "lessen or minimize the adverse impacts of a hazardous event";
- **Preparedness** relates to "the knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters".[1]

Disaster damage occurs during and immediately after the disaster. It describes the total or partial destruction of physical assets, the disruption of essential services and damage to sources of livelihood in the affected area. On the other hand, **disaster impact** is the total effect, including the negative and positive effects of a hazardous event or disaster. The term includes economic, human and environmental impacts and may consist of death, injuries, disease and other adverse effects on human physical, mental and social well-being.[1]

In 2022, the Emergency Event Database EM-DAT documented 387 natural hazards and disasters worldwide, leading to the loss of 30,704 lives and affecting 185 million individuals. The economic losses amounted to approximately US$223.8 billion. Heat waves caused 16,000 excess deaths, while droughts impacted 88.9 million people in Africa. Hurricane Ian inflicted damage worth US$100 billion in the Americas. Africa experienced a comparatively higher human and economic impact from disasters, accounting for 16.4% of deaths compared to 3.8% in the previous two decades. In contrast, despite facing some of the most destructive disasters in 2022, Asia had a relatively lower share of deaths.[2]

Disaster risk is defined as the potential loss of life, injury, or destroyed or damaged assets that could occur to a system, society or community in a specific period, determined probabilistically as a function of hazard, exposure, vulnerability and capacity:

- **Hazard** is a "process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation";
- **Exposure** is related to "the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas";

- **Vulnerability** concerns "the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards";
- **Capacity** combines all "the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience."[1]

In the 1970s, the United Nations Office for Disaster Risk Reduction (UNDRR) was established to advocate, support, and coordinate the mission of disaster risk management [3]. Over the past decades, UNDRR has supported governments, partners and communities in reducing disaster risk and losses while shifting the paradigm from a mere technical concept to a global movement. The "Hyogo Framework for Action", a ten-year plan for action on disaster risk reduction, was set up in 2005, followed by another framework called the "Sendai Framework for Disaster Risk Reduction 2015-2030".[4][5] Since then, the UNDRR has been tasked with supporting the implementation, follow-up and review of the Sendai Framework and has played a crucial role in disaster risk management, including prevention, mitigation, preparedness, response and recovery, mainly through their efforts in helping countries to apply the Sendai Framework.

Discussion:

1. Epidemiology of Disasters
Epidemiology is defined as "the study of the occurrence and distribution of health-related events, states, and processes in specified populations, including the study of the determinants influencing such processes, and the application of this knowledge to control relevant health problems." [6]

According to a comprehensive report from the World Meteorological Organization (WMO), disasters related to weather, climate, and water hazards have been prevalent worldwide over the past 50 years. On average, there has been a weather, climate, or water-related disaster every day during this period, resulting in 115 deaths and $202 million in losses per day. The number of disasters has increased fivefold, primarily due to climate change, more extreme weather events, and improved reporting. However, thanks to improved early warning systems and disaster management, deaths have decreased by almost three times. From 1970 to 2019, more than 11,000 reported disasters were attributed to these hazards globally, causing over 2 million deaths and $3.64 trillion in losses. Weather, climate, and water hazards accounted for 50% of all disasters, 45% of reported deaths, and 74% of reported economic losses during this period. The most significant contributors to human losses were droughts, storms, floods, and extreme temperatures. Deaths decreased from over 50,000 in the 1970s to less than 20,000 in the 2010s. Economic losses have increased sevenfold, with storms being the primary cause. International cooperation and investment in comprehensive disaster risk management, including climate change adaptation, are necessary to address the increasing frequency and severity of these hazards and reduce the displacement of people caused by floods, storms, and droughts.[7]

In the World Risk Report 2022, a report assessing disaster risk for 193 countries, several countries and regions are identified as being most prone to disasters. According to the WorldRiskIndex the Philippines (WRI 46.82), India (WRI 42.31), and Indonesia (WRI 41.46) have the highest disaster risk worldwide. It is noteworthy that nine out of the 15 countries with the highest disaster risk are also among the 15 most populous countries in the world. However, the ranking has changed due to the recalculation of the WorldRiskIndex, which now incorporates both absolute and percentage figures of the population at risk. This recalculation aims to avoid distortions caused by population size.[8]

In terms of exposure, China has the highest exposure to disasters, followed by Mexico and Japan. On the other hand, the most vulnerable country in the world is Somalia, followed by Chad and South Sudan. It is important to recognise that vulnerability plays a significant role in determining disaster risk, as demonstrated by examples such as South Korea, Italy, and Greece, where low vulnerability can mitigate disaster risk despite high exposure. Conversely, countries like DR Congo, Nigeria, Sudan, and Iraq illustrate that high vulnerability can lead to elevated disaster risk even with medium exposure.[8]

When considering continents, the Americas have the highest overall disaster risk, with Asia ranking second, followed closely by Africa and Oceania. In a global comparison, Europe has the lowest risk. Moreover, Africa stands out as the continent with the highest overall vulnerability, with 13 of the 15 most vulnerable countries in the world located there.[8]

Certain communities are more prone to disasters due to their vulnerabilities and specific needs. People with disabilities are particularly at risk during large-scale catastrophes. They may face difficulties understanding instructions or evacuation orders, lack accessible transportation for evacuation, and encounter shelters that are ill-equipped to meet their needs. Similarly, individuals with mental disabilities may struggle with the evacuation process and may be treated roughly or be inappropriately institutionalised. Elderly persons, who often have chronic illnesses and mobility limitations, are also more susceptible to the negative impacts of disasters. They may experience worsened health conditions, nutritional deficiencies, and disruptions in medical treatment. Pregnant women face increased risks, including underweight babies and premature deliveries, and may lose access to essential medication and prenatal care during emergencies. Children, due to their size, dependency, and susceptibility to injury and disease, require special attention and care during disasters. They are more prone to trauma, malnutrition, and infectious diseases.[9]

These vulnerable communities should be prioritised in disaster response and recovery efforts to ensure their safety and well-being. Inadequate preparation for their specific needs can result in catastrophic consequences and long-term negative impacts on their lives. It is crucial for decision-makers to carefully plan and prepare for emergencies, addressing the needs of vulnerable groups in all phases of emergency response operations. Failure to do so, not only harms these individuals, but also erodes public trust in the government's ability to protect its citizens. By recognising and addressing the vulnerabilities of these communities, response and recovery efforts can be more effective and inclusive, leading to better outcomes for all. [9]

The epidemiology of disasters encompasses the study of the distribution, determinants, and impact of disasters on populations. Disasters affect countries and regions worldwide, with notable examples including the Philippines, India, and Indonesia, which have consistently experienced high disaster risks. Risk factors contributing to the impact of disasters include geographical location, climate, infrastructure, and socio-economic factors. Vulnerable communities, such as people with disabilities, the elderly, pregnant women, and children, are particularly prone to adverse effects during disasters due to their specific needs and dependencies. Understanding the epidemiology of disasters helps identify at-risk populations, inform preparedness and response strategies, and prioritise resources to mitigate the health and socio-economic consequences of these devastating events.[7][8][9]

