Green Buildings Mitigating Heat Island

綠建緩減熱島

M K Leung
Director / Director of Sustainable Design

梁文傑
董事/環保設計總監

RONALD LU & PARTNERS 呂元祥建築師事務所

1 建築與熱島

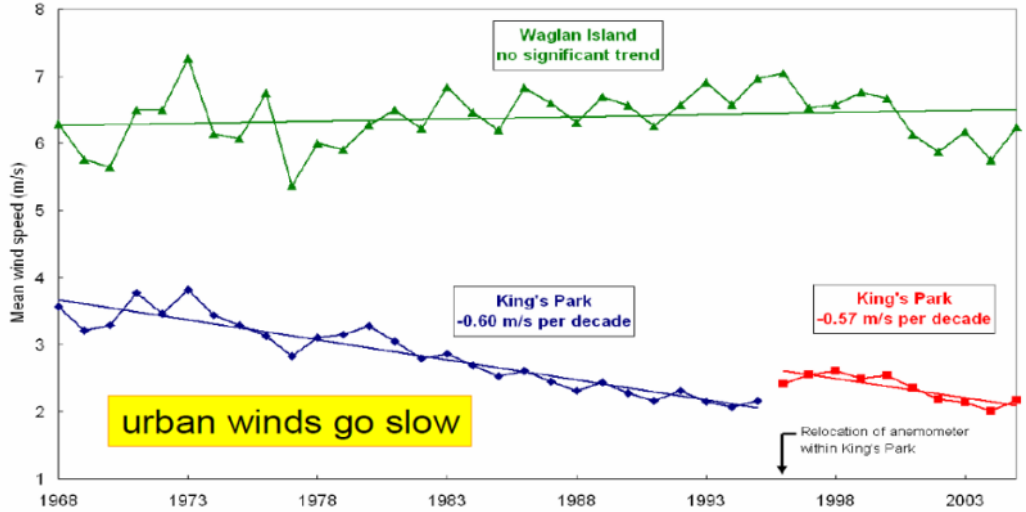
2 可持續建築設計指引

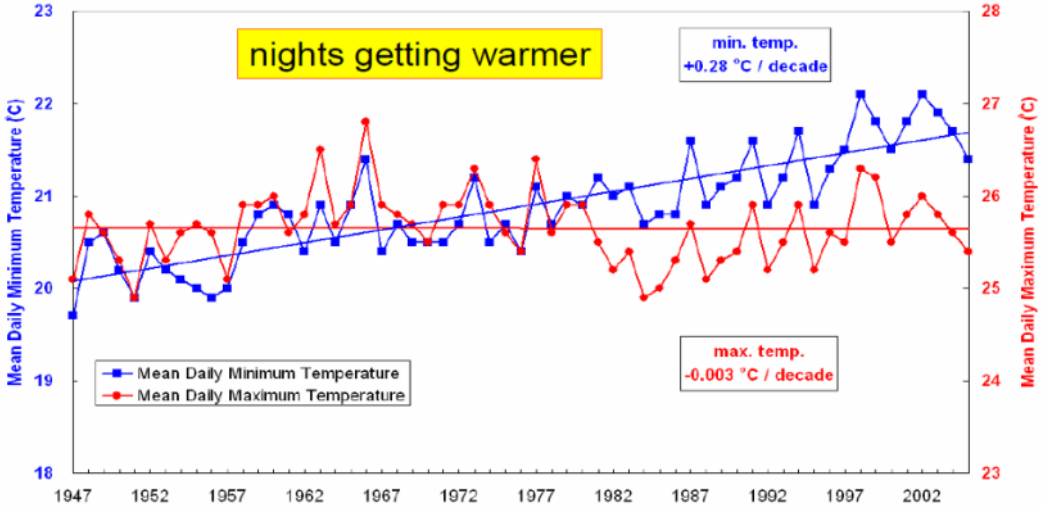
3 範例

4 展望

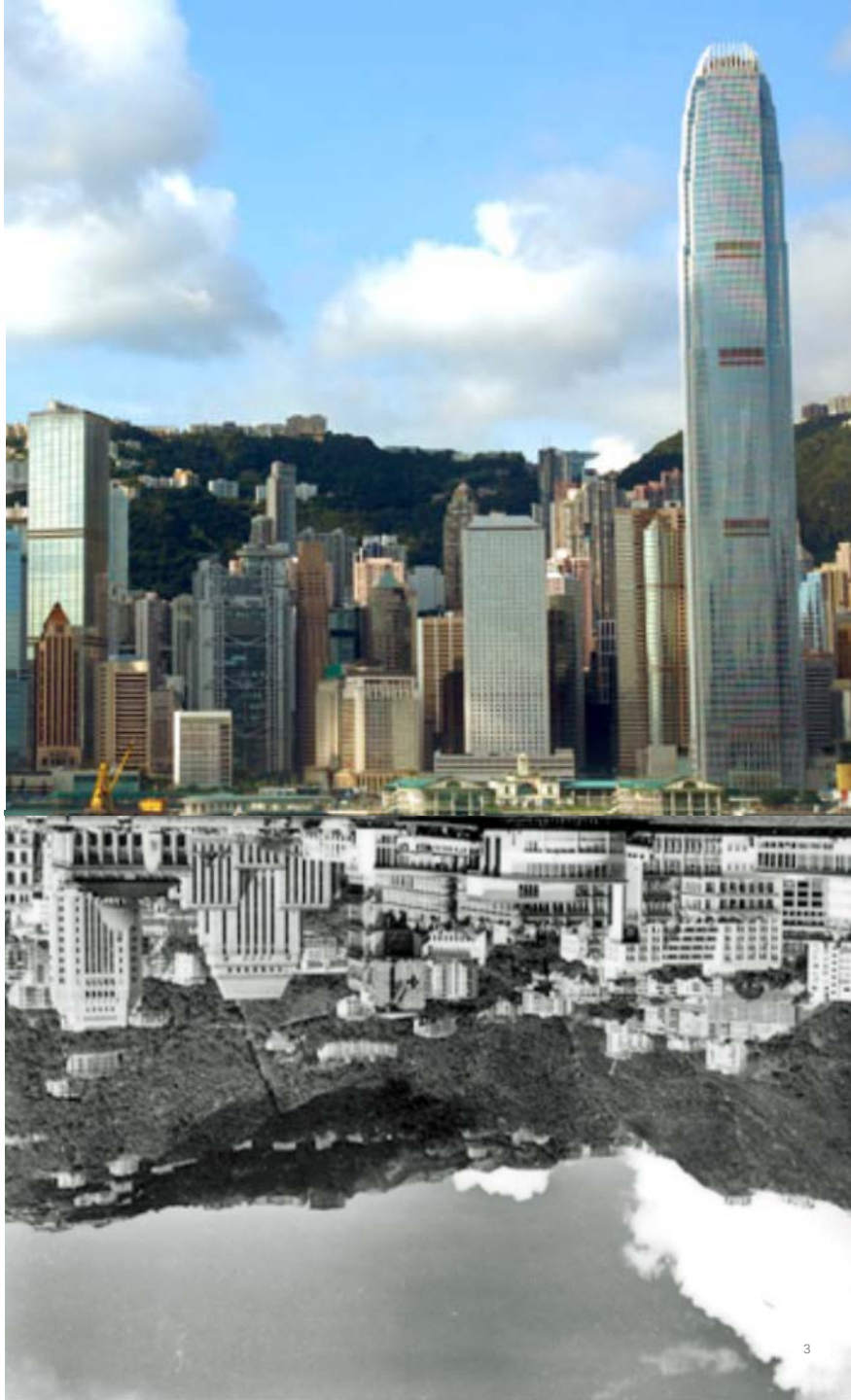
1 建築與熱島

Urbanization versus Environmental Quality





Urban winds and night temperatures in Hong Kong (Source: HK Observatory)

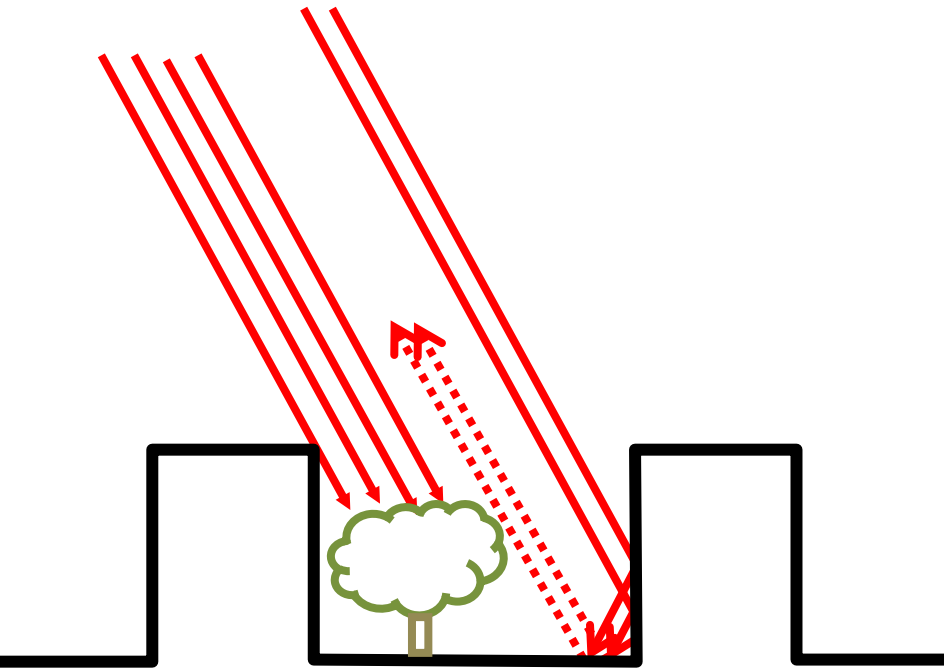


1

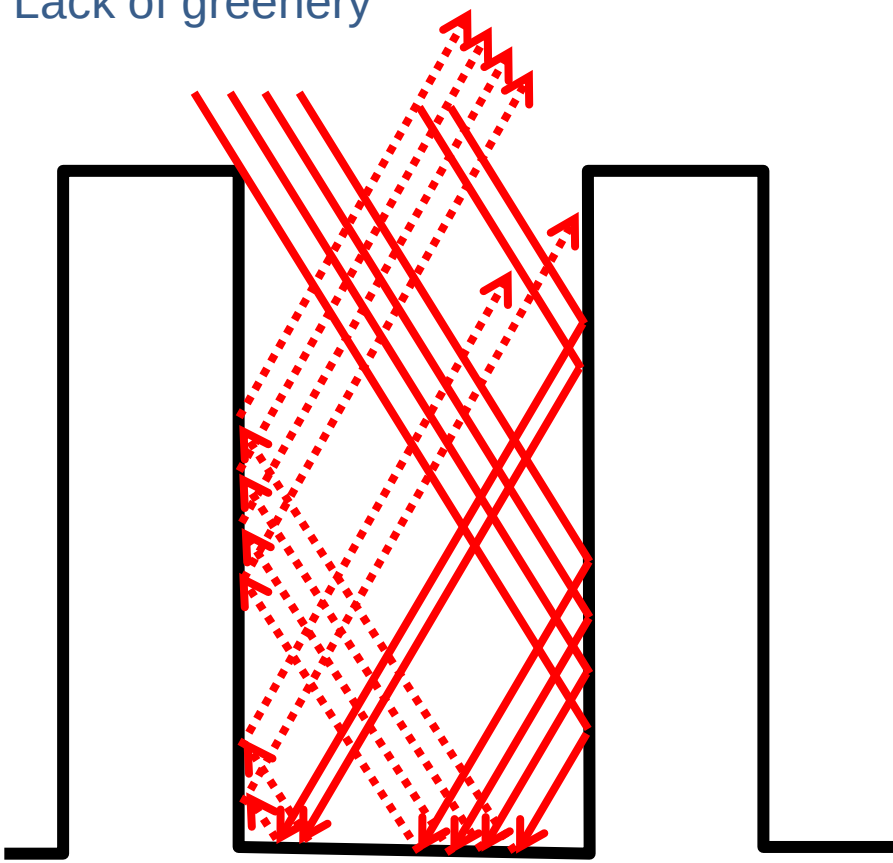
Urban Heat Island Effect

城市熱島

- Materials with high thermal absorptivity
- Restricted sky view
- Lack of greenery



