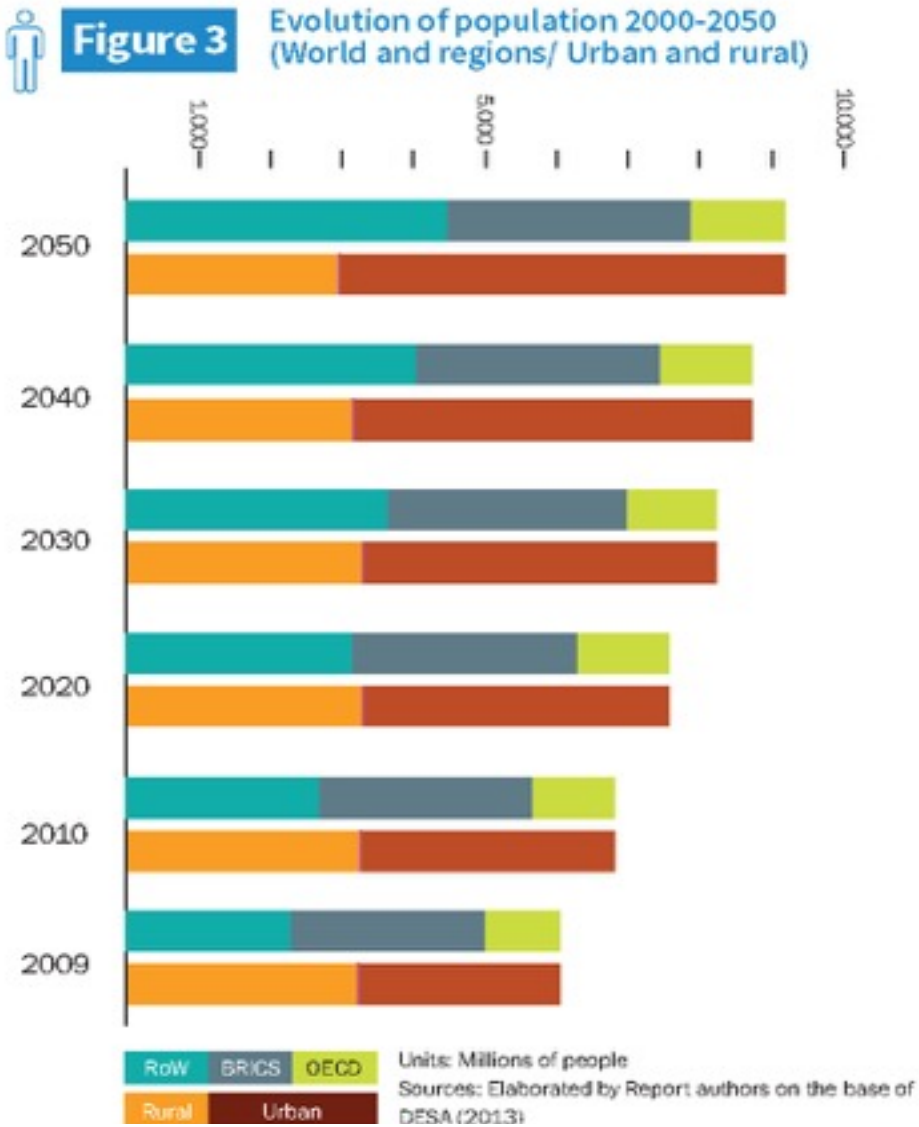
Compact Sustainability and Liveability in Hong Kong

Professor John NG

Director and Chairman of Green Labelling Committee
Hong Kong Green Building Council

Growing Urban Population



- Population growth will happen in **developing countries**
- Increase takes place in **cities**

Source: Global Vision Report 2014

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Growing Habitability Demand

2010		2050
	Population X1.35	
	Number of homes X1.68	
	Housing stock (m2) X1.87	
	Service building (m2) X1.70	
	People per home X0.79	
	Home area X1.30	

