2021 APRU Multi-Hazards Webinar Series: Health, Climate Change and Innovation in Disaster Risk Reduction:

Latest Frontier and application of Health-EDRM for Multihazard Context: The case of COVID-19

12th October 2021

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Co-Chair, WHO Thematic Research network for Health-EDRM
• Academic partner of:

• Integrated Research on Disaster Risk
  International Centre of Excellence (IRDR ICoE)
  – One of the ICoEs since Nov 2016
  – Focuses on Health and DRR
Health and DRR: WHO Health-EDRM Framework

• The **Health-EDRM Framework (WHO 2019)** provides a common language and a comprehensive approach for all actors in health and other sectors, to reduce health risks and consequences of emergencies and disasters

• **Top-down** government efforts in infection control and management, **Bottom-up** resilience efforts at the individual and household level have crucial roles of health-EDRM for biological hazards

• Health-centred
  – putting **people’s health** at the centre of emergency and disaster risk management
  – emphasizes the centrality of prevention, preparedness and readiness, together with the more traditional focuses of response and recovery

• Comprehensive and interdisciplinary approach
  – originates from the current fragmented approaches to different types of hazards and gaps in coordination across the entire health system
  – emphasizes assessing, communicating and reducing risks across **the whole risk reduction continuum**
Health-EDRM: Health-Emergency and Disaster Risk Management

• Health Emergency Disaster Risk Management (Health-EDRM) is the latest World Health Organization paradigm that includes DRR at intra-, inter- and multi-disciplinary levels. Scientific advancement under Health-EDRM is necessary for health and non-health actors in DRR education and research (WHO 2019).

• Relevant Interventions can be divided by when they should be implemented:

<table>
<thead>
<tr>
<th>PRIMARY:</th>
<th>to prevent health risk before the disaster</th>
<th>EXAMPLE: childhood vaccination programmes, and early warning systems: Impact driven Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECONDARY:</td>
<td>to prevent health risks after the disaster</td>
<td>EXAMPLE: emergency vaccination campaigns, knowing how to prepare ORS</td>
</tr>
<tr>
<td>TERTIARY:</td>
<td>to reduce the impact after disaster</td>
<td>EXAMPLE: using ORS, provide first aid (physical and psychological), and healthcare staff specifically trained for disaster-related injury/disease outbreak</td>
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</table>
Health EDRM: the systematic analysis and management of health risks surrounding emergencies and disasters by reducing the hazards and vulnerability along with extending preparedness, response, and recovery measures.
What are the health research needs for the Sendai Framework (2017)

There is an important opportunity to build coherence across different policy areas with the 2015-16 adoption of four landmark UN agreements—the Sendai Framework for Disaster Risk Reduction 2015-2030, the 2030 Sustainable Development Goals (SDGs), the Paris Agreement, and the New Urban Agenda (Habitat III). Ensuring that health is at the heart of the Sendai Framework is crucial. The 2030 targets of the Sendai Framework call for substantial global reductions in disaster-related mortality, number of affected people, direct economic loss, and damage to critical infrastructure (panel). The framework identifies strategies that might alleviate the impact of disasters, including reduction and management of hazard, exposure, and vulnerability and capacity building for prevention, preparedness, response, and recovery. Health resilience is also promoted throughout the Sendai Framework. Since 2007, global platforms for disaster risk reduction have provided a biennial forum for strategic advice, coordination, partnership development, and review of progress in the implementation of international instruments on disaster risk reduction. On May 24-26, 2017, the Global Platform in Cancun, Mexico, highlighted measures needed to ensure implementation of the Sendai Framework and presented the proposed indicator framework to monitor the seven Sendai targets, such as the building of resilience of infrastructure and housing. Although discussion at the Global Platform recognised and health systems resilience. Health-EDRM promotes the intersection of health and disaster risk reduction and supports the implementation of the health aspects of the Sendai Framework.

If the Sendai Framework objectives are to be fulfilled, research gaps must be addressed. There are general uncertainties about the agreed tracking and monitoring of health indicators for disaster risk reduction. The absence of an agreed all-hazard and disasters classification is an issue for health data collection. Working epidemiological definitions are required, given concerns about how thresholds relating to temporality (slow-onset/protracted events), attribution (direct vs indirect causes of morbidity and mortality), and baseline data should be accounted for. Furthermore, global data collection systems, such as the International Health Regulations and the Lancet Countdown, could have a role in facilitating the identification, prevention, preparation, response, and recovery from emergency threats and risks. Indicator reporting guidelines require consultation with a diverse range of stakeholders to ensure adequate implementation and integration with national data collection systems.

