

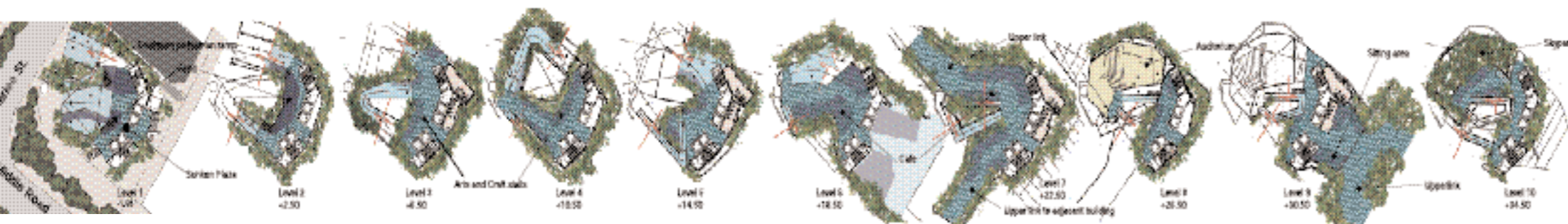
EDITT Tower Singapore

Scraping the Green Sky

Ken Yeang's concept for a 'bioclimatic' exhibition tower stakes out the environmental agenda for architects for the new millennium.

Architects / T R Hamzah & Yeang Sdn Bhd

Review by Lindsay Johnston



● **This latest concept project from the offices** of T R Hamzah and Yeang introduces a further chapter in the innovative design career of Dr Ken Yeang. Over a period of nearly 25 years he has established himself as a seminal contributor to thinking and practice in, to use his own favoured words, 'bioclimatic' architecture. His best known 'bioclimatic' buildings are the UMNO Tower in Penang and Menara Mesiniaga in Selangor, both in Malaysia, and his books include *Designing with Nature: the Ecological Basis for Architecture Design*, (New York, McGraw-Hill, 1995) and *The Skyscraper Bioclimatically Considered: a Design Primer*, (London, Academy Editions, 1996).

The proposed 26-storey EDITT tower is located on a site at the junction of Waterloo Road and Middle Road in Singapore and is proposed as a 'loose fit' multi-use high rise building, initially conceived as an exhibition building incorporating exhibition spaces, auditorium, retail and office use, with the potential to metamorphosise later in its 100-150 year design life into a full office tower or apartment building. The site is a small 838 sq.m and the projected gross floor area is at a plot ratio of 7:1, giving a gross area of 6,033 sq.m. In its initial iteration, the tower will yield a net useable area of 3,567 sq.m (FSR 4.3:1) with an area of planting and vegetation of 3,841 sq.m. The design concept brings together a range of issues that demonstrates the expanding domain of the architect for the new century – urban context, vertical placemaking, high level linkages, ecological response to site, orientation, sun control, vertical landscaping, wind effects, deconstruction and recyclability, waste recycling, water collection and re-use, on-site energy production, embodied energy, energy in use, hybrid mixed mode services, and more. The result is a visually stunning architecture that marries some of the best plastic aspects of the early twentieth century modern movement with the 'bowellism' of the European 'high-tech' school (Pompidou and Lloyds) and adds Yeang's own now characteristic freedom of form and itinerary, underpinned by an attempt to present methods and measurables in terms of environmental and energy performance. Summarising Yeang's contribution at the recent Flashpoint Conference in Sydney, Adrian Boddy, of the University of Technology, Sydney, (UTS) observed that "Yeang has made Architectural Science look sexy!"

Placemaking and wind studies The treatise on the project provided by the

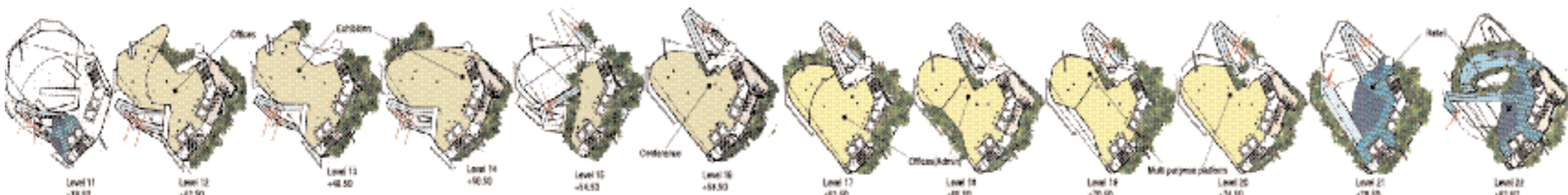
architects elaborates the design process, describing a broad analysis of the site context, views, microclimate and non-existent flora and fauna – described as a 'zeroculture' at the bottom of Yeang's hierarchy of ecosystems. A worthy evaluation of the vegetation patterns within a 1.5 km radius of the site is used to inform a program of planting on the project that is integrated with the site and structure in a vertical landscaping scheme of planted terraces and facades, using species selected to be compatible with indigenous species of the locality.