Source: Global Vision Report 2014

Hong Kong – a Compact City

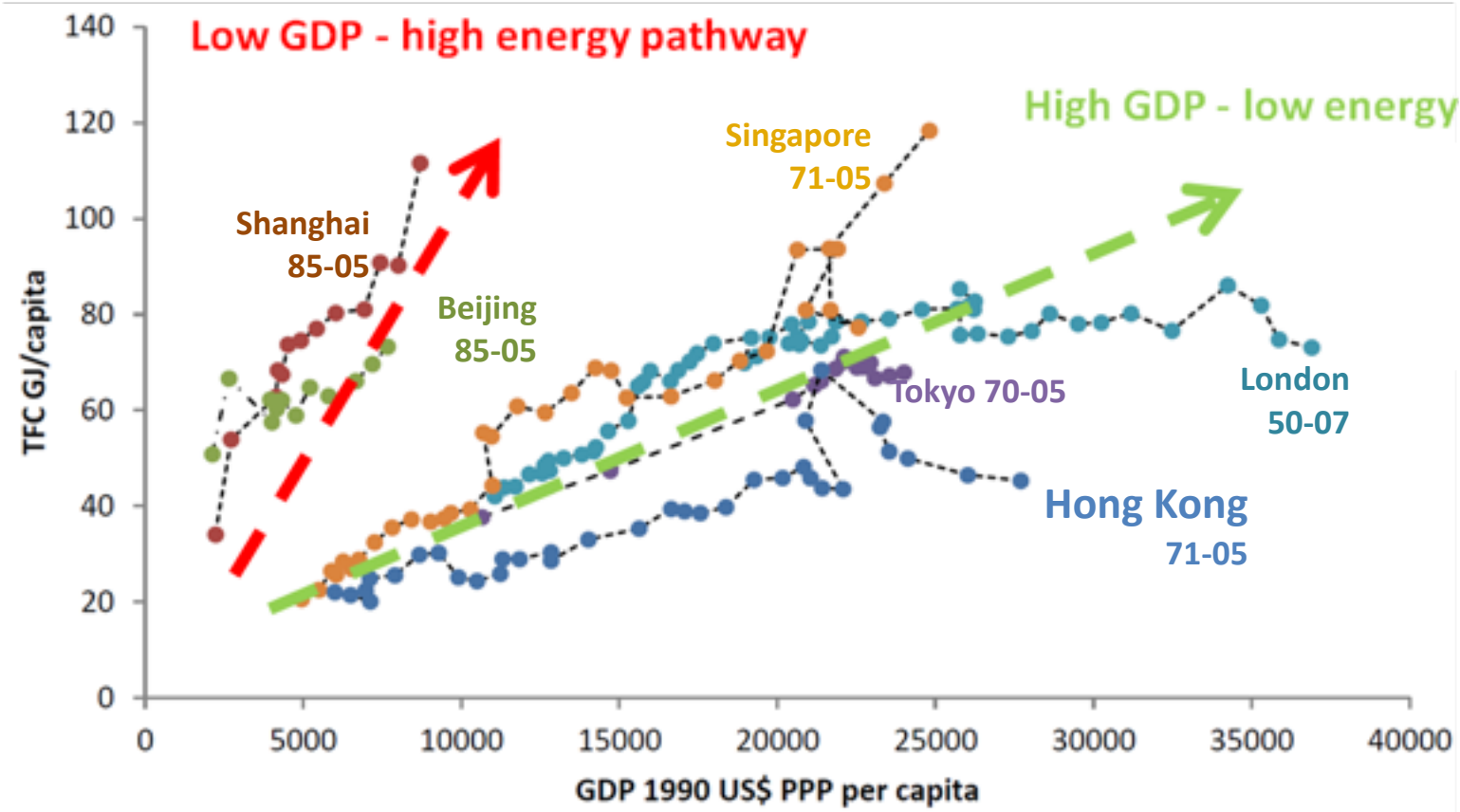
7.2 million inhabitants

54 million visitors in 2013

1,100 km² total land area

6,650 persons/km²

Energy Consumption & Growth



Courtesy to Dr. Serge Salat

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Compact Sustainability

8 Principes for Low Carbon, Adaptive and Liveable Urban Development
(*summary*)

1. Built-up areas are **compact,** a **high density of buildings** and **matching urban amenities** and **social infrastructures**;

2. **Street networks** are **dense** and **interconnected** in different sizes and functions;

3. **Public transit modality** and **capacity** match with population and jobs density, land use and social infrastructure;

4. Main **urban amenities** such as schools, green spaces or transit are **accessible by walking**;

5. Urban blocks are small-sized and **buildings are aligned along the streets** to create various street fronts and vibrant sidewalks;

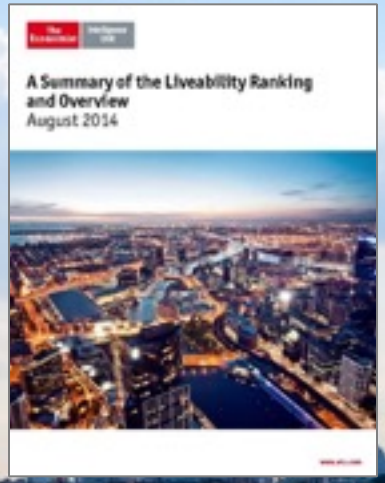
6. Neighbourhoods, blocks and buildings are **mixed use**;

7. Streets are **places for people** and promote walking; and

8. Buildings and streets are designed and oriented to **optimise bioclimatic potential**.

Courtesy to Dr. Serge Salat

EIU – Liveability Ranking 2014



5 Categories

- Stability
- Healthcare
- Culture & Environment
- Education
- Infrastructure

1. Melbourne
2. Vienna
3. Vancouver
4. Toronto
5. Adelaide
6. Calgary
7. Sydney
8. Helsinki
9. Perth
10. Auckland
…
31. Hong Kong

EIU

Spatially Adjusted Liveability Index 2012

1. Hong Kong
2. Amsterdam
3. Osaka
4. Paris
5. Sydney
6. Stockholm
7. Berlin
8. Toronto
9. Munich
10. Tokyo

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Spatially Adjusted Liveability Index

Spatial Characteristics	• Green Space, Urban Sprawl, Natural Assets, Cultural Assets, Connectivity, Isolation, Pollution
Stability	• Crime and Threat of terror, military conflict, and civil unrest
Healthcare	• Availability and Quality of Private and Public Healthcare, Availability of over-the-counter drugs, General Healthcare Indicators
Culture & Environment	• Humidity/ Temperature, Discomfort of Climate, Corruption, Religious Restrictions, Censorship, Sporting and Culture Availability, Food & Drinks, Consumer Goods & Services
Education	• Availability and Quality of Private Education, Public Education
Infrastructure	• Quality of Road, Public Transport, International Links, Energy Provision, Water Provision and Telecommunications, Availability of Good Quality Housing