城市

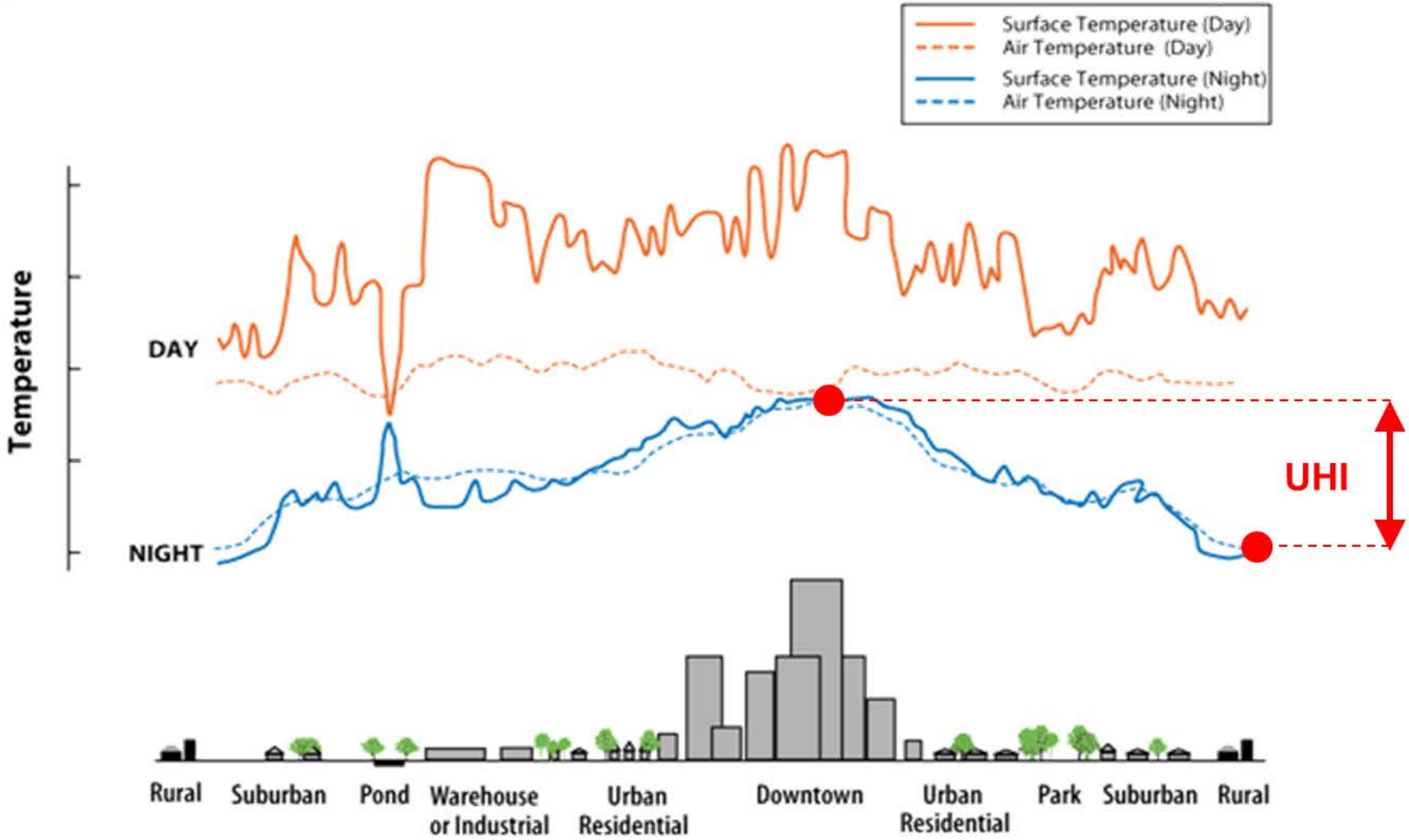


城市

1

Urban Heat Island Effect

城市熱島



Source: www.epa.gov/heatisland/about/index.htm)

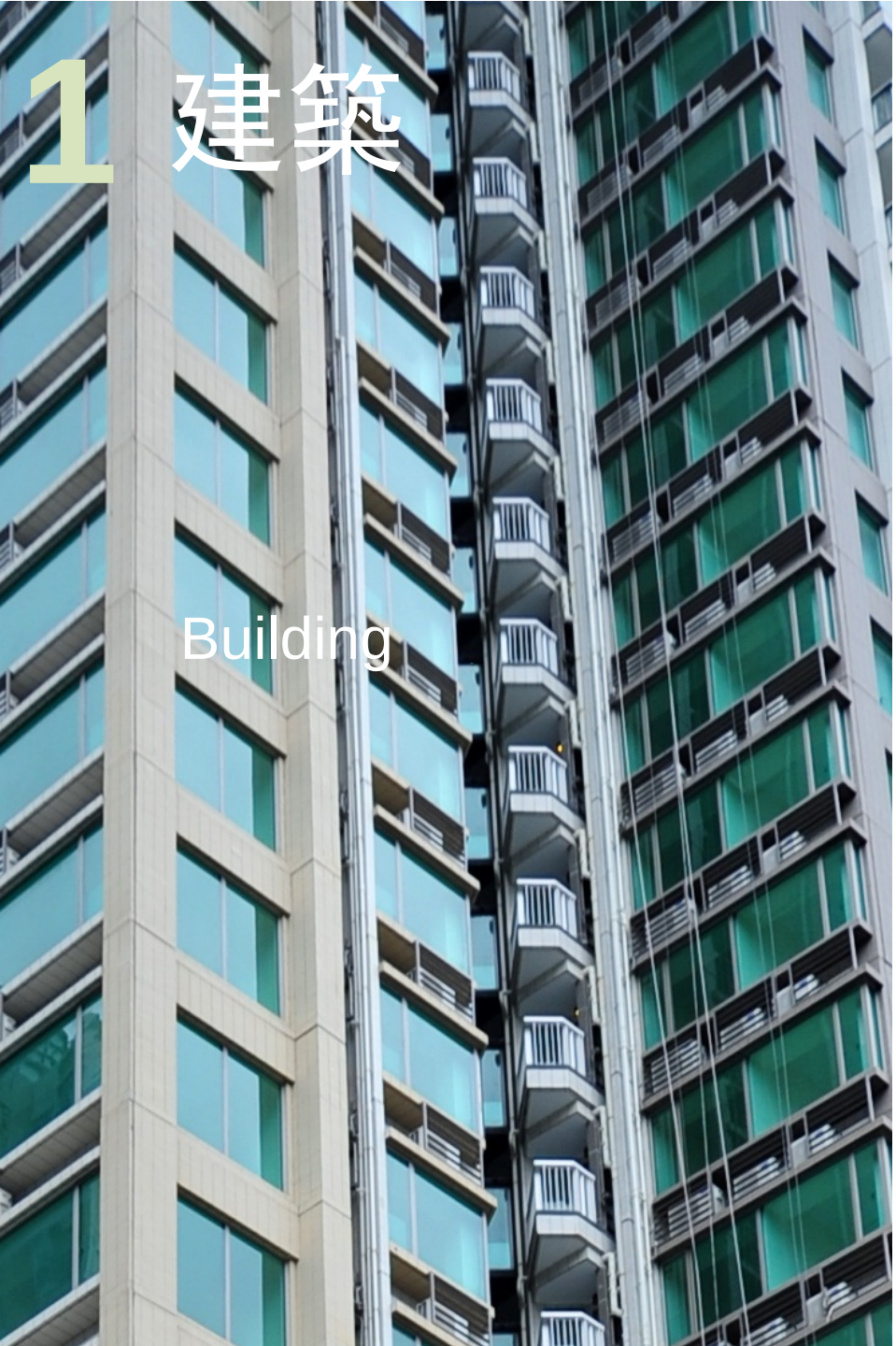
1

Increasing Hot Nights (Temperature > 28oC)

熱夜增加 (溫度達到28 度或以上的晚上)

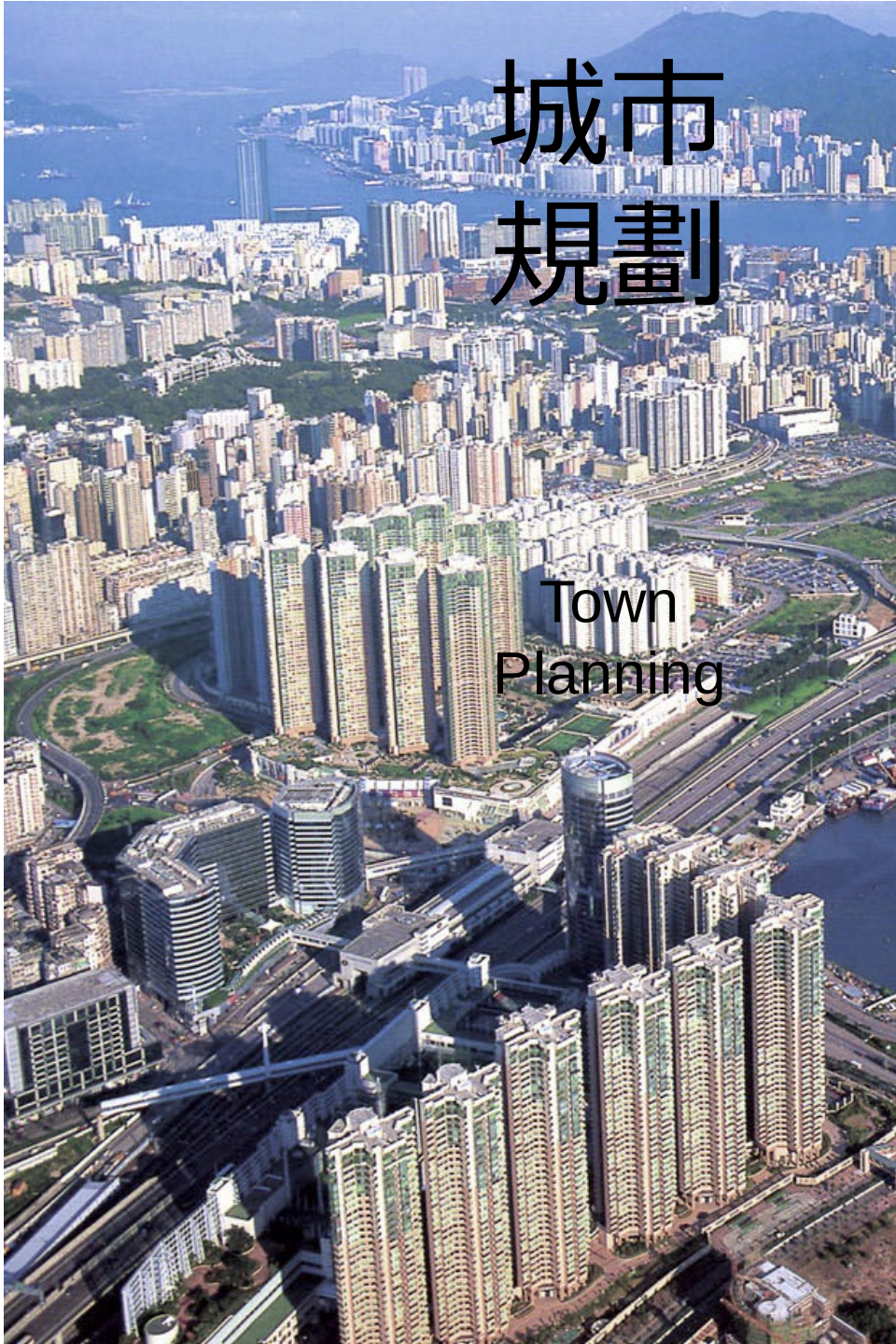
1950	2015	2030+ (估算 Projected)
0	37	>45

Source: HK Observatory (http://www.hko.gov.hk/climate_change/proj_hk_info_e.htm#temp)



1 建築

Building



城市規劃

Town Planning


1 建築
Building
都市
生活
空間
Urban
Living
Space
城市
規劃
Town
Planning

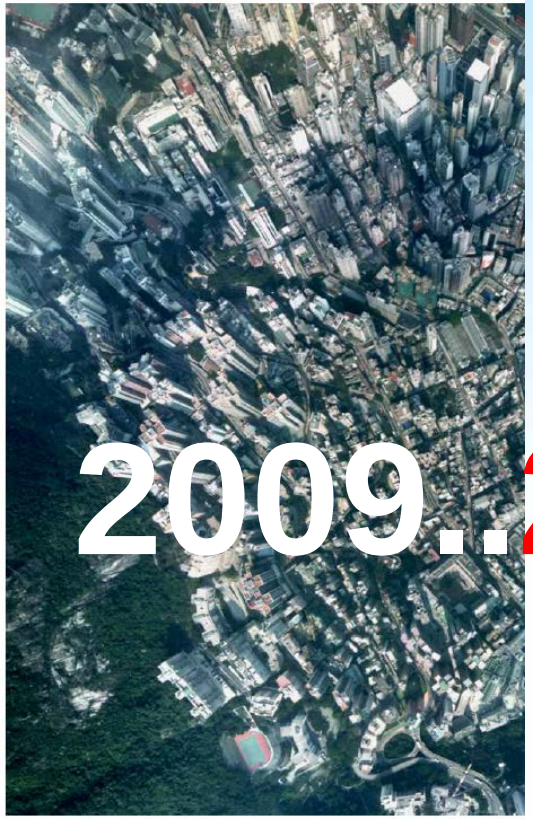
2

可持續建築
設計指引
SBDG

Buildings Department, the Government of the HKSAR
Consultancy Agreement No. BA/01/2006

Consultancy Study on
Building Design that Supports Sustainable Urban Living Space in HK

FINAL REPORT



Buildings Department	Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers	APP-152

Sustainable Building Design Guidelines

[illegible] practice note promulgates guidelines on building design which will enhance the quality and sustainability of the built environment in Hong Kong. These guidelines are the Sustainable Building Design Guidelines (SBD Guidelines) referred to in the Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) APP-151, the compliance with which the Building Authority (BA) will take into account, where applicable, as a pre-requisite in exempting or disregarding green and amenity features and non-mandatory / non-essential plant rooms and services from gross floor area and/or site coverage calculations (GFA concessions) for new building developments. Terminology used in the SBD Guidelines is listed in Appendix A.

