Building a Resilient City in the Post Covid-19 Era: Towards an Integrated Urban Climate, Environment and Health Services

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- *Risks generated by the interaction of complex human and natural systems*, amplified by changes in the climate, *are increasing its tendency for systems reverberations/syndrome*. It has been called as "Systemic Risk", especially in urban areas.
- *The pandemic of the Covid-19 has shown the world is not ready to deal with* not only the increasing health crisis, but also *the risk interconnectivity which have affected people's life, living and their production activities.*
- These are ultimately reversing efforts to achieve the 2030 SDGs, Paris Agreement on Climate Change, the SFDRR, and the New Urban Agenda - Habitat III.

Building a Resilient City

- A resilient city in such new era: *appropriate form, physical and virtual infrastructure/capacity to be more prepared for the physical, social, and economic challenges in a city*
- To address the changes, *it calls for urban readiness on the systemic reverberations/syndrome of risk connectivity, its adaptation and emergency response*
- Some points for building urban resilience including science based, sustained and integrated urban services in a post-carbon, post-Covid-19, disaster-mitigated, climate-responsive ”environment” may apply.
- In order to ensure the cities are safer, securer, and healthier; become increasingly resilient to pandemic, climate, and nature in a synergistic way.

Some points, but not limited to, for building urban resilience and science based urban services in a post-carbon and post-Covid-19 era

- Strong digital networks in support of new mode of work at home and on-line shopping as common lifestyles;
- Strong integrated urban information system to keep city dwellers risk informed for early response and reducing infodemic;
- Strong capacity on community centered/based governance, such as Community WhatsApp, We-chat etc., mobilizing volunteer for community carefulness, strong connection with elder people; It requires active participation of community members at all scales
- Strong capacity in remote medical diagnose and treatment with a new type of public health carefulness network/mechanism;
- Strong resettlement mechanism for the most vulnerable groups in cities, such as for homeless, etc.
- Prioritize walking as the preferred mode of living and work, and as a defining component of a healthy life in the urban planning and design. Promote healthy life style, such as washing hands, keeping social distance, taking vaccine etc.;

Some points, but not limited to, for building urban resilience and science based urban services in a post-carbon and post-Covid-19 era (partly from MARNI EVANS, 2019)

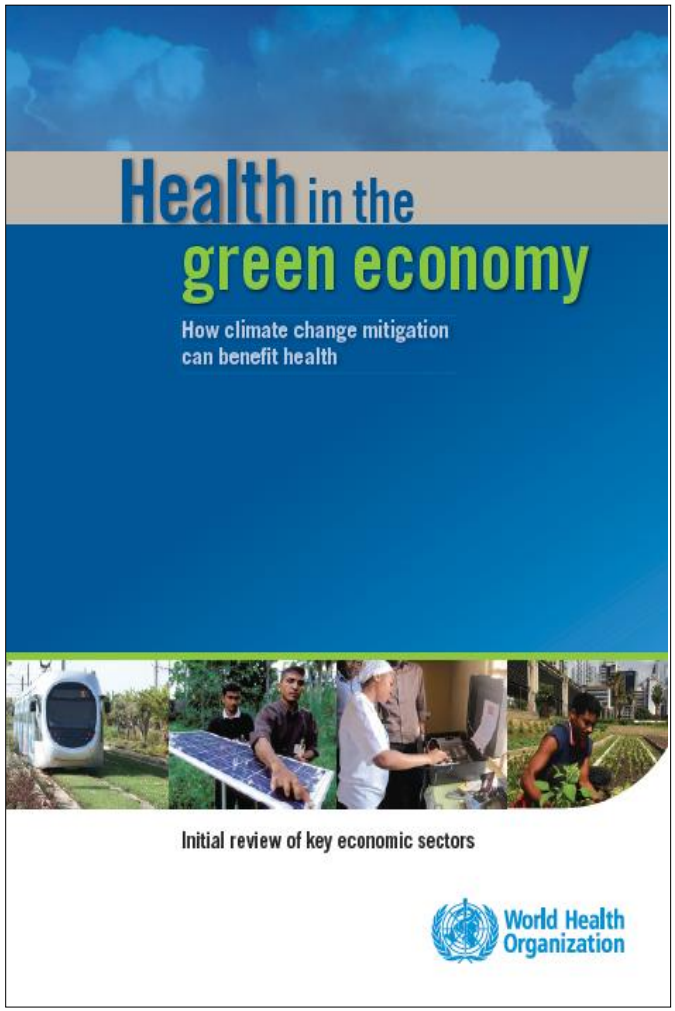
- Focus energy and resources on conserving, enhancing, and creating strong, vibrant places, which are a significant component of the neighborhood's structure and of the community's identity.
- Conserve and enhance the health of natural systems (including climate) and areas of environmental significance, and manage the impacts of climate change and climate extremes.
- Plan and design for redundancy/flexibility and durability of urban life safety and critical infrastructure systems. Planning and design of these systems will aim for levels of redundancy/flexibility and durability that are commensurate with the increasing environmental, social, and economic stresses associated with the impacts of climate change, pandemic and peak oil.
- Enhance the effectiveness, efficiency, and safety of their technical and industrial systems and processes, including their manufacturing, transportation, communications, and construction infrastructure and systems to increase their energy efficiency, and reduce their environmental footprint.

UN Actions: Call for an Integrated, sustainable planning for urban health requested by WHO - example

"Health benefits from reduced air pollution as a result of actions to reduce greenhouse gas emissions… may offset a substantial fraction of mitigation costs" – IPCC, 2007

"while the climatic effects of mitigation measures are long-term and dispersed throughout the world, the health benefits are immediate and local" – M. Chan, 2009

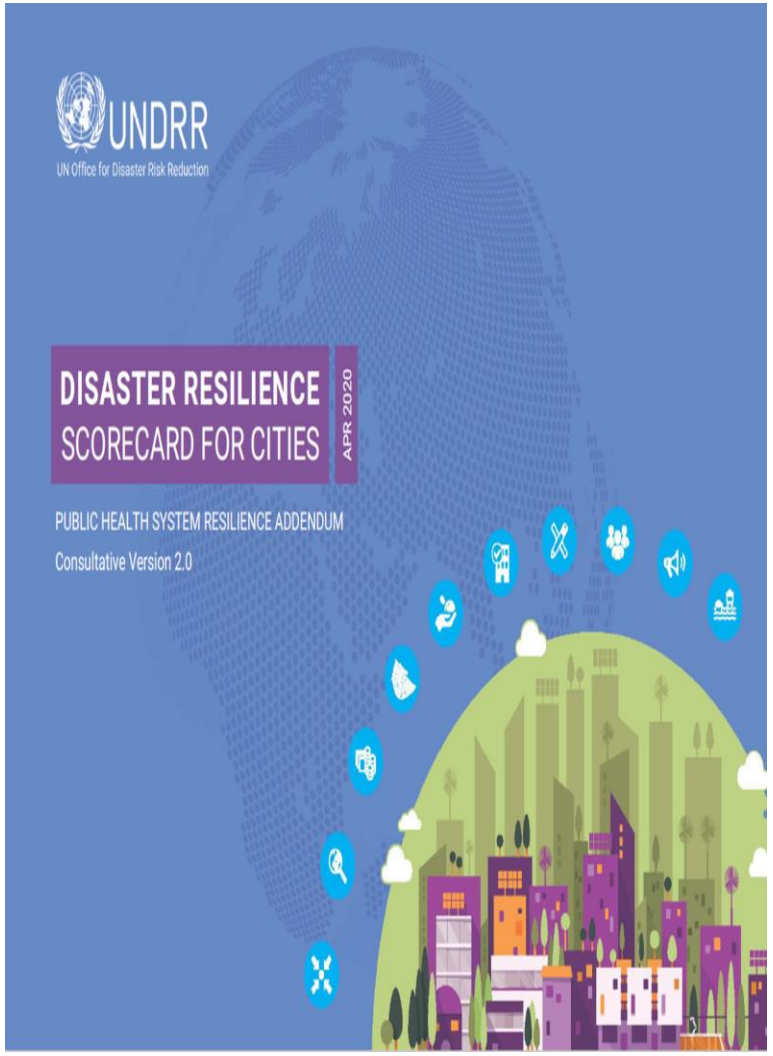
E.g. Sustainable urban transport – could cut heart disease, stroke and cancer by 10-20%



UN Actions: UNDRR's Disaster Resilience Scorecard for Cities (DRSC) & its Conjunction with WHO Health EDRM – example