2. Drivers of Disasters

For the purpose of developing a homogenous framework of study and reference, disasters are classified based on the nature of the respective hazard. Natural disasters stem from geophysical, meteorological hydrological, climatological, biological, or extra-terrestrial hazards.[10] On the other hand, human-caused disasters include socio-technological disasters and warfare.[11]

Yet, this traditional division between national and human-caused disasters is frequently challenged. The first point of criticism in this notion stems from the fact that while some hazards may be of natural origin, they do not consist of disasters on their own. Rather, they impact a community, whose capacity and resilience determines whether that event evolves into a disaster. Thus, due to the global resources injustice and the lack of equitable development, the vulnerability of the communities is a predominantly human-induced factor.[12][13][14]

The second point of criticism stems from the hybrid origin of the hazards. Climate change has enhanced the frequency and severity of disasters thought to be of natural origin, however, since the climate crisis itself is traced back to human activity, it is argued that the exaggeration of these hazards is indirectly, yet obviously, human-caused as well.[12][15][16]

Disaster risk, as a fluid and intersectional phenomenon, greatly changes and evolves over time. Past experiences and the situation we encountered can not be the only predictive factor of disaster risk, as there is a whole sphere of nature and man-made components that can influence disaster risk evolvement.[17] Disasters are representation of intersectionality and dependance of different components leading to a disaster, such as hazard, vulnerability and exposure to certain events. Research, analyses and data collection using past events led to the possibility of identifying and quantifying different socioeconomic and political drivers strongly associated with disaster risk and vulnerability of specific areas of the world. Adverse research included nearly nine thousand disaster incidents,including earthquakes, floods and hurricanes. The results showed some drivers can influence magnitude of past disasters and identified the most important drivers for prediction of future disasters. Similar research methods, GIS models and statistical multiple regression analysis were used in the development of Global Risk Analysis of the Global Assessment Report on Disaster Risk Reduction.[18] Risk drivers *per se* are different processes and conditions influencing the disaster risk by either increased exposure, increased and deficient vulnerability and reduction in capacity and preparedness. Five of the most important identified factors are:[17]

    i.   Climate change;
    ii.   Conflict;
    iii.   Gender inequality;
    iv.   Food and water insecurity;
    v.   Urbanisation;
    vi.   Forced displacement.

Risk drivers interact constantly among each other, as nothing can be caused by one thing only. They manifest in multiple ways and have the ability to increase previously existing risk and result in the creation of new risks.[18]

2.1. Climate Change

Climate change is currently affecting every corner of the world and its effects are visible in daily life

already. Climate change is increasing disaster risks in many ways, more or less obvious. In general, Climate Change is at the same time significantly increasing the frequency and number of hazards, while decreasing resilience.[19] Climate change, as a disaster driver, refers to how climate change has worsened increasingly for decades and is caused more by human activities rather than natural causes themselves. Globally, the most important change can be seen in the frequency and intensity of weather-related hazards, increased vulnerability of different areas and decreasing resilience of exposed populations by decreasing access to water, instability of temperatures and rainfall. Another important aspect is the change in geographical distribution of weather-related hazards that creates a completely new pattern and map of possible disasters, which makes them less predictable and more dangerous. Although climate change might include wide spectre of impacts, most projected ones include:[20]

- **Droughts**: The number of people endangered by extreme and frequent droughts across the world is rising daily and could even double in the next 50 years. Droughts have a major impact on rural areas mostly and are causing increase in migration and desertion of rural areas. Another problem is reduction of natural land water storage, which might affect two thirds of the world in the next decades, especially in underdeveloped countries. In two-thirds of the world, there is also likely to be a large reduction in natural land water storage, especially in the Southern Hemisphere.[21]
- **Sea level rise:** Sea level rising in different coastal areas are greatly increasing the risk of floods. The coastal floods are endangering both developed and underdeveloped countries.
- Coastal flooding events have the ability to threaten assets that are worth up to 20% of the global GDP and 21% by the year 2100. This is in part due to the population of coastal areas growing faster than the overall increase in the global population. Global "hotspots" for flooding are projected to be in north western Europe, all over the Asian coast and in pacific coastal areas of North America.[22]
- **Infectious diseases**: Distribution and frequency of mosquitoes carrying vector-borne diseases has doubled in the last 10 years and distribution of certain diseases has changed greatly and affected different areas. By 2050, mosquitoes that carry Malaria might endanger more than 500 million additional people, causing a global shift in Malaria distribution.
- Other infectious diseases and zoonoses are affected by climate. This is because global warming is resulting in a loss to biodiversity, consequently resulting in increased transmission and incidence of disease. Due to urbanisation and deforestation, altered climate patterns, rodents and bats (which are responsible for 60% of the zoonotic disease transmissions) diseases have flourished.[19]
- **Wildfires**: Apart from already increased wildfires frequency. And by 2030, fire season could prolong for more than 3 months in areas already exposed to wildfires. Common wildfire seasons might also establish in the areas that are not regularly affected, and affect new areas. [18]
- **Cyclones**: Assessing the attribution of tropical cyclones to climate change is more difficult, but evidence suggests that the sudden increase of the most devastating storms is associated with climate change. The incidence of devastating storms are forecasted re to occur up to twice as often with 2.5°C of global warming.[20]

2.2. Conflict
Armed conflicts have a significant impact on people's health, extending beyond casualties and physical damage. The consequences of war also have indirect effects, including compromised human rights, displacement of populations, economic instability, disrupted social activities, increased vulnerability, and the normalisation of violence. These factors contribute to both immediate and long-term adverse effects

on individuals' well-being, as well as public health, deepening health disparities, heightening risks of communicable diseases, increasing the burden of non-communicable diseases, and exacerbated mental health problems [23][24].

2.3. Gender Inequality

Gender inequity refers to the unjust disparities that hinder individuals from fully enjoying their rights and opportunities based on their gender identity or expression. Gender inequity is recognised as a component of the social determinants of health, and the exclusion and discrimination faced by individuals based on their gender have direct negative impacts on their physical, social, and psychological well-being. Enhancing gender equity in healthcare is therefore a direct and powerful approach to reducing health disparities and optimising the utilisation of healthcare resources.[25]

Gender inequality stands as a formidable barrier to the advancement of risk-informed development, permeating through all other drivers of risk. Without a deliberate and comprehensive approach to address gender disparities, women are bound to face unyielding cycles of poverty exacerbated by the occurrence of disasters. Extensive global research consistently reveals the pervasive discrimination experienced by women and girls across various domains, including education, employment, healthcare, political representation, and more. Furthermore, when disasters strike, women and girls are disproportionately affected, often finding themselves at the forefront of response efforts. However, their contributions are frequently undermined and overlooked during the subsequent phases of recovery and rehabilitation, perpetuating the cycle of inequity.[26]