Objectives

2. The SBD Guidelines establish 3 key building design elements to enhance the environmental sustainability of our living space. They are building separation, building setback and site coverage of greenery. The objectives are to achieve better air ventilation, enhance the environmental quality of our living space, provide more greenery, particularly at pedestrian level; and mitigate the heat island effect.

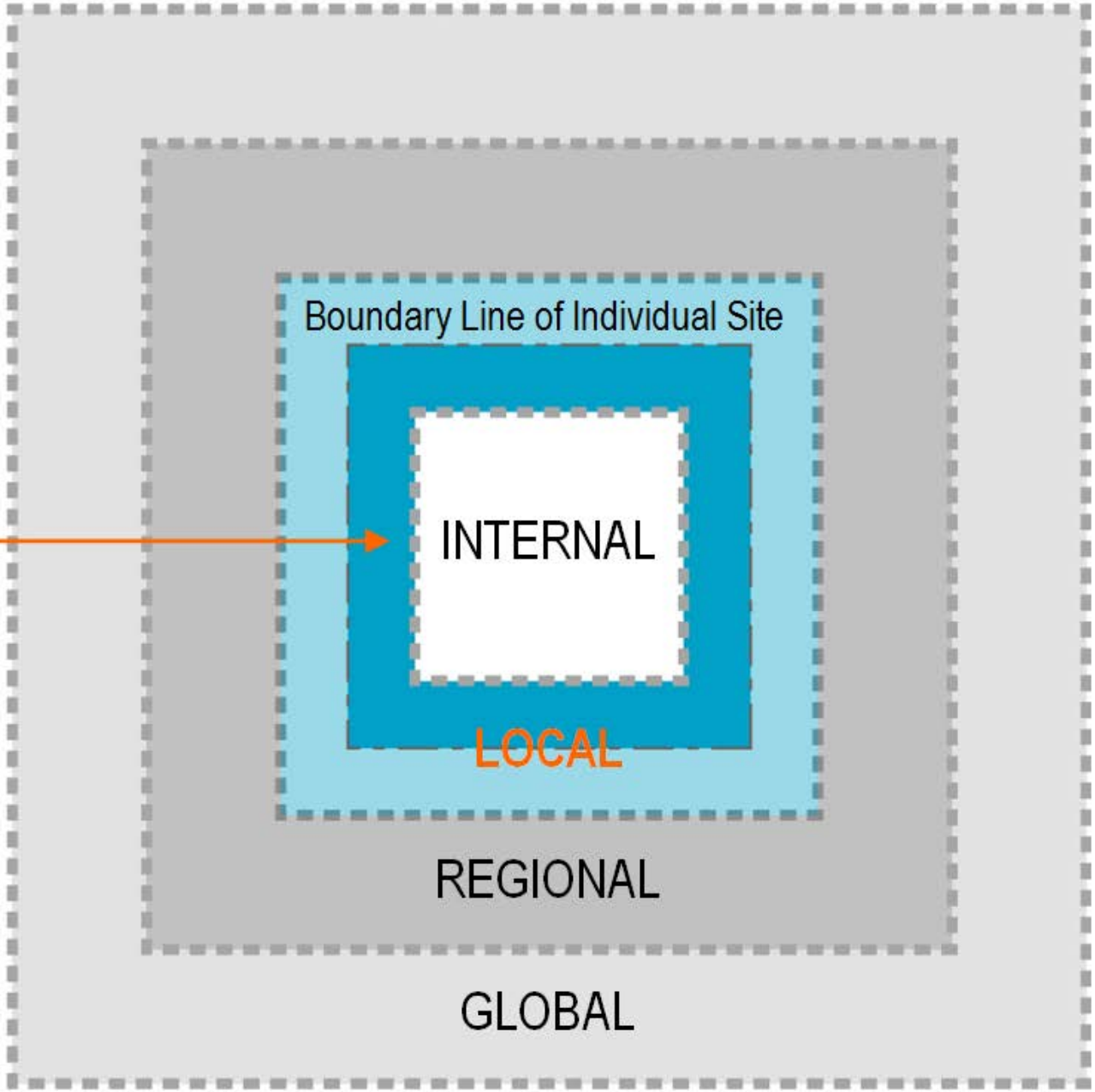
2009.. 2010.. 2011.. 2016..

2

Urban Climate
(Air Ventilation, etc)

Urban Greenery

Environmental Quality of Pedestrian Level ...



2

可持續建築設計指引

Sustainable Building Design Guidelines

2

可持續建築設計指引

Sustainable Building Design Guidelines

Building Separation: Why?

1

Against the undesirable street canyon effect formed between tall buildings on both sides abutting a street by control of

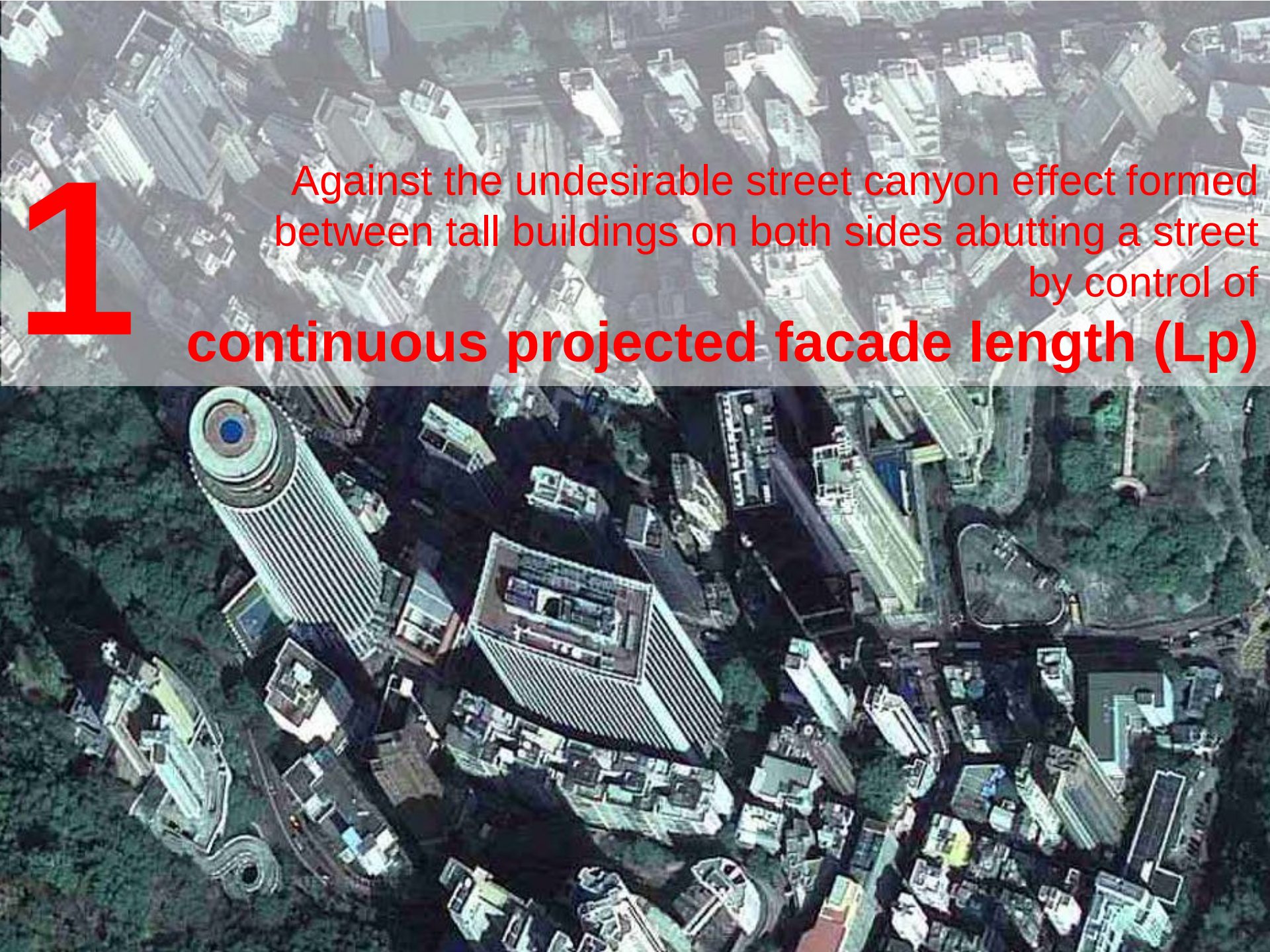
continuous projected facade length (Lp)

2

Against the undesirable walling effect of “long buildings”, buildings in large development sites should be separated by

intervening spaces + permeable elements.


The Past



1

Against the undesirable street canyon effect formed between tall buildings on both sides abutting a street by control of

continuous projected facade length (Lp)

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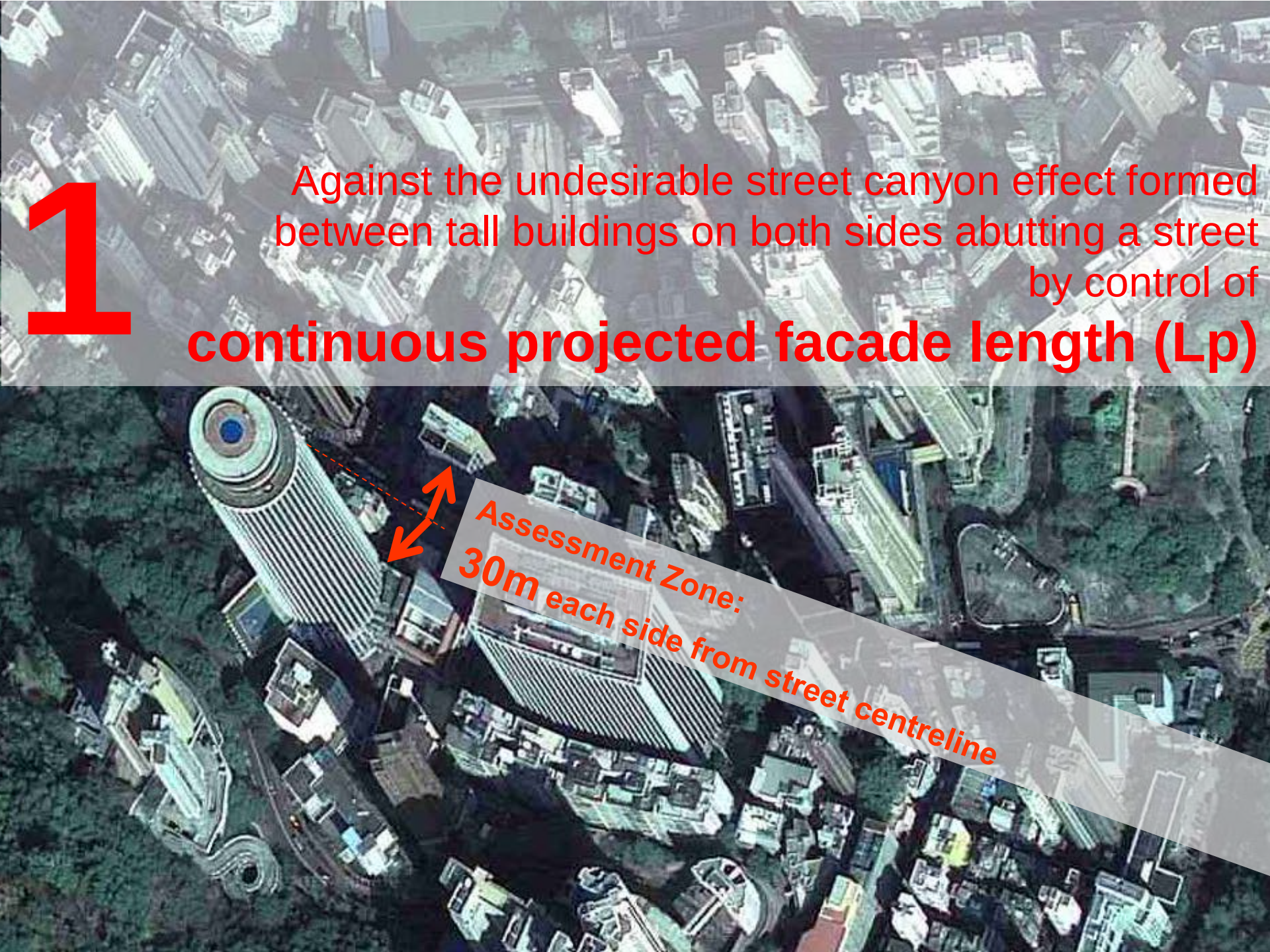

