Policy Implication of Health Impacts of Climate Change in Hong Kong – What’s Next?

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The Chinese University of Hong Kong (CUHK)
Outline

Part 1: Climate change and Hong Kong

Part 2: Climate change and health

Part 3: Health impacts of climate change – Hong Kong

Part 4: Policy implications – What’s next?
About Climate Change

What is “Climate change”?

“a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”

Article 1, United Nations Framework Convention on Climate Change
Climate change = global warming?

- One of the climate change phenomena
- A cause of climate change

Photo credit: National Geographic
Climate change phenomena

1. Temperature rise and Extreme temperature: ↑ 0.85°C in the past 100 years

Source: IPCC, 2013
2. Sea Level Rise: 1.7 mm each year since 20th century

Source: IPCC 2007
3. Extreme Precipitation: annual average, frequency and intensity all increase

Observed change in annual precipitation over land

Source: IPCC, 2013
4. More Disasters/ Extreme Weather Events

*Numbers and Types of Natural Disasters, 1950-2012*

- Geophysical disasters (e.g. earthquake, volcano eruption)
- Climate-related (hydro-meteorologic) disasters

Source: Leaning & Guha-Sapir, 2013
Climate Change Phenomena

- Temperature Changes
- Rainfall Changes
- Sea-level Rise
- More Disasters
Global Level

• United Nations Framework Convention on Climate Change (UNFCCC) (1992)
  ➢ Kyoto Protocol (1997)
  ➢ Paris Agreement (2015): to keep global average temperature increase well below 2 °C and to pursue efforts to limit it to 1.5 °C

• Inter-governmental Panel on Climate Change (IPCC): 5th report in 2014
Relevant to Hong Kong?

<table>
<thead>
<tr>
<th>Climate change phenomena</th>
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</table>
Hong Kong……

• one of the world’s highest average increase of urban ambient temperature during the past century

• 2015: highest annual mean temperature in Hong Kong since 1885

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Highest annual °C</th>
<th>Year of Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24.2</td>
<td>2015</td>
</tr>
<tr>
<td>2</td>
<td>24.0</td>
<td>1998</td>
</tr>
<tr>
<td>3</td>
<td>23.9</td>
<td>2002</td>
</tr>
<tr>
<td>3</td>
<td>23.9</td>
<td>2017</td>
</tr>
</tbody>
</table>

• 2017: highest annual maximum temperature in Hong Kong since 1885 (36.6°C)
<table>
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<tr>
<th>Climate change phenomena</th>
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<td>4. Extreme weather events</td>
<td>➢ Storm surges brought by tropical cyclones to increase</td>
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</table>

Source: Hong Kong Observatory
Climate Change and Health

Does climate change make you “sick”??
Climate Change and Health

- Climate change:

  - “the defining issue for health systems in the 21st century” (WHO)

  - “represent an acceptably high and potentially catastrophic risk to human health” (Lancet Commission on Health and Climate Change)

  - “will exacerbate existing health problems ...... by 2100, even common human activities will be compromised, including growing of food and working outdoors (IPCC)
Effects of Climate Change on Health

Direct Effects
- Extreme temperature (heat wave/cold wave)
- Sea level rise
- Flood
- Extreme precipitation
- Drought

Indirect Effects
- Quality of drinking water
- Change of ecosystem
- Air pollution
- Change of land use

Social Dynamics
- Age and sex
- Health status
- Social economic status
- Social capital
- Public health infrastructure
- Population movement and conflict

Impact on Health
- Psychological and mental illness
- Respiratory disease
- Trauma
- Toxidosis / poisoning
- Allergy
- Infectious disease
- Cardiovascular disease
- Malnutrition

Source: Adapted from Watts et al., 2015
Extreme Temperature

Basic health demand
- Air pollution
- Food supply is affected
- Cooling and heating devices in shelters may not be able to cope

Environmental change
- Change of temperature

Infrastructure
- The demand for electricity increases, electricity supply facilities overloads
- Road deformation or frost

Population movement

Infectious diseases
- Respiratory tract diseases (e.g. Asthma)
- Diseases spread by mosquitoes (e.g. dengue fever)
- Diseases spread by food (e.g. Salmonellosis)

Non-communicable diseases
- Heart cerebrovascular diseases
- Worsening of chronic diseases