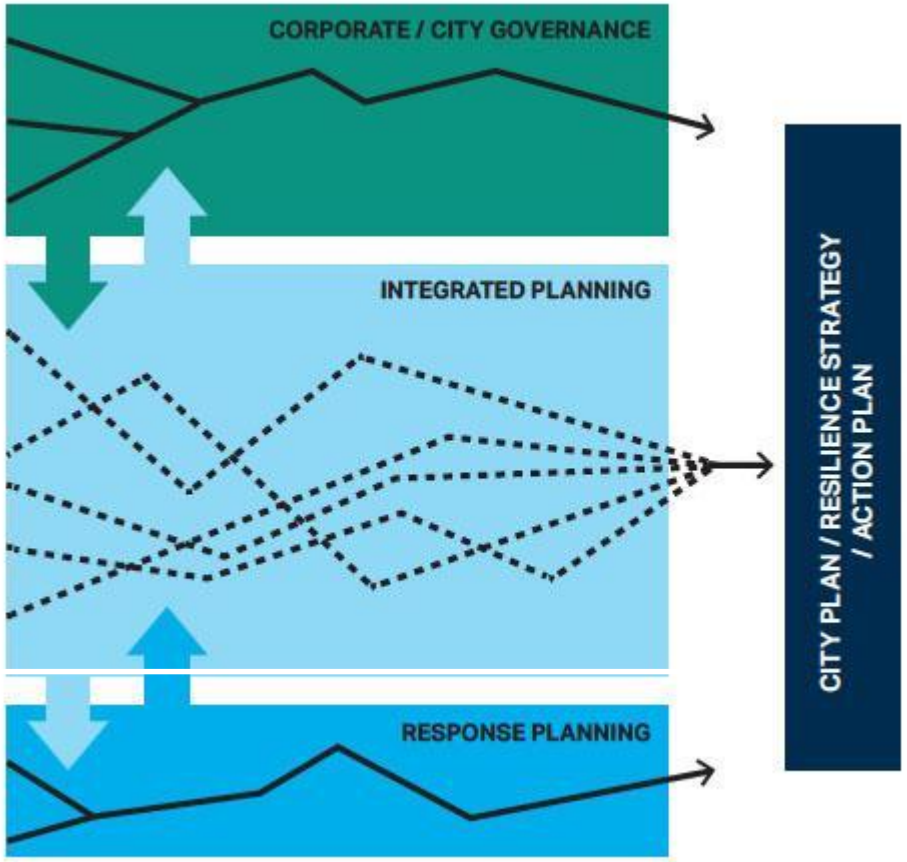
- While the more obvious health factors such as hospital services capacities and structural and nonstructural safety should be addressed for the peak emergencies in a disaster and crisis situation and have been covered in the Scorecard (under Essential 8), other disaster-related public health issues have not been well addressed.

- The Addendum should be used in conjunction with the UNDRR Scorecard, and WHO's Health Emergency and Disaster Risk Management (Health EDRM) Framework.

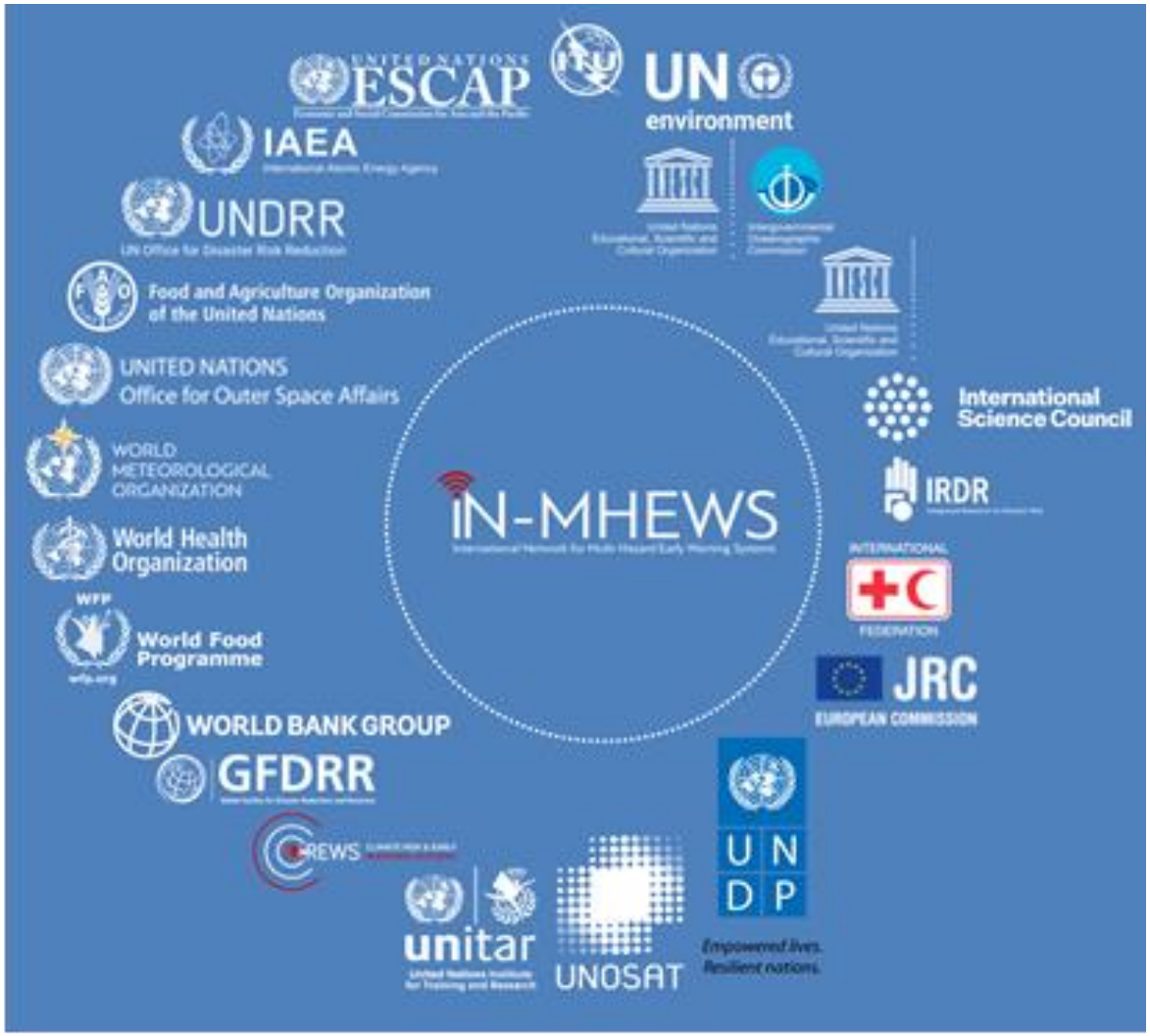


The TEN Essentials (DRSC) for Making Cities Resilient through integrated efforts – *It Calls for an integrated approach to break the Silo Ways on Risk Management*

1. ORGANISE FOR DISASTER RESILIENCE
2. IDENTIFY, UNDERSTAND AND USE CURRENT AND FUTURE RISK SCENARIOS
3. STRENGTHEN FINANCIAL CAPABILITY FOR RESILIENCE
4. PURSUE RESILIENT URBAN DEVELOPMENT AND DESIGN
5. SAFEGUARD NATURAL BUFFERS TO ENHANCE THE PROTECTIVE FUNCTIONS OFFERED BY NATURAL CAPITAL
6. STRENGTHEN INSTITUTIONAL CAPACITY FOR RESILIENCE
7. UNDERSTAND AND STRENGTHEN SOCIETAL CAPACITY FOR RESILIENCE
8. INCREASE INFRASTRUCTURE RESILIENCE
9. ENSURE EFFECTIVE DISASTER RESPONSE
10. EXPEDITE RECOVERY AND BUILD BACK BETTER



International Network for Multi-Hazard Early Warning Systems (IN-MHEWS) with 21 International Organizations: Global Framework in support of the Integrated Urban Services - example



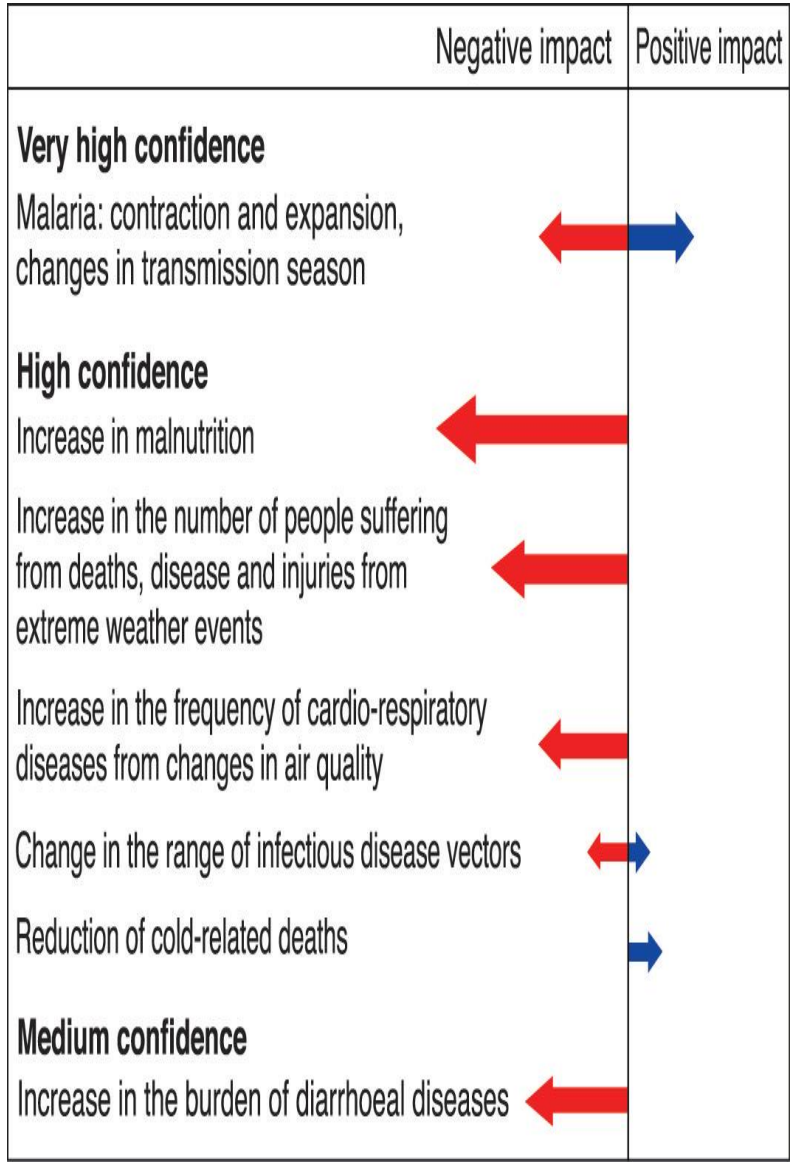
Science based Recognitions (AR4-8/IPCC): Health Effects of Climate Change

