MEETING WITH THE GREEN URBAN PLANNER
A Conversation Between Ken Yeang[1] and Steffen Lehmann[2] on Eco-Masterplanning for Green Cities

INTRODUCTION

Malaysian architect Dr. Ken Yeang is an architect-planner and is frequently described as one of the foremost eco-designers, theoreticians, and thinkers in the field of green design. He has been described as one of the world's leading advocates in ecological and passive low-energy design. He has designed over one hundred projects, and his theory of "bio-climatic" towers has had an impact around the world, fusing high-tech with organic principles. He was born in Penang, Malaysia, in 1948, and was educated in Penang, the United States, and at the Architectural Association in London. He received his doctorate in Architecture from Cambridge University in 1974. He is the author of a number of books on the topic of ecological planning and high-rise design (e.g., The Skyscraper: Bio-climatically Considered, *1996;* Eco-Masterplanning, *2009). According to Yeang, the "bioclimatic" high-rise tower is a low-energy tower that is based on bioclimatic design principles and designed as a vertical urban design typology crossed by air and light wells and protected by sun shading devices. Bio-climatic in architecture means responding to the climate with minimal reliance on fossil-fuel energy for achieving comfort.*

Ken Yeang's definition of bio-climatic is based on the following concepts: The integration of the grey (engineering), blue (water), red (human), and green (landscape) infrastructures in projects of all scales; the bio-integration of the building as an artificial element into the biosphere; the eco-mimesis, repeating nature's patterns such as solar energy and waste equals food; the re-linking of ecosystems by bridging the existing natural areas; and, finally, the monitoring for rectifying and improving the existing built environment. His single-minded pursuit of eco-design through his own architectural practice and writing for over 35 years has influenced countless architects around the world.

Major works by Ken Yeang include:

- *The IBM Malaysia Tower in Kuala Lumpur (1989–1992)*
- *The National Library Building in Singapore (2000–2005)*

The National Library is the first building in Singapore to obtain the Green Mark Platinum award. It incorporates many passive and active design strategies, e.g., a large naturally-ventilated and lit atrium space; the use of external sun-shading louvers; and integrated greenery for thermal benefits. The total embodiment of the building (being its first costs) was calculated to be 17GJ/m2, an impressive result achieved through carbon footprint considerations in the selection of all building materials.

The author met with Ken Yeang at the SASBE Conference in Delft, in June 2009, to discuss the future of sustainable urbanism and why our cities need to change. Here are excerpts from their conversation.

Steffen Lehmann (SL)

Ken, at the beginning I would like to talk with you about the challenges of designing sustainability at the scale of the district, not at the individual building or façade level, so that we can focus on potential strategies that you might bring to projects in the light of the huge challenges we are facing. For instance, how can we best address the broader requirements for the transformation of cities and their energy landscape?

Ken Yeang (KY)

I think it is not so much a matter of scale, but rather a matter of relationships between our human built environment and our activities with the natural environment, regardless of scale. Our human built environment needs to bio-integrate with the natural environment seamlessly and benignly at three levels: physically, systemically, and temporally.

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FIGURE 1. The 14-storey National Library Building in Singapore (2000–2005) is regarded as one of the most energy-effective buildings in South East Asia. (photos: S. Lehmann, July 2009)

SL

The concept of "ecological land use layers" is of particular relevance to the eco-masterplanning process. Could you please explain the key principles of this approach?

KY

The ecological land-use mapping approach is a useful and quick way to understand the ecology of any location prior to making site layout designs and planning decisions. However, it is a simplistic reductionist method, and in addition to this a series of ecological cross-checking needs to be done. The ecological land-use method, for example, does not take into account the state of ecological succession, or the energy flows through the ecosystem, the level of biodiversity, and so on. The key principle of this approach is the integration of all layers, which represent the grey, blue, red, and green infrastructures.

SL

Because eco-design in the 1970s did not have the benefit of research or academic theoretical models, you had to do your own research. Much of your design work is research-led and is based on in-house knowledge that you have built up over years, from one project to the next, where one project builds on the previous one. Design which is led by research and ongoing explorations—for instance in recycled material research, innovative technology for prefabrication of building systems, or energy-modeling—has increasingly been recognized as a driver for achieving a higher quality of work. Besides doing the daily project work, many practices now have a research and development division engaged in building special prototypes or other independent experiments that feed back into the daily office work. Given that you are now involved in projects from London to Dubai to Bangalore, how do you feel about exporting this know-how globally? How is the office driving the design of the masterplanning projects? Is the client usually willing to reimburse the research activities or are they simply expecting an architect to do such research as the basis for a commission?