Also worthy is the strategy to confront the issue of spatial continuity, universally lacking in high-rise buildings due to physical compartmentation of floors. The design creates 'vertical places', using a ramp system that allows pedestrian movement vertically through the tower along a vertical 'street' lined with exhibition and performance spaces, cafés, shops and offices with occasional sitting and gathering areas. There are bridge links to adjoining buildings that reinforce the lower levels as public territory and planted terraces and sky-gardens continue up the full height of the building.

A wind study of the proposed tower elaborates early Yeang studies of the impact of 'wind wing walls' in domestic buildings using a radical (and far fetched) concept of inflatable air bags as wind fins strategically positioned on the outside of the tower to create vortices that improve the natural ventilation and that modify wind loads on the building, resulting perhaps in a lightening of the vertical structure. At a more mundane level, these studies also demonstrate the natural ventilation of toilet pods hung on the side of the structure.

Recycling and embodied energy There is no reference to the use of recycled materials, but considerable emphasis is given to the energy implications of the construction and structure which are designed to be capable of adaptation during use and 'deconstruction' at the end of use. A hybrid primary structure is nominated of reinforced concrete columns and core and dry fireproofed steel beams with mechanical joints that can be readily disassembled. Bill Lawson of the University of New South Wales has been involved as an embodied energy adviser and an embodied energy analysis concludes that the building has a very high embodied energy at 14.2 GJ/sq.m compared to a quoted norm in the range 6-8 GJ/sq.m for a similar conventional building. This high figure is attributed to

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left: Floor plans for the high-rise exhibition tower show the vertical 'street' and bioclimatic landscaping.

above: The tower design integrates strategies for sun control, rainwater collection, wind manipulation, ventilation, circulation and landscaping.

the high embodied energy content in photovoltaic solar panels and other energy saving devices that will, it is claimed, be repaid in utilisation energy savings over the life cycle of the building. The scheme includes a proposal to replace concrete floor slabs with timber floor cassettes that reduce the embodied energy figure by 1.6GJ/sq.m, but the solution to fire separation issues has not been defined at this stage. An ingenious solid waste recycling system is also described that segregates paper, plastic, aluminium, glass and garbage using a waste disposal chute dropping the full height of the building into rotating basement hoppers where the waste is compacted and removed from site.

Utilisation energy It is well understood that in-use energy in buildings far overshadows the embodied energy and it is correct to set out in a life cycle analysis to ensure that the energy demands are minimised and that methods of meeting these demands are 'greened'. The passive design strategies of this proposed building, with sun shading and access to natural vegetation, should moderate the energy load required to deliver environmental comfort. It is not possible to achieve an acceptable working environment in Singapore without air-conditioning, and the proposal suggests a 'mixed mode' or, as it has become commonly known, a 'Hyvent' system where natural ventilation is used to the maximum and supplemented where necessary by mechanical air-conditioning.

An integrated arrangement for sun shades to window glazing, light shelves, rainwater catchment scallops and the location of the proposed photovoltaic panels exemplifies the necessary total systems approach and combines to reduce solar load on the windows, collect water and bounce light onto the ceilings and back into the building, thus reducing energy demand and cooling load.

The proposal does not document any thermal modelling or relate this to utilisation energy demand. It was suggested that the building could be 40 percent energy self-sufficient through energy sourced from solar photovoltaic panels, but this has been revised downwards to 20.4 percent based on photovoltaics yielding a perhaps over optimistic 1.05 kWh/sq.m/day (0.75 kWh/sq.m/day would be more realistic?). The figures supplied have the overall energy demand of the building, with a working population of 356 people, at 228 kWh/sq.m/year gross, including the open vegetated ramps, or 385 kWh/sq.m/year net, which seems high

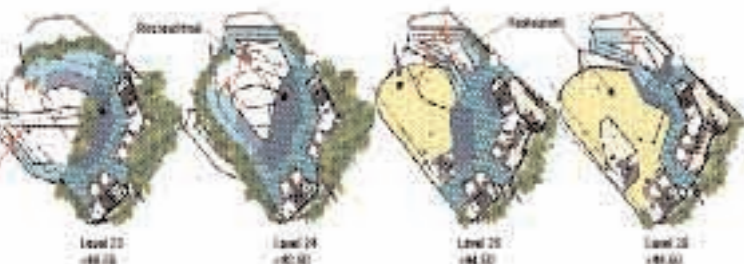
(Foster's Commerzbank is quoted at 185 kWh/sq.m/year. SEDA NSW five-star rating equates to 125 kWh/sq.m/year.).

