

# Edward Y Y Ng

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Five papers here represent my general research interest in the last few years to examine high density city (environmental) design, and to seek policy level measures to control and optimize the design efforts.

It has been important to walk the discovery path of fundamental sciences, design method, and policy implementation. Hence, all the papers here are not only scientifically based, more importantly, they all have policy implications now affecting design practices in Hong Kong and beyond.

One design project is included here to represent my architectural thoughts on ecological and sustainable design.

Ng, E, **Studies on Daylight Design of High Density Residential Housing in Hong Kong**, International Journal of Lighting Research and Technology, CIBSE, United Kingdom, 35, 2, pp. 127-140, 2003.

Ng, E, **Air Ventilation Assessment System for High Density Planning and Design**, Proceedings of PLEA International Conference 2006, Geneva Switzerland, 6-8 Sept 2006, 1-323.

Ng, E., Cheng, V., Gadi, A., Jun, M. and Lee, M., **Defining Standard Skies for Hong Kong**, Building and Environment, 42, 2007, pp.866-876.

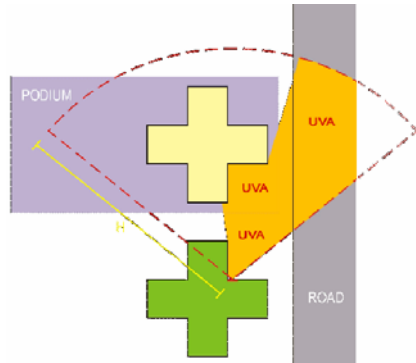
Ng, E., Gadi, A., Jun, M. and Lee, M., **Predicting Daylight Availability based on Forecast of a Weather Observatory**, International Journal of Lighting Research and Technology, CIBSE, United Kingdom, vol 39, no. 1, 2007, pp.69-77.

Ng, E, Wong, N H and Han, Meiqi, **Parametric studies of Urban Design Morphologies and Their Implied Environmental Performance**, in Bay, J H, and B L Ong (ed.), Tropical Sustainable Architecture: Social and Environmental Dimensions, UK, London: Architectural Press, an imprint of Elsevier, 2006, pp.151-180. [ISBN 0-7506-6797-4]

**A Bridge too Far – A Dream comes True.** A village bridge in Gansu, China. (Design Project)

Review of

# Lighting and Ventilation of buildings in Hong Kong



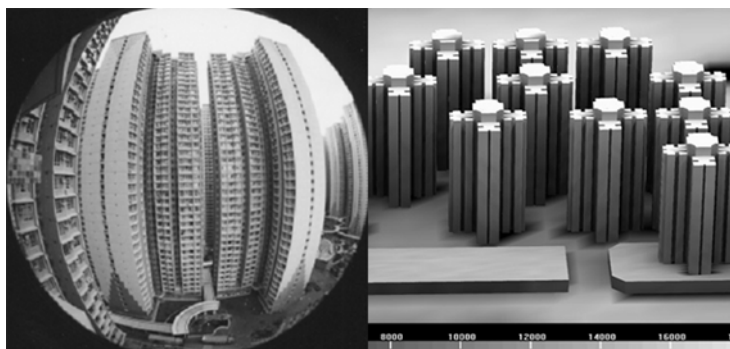
The UVA method of building regulations

## Impact

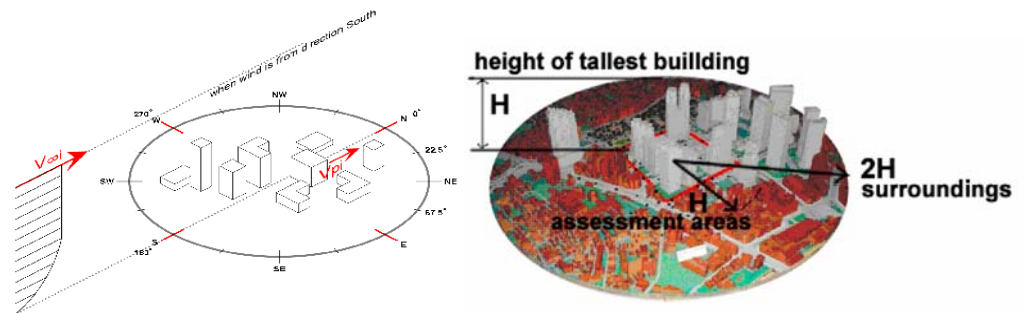
The research reported in this paper was commissioned by the Hong Kong Government. The findings of the research leads to the introduction of a performance based building regulations in Hong Kong in 2003.