2.4. Food and Water Insecurity

Food and water insecurity are widely acknowledged as the most significant perilous factors that pose substantial threats to our future.[27] The agricultural sector is exceptionally vulnerable to the devastating impacts of natural hazards and disasters. While the agricultural industry has always accounted for the inherent variability in weather and climate conditions when predicting crop yields and productivity, sudden disasters exceed the normal range of expected fluctuations. The notable escalation in the frequency and intensity of extreme weather events and climate-induced phenomena observed in recent decades presents a significant and daunting challenge to agricultural systems that heavily rely on favourable weather patterns and climatic stability. Disasters can inflict extensive damage on crop growth, livestock health, fisheries and aquaculture operations, and can severely compromise the integrity of forests and other ecosystems. Furthermore, there has been a troubling rise in the occurrence of transboundary animal and plant pests and diseases, exerting immense pressure on the global food chain and posing additional risks to food security.[28]

2.5. Urbanisation

In 2023 more than half of the population in the world will be living in urban areas and the number of high density cities is rapidly increasing. Urbanisation across many underdeveloped countries and countries in development has also increased rapidly in the last 25 years. Some Asian countries have seen an increase in urban areas population more than 4 times and certain African regions have tripled.[29] The main key of successful and resilient urbanisation is urban planning. At this point not every country keeps up with the urbanisation programme, this has led to unplanned growth of the cities, slums development and restriction to access basic resources. Unplanned urban areas can be found in more than 80% of cities worldwide. These areas are more vulnerable to different hazards, including flooding, earthquakes and windstorms. Transformed into real numbers, over 283 million urban residents are at risk of earthquakes,

379 million are at risk of floods and more than 157 million people are threatened by windstorms. To increase the risk, it is predicted that a rise of the sea level by 5 meters could endanger more than 75% of the population of cities and urban areas on coastal sites around the world, especially on the coasts of the Pacific ocean.[20]

Urban areas have developed new patterns of disaster risk, caused by different paces of urbanisation. Most affected are areas of low income countries, with an increased percentage of unplanned and illegal housing.

- **Urban development and hazards**
  Urban development caused many changes in the ecosystem. Some examples include expansion of impermeable areas covered in pavement and concrete that prevent rain from absorbing into the soil, therefore increasing the risk of flooding. Inadequately planned and managed cities create new risks that threaten to erode current development gains. Many urban areas lack adequate and safe housing options and health services, which leads to increased risk of natural hazards and the spread of infectious diseases. Blockage of sewage and storm water networks can occur via poor waste management, consequently, this can lead to flooding and waterlogging which in turn, increases the occurrence of infectious diseases. Water contamination or scarcity can also be caused by this destruction or damage to infrastructure. Another issue is the creation of man-made hazards through poor planning of industrial areas, inadequate infrastructure in factories and industry or non adequate waste management. All these can cause different hazards leading to increased disaster risk.
- **Urban development and exposure**
  As already mentioned, the concentration of populations in urban areas has surely doubled, even tripled. In high-hazard areas, there is a growing concentration of assets and people, which has led to the marginalisation of the poor urban areas, creating particularly unsafe areas. Therefore, more urban dwellers are facing increasing harmful consequences caused by disasters, in terms of housing, employment and critical infrastructure (including roads, water supply and power). As such, city expansion for political or economic reasons can often outweigh considerations of risk.
- **Urban development and vulnerability**
  When it comes to vulnerability, numerous characteristics of lacking urban planning and development drive vulnerability. The most common issue when it comes to planning is rarely taking disaster risk into account in investment decisions. Lack of regulation will allow the transfer of risk from construction companies to the population living and working in the areas. The most vulnerable groups, living in unplanned and poor areas and settlements, tend to settle and build homes in unsafe locations and are without adequate provision of infrastructure and critical services. The poor urban areas, due to their location and lack of basic, reliable services, are particularly vulnerable to climate change.[29]

2.6. Forced Displacement
By the end of 2022, 108.4 million people worldwide were forcibly displaced due to conflict, human rights violations, violence, persecution, or events seriously disturbing public order, the largest number in human history.[30] About 25 million people are displaced each year due to disasters, experiencing reduced access to essential services and livelihood options, and increased exposure to violence, poverty and insecurity. There is an inherent difficulty in building resilience when people are on the move, which creates a set of particular health needs, as people along this route, within and across borders, are exposed to many social, economic, legal, and environmental difficulties.[31][32]

3. Health Impact of Disasters

Disasters have profound impacts on various aspects of public health, posing significant challenges to individuals, communities, and healthcare systems. A comprehensive analysis of multiple studies reveals the diverse effects of disasters on health, ranging from mental health outcomes to physical health consequences. In the aftermath of multiple disasters, mental health emerges as a prominent concern, with high rates of psychological distress, post-traumatic stress disorder (PTSD), depression, and increased risk of suicide attempts observed among affected populations. Furthermore, the cumulative effect of multiple disaster exposures exacerbates these risks, dispelling the notion that previous exposure to one disaster can protect against the mental health effects of subsequent events. Additionally, factors such as the severity of exposures, sociodemographic characteristics, and occupational risks further contribute to the complex landscape of mental health outcomes.

Moreover, disasters have significant implications for physical health, as studies demonstrate increased incidences of chronic conditions, poor self-rated health, and physical health symptoms in communities exposed to multiple disasters. The interplay between mental and physical health underscores the need for a comprehensive approach to addressing the long-term health consequences of recurring disasters. Furthermore, indirect impacts on public health, including challenges faced by healthcare facilities, risk perception, household and community responses, and government interventions, further complicate the resilience and well-being of affected populations. Understanding and addressing these multifaceted impacts is crucial for developing effective policies and interventions that can mitigate the adverse health outcomes associated with multiple disasters.[33]

After a disaster, most people recover promptly and adapt to situational needs, although they may still be affected. Some even experience post-traumatic growth. However, some may also suffer from adverse mental health effects as a result of ecological disasters. Disasters can result in psychological effects that begin right after the event and continue for a long time, affecting not only the directly impacted region but also the broader community and culture.[34]

People who have been displaced due to ecological disasters may experience various losses, including not only physical possessions, but also their sense of community, familiarity with their surroundings, pets, and daily routines. People who have sought refuge in evacuation centers and shelters may also feel a loss of safety and security, as well as the comforts of home and the restorative benefits of a regular sleep schedule.[34]

3.1. Physical Health Impact

Multiple disasters significantly impact communities' physical health, as highlighted by 16 articles focused on this topic. These studies indicate that exposure to numerous disasters can lead to various physical health issues. For instance, a study conducted across 500 communities in the USA found that recurring disasters were associated with increased incidences of asthma, high blood pressure, and self-reported poor mental and physical health. The incidence of these outcomes further increased with each additional year of experiencing disasters. Another study examining the aftermath of Hurricane Katrina and the Deepwater Horizon oil spill on the Gulf Coast of the USA found that individuals exposed to both disasters had more physical health symptoms than those exposed to only one of the disasters, suggesting a cumulative effect.[33]