Water collection and recycling A fascinating system of water collection and reticulation is described, involving a sculptural rain scoop on the roof and a system of water collection scallops down the façade combined with a proposal to recycle grey water through soil bed filters in the vertical landscaping. It was suggested that the building could be 55 percent self-sufficient in terms of water supply, but this has been revised downwards to 31 percent, based on a Singapore rainfall of 2344mm per annum and a collection area of 518 sq.m. yielding 3300 litres per day average. An initial calculation of the volume of sewage sludge to be collected and recycled appeared to be excessive at 15,190 cu.m per year but was revised down to 8,850 cu.m. This still seems high and it is not explained how this could be recycled on site. The whole proposal for water collection and re-use does not appear to be well thought through. The water demand appears to be overstated and the need for an elaborate filtration system for rainwater is unclear. A more conservative water demand could be used as the basis of calculation, and segregation of the black and grey water and the use of recycled grey water should reduce the overall water consumption.

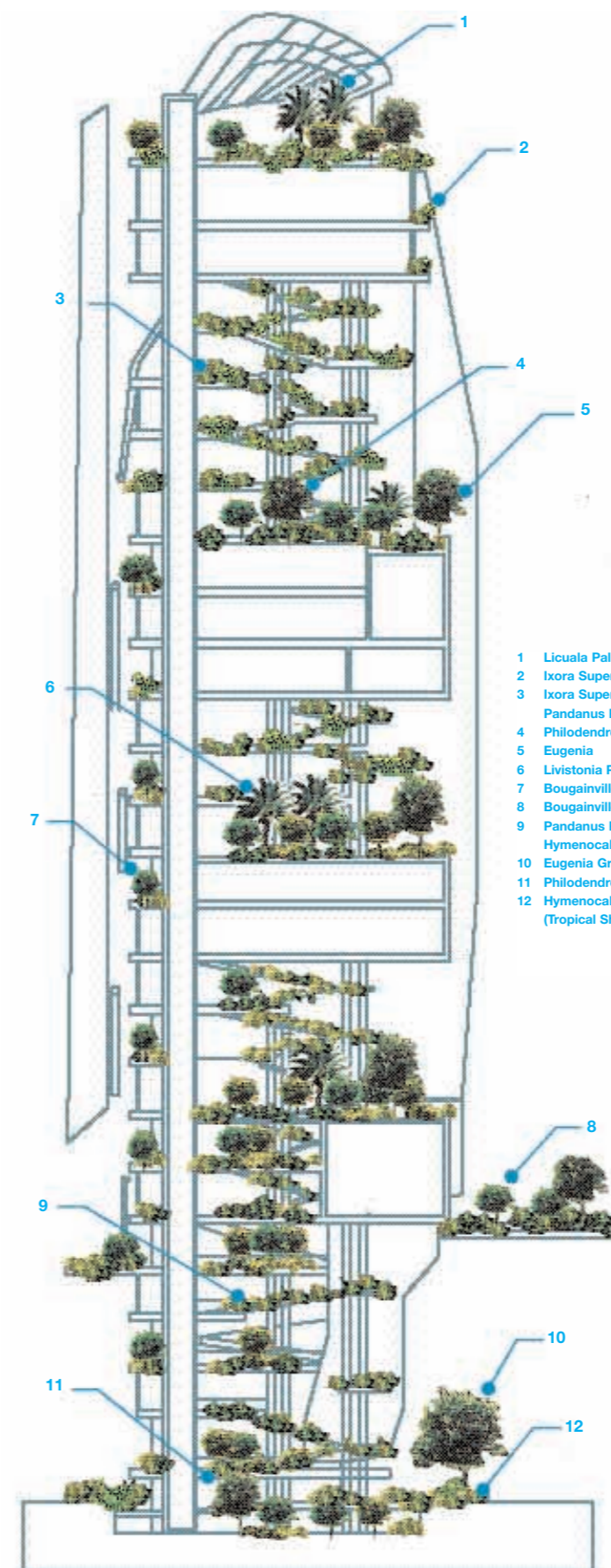
Summary The main tenet of 'green' architecture is that it must deliver energy and resource efficiency and environmental comfort – it is not a style. The EDITT Tower is a concept project that one hopes will see realisation as a paradigm for integrated 'bioclimatic' big building design. The formal and stylistic qualities of the design are seductive, but the technical detail appears to need more careful consideration and refinement. The building has a very high embodied energy (and is probably very expensive) but it does not yet appear to demonstrate commensurate utilisation energy savings and associated thermal comfort.