Ng, E, **Studies on Daylight Design of High Density Residential Housing in Hong Kong**, International Journal of Lighting Research and Technology, CIBSE, United Kingdom, 35, 2, pp. 127-140, 2003.

The paper describes a series of studies that led to a change of building regulations in Hong Kong. It summarizes research works from 2000 to 2003. It walks the logical processes of the methodology, as well as introduces the findings. The study examined critically the historical rationale of the current building regulations, it looked into the current issues and problems, it conducted field measurement studies as well as carried out a user survey, and finally it outlined a new performance based assessment methodology based on the novel concept of Unobstructed Vision Area concept. The work is unique to Hong Kong, but the thinking process and the development of the underlying rationale is generally applicable.



# Air Ventilation Assessment System for Planning



## Impact

Since 2003, research works have been carried out with the Planning Department, HKSAR to develop an Air Ventilation Assessment System for planners and for development control. The idea has been to find a way that our high density city could be better planned. Better wind ventilation through the urban fabric for better thermal comfort in the summer months is the main objective. The paper quoted here epitomizes some of the findings. The study findings have been policy implemented and are affecting planning and design developments in Hong Kong:

The joint government bureau Technical Circular “Air Ventilation Assessment Method (AVA)”,

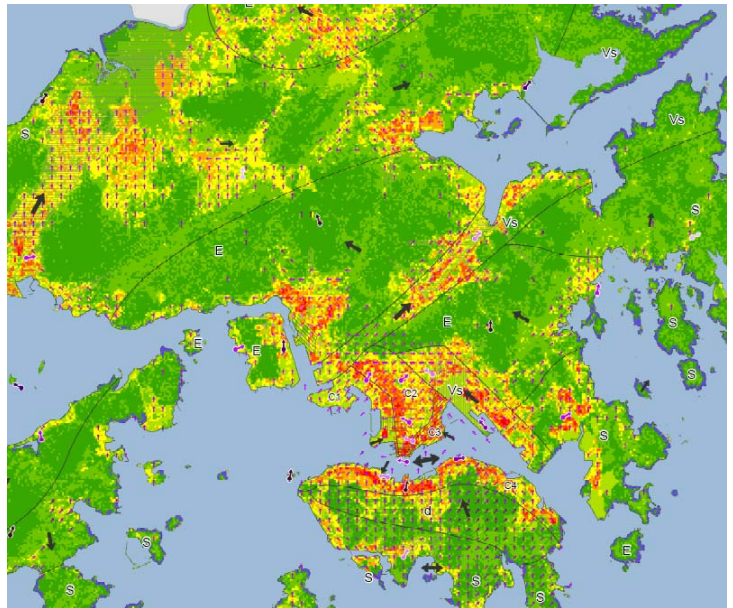
The Hong Kong Planning Standards and Guidelines (HKPSG) – Chapter 11: City Ventilation.

The study reported here has won the Hong Kong Institute of Architects **Research Award** 2005; the Professional Green Building Council **Grand Award** – Research and Planning Studies Category; and a **Best Paper Award** of the annual conference of Passive Low Energy Architecture in Geneva, 2006.

Ng, E, **Air Ventilation Assessment System for High Density Planning and Design**, Proceedings of PLEA International Conference 2006, Geneva Switzerland, 6-8 Sept 2006, 1-323.

In 2003, Hong Kong was hit by Severe Acute Respiratory Syndrome (SARS) from which many people died. The Hong Kong Government subsequently set up a Team Clean Committee to investigate possible infectious disease prevention measures and policies. One of the general feelings was that SARS should be taken as a wake up call to critically examine the city for healthy living. Team Clean then charged the task to the Planning Department, HKSAR. It initiated a study titled: “Feasibility Study for Establishment of Air Ventilation Assessment (AVA) System”. In 2003, the research contract was entrusted to Professor Edward Ng of Department of Architecture, CUHK. Over the next two and a half years, a number of studies were conducted. The study eventually led to a methodology of Air Ventilation Assessment (AVA). Unlike many countries with guidelines for dealing with strong wind conditions, AVA is a guideline for weak wind conditions specifically designed to deal with congested urban conditions. The AVA system basically establishes a method for project developers to objectively assess their designs. The Government of Hong Kong has adopted the system and will require all major development projects to undertake the assessment. The first test case has been a 328 hectare old-airport site in the city centre. The scientific and implementation processes leading to the AVA system is reported in this paper.

