

Geo-science applications in public health and the environment



Dr. P.C. Lai

Associate Professor
Department of Geography
The University of Hong Kong

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Geographic Information Systems

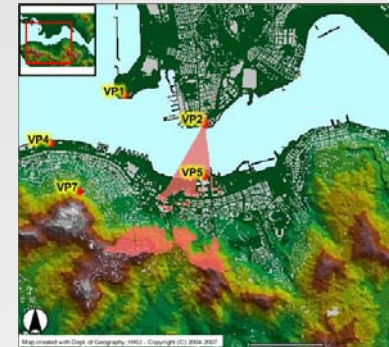
A Geographic Information System is primarily a tool for spatial analysis

and cartographic modelling

We use spatial analysis to explore or discover

Spatial analysis examines a natural event by considering the geography of a place

Where?

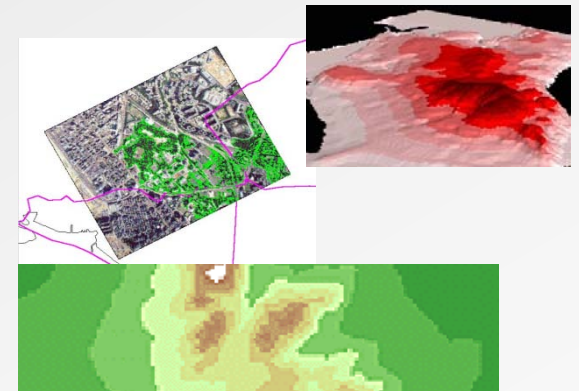


What?

Why?

How?

Cartographic modelling manipulates maps in different ways to simulate a natural event

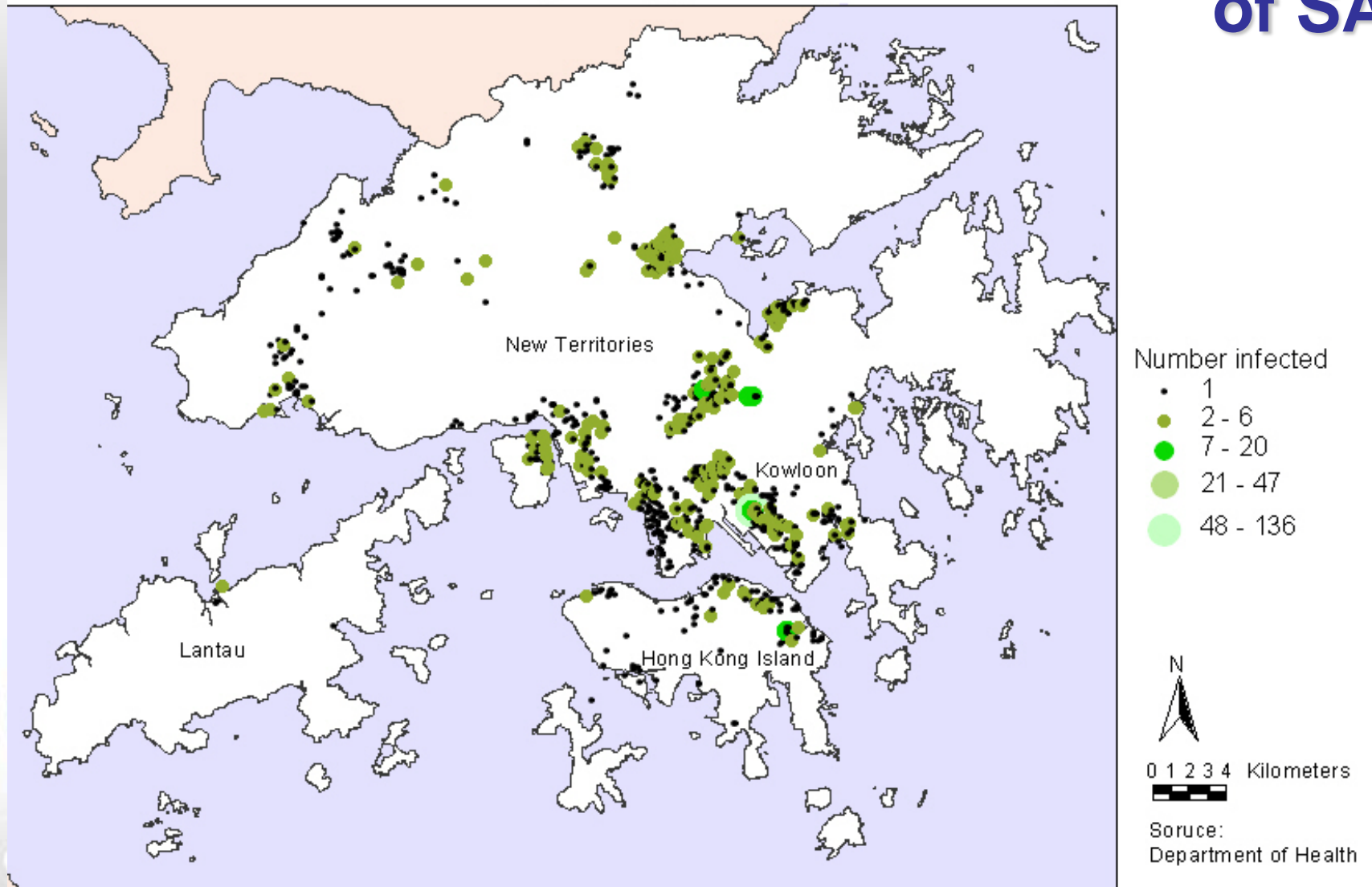


We use cartographic modelling to investigate further and to gain a better understanding of an event happening in a geographic space

