

Light Green and Dark Green

Green Architecture in Hong Kong, the densest city in the World

By Edward Ng

Rumour has it that when the Empress Dowager of the Ching Dynasty was asked to cease sovereignty of “an island” to the British Empire, she enquired her eunuch, “where exactly is it?” It was noted that she was a bit impatient when the map of the Empire and the insignificant dot at the corner of it was shown. “What is the British going to do with a barren piece of rock like that?” she questioned. “And I would like to make it a point that I should not be disturbed with such a minor request next time.” She added. She would never have imagined that, one hundred and fifty years on, this little ‘rock’ of 1000 or so villagers could become a major Asian metropolis and earned itself a place as one of the Ten ‘must visit’ places from the National Geographic Magazine.

Hong Kong is situated at the southern end of China. Hong Kong’s climate is sub-tropical. For half of the year from October to March, it is tending towards temperate with pleasant breezes, plenty of sunshine and comfortable average temperature of 20°C. Occasional cool fronts from Continental China can lower the temperature to below 10°C in urban areas. Nonetheless, these are the best months of the year. The other half of the year is hot and humid. Humidity of over 80% and daytime temperature average 28°C and up to 34°C characterise the weather. Tropical cyclones visit Hong Kong from time to time during the summer months bringing with them heavy rain and high winds of 150 kilometres per hour or more. Climatically, designing buildings for Hong Kong is not difficult. The strategy is to maximize natural ventilation, minimize solar heat gain and provide sturdy shelter for heavy tropical rainstorms and cyclones.

Dealing with the environmental characteristics of Hong Kong is straightforward. However, attempts to classify Hong Kong under any known social, cultural, urban and environmental theory have failed. Like the locals say, “there is only one Hong Kong, and it is impossible to find imitates”. In a nutshell, Hong Kong is a collection of islands totaled 1,100 square Kilometers and a population of 7 million. It is an economy one seventh the size of the United Kingdom’s and boasts a GNP of US\$26,000 per capita. It has the world busiest container port and houses some of the world’s most profitable enterprises. An airport the size of Gatwick and Heathrow combine, on land completely reclaimed from the sea, has just been built. It is a jungle city of high rises. The foundations of the world’s tallest building are being laid. And over 10 million visitors arrive yearly to marvel at all these. Yet amidst all the hustle and bustle of the economy and international travels, Hong Kong also boasts a collection of country parks almost 50% of its land area. It houses one of Asia’s most important Wetlands under the 1971 Ramsar Convention. It is also home to the 100 or so unique and endangered ‘Pink’ dolphins. And, within its tight boundaries, it is still possible to find fishing villages and settlements almost untouched by the onslaught of civilisation.

Hong Kong is a land of paradoxes. It defies gravity and common sense – literally in that order if first time visitors had the opportunity to land at the old Kai Tak Airport flying over the then Kowloon Wall City at point blank. Given the circumstances and the dilemma, how should one proceed to define Green Architecture in Hong Kong? If there is such a thing as Green Architecture in an ultra-dense, ultra-compact metropolis, what is it? And how should it be critically understood? What shade of Green could it be conveniently referenced?

Hong Kong has always been a ‘sustainable’ city long before that term is used – or hijacked – by the environmentalists. Since 1949, when the communists took over China, Hong Kong has been a safe haven for economic and political emigrants from China. These people, millions of them over a period of some 30 years, bought with them nothing but a hope to ‘ensure and sustain a quality of life’ for them and their next generations. This desire to survive and to make life has remained the spirit of Hong Kong until today. Hong Kong has no natural resources of its own. Apart from the air one breaths, everything, including water, has to be imported. The gregarious and tolerant mentality of an average inhabitant of Hong Kong could best be seen in the houses, or pigeonholes, they live. Mass housing of unprecedented height and density is the norm in Hong Kong. The newly constructed residential sites in satellite towns of Hong Kong are designed with a Net Residential Density of 2000 to 2500 inhabitants per hectare. If there is a Nobel Prize on the most efficient and effective use of land resources, Hong Kong will win hands down. Blocks of apartment some 100 metres high are packed so closely together that the distance between them is a meagre 40 metres. To ensure that no valuable land is wasted, the blocks are built on top of a multi-storey podium, which houses all the amenities required to support the community. To service the town, mass transit railway and main artery are built, cutting the estate into manageable plots. Any left over is given to charitable organization for school buildings and community centers. The crumbs are collectively known as parks and leisure grounds.