# Urban Climatic Mapping



## Impact

Finding ways to strategically plan a city environmentally requires climatic information that is scientifically based. Hong Kong is a high density city with a sub-tropical climate and a hilly topography. The government of Hong Kong has recently commissioned studies towards producing an urban climatic map. The extraordinary urban morphology of Hong Kong makes the task a unique challenge. A GIS based map has been created using planning and land use data. This has been classified and coded. Land use, ground coverage, building bulk, and greenery intensities have been incorporated. Overlaying it is the climatic data available from the Observatory. A draft Urban Climatic Map has been produced. Works are still on-going. Based on this initial Urban Climatic Map, the government of Hong Kong is re-working their urban zoning plans.

- Ng, E., **Towards Formulating an Urban Climatic Map - an Experience from Hong Kong**, Proceedings of **PLEA** International Conference 2007, Singapore, 22-24 Nov 2007. (accepted)
- An, X. P., Letzel, M. and Ng, E., **A Large Eddy Simulation Study of an Extremely Dense Neighbourhood in Hong Kong – an Experience of Methodology and Results**, Proceedings of **PLEA** International Conference 2007, Singapore, 22-24 Nov 2007. (accepted)
- Cheng, V., Ng, E. and Gvioni, B., **Outdoor Thermal Comfort for Hong Kong People: A Longitudinal Study**, Proceedings of **PLEA** International Conference 2007, Singapore, 22-24 Nov 2007. (accepted)
- Ng, E., **Some Issues Regarding Wind Tunnel Engineering for Urban Climatic Studies of High Density Cities with Complex Topographical Features**, invited paper, in Proceedings of Symposium on Architectural Wind Engineering, Centre of Excellence **COE** – Wind Engineering Research Center of Tokyo Polytechnics University, 5-6 November 2007, Tokyo, Japan.
- Ng, E., **Policies and Technical Guidelines for Urban Planning of High Density Cities – Air Ventilation Assessment (AVA) of Hong Kong**, invited paper, in Proceedings of the 6<sup>th</sup> International Conference on Indoor Air Quality, Ventilation and Energy Conservation in Buildings **IAQVEC07**, Sendai, Japan, 28-31 Oct 2007.



## Impact

The following journal paper represents studies that are fundamental scientifically. They summarize the works of the CIE IDMP Research Class Daylight Monitoring Station in Hong Kong. Results of the work are now contributing to the drafting of an CIE Daylight Design Guide.

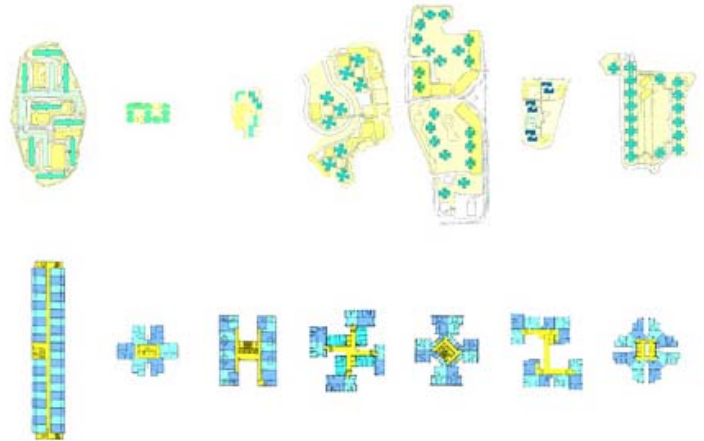
Ng, E., Cheng, V., Gadi, A., Jun, M. and Lee, M., **Defining Standard Skies for Hong Kong**, Building and Environment, 42, 2007, pp.866-876.

A CIE IDMP General Class Station was established in 2000 at the Chinese University of Hong Kong. The station was upgraded to Research Class IDMP Station in April 2003. The study, which includes the sky luminance scan data collected from April 2003 to May 2005, firstly fits the data to the CIE Standard General Sky definitions, which consist of 15 luminance distributions for modeling the sky from the heavily overcast sky to cloudless clear sky. Then the paper proposes a reduced set of CIE general skies (and their probability of occurrence) to represent the sky conditions of Hong Kong. This reduced set will be known in this paper as “Hong Kong Representative Sky” (HKRS). Further, the paper evaluates the sensitivity of vertical sky component (VSC) to differences between the HKRS and the standard CIE Overcast Sky model. Comparing with observed data, it is demonstrated that the HKRS could give better results. A reduction in error of approximately 20% to 40% could be expected, depending on the orientation of a surface. Using the HKRS, building designers could better predict daylight availability of their design. Energy saving and more sustainable buildings might result.

Ng, E., Gadi, A., Jun, M. and Lee, M., **Predicting Daylight Availability based on Forecast of a Weather Observatory**, International Journal of Lighting Research and Technology, CIBSE, United Kingdom, vol 39, no. 1, 2007, pp.69-77.