Efficient Public Transportation

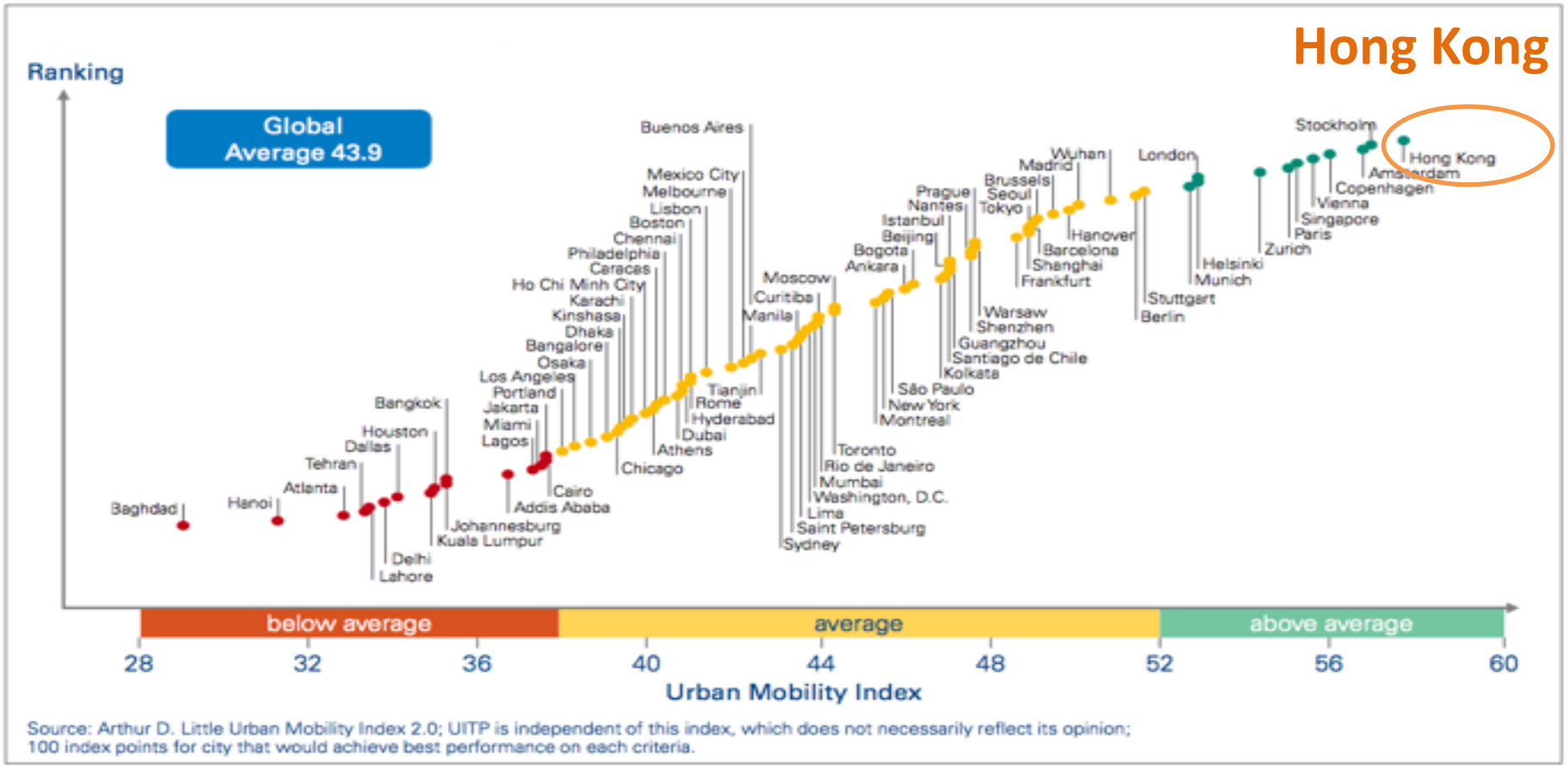
Multi-modal – Railways, trams, buses, minibuses, ferries

90% population use public transport

10% population use private cars

59 passenger cars per 1,000 people (world average = 124)

Urban Mobility Index 2.0



Source: Arthur D. Little Urban Mobility Index 2.0; UITP is independent of this index, which does not necessarily reflect its opinion; 100 index points for city that would achieve best performance on each criteria.

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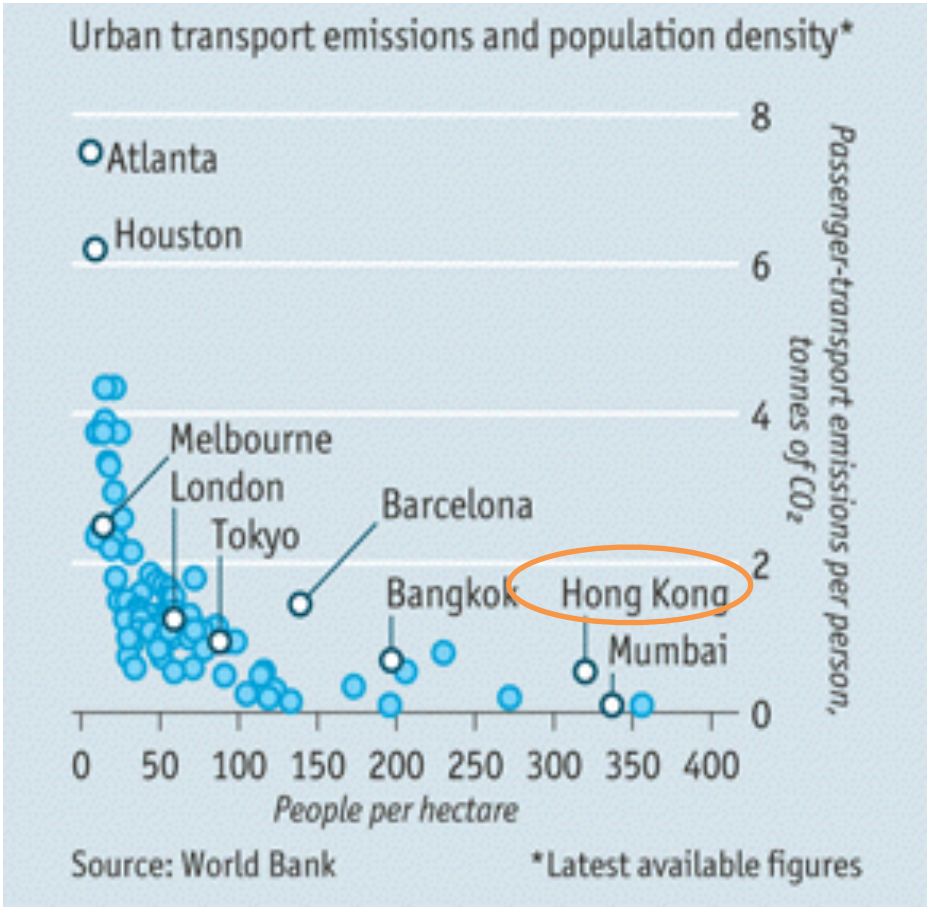
Population Density and Transport Emissions