Trauma
- Accident
- Heatstroke

Health damage (physical, mental and social).
The number of people suffering from illness and injury increases. The death toll rises

The burden on the medical system becomes heavier and the demand for social welfare increases

Source: Globalization – Climate Change and Human Health, CCOUC 2017
Sea Level Rise

- Basic health demand
  - Fresh water is polluted
  - Food supply is affected
  - Houses are flooded

- Environmental change
  - Water level rises
  - Soil salinization

- Infrastructure
  - Buildings and bridges are destroyed by water
  - Roads are blocked
  - Power stations and electricity supplies are destroyed or disrupted

- Population movement

- Infectious diseases
  - Mosquito-borne diseases (e.g. malaria)
  - Waterborne diseases (e.g. cholera)

- Non-communicable diseases
  - Malnutrition
  - Worsening of chronic diseases

- Trauma
  - Accidents (e.g. drowning)
  - Conflict

Health damage (physical, mental and social). The number of people suffering from illness and injury increases. The death toll rises

The burden on the medical system becomes heavier and the demand for social welfare increases

Source: Globalization – Climate Change and Human Health, CCOUC 2017
Rainfall Increase

Basic health demand
- Farmland is flooded or destroyed

Environmental change
- Water level rises
- Air humidity increases
- Increased stagnant water

Infrastructure
- Wet roads
- The burden on the drainage system increases

Population movement

Infectious diseases
- Waterborne diseases (e.g. cholera)
- Mosquito-borne diseases (e.g. dengue fever)
- Foodborne diseases (e.g. dysentery)

Non-communicable diseases
- Worsening of chronic diseases

Trauma
- Accidents

Health damage
- (physical, mental and social)
- The number of people suffering from illness and injury increases. The death toll rises

The burden on the medical system becomes heavier and the demand for social welfare increases

Source: Globalization — Climate Change and Human Health, CCOUC 2017
Collaborating Centre for Oxford University and CUHK
for Disaster and Medical Humanitarian Response
CCOUC 災害與人道救援研究所

Flooding

Basic health demand
- Fresh water is polluted
- Food supply is affected
- Living conditions are affected

Environmental change
- The land is flooded

Infrastructure
- Water and electricity supply facilities are damaged
- Transportation and telecommunication systems malfunction

Population movement

Infectious diseases
- Waterborne diseases (e.g. cholera)
- Mosquito-borne diseases (e.g. malaria)
- Diseases spread through direct contact (e.g. skin diseases)
- Parasitic diseases (e.g. schistosomiasis)

Non-communicable diseases
- Worsening of chronic diseases

Trauma
- Accidents (e.g. drowning, food poisoning)
- Conflict

Health damage
(physical, mental and social).
The number of people suffering from illness and injury increases. The death toll rises

The burden on medical system becomes heavier and the demand of social welfare increases

Source: Globalization – Climate Change and Human Health, CCOUC 2017
## Climate Change and Health – Hong Kong?

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<th>Health Impacts</th>
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<tr>
<td>Climate Changes in Hong Kong in the 21st Century</td>
<td>Threats/ Pathways</td>
<td>Health Impacts</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>Temperatures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Annual mean temperature to rise by 3 to 6 °C</td>
<td>• Very hot days, heat waves&lt;br&gt;• Flooding&lt;br&gt;• Landslides&lt;br&gt;• Drain backflow&lt;br&gt;• Storm surge&lt;br&gt;• Cyclones&lt;br&gt;• Air pollution&lt;br&gt;• Altered survival patterns of vectors&lt;br&gt;• More active pathogens</td>
<td>(a) <strong>Temperature-related illnesses:</strong> e.g. heat cramps, heat exhaustion, heatstroke, hyperthermia, hypothermia</td>
</tr>
<tr>
<td>Precipitation:</td>
<td></td>
<td>(b) <strong>Non-communicable diseases:</strong> e.g. cardiovascular disease, respiratory disease, skin cancer</td>
</tr>
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<td>- Annual rainfall to rise by about 180 mm</td>
<td></td>
<td>(c) <strong>Communicable diseases:</strong> e.g. vector-borne diseases (dengue fever, Japanese encephalitis, malaria), food/ water-borne diseases (cholera, Salmonella poisoning), diarrheal diseases</td>
</tr>
<tr>
<td>- Extremely wet years to increase from 3 to 12</td>
<td></td>
<td>(d) <strong>Physical injuries:</strong> e.g. drowning</td>
</tr>
<tr>
<td>Sea level:</td>
<td></td>
<td>(e) <strong>Mental health issues:</strong> e.g. stress, anxiety, depression, post-traumatic stress disorder</td>
</tr>
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<td>- Annual mean sea level to rise by 0.63 to 1.07 m</td>
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Climate Change and Health – Hong Kong?