Climate change:

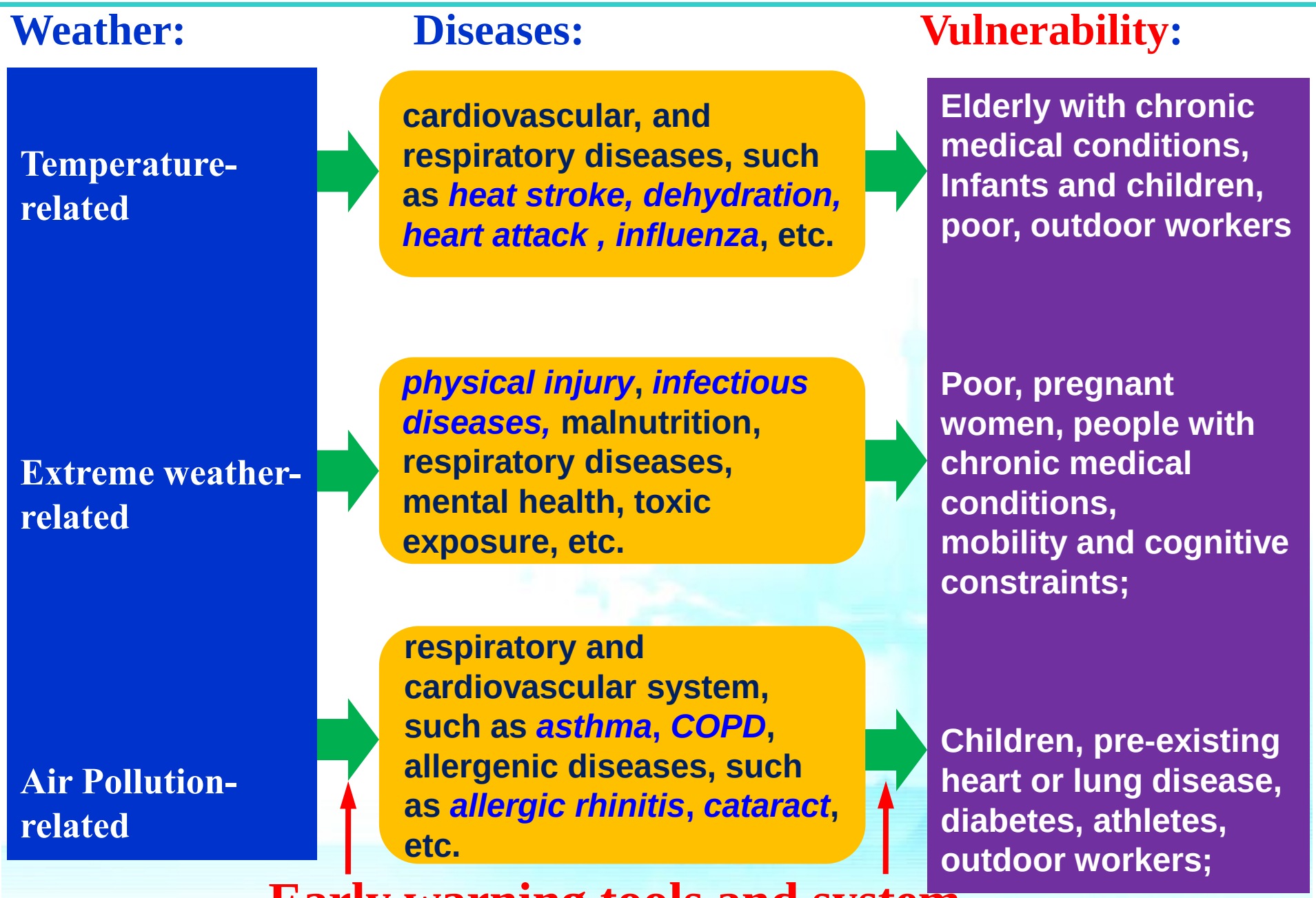
- Weather extremes
- Sea level rise
- Ecosystem changes

→

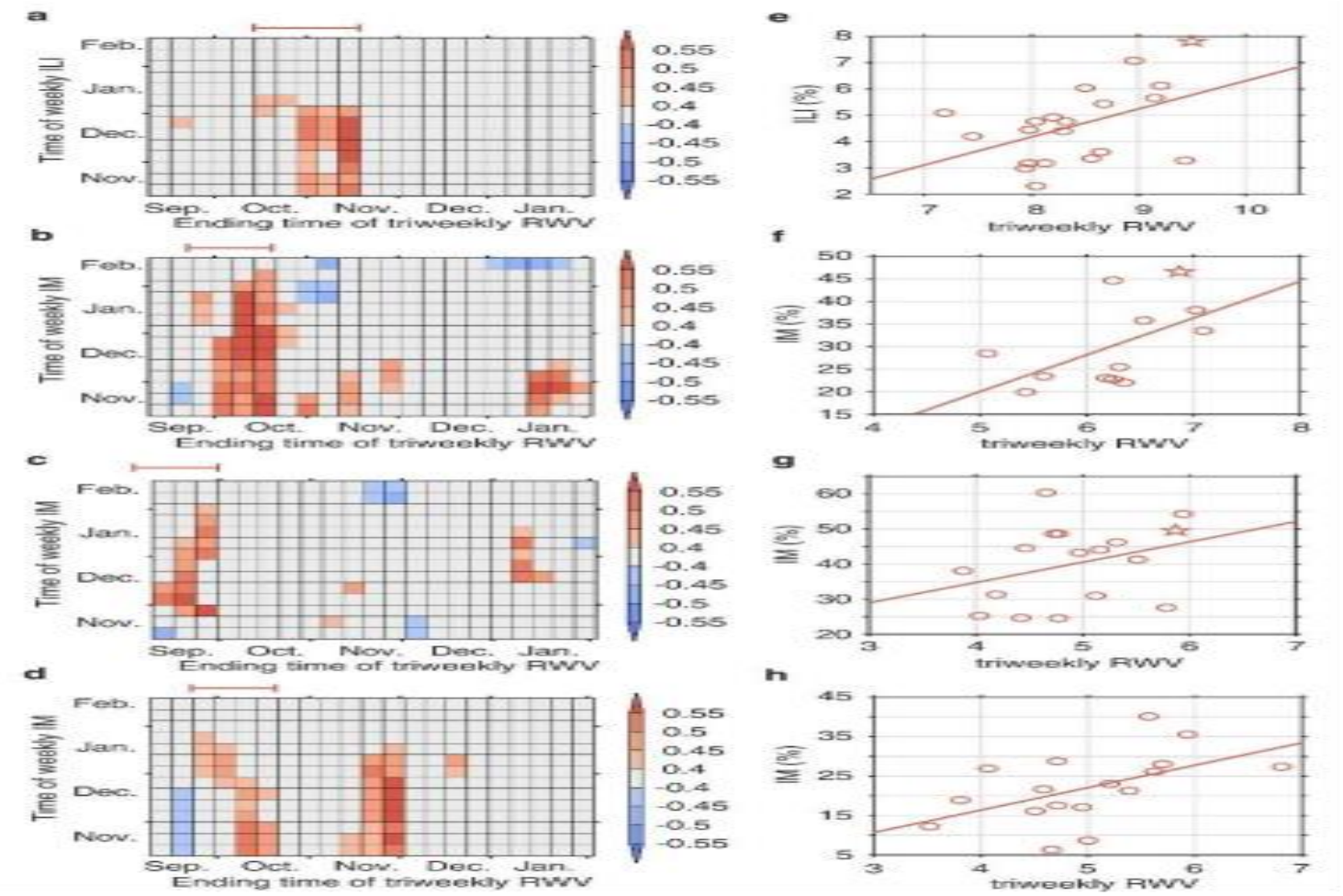
- HEAT
- SEVERE WEATHER
- AIR POLLUTION
- ALLERGIES
- VECTOR-BORNE DISEASES
- WATER-BORNE DISEASES
- WATER AND FOOD SUPPLY
- MENTAL HEALTH
- ENVIRONMENTAL REFUGEES



