REGIONAL TOOLKIT FOR HEATWAVE MANAGEMENT IN ASIAN CITIES: A VISUAL GUIDE
PURPOSE OF THE DOCUMENT

Every city differs in definition of a heatwave due to local contexts and the population’s ability to acclimatize to extreme temperatures. This Visual Guide is intended for use by local authorities and other stakeholders in large Asian cities who are involved in extreme temperature and heatwave mitigation. Keeping a focus on the Asian context, the Visual Guide builds on regional and international best practices to offer guidance and resources for the development of heatwave management strategies at the municipal level. This Visual Guide has a modular structure and guides the reader through the key steps and considerations needed to develop and implement heatwave management plans. It highlights simple tools and knowledge resources to help move from theory to action.

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1 CULTIVATING INSTITUTIONAL SUPPORT

GENERATING CITY-LEVEL COMMITMENT

- Obtain endorsement and commitment by the city executive to participate in the heatwave management planning process.
- Establish steering committees of municipal leaders and representatives from external agencies to oversee the planning process.
- Present robust evidence to increase the relevance of heatwaves to decision makers and the public.

ENHANCING INSTITUTIONAL CAPACITIES

- Enhance local disaster response capacities
- Strengthen institutions and community assets
- Understand external influence factors

POLICY INTEGRATION OF HEATWAVE MANAGEMENT

Explicit recognition and integration of heatwave management issues into existing policies and practices is part of a robust response to heatwaves.

- Reflect on opportunities and challenges for integration of heatwave management activities.
- Integrate heat-health communications by public agencies.
- Embed generation of information on impacts from extreme heat in research and development.
Over the past 20 years, heatwaves have increased in frequency and intensity in the state of Victoria, Australia.

**2009**
Vitoria police, was assigned the lead role which was not fully recognized by stakeholders.

**2014**
An intense heatwave hit the region. The Victoria Police, was unprepared to delegate roles and responsibilities.

**2015**
Shortcoming addressed in heat-health plan which clearly sets out the actions for new lead agency.

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**S-W-O-T ANALYSIS FRAMEWORK FOR KARACHI**

**Strengths**
- Improved Emergency Response
- Collaboration of local stakeholders.
- Strong stakeholder appetite and interest.
- Emergency plans and SOPs in place.
- Perception that resources are sufficient.

**Weaknesses**
- Extreme heat not priority hazard.
- Insufficient institutional capacity and leadership.
- Inadequate public communication.
- Reactive institutional approach.
- Sensationalist media.

**Opportunities**
- Buy in for long term heat mitigation measures.

**Threats**
- Religious practices not harmonized with public health safety.
IDENTIFICATION OF GOALS AND STRATEGIES

URBAN AREAS AND EXTREME HEAT

- Heatwave intensity and frequency is expected to increase in future.
- Urban heat island effect is a major risk factor for cities.
- Urban areas are highly vulnerable to extreme heat impacts.

FACTORS CAUSING URBAN HEAT ISLAND EFFECT

- Anthropogenic Heat
- Geographical Location
- Pollution
- Replacing Green Fields
- Land Use
- Building Density
- Population Density

The Urban Heat Island (UHI) effect is a phenomenon where temperatures in urban areas are several degrees higher than in surrounding areas.

HEALTH EFFECTS AND VULNERABILITIES

- Heat Stroke
- Heat Exhaustion
- Heat Fainting
- Heat Cramps
- Heat Rash
- Heat Edema
ASIAN CITIES AND EXTREME HEAT: A COMPARISON

TEHRAN
- Heatwave reported: Between 2001-2010
- Temperature: 37.8°C
- 40°C in 2009

KARACHI
- Affected people in 2015 heatwave: 65,000
- People treated in hospitals: 40,000
- People died during heatwave: 1200
- Temperature reported during heatwave: 40°C-49°C

AHMEDABAD
- National heatwave threshold: 45°C
- Temperature reported during 2010 heatwave: 46.8°C
- More deaths were reported in 2010 as compared to 2009 and 2011.

SHANGHAI
- Temperature exceeding from 35°C for 89 consecutive days in August 1998
- Temperature reached at 39.4°C on August 15th and 16th.
- 752 three times the daily average of deaths as compared to non-heat days average.

ASIA’S VULNERABILITY TO HEATWAVES

13 Asian Megacities with 1 Million Population

59 Heatwaves Reported Between 1953-2015

Causing More Than 15,876 Fatalities

ASIAN COUNTRIES HIGHLY VULNERABLE TO HEATWAVES

CHINA  INDIA  JAPAN  NEPAL  PAKISTAN  SOUTH KOREA
3 DEVELOPING HEATWAVE MANAGEMENT STRATEGY

IDENTIFYING AN ALERT TRIGGER OR THRESHOLD

Thresholds are numerical values derived from one or more weather parameters.