One of the many new towns recently taking shape is Tseung Kwan O situated on the east side of the Kowloon peninsula. 18 years ago, part of the town was a landfill site, then massive land reclamation took place. Now it is a striving town of two hundred and fifty thousand inhabitants living in an area just shy of 600 hectares. In 2 years time, the mass transit line will be completed. By then it will continue to grow until it reaches five to six hundred thousands, or a Gross Residential Density of 1000.

Situated at the edge of the town center is the award winning Verbena Heights by Anthony Ng Architects Ltd. The development is reputed to be the first high density housing in Hong Kong that takes Green issue seriously from day one. According to Anthony, “the project represents an attempt to address environmental design concerns (energy and waste minimization, resources efficiency, water conservation, occupancy health and comfort) appropriate to the sub-tropical climate whilst providing a high density, high rise housing design integrating with identity and delight for residents. Instead of the prevalent cruciform plan commonly adopted elsewhere in Hong Kong, an alternative thin linear layout is developed for the residential floors.”

The site area of 2.1 hectares is planned to provide 140,000 square metres of floor areas for 8000 inhabitants. Two third of the flats are for sale while the rest are for rental.

The linear blocks are planned around elevated landscaped courtyards. Extensive wind tunnel tests were conducted to maximize natural and cross ventilation at ground and the upper levels. The building height steps down towards the directions of the prevalent summer breeze. Multi-storey mid-air balconies were devised to enhance wind permeability of the building mass. The results were drastic improvements in air movement in and around the site. So much so that windbreaks and canopies have to be employed at strategic positions to enhance pedestrian level wind climate.

The solar and daylight studies went hand in hand with the ventilation studies. External screens and light shelves were employed and designed to provide effective shading as well as to enhance daylight of interior spaces. Practical considerations were factored in. For example, vertical shading devices were preferred. As they are less problematic in terms of maintenance and hygiene in high rise living conditions. Environmentally friendly construction process was also studied and implemented. Low embodied energy, longer lasting and recycled materials were specified as far as possible.

The development is provided with a wide spectrum of community facilities at the ground and podium level. Landscaped and covered walkways connect the blocks together, to other nodal points and to nearby public transport interchange. The careful consideration of human scales and spaces at 'walking' intervals ensures that it remains a pedestrian city. In reality, it costs more, takes longer and less pleasant to do what needs to be done in a day driving than walking.

Whilst Verbena Heights consciously addressed the issue of environmental design, another urban high density housing by Rocco Design Ltd, approached the notion of sustainability more subtly. "Since the nineties, when we started to deal with projects in the midst of our urban areas, the term 'relationship' has for us taken on a wholly new dimension. Pre-occupied with the making of architecture in the city, I have come to cherish the notion of the city in architecture." Rocco Yim articulated.

Hollywood Terrace is located at the heart of an old and established district in urban Hong Kong. The challenge was to respect, 'sustain' and complement the existing open space, traffic and circulation systems, and the urban pattern in the neighbourhood. Nesting through the development is a series of public landscaped terraces, lifts and stairs forming part of an elaborate and efficient route linking the two plateau of the sloping site allowing 24 hour pedestrian access through it. The forms and levels of the route are designed around the natural contours of the site. Cuts and fills were minimized. The journey is a pleasant and a surprising one, almost like an oasis and a maze in one. Although the private and public routes and spaces were separated, there is little visual segregation. "The social fabric in and around the site must be sustained." Rocco said.

Environmental comfort has not been neglected. The apartments are configured so that they all face predominantly north and south – despite a very difficult site. "It was an evolved version of the standard plan, so much so that it is cost effective as well as site specific." Rocco pointed out. Overlooking between apartments is essentially avoided

thus allowing the occupants the option to pull back the blinds for daylight. And despite the small unit size, most living areas are capable of being cross-ventilated.

Both Verbena Heights and Hollywood Terrace were designed for the Hong Kong Housing Society – a provider of affordable housing for the low and mid-income groups. There is little advanced technology or gadgets employed. There is no money for anything excessive. Everything must be there for a reason, and most of the time for a couple of reasons. However, one of the reasons must surely remain hidden from the client. Almost unspoken and unspeakable – for a money value could not be easily assigned – is the notion of pose and purpose. For the trained, it is that little touch of aesthetics, almost magical, that glorifies the ordinary. For the layman, they are recognizably different from the rest of them; it is about identity and dignity. After all, life is only worth sustaining if it is dignified.

