

Extreme configurations WalkableHK

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Translation by Xian SU

HKURBAN
lab

URBAN SPACE ANALYSIS FORUM AND THE THIRD SYMPOSIUM ON SPACE SYNTAX IN CHINA



WalkableHK

宜步行的香港



HK Landscape – not a compact urban form

香港的景观-- 非紧凑型土地形态

25%

Hong Kong land built up
香港建成区土地面积约

≈ 275 km² / 1,105.7 km²

Arable land 可耕种的土地	2.95%	32.62 km ²
Permanent crops 永久性作物	0.95%	10.50 km ²
Other 其他	96.10% (2012 est.) (CIA)	

HK Density 香港密度	26,850/km ²
Paris Arrondissements 大巴黎地区 excluding Bois de Vincennes & Bois de Boulogne	25,650/km ²

Humid subtropical climate 湿润的亚热带气候

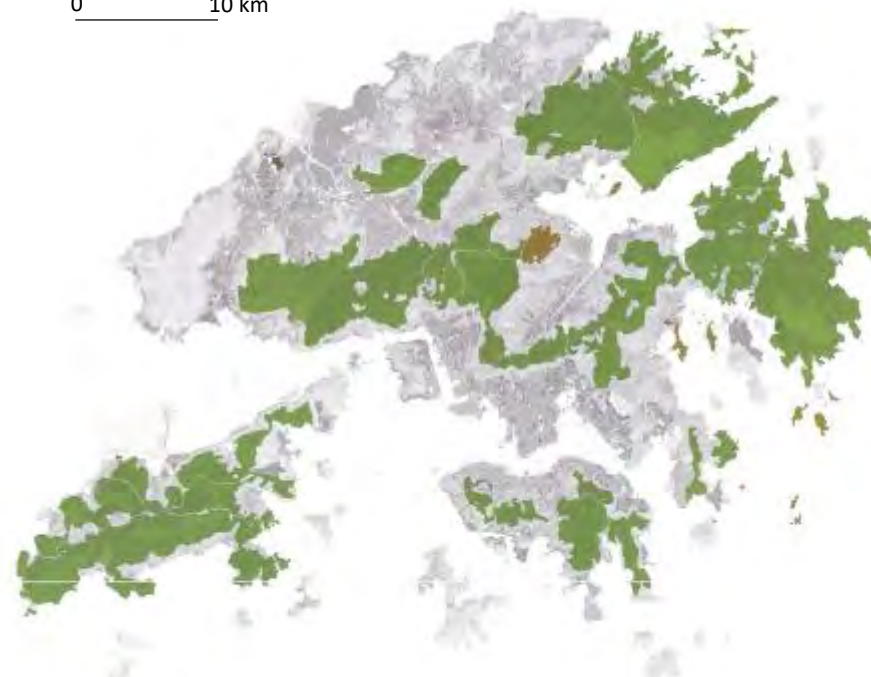
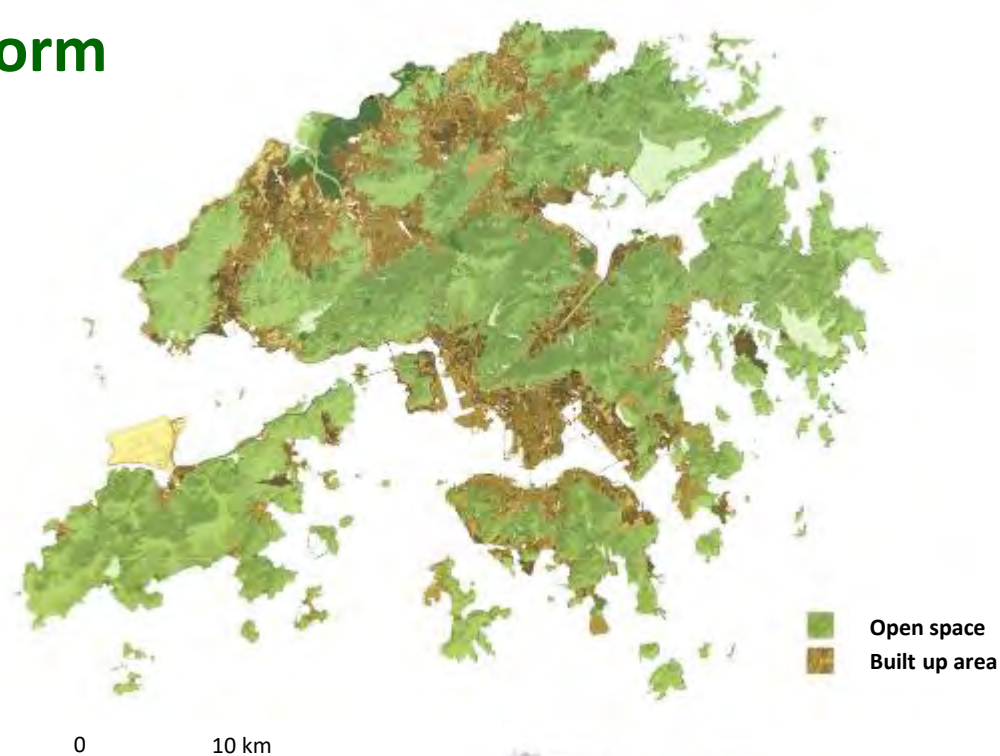
40%

Hong Kong's park system
香港的绿地系统

40% of the city is protected by law as officially designated
country parks and special areas

40%的地区作为绿地公园受法律保护，不能开发。

about 443 km² / 1,105.7 km²



HK Landscape – not flat 香港的景观 -- 山峦起伏

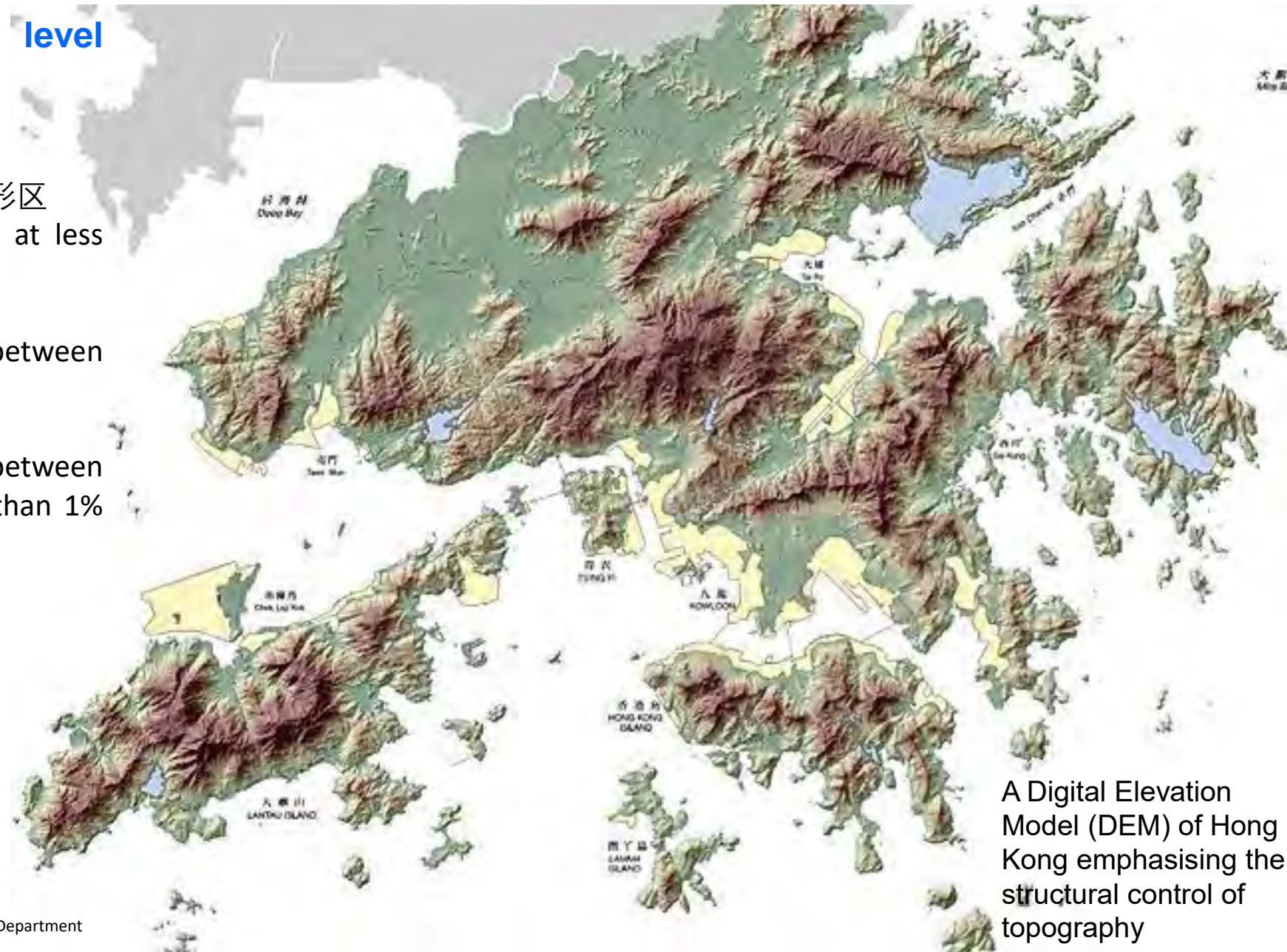
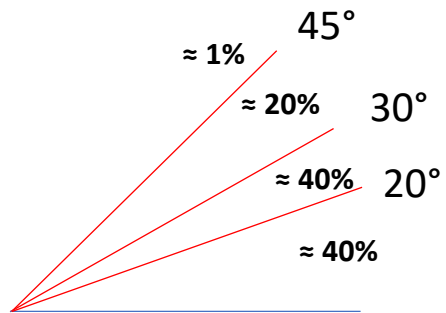
shortage of easily developed level land in Hong Kong