Disasters affect people’s wellbeing and human development with both short-term and long-term effects, such as loss of life, injury and illness, and disability. There is insufficient research on the long-term health effects of disasters on mental health, social health, and wellbeing. More research is needed about disaster

• Build coherence across different global policies
  • Sendai Framework
  • Sustainable Development Goals (SDGs)
  • Paris Agreement
  • New Urban Agenda (Habitat III)

• Sendai Framework
  • Alleviate impact of disasters across all disaster phases
  • Account for exposure, vulnerability, capacity building

Multidisciplinary gap

## H-EDRM Research Gap in Sendai Priority

<table>
<thead>
<tr>
<th>Research Gaps</th>
<th>Example</th>
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<tbody>
<tr>
<td>1. What might be acceptable agreed all-hazard and disasters classification?</td>
<td>Delphi method study to develop working epidemiological definitions of thresholds relating to temporality (slow-onset/protracted events), attribution (direct vs indirect causes of morbidity and mortality), baseline data and Indicator reporting guidelines.</td>
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<td>2. How to provide an updated picture of patterns and trends in health risks associated with disasters and emergencies?</td>
<td>How to use Big/Data, Global data collection systems, (eg the International Health Regulations and the <em>Lancet</em> Countdown) to facilitate the identification, prevention, preparation, response, and recovery from emergency threats and risks?</td>
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<td>3. How to profile health risk for subgroups with vulnerabilities — eg, very old people, people with disabilities, patients with chronic conditions? — because these groups have specific health needs that are not always recognized in national local policies, plans, and practices.</td>
<td>Health Vulnerability Index Development</td>
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<td>4. What might be effective ways to support preparedness, response and rehabilitation in Health?</td>
<td>Community intervention trials should be implemented to assess the best strategies to build bottom up capacity at all level (individual, household, and community-based disaster risk literacy)</td>
</tr>
<tr>
<td>5. How to engage in health risk communication for warning and health protection efforts and health decision making?</td>
<td>Stakeholders interviews, Community RCT of technology applications of disaster health risk message</td>
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Chan EYY and Murray V. What are the health research needs for the Sendai Framework? Lancet June 19, 2017 http://dx.doi.org/10.1016/S0140-6736(17)31670-7
## WHO Classification of hazards

<table>
<thead>
<tr>
<th>GENERIC GROUPS</th>
<th>1. NATURAL</th>
<th>1.2 HYDRO-METEOROLOGICAL</th>
<th>2. HUMAN-INDUCED</th>
<th>3. ENVIRONMENTAL DEGRADATION</th>
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<tr>
<td>GROUPS</td>
<td>1.1 GEOPHYSICAL</td>
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<td>1.2.3 CLIMATOLOGICAL</td>
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<tr>
<td>SUBGROUPS</td>
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<tr>
<td>MAIN TYPES</td>
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<tr>
<td>- SUBTYPES</td>
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### Example:
- **Earthquake**: ground-shaking, landslides, rock fall, subsidence, liquefaction, volcanic activity (ash fall, lahar, pyroclastic flow, lava flow).
- **Flood**: riverine flood, flash flood, coastal flood, ice jam flood.
- **Storm**: extratropical storm, tropical cyclone (cyclonic wind, cyclonic rain, cyclone (storm) surge).
- **Drought**: wild fire [e.g. brush, bush, pasture], forest fire.
- **Airborne diseases**: impact: airburst, meteorite.
- **Space weather**: energetic particles, geomagnetic storms, shockwave.
- **Animals**: animal-human contact, venomous animals [snakes, spiders].
- **Foodborne outbreaks**: insect infestation, grasshopper, locust, animal diseases, plant diseases, aerosol allergens, antimicrobial resistant microorganisms.
- **Infrastructure disruption**: power outage, water supply, solid waste, waste water, telecommunication, cybersecurity, hazardous materials in air, soil, water.
- **Erosion**: acts of violence, armed conflicts, international, non-international, civil unrest, stampede, terrorism, air pollution, haze, infrastructure disruption, financial crises, hyper-inflation, currency crisis.

Case of DRR: Climate change and Health

Subtropical context
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Hong Kong

Population: 7,300,000

GDP per capita: US$ 42,290

Climate: Sub-tropical (Hot summer and mild winter)
Hong Kong SAR

- Hong Kong is a highly urbanized and **densely** populated city with a complex spatial distribution of population
  - an estimated population about 7.47 million (17% in Hong Kong Island, 31% in Kowloon, and 52% in New Territories)
  - Hong Kong also has one of the highest **income inequalities** in the world

- Hong Kong's climate is **subtropical** with cold winters and wet, hot summers, and a pronounced urban heat island effect
  - annual temperature is **23.5°C**
  - annual rainfall is **2,431.2 mm**
Hong Kong’s Climate and Geography (1)

- **South-eastern tip of China**

- **Three main territories**
  - Hong Kong Island,
  - Kowloon Peninsula, and
  - New Territories (includes outlying islands)

- **Total area:** 1,106.34 km²

- **Total population:** approx. 7.34 million (2016)
  - Population density: 6,780 people per square kilometre
  - Dense urban development resulted in significant long-term decrease in local wind speed in the past few decades

http://www.hko.gov.hk/cis/climahk_e.htm
# Climate change in Hong Kong

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<td>Extreme Rainfall: 180 mm</td>
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Summary: Metereological Impact

Hong Kong Subtropical Climate (Hottest time: May – Sept)
• Vertical-based City
• Intra-city variation effect (Heat Island Effect)
• Seasonal Variation in mortality*

Impact of Climate change on Temperature
• Reduce wind speed
• Losing night time cooling
• 2-3 degree increase than current scenario (WBGT)

Health Impact?