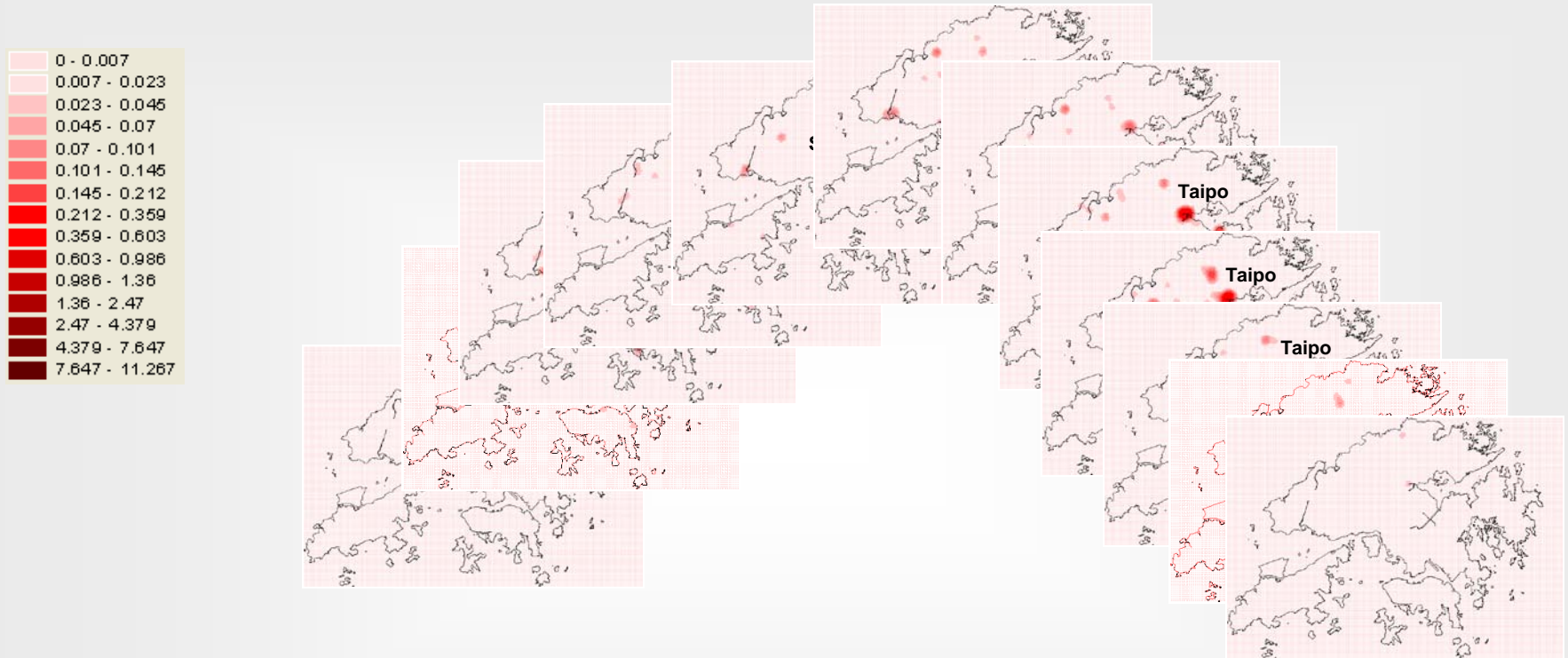
Research – Health (1)

Spatial Analysis of SARS

SARS Infected Cases in Hong Kong (February - June 2003)



Research – Health (2)

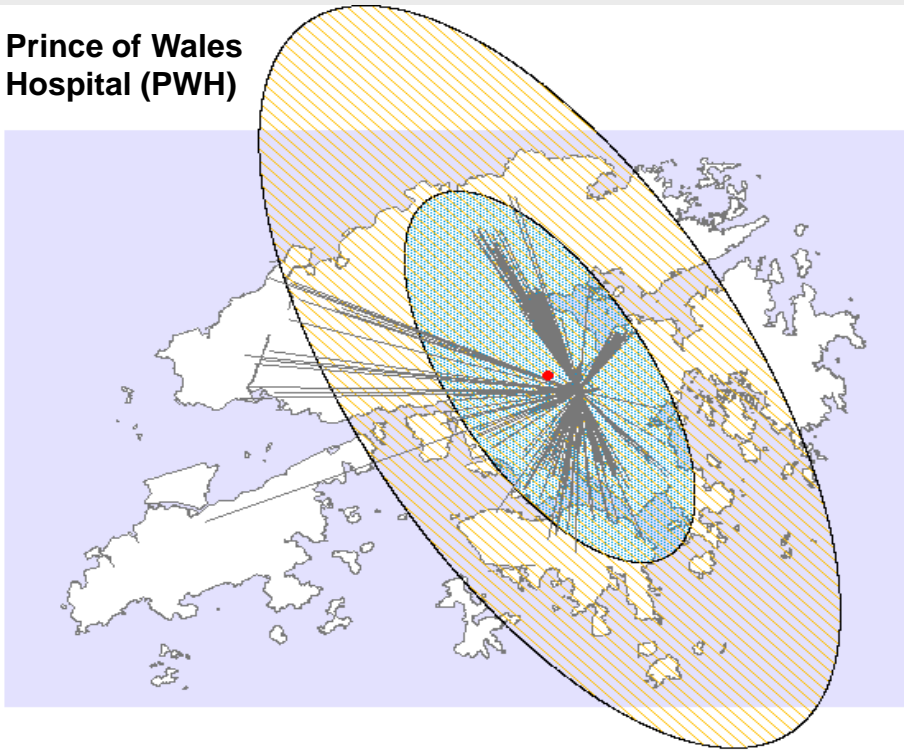


Animated series at <http://geog.hku.hk/pclai/kernel/>
(Username: kernel, Password: flash)

Research – Health (3)

Standard Deviation Ellipses

Prince of Wales Hospital (PWH)