KY

We have no problem with disseminating our knowledge and skills globally—in fact we present all our discoveries and ideas in our books and publications. Regarding the in-house research, most of our clients

will not offer extra reimbursement to the research activities. They expect an architect to do such research as the basis for a commission. Our clients are mostly interested in the end result and the output, not so much in the process. In the future, we will see much more need for ongoing in-house research activities simply to stay ahead of the developments.

SL

Sustainable design is always about holistic approaches and about seeing things, systemically exploring and understanding the variety of solutions that are usually available to any problem. You frequently use large glass panels to achieve transparency in your designs, even in projects located in hot and humid climates such as in Kuwait, Kuala Lumpur, or Bangalore. In building design, there are different ways to avoid heat gain; for instance, by reducing the glass surface. In your architecture, there is a desire to build transparency similar to the early modernists. How can it be climatically controlled?

KY

We generally like to achieve a more natural and unobstructed relationship between the interior and the exterior, which is why we use high-performance glass. We also try to bring in as much natural daylight into the insides of buildings as possible to reduce the use of artificial lighting. To climatically control the building and to avoid overheating, it is necessary to use cool roofs and façade materials, with reflective or white surfaces to avoid heat storage, and integrate greenery, in addition with effective sun-shading devices.

SL

In your recent book *Eco-Masterplanning,* published in 2009, you present nothing less than twenty huge masterplanning projects based on your particular approach and design process. I want to talk with you about the question of density in urban design, and the idea of high-rise. Firstly, does the notion of "green high-rise tower" actually exist? Secondly, if yes, how can a high-rise ever be truly green? Finally, in regard to transport-oriented developments close to public transport and mixed-use neighborhoods, which densities should we aspire to in our urban design?

KY

At the start, we need to determine the carrying capacity of a particular location or site and its permissible ecological footprint. We have demonstrated that we can build bio-climatical, sustainable high-rise towers, for instance in Kuala Lumpur. To stop sprawl and the further consumption of precious land, we need to build more densely, employing vertical typologies. There is no need to be scared by higher densities.

SL

But many of the buildings you design are large mono-functional "machines"; for instance, the large office towers which are used as headquarters of banks and global corporations are huge complexes—and I know the brief is asking for these mono-functional towers. Do you see new mixed-use typologies emerging? In this regard, what is, then, the future of Asian cities, where we are currently experiencing the most rapid urbanization processes?

KY

On the contrary, I usually design buildings like cities-in-the-sky or as vertical urban design, as illustrated in my earlier book *Reinventing the Skyscraper: A Vertical Theory of Urban Design,* published already in 2002. For instance, my BATC project from 1997, which is part of a much larger urban idea, is a classic model of mixed-use, multiple accessibility and vertical urban design. Asian cities will continue to grow and build high-rise towers. So our task is to ensure that these towers are bio-climatic, energy-efficient towers. Bio-climatic design achieves two outcomes: It results in a design that is passive-mode and low energy; and, secondly, by being tied to the climate of the locality, it is more regionalist in its design.

SL

In order to reduce car-dependency, Barcelona and Copenhagen are regarded as a robust model, where walking is very pleasant and well supported by an inter-linked public space network. However, Barcelona has about double the population density per square kilometer compared to, for instance, Sydney or Houston. A lot of new research indicates that compact 4 to 6-storey buildings are more likely to deliver social and environmental sustainability.

But we rarely build new cities from scratch today, outside of China. So, what should we do with the existing cities and existing building stock? And what should happen with low-density suburbs?

KY

We should retrofit existing cities and existing building stock and transform them into green eco-cities and green buildings, thereby avoiding sprawl and reconnecting existent low-density suburbs with its green hinterland. The disconnection between the rural and the urban needs to be better considered. If people abandon suburbs and living in these suburbs is not cost-effective, we will need to consider demolishing them and returning the land back to nature.