By using measured data of the research class IDMP station, a subset of three sky types and their probability of occurrence has previously been established to represent sky conditions of Hong Kong. This was dubbed the Hong Kong Representative Sky (HKRS). The HKRS allows a better prediction of daylight on vertical surfaces of buildings than the CIE Overcast Sky. The HKRS was still a static representation. This paper investigates the possibility of using weather predictions of the observatory to establish dynamically the HKRS. A methodology is proposed and the results indicate that the approach is feasible. It is established that the weather prediction information issued by the Hong Kong Observatory provides a reliable means for estimating probabilities of the sky types at a particular moment. By using this information, a better prediction of Vertical Sky Component (VSC) on building surfaces with a reduction of 20-30% mean absolute error can be achieved. Engineers and architects may use this more accurate information to design more dynamically.

# High Density city design

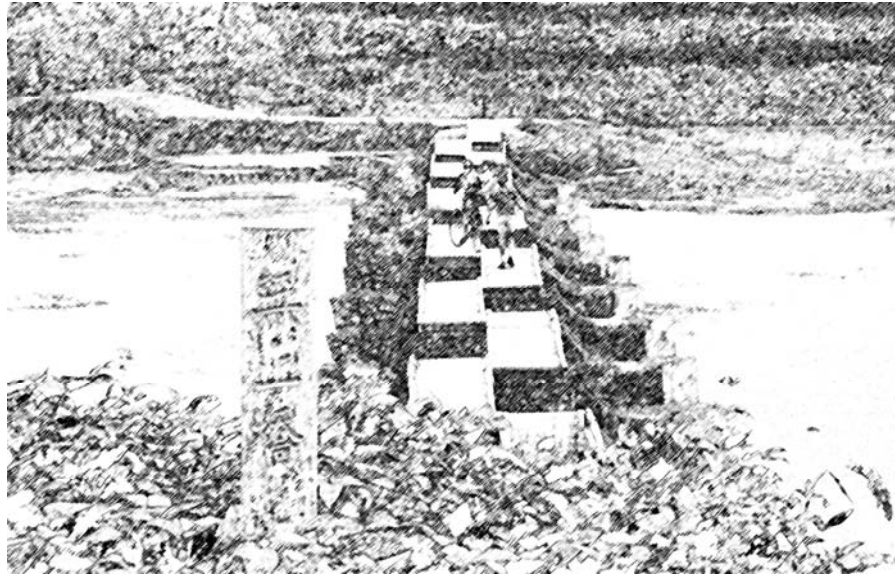


## Impact

The study and understanding of High Density city living using Hong Kong as a study laboratory has been conducted. The following paper examines the design issues of High Density Cities. Parametric studies have been done to quantitatively understand the issues. Findings have been incorporated into **The Hong Kong Planning Standards and Guidelines (HKPSG)** – Chapter 11: City Ventilation. In particular, the Town Planning Board of the Hong Kong government is now referring for example the gaps between buildings as a basic requirement of building separation.

Ng, E, Wong, N H and Han, Meiqi, **Parametric studies of Urban Design Morphologies and Their Implied Environmental Performance**, in Bay, J H, and B L Ong (ed.), *Tropical Sustainable Architecture: Social and Environmental Dimensions*, UK, London: Architectural Press, an imprint of Elsevier, 2006, pp.151-180. [ISBN 0-7506-6797-4]

Cities of tomorrow must embody the concept of sustainability. Urban design is not about drawing patterns on paper and its architectural studies could not be merely spatial, formal or geometrical. Urban design of the next millennium is about providing and optimising an infrastructure for the enjoyment of its inhabitants while at the same time minimising energy and resources needed, and maximising the benefits of the natural environment. An important consideration of urban design is to provide natural outdoor conditions that are pleasant to human activities. A well designed outdoor urban environment will also make the design of individual buildings within it easier. Hong Kong and Singapore share common climatic and environmental conditions. Both are cities with limited land resources with a growing and more demanding population. Planning the cities to cope with needs is an important task for their planners. There are many design parameters, for example: Development Density, Plot ratio, Site Coverage, Skyline, Building to Space Ratio, Permeability, Building Shapes and so on. This paper reports a study based on “skylight” as a design parameter, it reports how it affects daylight and natural ventilation performances. Experiments were conducted with physical models in wind tunnel and artificial sky, as well as using CFD and computational lighting simulation. The study establishes that, for example, by varying the skylines of the city, the overall daylight and natural ventilation performances could be improved drastically when compared to a city with a uniform skyline. A key message of the paper is that: through better understanding, high density cities could be planned and optimised environmentally without losing the development efficacy of the land.