When thresholds are exceeded, an alert is issued.

The benchmark for issuing an alert varies from place to place because local responses to extreme weather differ markedly.

The intensity and duration of the event reflects an increased risk of morbidity and mortality of a specific population.

THRESHOLD VARIATIONS ACROSS REGIONS

Winnipeg (Canada)
Average Maximum Summer Temp 26°C
Heatwave is communicated to the Public 33°C for 03 consecutive days

Ahmedabad (India)
Average Maximum Summer Temp 40°C
Heatwave is Communicated to the Public 41°C is forecasted by Meteorological

The alert protocol incorporates higher heat thresholds for Ahmedabad as compared to the residents of Winnipeg.

TYPES OF HEAT ALERT SYSTEMS

1. SINGLE OR FEW ALERT SYSTEM METHODS
   based on a single temperature metric or a modified form of temperature.

   CITIES USING THIS METHOD:
   ▶ Melbourne
   ▶ Victoria
   ▶ Odisha

2. HEAT BUDGET METHOD
   based on perceived temperature (PT), rather than focus on local climate conditions. Germany uses this model at the national level defines four levels of heat stress:
   - Strong
   - Moderate
   - Slight

3. SYNOPTIC BASED SYSTEMS
   incorporate multiple variables (e.g., temperature, dew point, wind direction, wind speed, cloud cover and pressure) to classify air masses into a pre-defined category of ambient conditions.

   The City of Toronto formerly used a synoptic approach to establish heat alerts.
FACTORS FOR ESCALATING HIGH ALERT LEVELS

- Increase in mortality and morbidity
- Worsened air quality
- Limited availability of drinking water
- Likelihood of an electrical emergency

CHARACTERIZATION OF ALERT PROTOCOL

**Leading Authority**
- Identify responsible authority for issuing an alert.

**Communication**
- Outline communication activities and information flows.

**Deactivation Point**
- Specify deactivation point where weather conditions are normalized.

PRINCIPLES FOR EFFECTIVE HEAT RISK COMMUNICATION

- **Trust**: Communicate with public in ways that build, maintain or restore trust.
- **Announcing early warnings**: Establishing trust begins with the first official notification.
- **Transparency**: Transparent approaches for information gathering, risk-assessing and decision making.
- **Understanding the public**: It is usually difficult to change pre-existing beliefs without addressing them explicitly.

EVALUATING THE ALERT PROTOCOL

- **Simplicity**: The alert protocol should be as simple as possible, while still meeting objectives.
- **Acceptability**: The willingness of individuals and organizations to participate in it.
- **Timeliness**: Related to the different response activities.
- **Sensitivity**: The number of times a warning is issued.
- **Specificity**: The accuracy of the meteorological forecasts on which they depend.
- **Reach**: Who is getting the information and what are their main takeaways?
4 MODELING THE EVALUATION STRATEGY

*Evaluations* help validate the effectiveness of heatwave management interventions and provide *learnings* to improve heat alert protocols.

### TYPES OF EVALUATION

**OUTCOME EVALUATION**
Assess whether the plan made a difference. Focuses on mortality and morbidity as outcome measure.

**PROCESS EVALUATION**
Assess that the plan is being implemented. Focuses on examining the process of an intervention.

### ISSUES TO BE ASSESSED

- Health care utilization
- Health behavior
- Temperature-mortality
- Productivity and absenteeism
- Morbidity
- Awareness about plan
- Issuance of warnings
- Stakeholders uptake of the plan
- Possible unintended consequences
- Barriers for implementation

### METHODS

- **Quantitative & qualitative**
- **Formal assessment of epidemiological data**
- **Quantitative & semi-qualitative**
- **Data collection through multiple sources**
- **Contextual Analysis**

### LIMITATIONS

- Difficulties to identify and acquire required data.
- Challenges related to the attribution.
- Ethical issues for experimental studies.
- Need to identify key players in advance.
- Selection of small number of people.
- Cannot provide definitive answers.
FACTORS AFFECTING THE EVALUATION

1. Enlist indicators for evaluation criterion
2. Data collection and analysis
3. Identify custodian of the evaluation results
4. Disseminating the results
5. Establish cost effectiveness
6. Assess relevance and effectiveness
7. Clarify the goals and objectives

After every heat season, the city or state must assess the efficacy of its heat action plan, including the processes, outcomes, and impacts. Regular process evaluations will build awareness and confidence in the system.