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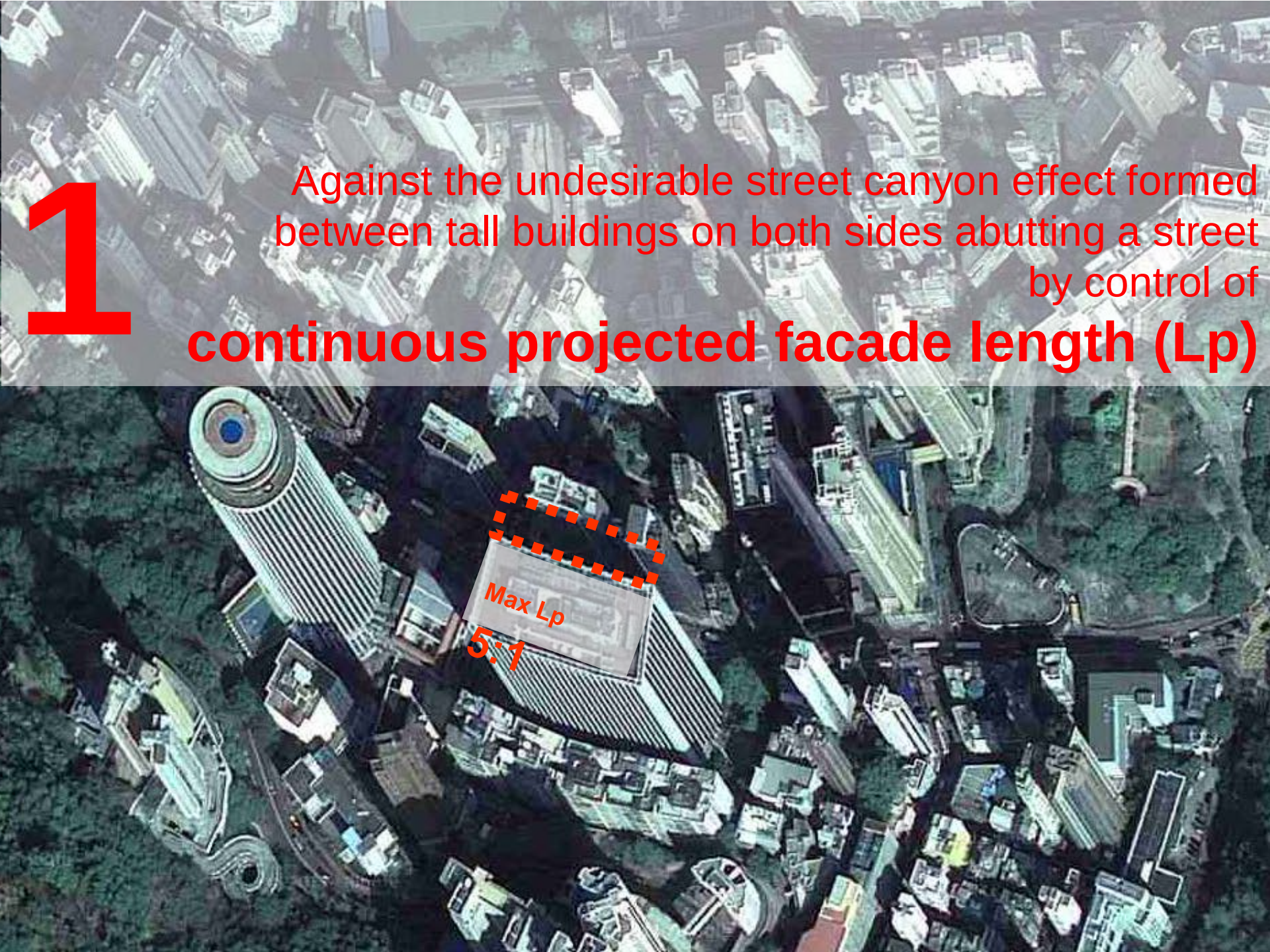
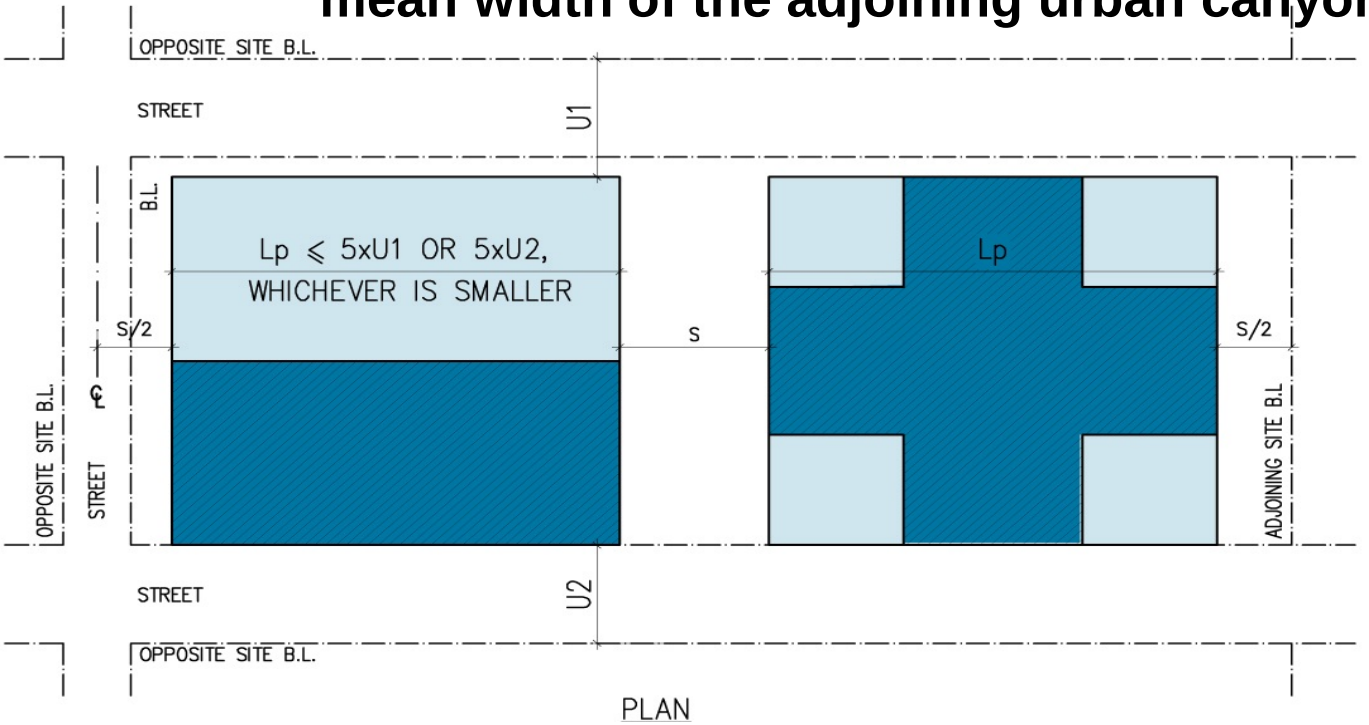


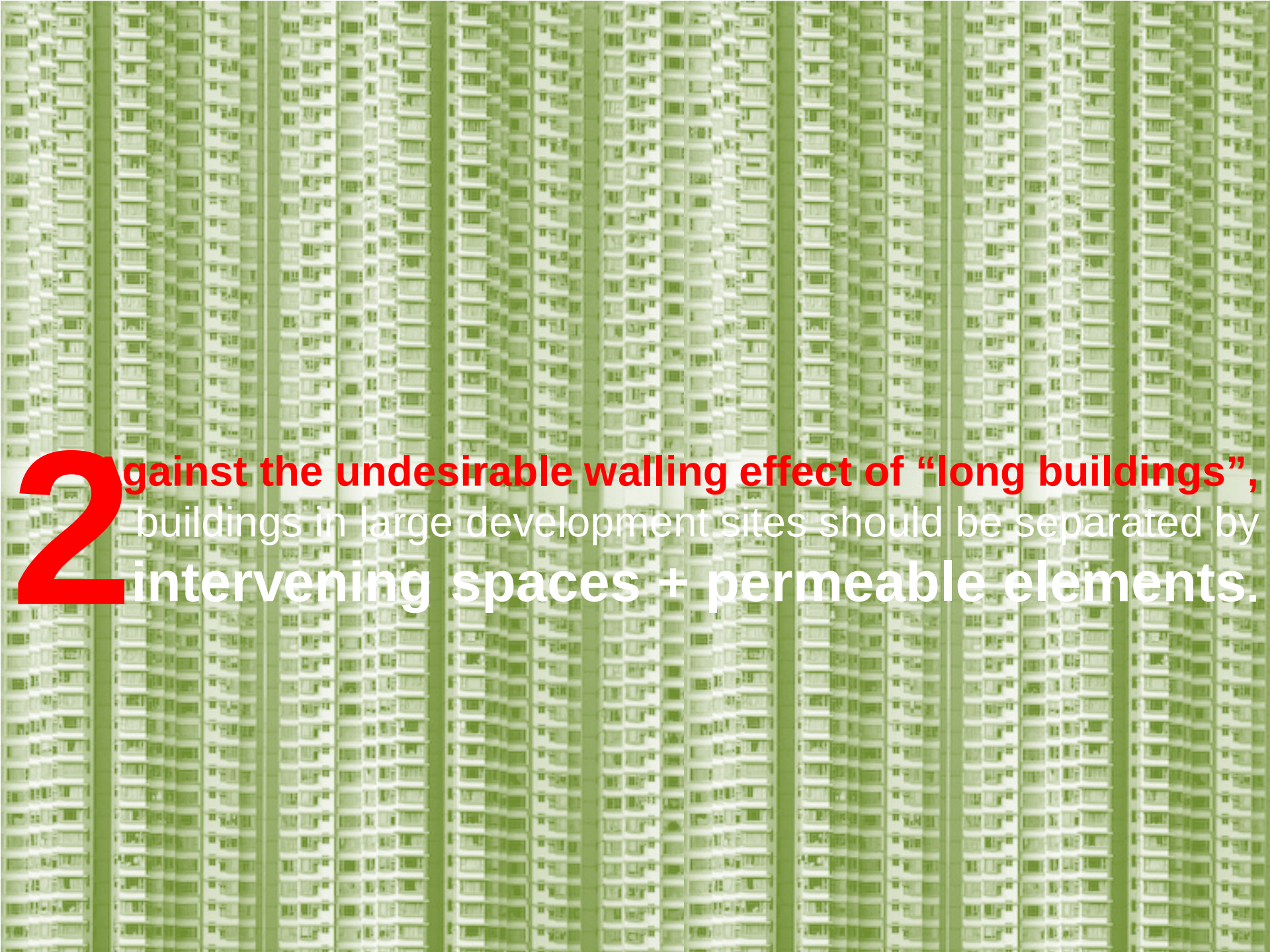
1

Against the undesirable street canyon effect formed between tall buildings on both sides abutting a street by control of