High density cities enable:

- Efficient public transport
- Low car dependency
- Lower carbon emissions



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Rich Ecology & Easy Accessibility

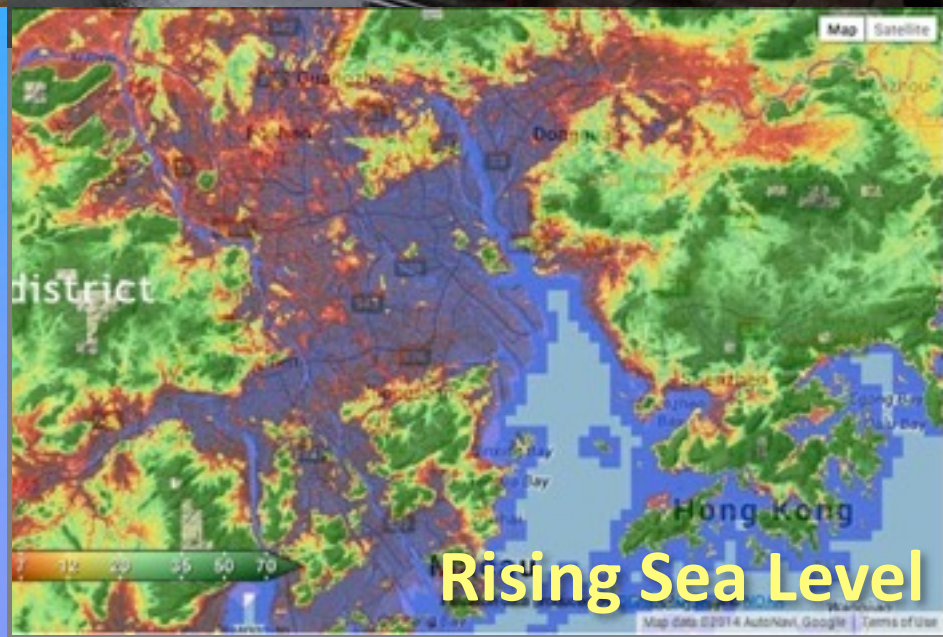
845 km² of non-built-up area, about **76%** of land area

40% of land as **Country Parks**, more than **1,000** animal species

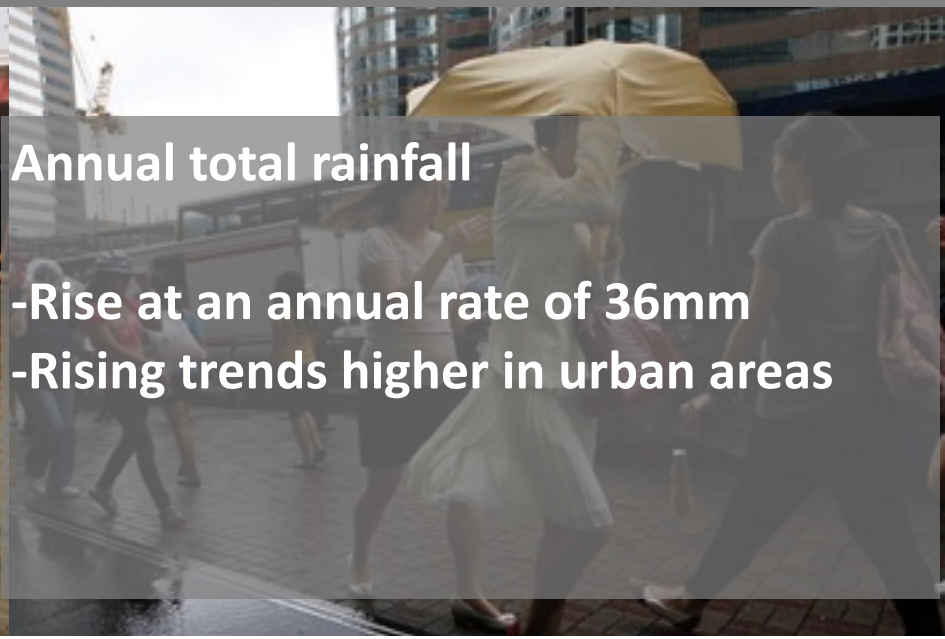
24 Country Parks and **22** Special Areas for natural preservation