## The A Bridge2far project has won

- 2008 **Jury Special Award**, Architect Regional Council of Asia (ARCASIA) Awards for Architectural Excellence in Asia
- 2007 Top 100 Designs that Improve Life, **Index 2007 Awards**, Denmark
- 2006 **AIA Citation Award**, American Institute of Architects (AIA)
- 2006 **RIBA International Awards**, Royal Institute of British Architects (RIBA), UK.
- 2005 **Project Outside HK Award**, Hong Kong Institute of Architects (HKIA)
- 2005 **Highly Commended Award** AR Emerging Architecture International Design Competition, Architectural Review, UK.

## The A Bridge2far project has been TV filmed by

- "A Bridge Too Far – A Dream Comes True", Cable TV news Highlights, 8 May 06; • "Green school and Life in North West China – the story of a bridge", The Monday File, a television documentary on our School and Bridge projects. TVB Jade 16 Jan 2005. And Again with English translation: Pearl Report – TVB Pearl 30 Jan 2005; • "A Bridge Too Far – A Dream Comes True", a special documentary of the project, Sunday File, TVB Jade, 18<sup>th</sup> Sept 2005.

## The A Bridge2far project has been exhibited @

- The Design, Technology and Realisation of a Village Bridge in Gansu, China", 26-31 Aug 2005, Taikoo Place, HK. • winning entries of AR Awards for Emerging Architecture, 6 Dec 2005 – 28 Feb 2006, Royal Institute of British Architects HQ, Portland Place, London. • Pacific Place, HKIA Award Exhibition, 24 Apr – 29 Apr 2006. • London Hilton Hotel – Park Lane, RIBA Award Exhibition, 23 Jun 06. • L'eau, source d'architecture (Water as an architectural fount, in Paris at the Electra gallery and in Toulouse at the Bazacle gallery, Sept to Dec 06 Exhibition, SESV Gallery, Florence, Italy, 22 May 07. • Award Exhibition, Kongens Nytorv, Copenhagen, Denmark, 17 Aug – 24 Sept 07. • Exhibition, 70<sup>th</sup> Floor, Bank of China HQ, Hong Kong, 12 April 07. • Exhibition, "Very Hong Kong – 10 years of Design", 80 top designs from 1997 to 2007 in Hong Kong, an international exhibition organised by Hong Kong Design Centre (HKDC), Oct-Dec 2007. The exhibition will tour China, USA and UK afterwards. • Exhibition, "Top 100 Best Designs that Improve Life", Gwangju Design Biennale 2007, Korea. (www.design-biennale.org), 5 Oct – 3 Nov 07

## The A Bridge2far project has been reviewed and featured in

- A Bridge too Far, in Design Like You Give a Damn: Architectural Responses to Humanitarian Crises, Architecture for Humanity (ed.), USA: Metropolis Books and Thames and Hudson, 2006. pp.272-275. [ISBN 1-933045-25-6] • Pang, L C., A Bridge Too Far, Reader's Digest, Sept 2006, pp.14-16. [ISSN 1017-4265]. • Cheng, L. et al., A Bridge Too Far, SEE magazine, issue 007, Julypp.38-41. [ISSN 1816-1057]. • Li, P K., A Bridge Too Far, Hong Kong Institute of Architects Journal, Issue 44, 4<sup>th</sup> Q., 2005, pp.26-29. [ISSN 1028-4842]. • "A Bridge Too Far – Project outside HK award winner", in HKIA Annual Awards 2005, Basheer Design Books (HK) Ltd. Publishers, 2006. [ISBN-988-98392-5-3] • "A Bridge in Maosi – RIBA International Awards 2006 winner", Design featured in Architects' Journal, EMAP Construct, 22.06.06, p.80. [ISSN-0003-8466]. • A Bridge Too Far, in "Folio-07", edited by He Limin, published by NUS, Singapore. • Vanishing Bridge Appears, in "The Times", London, 11 Jan 06. • A Bridge Too Far, in The Guide to the RIBA Awards 06, Merrell, London and New York, pp.192-193. [ISBN-10-1-8589-4342-6]. • A Bridge Too Far – a photo album, August 2005, CUHK. [ISBN 962-8272-06-3]. • A Bridge in Maosi, Gansu, Winning entry of AR Emerging Architecture 2005 Award, in Architectural Review, pp.66-67, Dec 2005, UK. [ISSN 0003-961X]. • Lotus International 130, Milan Italy, 2007, pp. 79-82. • A Bridge too Far, in Natural Architecture, edited by Alessandro Rocca, Francesca Tatarella Publisher, pp.172-183, 2006, Milan, Italy.