香港易开发的平坦土地非常短缺

About 650 km², or 60%, is natural terrain

约650km², 大概60%的土地是自然地形区

- About 40% of natural hillsides slope at less than 20 degree
- About 40% of natural hillsides slope between 20 degree and 30 degree
- About 20% of natural hillsides slope between 30 degree and 45 degree, with less than 1% sloping at more than 45 degree

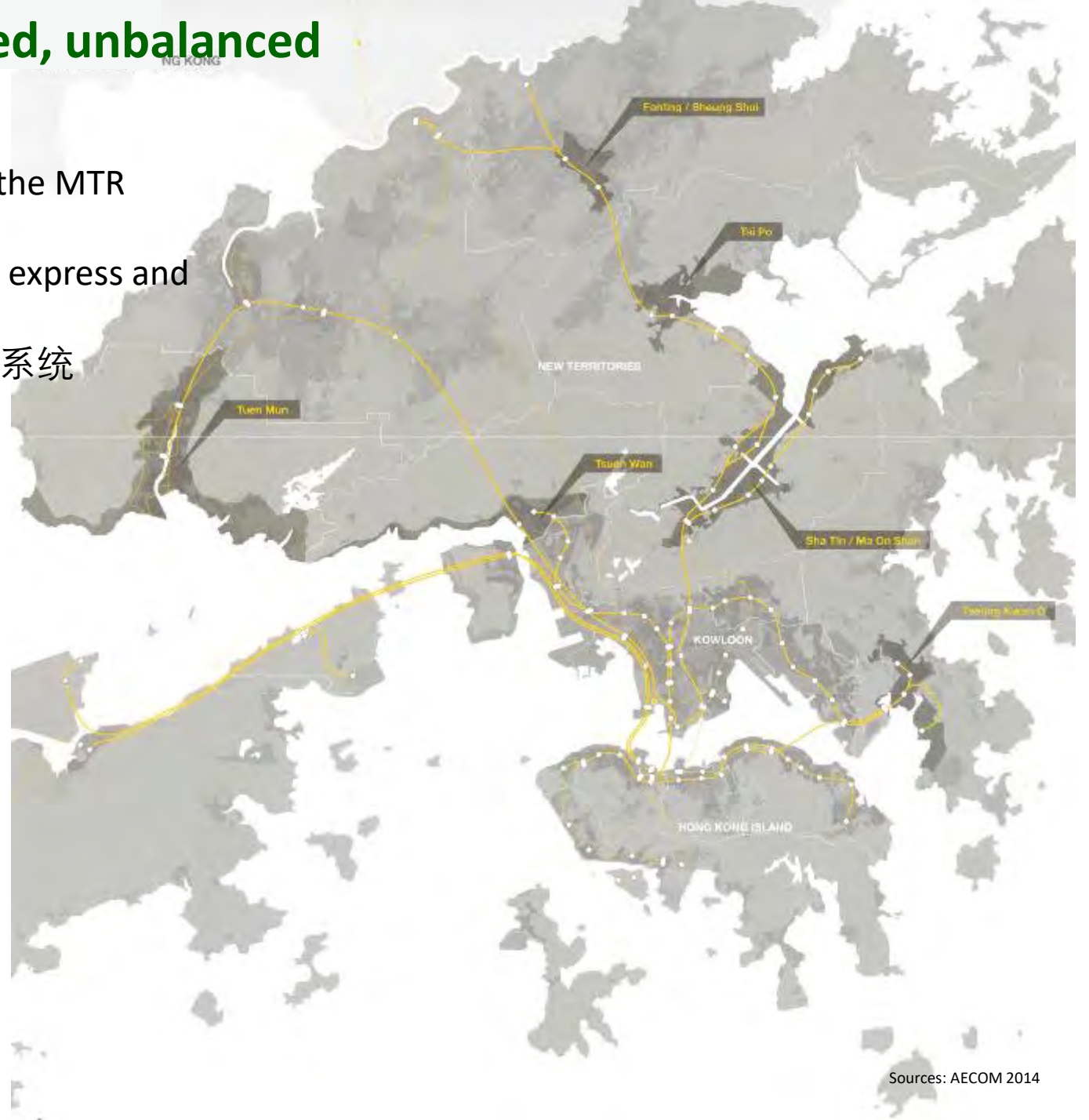


A Digital Elevation Model (DEM) of Hong Kong emphasising the structural control of topography

MTR – over centralising, congested, unbalanced

港铁系统 -- 集中，拥挤，失衡

- Every new town ended to be connected with the MTR
每个卫星城、大居住区都被港铁系统连接
- MTR operates 9 rapid transit lines, the airport express and the light rail systems
港铁有9条轨道交通线路，机场快线和轻轨系统



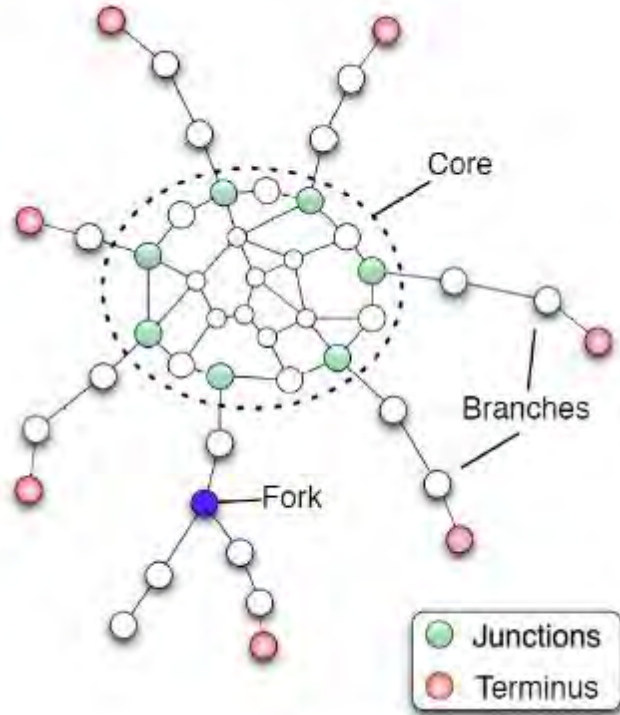
New Town

	Development Area	Projected population 2015	Urban area Equivalent to	Density Pers/ha
Sha Tin / Ma On Shan	3,951	711,100	Athens	180
Tsuen Wan	3,285	796,000	San Francisco	242
Tuen Mun	3,259	496,000	Denver	152
Tai Po	2,897	278,100	Cardiff	96
Fanling / Sheung Shui	768	266,300	Cincinnati	347
Tseug Kwan O	1,738	402,800	Atlanta	232