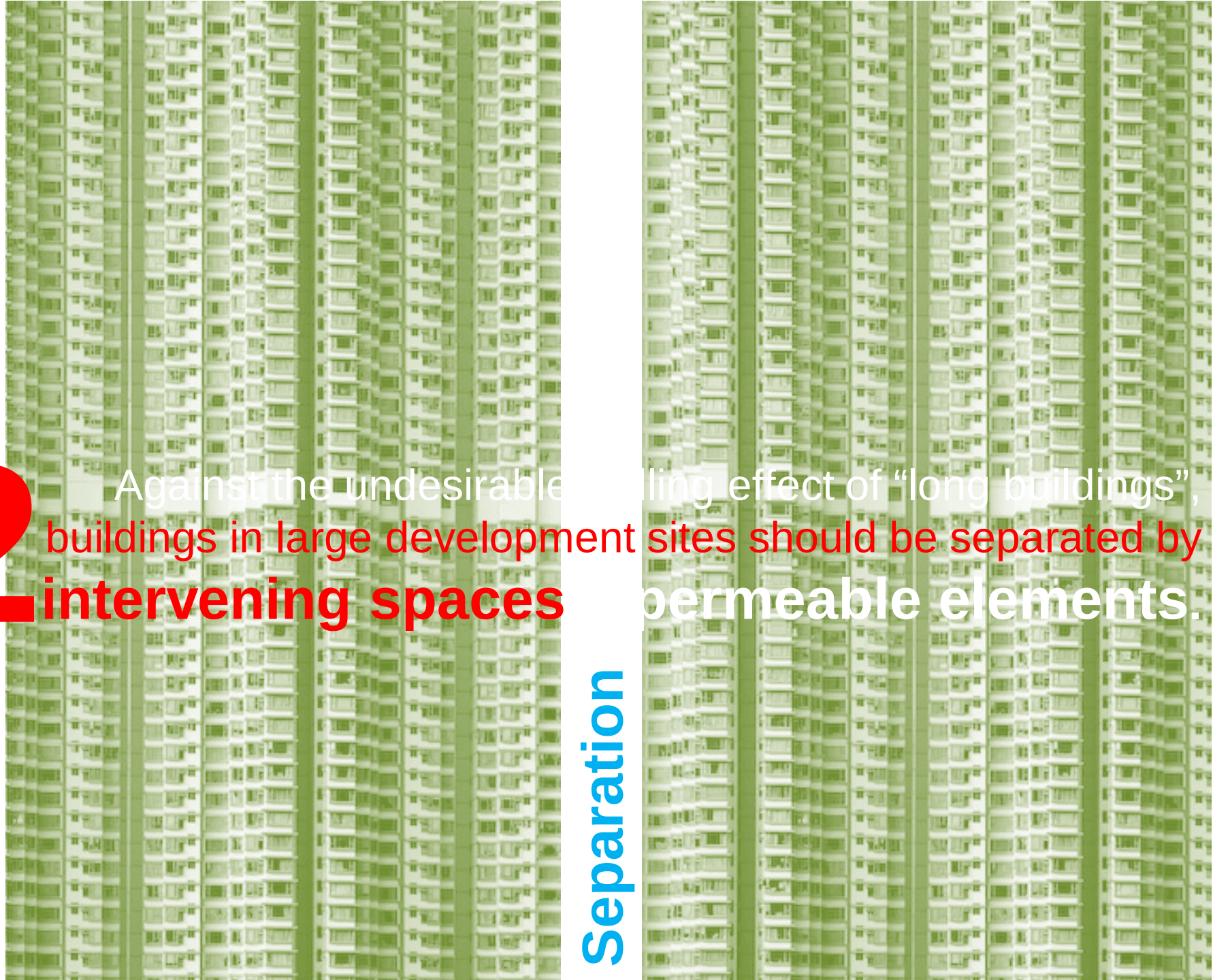
continuous projected facade length (Lp)

- **Lp shall not be larger than 5 times of the mean width of the adjoining urban canyons.**





2 **gainst the undesirable walling effect of "long buildings",** buildings in large development sites should be separated by **intervening spaces + permeable elements.**



2

Against the undesirable [illegible]ling effect of “long buildings”, buildings in large development sites should be separated by **intervening spaces** [illegible]**permeable elements.**

Setback

Separation

Stepping Height

2

Against the undesirable [illegible]ling effect of “long buildings”, buildings in large development sites should be separated by **intervening spaces** [illegible]**permeable elements.**

Setback

Separation

Stepping Height

Sky Garden

2

Against the undesirable [illegible]ling effect of “long buildings”,
buildings in large development sites should be separated by
intervening spaces + permeable elements.

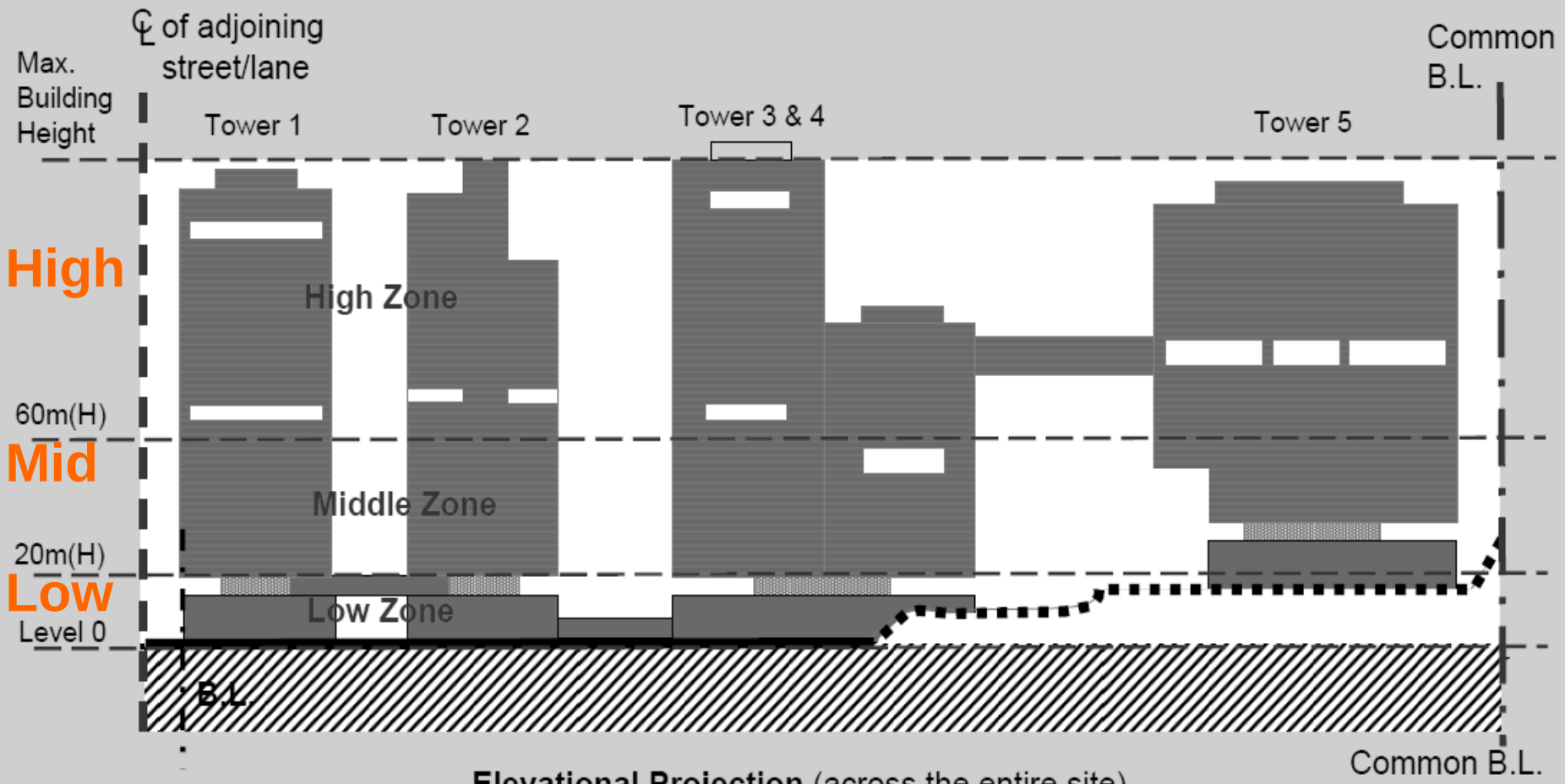
Setback

Separation

Podium Garden

Permeability (P)

$$(P) = \frac{\text{Sum of areas of intervening spaces \& permeable elements}}{\text{Area of the assessment zone}} \times 100\%$$

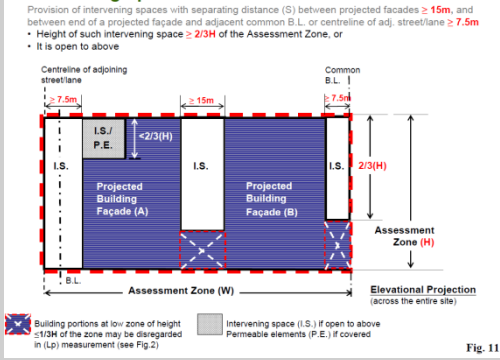


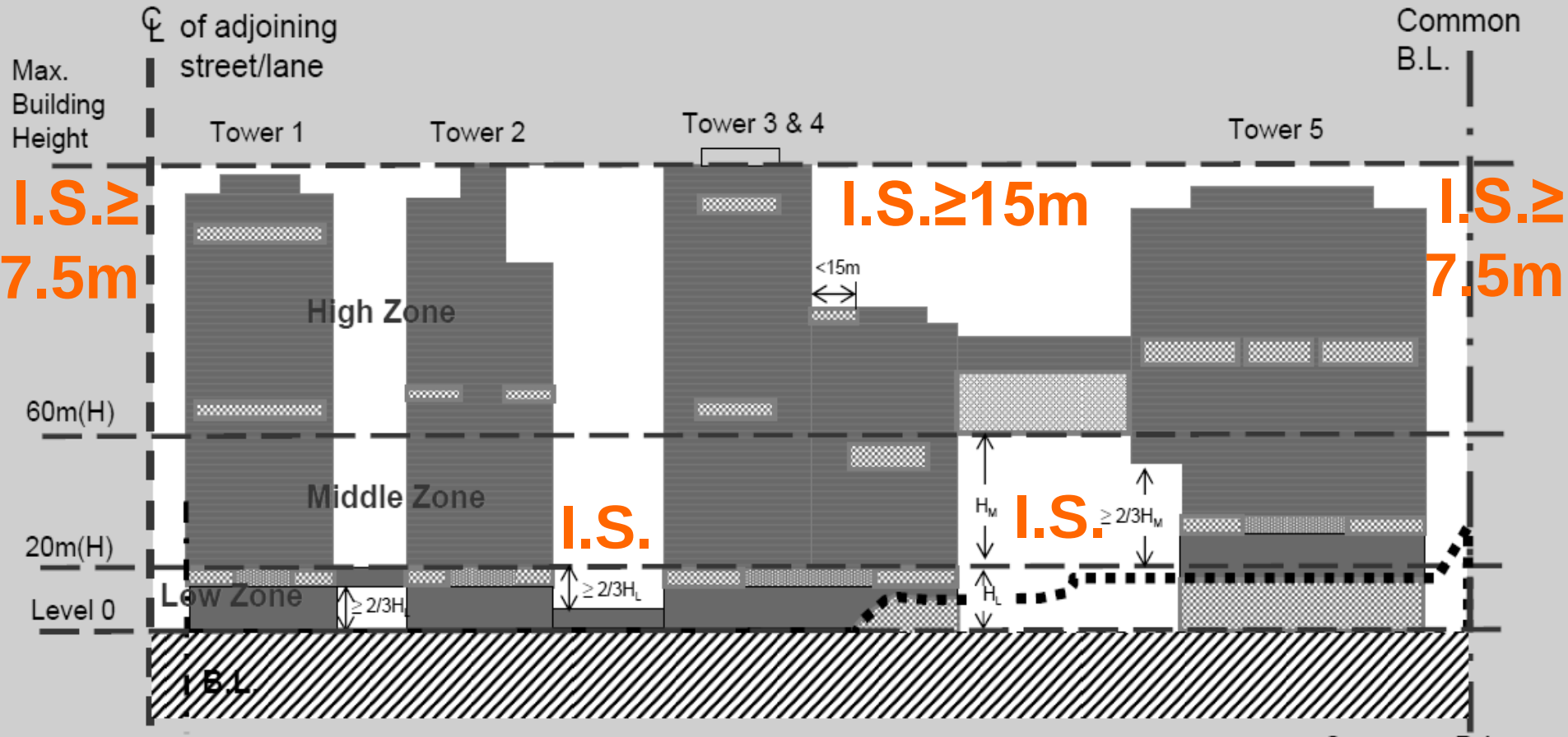
Elevational Projection (across the entire site)

Fig. 9

Intervening Space

$$\frac{\text{Sum of areas of intervening spaces}}{\text{Area of the assessment zone}} \times 100\% \geq 2/3 \times (P)$$