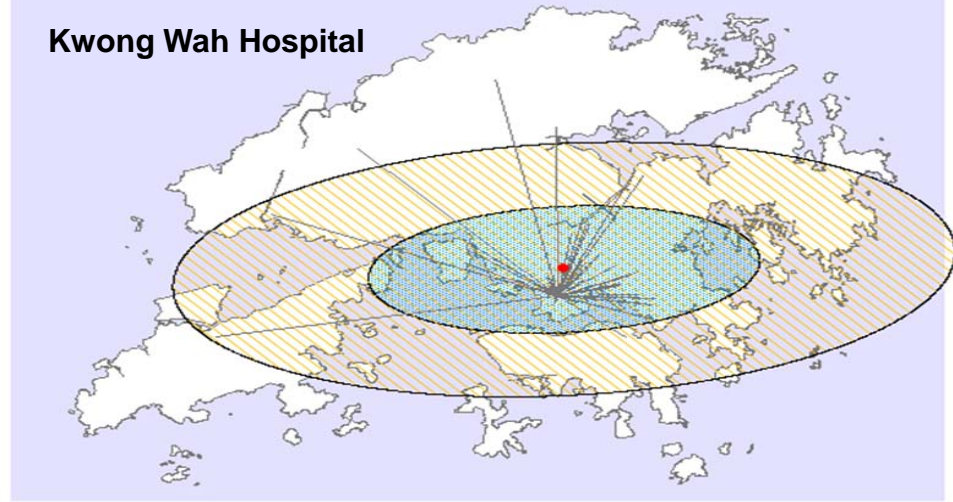
N = 212

Standard deviation ellipses

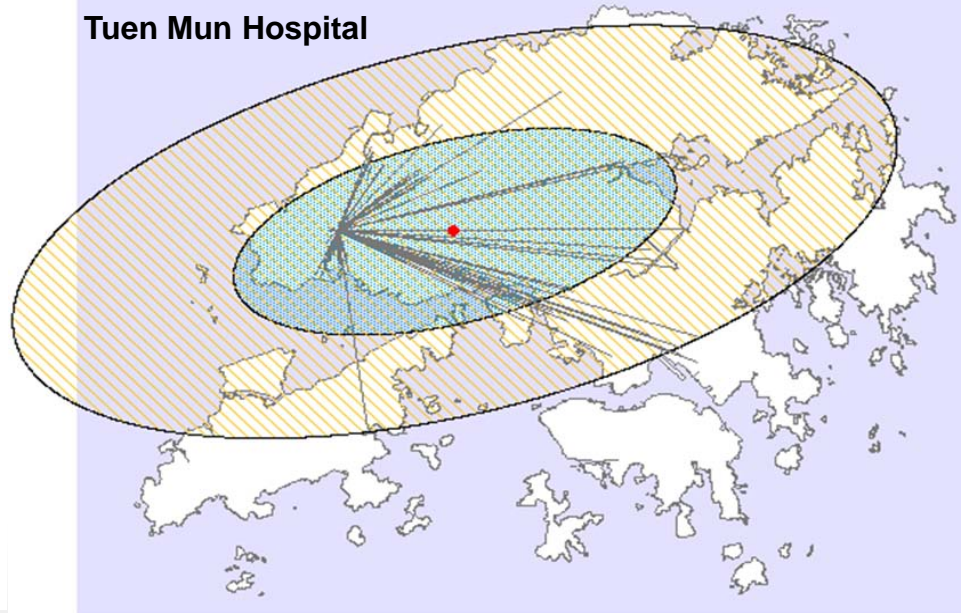
Ellipse 1: x-length = 7889.94m; y-length = 18541.37m

Ellipse 2: x-length = 15779.88m; y-length = 37082.74m

Kwong Wah Hospital

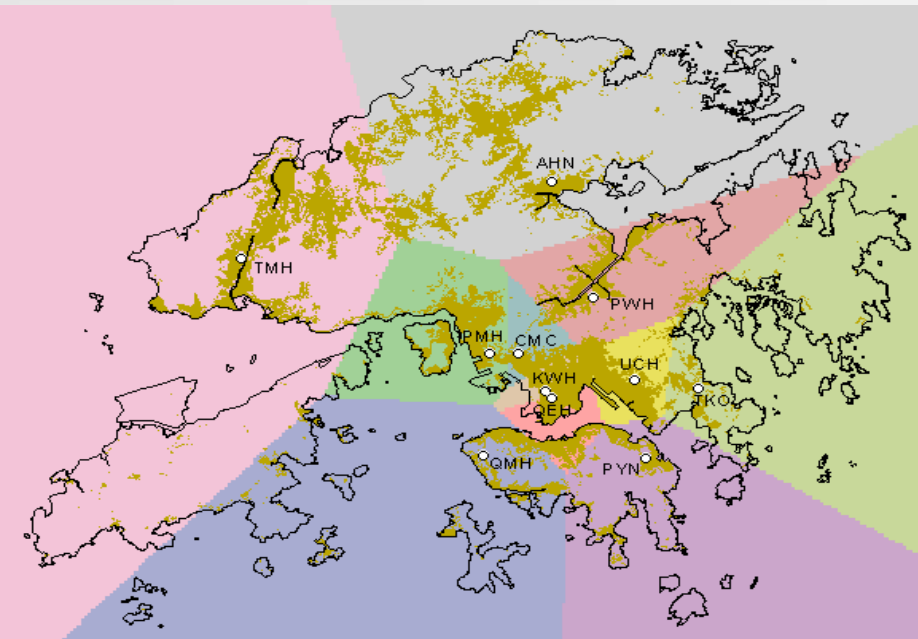


Tuen Mun Hospital

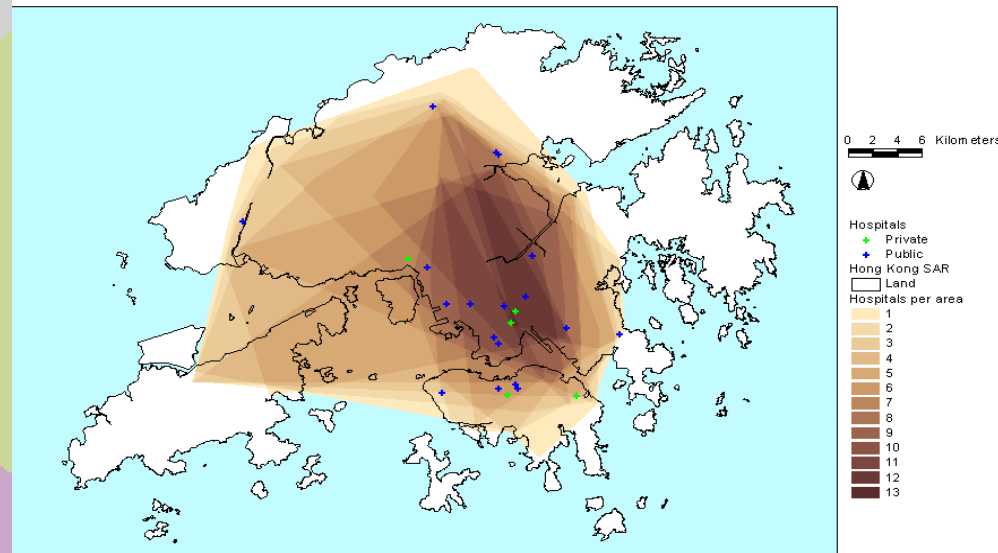
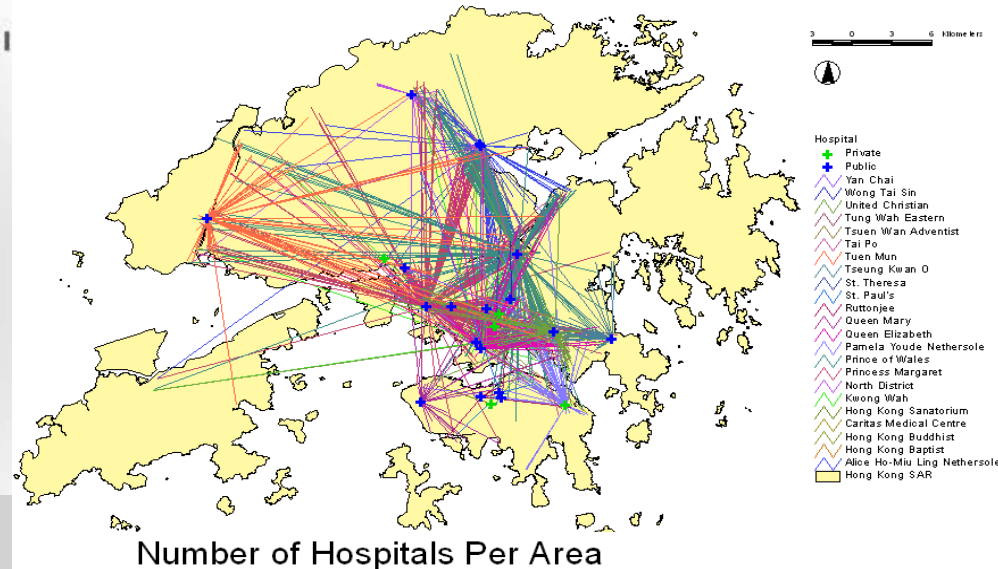