525 species of birds (more than 30% of bird species in China)

Climate Change



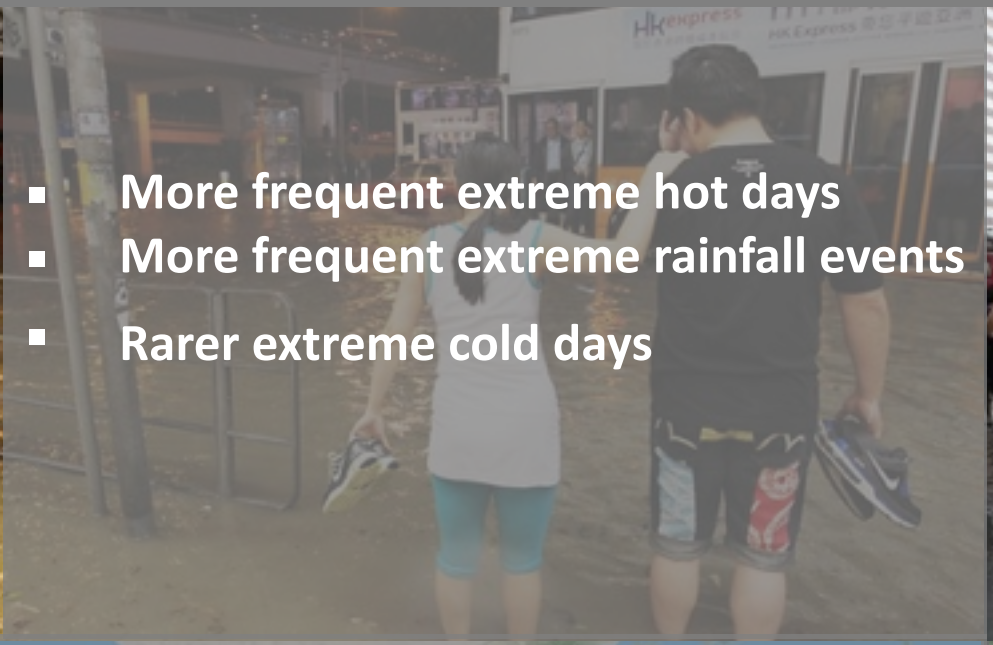
Climate Change



Annual total rainfall

-Rise at an annual rate of 36mm
-Rising trends higher in urban areas

Climate Change

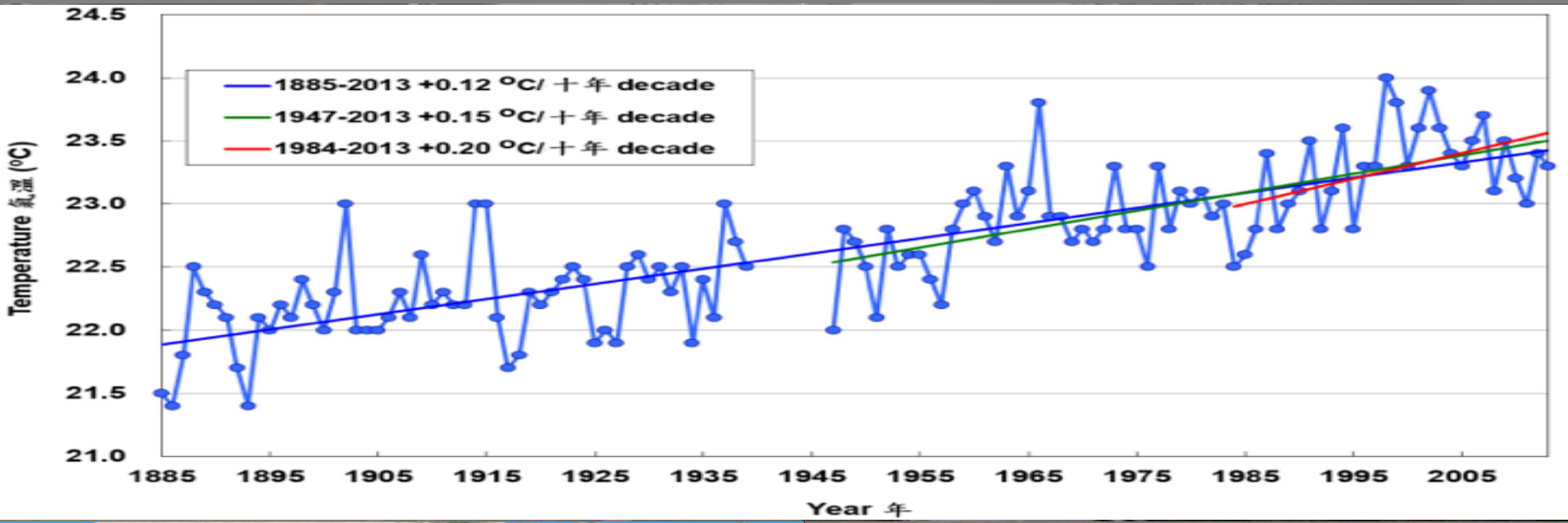


- More frequent extreme hot days
- More frequent extreme rainfall events
- Rarer extreme cold days

Extreme Weather Events

Extreme weather event	Return period in 1900	Return period in 2000
Daily Minimum Temperature **≤ 4 °C**	6 years	163 years
Daily Maximum Temperature **≥ 35 °C**	32 years	4.5 years
Hourly rainfall ≥ 100 mm	37 years	18 years
2-hourly rainfall ≥ 150 mm	32 years	14 years
3-hourly rainfall **≥ 200 mm**	41 years	21 years