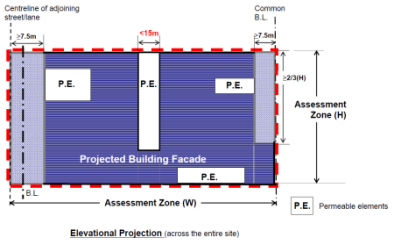


Elevational Projection (across the entire site)

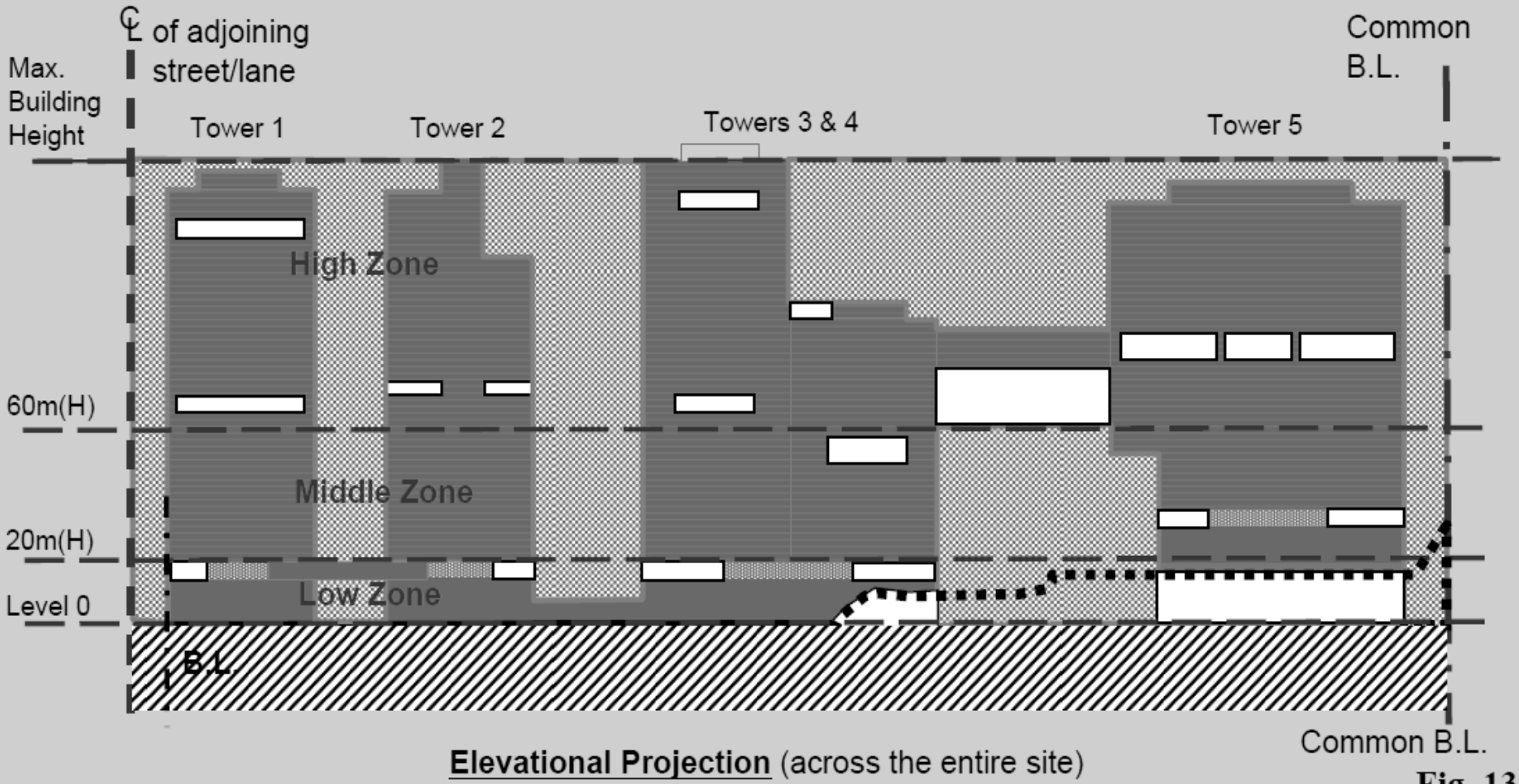
Fig. 10

Permeable Element

$$\frac{\text{Sum of areas of permeable elements}}{\text{Area of the assessment zone}} \times 100\% \leq 1/3 \times (P)$$



P.E.≥3m



Elevational Projection (across the entire site)

Fig. 13


Benchmark: the existing urban grids in districts like Mongkok
(older buildings are normally up to about 60m only)

20-25% permeability

(Mongkok)

P ~30%
(Lp = 30~45m,
S = 15~30m)

Building Separation: How?

Prescriptive

Permeability (P)

Height (H) of the tallest building	Minimum P of buildings in each *assessment zone* on two projection planes		
	Site area $< 20{,}000m^2$ and with $Lp \geq 60m$	Site area $\geq 20{,}000m^2$	
	Each Plane	Plane 1	Plane 2
$H \leq 60m$	20%	20%	25%
$H > 60m$	20%	20%	33.3%

The more wind, the better the urban living environment for sub-tropical-high-density context of Hong Kong

… the gap between 2 building blocks be at least 50% of the combined width of the blocks (The equivalent permeability is 33%.)

… 60m is roughly equivalent to the height of a typical existing 20-storey building in the urban area of Hong Kong. The intention is to safeguard reasonable wind availability to the majority of existing building stock.

2

可持續建築設計指引

Sustainable Building Design Guidelines

Green Coverage: Why?

1

To improve the
environmental quality of the urban space,
particularly at the pedestrian level

2

To mitigate
heat island effect

SBDG-2

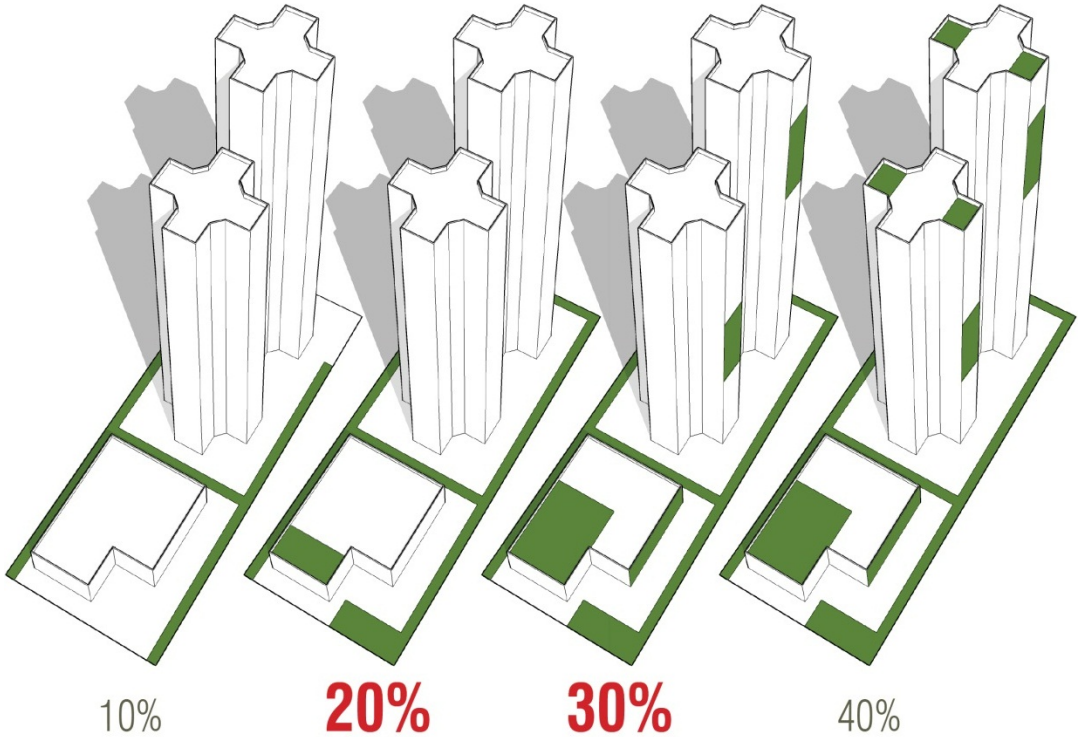
Green Coverage: How?

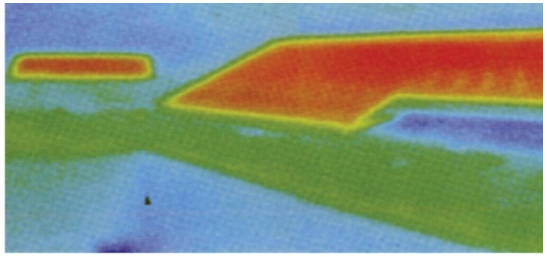
Site Coverage of Greenery

For sites ≥ 1,000m^2

(not applicable to sites with a single family house only)

Site Area	Minimum Site Coverage of Greenery	
	Primary zone	Overall
1,000 m^2 – 20,000 m^2	10%	20%
≥ 20,000 m^2	15%	30%





Cooling Effect of Green Roof

Vertical Greenery

Grass Paver

Water Body

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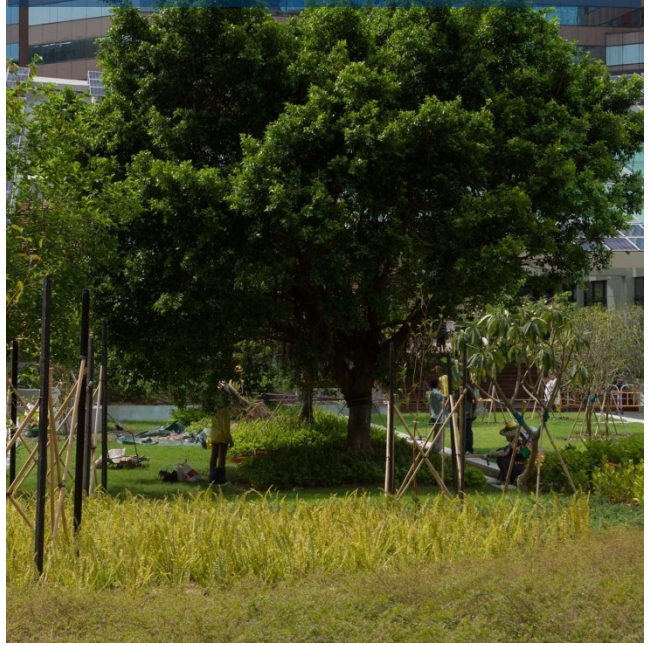
Roof Garden

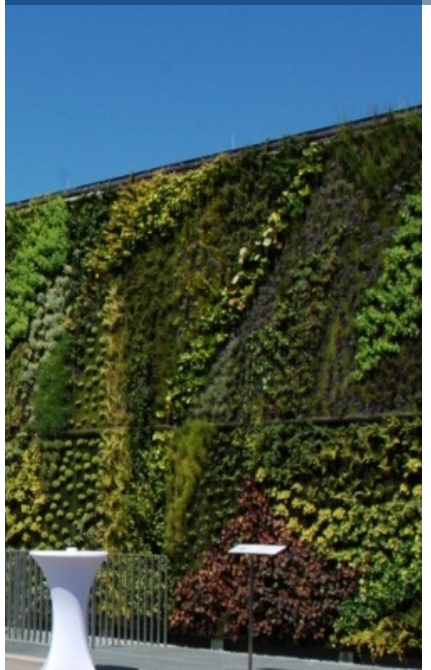
Uncovered Greenery Areas

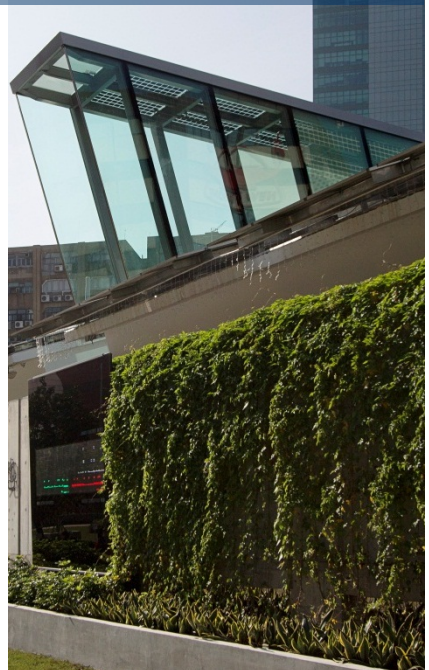


Covered Greenery Areas

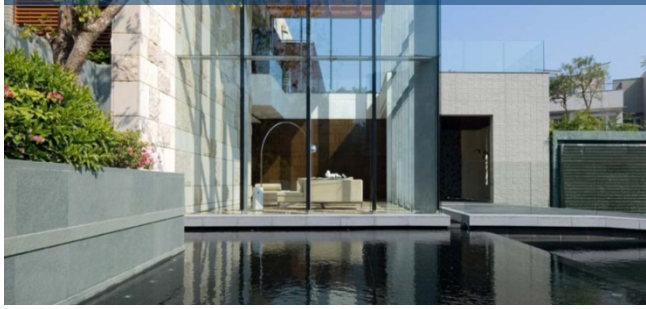
Greening on Slope

Vertical Greenery





Water Feature



Grass Paving

2

可持續建築設計指引

Sustainable Building Design Guidelines

Building Setback: Why?