Moreover, there is evidence of a connection between mental health and physical health outcomes in

multiple disaster settings. Losses resulting from one disaster, such as Hurricane Katrina, were associated with subsequent distress related to another disaster, like the Deepwater Horizon oil spill, which in turn was related to physical health symptoms. Similarly, post-traumatic stress disorder and insomnia following the 3.11 triple disaster in Japan were found to be associated with increased fracture risk among older adults. Additionally, studies conducted in the context of the 3.11 disasters in Japan revealed a substantial increase in diabetes, body weight, body-mass index, waist circumference, and polycythemia among populations exposed to the disasters. These findings suggest that exposure to multiple disasters can have a detrimental impact on physical health, potentially exacerbating existing health conditions and increasing the risk of developing new ones.[33]

3.2. Emotional and Mental Health Impact
The impact of disasters on health is far-reaching and encompasses various aspects of well-being. As observed in numerous studies, mental health is a significant concern in the aftermath of multiple disasters. The prevalence of psychological distress, acute stress disorder, post-traumatic stress disorder (PTSD), depression, panic disorder, and suicide attempts increases in populations affected by multiple disasters. Exposure to numerous disasters is associated with a cumulative effect on mental health, with individuals facing higher risks than those exposed to a single disaster. Contrary to the notion that exposure to one disaster might mentally prepare individuals for future events, evidence suggests this is not the case. Experiencing multiple disasters can lead to poor mental health outcomes, even when individuals perceive benefits from the initial disaster. The severity of disaster exposure also plays a role, with higher levels of exposure leading to more adverse mental health outcomes. Children who experience multiple disasters are also vulnerable to cumulative effects on mental health.

During disasters, people can develop PTSD which is usually accompanied by symptoms of other anxiety disorders, major depressive disorder (MDD), and substance use disorders. More than 50% of survivors of disasters such as the Oklahoma City bombing and the WTC attacks experienced PTSD and were also identified as having major depression.[35] Individuals who have comorbid psychological conditions tend to face greater impairment than those with only one condition, and they are at a higher risk of developing chronic disorders.[35]

When considering the psychological and behavioural effects of disasters, the focus is often on psychological distress processes such as PTSD, depression, and anxiety, which can cause significant harm and require immediate intervention. However, it's important to recognise that distress reactions and health risk behaviors are also common initial responses to disasters. These should also be addressed in a timely manner to prevent further harm.[34] Grief is a common response to ecological disasters and occurs when people experience significant loss. This loss can include not only loved ones, but also homes and cherished possessions, such as photographs or family heirlooms. [34]

Experiencing traumatic grief increases the likelihood of negative mental health outcomes. As an example, family members from Norway who lost loved ones in the 2004 Asian tsunami were studied six years after the event. The study found that 36% of participants had a psychiatric disorder, and the presence of prolonged grief disorder was found to be a factor that independently increased the risk of functional impairment.[34] Ecological disasters can damage infrastructure, which can create a risk for exposure and contamination from hazardous materials such as chemical, biological, radiological, or nuclear (CBRN) substances. This requires specific public health preparedness measures to be taken. Additionally, ecological disasters can lead to overflowing waste treatment plants, damage to nuclear or

biological facilities, and the disinterment of human remains due to extreme weather events, all of which can cause psychological and behavioural responses within affected communities.[34]

3.3. Public Health Implications of Disasters

Disasters also have indirect implications for public health. Health-care facilities face challenges such as staff shortages in the aftermath of multiple disasters, affecting patient care and the well-being of hospital staff. Risk perception and evacuation behaviors vary in settings with recurring disasters. The severity of past disaster experiences influences perceptions of disaster risk, but the number of past disaster experiences does not directly impact evacuation likelihood. Communication and knowledge exchange between residents and government actors require improvement in settings affected by multiple disasters. Coping strategies at the household and community levels play a crucial role, with the use of traditional knowledge systems and government support aiding in disaster preparedness and response. However, government responses often face challenges in balancing national disaster management and local governance, causing disruptions in communications and hindered organizational learning.[33]

Healthcare settings, particularly primary care and emergency settings, often identify concerns such as insomnia, anxiety, and altered substance use patterns following ecological disasters. To effectively manage the predictable responses of affected individuals, it's essential for healthcare systems to provide adequate education and resources to primary care and emergency personnel. By understanding the broad range of adverse effects, healthcare systems can enhance their planning, preparedness, and response efforts to better support affected communities.[34] The approach to healthcare and disaster management should move towards early screening and evidence-based public health interventions that are cost-effective, accessible, and community-focused. This transition is important for reducing distress, enhancing well-being, and preventing the progression of psychological disorders.[34]

The impact of disasters on the social health of communities is a significant concern, as highlighted by a study conducted in the Philippines. The Philippines, being located along the typhoon belt and Pacific Ring of Fire, experiences a high frequency of typhoons, earthquakes, and volcanic activity. These disasters have detrimental effects on the health infrastructure, leading to limited access to healthcare facilities due to flooding, debris, and damaged roads. To address these challenges, people-centered early warning systems are essential for timely information dissemination and knowledge exchange. In the Philippines, initiatives like the Nationwide Operational Assessment of Hazards (UP NOAH) and HazardHunterPH, an online hazard assessment website, provide free and publicly available tools to evaluate natural disaster risks in different areas of the country. Such initiatives empower communities and facilitate early action and advanced planning.[36]

Disasters also bring forth the need to anticipate and prepare for disaster-related injuries, food- and water-borne diseases, and obstetric emergencies. It is crucial to include health services delivery in disaster preparation and management. Mobile emergency facilities, including disaster relief tents, should be readily available, and well-equipped referral centers need to be identified in advance.[36]

Furthermore, disasters are associated with multiple health risks that have a lasting impact on individuals' physical, psychological, and social well-being. Mental health concerns often persist long after the physical injuries have healed, emphasising the importance of prioritising health even during the recovery and rehabilitation phase. The implementation of the Mental Health Act and Universal Health Care Act in the Philippines is deemed necessary to address these concerns.[36]

To effectively support communities in the aftermath of disasters and enhance recovery, disaster support programs should examine socio-cultural, environmental, and political determinants of disasters. These programs should aim to develop grounded interventions that directly address public health issues, taking into account the unique challenges faced by each community. By considering these factors, policymakers and stakeholders can work towards building resilience and promoting social health in disaster-affected communities.[36]

4. Vulnerability and Disasters

4.1. Children's and Adolescents

Children's and adolescents' psychological and behavioural responses to situations may be similar to those of adults, but they may also differ based on their developmental stages and individual factors. Unfortunately, these responses can be easily mistaken for disruptive behavior by parents, educators, and school administrators who are stressed and not paying close attention.[37] Factors such as separation from primary caregivers, parental distraction and family problems, and changes in routines can make children and adolescents more vulnerable. It suggests that providing education and support resources for parents, teachers, and school staff can help them better recognise signs of distress in young people and allow for quicker and more effective interventions to support them. [37] The impact of climate change affects more than 175 million children all over the world, with approximately 45% of children living in countries classified as "extremely high-risk". The risk environmental hazards are nearly universal for children, whereas in the worst affected countries these threats overlap and deepen child deprivations.[38]