MTR – over centralising, congested, unbalanced

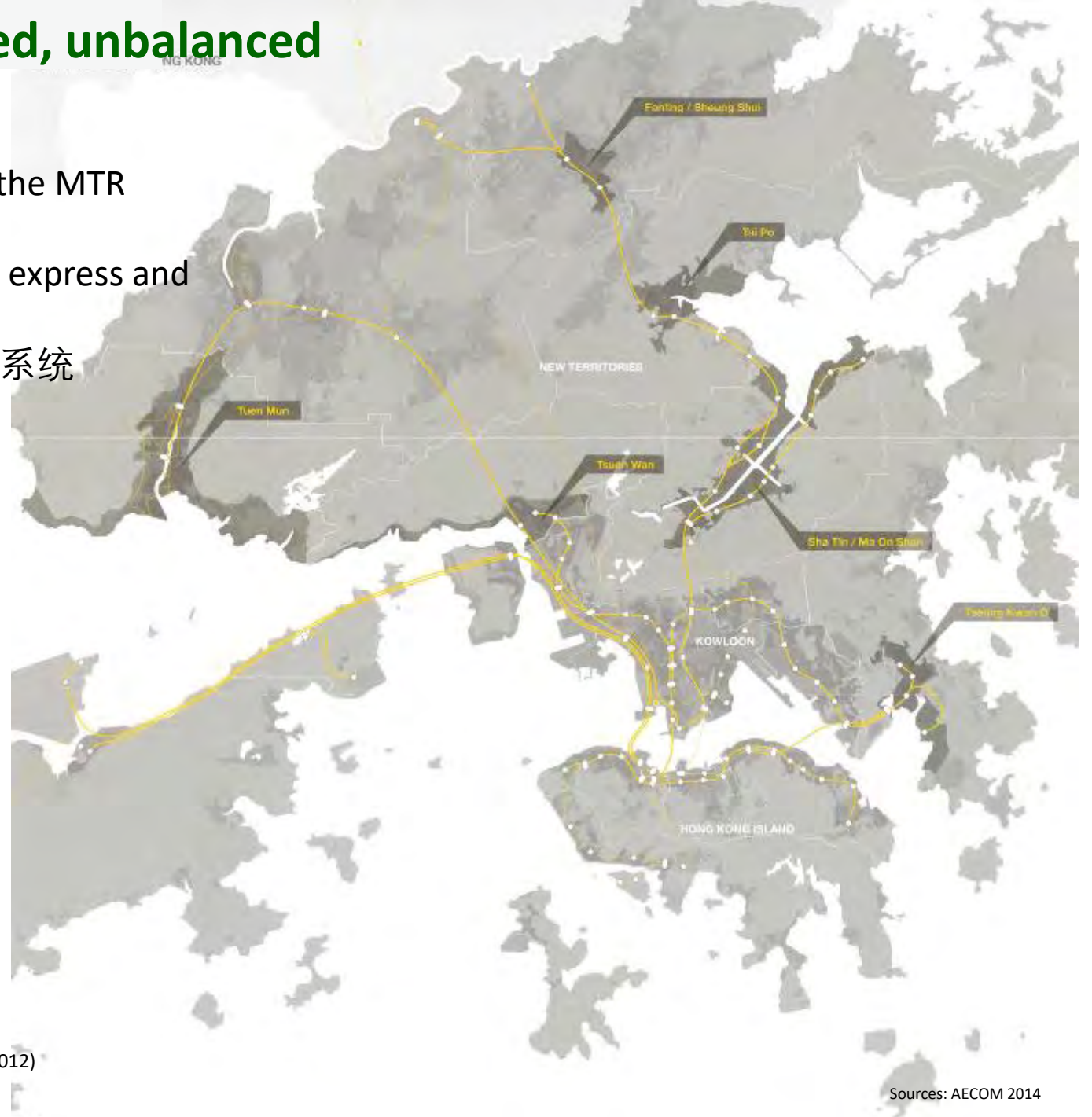
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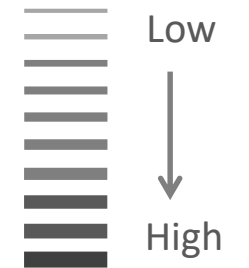
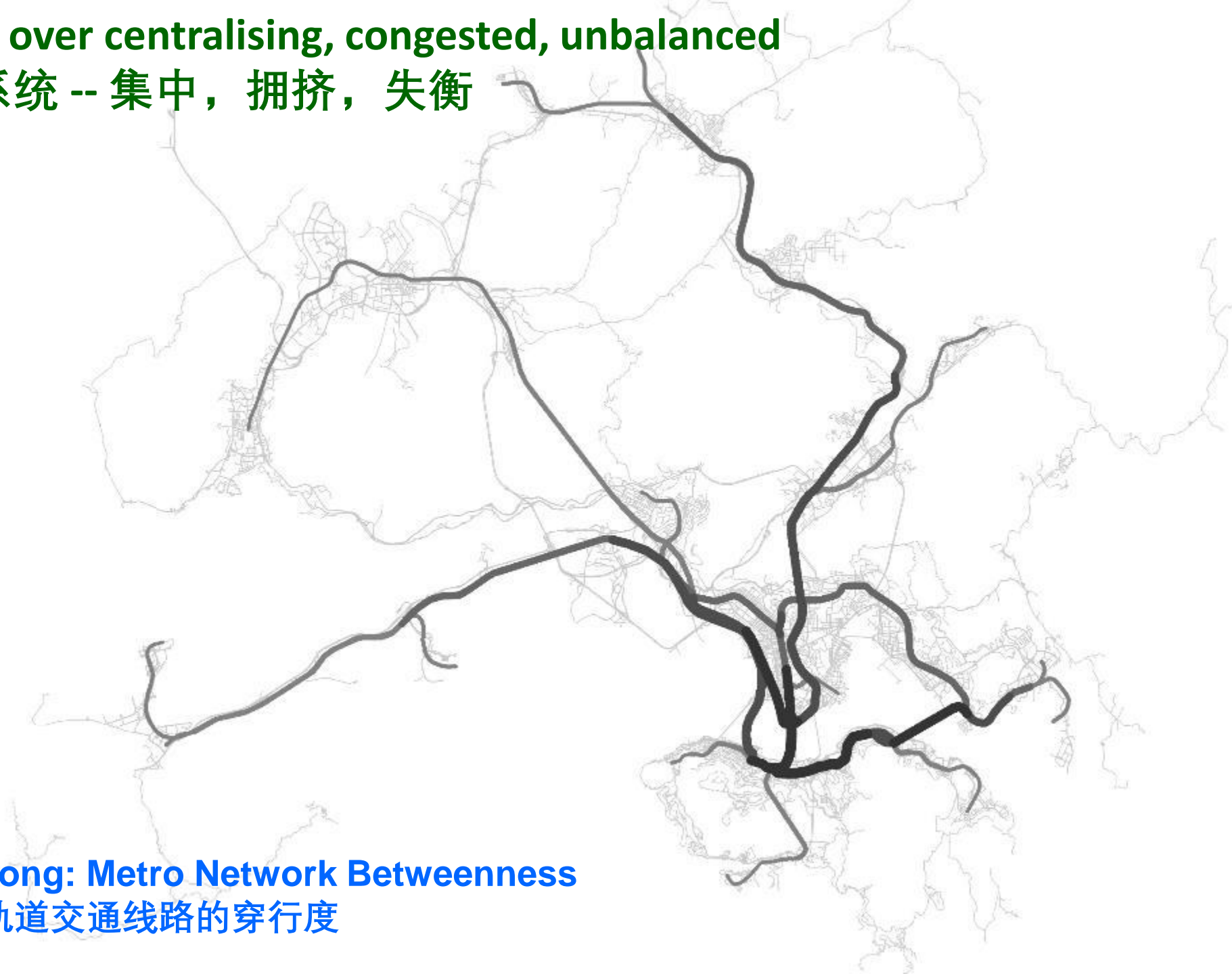
Shanghai, Beijing,
Moscow,
Tokyo, Osaka,
Seoul,
Mexico,
New York City, Chicago,
London, Paris, Berlin, Madrid, Barcelona

Metropolitan network design profiling (Roth C., Kang S.G., Batty M., Barthelemy M., 2012)



Sources: AECOM 2014

MTR – over centralising, congested, unbalanced 港铁系统 -- 集中，拥挤，失衡



Hong Kong: Metro Network Betweenness
香港：轨道交通线路的穿行度

Lifestyle footprint

生态足迹比较

US vs HK

HongKongers & Americans have about the same levels of wealth and prosperity

US
\$51,704
GDP/Capita

HK
\$50,936
GDP/Capita

HongKonger emits 68% less carbon emissions than an American

17.2
mTCO₂e /year

5.5
mTCO₂e /year

lives in a home that is 78% smaller than an American's

201 m²
average new dwelling size

45 m²

Commute mainly by public transport

95%
of the population who commute by car

10 %

Land use efficiency?
Land use effectiveness?

and lives longer

78.6
Average life expectancy at birth

82.2
Average life expectancy at birth

and have a higher level of inequality

0.46
gini

0.54
gini

Walkability: what is it?

可步行性是什么？

It depends who is asking 取决于提问的对象

- “pedestrians can move in an unimpeded manner with as much space as possible” (HCM, 1950, USA, LOS)
- “The extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area” (Abley, 2005, NZ)
- Defining walkable environment, as an ability to walk indicate not only a type of mobility and means of travel, it is also a type of sociability (Moudon et al. 2006, USA)
- Perceived, experienced, intersubjective dimensions of walkability

Dimensions of walkability

可步行性的维度

Research provides good evidence for 研究给我们提供了证据

- **intrinsic factors - dimensions** such as gender, age, and weight, education, income
内在因素
- **extrinsic factors - dimensions** such as public transportation, density,... i.e. environmental features or means of making walkable environments
外在因素

Complication 1

疑难1

- **Interaction between intrinsic and extrinsic dimensions:**
内在因素和外在因素的相互作用
evidence about how these dimensions interact (such as the influence of environmental factors on older or obese individuals) is more limited

Complication 2

疑难2

- **Purpose and motivations**
目的和动力

Dimensions of walkability

可步行性的维度

Research provides good evidence

- **intrinsic factors - dimensions** such as gender, age, and weight, education, income
内在因素
- **extrinsic factors - dimensions** such as public transportation, density,... i.e. environmental features or means of making walkable environments
外在因素

Complication 3

疑难3

- **Changing the environment does not always results in behaviour change.**
环境改变并不总是导致行为模式的改变
Change in behaviour requires capability, opportunity, motivation.



Dimensions of walkability

可步行性的维度

Research provides good evidence

- **intrinsic factors - dimensions** such as gender, age, and weight, education, income
内在因素
- **extrinsic factors - dimensions** such as public transportation, density,... i.e. environmental features or means of making walkable environments
外在因素

Complication 4 the particular versus the generic

疑难4 个体与大众

- Moving from **basic research, to applied research and to clinical research of walkability**
 - Basic research involves a search for general principles, cover a variety of situations and cases
 - Applied research adapts the findings of basic research to classes of problems
 - Clinical research involves specific cases.

Measuring walkability – assessment tools

衡量可步行性 -- 评定工具

	Self scoring	Benchmark	Diagnosis	Engage community	Evaluate scenario	CBA	Nb of UD features	Place type	Data collection	Cost	Best for	3D
Walk Score		✓			✓		4	Urban walkable	NA	Free & Paid	Public brokers	
State of place		✓	✓	✓	✓	✓	290+	All	20-25 per block	Paid	Cities, BIDs, Developers	
Walc Institute	✓		✓	✓			68	Variious	60-90 per block	Free & Paid	NGOs	
Walkonomics		✓					8	Untested	10 min / block	Free	Public	
AARP		✓	✓				60	Various	NA	Free	Cities, NGOs	
CDC	✓		✓	✓			9	Commercial	10 min / block	Free	Advocacy, firms	
Maps-mini	✓	✓	✓	✓			15	various	15 min / block	Free	NGOs	

State of Place: <http://www.stateofplace.co/our-blog/2017/4/walkability-tools>



pedestrian congestion – not just HK

“行人拥堵”