Climate Change



Temperature Increase

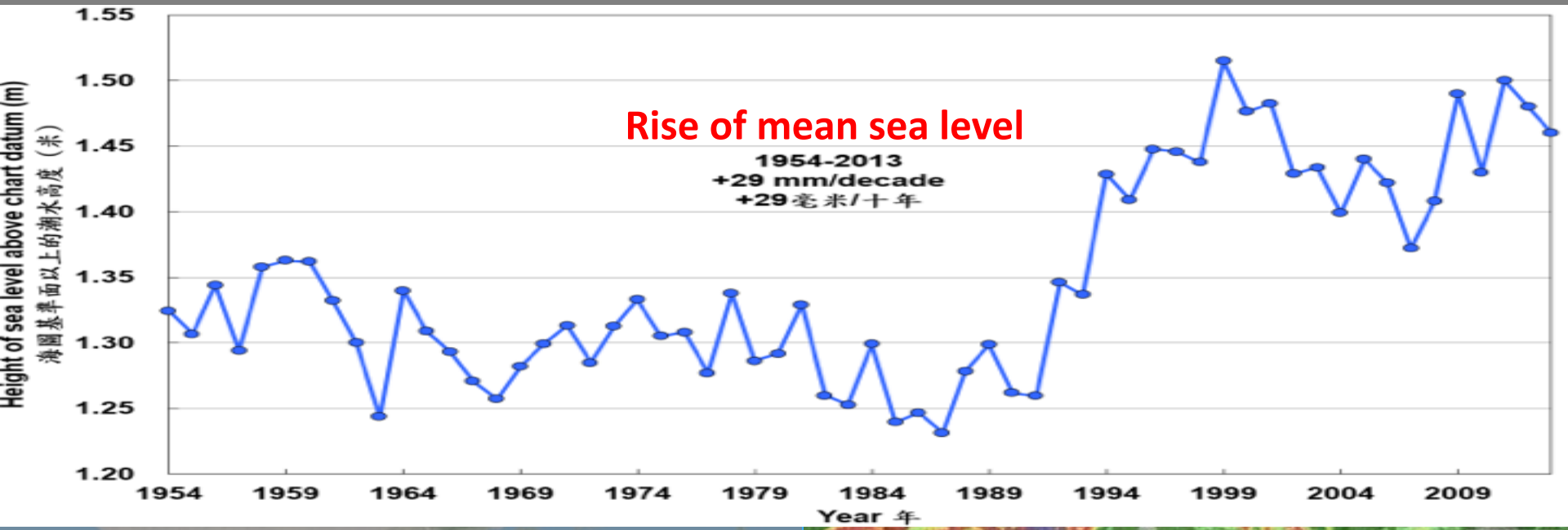
1947-2013 – 0.15℃

1984-2013 – 0.2℃

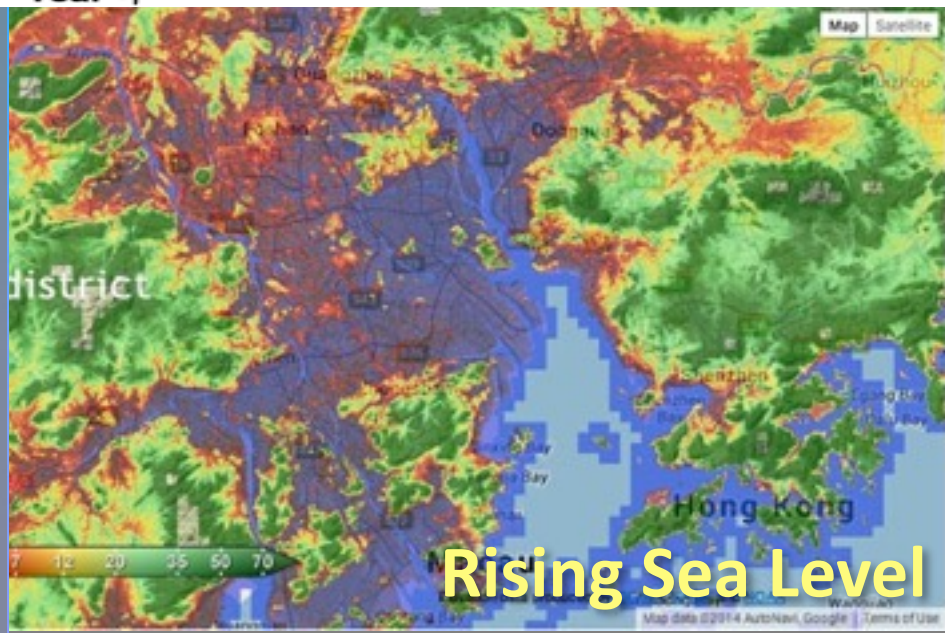
→ Higher rate of increase in latter half of 20th century

Rising Sea Level

Climate Change



- Increase sea flooding due to storm surges caused by tropical cyclones
- Return cycle of high sea level of 3.53M shortened from 50 to 5 years by mid-21st century