4.2 Women

Women are more susceptible to injuries or death during disasters compared to men. Additionally, violence against women and girls can increase during emergencies. Women also bear a greater responsibility for care tasks, including providing food and water as well as caring for the ill and injured following conflicts and disasters, which can hinder their participation in other activities. Women Rights during disasters are protected by the 1979 Convention on the Elimination of All Forms of Discrimination Against Women and the 1999 Optional Protocol to the Convention on the Elimination of All Forms of Discrimination Against Women. [37] In spite of being an important stakeholder, policies don't take into consideration the perspective of women. Statistically, women's mortality rates from disasters are much higher than those of men. Furthermore, disasters increase and/or exacerbate the factors leading to different forms of violence against women and girls including, but not limited to, rape, sexual assault, intimate partner violence, and trafficking. [39]
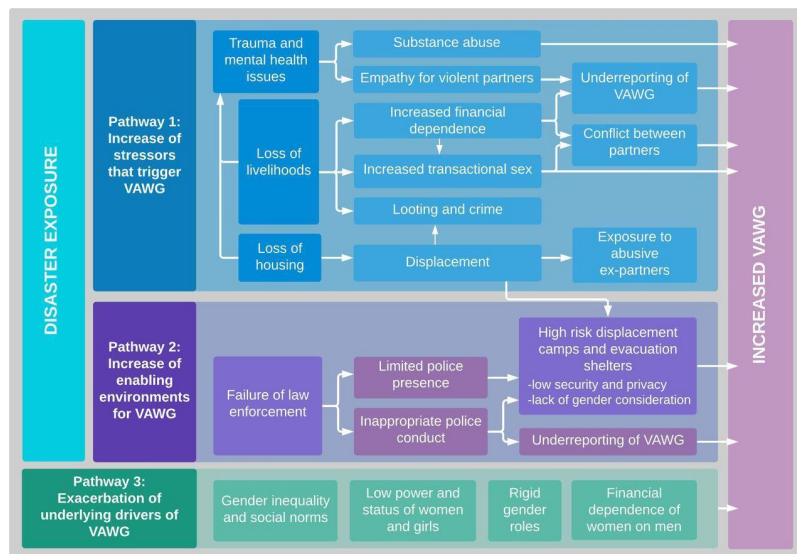
Figure: Framework explaining how exposure to disasters results in increased violence against women and girls [39]

4.3. Elderly

The current international legal frameworks do not provide universally applicable standards or a United Nations Convention on the Rights of Older People to protect their rights. This results in older persons being invisible within the legal framework, despite frequent calls for enhanced actions to promote their full enjoyment of all human rights. However, the 1991 United Nations Principles for Older Persons outlines the rights of older individuals in terms of independence, participation, care, self-fulfillment, and dignity. These principles can be utilised during emergencies and humanitarian situations.[37]

4.4. People with disabilities

Studies show that individuals with disabilities are more likely to be impacted by disasters and conflicts compared to the general population. These individuals have a higher mortality rate, with evidence indicating that they are twice or even up to four times more likely to die in disaster settings compared to the general population. [37] During emergency responses, individuals with disabilities may face additional challenges and are more likely to be left behind or lose critical assistive devices like spectacles, hearing aids, and mobility aids, as well as medications. They may also face obstacles in accessing humanitarian services due to various environmental, physical, and social barriers.[37] They also may face difficulties accessing basic needs such as food, water, shelter, latrines, and health-care services. In addition, these individuals may face higher risks associated with safety, protection, and dignity. They may also be particularly vulnerable to violence, exploitation, and sexual abuse.[37] Traditional caring mechanisms within the community are disrupted, resulting in reduced capacity of caregivers and care settings to support individuals with disabilities. As a result, people with disabilities are likely to face increased vulnerabilities and risks during the disaster.[37]

5. Disaster Management and Risk Reduction

5.1. International Strategies and Frameworks

5.1.1 Sendai Framework for Disaster Risk Reduction 2015-2030

In 1970, the United Nations General Assembly adopted Resolution 2717, "Assistance in cases of natural disaster," addressing for the first time the challenges of disaster risk reduction at a global level by inviting the Secretary-General to submit recommendations on disaster preparedness and mitigation, in a context of international cooperation and coordination. [40]

This milestone set the path towards global partnership for risk reduction, culminating in the adoption of the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) at the Third UN World Conference on Disaster Reduction and its endorsement by the General Assembly of the United Nations in June 2015. This was the third agreement on an action plan and represented a paradigm shift in disaster risk management as the outcome of the lessons learned and gaps identified in previous strategies. The UN Office for Disaster Risk Reduction (UNDRR) coordinates action within the UN system around disaster risk reduction to support the implementation, follow-up, and review of the Sendai Framework.[5]

The Sendai Framework is a voluntary and non-binding agreement establishing priorities, targets and guiding principles in disaster risk reduction from a multisectoral approach to guide actions at different levels to preserve health and development gains. It aims to "prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience".[5] Its application is coordinated with other Agenda 2030 agreements, including The Paris Agreement on Climate Change, The Addis Ababa Action Agenda on Financing for Development, the New Urban Agenda, and the Sustainable Development Goals. It is set as the primary reference for other frameworks in disaster management that address a specific sector or a specific risk driver. The Sendai Framework outlines four priorities for action [5]:

1. Understanding disaster risk;
2. Strengthening disaster risk governance to manage disaster risk;
3. Investing in disaster risk reduction for resilience;
4. Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction.

There are seven global targets to assess the progress towards the framework implementation, for which 38 indicators measure their achievement. Global targets are categorised into two groups [41]:

Targeting substantial reduction of:

1. Global disaster mortality;
2. Number of affected people globally;
3. Direct disaster economic losses in relation to GDP;
4. Disaster damage to critical infrastructure and basic services disruption;

Targeting substantial increase of:

1. Number of countries with national and local disaster risk reduction strategies
2. International cooperation for DRR
3. Availability of and access to early warning systems and risk information

The Midterm Review of the Implementation of the Sendai Framework, published in January 2023, recognises the significant progress made in implementing the Sendai Framework, highlighting mainly the

advances in disaster risk understanding (Priority 1); however, gaps still exist. The main gaps were the unequal spreading of progress across geographical scales and income levels and data biases hindering risk-informed decision-making.[42]

5.1.2. Bangkok Principles

A year after its ratification, the International Conference on the Implementation of the Health Aspects of the Sendai Framework for Disaster Risk Reduction 2015-2030 in Bangkok recommended seven measures to address risk reduction of health emergencies, primarily from biological hazards. These are the seven **"Bangkok Principles"** [43]

1. Promote systematic integration of health into national and sub-national DRR policies and plans and the inclusion of emergency and disaster risk management programmes in national and sub-national strategies.
2. Enhance cooperation between health authorities and other relevant stakeholders to strengthen country capacity for Disaster risk management for health, the implementation of the International Health Regulations (2005) and building of resilient health systems.
3. Stimulate people-centered public and private investment in emergency and disaster risk reduction, including health facilities and infrastructures.
4. Integrate disaster risk reduction into health education and training and strengthen the capacity-building of health workers in disaster risk reduction.
5. Incorporate disaster-related mortality, morbidity and disability data into multi-hazards early warning systems, health core indicators, and national risk assessments.
6. Advocate for, and support cross-sectoral, transboundary collaboration, including information sharing and science and technology for all hazards, including biological hazards.
7. Promote coherence and further development of local and national policies and strategies, legal frameworks, regulations, and institutional arrangements.