New York - MANHATTAN pedestrian congestion

纽约曼哈顿的行人拥堵情况

New York's Sidewalks Are So Packed, Pedestrians Are Taking to the Streets

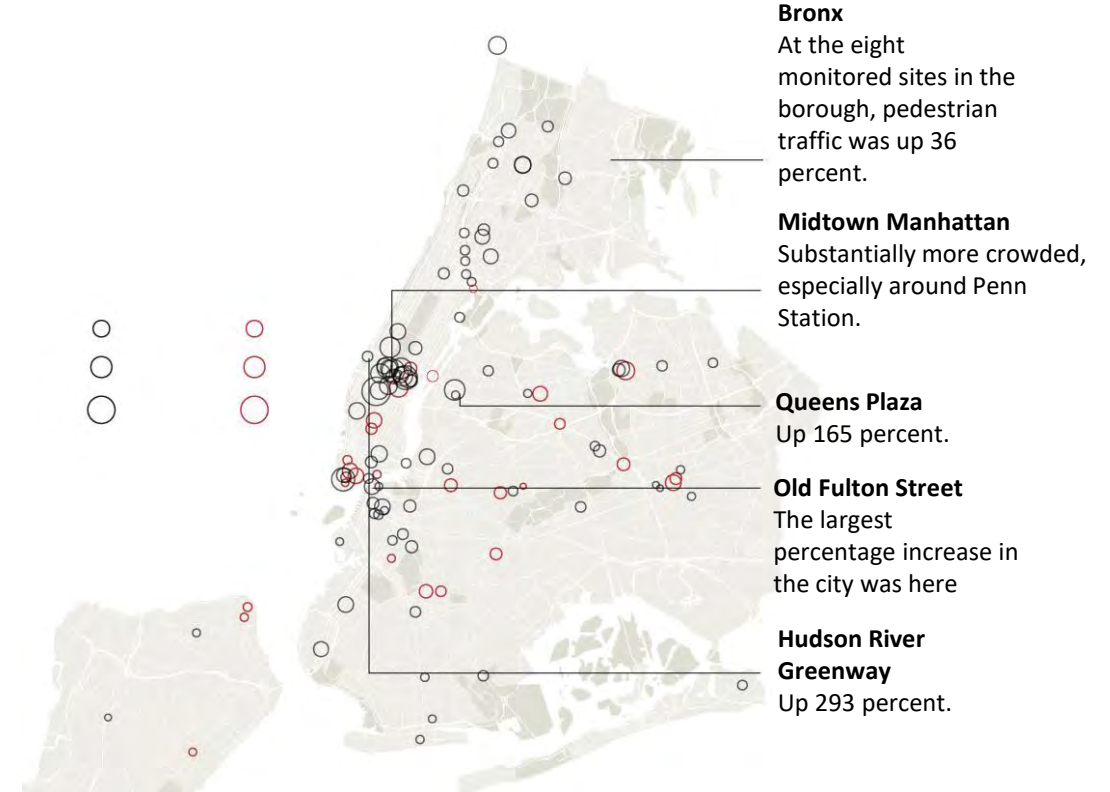


Seventh Avenue in Midtown Manhattan during an evening rush. Overcrowded sidewalks topped the list of residents' concerns in the 2015 survey by a local community board in Lower Manhattan

The New York Times 2016, June 30

Change in number of pedestrians

At the eight monitored sites in the borough, traffic was up 36 percent. Weekday, May 2009 to May 2015, selected sites



Source: New York City Department of Transportation
By The New York Times

<https://www.nytimes.com/2016/07/01/nyregion/new-york-city-overcrowded-sidewalks.html>

London, OXFORD STREET pedestrian congestion

伦敦牛津街的行人拥堵情况



Friday April 1 2016, 8:00am, Time Out



71 bus routes through Oxford St. (Diesel)

Air pollution over 11 times the permitted EU maximum



Traffic-free shopping days have been a feature of Oxford Street since 2005
BBC July 2016

Oxford Street to be pedestrianised by 2020

'Pedestrianised Oxford Street would blight locals with enormous increase in congestion and pollution'

Evening Standard 2016, Dec. 20

<https://www.timeout.com/london/blog/walk-this-pay-theres-going-to-be-a-congestion-charge-for-pedestrians-033116>

<http://www.bbc.com/news/uk-england-london-36791485>

<https://www.standard.co.uk/news/london/pedestrianised-oxford-street-would-blight-locals-with-enormous-increase-in-congestion-and-pollution-a3424691.html>

Pedestrian congestion mitigation

缓解行人拥堵



Different lanes for different directions

分方向的步行道

(existing policy in Sydney, Australia)



Street furniture relocation
重新布局街道设施位置

and provision of dedicated bays for leaflet distributors and mobile traders
(existing policy in Washington DC, USA and many other towns)



Provision of a separated path for faster pedestrians

给快速行走的行人提供快速通道
like commuters and people in a hurry (proposed for Oxford Street, London)



Provision of a separated path for slower pedestrians:

给行走速度较慢的行人提供慢行通道
map readers, mobile phone addict, elderly, groups

Distracted walking injuries in the US are rising fast, with 1,506 recorded in US emergency rooms in 2010, up from 256 in 2005



Parallel – Multilevel cities

平行对比 -- 多层系统城市

Calgary
卡尔加里



Dallas
达拉斯



Riyadh
利雅得



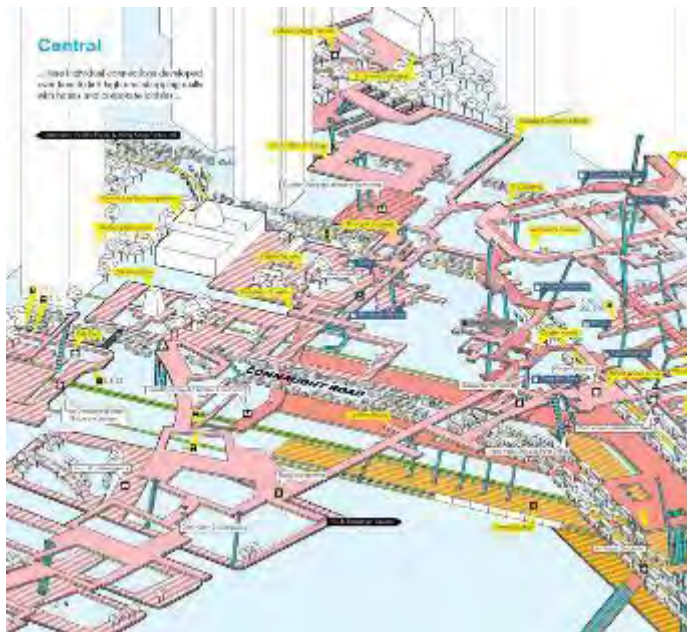
Minneapolis
明尼阿波利斯



Montreal
蒙特利尔



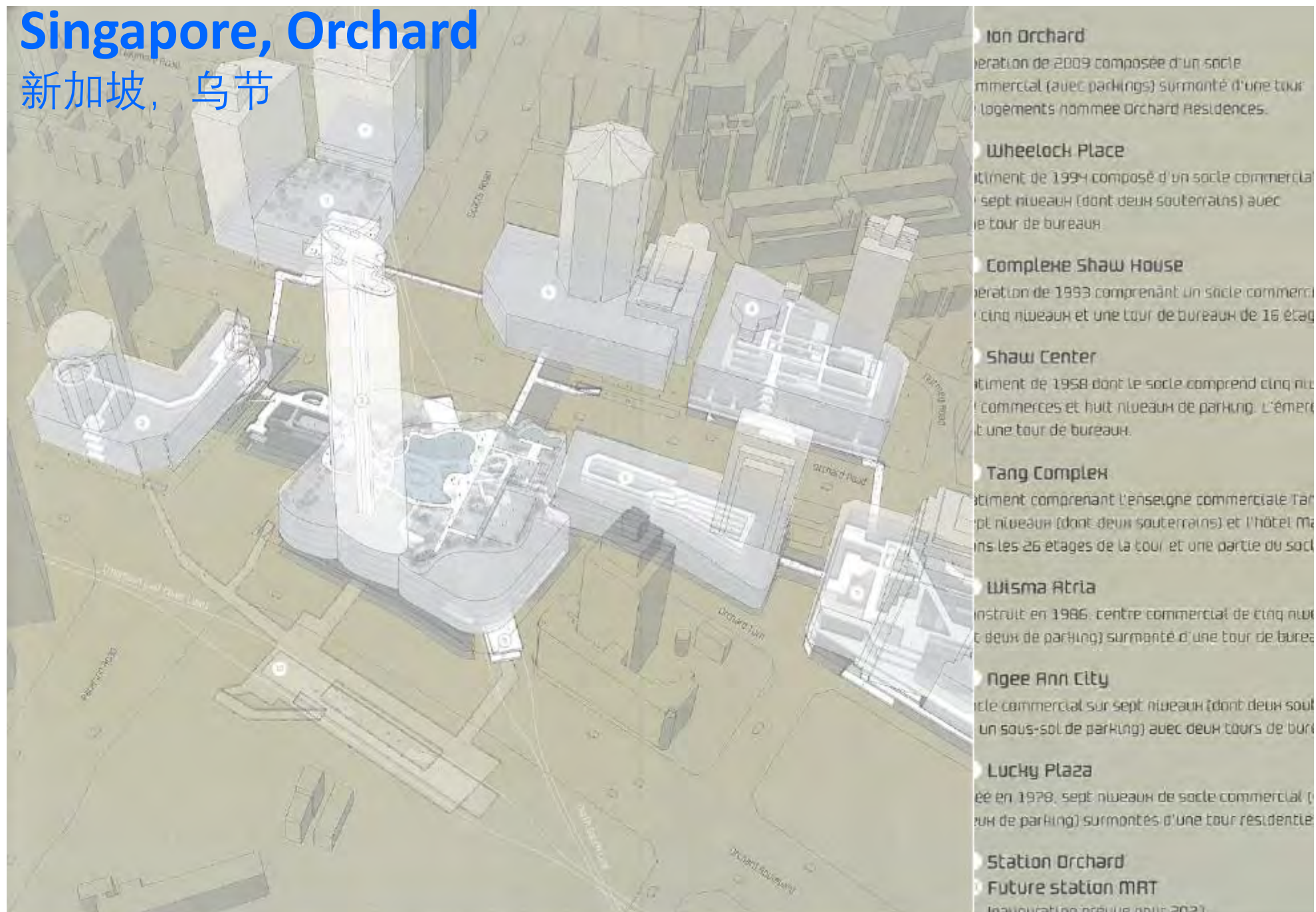
Parallel Cities, the multilevel metropolis, 2016



City without Ground, 2012

Singapore, Orchard

新加坡, 乌节



Ion Orchard

Édification de 2009 composée d'un socle commercial (avec parkings) surmonté d'une tour de logements nommée Orchard Residences.

Wheelock Place

Bâtiment de 1994 composé d'un socle commercial à sept niveaux (dont deux souterrains) avec une tour de bureaux.