Research – Health (4)

Theoretical service areas
based upon proximity by
radial distance

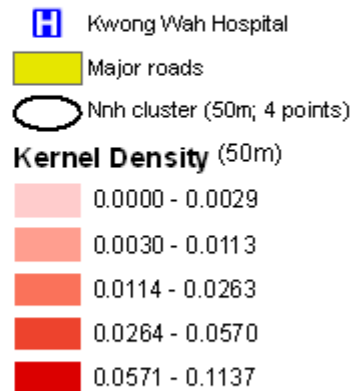
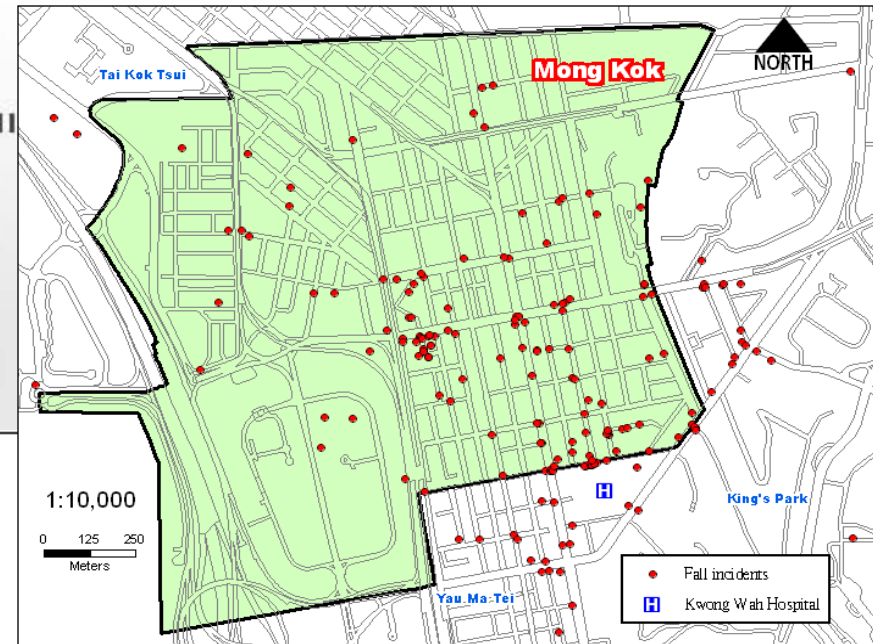
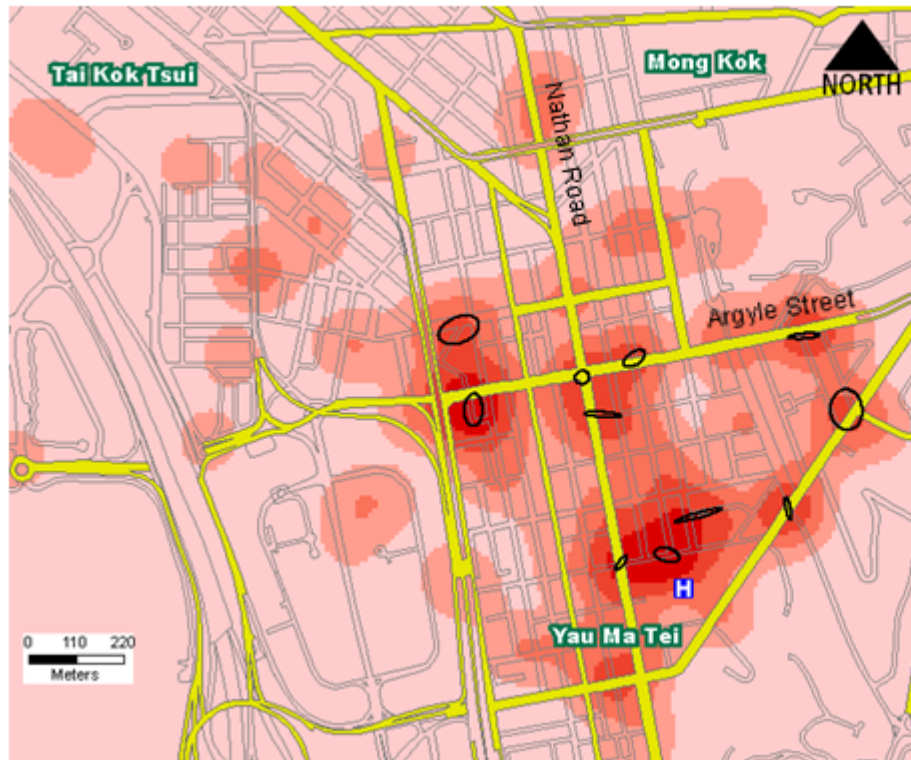


Service Areas of Hospitals (Based upon hospital admission record of SARS patients in February-May 2003 by the Hong Kong Department of Health)



Research – Health (5)

Risk surface of falls by kernel density method



Collaboration
between the
Kwong Wah
Hospital and
HKU

Nhh cluster (50m; 4 points)

Kwong Wah Hospital

Kernel Density (50m)