5.1.3. Health Emergency and Disaster Risk Management Framework

The World Health Association developed the Health Emergency and Disaster Risk Management (Health EDRM) Framework to provide healthcare stakeholders with a state-of-the-art overview of risk management, focusing on the health sector. Health EDRM functions are organised under the following eight components [44]:

1. Policies, strategies and legislation;
2. Planning and coordination;
3. Human resources;
4. Financial Resources;
5. Information and knowledge management
6. Risk communications
7. Health infrastructure and logistics
8. Health and related services

Data availability and utilization play a crucial role in enhancing Health Emergency and Disaster Risk Management. Data is a valuable resource in supporting disaster mitigation efforts led by governments and community-driven initiatives to build resilience. High-quality data guides research, informs evidence-based policies and designs effective programs. Recognising that a one-size-fits-all approach may not be suitable for all populations, data should reflect community-specific knowledge, perceptions, attitudes, and behaviors and the dynamic changes of these factors during prolonged crises. Ultimately, interdisciplinary advancements in Health-EDRM research should be utilised to shape policies, promote

disaster risk reduction, and maximise community protection. Research endeavors have demonstrated the potential of collaborative efforts in rapid information sharing, open data governance, and integration of diverse data platforms to provide real-time insights into the needs of populations. It is essential to empower researchers, health professionals, policymakers, and other stakeholders to leverage this opportunity to improve community health in response to addressing various natural and human-induced disasters.[45]

5.1.4. International Health Regulations

The International Health Regulations (IHR) are a legally binding framework established by the World Health Organization to help countries prevent, detect, and respond to public health emergencies of international concern (PHEIC). The IHR requires countries to monitor public health events, report them to WHO, and strengthen their national public health systems. The IHR are an essential tool for protecting global health, being vital for biological disaster preparedness and response.[46]

5.2. Climate Change Risk Reduction

In 2022, climate-related hazards and disasters affected the highest number of individuals and caused the highest losses worldwide. Therefore a specific approach to cope with climate change-related risk is critical.[47] Despite lacking a unified consensus on climate change risk reduction implementation, the Intergovernmental Panel on Climate Change (IPCC) recommendations are the basis for the different existing frameworks.

In their last assessment report (6th AR) [48], the IPCC identified the gaps, opportunities for action, limits for risk reduction and recommendations for climate-resilient development. Challenges faced are unequal progress in adaptation at all levels and across regions, affecting primarily already vulnerable populations and the trend to short-term mitigation instead of building resilience through transformational adaptation. Besides, financial constraints and natural systems reaching their adaptation limits impose soft and hard limits to act. Nevertheless, the report highlights the possibility of feasible and effective adaptation for risk reduction. And at the same time, it warns about the risks of maladaptation which puts vulnerable groups and ecosystems at greater risk. Adaptation efforts focus on three areas:

1. Land, Ocean and Ecosystems Transition
2. Urban, Rural and Infrastructure Transition
3. Energy System Transition

The report emphasises ecosystem-based adaptation and social safety as principles for action. Finally, the report also acknowledges how adaptation efforts reduce the negative impacts of climate-related or involuntary displacement on migrants and sending and receiving areas.

The 6th AR also includes cross-cutting recommendations on strengthening health systems' resiliency. Regarding health systems, recommendations are the implementation of monitoring and early warning and response systems for heat waves, mental health, and water-, food- and vector-borne infectious diseases. Other actions for infectious disease prevention are guaranteeing water security and sanitation, especially after floodings or extreme weather events, and vaccine development.

In 2022, the International Federation of the Red Cross and Red Crescent Societies launched a 5-year Global Climate Resilience Programme [49] aiming to support climate adaptation efforts in 100 developing countries and reach 500 million people by 2027. The programme is based on four pillars:

1. Scaling up Climate-smart disaster risk reduction, early warning, anticipatory action, and preparedness.
2. Reducing public health impacts of climate change
3. Addressing climate displacement

4. Enabling climate resilient livelihoods and ecosystem services.

6. Disaster Management Ethics and Humanitarian Action

6.1. Disaster Management Ethics
While ethical dilemmas are present in all stages of disaster management, they are more prevalent during the response phase due to the definitory imbalance between the needs of a community and the available resources.[50][51]

Due to this inherit condition of disasters, there is a need for prioritisation regarding resource allocation. This concept is most vividly expressed during triage, as it sets an order of priorities for treatment that will save the most significant number of lives and restrict morbidity to a minimum.[52] While it is crucial for a triage framework to outline a bias-free decision-making algorithm based solely on medical needs, a human rights-based approach promotes the allocation of resources in an equitable, rather than an equal, manner.[53] Medical ethics should be the guiding principle of these issues related to medical aid during disasters.[50]

The European and Mediterranean Major Hazards Agreement (EUR-OPA) published an ethical charter on resilience to disasters upon request by the Parliamentary Assembly of the Council of Europe. From the Human Rights based approach, the document establishes a series of ethical principles, applying to all parties and through the whole disaster management cycle. It emphasises the fundamental humanitarian principles as the main general principles guiding disaster relief, rehabilitation and prevention. Furthermore, it acknowledges the right to a healthy environment, the right to receive proper information, and the right to health. It also highlights the relevance of protection of dignity, social bonds and human rights, including economic, social, cultural, civil and political rights. Finally, regarding humanitarian workers, it calls for protection of their fundamental rights and ensuring they have access to psychological assistance.[54]

In order to support ethical decision-making of humanitarian workers and other stakeholders, there are certain frameworks providing tools for a systematic and comprehensive ethical analysis. The Humanitarian Health Ethics Analysis Tool (HHEAT) is a 6-step approach:[55]
1. Identify/Clarify the ethical issue;
2. Gather information considering:
   a) Resource allocation and clinical features,
   b) Participation, perspectives and power,
   c) Community, projects and policies;
3. Review the ethical issue;
4. Explore ethics resources;
5. Evaluate and select the best option based on potential consequences and viability;
6. Follow- up and learning.

6.2. Complex Humanitarian Emergencies
Disaster management is an essential component of humanitarian action, setting the framework for responding to complex humanitarian emergencies and requiring extensive political and governance coordination. A **Complex Emergency** is defined as "a humanitarian crisis that occurs in a country, region, or society where there is a total or considerable breakdown of authority resulting from conflict, requiring

an international response that goes beyond the mandate or capacity of any single agency impact of disasters".[56]

In addition to preventing and responding to disasters, disaster management can also play a role in helping communities to recover from disasters. This can involve financial assistance, help to rebuild homes and businesses, and support for psychological recovery. By assisting communities to recover from disasters, disaster management can help to reduce the long-term impact of disasters and to build more resilient communities.