Complexe Shaw House

Édification de 1993 comprenant un socle commercial à cinq niveaux et une tour de bureaux de 16 étages.

Shaw Center

Bâtiment de 1958 dont le socle comprend cinq niveaux commerciaux et huit niveaux de parking. L'édifice possède une tour de bureaux.

Tang Complex

Bâtiment comprenant l'enseigne commerciale Tang. Il comprend sept niveaux (dont deux souterrains) et l'hôtel Mandarin les 26 étages de la tour et une partie du socle.

Wisma Atria

Construit en 1986, centre commercial de cinq niveaux (dont deux de parking) surmonté d'une tour de bureaux.

Ngee Ann City

Socle commercial sur sept niveaux (dont deux souterrains) avec un sous-sol de parking) avec deux tours de bureaux.

Lucky Plaza

Édifié en 1978, sept niveaux de socle commercial (dont deux de parking) surmontés d'une tour résidentielle.

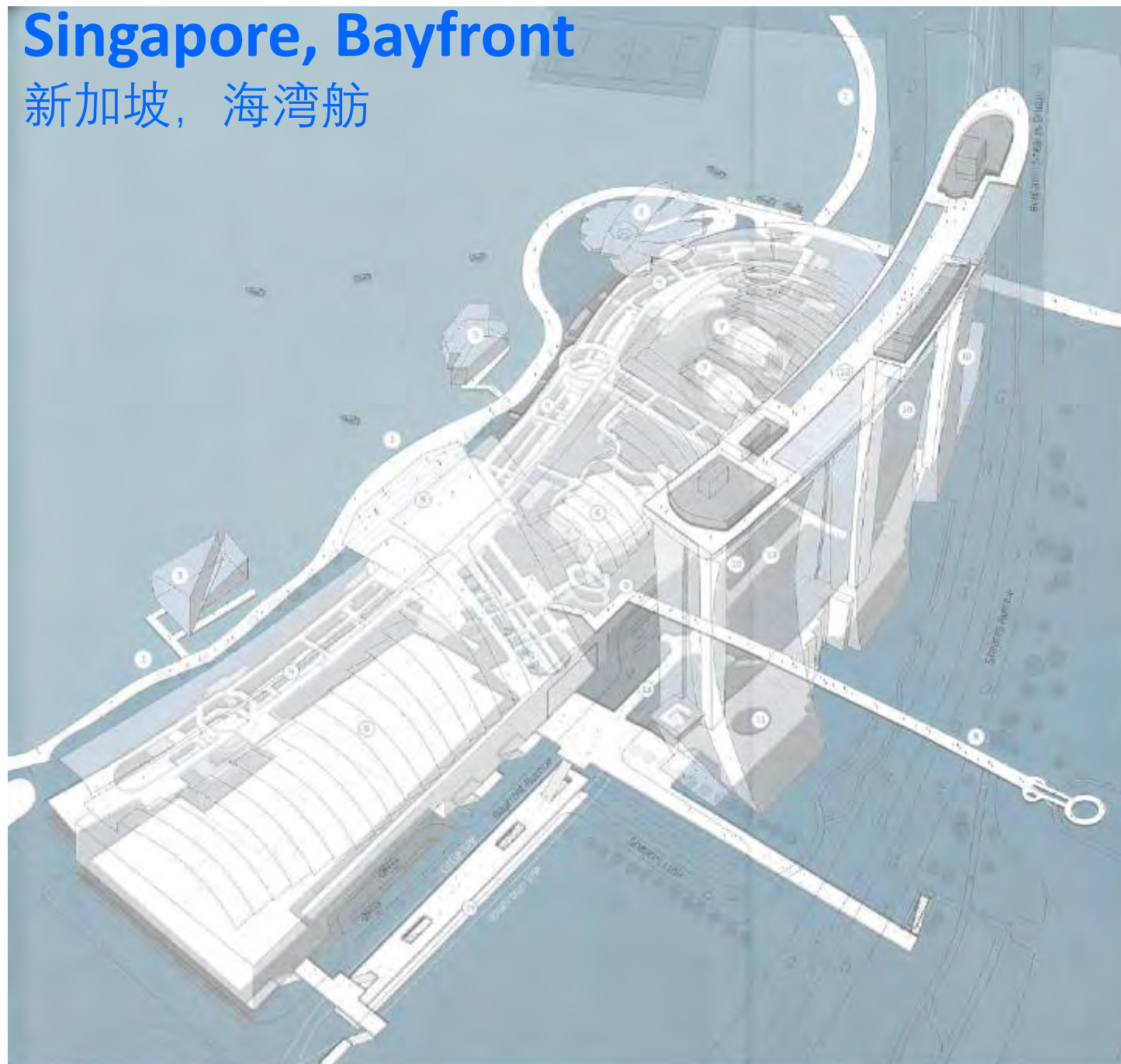
Station Orchard

Future station MRT

Inauguration prévue pour 2021.

Singapore, Bayfront

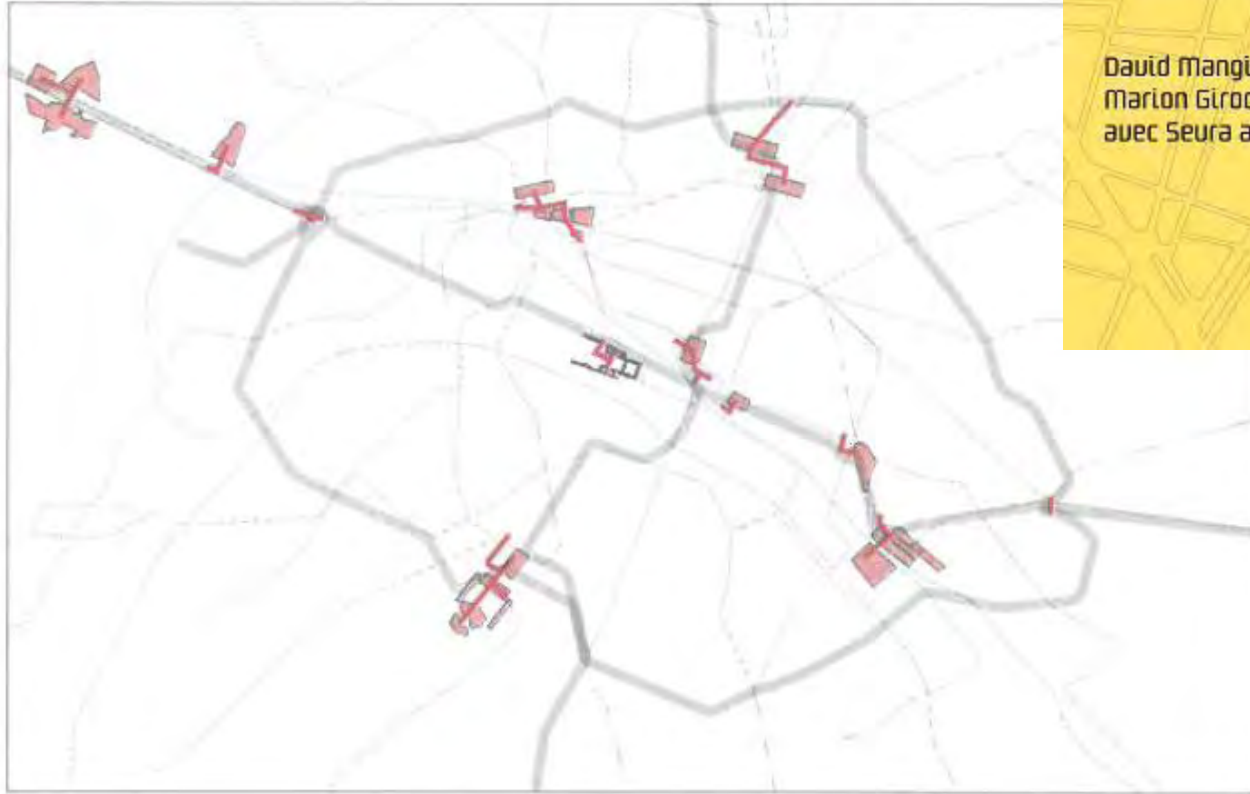
新加坡, 海湾舫



- 1 **Waterfront Promenade**
Promenade publique : ponton longeant le réservoir
- 2 **Art Science Museum**
Musée de 15 000 m² conçu en forme de lotus.
- 3 **Crystal Pavillon (North and South)**
Commerces de luxe (nord) et night clubs (au sud).
- 4 **Retail Arcade**
245 000 m² de commerces et de restaurants.
- 5 **Event Plaza** Place publique (5 000 m²)
- 6 **Casino**
15 000 m² d'espaces de jeux, répartis sur quatre niveaux autour d'un grand atrium.
- 7 **MasterCard Theatres**
Deux théâtres pouvant recevoir jusqu'à 4 000 personnes.
- 8 **Sand Expo et Convention Center**
120 000 m² d'espaces d'exposition sur cinq niveaux.
- 9 **Roof garden**
Promenade piétonne sur la toiture, qui se prolonge en passerelle surplombant les voies.
- 10 **Bay Tower et Garden Tower**
Hôtel de 2 560 chambres : dans trois tours.
- 11 **Lobby Atrium** Hall de l'hôtel.
- 12 **SkyPark** Toiture multifonctionnelle (10 000 m²)
- 13 **Liens** Couloirs sous Bayfront Avenue reliant les deux parties du complexe.
- 14 **Station de métro Bayfront**