AHMEDABAD HEAT MORTALITY EVALUATION

The Heat Action Plan (HAP) for the city of Ahmedabad was launched in April 2013.

- 2013: 120.5
- 2010: 143.9
- 2014: 133

Average Daily Mortality

- Excess Deaths:
  - 1st year of HAP: 1344
  - 2nd year of HAP: 617
  - 2014: 1004

25% decrease in May's excess all-cause mortality after the launch of the HAP.

FACTORS AFFECTING HEAT MORTALITY COMPARISON ACROSS YEARS

- Population growth
- Air pollution
- Outbreak of infectious diseases
- Availability of air conditioning
- Changes in environmental exposure
IMPLEMENTING HEATWAVE MANAGEMENT STRATEGY

Successful implementation of heatwave management plans at the city level relies on:
- Leadership from local governments.
- Coordinated action of key stakeholders.

DEVELOPING STANDARD OPERATING PROCEDURES
SOPs are essential guidance for implementation partners to carry out preparedness and response measures.

Karachi Heatwave Management Plan
The city’s first heatwave management plan incorporates strategies to empower implementation agencies to enable supply of required coordinated services.

Ahmedabad Heat Action Plan
Ahmedabad’s HAP includes a series of seasonal checklists by implementation agencies.
- Pre-season.
- During the heat season.
- Post season.

DATA COLLECTION AND MONITORING
Collecting “real-time” data (less than 48 hours) and reporting unusual

Challenges For Data Collection
- Systematic and centralized collection of data is limited in some cities and regions.
- Weather monitoring stations lack coverage to register spatial differences in heat conditions.
- The cities new to heatwave don’t have standardized data collection templates among health practitioners and emergency responders.

Initiatives For Data Collection

PAKISTAN
Karachi city heatwave management plan includes a commitment by the lead agency for installation of at least one weather monitoring station per district to be able to register microclimates shaped by built infrastructure.

INDIA
The think tank TARU is promoting a data collection approach for efficient heat action planning.
Would like crowd-sourced data collection to log temperature and humidity.
France experienced a heatwave in July 2006 lasting 19 days.

To monitor the health impacts of hot weather, indicators were developed to track daily cases of three heat-related pathologies:
- Elevated body temperature.
- Dehydration.
- Low sodium levels in the blood.

Correlations between health indicators and temperature showed that emergency departments are a very relevant source of information to monitor environmental health outcomes.

AHMEDABAD HAP AND INTERCONNECTED AGENCIES

- Ahmedabad Municipal Corporations
- Medical Colleges And Hospitals
- Public Health Managers
- Urban Health Centres
- Public Press Office
- Labor Department
- Emergency Services

ENABLERS FOR SUCCESSFUL IMPLEMENTATION

- Agreement on Lead Agency
  To coordinate activities of multiple agencies and direct responses during a heatwave emergency.

- Accurate & Timely Alert Protocols
  That define thresholds for action and orient communication of the risks.

- A Communication Plan
  That describes what is communicated, to whom and when.

- Response Measure to Reduce Indoor Heat Exposure,
  Such as advice on how to keep indoor temperatures low during heat episodes.

- Protecting Vulnerables
  Particular care for vulnerable population groups.

- Preparedness of the Health and Social Care System
  Including staff training and planning, and appropriate, accessible health care.

- Long-term Urban Planning
  To address building design and energy and transport policies that will ultimately reduce heat exposure.

- Real-time M&E
  Real-time monitoring and evaluation will highlight about the efficiency and effectiveness of the plan.
ENGAGING STAKEHOLDERS FOR HEATWAVE MANAGEMENT

Stakeholder role and engagement from the earliest planning development stages to the final delivery is critical for the successful implementation of heatwave management plans.

STAKEHOLDER ENGAGEMENT GUIDANCE

Stakeholder roles, capacities, and contributions should be woven throughout planning and delivery.

1. List Stakeholders
   Characteristics of stakeholders to be listed
   - Address an existing need
   - Contribute required network
   - Contribute experience and expertise
   - Liaise between the initiative and parent organization
   - Cater to heat-vulnerable groups
   - Present an opportunity to leverage resources

2. Analyze the List of Stakeholders
   To identify, for each:
   - Existing level of interest in heatwave management
   - Expected level of influence
   - Level of partnering ability

3. Develop the Engagement Plan
   The plan identifies stakeholders that should be:
   - Active partners
   - Kept involved
   - Consulted
   - Regularly informed of progress

4. Update the Engagement Plan
   Throughout the initiative, ensure all relevant groups are engaged at the right time, using the right format.