6.2.1. Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief

The principles of action in disaster relief align with the humanitarian principles and the human rights-based approach. As outlined in the Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief, the prime motivation of action shall be the humanitarian imperative to alleviate human suffering without discrimination while ensuring social and cultural acceptability. Non-Governmental Humanitarian Agencies shall not use aid to further political and religious standpoints and should remain independent of governmental influences, remaining accountable only to those receiving assistance and contributing resources.[57]

It is vital not to consider disaster relief and humanitarian action as long-term support for communities in emergencies but instead, as an assistance mechanism that shall involve those communities in the process of resolving the emergency, building capacity and resilience, and finally achieving sustainable development and peace.[57][58]

6.2.2. SPHERE Minimum Standards

In 1997, a group of NGOs and the International Red Cross and Red Crescent Movement founded the SPHERE Project aiming to improve humanitarian response quality and accountability by setting a set of shared guiding principles under the belief of the right for people affected by disasters to live with dignity. They published the SPHERE Handbook as a tool to guide humanitarian practitioners' actions in planning, managing and implementing the humanitarian response. Four technical chapters define the minimum standard in humanitarian action in four main sectors: Water Supply, Sanitation and Hygiene Promotion (WASH), Food Security and Nutrition, Shelter and Settlement, and Health. Each chapter contains a series of standards followed by critical actions, key indicators and guidance notes.[59]

6.2.3. International Coordination Mechanisms

In 2005 the Inter-Agency Standing Committee (IASC) introduced a series of reforms to humanitarian coordination under the "Humanitarian Reform Agenda," including introducing the Cluster Approach. It aims to improve response effectiveness in complex emergencies by establishing shared responsibilities while ensuring explicit coordination and leadership, thus enhancing predictability and accountability. Clusters are partnership groups of humanitarian organisations in each of the main sectors of humanitarian response under the lead role of UN programmes, funds or agencies, as well as NGOs, designated by the IASC, fulfilling six core functions at the field level:

1. Support service delivery;
2. Inform strategic decision-making for the Humanitarian Coordinator and Humanitarian Country Team;
3. Planning and strategy development;

4. Advocacy;
5. Monitoring;
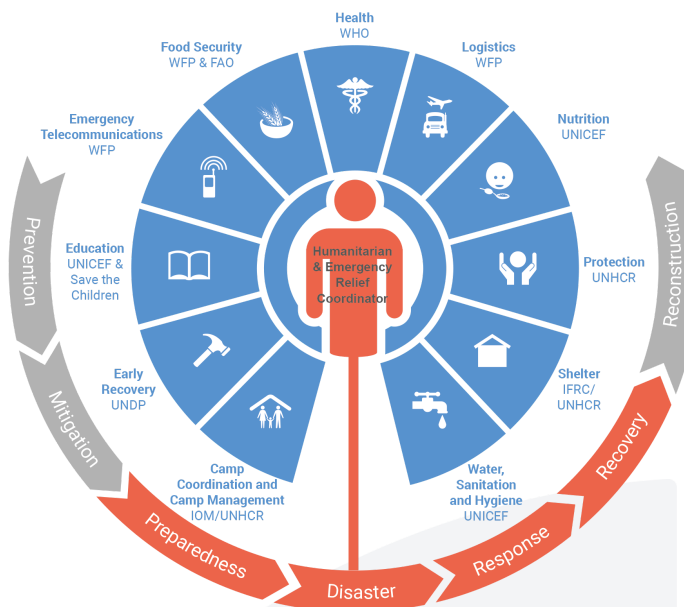6. Contingency planning, preparedness, and capacity building.[60]

Fig. 1. IASC Global Clusters. Source: UN OCHA

At the global level, the Health Cluster's vision is "to save lives and promote dignity in humanitarian and public emergencies." Its mission is "to collectively prepare for and respond to humanitarian and public health emergencies to improve the health outcomes of affected populations through timely, predictable, appropriate and effective coordinated health action." The Cluster mainly focuses on strengthening the provision of quality health care at all levels.[61]

7. Disaster Education, Training and Research

The priorities and the action points of the Sendai Framework for Disaster Risk Reduction directly or indirectly link to disaster education, training, and research, through multiple points throughout the framework. [5] The Sendai Framework for Disaster Risk Reduction aligns with Sustainable Development Goal #11: "Make cities and human settlements inclusive, safe, resilient, and sustainable." Overall, disaster risk also aligns with nine other SDGs and has 25 linked targets. Several of these targets align with disaster education, training, and research.[62]

7.1. Disaster Education and Training

Education builds resilience; the concept of disaster education aims to provide knowledge to individuals, communities, and organisations to take action to lessen their vulnerability to disasters. And it does not only help in disaster preparedness and readiness, but it helps reduce damages and recovery time. [63] While disaster education allows individuals, communities, and organisations to understand and acquire knowledge on different causes and types of disasters and the measures that can be taken to prepare for them, disaster training aims to capacitate and build the skills of individuals, communities, and organisations.[63]. Assessing target groups is one major step toward disaster education and training. Different target groups will need **additional and tailored** methodologies and programmes according to

their level of **information, education, and authority.[63]** Vulnerable groups should be identified to make disaster education more effective and inclusive. Those vulnerable people include but are not limited to, women, children, older adults, and people living with disabilities.[63]

According to research, educating women about disasters and emergencies proved to help not only the preparedness of women themselves but entire families, and due to their interest in educating and preparing for emergencies, they become active members in helping to promote disaster education.[63]
There are many benefits to early childhood disaster education, including, but not limited to, increased risk perception; in many countries, a considerable proportion of society is made up of children, and people don't forget what they learned as children leading to a gradual, sustainable increase in community awareness over time. Additionally, there is an international agreement that promoting early disaster education will improve preparedness and resilience among children toward disasters.[63]
As for older adults and people living with disabilities, different education methodologies should be constructed according to their mental and physical capabilities. The importance of educating older adults and people living with disabilities lies in minimising their reliability to younger people during disasters and emergencies.[63]

Medical students are crucial stakeholders in disaster training and education, as they serve as the next generation of physicians and the future of the health sector who will be called upon during a disaster. Thus, according to the World Medical Association, it is recommended that disaster medicine training be included in the curricula of the university and post-graduate courses in medicine.[64]

However, disaster medicine curricula in medical universities for undergraduates are meager at this point, and the sources for disaster medicine training and education are limited to post-graduate studies. Moreover, there is no standardised methodology for disaster medicine education.[65]

7.2. Disaster Research
Disaster research is not only crucial for filling the gaps in what we know about hazards and disaster mitigation, but the research findings also help in creating disaster risk reduction policies and programmes, making disaster research important in decision-making for different stakeholders.[66]