Talking about dignity, in Hong Kong, social status and recognition, at the workers' perspective, can sometimes be attributed to the number of jobs one holds, the hours one works and the number of phone calls one gets from his mobile. It is an accepted sign that one is getting there. Recent surveys and polls suggest that working hours among workers and students in Hong Kong are the highest in Asia. Whilst these people have never been too choosy about their work environment in the past, recent push for value adding and a higher grade of knowledge workers provide an opportunity for the local architects. Most of the time, this could mean another expensively clad high-rise tower. But there are more sensitive offerings. Jockey Club Environmental Building by Simon Kwan & Associates Ltd is one such example. Completed in 1996, it is situated under the flight path of the old Kai Tak Airport. The building adapted the principles of traditional Chinese building typologies, technologies and methods to contemporary urban circumstances. Located at the northern end of a small urban park, it has a modest but significant presence as a signifier and an entrance to the park. Quoting Simon Kwan, "If the cylindrical building form and its attendant fenestration refer, stylistically, to the traditional Hakka village fortress, then the decision to carve a public corridor through the building represents an interesting extension of this respective building typology. Two key insights apply. First, the permeable rendering of the building constitutes a signal of openness, optimism and confidence. Secondly, and perhaps more important, such a tactic complements and facilitates the building's environmental agenda."

The building is cunning for its simplicity and purity of form and planning. An open air public corridor runs through the building demarcating and defining the symbolic north south axis of traditional Chinese architecture. An open atrium greets the route providing natural ventilation and lighting to the passer-by as well as to the occupants of surrounding office spaces. The transparent atrium cap functions as double glazing, admitting daylight and controlling heat gain.

Smaller windows dominate the external façade. The solid east and west elevations need no additional help to shade the sun. The recessed, but fully glazed, windows signify the north south direction of the circular form. This majestic gesture is symbolic as well as environmental. For the more agreeable times of the year, windows of the offices could be opened.

“The conscious act of place making is intrinsically linked to the environmental features of the building.” Simon reckoned. The interplay of inside and outside through the building, the joy of light and shadow, solid and void, natural and artificial, and ‘yin’ and yang’ has its genealogy in Chinese architecture and philosophy. To be this close to the remote heritage where all these come from is to acknowledge the forces beyond the natural elements. If there is a hidden agenda, and if it has to be explained with the term sustainability, it appears that the building is answering it with poise and civility – almost like a Mandarin. “We search for solutions that elevate the pragmatic aspects of an architectural challenge, transform presumed constraints into engaging design and celebrate the refinement of necessity.” Simon concluded.

In mark contrast to The Jockey Club Environmental Building vernacular approach and appearance, the Kadoorie Biological Science Building by Leigh & Orange Architects Ltd celebrates an elegantly innovative architectural solution for a highly technical building on a small and constrained site. Deyan Sudjic’s critical commentary of Green building may be used to illustrate the contribution made by the Kadoorie Biological Science Building: “We assume that buildings are green if they look hand made and are built of natural materials --- but working in aluminum and glass might in the long run create a more genuinely sustainable architecture.”

The ten storey building, sits on eight 10 metre high upturned pyramidal column structure, contains eight floors of laboratories and one upper floor of supporting aquariums and greenhouses. The unfortunate east-west orientation of the site means that the buildings major facades will be exposed to long hours of solar heat gain. To the credit of the architects, the environmental challenge was conveniently translated into a powerful and yet effective architectural solution. The ‘black-box’ laboratories were enveloped with a concrete enclosure and semi-perforated outer curtain walls. The two are set 2.5 metres apart forming external zones for services, maintenance and a filter to the external environment. The double skin arrangement was designed to prevent solar gain and create a stack effect taking unwanted solar and equipment heat away. The result is a calculated reduction of 37 tonnes of CO₂ per year.

Beneath the high tech skins is the back box. This ordinary looking entity boosts a net to gloss percentage floor ratio of approximately 80%. This is achieved by adopting a deep plan double suite arrangement. There has been a serious attempt in designing this back box to be as flexible as possible. A claimed life of 50 years was aimed. Each of the laboratory suite measures 24m x 24.6m by 3m high. Spaces are subdivided using proprietary metal partitions pressure fixed between floor and the suspended ceiling. The space is serviced from the ceiling on a 3 metre grid using flexible connectors. The benching system is a custom designed modular system with an integrated serviced spine. They could be bolted together in different combinations with flexible service connectors. High performance movable fume cupboards utilizing the latest ‘votrex’ fume scrubbing technology are used. This allows the air to be re-circulated, thus obviates the need to extract to atmosphere under most circumstances. The laboratory suites on various floors are serviced separately. This allows safe zoning and minimizing energy needed.