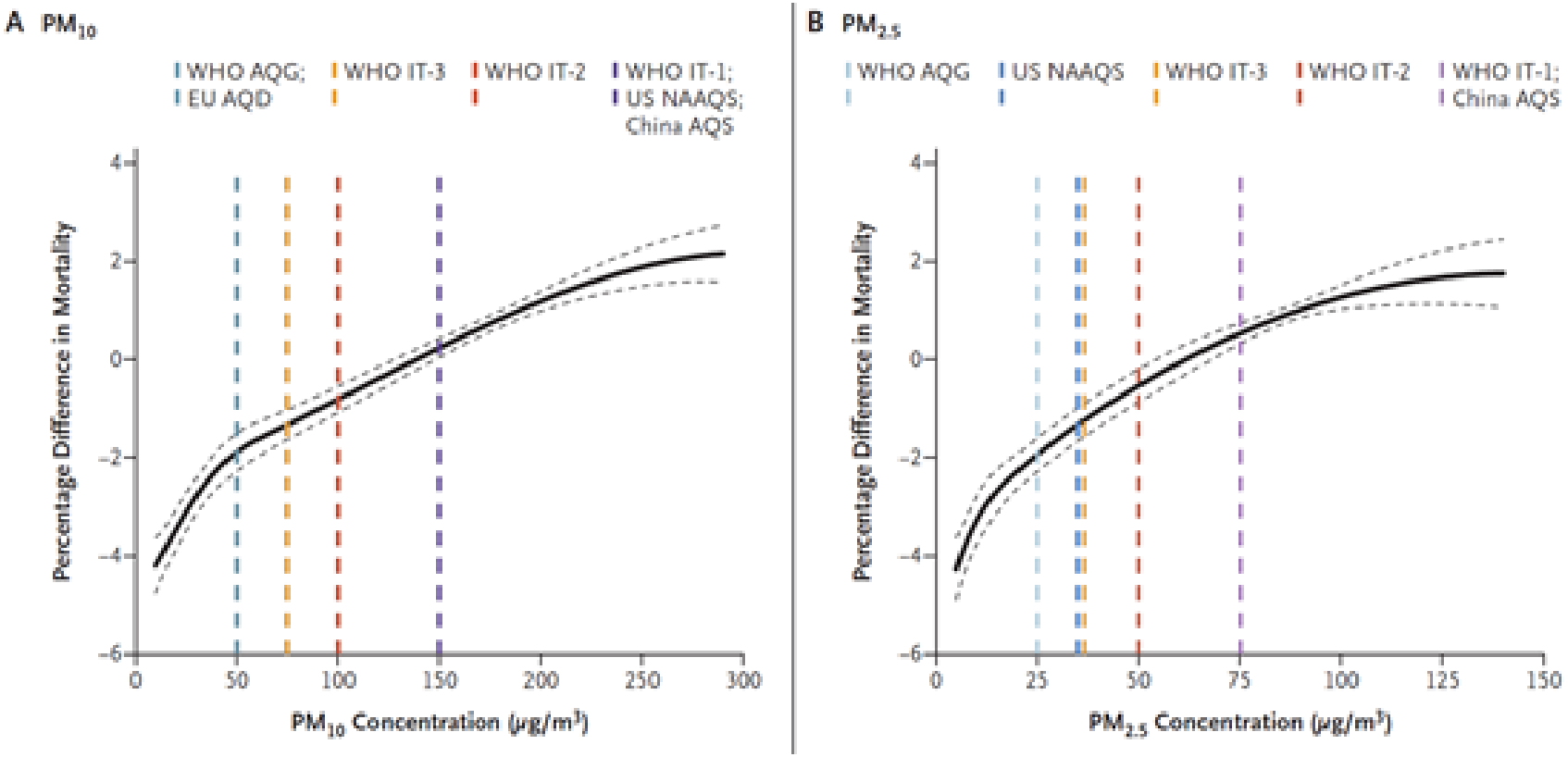
Science based Services: Weather/Environment-sensitive diseases and its vulnerability



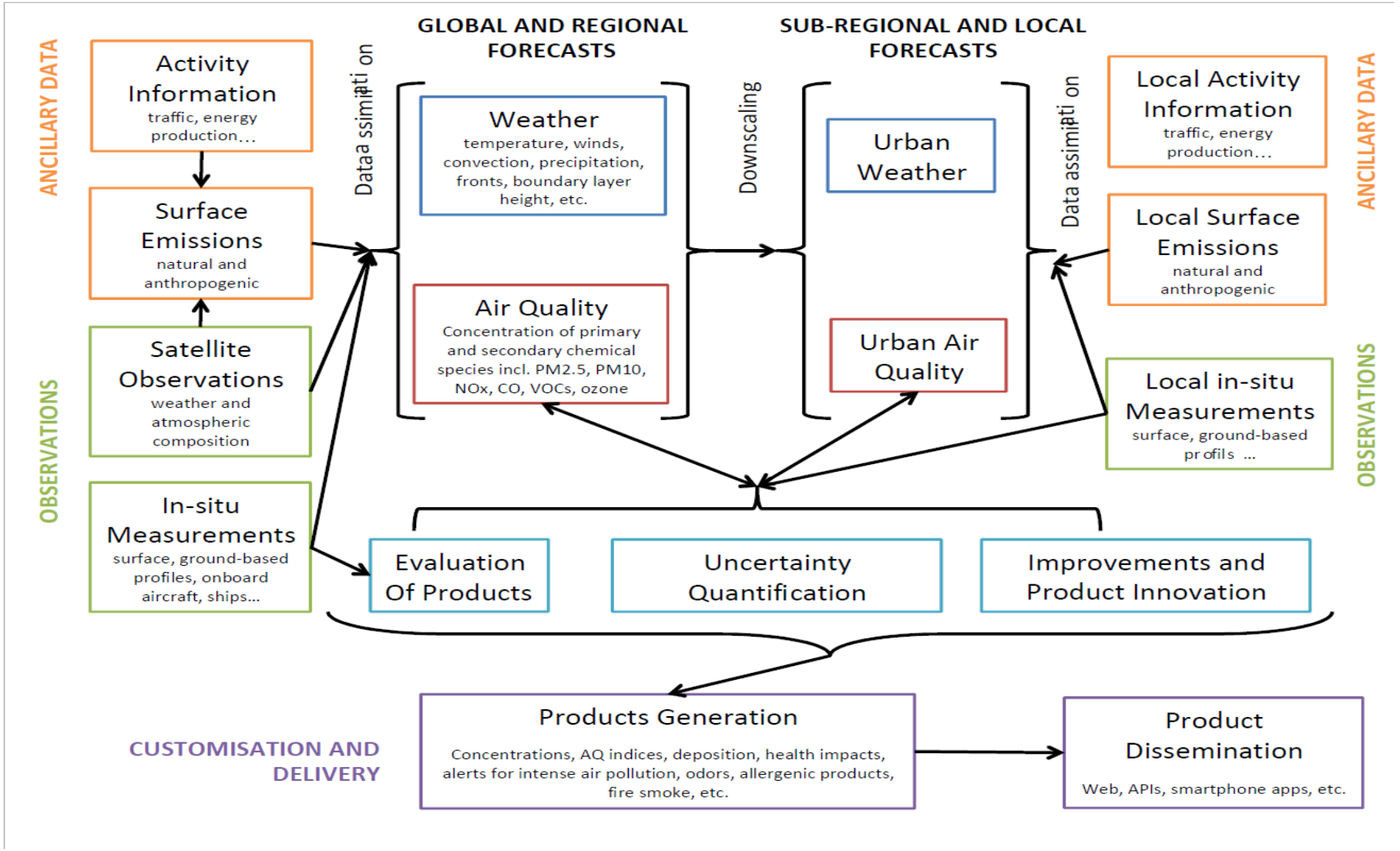
An example of the relationship between rapid weather variation (RWV), which affects human immune system, and influenza-like illness/influenza morbidity is shown in US, China, Italy, and France (Liu et al., 2020)