The theoretical basis and practical exploration of this and other projects from Hamzah and Yeang are documented in Dr Ken Yeang's latest book *The Green Skyscraper – the Basis for Designing Sustainable Intensive Buildings*, published by Prestel Verlag, Munich, 1999 (ISBN 3-7913-1993-0).

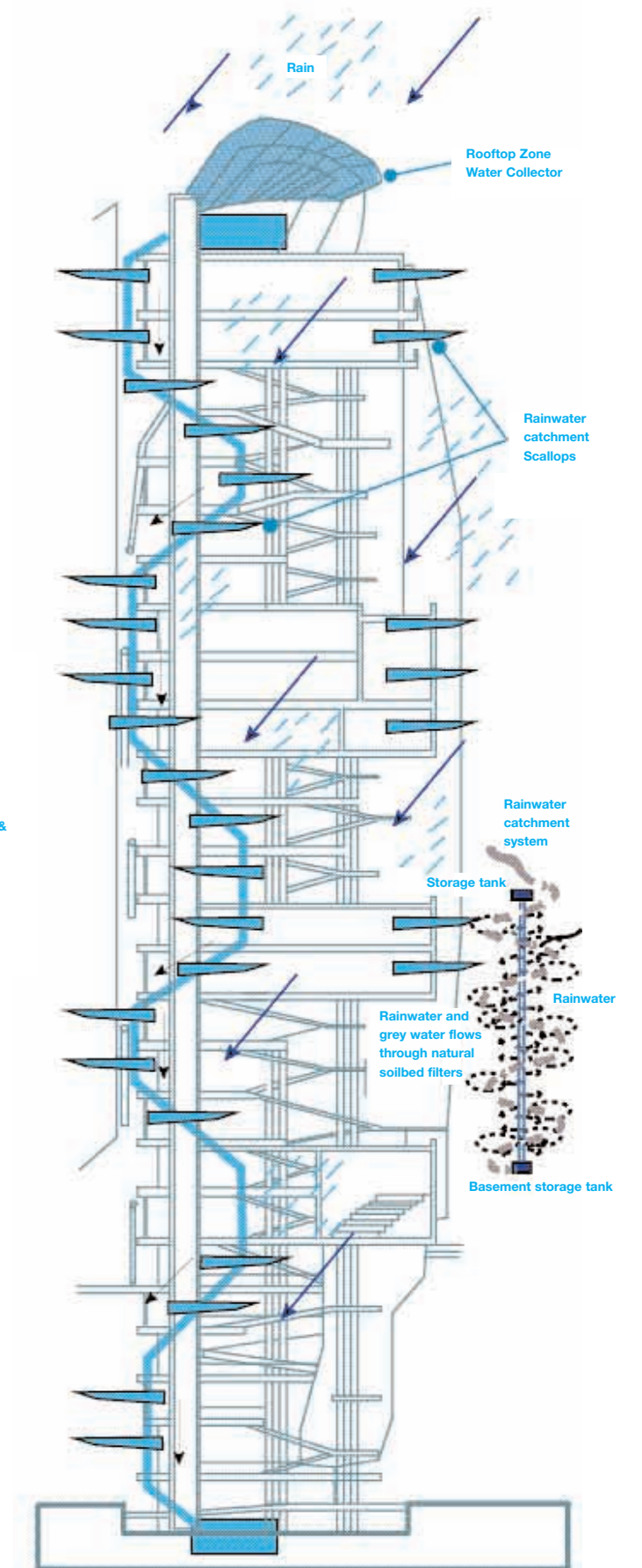
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Clients Urban Redevelopment Authority (URA) Singapore (sponsor)
 Ecological Design in the Tropics (EDITT) (sponsor)
 University of Singapore (sponsor)
Consultants Environmental: Battle McCarthy (London)
 Embodied energy: Bill Lawson (UNSW Sydney)
 Architect-of-record: James Leong, Swan & McLaren



Reintroduction of organic mass to urban site to counter balance inorganic nature of the site



Rainwater collection and recycling system