Latest research findings ......
**Health Impact of Extreme Temperatures**

**Hot Season**
- Mortality ↑ by 1.8% for every increase of 1°C above 28.2°C
- Hospital admissions ↑ by 4.5% for every increase of 1°C above 29°C
- Emergency calls ↑ when the temperature reaches 30 to 32°C. About 49% of calls were for explicit health-related reasons
- 1.9% Heatstroke
- 88.4% reported behavioral changes

**Cold Season**
- Cumulative mortality* ↑ by 3.8% for every decrease of 1°C
- Hospital admissions ↑ by 1.4% for every decrease of 1°C within the range of 8.2-26.9°C
- After a cold wave in 2016, 13.4% of respondents sought medical care: 82.1% professional medical help, 17.9% self-care
- 67.2% have symptoms
- 67.1% reported behavioral changes

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Notes: * Cumulative mortality is used because the lagged effect of coldness towards mortality is estimated to be 3 weeks. ‡ Symptoms include respiratory symptoms, cardiovascular symptoms and musculoskeletal pains. † Behavioral changes include amount of physical activity, appetite, frequency of social activity, mood and sleeping quality.
**Hong Kong Study on Extreme Temperature and Mortality**

**Hot Weather**

1 °C increase in daily mean temperature above 28.2 °C was associated with 1.8% increase in mortality

**Cold Weather**

1 °C decrease in mean temperature was associated with 3.8% increase in cumulative mortality rate (three weeks lagged effect)

**Monthly mean temperatures from June to August in the past four years (2014 - 2017) are all above 28.2 °C**


Between 2002 and 2011:
- 169,879 hospital admission due to HF
- 7,831 deaths due to HF

Cold weather was strongly associated with increased HF admissions and mortality (based on a 11°C. day vs. a 25°C day)

- HF admission rate is 2.63 times higher on the colder day
- HF mortality rate is 3.13 times higher on the colder day
- Stronger association among older age groups and for new hospitalizations

Hong Kong Study on Heat Island Effect and Mortality

When average temperature is above 29 °C for five days, 1 °C rise above 29 °C was associated with

- Areas with high urban heat island index (UHII): **4.1% increase** in natural mortality
- Areas with low UHII **0.7% increase** in natural mortality

Hong Kong Study on Extreme Temperature and Hospital Admission (overall)

**Hot Weather**

*Hospital admission rate increased by 4.5% for every increase of 1 °C above 29 °C*

**Cold Weather**

*Hospital admission rate increased by 1.4% for every decrease of 1 °C within the 8.2-26.9 °C range*

## Hong Kong Study on Extreme Temperature and Hospital Admission (specific disease)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Findings</th>
</tr>
</thead>
</table>
| 1. Hand, foot and mouth disease | • Temperature over 25°C: rising trend  
                                 • Relative humanity over 80%: significant increase |
| 2. Heart disease            | • 1 °C drop below 24 °C: 3.7% increase AMI admission                     |
| 3. Stroke                   | • 1°C drop in 5-day average temperature: 2.7% increase in hemorrhagic stroke admission |
| 4. Injuries                 | • 1 °C rise above 29 °C: 1.9% increase  
                                 • 1 °C drop within the range of 8.2 to 26.9°C: 2.4% increase |


Local research on health impacts of climate change is still very limited!!!
Health impacts of climate change in Hong Kong are real!

How are we managing them?
Policy implications – What’s next?