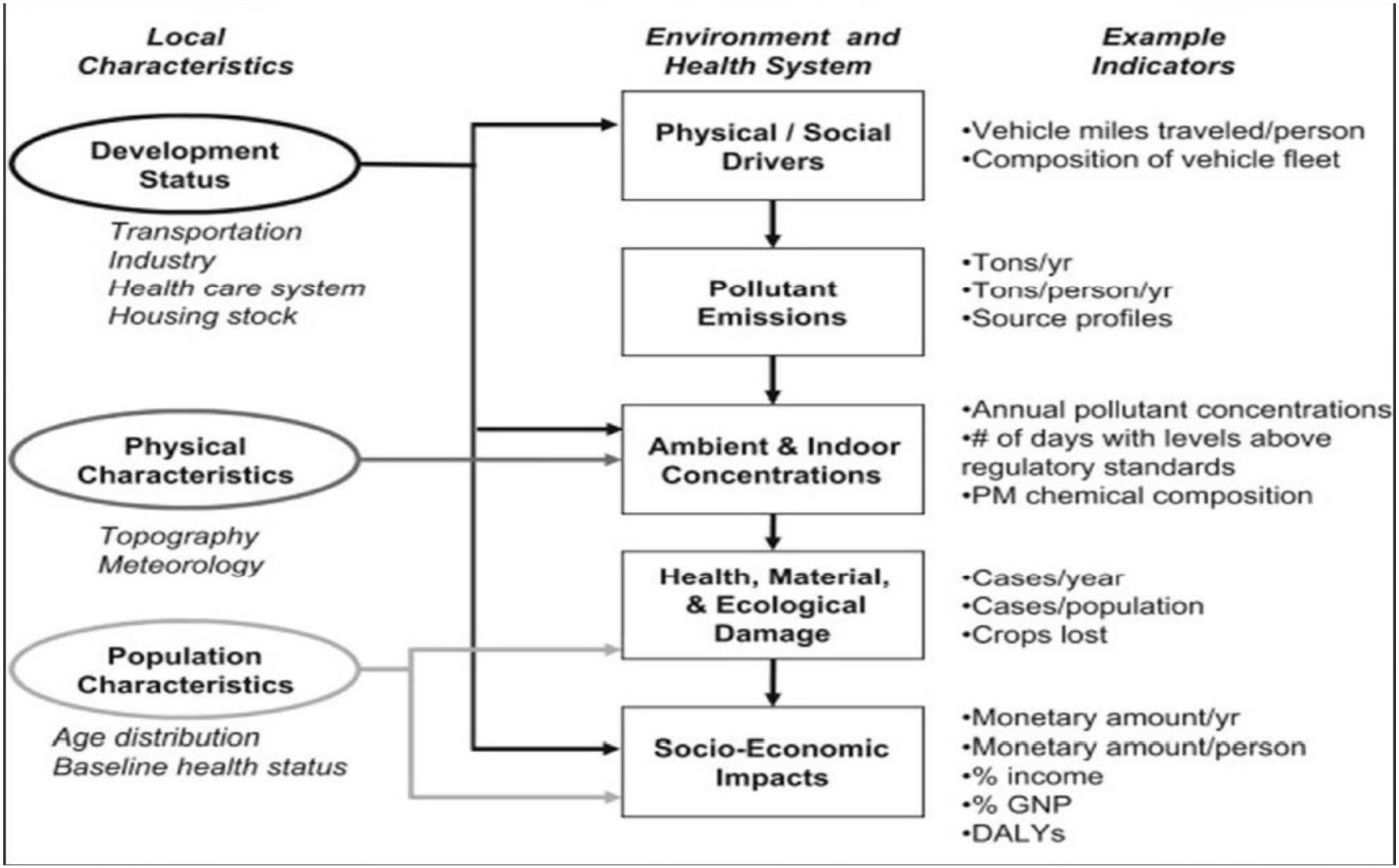
Example - Exposure-Response Relationship Between PM10/PM2.5 and Daily Mortality in 652 global cities (Liu et al., 2019).

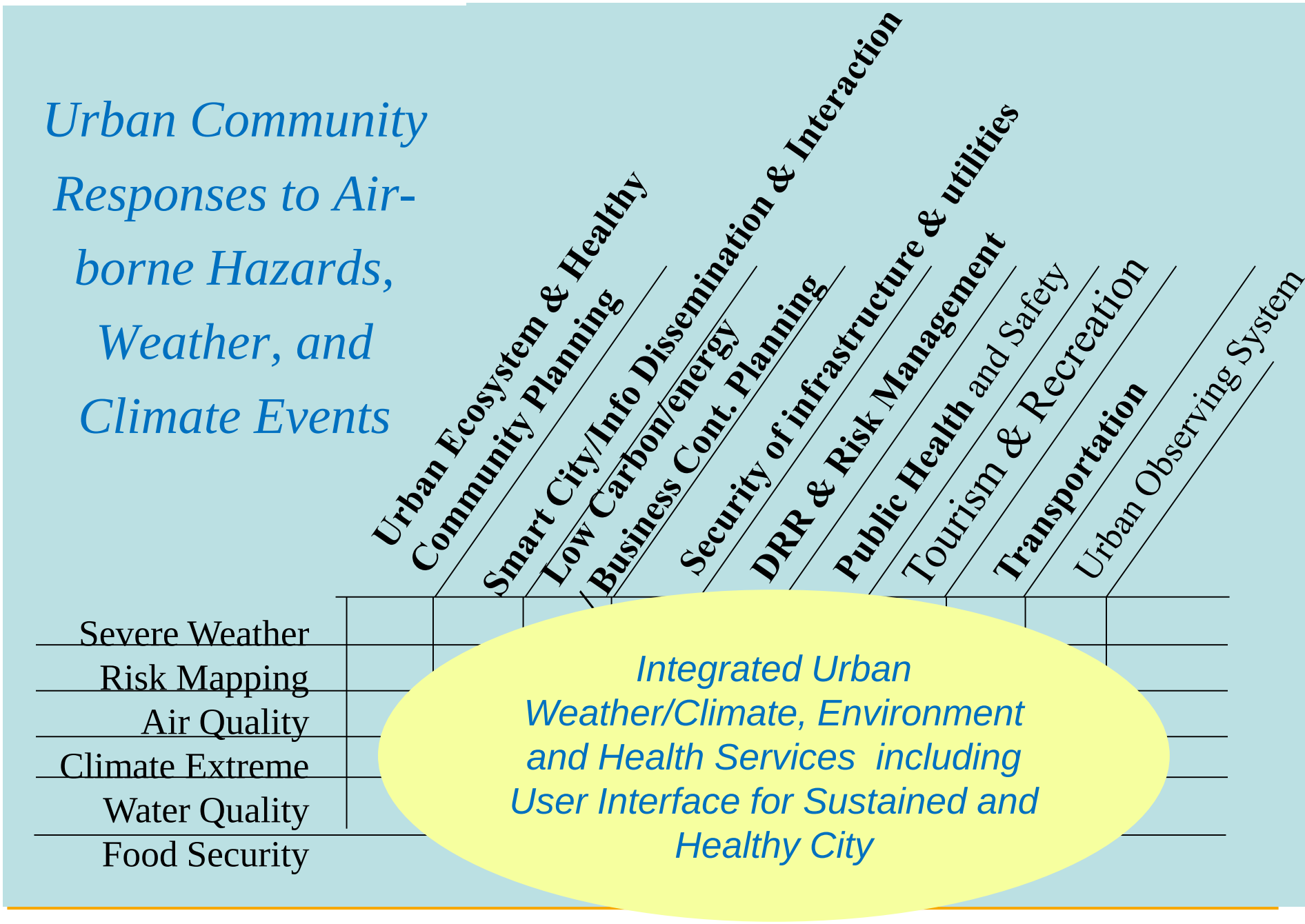


Integrated Approach: Weather/Environment, MAP-AQ, IGAC/WMO - example



An Integrated Perspective (developed by MAP-AQ/WHO): From Drivers to Societal Impacts on Climate/Health - example





Conceptual Model For Climate Smart City has been demonstrated

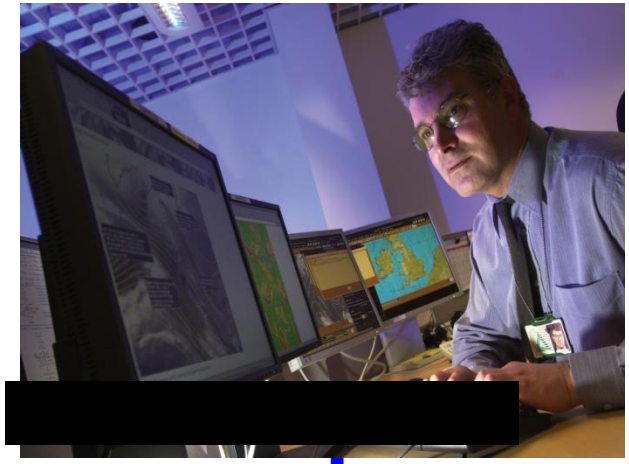
User Interface Platform -GFCS

International coordination through User Interface Platform

Government & community decisions

Global	Feedback User community needs Priorities	
Regional	Dialogue Requirements Intersecting w/ other pillars	
National	Literacy Advocacy & outreach	
Community	Evaluation & monitoring Programme & activity implementation	

Urban Community Responses to Air-borne Hazards, Weather, and Climate Events – National level, Example in U.K.