1 To improve air ventilation and mitigate street canyon effect

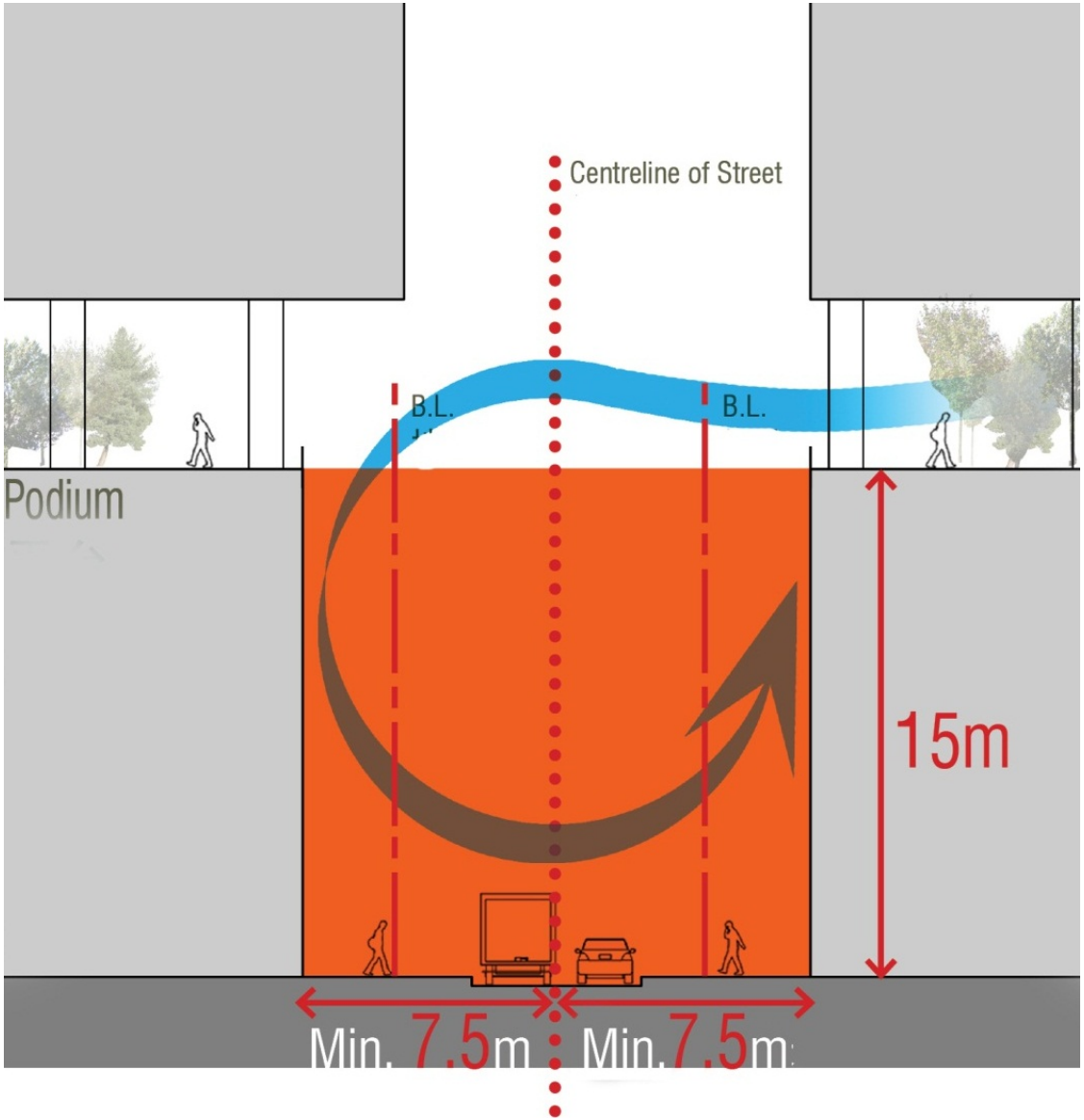
2 To enhance environmental quality at pedestrian level

SBDG-3


24 hrs
全日


一平裝裱字畫各款畫框
一平鋁質相架
一平新款畫架
一平裝裱字畫各款畫框
一平鋁質相架
一平新款畫架
一平裝裱字畫各款畫框
一平裝裱字畫各款畫框
一平裝裱字畫各款畫框
一平
VICK PING FACTORY
一平
一平
品小
興廣
榮興行

Building Setback: How?



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3

範例

Cases Sharing

One Harbour Gate, Hong Kong

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3

Park Vista, Hong Kong

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3

Siu Sai Wan Complex, Hong Kong

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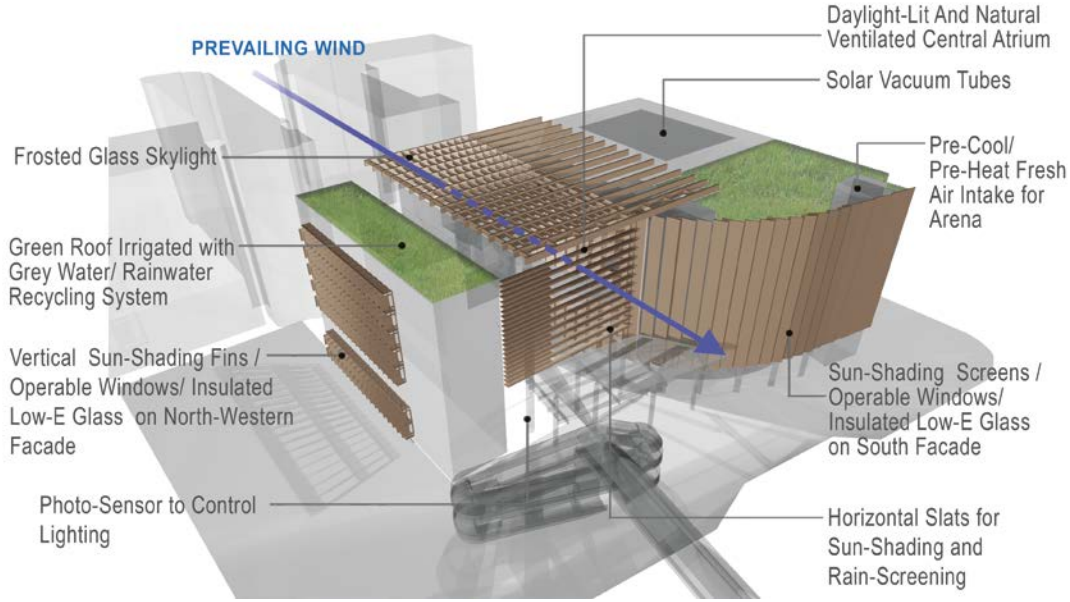
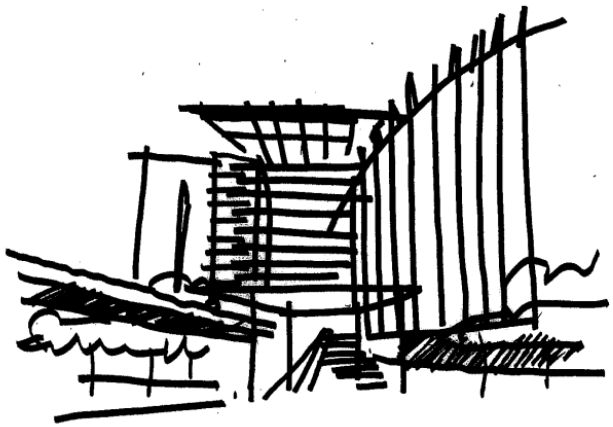
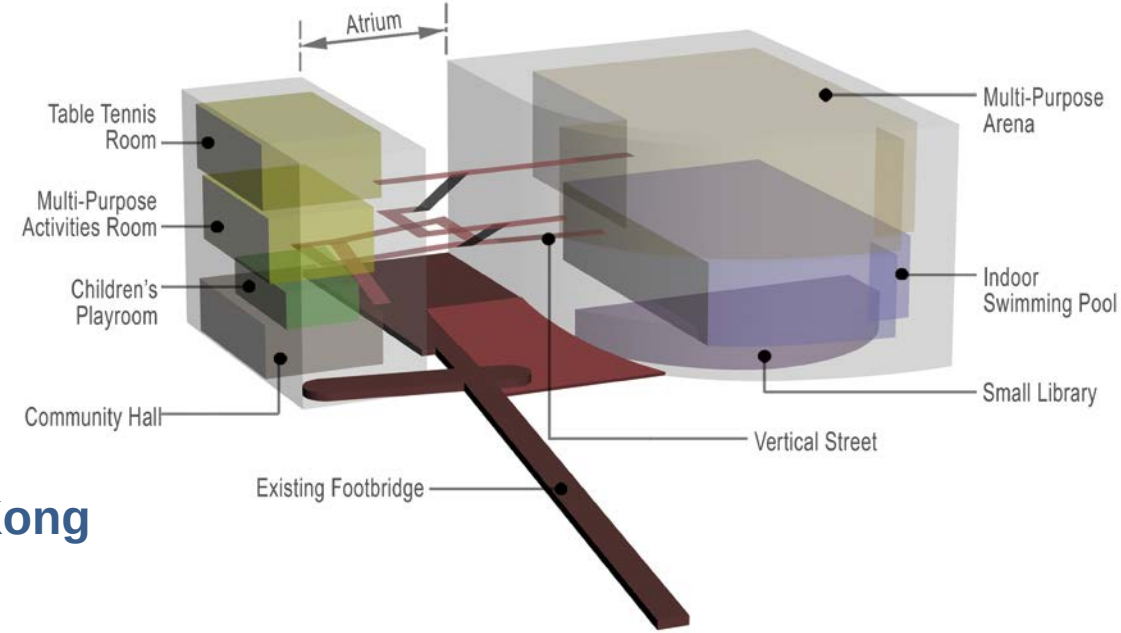
3