• Climate change-related policies
• Existing policy in Hong Kong (?)
• Our policy call
International Climate-change “policies”

• Paris Agreement 2015 (COP 21)

• Transforming our world: the 2030 Agenda for Sustainable Development (Sustainable Development Goals)

• Sendai Framework for Disaster Risk Reduction 2015 – 2030
Response to climate change:
Mitigation and Adaptation
<table>
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<tr>
<th>Mitigation Policies</th>
<th>Adaptation Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tax on fossil fuels/ subsidies on renewable energy</td>
<td>• Water resource management: desalination, rainwater storage and preservation</td>
</tr>
<tr>
<td>• Standards on carbon emission for transport</td>
<td>• Reduce dependence on single energy source</td>
</tr>
<tr>
<td>• Infrastructure to promote cycling and walking</td>
<td>• Tree planting</td>
</tr>
<tr>
<td>• Energy efficiency labelling</td>
<td>• Strengthen health service and contingency planning</td>
</tr>
<tr>
<td>• Building regulation on energy efficiency</td>
<td>• Surveillance on climate-related diseases</td>
</tr>
</tbody>
</table>
Adaptation and Mitigation Synergies

**Adaptation Measures**
- Enhance the hygienic and medical infrastructure
- Assessment of water quality and water supply
- Haze Pollution Warning, Air Quality Health Index
- Mosquitoes control measures

**Integrated Measures**
- Green roofs
- Save water
- Afforestation
- Strengthen public education

**Mitigation Measures**
- Renewable energy
- Energy saving vehicles
- Reduce air transportation

(Adapted from Center for Clean Air Policy, 2013)

Source: Globalization – Climate Change and Human Health, CCOUC, 2017
HKSARG Climate Change Reports
## Possible Major Climate Change Impacts Affecting Hong Kong

<table>
<thead>
<tr>
<th>Category</th>
<th>Impacts</th>
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</thead>
<tbody>
<tr>
<td><strong>Biodiversity</strong></td>
<td>Greater stress to montane and freshwater ecosystems due to increase in surface temperatures and extreme weather; loss of intertidal habitats, such as coral reefs or mangroves due to sea-level rise; harsher growing environments; increased erosion and landscape degradation and change in species distribution and migration patterns.</td>
</tr>
<tr>
<td><strong>Built Environment and Physical Infrastructure</strong></td>
<td>Damage to building foundations; damage to utilities cables, pipes and assets; increase risk of rain penetration, flooding and landslides due to heavy rain, storm surges, tree failures and extreme weather.</td>
</tr>
<tr>
<td><strong>Business and Industry</strong></td>
<td>Higher maintenance and insurance costs due to extreme weather related damage; staff training to deal with extreme weather events.</td>
</tr>
<tr>
<td><strong>Energy Supply</strong></td>
<td>Damage to power lines and other assets under extreme weather; higher energy demand due to increase in temperature and extreme weather; supply interruptions and power spikes.</td>
</tr>
<tr>
<td><strong>Financial Services</strong></td>
<td>Direct and indirect risk related to telecommunications and computer system failure; changes in risk profile of individual business and investment; insurance sector exposed to higher extreme weather risks.</td>
</tr>
<tr>
<td><strong>Food Resources</strong></td>
<td>Lower availability of local regional food output as a result of extreme weather.</td>
</tr>
<tr>
<td><strong>Human Health</strong></td>
<td>Aggravate chronic health condition; higher risk of thermal stress, exacerbation of asthma and heat stroke; more accidents and emergency situations; changes in transmission patterns of infectious diseases.</td>
</tr>
<tr>
<td><strong>Water Resources</strong></td>
<td>Change in rainfall pattern and rise of demand under higher temperature may affect local water resources.</td>
</tr>
</tbody>
</table>

Source: Hong Kong’s Climate Action Plan 2030+, 2017, Environmental Bureau
Statements of SFH

“Climate and weather play a role in people’s health. Climate change affects the average weather conditions that we are used to. Hotter weather could increase the number of heat-related illnesses. Changes in temperature, rainfall patterns, and the increase extreme weather events could also enhance the spread of certain diseases. We need to stay vigilant of these changes from the healthcare perspectives.”

Dr WM Ko  Secretary for Food and Health

Source: Hong Kong Climate Change Report, 2015, Environmental Bureau

“We have a good grasp of the climate change-related risks that could impact on the health of our people. We have a role in helping Hong Kong people to become more aware of those health risks, and for the community as a whole to prepare better.”

Ko Wing-man  Secretary for Food and Health

Source: Hong Kong’s Climate Action Plan 2030+, 2017, Environmental Bureau
• Health impact of climate change recognized
• Role of Government (health authorities)
  – Help people to be more aware of the health impacts of climate change
  – Help community as a whole to prepare better

How to move forward?
Existing policies in Hong Kong?