NHS Network

Health Forecasts

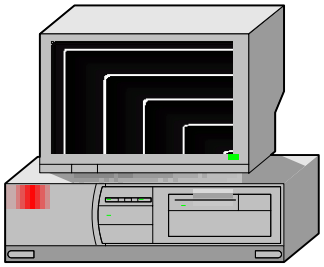
NHS General Practice Practitioner Health Service

Call logs

Patient name and tel no, changes to patient status

Medicine software on NHS Server

Monitoring



Medicine administrator

Telephone numbers

Patient responses

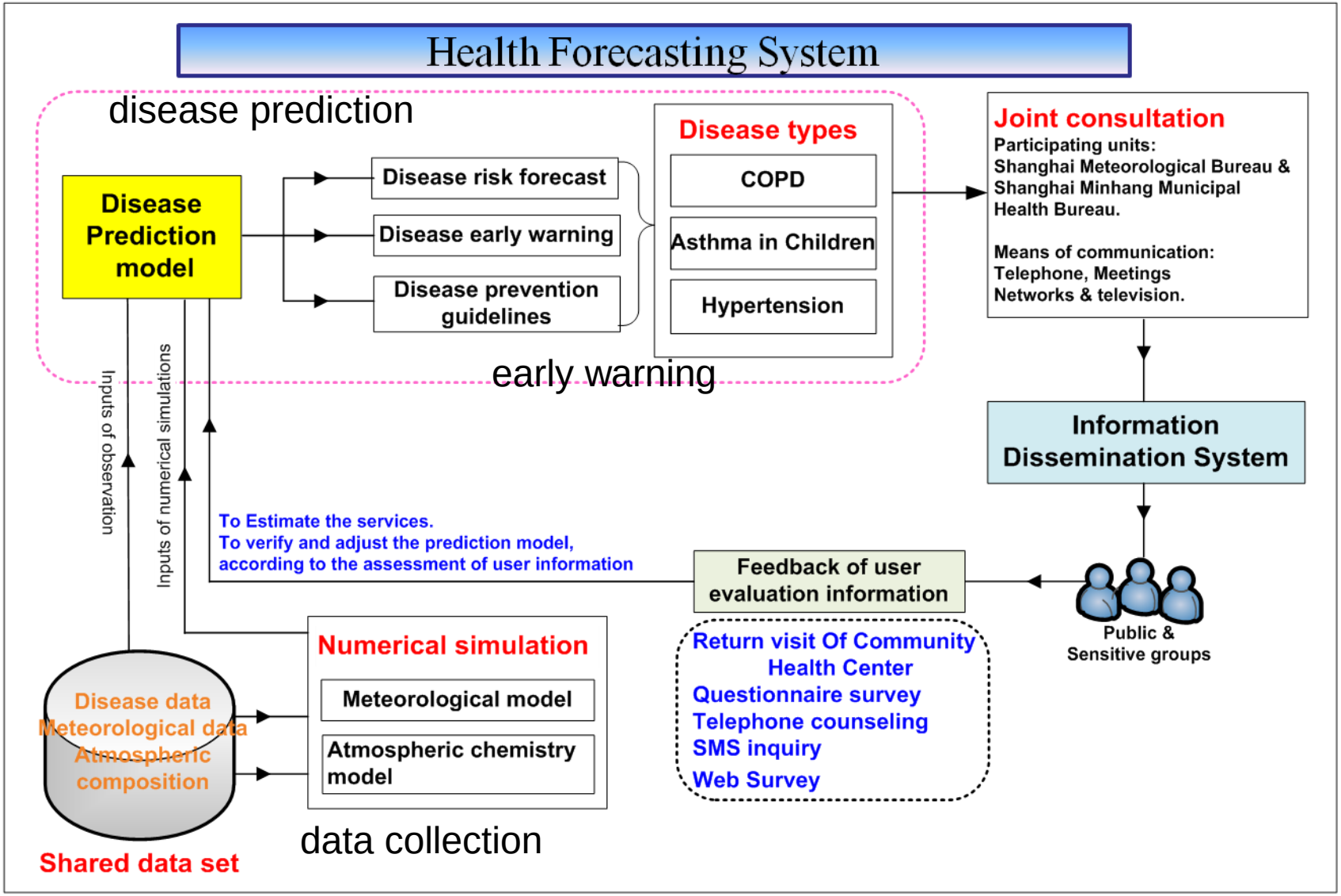
Person with COPD

Automated telephone call

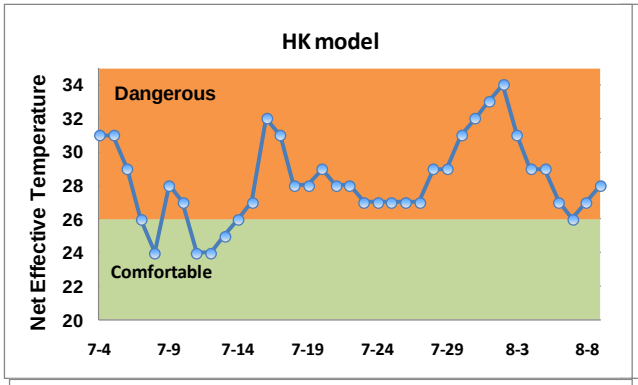
Patient responses

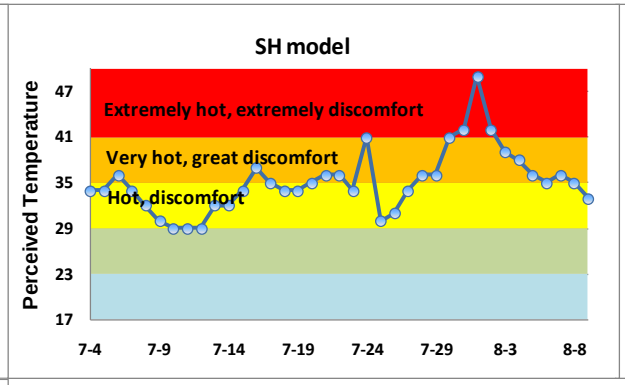
interactive voice response system

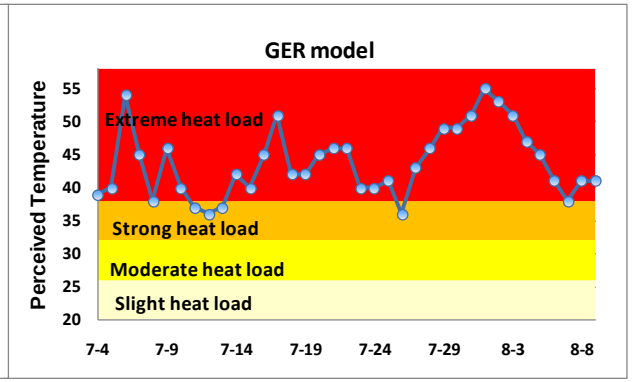
Operational framework at city level (Shanghai Example)

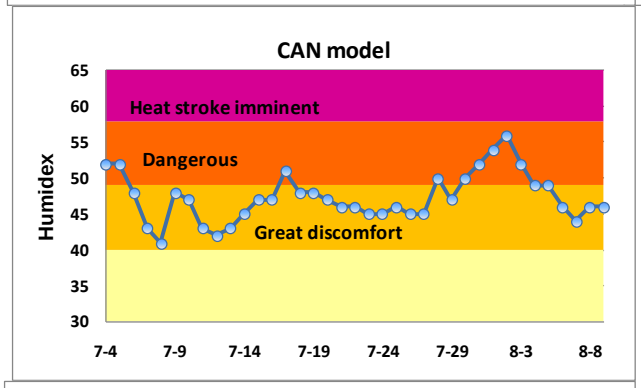


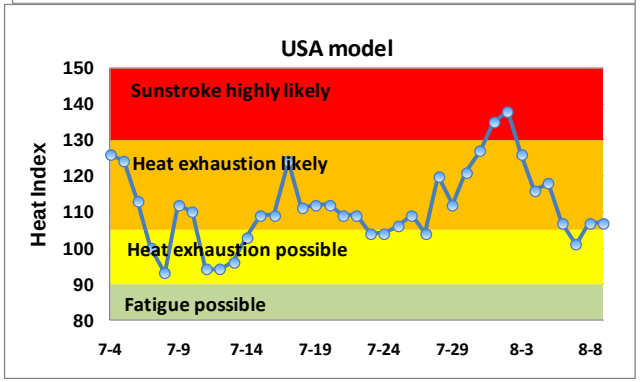
Example - Heat impact Warning Systems and its Comparison – Heat index







