significance of
sky gardens for
healthy high-rise living
of urban children and old adults

presented by:
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Ronald Lu & Partners

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BEAM Pro, GB Faculty, BREEAM AP, LEED AP, WELL AP
41 years
5 offices
600 + staff
The higher we live from the ground level, the more disconnected we feel from the natural world and even from each other within a community.
Urban green spaces with the natural setting can provide some peace and quiet away from the hustle and bustle of the city, and contribute to health and wellbeing (Baur & Tynon 2010).
Natural environments evoked “soft fascination” and improved performance in memory and learning tasks as well as self-regulation tasks, such as impulse control. (Kaplan & Berman, 2010)
[Physiological] - Daily activities in green spaces for 5 minutes can effectively give positive effects on mood and self-esteem (Barton & Pretty 2010).
[Social] - Pleasure-derived leisure experiences are found in a garden which serves as a social arena for family and neighbours gathering (Connell 2004)
Biophobia may be developed due to people’s fear of living things and unexpectedness from nature. Urban children may have negative feelings such as fear, scary, disgusting and uncomfortable with nature. (Collado et al., 2015)
Urban green spaces play a key role of maintaining high ecological diversity. Biophilic design advocates the urge to affiliate with other forms of life. (E.O. Wilson, 1984)
For 3-5 year-old children, neighbourhood green space may help them to have better emotional health early in life. (Flouri et al., 2014)
For 7-12 year-old children, natural environment may catch children’s attention easily and help them to learn new things especially situations, spaces and materials more effectively. (Laaksoharju, 2012)
For 9-10 year-old children, contact with nature had significantly positive effect on nurturing biophilic attitudes to wildlife and enhancing their willingness to support animal conservation. (Zhang et al., 2014)
Communal green spaces benefit elderly residents’ social integration and healthy development (Delvin & Zaff, 1998; Kweon et al., 1998)
Sky Gardens?
Urban Living
Hong Kong
Hong Kong government issued ‘green incentives’ for sky gardens in new residential buildings in 2001, aiming at improving urban ventilation, greenery and recreational garden space for communal use.