0.0000 - 0.0029
0.0030 - 0.0113
0.0114 - 0.0263
0.0264 - 0.0570
0.0571 - 0.1137

Cooked foodstall

0-10ra
10ra-20ra
20ra-30ra

Refuse collection point

0-10ra
10ra-20ra
20ra-30ra

Public toilet

0-10ra
10ra-20ra
20ra-30ra

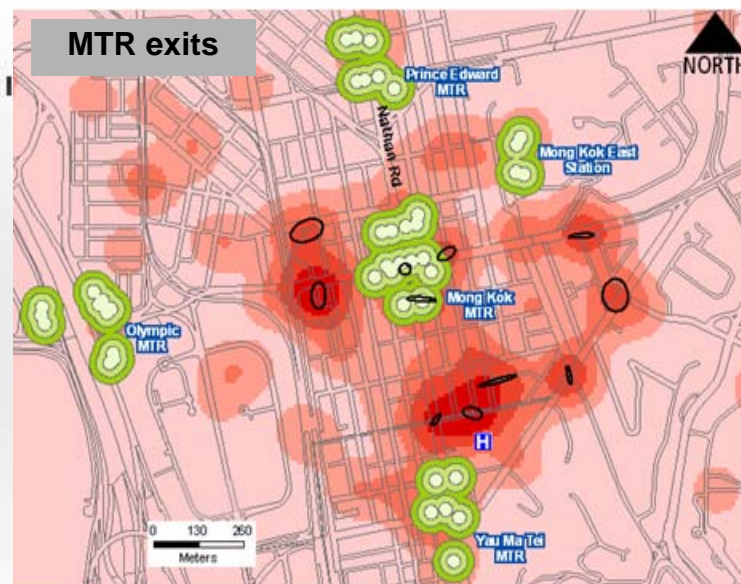
Research – Health (6)

Environmental risk factors of falls

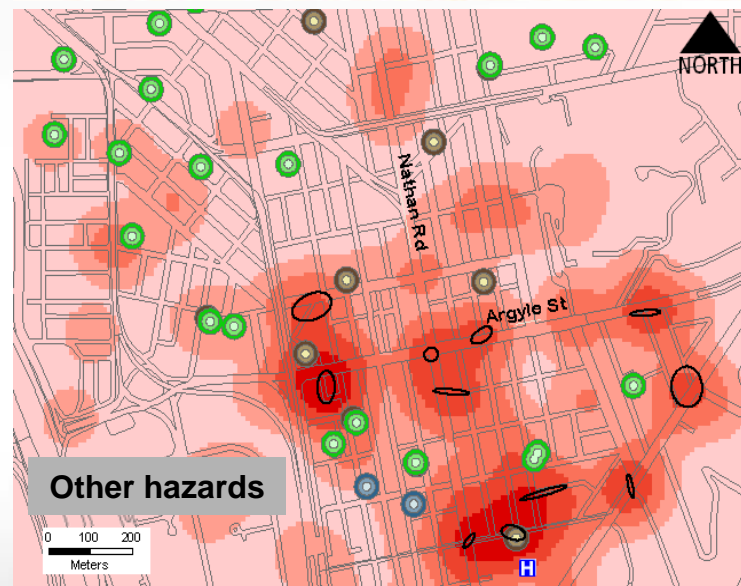
Outdoor wet markets



MTR exits

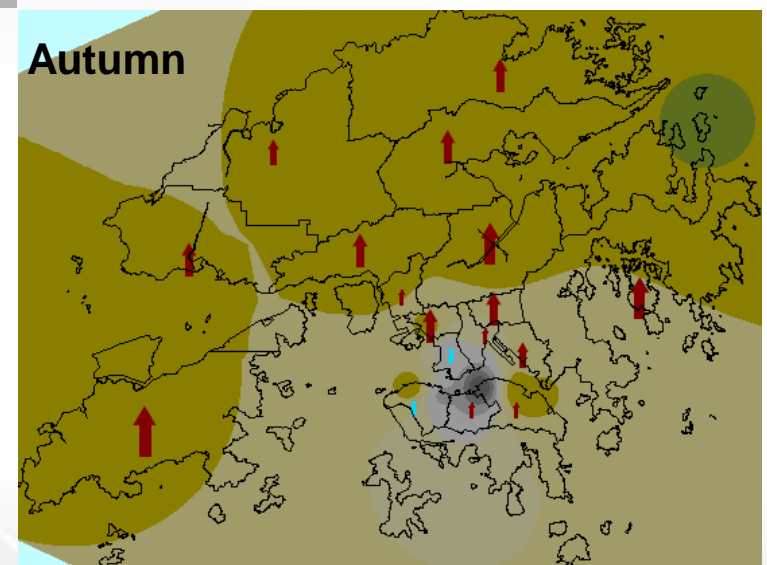
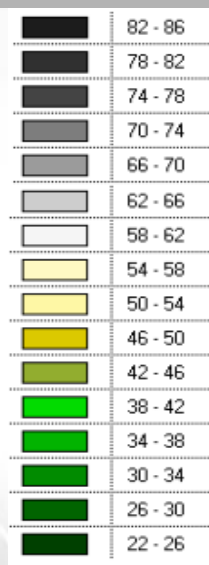
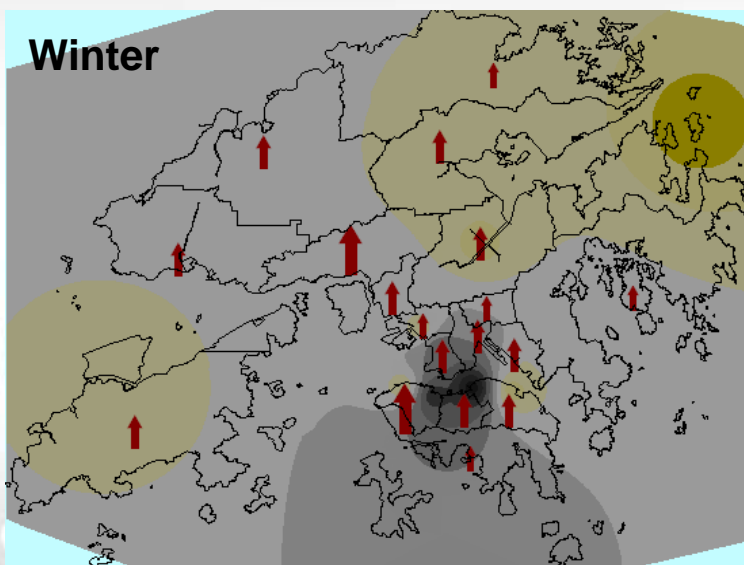
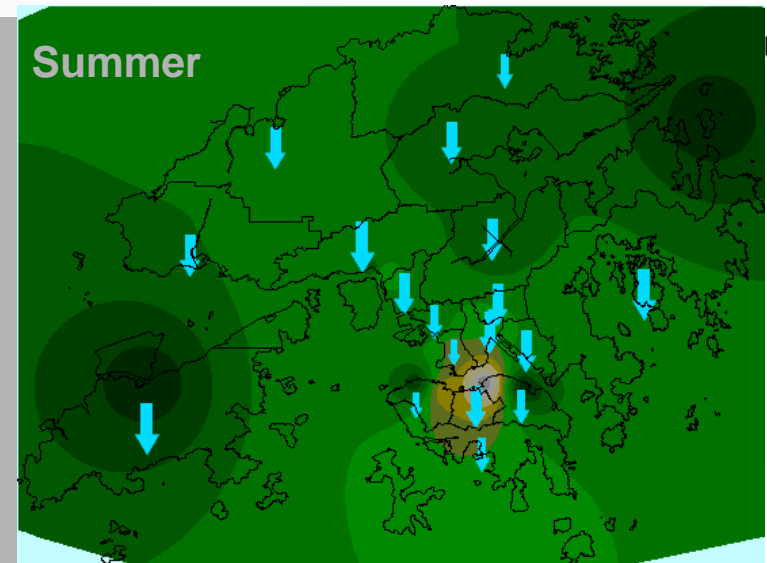
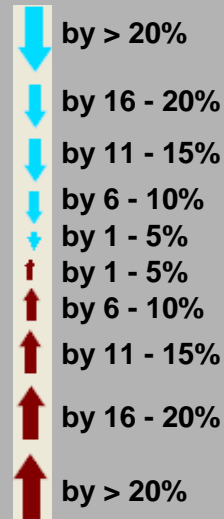
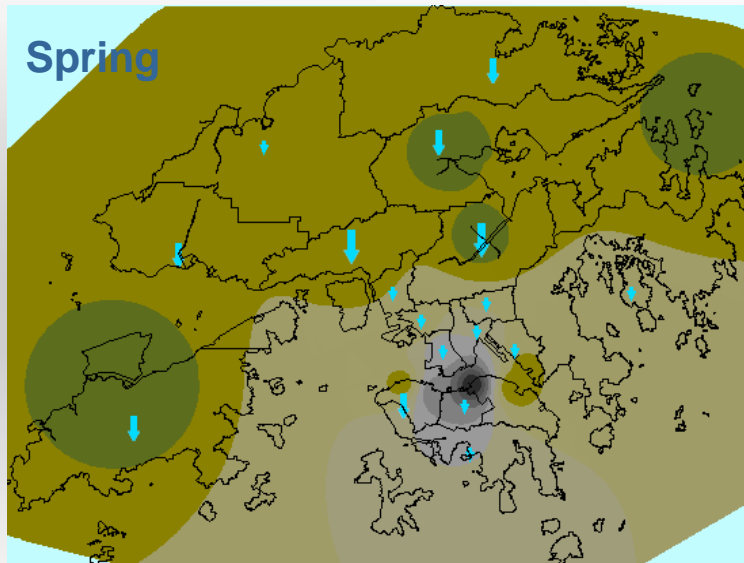