Paris

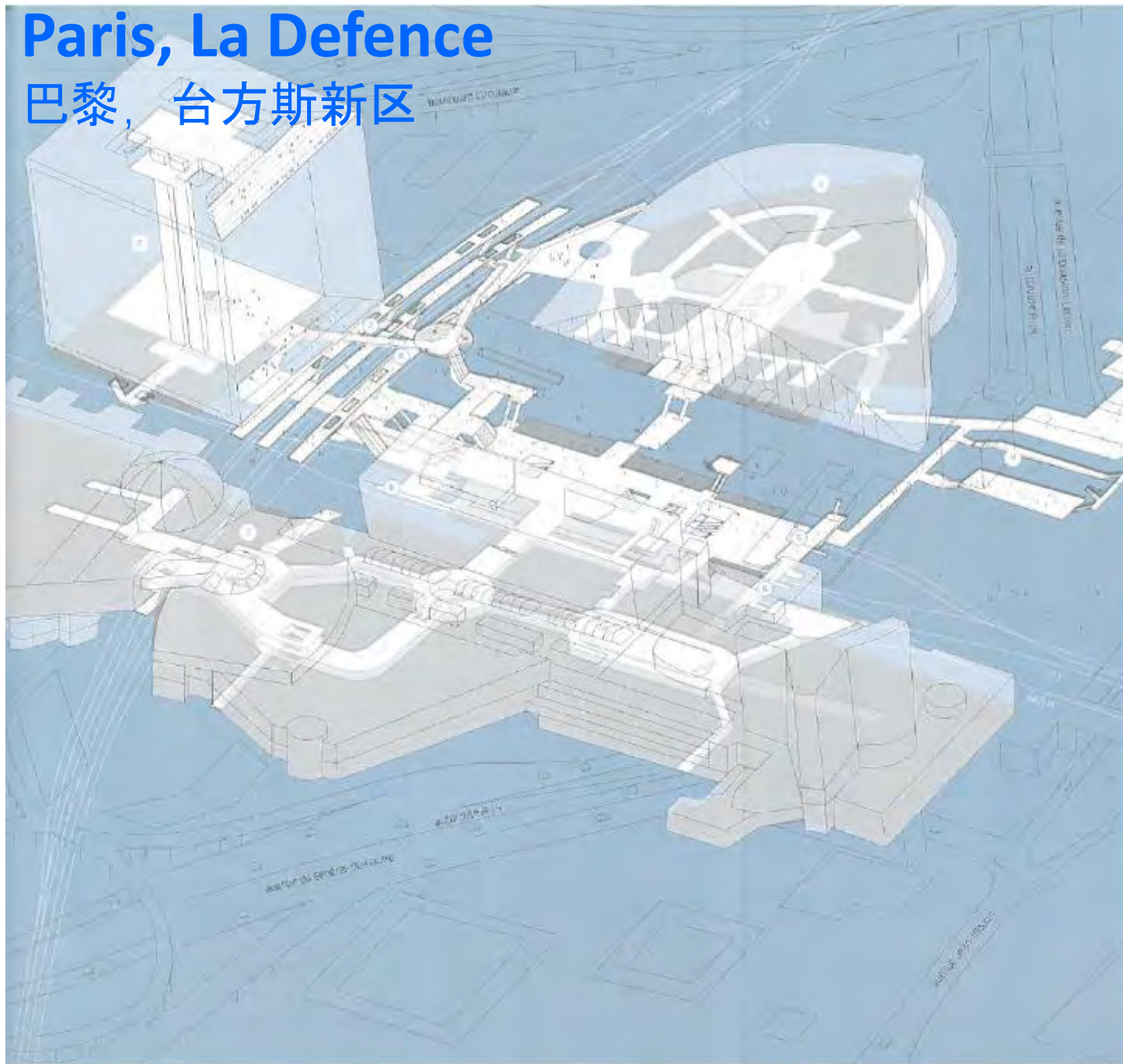
巴黎



Source: Mangin, Girodo, Seura

Paris, La Defence

巴黎，台方斯新区



巴黎，名族广场



Paris, Place de la Bastille, Opera House

巴黎，巴士底广场



Paris, City Hall & BHV Department Store

巴黎，市政厅和BHV百货



Paris, Les Halles

巴黎大堂



Paris, Le Louvre

巴黎，卢浮宫博物馆



Paris, Place de l'Etoile

巴黎，星星广场



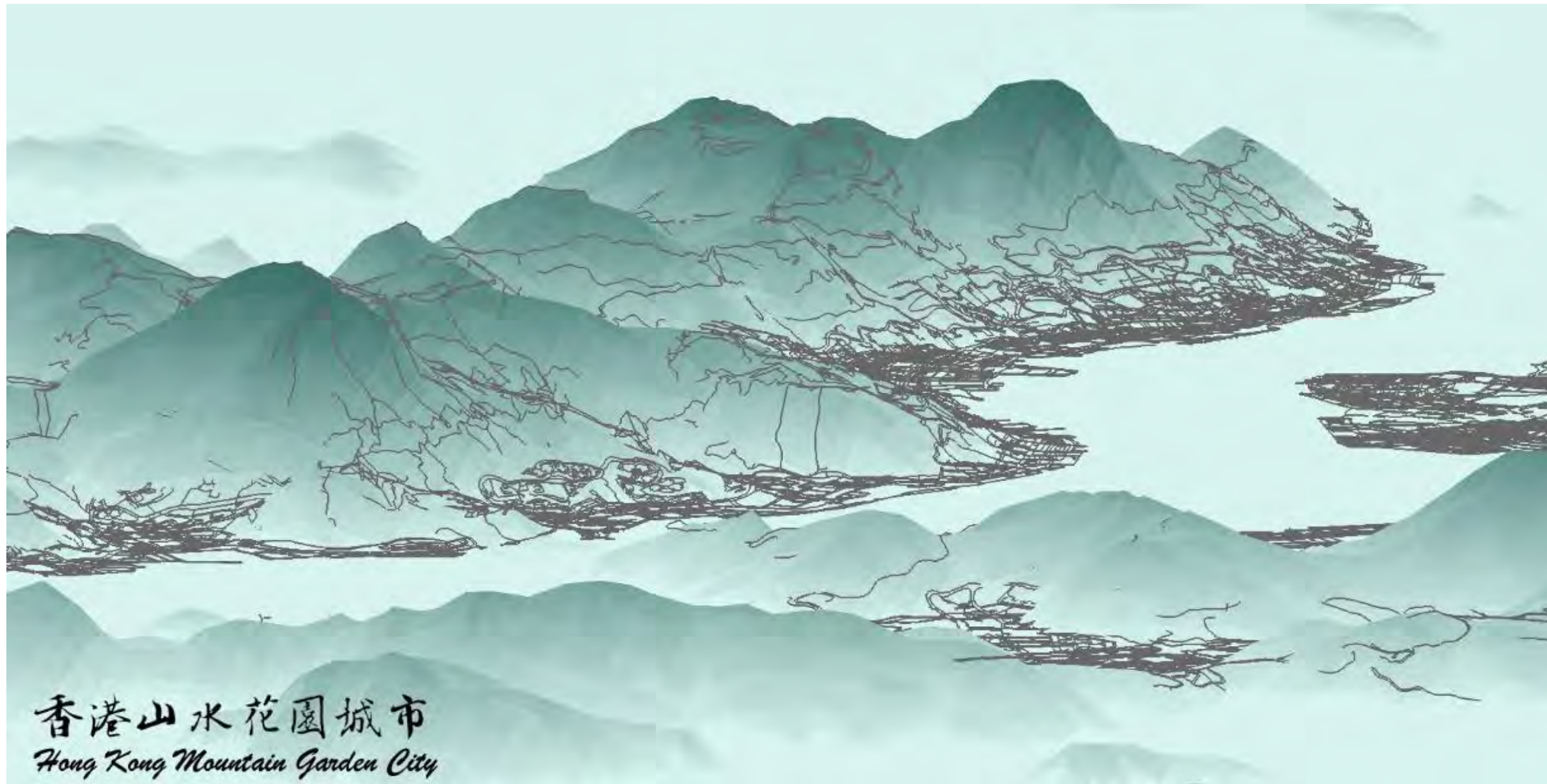
WalkableHK 宜步行的香港



WalkableHK

the 3D urban outdoor pedestrian network is over 6,000 km long

3D的城市户外人行道网络超过6,000km长



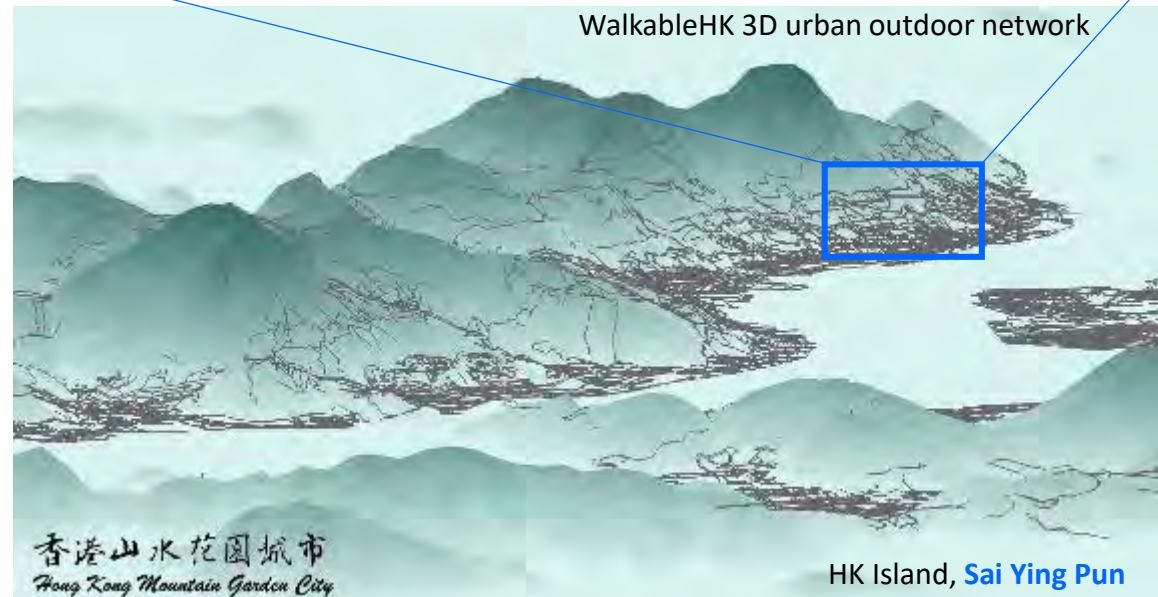
香港山水花園城市
Hong Kong Mountain Garden City

WalkableHK

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Adapted from © 2017 Google Digital Globe