*Winter is known to accumulate more mortality
WHAT IS THE CURRENT KNOWLEDGE AND SCIENTIFIC FINDINGS IN TEMPERATURE AND HEALTH?
Urgent multi-disciplinary support in health systems and sectoral improvements in 6 areas are identified. Namely, 

1. Infrastructural support for health system resilience; 
2. Data management to support medical research health decision making; 
3. Residual risk management; 
4. Risk communication; 
5. Digital literacy; 

Extreme Temperature

Basic Health Needs
- Air Pollution
- Affected supply of food
- Temperature regulation measures may not be adequate enough

Change in environment
Change in air temperature

Basic Infrastructure
- Increased demand of electricity
- Increased burden of electrical appliance
- Deformation of road

Population Move

Infectious Diseases
- Respiratory Disease
- Vector-borne diseases
- Food-borne diseases

Non-communicable diseases
- Cardiovascular diseases
- Brain diseases
- Worsening of chronic diseases

Injuries
- Accidents
- Heat Stroke

Health Damage (Physical, Mental & Social)
- Increase in death, injuries and illness
- Increase the burden of public health system
- Increase in the demand of social welfare
## Modeling Methods and DATA

<table>
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<tr>
<th>Outcome Dimensions</th>
<th>Outcome Indicators</th>
<th>Sources</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>Causes of Death (By age, gender, district, socio-economic status)</td>
<td>Hong Kong Census and Statistic. Government of HKSAR, PRC China</td>
<td>99%</td>
</tr>
<tr>
<td>Morbidity</td>
<td>Daily Hospital Admissions; ICD 9 &amp; ICD 10.</td>
<td>Hong Kong Hospital Authority. Government of HKSAR, PRC China.</td>
<td>83%</td>
</tr>
<tr>
<td>Practices: Health Seeking behavior</td>
<td>Hotline calls, Reasons for calls, outcomes of calls</td>
<td>PE Link(HK Government Subsidized NGOs target vulnerable population)</td>
<td>75%</td>
</tr>
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<td>Practices: Self-reported self help</td>
<td>Self-reported activities. Semi-structured</td>
<td>Randomized, Population based, computerized telephone survey</td>
<td>96%</td>
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<td>Practices: Behavior changes</td>
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<td>Perception: Attitude</td>
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<td>Knowledge</td>
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Time-series temperature-health studies

1) Basic Model: Generalized Additive Model

\[
E \left[ \text{daily record of admissions/deaths} \right] = \text{mean temperature} + \text{mean RH} + \text{mean wind speed}^* + \text{total solar radiation}^* + \text{mean level air-pollutants}^* + \text{long term trend} + \text{seasonal trend} + \text{holiday effect} + \text{day-of-week} + \text{same day rainfall}
\]

2) Stratified analysis with: Season, Gender, Age, Disease subtypes (ICD 9 and ICD 10),

*Variables were included when substantial associations were observed.
Overall Mortality and Hot temperature Relationship

An average 1°C increase in daily mean temperature above 28.2°C was associated with an estimated 1.8% increase in mortality. Women, men less than 75 years old, people living in low socioeconomic districts, those with unknown residence and married people were more vulnerable. Non-cancer-related causes such as cardiovascular and respiratory infection-related deaths were more sensitive to high temperature effects.

Hospital admissions $\uparrow$ by 4.5% for every increase of 1°C above 29°C

Mortality $\uparrow$ by 1.8% for every increase of 1°C above 28.2°C

Help-seeking e.g. Clinic attendance

Cumulative mortality* $\uparrow$ by 3.8% for every decrease of 1°C

Mild symptoms and Discomfort

12.7% Required medical care
82% Professional medical help
18% Self-care only

Behavioral changes#

66.9% Have symptoms

67.1% reported changes

Health-related calls $\uparrow$ when max. temp. reaches 30-32°C. About 49% of calls were for explicit health-related reasons

2% Required medical care
95% Professional Medical Health (Western 70.0%/Chinese 25.0%)
5% Self-Care only

1.9% Heatstroke

88.4% reported changes

* Cumulative mortality is used because the lagged effect of coldness towards mortality is estimated to be 3 weeks. # Behavioral changes include amount of physical activity, appetite, frequency of social activity, mood and sleeping quality
Low temperature pose much stronger overall effect on mortality than high temperature in Hong Kong, a subtropical city.

Liu S et al 2020
Temperature effect on different cause of death by SES groups

The cold (12.9°C, 2.5th at lag 0-21) and heat effect (30.3°C, 97.5th at lag 0-3) compared to 27°C by cause of death and SES groups (where One = the highest SES, Four = lowest SES).

Key Findings

- Cold effect was significantly associated with higher mortality risk across all SES groups, despite the inter group difference was not clear.
- Heat effect was only significant among lower SES groups.

Liu S et al 2020
Temperature effect on different gender and age by SES groups

The cold (12.9°C, 2.5th at lag 0-21) and heat effect (30.3°C, 97.5th at lag 0-3) compared to 27°C by cause of death and SES groups (where One = the highest SES, Four = lowest SES)

Key Findings

• No clear gender difference for cold effect, but female may be more sensitive to hot temperature.

• Higher cold effect was observed in highest SES group.

• Older age was associated with higher mortality risk for both high and low temperature.
An increase of 10% in green space density for a TPU was associated with a decrease of 4.8% of non-accidental mortality.