• Stronger emphasis on mitigation (to meet emission target) than adaptation (changing?)

• Recognized health impact of climate change (?)

• NO policy targeting at health impact of climate change (some existing structures)
Our Policy Call

Priority areas

1. Recognize climate change as a public health issue

2. Recognize health co-benefits of existing climate change policies

3. Mainstream climate resilience into health system
Priority 1: Recognize climate change as a public health issue

- FHB’s portfolio
- Not only under general climate change efforts
- Local research

* Existing structures:
DEVB: CCWGI, Inter-departmental Task Force on Emergency Preparedness
Priority 2: Recognize health co-benefits of existing climate change policies

• “health co-benefits”: health gains from policies primarily directed at mitigation of climate change

<table>
<thead>
<tr>
<th>Climate change policies</th>
<th>Health co-benefits</th>
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<tbody>
<tr>
<td>Reduce fossil fuels</td>
<td>Improve respiratory health related to air pollution</td>
</tr>
<tr>
<td>Promote cycling and walking</td>
<td>Reduce obesity, diabetes, depression caused by inactive lifestyle</td>
</tr>
<tr>
<td>Increase green space</td>
<td>Reduce diseases related to high temperature</td>
</tr>
</tbody>
</table>
• No mention of co-benefits in 2015 Report; general reference in 2017 Report, including health co-benefits

• Advantages –
  – Bring up profile/ awareness of health impact of climate change
  – Stronger justifications for mitigation policies
  – Health impact assessment
Priority 3: Mainstream climate resilience into health system

• Climate resilient health system:

“capable to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stress, so as to bring sustained improvement in population health, despite an unstable climate” (WHO, 2015)

• Not piecemeal changes but an evidence-informed system transformation
WHO’s “six building blocks” of Health System

- Leadership / governance
- Health care financing
- Health workforce
- Medical products, technologies
- Information and research
- Service delivery

Source: WPRO, WHO
WHO’s “ten components framework” on Climate-resilient Health System

1. **Leadership and Governance:** main climate change policies should reflect climate change and health connection

- Develop **government-wide strategy** on climate change and health
- Climate change and health **lead/team within FHB**, with specific programme and budget
- **Mainstream health** into climate-related policies/health impact assessment
- **Health representation** in climate change processes at local and national level

* Existing structure: Steering Committee on Climate Change (CS chair)
2. **Health workforce**: empower healthcare personnel to address climate change and health links

- **Training courses** on climate change and health for health personnel (HKJCDPRI, CCOUC/ CUHK)

- Develop **contingency plan** for deployment of sufficient health personnel in case of extreme weather events (local research on mortality and hospital admission)

- **Communications plans and forums**
3. **Health Information Systems:** surveillance system to monitor disease risks posed by climate change

- Measure baseline rates of climate-related health conditions and identify vulnerable population (e.g. data on old people admitted for AMI during coldest months)
- Identify changing incidence and trigger early action and warning (e.g. health facilities contingency plan)
- Support multidisciplinary research on local situation and mechanism for research to inform policy

* Existing structures: CHP surveillance on flu, HFMD, EV71, etc.; HKO very hot weather warning
4. **Essential medical products and technologies:** ensure climate sustainability of health care facilities

- Sustainability in procurement, e.g. waste management, transport
- Take into account climate risk in siting and construction of health facilities
- Use new technologies to improve performance, e.g. satellite imagery in anticipating disease pattern
5. **Service Delivery:** control programmes and emergency management of climate-sensitive diseases

- New health interventions: outreach to elderly living alone with chronic conditions, cooling centres
- Analyze impact of climate change on existing disease control programmes (e.g. FEHD’s ovitrap index for dengue fever)
- Health sector contingency planning
- Empower community groups as primary actors in emergency preparedness

Photo credit: FEHD
6. **Financing:** health budget designated for climate change and health issues

- Part of central health budget
- New money item?
- Contracting out / financial incentives for NGO participation?
• **Non-health sectors**: other key determinants of health – environmental and social
  – Urban planning
  – Energy
  – Food
  – Environmental hazards
Summary

Mainstream climate resilience to health system through –
1. Leadership and governance
2. Health workforce
3. Health information systems
4. Essential medical products and technologies
5. Service delivery

✓ Components are interconnected
✓ Start with building on some existing structures
✓ Political will to recognize it as an essential public policy area
Questions and Discussion