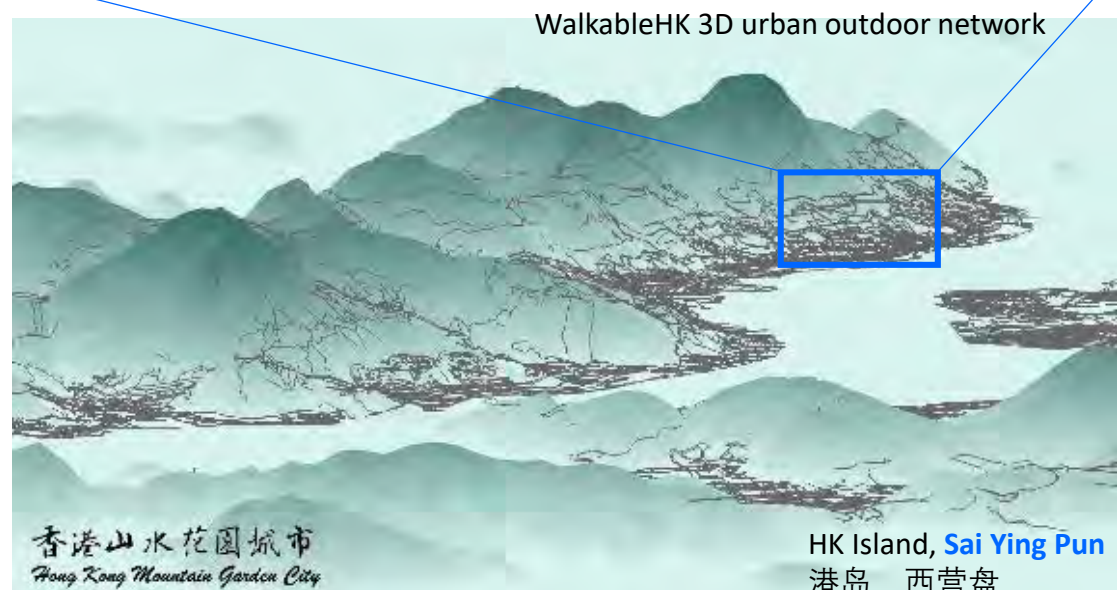
Human and machine readable 3D
outdoor pedestrian network
(WalkableHK)
人和计算机可读的3D户外步行者
网络

WalkableHK

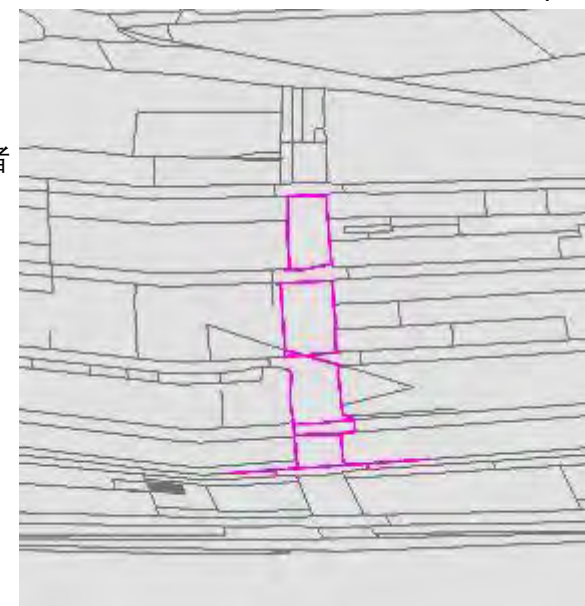
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Adapted from © 2017 Google Street



Human and machine readable 3D outdoor pedestrian network (WalkableHK)
人和计算机可读的3D户外步行者网络



WalkableHK inequity, ageing, delivering, growing, congestion

宜步行的香港 -- 残疾人，老人，快递员，增长和拥挤



WalkableHK inequity, ageing, delivering, growing, congestion

宜步行的香港 -- 残疾人，老人，快递员，增长和拥挤



WalkableHK 宜步行的香港

How: Develop barriers surveys mapping with communities, stakeholders to create barriers selection criteria, set profile and custom user preferences criteria (including cognitive criteria).

Pre-set capacity profile

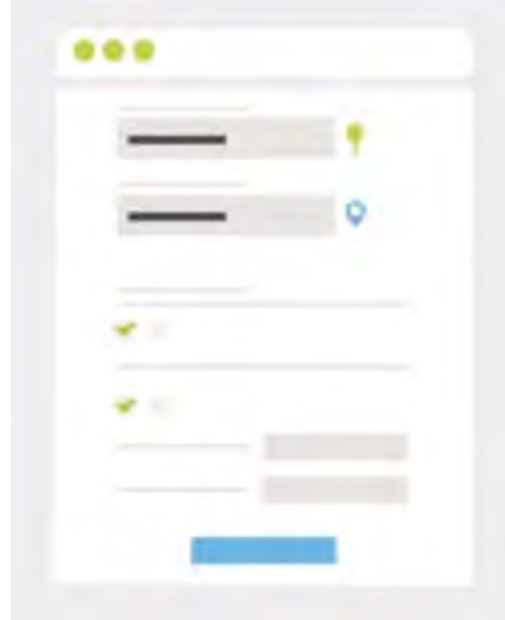
提前设置承载能力

- Electric wheelchair
- Manual wheelchair
- Cognitive impairment

user selected barrier criteria

用户自己选择障碍物标准

- Path and route choice (6)
- Stairs (2)
- Crossing (3)
- Dangers and barriers (6)

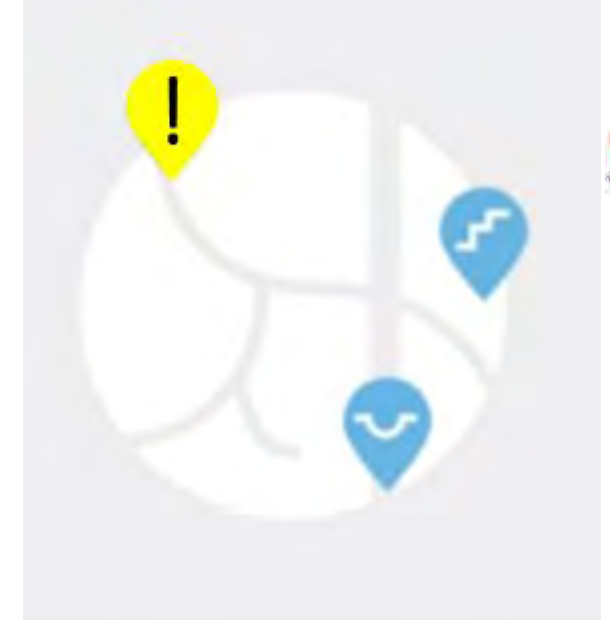


Mapping walking with wheels obstacle, Central

绘制步行和轮椅出行的障碍地图，中环地区

How: Survey and Mapping and geo-coding all obstacles

– all accessibility barriers using automated GIS tablet.



WalkableHK

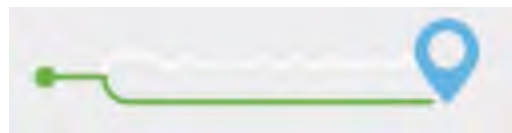
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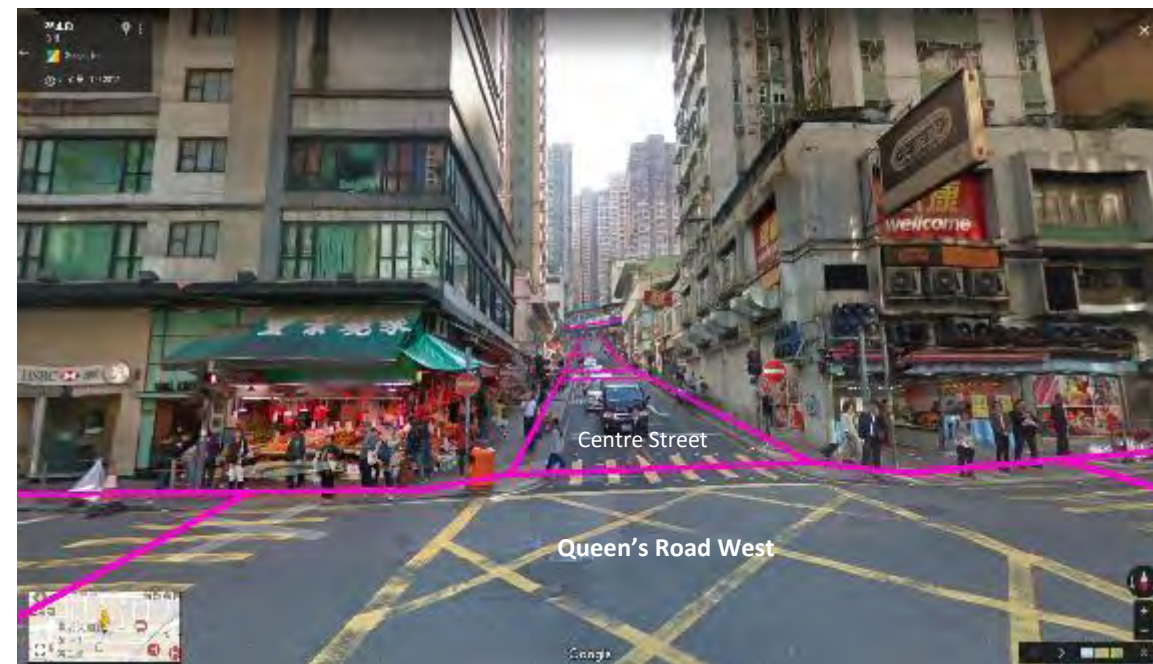
find me a barrier-free route from here to XY