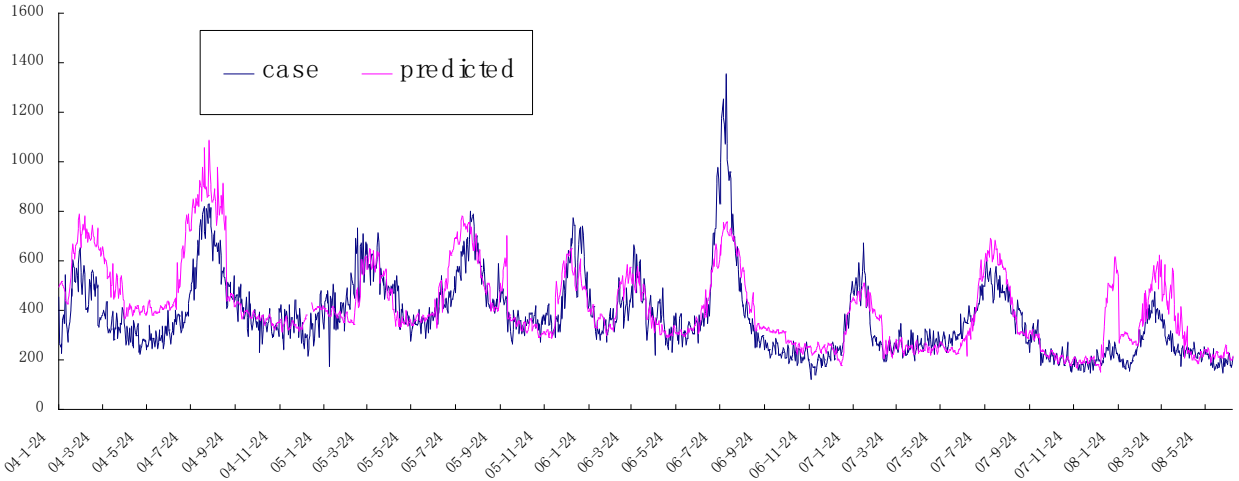




Heat index forecast Interface

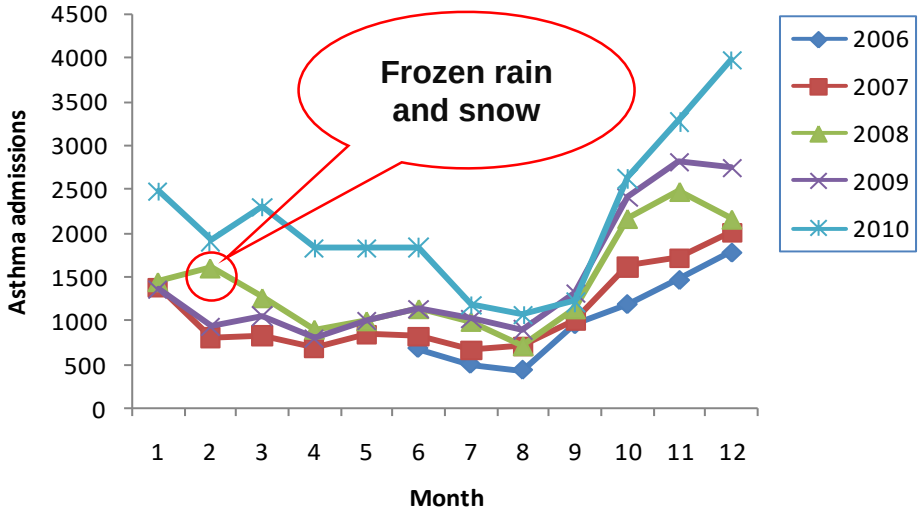
Example - Respiratory disease Forecast - Influenza

Warnings and Guidance (Influenza)



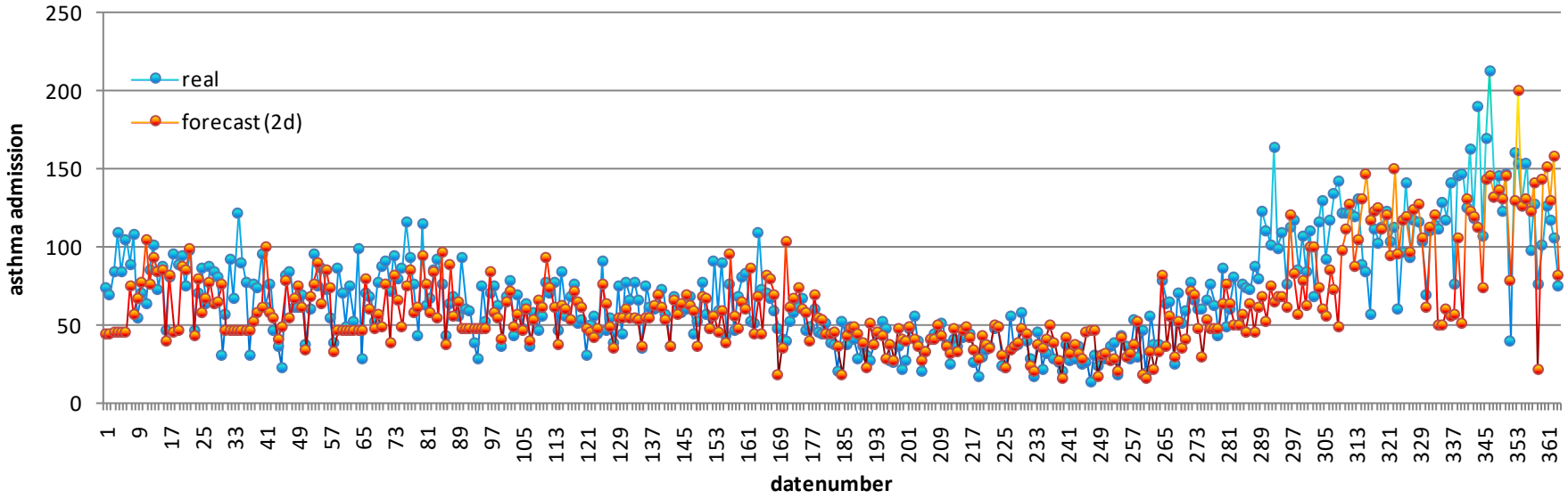
Grade	Des	Stands (Incidence)	Guidance
0	Null	<300	Null
1	Low (Yellow)	300~750	Eat Light diet, keep warm, develop physical training; frequent ventilation and hands washing, avoid droplet infection; take medicine and inject vaccine
2	Moderate (Orange)	750~1100	Decrease assembling; ask for leave; frequent ventilation and hands washing; take disinfection measures, avoid droplet infection; inject vaccine
3	High (Red)	>1100	Avoid assembling; hospitalization and isolation; frequent ventilation and hands washing; take disinfection measures, avoid droplet infection; inject vaccine

Example - Respiratory disease Forecast - Childhood Asthma



the prevalence rate of asthma went up from 1.5%-3.4% between 1990 and 2000 in Shanghai, and remains the highest in China.

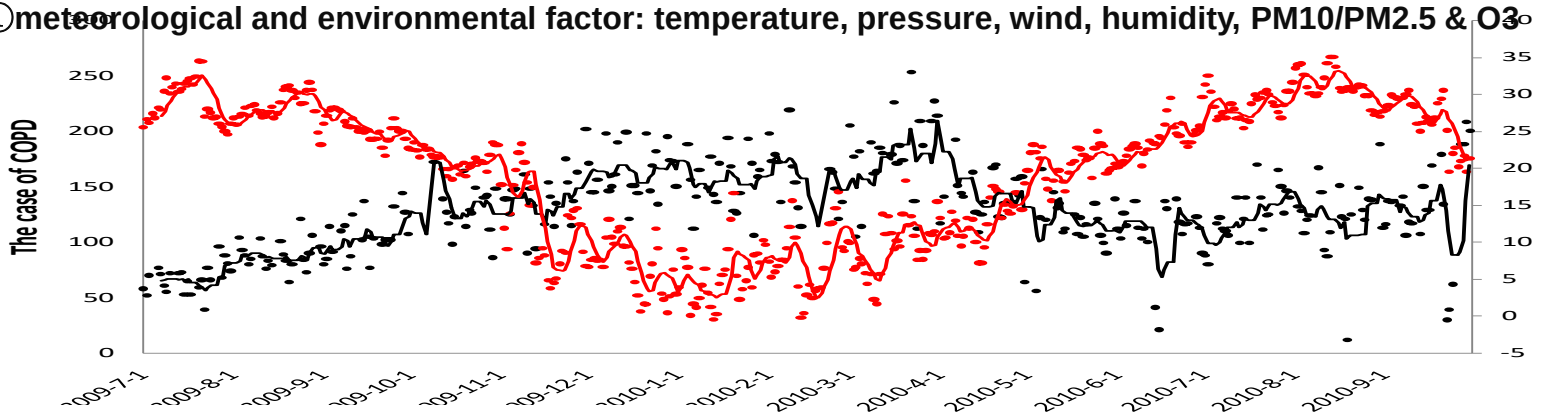
meteorological factor: temperature, pressure, wind, relative humidity, precipitation.

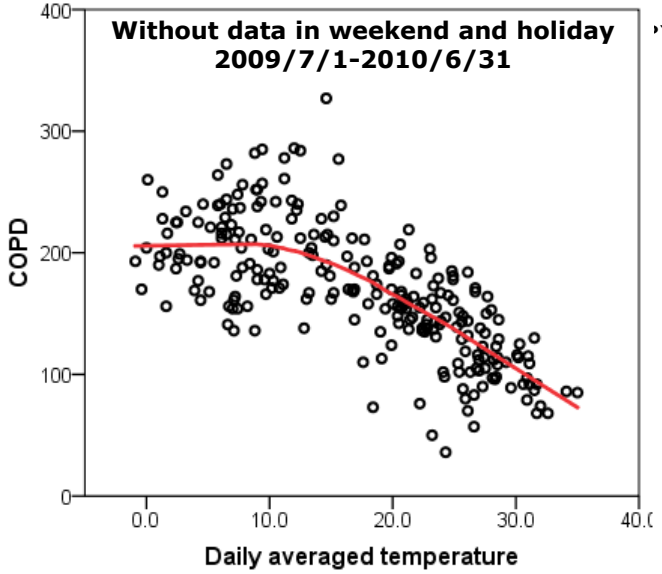


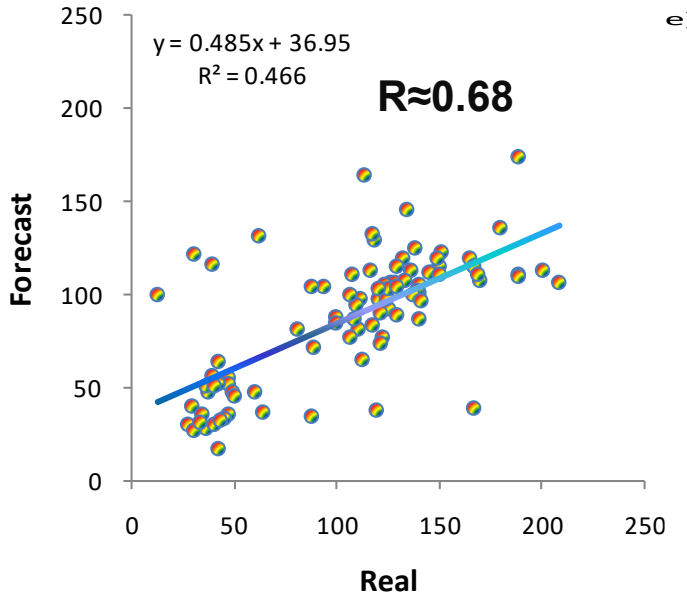
Example - Respiratory disease Forecast
Chronic obstructive pulmonary disease(COPD)

4th leading cause of death worldwide. In China, 8.2% of the population over 40 years is affected by COPD. the averaged medicine cost of COPD patient in 2007 was between ¥3546 and ¥4673 per hospital visit, and the hospitalization cost every time was estimated to be between ¥8079 and ¥8925.