Huang Z et al 2021
Climate change in Hong Kong

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<td>400 flights cancelled, 4500 Trees collapsed, Rotated 2 Boeing planes</td>
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Health in DRR included:

- The importance of multi-sectoral, multi-hazard action plans;
- Re-Conceptualization of Human Health security and Health-EDRM for compound, complex, cascading, concurrent and protracted crisis
- Adaptation to technological advancements in data collection, dissemination and protection
- The improving inclusivity in digital literacy.

[On 19th April 2021]
Case of DRR: COVID-19

Subtropical context
### WHO Classification of Hazards

#### Generic Groups

<table>
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<tr>
<th>Groups</th>
<th>Subgroups</th>
<th>Main Types</th>
<th>Subtypes</th>
</tr>
</thead>
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<tr>
<td>Natural</td>
<td>Hydro-Meteorological</td>
<td>Flood</td>
<td>Earthquake: - ground-shaking, - landslide, - rock fall, - subside</td>
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<tr>
<td></td>
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<td>Storm</td>
<td>- extratropical storm, - tropical cyclone, - convective storm</td>
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<td>Drought</td>
<td>- wild fire, - land fire [e.g. brush, bush, pasture]</td>
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<td>Glacial lake outburst</td>
<td>- forest fire</td>
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<tr>
<td>Human-Induced</td>
<td>Technological</td>
<td>Industrial hazards:</td>
<td>- chemical spill, - gas leak, - radiation [radiological, nuclear]</td>
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<td>Structural collapse:</td>
<td>- building collapse, - dam/bridge failures</td>
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<td>Occupational hazards:</td>
<td>- mining</td>
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<td></td>
<td></td>
<td>Transportation:</td>
<td>- air, road, rail, water, space</td>
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<td>Explosions</td>
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<td>Fire</td>
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<td>Air pollution</td>
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<td>Haze</td>
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<td></td>
<td></td>
<td>Infrastructure disruption:</td>
<td>- power outage, - water supply, - solid waste, - waste water</td>
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<td>Cybersecurity</td>
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<td></td>
<td>Hazardous materials</td>
<td>in air, soil, water, telecommunication</td>
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<td>Animal-human contact</td>
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<td></td>
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<td>Venomous animals</td>
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<td>Other</td>
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#### Environmental Degradation

- Erosion
- Deforestation
- Salinization
- Sea level rise
- Desertification
- Wetland loss/degradation
- Stampede
- Glacier retreat/melting
- Sand encroachment

Source: [WHO Classification of Hazards](https://www.who.int/hac/techguidance/preparedness/health-emergency-and-disaster-risk-management-framework-eng.pdf?ua=1)
COVID-19 Pandemic as a Biological Hazard

- **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.”

- **Biological hazards** are those “of organic origin or conveyed by biological vectors, including pathogenic microorganisms, toxins and bioactive substances”

Salmonella bacteria  COVID-19  Mad Cow Disease  Parasite
About COVID-19 Pandemic

• The SARS-CoV2, also known as COVID-19, belongs to the coronavirus family, which is the same family as SARS and MERS viruses.

• The COVID-19 pandemic was considered a Public Health Emergency of International Concern (PHEIC) by the WHO on 30 Jan 2020.

• COVID-19 is a serious public health emergency threat:
  • Several 1.9 million deaths reported and affected 88million in global (Jan 2021).
  • Health Threats to overwhelm the national healthcare systems globally.

• COVID-19 has reinforced the need to revisit the integration of health within disaster risk reduction (DRR) strategies for biological hazards in a systems-wide approach.

Source: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20201005-weekly-epi-update-8.pdf
COVID-19 situation (11\textsuperscript{th} October 2021)

Total Cases: 237,851,281
Total Deaths: 4,851,509
Total Vaccine Doses Administered: 6,459,979,918

Source: https://coronavirus.jhu.edu/map.html
Protracted biological hazard: Case of COVID-19 Pandemic

• Disaster risk management planning and response strategies have yet to better reflect the non-linear transition of biological hazards
  – the community must enter a response phase before the previous recovery phase is completed
  – Health systems will also be required to plan and implement strategies to support, strengthen and restore local capacities during protracted crises

• There remains a huge gap in the resilience and preparedness strategy, planning and building about a protracted biological hazard
Panel: Ways to advance bottom-up citizen engagement in health disaster and emergency management programmes, policies, and research

Risk communication
- Identify ways to build trust, awareness, and knowledge before, during, and after responses, and address underlying drivers of fear, anxiety, and stigma.\textsuperscript{10}
- Recognise that resource and information channels vary with demographics, acceptability, and access, and tailor communication to participant groups.\textsuperscript{12}

Research participation
- Identify systematic ways to rapidly involve communities in participation, notably clinical research for vaccines and therapeutics.\textsuperscript{10,12}
- Develop protocols for rapid research ethics review to allow impactful and timely community involvement.\textsuperscript{8,12}

Research design
- Identify approaches to encourage participation with urbanised, isolated, and mobile populations equitably.\textsuperscript{8,12}
- Capture disaggregated data to understand the complexity of community diversity, particularly in relation to marginalised, vulnerable, and underserviced groups.\textsuperscript{10,12}
- Develop protocols for appropriate research design and outcome evaluation to maximise impact and relevance.\textsuperscript{10}