Challenge 1—Air Pollution

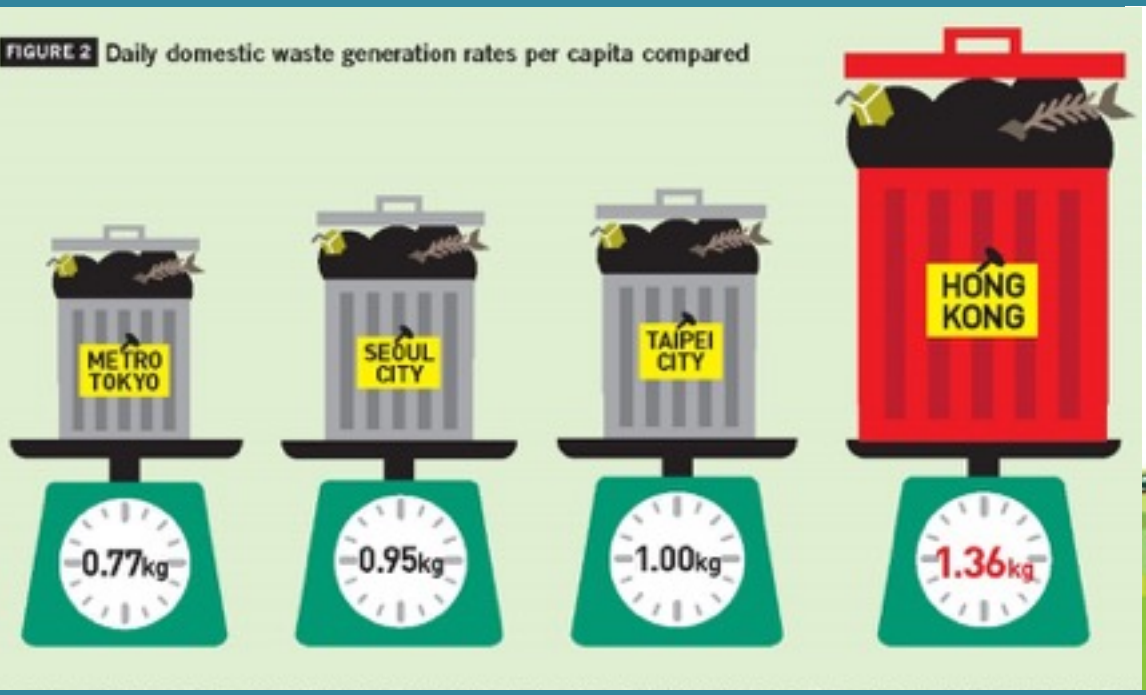
A Clean Air Plan for Hong Kong (2013)

- Hong Kong-Guangdong 2015 and 2020 emissions reduction targets
- Green Transport Fund for new Diesel Commercial Vehicle replacement (2014-2019)
- Urban Greening

Challenge 1—Air Pollution

- Worsening Roadside and Marine Pollution
- Hedley Environmental Index calculates economic loss of healthy life value
- Air Quality Health Index

Challenge 2—Waste



Hong Kong Blueprint for Sustainable Use of Resources 2013—2022

Target: Reduce 40% of MSW by 2022

- Drive Behavioural change (e.g. MSW charging, Producer Responsibility Schemes)
- Community campaigns in recycling and reduction of waste
- Invest in infrastructure (e.g. Organic Waste Treatment Facilities, Waste-to-energy MSW Treatment)

Social inequity

13,500 tonnes everyday (>3,200 tonnes of food waste)

source:

Challenge 3—Shortage of Land

Lack of affordable housing

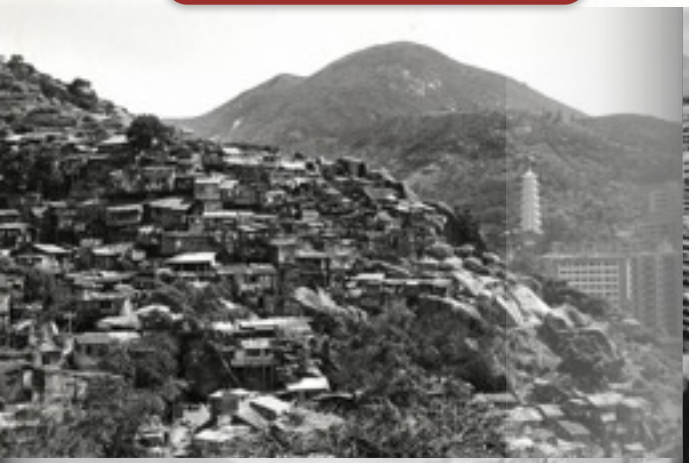
- Substandard homes & subdivided flats
- Rising inequality