SL

All experts agree that cities will play a major role in reducing the negative effects of climate change. In the past few years, this role has been actively debated at all levels and some experts have expressed a very clear and progressive view of what cities could do to tackle climate change related issues. For instance, we could start with city-wide, urban-scale transformations of existing districts. The technology and concepts for holistic solutions are available; however, not much of it has really been taken up so far. In the meantime, some cities have grown considerably, and have further increased their ecological footprint. A high percentage of environmental problems are produced by the uncontrolled expansion of cities. How can a more sustainable, more compact form of urban design be achieved?

KY

A more compact form of urban design should be implemented and designed at the outset. Retrofitting existent layouts are often costly to implement and difficult to achieve due to multiple land ownership issues. We should work towards creating more compact and intense urban developments, instead of dispersed, low-density models. The more compact, mixed-use, multicultural, and diverse a city is the more effective and sustainable it becomes. Most cities lack a growth boundary and allow uncontrolled sprawl into the precious landscape. Sustainability, of course, deals with all human activity; it is not just a concept of energy, but it has to do with environmental, as well as social and economic issues. A responsible design from an energy point of view is a good start, but is, in itself, not enough. The quality of public space around and between buildings is extremely important; it impacts the quality of life for citizens, as well as enabling social sustainability. Ideally, all individuals and institutions would participate and, in the process, citizens would play an active role in the creation of public space. It is important to consider the broader city-wide context of sustainable development, and the general idea of imagining communities outside of the narrow confines of building projects. I call it "eco-masterplanning."

SL

Sustainability has a long history and there are multiple examples of traditional solutions in vernacular architecture throughout the world, where passive design principles have been convincingly applied. However, over the last fifty years, with the introduction of mechanical air conditioning systems and other techno-fix solutions, it seems like we have forgotten about the most basic and elementary design concepts. Are these passive design principles still relevant today?

KY

Buildings often do not respond well to their environment and context. A good building design guarantees a better life for its users and lower maintenance

FIGURE 2. Conversation between Ken Yeang and Steffen Lehmann, 2009.

costs throughout its life cycle, making sustainable buildings more economically efficient. There are active systems, such as the implementation of new technologies and new materials, as well as passive ones, which are based on the design criteria and don't require a budget increase. Firstly, we need to focus on using the passive systems, such as cross-ventilation or sun-shading systems. By doing so, we are already improving the energy efficiency of the building.

SL

As a consequence, should buildings be simpler and more generic, less specific, to make them more flexible and to integrate newly-developed systems easier?

KY

Yes, buildings could be simpler, more flexible, with newly-developed sustainable systems better integrated with the natural environment. If buildings are complex, it is often difficult and expensive to change things or integrate them with the sustainability systems, which has an effect on the life-cycle of the buildings. The need for buildings to be recyclable, to be assembled and disassembled easily has already pressured the architecture community to think differently.

SL

With the Solaris offices building in Singapore you are currently realizing "the ideal manifestation of a human-made eco-system." Can you please explain what you mean by this?

KY

The Solaris building features a spiral ramp, like a green ribbon on the outside of the building, more than 3 meters wide and running over an entire kilometer long. This means the amount of planted area, winding its way up the building, has a larger square footage, of about 9,000 square meters, than the footprint of the site itself, which is only 7,500 square meters in size. In this way the building will act like a human-made eco-system, maximizing the amount of landscaping provided to cool the air and to absorb CO_2.

SL

It seems that many of our leading philosophers and thinkers today have not yet started to embrace the life-shaping issues around sustainability. There is not enough discourse about the future of the city, about the question why we need urbanity. Brazilian urban planner Jaime Lerner said that "it is possible to change and transform a city in just two years." Curitiba is a good example, which illustrates that even small, inexpensive initiatives are able to generate big transformations and improve the urban complexity as a whole. How do you see the future of our cities and the development of urban models in the next twenty years?

KY

Cities are complex systems that are already stressed, and very inefficient in some aspects, for example in relation to the management of resources. Not enough has been done to explore new urban models to improve the efficiency of cities in the past few decades. I believe this is, increasingly, a lost opportunity, and we are losing precious time in the battle against climate change. Many times it has been pointed out that cities are both the problem and the solution. Indeed, many things could be done immediately; for instance, implementing new solutions for mobility, waste management, water treatment, installation of smart grid technology, energy or environmental education, and so on. All these ideas would improve the existing city and set a new standard for a very different future. More needs to be done by architects and designers, to make sustainable design the standard, not an option.

SL

Ken, thank you very much for the conversation.