Knowledge sharing
- Identify relevant channels for dissemination of research learnings into the source community to better understand and scale up effective and empowering innovation among citizens and vulnerable groups.\textsuperscript{8,12}
- Build mechanisms for multidisciplinary partnerships to analyse and share data related to community preparedness, response, and evaluations.\textsuperscript{8,12}

Bottom Up citizen engagement in Health-EDRM since COVID 19 (Lancet/2021)

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01233-2/fulltext
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<td><strong>3</strong> How to profile health risk for subgroups with vulnerabilities—eg, very old people, people with disabilities, patients with chronic conditions? —because these groups have specific health needs that are not always recognized in national local policies, plans, and practices.</td>
<td>Health Vulnerability Index Development</td>
</tr>
<tr>
<td><strong>4</strong> What might be effective ways to support preparedness, response and rehabilitation in Health?</td>
<td>Community intervention trials should be implemented to assess the best strategies to build bottom up capacity at all level (individual, household, and community-based disaster risk literacy)</td>
</tr>
<tr>
<td><strong>5</strong> How to engage in health risk communication for warning and health protection efforts and health decision making?</td>
<td>Stakeholders interviews, Community RCT of technology applications of disaster health risk message</td>
</tr>
</tbody>
</table>
Hong Kong COVID-19 pandemic waves (2020-2021) with daily caseloads, government pandemic responses and timing of the serial cross-sectional studies.
## Sociodemographic comparison

<table>
<thead>
<tr>
<th></th>
<th>First Wave sample (n=765)</th>
<th>Third Wave sample (n=651)</th>
<th>2016 Hong Kong census</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>46.5% (356)</td>
<td>48.4% (315)</td>
<td>45.1%</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>53.5% (409)</td>
<td>51.6% (336)</td>
<td>54.9%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18-24</strong></td>
<td>9.3% (71)</td>
<td>6.9% (45)</td>
<td>9.5%</td>
</tr>
<tr>
<td><strong>25-44</strong></td>
<td>32.4% (248)</td>
<td>26.3% (171)</td>
<td>35.3%</td>
</tr>
<tr>
<td><strong>45-64</strong></td>
<td>39.6% (303)</td>
<td>41.8% (272)</td>
<td>36.8%</td>
</tr>
<tr>
<td><strong>65 or older</strong></td>
<td>18.7% (143)</td>
<td>25.0% (163)</td>
<td>18.4%</td>
</tr>
<tr>
<td><strong>Residential district</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hong Kong Island</strong></td>
<td>19.2% (147)</td>
<td>17.5% (114)</td>
<td>17.2%</td>
</tr>
<tr>
<td><strong>Kowloon</strong></td>
<td>30.2% (213)</td>
<td>29.8% (194)</td>
<td>30.6%</td>
</tr>
<tr>
<td><strong>New Territory</strong></td>
<td>50.6% (387)</td>
<td>52.6% (342)</td>
<td>52.2%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Primary level or below</strong></td>
<td>8% (61)</td>
<td>12.8% (83)</td>
<td>25.7%</td>
</tr>
<tr>
<td><strong>Secondary</strong></td>
<td>43.3% (330)</td>
<td>43.7% (283)</td>
<td>43.7%</td>
</tr>
<tr>
<td><strong>Tertiary level</strong></td>
<td>48.7% (371)</td>
<td>43.5% (282)</td>
<td>30.6%</td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>&lt;2000 - 7999</strong></td>
<td>9.3% (66)</td>
<td>13.7% (86)</td>
<td>15.1%</td>
</tr>
<tr>
<td><strong>8000-19999</strong></td>
<td>14.1% (101)</td>
<td>16.2% (102)</td>
<td>25.9%</td>
</tr>
<tr>
<td><strong>20000 - 39999</strong></td>
<td>26.6% (191)</td>
<td>27.3% (172)</td>
<td>27.8%</td>
</tr>
<tr>
<td><strong>40000 or more</strong></td>
<td>50.2% (360)</td>
<td>42.8% (269)</td>
<td>31.2%</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>White collar worker</strong></td>
<td>44.6% (341)</td>
<td>42.2% (275)</td>
<td>26.5%</td>
</tr>
<tr>
<td><strong>Blue collar worker</strong></td>
<td>16.7% (128)</td>
<td>14.3% (93)</td>
<td>24.7%</td>
</tr>
<tr>
<td><strong>Housewife</strong></td>
<td>12.2% (93)</td>
<td>12.9% (84)</td>
<td>7.4%</td>
</tr>
<tr>
<td><strong>Fulltime student</strong></td>
<td>6.1% (47)</td>
<td>3.5% (23)</td>
<td>15.0%</td>
</tr>
<tr>
<td><strong>Unemployed/Retired</strong></td>
<td>19.0% (145)</td>
<td>26.7% (174)</td>
<td>26.4%</td>
</tr>
</tbody>
</table>
Preventive behaviors against COVID-19 *