The building does not sit on the ground. It hovers on eight upturned pyramidal column bases. Apart from saving on foundation costs, it frees the ground plane for circulation, it reconnects the urban fabric together and provides a covered, naturally lit

and ventilated area for people to gather, rest and eat their lunches. During the early hours in the morning, passers-by are greeted by the calmness of people practicing Tai-Chi, creating yet another scene of a paradox of life.

The building is no obvious solution. Paraphrasing Terence Smith, architect, “I would like to say that the building must be regarded a substantial long term investment of the University. We had a head start with the client and the sponsor both interested in the environment. There were hurdles, especially when new and innovative ideas had to be introduced to the statutory officials and to the users. One must persevere and do what one believes.”

The four projects may be unrelated in their own inceptions. They might have looked very different from each other. Apart from the two residential projects, they serve different purposes. However, they all share common agendas. And they are: How the spaces could be designed to be as dense and as flexible as possible to minimize the resources used in the first place. How the building addresses the land and the urban fabric around it. And how the building contributes to a matrix of movement and human needs. “If one looks at human history, it has always been the cities that sustain and foster ideas, culture and courageous endeavors. I can see little alternatives. Cities will continue to be dense and getting denser. The challenge is not so much to create green buildings, but to create ‘lungs’, green spaces that allow these buildings to come together, sometimes as close together as they could. At the moment, Hong Kong’s greatest natural assets are the harbour and the hills around it. Our role must therefore be to design a matrix of green spaces, corridors and connections in between the two.” Terence Smith commented.

To look at the building and to evaluate them against the amount of energy used, the material spent and the waste they produce in isolation is missing the point. In a dense built environment, it is the combine effects of the buildings themselves and the collective whole of buildings supporting human life with the minimum effort and maximum efficiency that count.

Since the Chief Executive’s Policy Address in 1998, environmental sustainability has been a catch phrase in Hong Kong. The Hong Kong Institute of Architects (HKIA) has set up an Environment and Sustainable Development Committee to try to pull things together. It has just completed a series of events and seminars under the Greening 2000 banner. Responding to Brenda Vale’s keynote speech in one of such seminars, Mr Rocco Yim, reckoned that Hong Kong is already doing a lot of what needs to be done correctly. Hard figures support that claim too (Table 1). The per capita energy consumption is low compared to cities of equivalent size and economic standing, like Singapore. What is more important is that the energy has been very efficiently used to generate wealth and a material quality of living.

Table 1 Energy consumption and CO2 emission - Hong Kong vs. other key industrialized nations.

	Emission		Consumption	
	CO2 / capita Metric tonnes	CO2 Kg/ PPP \$ of GDP	Kg of oil equivalent / capita	\$ GDP / Kg of oil equivalent
Hong Kong	3.7	0.2	1,931	12
China	2.8	1.0	902	0.7
Singapore	21.6	0.9	7,835	3.8
Japan	9.3	0.4	4,058	10.5
USA	20.0	0.7	8,051	3.4
UK	9.5	0.5	3,992	4.8

**1997 data (source: United Nations Statistics Yearbook, 1997.)*

Paraphrasing Mr K S Wong, Chairman of the aforementioned committee of HKIA, “In Hong Kong, two densities matter: The urban density that is conducive to the population in general and the occupancy density that is acceptable to the family units. Wrestling the two is something a lot of on-lookers missed.” The urban jungle has a lot of concrete and few trees, but it occupies so little space that trees could continue to grow around it. Buildings are compact, efficient, mostly mixed use and provided with well-planned amenities at walking distance away. The towns and settlements are so compact that they could be served by a highly efficient and cost effective public transport system.

It does not mean that nothing more could be achieved. “What needs to be done now”, Rocco reckoned, “is to seek ways to reduce the sunk costs of the mega-metropolis.” He is right. Ultimately, it is not the cost of energy, but the results of using the energy that will put a halt to the ‘quality of life’ in Hong Kong.

If there is a need to characterize it, one might argue that whilst the rest of the world is pressed to achieve a ‘light green’ version of sustainability, Hong Kong, given its unique circumstances, is leading a ‘dark green’ version of the same. It has proved itself to be a viable alternative. Perhaps in 20 years time, when land resources in other parts of the world approaches the same severity experienced in Hong Kong, the dark green version will begin to make sense. In the meantime, the grass is always greener elsewhere. Those who could make it in Hong Kong have, and will, continue to emigrate to USA, Australia and Canada. They will start to contribute to the sub-urban crawl, drive gas guzzling SUVs for their milks and newspapers, own large automatic climatically-regulated houses of un-occupied spaces, join the environmentalist organizations, and start complaining about global warming.