In Singapore, GFA exemption for sky gardens was first introduced in 1997, aiming at promoting more quality communal spaces and contributing towards the overall greenery and environmental quality of the surrounding areas.
<table>
<thead>
<tr>
<th><strong>Government Policy</strong></th>
<th>Hong Kong</th>
<th>Singapore</th>
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</thead>
<tbody>
<tr>
<td>Joint Practice Note issued by Buildings Department, Planning Department and Lands Department. (JPN 1)</td>
<td></td>
<td>Circular to Professional Institutes issued by Urban Redevelopment Authority. (Circular No. URA/PB/2009/12-DCG)</td>
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<table>
<thead>
<tr>
<th><strong>Year</strong></th>
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<th>Singapore</th>
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<tbody>
<tr>
<td>First issued in 2001; revised in 2011</td>
<td>First introduced in 1997; revised in 2009</td>
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<table>
<thead>
<tr>
<th><strong>Sky Garden Objectives</strong></th>
<th>Hong Kong</th>
<th>Singapore</th>
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<tbody>
<tr>
<td>Sky gardens provide natural ventilation, greenery and recreational garden space for communal use.</td>
<td>Sky gardens serve as quality communal spaces; and contribute towards the overall greenery and environmental quality of the surrounding area</td>
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<table>
<thead>
<tr>
<th><strong>Configuration</strong></th>
<th>Hong Kong</th>
<th>Singapore</th>
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<tbody>
<tr>
<td>The minimum headroom is 4.5m and it is open-sided above safe parapet height on at least two opposite sides for cross ventilation.</td>
<td>The proposed depth should be at least 5m.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Quantities</strong></th>
<th>Hong Kong</th>
<th>Singapore</th>
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</thead>
<tbody>
<tr>
<td>The maximum number of sky gardens provided is equal to or less than the number of residential storeys divided by 15. Such garden can be split into multi-levels but it occupies not less than one-third of the area of the floor plate.</td>
<td>No specific requirement.</td>
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<thead>
<tr>
<th><strong>Locations</strong></th>
<th>Hong Kong</th>
<th>Singapore</th>
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<tbody>
<tr>
<td>Sky gardens are at least at 10 storeys apart from each other or podium garden unless under exceptional circumstances where strong environmental justifications are requested.</td>
<td>No specific requirement.</td>
<td></td>
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<tr>
<td>Greenery</td>
<td>Hong Kong</td>
<td>Singapore</td>
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<td>Not less than 15% of the garden area is to be planted with greenery.</td>
<td>Lushly landscaped with a suitable variety of plants is required. The greenery should be enjoyed by the building users and be visible from the surrounding environment.</td>
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<table>
<thead>
<tr>
<th>Incentives</th>
<th>Hong Kong</th>
<th>Singapore</th>
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</table>
| - GFA of sky gardens can be exempted if the above requirements are complied.  
- However, floor height of sky gardens may not be exempted if the overall building height is capped under the Outline Zoning Plan (OZP) or the land lease. | - GFA exemption is granted for areas within 45 degree projection line of sunlight from the building edge above.  
- Additional floor height allowance for predominant sky gardens: If SG area exceeds 60% of the floor plate, additional heights of 10m(7-20storeys), 15m(21-30s), 20m(31-40s), 25m(41-50s) & 30m(>50s). |
Newton Suites (2007)
Central Horizon (2008)
Pinnacle at Duxton (2009)
RiverGate (2009)
Skypark at Somerset (2010)
Reflections at Keppel Bay (2011)
Martin Place Residences (2011)
Soleil @ Sinaran (2011)
Parc Seabreeze (2012)
Ascentia Sky (2014)
Novel 18 (2014)
Lincoln Suites (2014)
Spottiswoode Residence (2014)
Spottiswoode 18 (2015)
SkyTerrace at Dawson (2015)
Sky Habitat (2015)
Robinson Suite (2016)
Scotts Tower (2016)
The Tembusu Kovan (2017)
City Gate (2019)
<table>
<thead>
<tr>
<th>Location</th>
<th>No. of storeys (residential floors)</th>
<th>No. of sky gardens</th>
<th>Sky garden location</th>
<th>Doorstep from units</th>
<th>Near podium clubhouse</th>
<th>Near sky clubhouse</th>
<th>At roof level</th>
<th>Connect different blocks</th>
<th>Amenities, except seating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hong Kong</strong></td>
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<td>The Orchard  (2003)</td>
<td>38</td>
<td>2</td>
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<tr>
<td>The Arch     (2005)</td>
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<td>Centre Place (2006)</td>
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<td>55</td>
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<td>●</td>
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<tr>
<td>31 Robinson Road (2007)</td>
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<td>Manhattan Hill (2007)</td>
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<tr>
<td>The Apex (2007)</td>
<td>44 (2-50/F)</td>
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<td>R/F</td>
<td>●</td>
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<td>The Forest Hills (2008)</td>
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<td>De Novo (2015)</td>
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<td>Newton Suites (2007)</td>
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<td>●</td>
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<tr>
<td>RiverGate (2009)</td>
<td>43</td>
<td>20+</td>
<td>every 2-3 floors</td>
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<td>15</td>
<td>every 2 floors</td>
<td>●</td>
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<td>Reflections at Keppel Bay (2011)</td>
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<td>8, 15, 22, R/F</td>
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<tr>
<td>Martin Place Residences (2011)</td>
<td>33</td>
<td>1</td>
<td>14/F</td>
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<td>Soleil @ Sinaran (2011)</td>
<td>33</td>
<td>1</td>
<td>14/F</td>
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<td>Parc Seabreeze (2012)</td>
<td>20</td>
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<td>14/F</td>
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<td>10</td>
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<td>Novel 18 (2014)</td>
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<td>8</td>
<td>11-26/F</td>
<td>●</td>
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<td>Lincoln Suites (2014)</td>
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<td>24/F</td>
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<td>Spottiswoode 18 (2015)</td>
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<td>14, 24/F</td>
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<td>SkyTerrace at Dawson (2015)</td>
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<td>2</td>
<td>19,33/F</td>
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<td>Sky Habitat (2015)</td>
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<td>14,26,38/F</td>
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<tr>
<td>Robinson Suite (2016)</td>
<td>42</td>
<td>2</td>
<td>7, 19/F</td>
<td>●</td>
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<td>Scotts Tower (2016)</td>
<td>31</td>
<td>1</td>
<td>25/F</td>
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<tr>
<td>The Tembusu Kovan (2017)</td>
<td>18</td>
<td>3</td>
<td>6,12,18/F</td>
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<tr>
<td>City Gate (2019)</td>
<td>30</td>
<td>2</td>
<td>6,24/F</td>
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</tbody>
</table>
Contributing factors to promote health & well-being of urban living with sky gardens