Other hazards



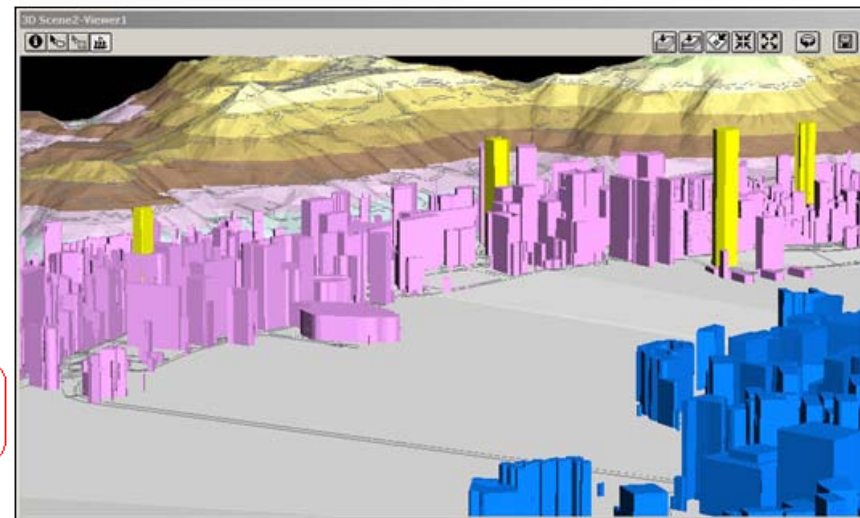
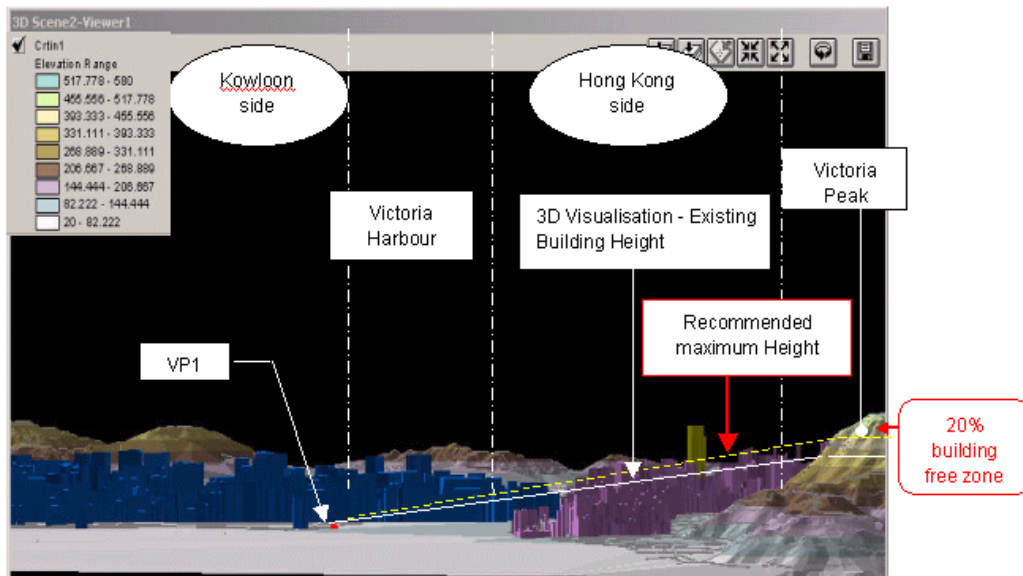
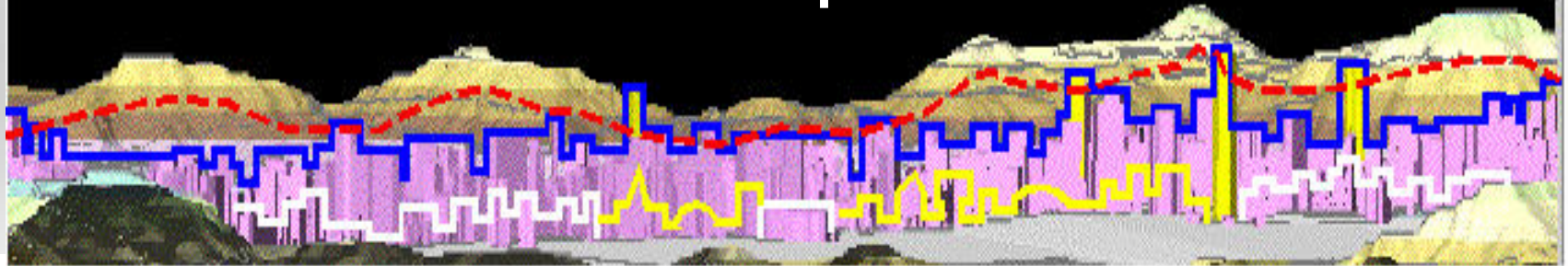
Research – Health (7)