End user pre-set profiles
or
customization criteria



route calculators
规划出行路径
obstacles avoidance
danger alert



HTTP Request / Response



at the next traffic light
sound, turn left



Third party apps
(Android, iOS, Website)

Augmented reality overlay and/or voice routing

增加现实地表物现状和语音导航
Precise and low cost LBS by snap to network via GPS+wi-fi

WalkableHK 宜步行的香港



Geo-database

地理信息库

Point of Interest

Transport service access points

Geography

Barriers geographies

common spatial data standard



End user pre-set profiles

or

customization criteria



route calculators

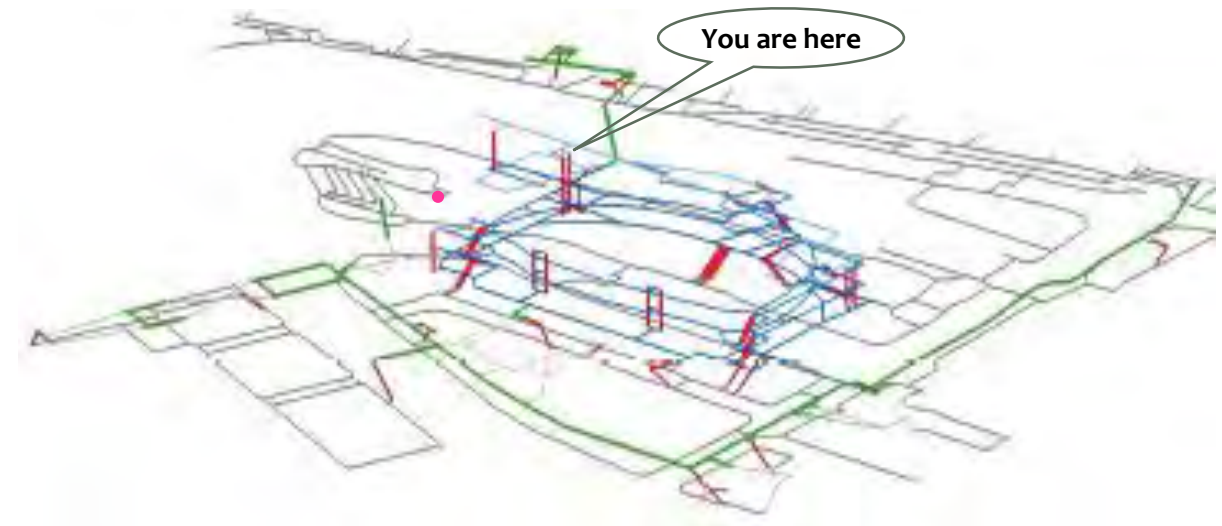
路径规划

obstacles avoidance

danger alert

the 3D urban indoor pedestrian network in progress

3D 城市室内步行网络地图正在进行中



3D urban indoor and outdoor pedestrian network X-ray (see through mode)

Include escalator, lift, sky walk, underground, etc.



Third party apps
(Android, iOS, Website)

Augmented reality overlay and/or voice routing

增加现实地表物现状和语音导航

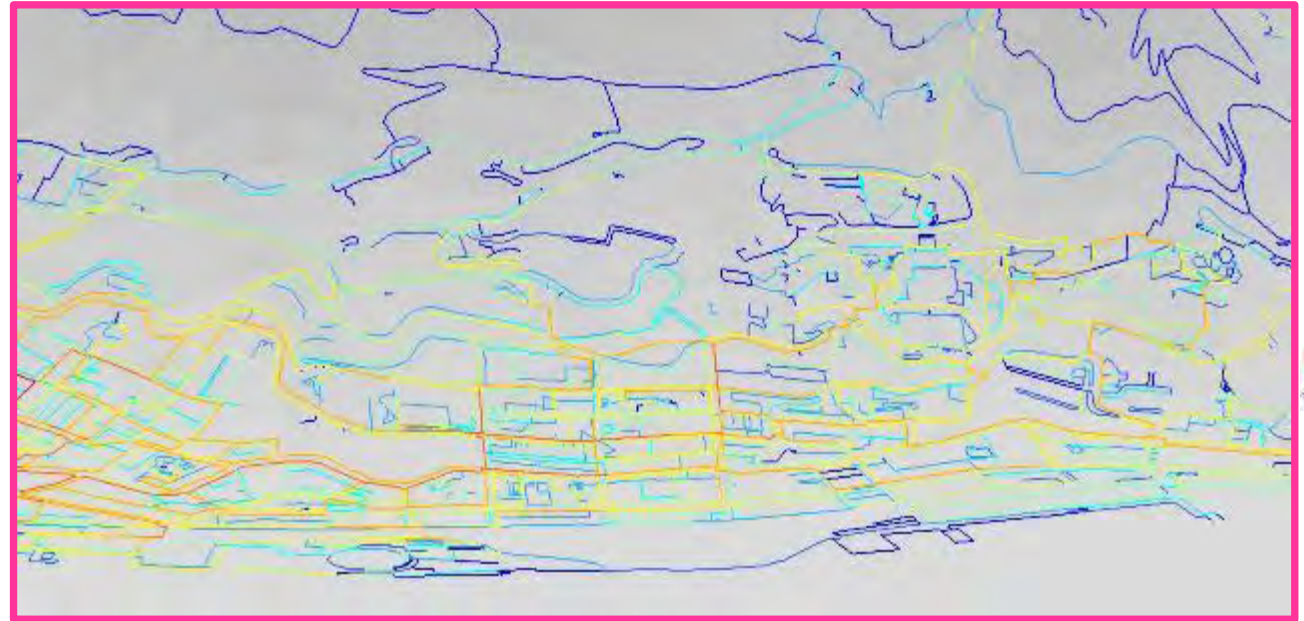
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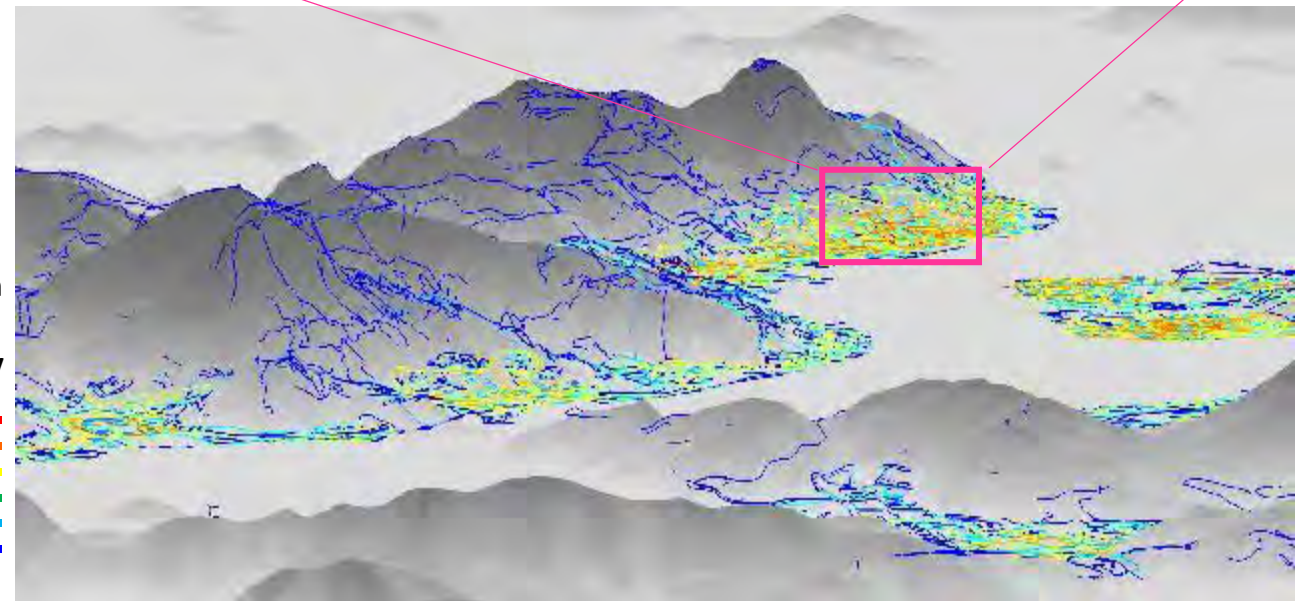
WalkableHK 宜步行香港



- standard link node data structure
标准化路段节点数据结构
- 21 link attributes
21个连接属性



3D predictive pedestrian route choice algorithm (unweighted)



WalkableHK 宜步行香港

How: implementing, monitoring and updating – maintenance

如何实现，检测和更新数据 -- 维护



Membership business model for dissemination, expansion and maintenance.

The geo-database uses common spatial data standard and can be used as asset management tool for different government departments.

- provides pedestrian network infrastructure maps and cognitive coding of the entire territory
- provides searchable accessibility conditions survey baseline on the basis of a diagnosis carried out in the field;
- enables coordination of actions across the mobility chains and across services delivery
- Helps the asset management of the highways and public spaces
- Accessibility evaluation compliance of development plans
- Crowdsourcing/citizen participation in maintenance and updating



Seamless customised integration with all mode of transport

(TD, LD, PlanD, HD, AFCD, MTR)

根据客户需求提供所有交通模式的无缝连接出行

Autonomous Vehicle pedestrian interaction

(HD, TD, LD, PlanD)

自发的车辆行人交互

Location Based Services to the moving persons

(Tourist Board, Exhibition Industry,...)

为行人提供基于定位的相关服务



WalkableHK the 3D outdoor pedestrian network

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香港山水花園城市
Hong Kong Mountain Garden City



Extreme configurations WalkableHK

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Translation by Xian SU

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URBAN SPACE ANALYSIS FORUM AND THE THIRD SYMPOSIUM ON SPACE SYNTAX IN CHINA