**Psychological**
- Stress reduction
- Attention restoration
- Soft fascination
- Others

**Physiological**
- Mood and heart rate variability
- Blood pressure
- Others

**Social**
- Neighborhood
- Community building
- Sense of belonging
- Others

**Environmental**
- Microclimate
- Urban ventilation
- Outdoor thermal comfort
- Others

**Ecological**
- Urban biodiversity
- Humans’ affinity to nature
- Others

**Light & Air**
- Location
- Orientation
- Floor height
- Openness

**Distant View**
- Site planning
- Location
- Orientation
- Openness

**Greenery**
- Vegetation volume
- Green coverage
- Vegetation structure
- Flowering

**Quantity & Quality**
- Visual amenity
- Sensory exposure
- Gardening

**Interaction**
- Native vs exotic
- Non-invasive
- Richness

**Species**
- Covered outdoor space
- Spacious
- Flexible

**Amenities**
- Purposeful interactions
- Serendipitous / casual interactions
- Sense of being safe at high
- Under supervision
- Management restrictions
- Active vs passive
- Individual
- Family
- Neighborhood
- Public

**Communal Spaces**
- Covered outdoor space
- Spacious
- Flexible

**Spatial Design**
- Purposeful interactions
- Serendipitous / casual interactions

**Connectivity**
- Sense of being safe at high
- Under supervision
- Management restrictions

**Accessibility**
- Active vs passive
- Individual
- Family
- Neighborhood
- Public
Light, Air and View

One mid-level sky garden

One low-level & one mid-level sky gardens

One high-level sky garden connecting to sky clubhouse
sunlight and air for health and enjoyment
Sky garden
Daylight penetration
- Headroom
- Ceiling design
- Orientation

Wind [Marco] : urban ventilation
- Effective at low zone for street ventilation, then high headroom and fully permeable [less windy]

Wind [Micro] : outdoor thermal comfort
- At mid/high zones, wind breaking design by using parapet and vegetation
- Opening size, configuration and orientation

Our psychological need to be around life and life-like process is recognized. The direct experience of nature or nature-derived patterns can improve experience, mood and happiness. (WELL, 2012)
Extensive greenery in a deliberately designed vegetation volume creates desirable outdoor thermally comfortable environment and visual buffers from the densely populated surrounding.
Greenery

Edges

Core
Greenery

a shaded, comfortable green environment

[50/F, Pinnacle at Duxton, Singapore]
Vegetation @ Sky Gardens
- Wind tolerant
- Ability to grow under shade
- Less irrigation
- Diversity for different functions (wind break, visual, smell, edible, seasonal etc.)

Sky gardens purposefully improve neighbourhood and social interactions by creating spacious, scenic, entertaining and safe green areas with children and elderly friendly amenities and good accessibility; meanwhile, vegetation offers joyful visual amenity.

http://www.thecoolist.com
Accessibility

Connecting all towers

At a separate floor

Doorstep gardens
Communal Spaces

Connectivity

Circulation

Amenity

Space

Park
Improvised extension of living spaces may facilitate daily activities and incidental or causal interactions
Communal Spaces

Level 14

Level 26

Level 38

[38/F, Sky Habitat, Singapore]
Physical inactivity is attributable to 9.4% of all deaths worldwide, or 3.5 million people every year. (WELL, 2012)
## Amenities

<table>
<thead>
<tr>
<th>Amenities / Features</th>
<th>Popularity in sky garden provision</th>
<th>Facilities requirements</th>
<th>Spatial requirements</th>
<th>Appropriateness in green areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Landscape garden with scenic views</strong></td>
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<tr>
<td>Water features</td>
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<tr>
<td>Sculpture / Artwork</td>
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<td>Audio devices</td>
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<tr>
<td>Lighting effect</td>
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<td>Feature paving</td>
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<td>Planting</td>
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<tr>
<td><strong>Self-retreat / seating / reading in a peaceful environment</strong></td>
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<tr>
<td>Sitting area</td>
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<tr>
<td>Reading</td>
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<td>Swinging beds</td>
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<tr>
<td><strong>Leisure walk with family and friends</strong></td>
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<td>Strolling path</td>
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<td>Viewing platform</td>
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<td><strong>Doing exercises and stretching</strong></td>
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<td>Children play facilities</td>
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<td><strong>Chatting and social gathering with neighbours and friends</strong></td>
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<td>Tea leisure</td>
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<td>Lounge</td>
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<td><strong>Other amenity facilities</strong></td>
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<td>Barbeque</td>
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<td>Gym facilities</td>
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<td>Swimming pool</td>
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Aiming at a low carbon living environment, a sky garden can act as a naturally-ventilated sky clubhouse and as an alternative to provide amenity facilities in a more energy efficient way.
Covered landscape is good for provisioning semi-outdoor spaces on rainy or hot summer days.
Luxury knows no bounds at Nouvel 18. Elevating from ground level and rising high to the sky, a lavish flow of relaxation and recreational selections await your exclusive indulgence. Be spoilt for choice by the 8 themed sky terraces that grace the residential towers, each uniquely different in its offering of facilities. Nouvel 18 has so much to proffer, one need not have to leave home to truly live it up.