Spatial Epidemiology



Research – Environment ⁽¹⁾ Planning

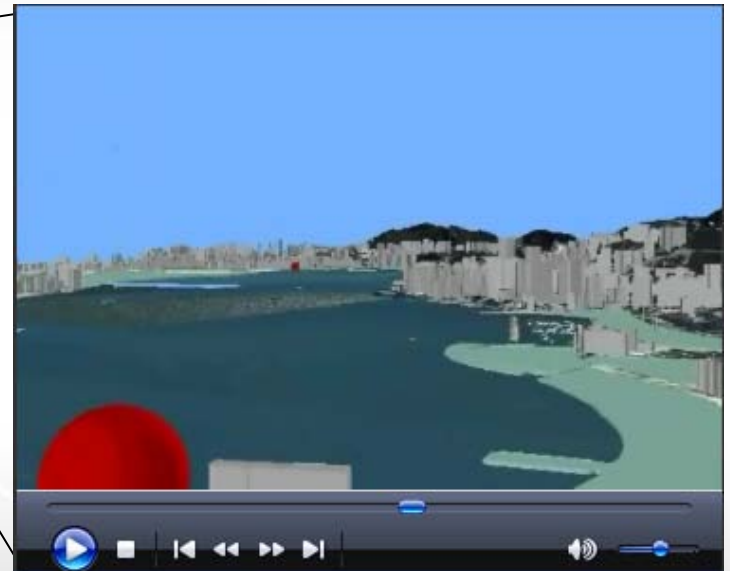
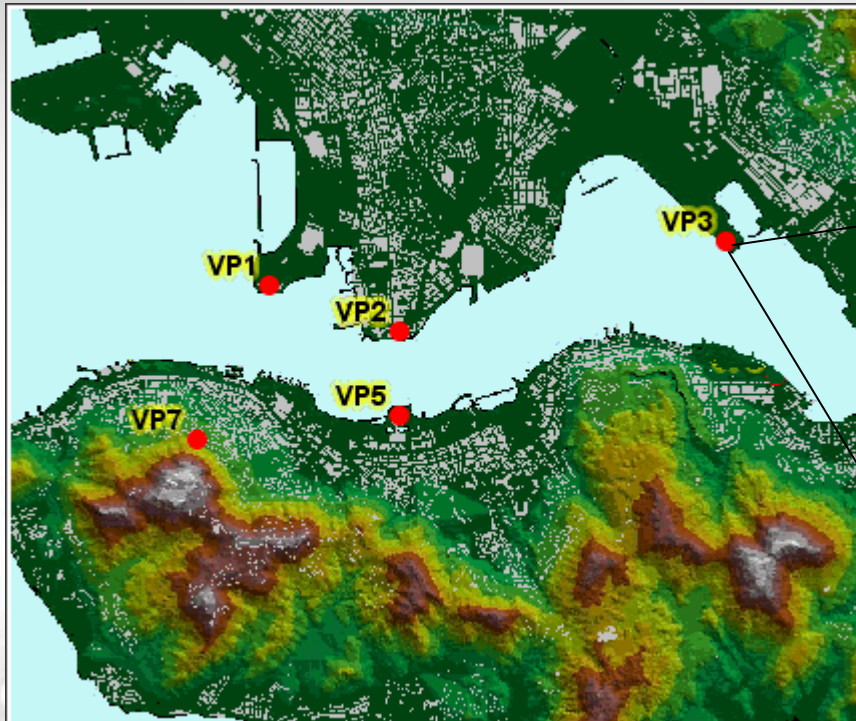
Proposed Terraced buildings and different roofscape



Research – Environment (2)

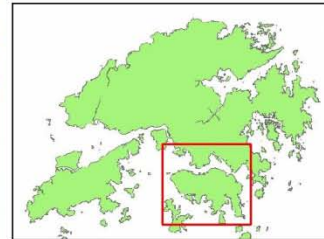
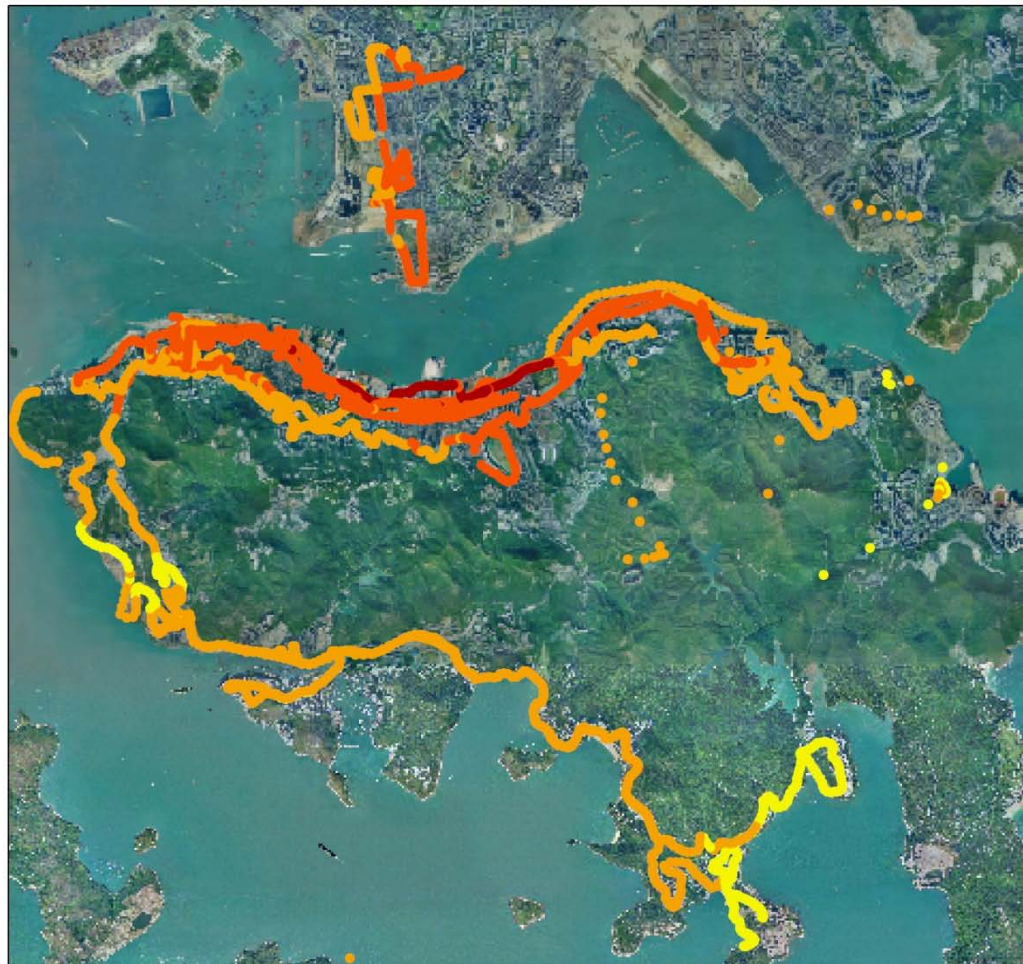
Public WebGIS Platform