①meteorological and environmental factor: temperature, pressure, wind, humidity, PM10/PM2.5 & O3







Example - Digestive disease Warning – Bacterial Food Poisoning

气温 / 湿度	-6~ -5.1	-4~ -2.1	-2~ -0.1	0~ 1.9	2~ 3.9	4~ 5.9	6~ 7.9	8~ 9.9	10~ 11.9	12~ 13.9	14~ 15.9	16~ 17.9	18~ 19.9	20~ 21.9	22~ 23.9	24~ 25.9	26~ 27.9	28~ 29.9	30~ 31.9	32~ 33.9	34~ 35.9	36~ 37.9
40~44																						
45~48				2									4	4	9	5						
49~52			2	2	2			2		1			8	9	10	10	5					
53~56				2	1		2	2	4	2	2	8	9	10	6	7						
57~60				2	1	1		2	1	4	2	2	11	4	6	11	13		16	8		
61~64			1	1	3	1	1		1	3	4	2	3	3	7	13	26	28	23	19	20	
65~68				1	0	2	2	1	1	2	5	4	4	5	9	13	19	29	25	31	23	
69~72					1	2	2	1	2	4	3	4	4	8	13	16	21	22	21	15		
73~76					0	1	1	2	3	4	5	2	5	7	15	17	24	21	18	11		
77~80				10	0	1	1	1	3	5	5	5	5	8	12	21	22	19	10			
81~84				10	11	1	1	1	1	4	4	5	7	6	12	14	21	13	6			
85~88				10	0	1	0	1	2	2	3	5	7	6	12	18	16	10				
89~92					0	0	2	1	1	2	2	3	7	9	16	21	13	5				
93~96					0	2	3	3	1	1		4	11	12	20	25	11					
97~100						0	2	1				3	6	7	12	15	7					

Incident number of bacterial food poisoning

- ***Food poisoning incidents during the past 15 years reveal that bacterial food poisoning is spread from June to September in Shanghai.***
- ***Through statistical analysis in historical data, the bacterial food poisoning admissions were found to be highly dependent on temperature and relative humidity***

上海市健康气象预报服务计划

SHANGHAI HEALTH FORECASTING SERVICE PROGRAM

概 述

DEVELOPED FOR
SHANGHAI HEALTH-METEOROLOGY PROFESSIONAL COMMITTEE

上海市健康气象专业委员会
2011年4月，上海
APRIL 2011, SHANGHAI, CHINA

中国气象局
China Meteorological Administration
(CMA)

世界气象组织
World Meteorological Organization
(WMO)

世界卫生组织
World Health Organization
(WHO)

昆士兰科技大学
Queensland University of Technology

奥克兰大学
The University of Auckland

纽约艾伯特大学
University of Alberta School of Public Health,

美国纽约设计规划中心
The Center for Active Design, NY, USA

International Symposium on Public Health Forecasting
organized by
The Shanghai Health Forecasting Service Steering Committee

上海市健康气象专业委员会
SHANGHAI HEALTH METEOROLOGY PROFESSIONAL COMMITTEE

Summaries: Some points for building urban resilience and science based urban services in a post-carbon and post-Covid-19 era

- ***Policy Interventions Summery,*** *it is necessary to develop:*

- Polices on planning and designing for controlling urban scale and population density; Policies for urban redundancy/flexibility and durability of urban life safety and critical infrastructure systems. Planning and design of these systems will aim for levels of redundancy/flexibility and durability that are commensurate with the increasing environmental, social, and economic stresses/emergency. Inter-city co-design and co-planning for coordinated actions are needed.
- Polices on enhancing effectiveness, efficiency, and safety of urban technical and industrial systems and processes, including their manufacturing, transportation, communications, and construction infrastructure and systems to increase urban energy efficiency, and reduce urban environmental footprint. Focus energy and resources on conserving, enhancing, and creating strong, vibrant places, which are a significant component of the neighborhood's structure and of the community's identity.
- Polices on promoting sustained urban healthy life style, such as washing hand, keeping social distance, taking vaccine etc.; Polices on prioritizing walking as the preferred mode of travel as a defining component of a healthy life. Polices on strong resettlement mechanism for the most vulnerable group in cities, such as for homeless, etc.

Summaries: Some points for building urban resilience and science based urban services in a post-carbon and post-Covid-19 era

- *Technological intervention Summary, it is necessary to develop:*

- Strong digital networks in support of new mode of work at home and on-line shopping as a new common lifestyle in cities ;

- Strong integrated urban information system to keep city dwellers risk informed for early response and reducing infodemic;

- *Address risks interconnectivity and its governance on climate-environment-health* related cascading impact to SED in urban areas

- Facilitate the development of a multi-hazard and impact information system and its services in urban areas at the policy, technical and institutional arrangement levels.

Summaries: Some points for building urban resilience and science based urban services in a post-carbon and post-Covid-19 era

- *Institutional arrangements summary, , it is necessary to:*

- *Conserve and enhance the health of natural systems* (including climate) and areas of environmental significance, and manage the impacts of climate change and climate extremes.

- Develop *a strong capacity on community centered/based governance for healthy community,* such as effective community connection by WhatsApp, We-chat etc., mobilizing volunteer for community carefulness, active connection with elder people; It requires the active participation of community members at all scales

- Develop *a strong capacity in remote medical diagnose and treatment* with a new type of public health carefulness network and mechanism;

Particularly with the following 3 recommendations as strategies in order to achieve safer, more resilient and sustainable buildings and cities for fighting the epidemics like COVID-19 pandemics.

- Address Integrated Urban Climate-Environment-Health Issue at the policy, technical and institutional arrangement levels
- *Address risks interconnectivity and its governance on climate-environment-health related cascading in urban areas* at the policy, technical and institutional arrangement levels.
- *Facilitate the development of a multi-hazard and impact information system and its services in urban areas* at the policy, technical and institutional arrangement levels.

Sustainable Cities & Sustainable Urbanization
Building Resilient & Climate Smart Cities
Thank you for your attention
What is good for human life
is good for all life

Recommendation 1:

- Address Integrated Urban Climate-Environment-Health Issue. healthy people, healthy environment, a healthy city and a healthy economy can be mutually supportive. This integrated approach helps reflect the growing need to synthesize more effectively our knowledge on the impacts of climate-environment-health-related multidimensional functionality and how it already affects human systems, urban supporting systems and economic systems. Embracing the urgent and transformative changes that are required to accelerate the transition to a more equitable and environmentally sustainable economy, and a healthier society, through top down policy guidance and bottom-up initiatives will underpin the well-being and prosperity of countries and their people now and in the future.

Recommendation 2:

- *Address risks interconnectivity and its governance on climate-environment-health related cascading in urban areas*. There is an urgent need to investigate further the direct and indirect linkages and effects of natural, biological, technological and other human-induced hazards to identify better and understand cascading and complex hazards and risks in a systematic way. The shift towards a broader view and a more context-dependent definition of hazards requires a systematic approach to risk that considers hazard, vulnerability, exposure and capacity together and better understands their complex interactions. Based on such efforts, improvement can be achieved for the targeted governance in urban areas.

Recommendation 3:

- *Facilitate the development of a multi-hazard and impact information system and its services in urban areas.* The need for a legal framework and clearly defined government agency interactions to enable the creation and maintenance of such services, and the scientific and technological advances are required to develop and implement them. The delivery of the integrated package of urban climate, environment and health information also needs to be considered. For example, using new methods of communication, social media will need to play an increasing role in developing and providing such integrated services.

UNDRR's Disaster Resilience Scorecard for Cities &WHO Health EDRM, esp. E-2,6,7,9.

- Essential One: Organise for Disaster Resilience
- Essential Two: Identify, Understand and Use Current and Future Risk Scenarios
- Essential Three: Strengthen Financial Capacity for Resilience
- Essential Four: Pursue Resilient Urban Development and Design
- Essential Five: Safeguard Natural Buffers to Enhance Ecosystems' Protective Functions
- Essential Six: Strengthen Institutional Capacity for Resilience
- Essential Seven: Understand and Strengthen Societal Capacity for Resilience
- Essential Eight: Increase Infrastructure Resilience
- Essential Nine: Ensure Effective Disaster Response
- Essential Ten: Expedite Recovery and Build Back Better