For the past two decades, disaster risk research has been increasing in parallel with the increase in risks and disasters. However, there are still many limitations to the field. Most of the research has been focused on single case studies and limited methodology, when the focus should be targeted toward causes of disasters and how the deficiencies in risk management get addressed or if they are addressed.[67] It is also important to note the importance of comparing national, regional, and international data and collaborating between institutions to reach the best practices and make knowledge and information available to facilitate better coordination and coherence regarding disaster risk reduction DRR. [67][66] Currently, data is scattered haphazardly, not organised according to the different stakeholders, and not translated into different languages. It is important to emphasise the dynamic character of knowledge, how it is built through social interaction and evaluation from different perspectives, and how knowledge is created by "accumulating and organising information with respect to breadth, depth, and amount.".[66] Additionally, the lack of research in monitoring and evaluating disaster programmes leads to challenges in designing and developing programmes and assessing their impact.[63]

Funding poses a significant hindrance when conducting disaster-based research, the time sensitivity of the data needed makes the capacity to obtain and apply for research funds challenging, and funding opportunities sometimes become available after the impact of a large-scale disaster.[68]

A significant barrier in disaster research is the data gap, resulting from the lack of a standardised framework for calculating disaster impact. A lack of consensus on determining relative economic loss, for example, impedes the accurate comparison of magnitude or severity. Reported economic damage is significant when there is more damage but does not necessarily require emergency assistance. This data gap is also affected by the inherent challenges of data collection after disasters since there is a high probability of damage to the functionality of data systems. Disruption to communication channels, infrastructure, and the health system creates information sharing and governance barriers. With the added time pressure of disasters, these multifaceted challenges pave the way to politicising data collection, use, and reporting.[45]

8. Role of Youth in Disaster and Emergency Management

8.1. Child And Youth Centered Approach

Youth is one of the most affected parts of society by disasters. It is estimated that from 1991 to 2000, 77 million children were affected by natural disasters or conflicts. According to these results, protecting children and youth is vital in managing the long-term effects of disasters. However, despite the thought of authorities about protecting youth, youth collaboration in disaster management is essential in disaster risk reduction and recovery. Excluding young people from disaster management threatens their safety when disaster strikes and ignores a valuable resource for risk communication, education, advocacy, and practical risk reduction activities. Implementing this strategy as working with youth volunteers in El Salvador and Haiti demonstrates the youth's efficiency and potential capability in Disaster Risk Reduction.[70] The Convention on the Rights of the Child (CRC) and the Declaration of the Rights of the Child (DRC) demonstrate that children and young adults are not only a group of 'dependents to be taken care of.' Youth have a right to express their thoughts in the decision-making process about decisions affecting their own.[69]

The method of child-centered disaster risk reduction (CC-DRR) is a much new method of including children and youth as individuals work to maintain their safety and make their communities more resilient to disasters. CC-DRR approaches prioritise children and youth, fostering their comprehension and asserting their rights. They recognise young individuals as both capable recipients and valuable sources of risk information. When incorporating children and youth into risk communication models, examining the varying degrees of trust assigned to different communication sources is crucial. [70] Two case studies of El Salvador and Portugal indicate youth engagement efficiency:

El Salvador experienced more than fifteen earthquakes and two hurricanes, with 1.5 million affected people. According to the Ministry of Health, 20% of victims required psychological/psychiatric care. In this case study, the plan was to educate and increase the awareness of youth about disasters and increase the contribution of youth to disaster risk reduction. This program includes effects of disasters, peer and self-assessment/management in disaster situations, first aid, and early warning detection. Within this model, children and youth are given the power to assume the role of protagonists. They actively seek and create opportunities within internal and external policy realms, creating R&D proposals and engaging in horizontal dialogues with adults to discuss risks and priorities. Furthermore, In the case study made in Portugal, hands-on training, informative lessons and past case studies were completed at secondary and

high school levels. According to the personnel declarations and academic research of this training, children who are more receptive and susceptible to educational initiatives are evident. Besides, further research shows implementing youth in disaster risk reduction has a crucial role in communities, yet their outlooks and necessities diverge from those of adults. Additionally, they have a vital contribution to make in terms of preventing and mitigating risks. [71]

8.2. Involvement of Medical Students in Disaster Management

In disaster situations, because of the increased workload, lack of operational personnel and collapse of the administrations, taking benefit of medical students in training has a crucial role in decreasing mobility/mortality rates. One such case is the 2005 Pakistan earthquake, which caused more than 87.350 deaths and 38.000 injuries.[72] According to the experience of medical and nursing students from Pakistan in 2005, the standard action plan was for intern (senior year) students to be there to assist. But after the arrival at the disaster areas, every person had to perform hands-on treatment for a patient without supervision, including students. Efficiency was insufficient because of a lack of knowledge, cultural biases, unpreparedness and lack of the usual hospital equipment. This means that unprepared students could have caused more harm than good to some patients while also becoming victims themselves. As they did not know what to expect, they endured physical and psychological harm, which could have been mitigated by adequate training. [73]

8.3. Mental Health Maintenance of Youth in Disasters with youth contribution

Mental Health is one of the most critical parts of disasters. Extensive research consistently demonstrates that children are highly susceptible to experiencing profound stress reactions in the aftermath of a natural calamity. These reactions manifest as clinical needs and experience increased behavioural problems, including insomnia, anxiety, depression, and post-traumatic stress disorder (PTSD).[74] Especially those who have endured the loss of their homes, possessions, or loved ones may undergo prolonged grief and suffering. In the aftermath of a disaster, the vulnerability of youth to develop psychiatric disorders surpasses that of adults. Reports indicate a surge in depression and anxiety among children following a natural disaster, with some symptoms persisting over an extended period. [75]

There are multiple ways of increasing resilience to the post-traumatic effects of disasters, one of the most important being peer support. During and after a disaster, maintaining close relationships becomes crucial for children and youth, even if they have been evacuated or displaced. These relationships offer valuable social support throughout the early recovery phase and ongoing rebuilding process. By connecting and communicating with their peers, young individuals can regain a sense of normalcy and security and receive mutual support and assistance from their peer groups. In the aftermath of a disaster, peer-to-peer relationships allow children and youth to establish age-appropriate connections, enabling them to share experiences and address their needs effectively. In addition to peer support, larger systems like schools play a significant role in promoting resilience among children and youth affected by traumatic events such as disasters. Given that disasters impact a substantial number of young individuals in communities, schools often serve as a platform for post-disaster recovery efforts, aiming to address the collective trauma experienced. School-based interventions focusing on routines, group problem-solving, and strategies to enhance learning and protective factors in childhood development can significantly enhance resilience. These interventions are essential for helping children and youth navigate the challenges posed by the disaster and promoting their overall well-being.[74] Finally, teaching youth how to help their peers demonstrates considerable importance in diminishing the mental health impact

of disasters. Thus, it is crucial to incorporate Psychological or Mental Health First Aid in formal education.[76]

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