<table>
<thead>
<tr>
<th></th>
<th>1st wave (n=765) % (n)</th>
<th>3rd wave (n=651) % (n)</th>
<th>% Change</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hygiene practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing face mask outside the home</td>
<td>97.4% (745)</td>
<td>100.0% (651)</td>
<td>+2.6%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Washing hands with soap</td>
<td>92.3% (706)</td>
<td>90.0% (586)</td>
<td>-2.3%</td>
<td>0.158</td>
</tr>
<tr>
<td>Use of serving utensils</td>
<td>74.2% (568)</td>
<td>69.4% (452)</td>
<td>-4.8%</td>
<td>0.051</td>
</tr>
<tr>
<td>Bring own utensils when dining out</td>
<td>7.9% (52)</td>
<td>5.3% (31)</td>
<td>-2.6%</td>
<td>0.086</td>
</tr>
<tr>
<td>Social distancing practices</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidance of international travel to high-risk regions</td>
<td>85.8% (656)</td>
<td>76.6% (498)</td>
<td>-9.1%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoidance of social gatherings</td>
<td>80.5% (616)</td>
<td>72.0% (469)</td>
<td>-8.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoidance of public places and public transport</td>
<td>53.3% (408)</td>
<td>26.0% (169)</td>
<td>-27.5%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Avoidance of dine-in services at restaurants by using takeout/home delivery services</td>
<td>34.4% (262)</td>
<td>44.8% (290)</td>
<td>+10.4%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>a</sup> Two-proportions z-test with continuity correction were used to test the difference between the two waves of studies

*% of respondents who stated that they “Always” or “Usually” engaged in the behaviors.
Shaw R, Chatterjee R and Dabral A (2020) Integrating Biological Hazards (including pandemics) into DRR Planning.

http://www.ccouc.ox.ac.uk/technical-advisory-document-integrating-biological-hazards-including-pandemics-into-rrr-planning
Sectors that help in mitigation

• The role of the **healthcare** sector is paramount in mitigating a health emergency
  • It provides early warning, and share critical information. During a health emergency, the sector supports containment efforts by carrying out testing, diagnosis and treatment

• The **Information and Telecommunication** sector underpins many sectors and can support the different aspects of the response to biological hazards
  • including medical services, information sharing, data collection, early warning, and risk communication. It also powers remote learning modalities, tele-medicine, tele-working and e-commerce
Risk Assessment Of Biological Hazards
Four key components of risk – hazards, exposure, vulnerability and coping capacity
Conclusion: Health

• COVID-19 pandemic presents an opportunity for multidisciplinary research and action engagement in DRR.

• Health-EDRM, as a platform of DRR and Health will provide a foundation for research and policy development.

• Update global lecture and webinar series which emphasizes on the multidisciplinary nature and capacity of Health-EDRM contribution to health and DRR. [www.ccouc.org](http://www.ccouc.org)
The case of informal case providers

Informal home care providers: the forgotten health-care workers during the COVID-19 pandemic (thelancet.com) Published Online June 1, 2020 https://doi.org/10.1016/S0140-6736(20)31254-X
Knowledge into Action: COVID 19, DRR and Health-EDRM

The Case of “Home Care”

WHO Home care for patients with suspected or confirmed COVID-19 and management of their contacts

March 17 2020 Version

August 12 2020 Version

Chan EYY, COVID19, DRR and S&T Agenda e-Asia Pacific Science and Technology Conference for Disaster Risk Reduction, 15th October 2020
Health-emergency disaster risk management and research ethics

Health-emergency disaster risk management (health-EDRM) aims to reduce the health risks and vulnerability associated with emergencies and disasters, such as natural disasters, infectious disease epidemics, complex emergencies, technology failure, or global population movement. Medical care and health responses in emergency contexts often rely on best-fit interventions rather than best practices to protect communities in suboptimally functioning systems and complex contexts. Unlike health emergency actions that are focused on the response, the health-EDRM approach emphasises emergency preparedness and disaster risk reduction and can take account of the limitations of the response-focused research landscape. A greater emphasis on prevention can provide opportunities for research infrastructure building in normal times to support any emergency-related research attempts.

The ecology of the global emergency research system involves a range of stakeholders including, but not limited to, families, caregivers, local governments or authorities, funders, research institutions, journals and publishers, and users of the relevant research results. Although research stakeholders have a responsibility to protect the interests of communities involved in research, achieving this is rarely straightforward in emergencies. Research can be simultaneously subject to different, sometimes competing, requirements and expectations. Issues such as decision making about research participation, determination of duties and roles at the research interface, treatment and public health, management of expectations on the front line, and participant protection from stigmatisation, discrimination, and exclusion are questions hotly debated in the bioethics community.

Infrastructure and platform
- Emphasis on prevention can provide for research infrastructure in normal times to support any emergency-related research attempts

Evidence based science
- Medical care and health response in emergency contexts often rely on best-fit interventions rather than best practices

Disaster Risk Reduction and Climate Change Adaptation: Understanding Framework Roadblocks

Bapon Fakhruddin, PhD
Technical Director - DRR and Climate Resilience
Chair - CODATA TG FAIR Data for DRR

2021 APRU Multi-Hazards Webinar Series: Health, Climate change, and Innovation in Disaster Risk Reduction
<table>
<thead>
<tr>
<th>Country</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonga</td>
<td>*Associated specialist sub-consultant</td>
</tr>
<tr>
<td>Marshall Islands</td>
<td></td>
</tr>
<tr>
<td>Kiribati</td>
<td></td>
</tr>
<tr>
<td>Nauru</td>
<td></td>
</tr>
<tr>
<td>Tuvalu</td>
<td></td>
</tr>
<tr>
<td>Cook Islands</td>
<td></td>
</tr>
<tr>
<td>Vanuatu</td>
<td></td>
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<tr>
<td>Solomon Islands</td>
<td></td>
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<tr>
<td>Samoa</td>
<td></td>
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<tr>
<td>Fiji</td>
<td></td>
</tr>
</tbody>
</table>
Historical + projected impacts of climate change