IDENTIFYING VULNERABLE GROUPS

An important step in planning and engagement is to determine who the vulnerable groups are and where they are located. Stakeholder agencies can use several methods to collect data for heat vulnerability assessments.

- Household surveys
- Focus group discussions
- Geographics information systems
**IDENTIFYING STAKEHOLDERS**

- Schools
- Workites
- Faith Organizations
- Public Health/Public Organizations
- Emergency Services
- Community Health Organizations
- Non-Governmental Organizations
- NGOs

**BENEFITS OF INVOLVING LOCAL STAKEHOLDERS**

- **Local stakeholders** are usually aware of the effects of the hot weather.
- **Vested interest** in mitigating heat events & can be readily available for seasonal planning.
- **Tend to be adept** at identifying relevant measures for their city and the region.
- **Identifying vulnerable** local stakeholders can be helpful in identifying vulnerable groups.

**FUNCTIONS OF HEAT-HEALTH COMMUNICATIONS**

- Alerting public about weather conditions.
- Developing public-health messages.
- Possible health impacts and protection measures.
- Disseminating messages using different channels.

**EXAMPLES OF HEAT COMMUNICATIONS**

**Social Media**

- Follow @NWS for heat advisories & excessive heat warnings so you can #BeatTheHeat this summer.
- Listen to local weather forecasts to prepare for extreme heat #BeatTheHeat.
- Extreme heat makes the body work extra hard to maintain normal temperature. Know the fact & prepare: www.ready.gov/heat or http://www.ready.gov/heal...HeatSafety.
ENGLAND

England has developed a heatwave plan that local governments can adapt to their own strategies:

**HEAT-HEALTH WATCH ALERT SYSTEM** that operates during summer season with five alert levels – from 0-4.

The plan contains extensive tables for actions that could be taken at various levels of implementation.

The Commissioners of health and social care are to use media to communicate public health messages tailored to vulnerable groups upon a level-2 alert.

KARACHI HEATWAVE MANAGEMENT PLAN 2017

Karachi Commissioner Office

As the lead agency, is responsible for overseeing the plan’s implementation and refinement over time.

The plan comprises three strategies to solidify the City’s heat alert and response system:

1. Timely communication of the specific information before, during and after extreme heat;
2. Uninterrupted supply of the required level of services and support;
3. Increasing knowledge of the heat-related outcomes.

DIFFERENT HEATWAVE APPROACHES TAKEN BY 30 LARGE ASIAN CITIES

- Not addressed/unclear: 11 cities
- Heat health integrated in climate change adaptation plan: 4 cities
- Heatwave plan or heat alert: 11 cities
- Research (epidemiology heat-health risk assessment, UHI): 3 cities
- Heat health integrated in environmental and urban development policy and plans: 1 city
HEATWAVE MANAGEMENT

SHANGHAI (CHINA)

In 2003, the Shanghai Municipal government has developed a Multi-hazard early warning system (MHEWS), with alert levels for extreme heat. The city has a tiered dissemination plan that includes communication with the public through:
- Text messages
- Newspaper
- Television
- Websites
- Radio

SOUTH KOREA

Heatwave is part of country’s climate change adaptation plan being led by:
Centre for Disaster and Safety Countermeasures

Ministry of Health and Welfare has developed several tools which provide:
- Healthcare guidelines.
- Mobile healthcare program for the elderly.
- Surveillance system to increase awareness at medical centres.

FUTURE OF HEATWAVE PLANNING IN INDIA

Heatwave plan completed and implemented
1. Ahmedabad
2. Odisha
3. Maharashtra

Heatwave plan under development
1. Hyderabad
2. Surat
3. Vijayawada Amaravati

Heat action planning is taking off in India. Nagpur and four neighboring cities analyzed their mortality rates to determine their own heatwave threshold temperature, setting the
- Orange level (heat alert day) at 43°C
- Red level (extreme heat alert day) at 45°C

Ahmedabad was the first city in South Asia to prepare a Heatwave Action Plan. CDKN provided the funding and technical assistance.

VICTORIA (AUSTRALIA)

The State of Victoria has a heatwave framework and plan to reduce the impact of heatwaves on public health.
Department of Health and Human Services is the lead agency.
The government has developed temperature thresholds for each city.
An audit function is also built-in to support continued improvements in effectiveness.
ABOUT

National Disaster Management Authority (NDMA) is the lead agency at the Federal level to deal with the whole spectrum of Disaster Management activities. It is the executive arm of the National Disaster Management Commission (NDMC) which has been established under the Chairmanship of the Prime Minister as the apex policy making body in the field of Disaster Management.

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