Amenities

Sky Terrace - Level 16
Aqua Veranda
Immerse in this tranquility of lounging in the leisure pool and drift lounging within the beauty of nature. Bask under the sun and change from relax to a refreshing dip.

Sky Terrace - Level 10
Forest Conservatory
In the company of towering trees, this is the perfect place to relax and bond with family and friends for intimate conversations and gatherings.

Sky Terrace - Level 11
Therapeutic Patio
Escape from the hustle and bustle of the city into the intimate patio. Sit on one of tropical furniture and enjoy a delicious meal where you can immerse in the rejuvenating waters of the whirlpool jacuzzis.

Sky Terrace - Level 11
Fitness Arena
A gym space and fitness area in the sky, this is the area dedicated to any age to work out to the rhythm of scenery and take in the breathtaking views of the city.

Sky Terrace - Level 14
Wellness Terrace
Take in the setting high above the city for a unique exercise in the Aqua Gym surrounded by nature. Feel, you can tone, sculpt and challenge your body with high-energy yet low-impact exercises in the water.

Sky Terrace - Level 14
Gourmet Pavilion
Immerse your guests to an extraordinary party at this spectacular venue that comes with an open kitchen for a gourmet showcase, and a magnificent city backdrop to bring your dining experience to an all-time high.

Sky Terrace - Level 15
Sky Botanique
By day, revel in the vibrant scenery with an inspiring view in hand to catch up with friends over afternoon tea. By night, create a perfect party setting where cocktails and signed menu complement the sparkling views of the city.

Sky Terrace - Level 15
Meditation Garden
Discover inner peace at the highest garden of Nouvel 18. Immerse the captivating views of the city and be one with the world as you enjoy your yoga, tea or meditation session.

Can do and Can’t do!

NOTICE

ALL VISITORS

NO SMOKING FOOD OR DRINK DOGS OR OTHER PETS ON SKY GARDEN

Residents and visitors shall observe the following when using the Sky Gardens:

- No pets
- No food and beverage
- No smoking or gambling
- No touting or soliciting
- No playing of loud music
- No setting up of tents or camping overnight or barbeque
- No social events at any part of the Sky Gardens
- No littering, marking or painting of any part of the Sky Gardens
- No storing of personal property or blocking of any entrance or exit
- No hanging of any wet items, towels, bedding, clothing or any other article
- No activities such as biking, skateboarding or other similar games or the use of any sport equipment
- No damage shall be caused to any lawn, garden, trees, plants, or flowers or any other facilities
- Children must be accompanied by supervising adults
- Everyone must leave the Sky Gardens when there is rain and thunderstorm
- Everyone must seek refuge at the 26th storey storey Sky Gardens or ground floor, via staircases in the event of any fire or other emergency

TANJONG PAGAR TOWN COUNCIL • PINNACLE @ DUXTON RESIDENTS' COMMITTEE

[50/F, Pinnacle at Duxton, Singapore]
The most frequent users are CHILDREN + ELDERLY
Less than one-fourth cases have amenities for kids
Apart from this, any other design considerations of advocating children-friendly living environment?
A safe, secure and spacious environment but offering a feeling of adventure and semi-wildness simultaneously is an ideal

Amenities
Garden-based activities with nature, such as picking fruits, planting seeds or taking care of vegetables, nurture positive, ecologically responsible attitudes.
New Typology
The higher the building, the more the liveable green spaces
Environmentally-driven considerations, including light, air and view.
Socially-oriented considerations, creating sense of neighbourhood with good accessibility and connectivity
Residents were willing to pay more for green spaces based on their pragmatic needs than moral or altruistic.
Doorstep gardens stimulate intimate touch with greenery in daily life
Amenities and green spaces to be liveable and enjoyable by daily frequent users.
More importantly, children are allowed to play outdoors with their neighbouring friends and nature.