Climate Change Indicators + Extreme Events → Key Impacts → Sectors

- CO₂ Concentration
- Ocean Acidification

Land & Sea Temperature Rise
- Drought
- Flooding
- Heavy Precipitation
- Hurricanes/Tropical Storms
- Warm Spells & Heatwaves
- Marine Heatwaves

Sea-level Rise

Coral Bleaching & Reef Damage
- Damaged Infrastructure
- Decreased Livestock & Crop Production
- Disruptions to Economic & Academic Activity
- Habitat Loss
- Heat Stress, Illness & Fatalities
- Public Health Risks & Disease
- Reduction of Fresh Water & Arable Land
- Coastal Erosion, Flooding & Retreat
- Storm Surges
- Saline Intrusion

Source: Adapted from State of Caribbean Climate 2020
FAIR DRR Data and International Policy Agreements – Coherence from Global Framework
The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems.
A systemic integration of Climate + Health Data for Risk Assessment

- Contextualising observed and anticipated climate
- Assessment of climate-related risks
- Modelling climate impacts on different socio-economic activities
- Enhancing predictions at different times and spatial scales
- To effectively utilise climate information in epidemic early warning
- Seasonal forecasts of temperature and rainfall – occurrence of malaria outbreak
- Real-time data (temperature and rainfall) – initiate tailormade interventions and assists in early disease outbreak detection

Fakhruddin et al., 2020
National Climate Risk Framework

• Range of expertise in climate change and risk assessments, vulnerability assessments, and risk in the context of Te Ao Māori

• The initial step was to create a risk assessment framework, which enable comparisons of a broad range of additional risks arising from climate change

• Weave in te ao Māori perspectives and values

• A national overview of how various hazards and threats may be influence by climate change

• Risk framework leads to risk assessment and national adaptation option
NCCRA – an overview

- New Zealand’s first National Climate Change Risk Assessment
- Provides picture of how New Zealand may be affected by climate change-related hazards
- Enables Government to prioritise actions
Climate science + risk evaluation for a foreseeable future

Emissions scenarios → Climate Science → Climate Projections
- Annual and decadal climate predictions
- Long range forecast
- Extended range climate forecast
- Medium range weather forecast
- Short range weather forecasts

Climate related hazards → Strategy → Institution and legal
- Market
- Technology
- Consequences
- Exposure
- Vulnerability

Transition risks
- Policy
- Liability
- Technology

Physical risks
- Flooding
- Drought
- Sea level rise
- Heat stress
- Wind

Loss modeling → Potential financial impacts modeling

Potential financial impacts
- Production/operation disruptions (e.g., power, transportation, worker availability)
- Supply chain disruptions
- Physical damage to assets (and raising insurance costs)
- Changes in resource/input prices (e.g., water, energy, food)
- Changes in demand for products/services

Climate mitigation and adaption measures

IPCC/Global Centers, GPCs, RCCs, NIWA, MetService → NIWA, MetService → MFE, Regional Council, Local government, Government → MFE, Insurance, Private sector → Insurance, ICNZ, Treasury → All users
Analysis of DRR inclusion in National Climate Change Commitments

NAPs/ NDCs and contributing documents were reviewed to better understand how disaster risk management is approached in climate change documents, and if systemic risk issues, where impacts cascade across sectors, are considered.
Geographic region, NAPs/NDCs, Population, Fatalities, World Risk Index, Development categories and income level.
Integration is defined as the approach and processes and actions within a country to integrate the implementation of Paris Agreement and Sendai Framework for Disaster Risk Reduction to increase efficiency, effectiveness, and the achievement of both common goals (e.g., resilience).
**Fiji**

- Planning, implementing, and coordinating organisations
- Coordination between stakeholders
- Partnerships between DRR and CCA stakeholders
- Monitoring and Evaluation institutions
- Sendai Framework for DRR
- Evidence of CCA and DRR activities mainstreaming in development plans
- Identification of vulnerable sectors and creation of sector specific CCA plans/activities
- Sector Specific DRR measures
- Monitoring and Evaluation mechanism (to track the progress)
- Data collection (Data collection include DRR and CCA measures)
- Responsible organisation
- Information Database
- Datasets and models (e.g., rainfall, temperature, climate models)

---

**Sri Lanka**

- Planning, implementing, and coordinating organisations
- Coordination between stakeholders
- Partnerships between DRR and CCA stakeholders
- Monitoring and Evaluation institutions
- Sendai Framework for DRR
- Evidence of CCA and DRR activities mainstreaming in development plans
- Identification of vulnerable sectors and creation of sector specific CCA plans/activities
- Sector Specific DRR measures
- Monitoring and Evaluation mechanism (to track the progress)
- Data collection (Data collection include DRR and CCA measures)
- Responsible organisation
- Information Database
- Datasets and models (e.g., rainfall, temperature, climate models)
Recommendations for Countries