<http://geog.hku.hk/gis-hr/>



Research – Environment (3)

Urban Heat Island (UHI) Magnitude (temperature difference between Ta Kwu Ling) on 23-May-2008



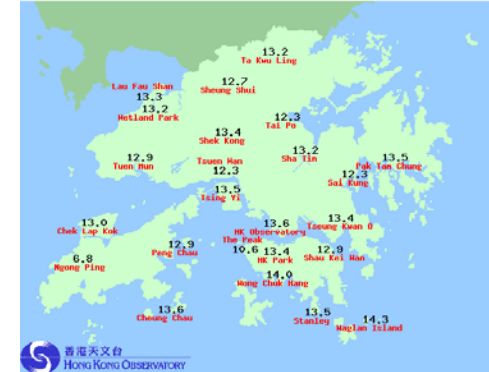
Legend:

UHI Magnitude (°C)

- -3.99 - -2.00
- -1.99 - 0.00
- 0.01 - 2.00
- 2.01 - 4.00

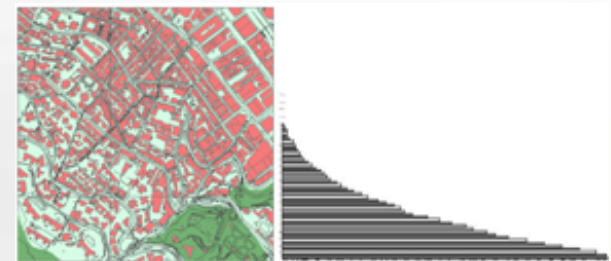
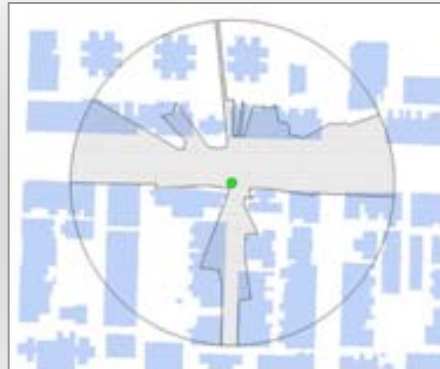
0 1,000 2,000 3,000 4,000
Meters

Air temperature at 12:00HKT on 14 FEB 2008 (°C)

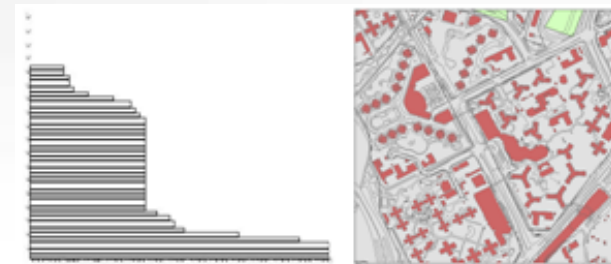


Research – Environment

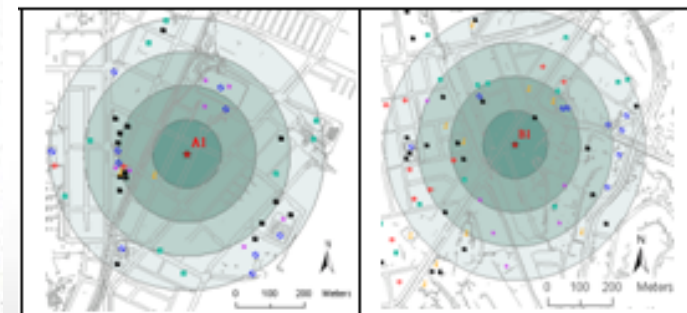
Sustainable (4) urban design



Central and Western district
(800m*800 m)



Yuen Long
(800m*800 m)



Research Challenges (1)

- Data integration
 - Various sources (public health departments, research organizations, hospitals, medical centers, and health insurance organizations)
 - Time-dependent, real-time, and voluminous
 - Broader issues of spatial data management, interoperability, and geoinformatics within the geosciences



Research Challenges (2)

- Practical limits of modelling
 - Computational challenges (manipulate, retrieve, and display large volumes of spatial data)
 - Sequential processing (data cannot be computed in one piece because of memory size limitations or extremely time consuming)
 - Tradeoff between scalability and more robustness + simplicity
 - Comparative static analysis as opposed to dynamic simulation, image processing, 3D graphics animation



Research Challenges (3)

- Leveraging visualization power of GIS
 - Indexing to speed access to large data sets (successively and visually zooming into more details)
 - Volunteered geographic information (VGI), geotagging, geotargeting
 - General enough to be flexible and specific enough to be useful (societal GIS for desktops, laptops, cell phones, GPS navigators, and other mobile devices anywhere, anytime)



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More Information



Please contact

Dr. P.C. Lai

Associate Professor

Department of Geography

The University of Hong Kong

Email: pclai@hku.hk

Tel: (852) 2859 2830

Fax: (852) 2559 8994