Siu Sai Wan Complex, Hong Kong

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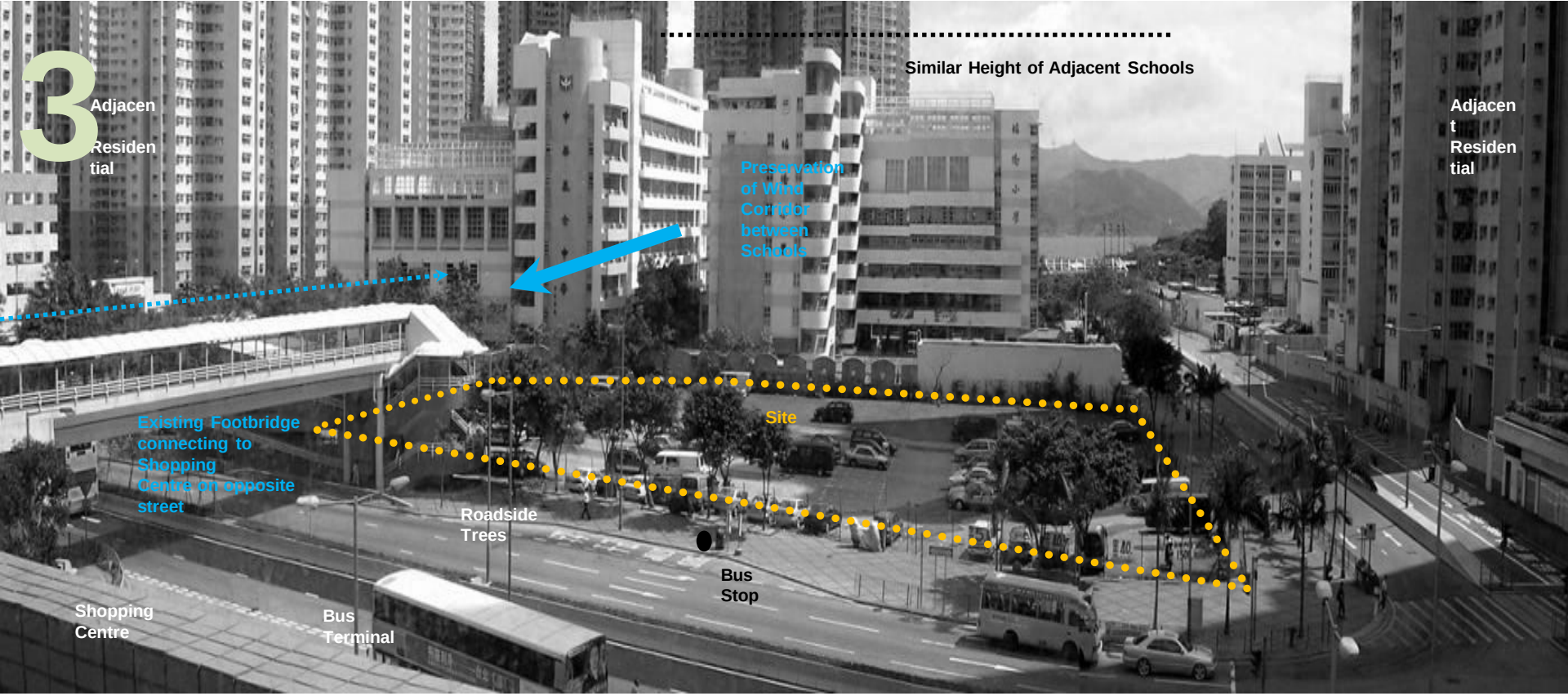
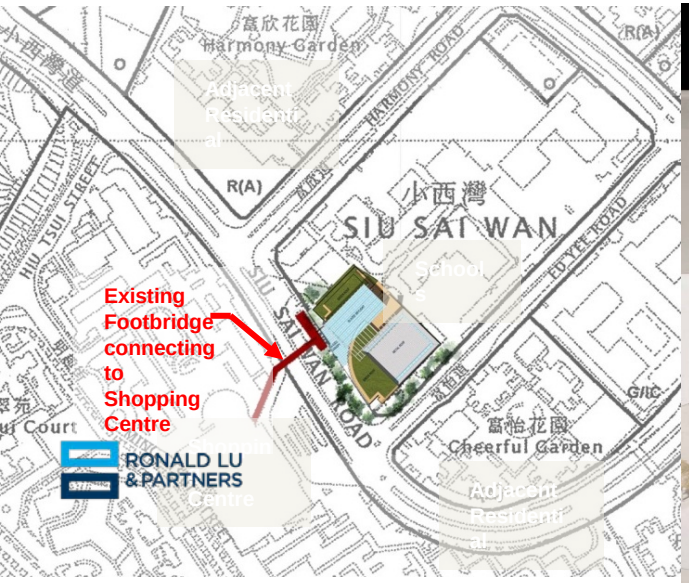
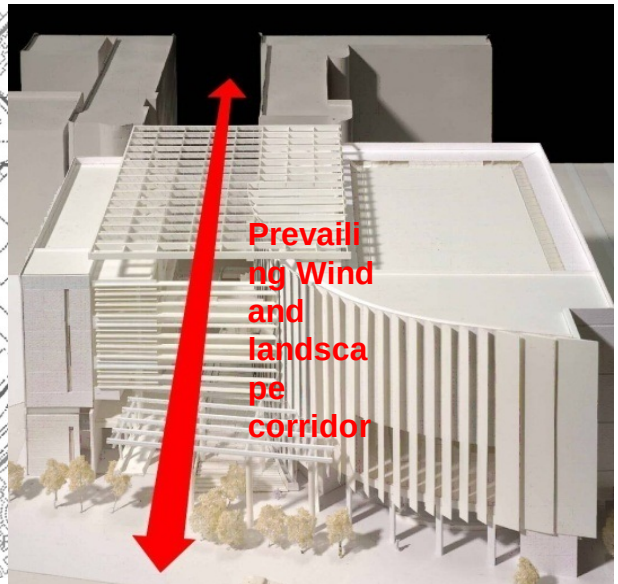
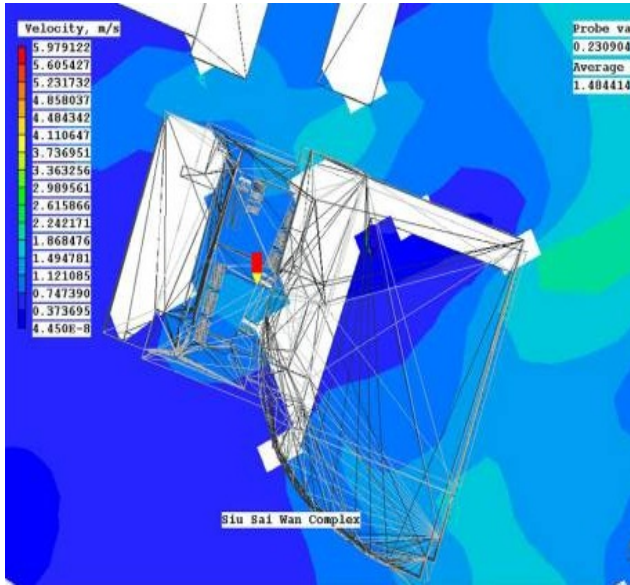
3


Adjacent Residential
Similar Height of Adjacent Schools
Adjacent Residential
Preservation of Wind Corridor between Schools
Existing Footbridge connecting to Shopping Centre on opposite street
Site
Roadside Trees
Bus Stop
Shopping Centre
Bus Terminal


高欣花園
Harmony Garden
Adjacent Residential
HARMONY ROAD
R(A)
HIU TSUI STREET
小西灣
SIU SAI WAN
School
Existing Footbridge connecting to Shopping Centre
SIU SAI WAN ROAD
GHC
高怡花園
Cheerful Garden
Adjacent Residential
RONALD LU & PARTNERS


Prevailing Wind and landscape corridor


Velocity, m/s
5.979122
5.605427
5.231732
4.858037
4.484342
4.110647
3.736951
3.363256
2.989561
2.615866
2.242171
1.868476
1.494781
1.121085
0.747390
0.373695
4.450E-8
Probe va
0.230904
Average
1.484414
Siu Sai Wan Complex

3

China Resource Building, Hong Kong

RONALD LU & PARTNERS

3

China Resource Building, Hong Kong

RONALD LU & PARTNERS

3

China Resource Building, Hong Kong

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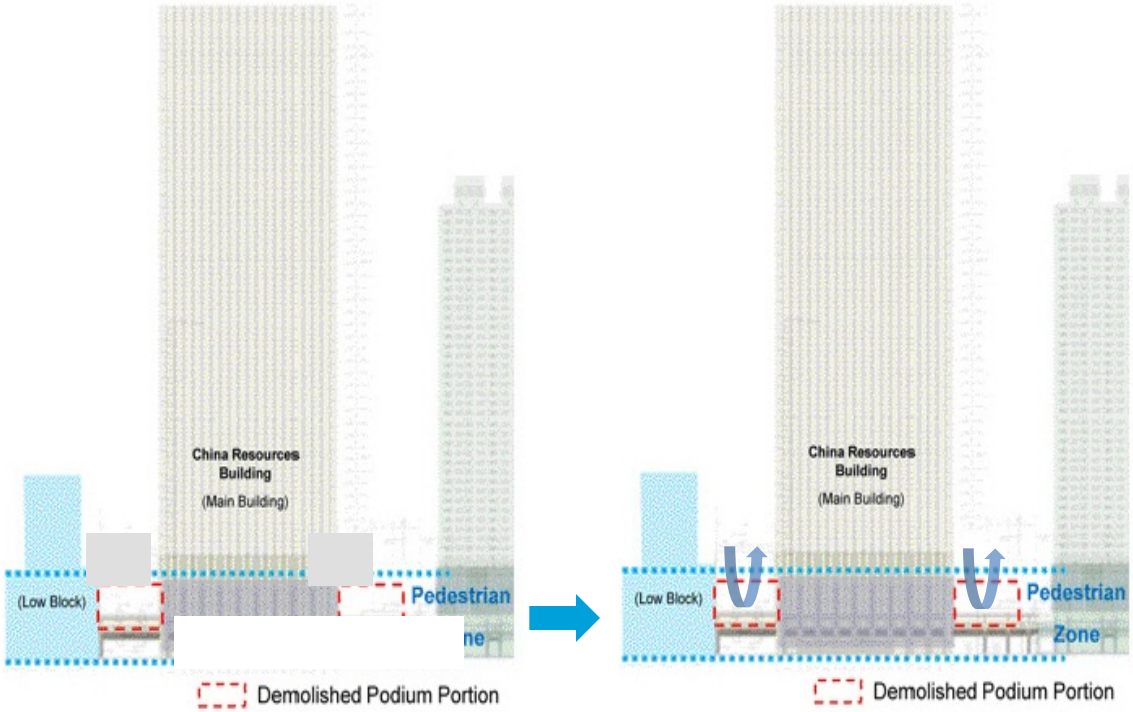
3 場所營造
Place-making

公共空間重塑
Remake Public Spaces



China Resource Building

Wanchai, Hong Kong

Podium Level

Before Renovation

Building Permeability:

7%

at Low Zone

Podium Level

After Renovation

Building Permeability:

33%

at Low Zone

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De Novo, Hong Kong

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3

THEi Chaiwan New Campus, Hong Kong

RONALD LU & PARTNERS

3

THEi Chaiwan New Campus, Hong Kong

RONALD LU & PARTNERS

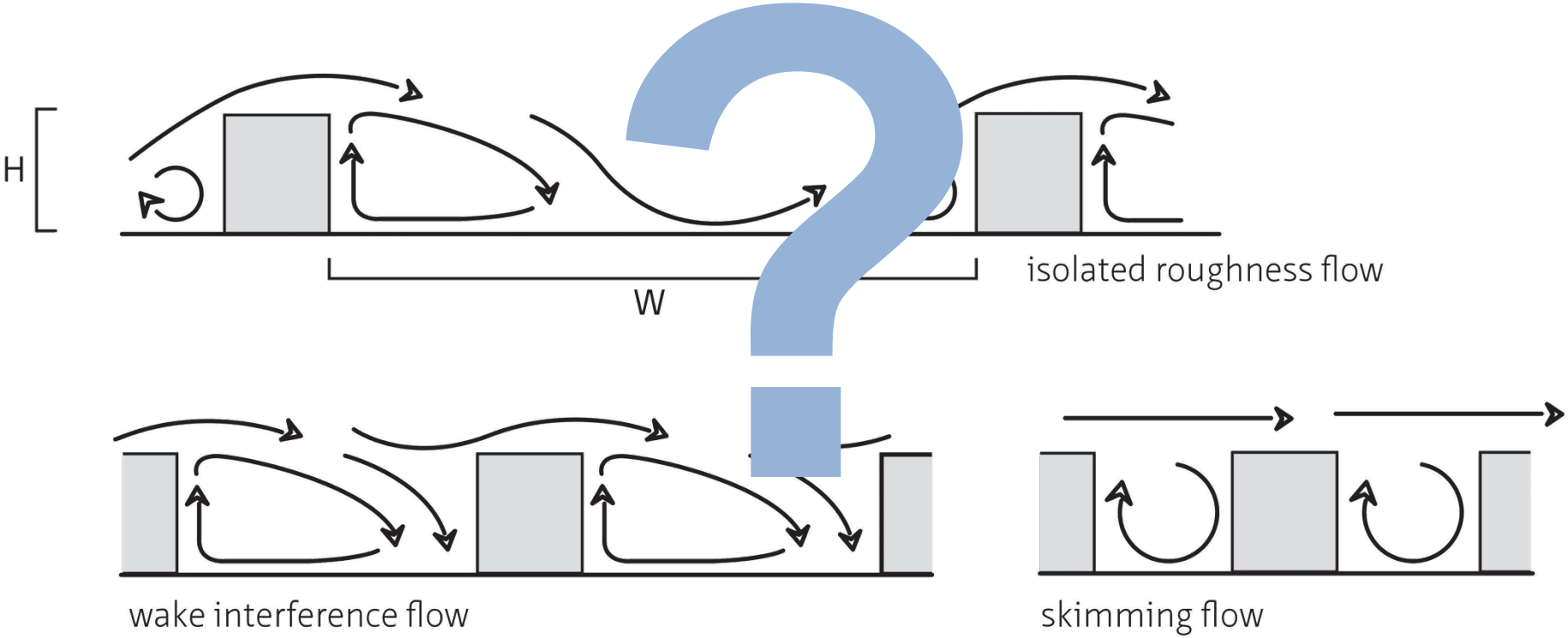
4

展望

Towards 2030+

2009..2010.. 2011..2016..

4


H
W
isolated roughness flow
wake interference flow
skimming flow

4

4

SDSG"+"

- urban ecology
- high-rise community green & blue
- zero-emissions
- …

謝謝

Thank you

香港 HONG KONG 2030+

跨越2030年的規劃遠景與策略

Towards a Planning Vision and Strategy Transcending 2030