- Clear roles and responsibilities of the institutions responsible for implementing the CCA and DRR measures
- NAP and NDC has different goals but could be informed, guided, and streamlined with each other; NDC could be used as an instrument or framework for the NAP
- Proper climate risk assessment to understand NAP
- Investments in awareness raising and capacity building programmes and infrastructure to store and collect available (current and future) climate information, data and risk assessment
Engagement for Capacity Building + Awareness

https://codata.org/events/webinars/
www.tonkintaylor.co.nz/what-we-do/events-and-webinars/
Resiliency in the 2030 Global Development Agenda

Sanny R. Jegillos
Team Leader and Senior Advisor
Disaster Risk Reduction and Recovery
Asia Pacific Region
UNDP Bangkok Regional Hub

2021
DRR: 30 years of Disaster Risk Reduction

**Pre-1970s: AD-HOC DISASTER RESPONSE**

1970s-1990s: HUMANITARIAN ARCHITECTURE

- **1989**: International Decade for Natural Disaster Reduction (IDNDR)
- **1992**: United Nations Framework Convention on Climate Change
- **1994**: Yokohama Strategy and Plan of Action
- **1999**: International Strategy for Disaster Reduction (ISDR)

**SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION 2015-2030**

- **2015**: Sendai Framework for Disaster Risk Reduction
- **2019**: SDGs (Sustainable Development Goals)

**RISK-INFORMED DEVELOPMENT**

**END POVERTY 2015**: Millennium Development Goals

**Climate Action Summit 2019**
• Aid $3 trillion, to disasters $106 Bn, to DRR 13 Bn. 40¢ in every $100 spent on international aid
• 12 out of 23 low-income countries received $160 response for every $1 DRR
• Investments to strengthen disaster resilience remain low

• Weaknesses in collection and analysis of hazard, climate and disaster impact data, particularly sector-specific damages and losses. Disaster risk information rarely used to inform development planning

• Unless scale of economic losses are made visible and fiscal impact understood - increased public investments in risk informed development would be difficult to justify
2030 Global Development Agenda

- Sendai Framework for DRR
- Sustainable Devt. Goals
- Addis Ababa Action Agenda
- New Urban Agenda
- Agenda for Humanity
- Paris Agreement on Climate Change
- Agenda for Humanity

- 2030 Development Agenda
Resilience to disasters common theme of all frameworks

✔ Expected Goal

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries

✔ Seven global targets

✔ Four Priorities of Action
Setting 7 Global Targets for 2030

3 INCREASES:
- # of countries with national & local DRR strategy
- International cooperation to developing countries
- Availability and access to multi-hazard early warning systems & disaster risk information and assessments

4 REDUCTIONS:
- Mortality
- Affected people
- Economic loss
- Damage to critical infrastructure and disruption to basic services
4 Priorities for Action

**Priority 1: Understanding disaster risk**
Policies and practices for DRR should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.

**Priority 2: Strengthening disaster risk governance to manage disaster risk**
Disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk.

**Priority 3: Investing in disaster risk reduction for resilience**
Public and private investment in DRR are essential to enhance the economic, social, health & cultural resilience of persons, communities, countries, their assets, as well as environment.

**Priority 4: Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction**
Strengthened disaster preparedness for response, recovery, rehabilitation and reconstruction are critical to build back better.
What is different: New Context and Challenges

1. Complexities of building resilience
2. Ensuring that development is sustainable
3. No one is left behind

Volatility, Uncertainty, Complexity, Ambiguity
The IPCC AR5 definition of Risk is:
• The probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur.
ARE WE REALLY GOING TO ACHIEVE OUR DEVELOPMENT GOALS WITH THE SAME STRATEGIES?

Understand the Risk Nexus

Dynamic Complexity
“Today’s problems come from yesterday’s solutions.”

Systems thinking to deal with complexity
What is different: How should we address these challenges?

1. Humanitarian and Development Nexus
2. The Risk Nexus
   - Risk and Climate
   - Risk and Poverty
   - Risk and Inequality
The achievement of SDGs 3, 4, 6, 7, 8, 9, 11, 13, 14 and 15, is heavily dependent on increased capital investment in infrastructure. However, in low income countries, AAL represents 30% of capital investments.
The achievement of SDGs 1, 2, 3, 4, 5, and 10 depends on increasing social expenditure. However, in low income countries, the AAL is 20% of social expenditure.
Resiliency for those who are left behind and furthest behind

- People at the intersection of these factors face reinforcing and compounding disadvantage and deprivation, making them likely among the furthest behind.

THE WORLD IS UNEQUAL.
DISASTER RISK REDUCTION/RESILIENCE
How to reduce risk and prevent risk accumulation?

1. DRR investments
   1. Stand alone
   2. Mainstream

2. Non DRR activities that affect vulnerability, hazard probability

**Challenge:**
Developing a complete balance sheet of DRR expenditures; And Expenditures that create risk
Setting 7 Global Targets for 2030

3 INCREASES:
- # of countries with national & local DRR strategy
- International cooperation to developing countries
- Availability and access to multi-hazard early warning systems & disaster risk information and assessments

4 REDUCTIONS:
- Mortality
- Affected people
- Economic loss
- Damage to critical infrastructure and disruption to basic services
Thank you!

SANNNY RAMOS JEGILLOS
Senior Advisor, UNDP Bangkok Regional Hub

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International Day for Disaster Risk Reduction 2021