→ Hong Kong Long Term Housing Strategy

- Supply target of 470,000 units in next 10 years
- public-private split 60:40

Housing

1950s → 1950-70s → 1980-10s



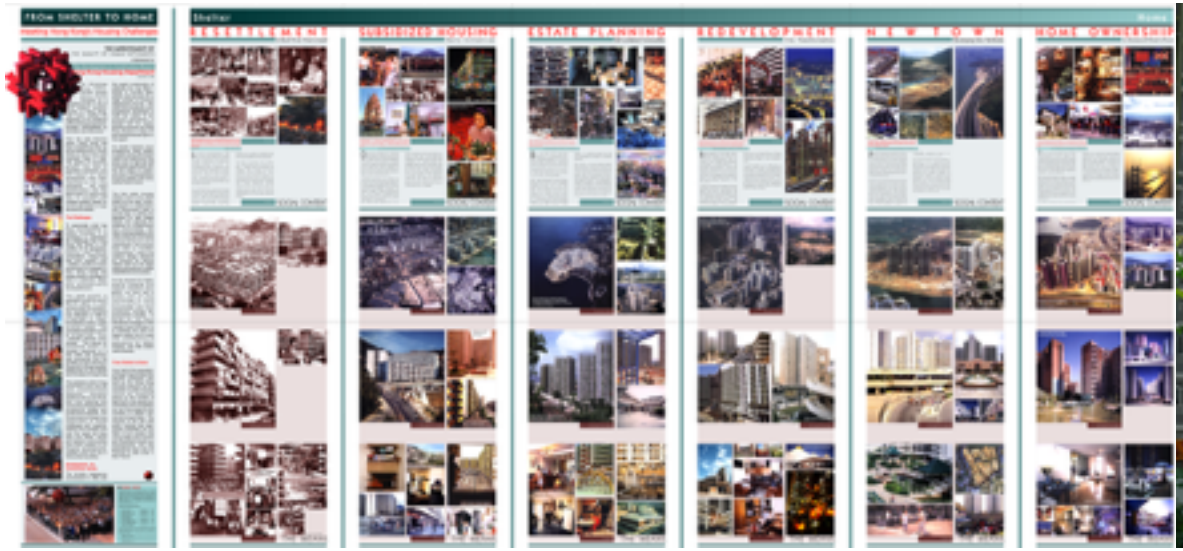
Squatter

Resettlement

Public housing

Public Housing

- About **30% of HK's 7.2 million population** are residing in public rental housing.
- about **750,000** public rental flats, and building an average of about **18,000** new flats per year.
- **Average living space is about 13 m^2** allocation standard is 7.0m^2 per person.



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Office space

Lack of new office space posing challenges to economic competitiveness

→ Revitalization of Kowloon East for CBD2

→ Explore New Development Areas in North East New Territories, Hung Shui Kiu.

Social movements

- Strong opposition to new developments in rural areas and traditional villages
- New round of social movements resulting in disruptions in new development plans and widening political divide

→ Call for more transparency in government policies, inclusive policy making, community engagement and new political wisdom

Buildings meet habitability needs

also account for

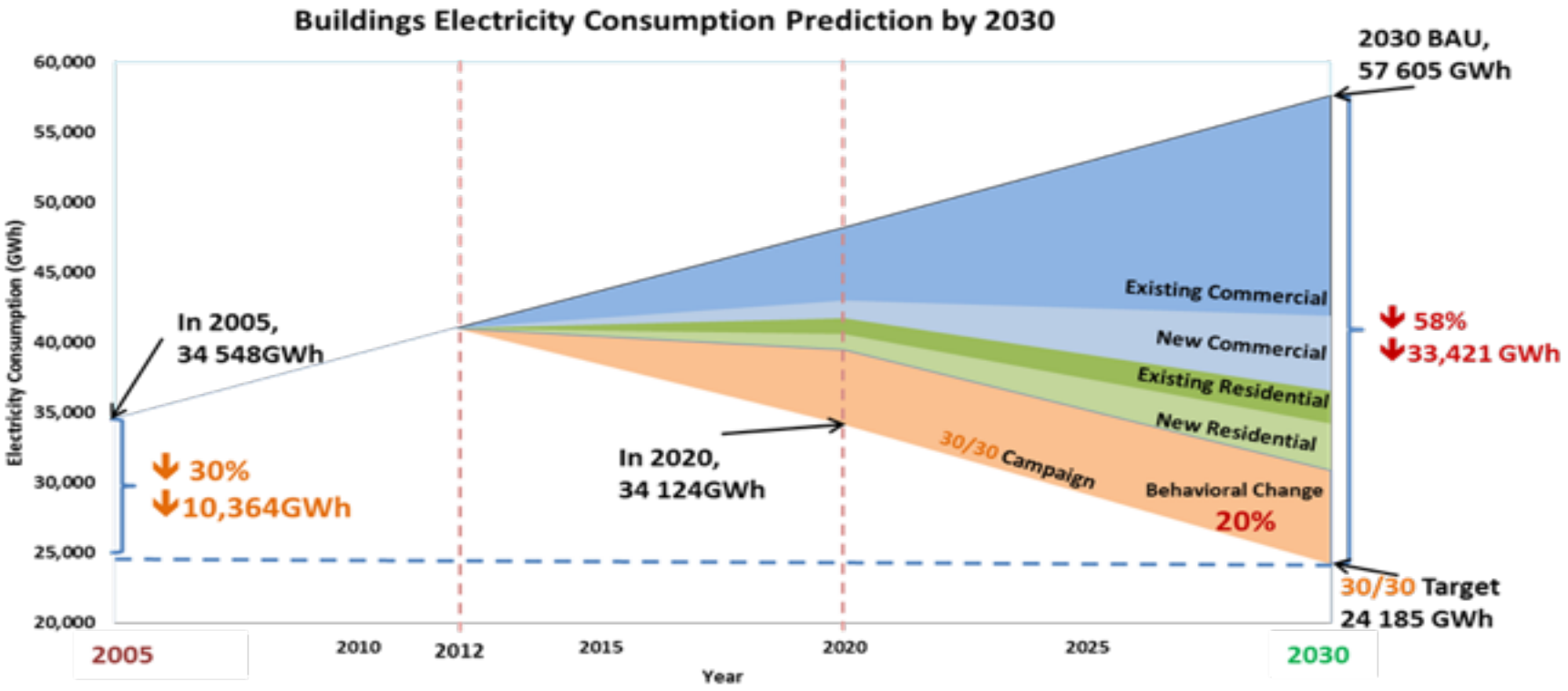
91% Electricity

60% GHG Emissions

Target Reduction **30%**

Electricity Consumption in Buildings

by **2030** (Baseline:2005)



Source: HK3030 Report, HKGBC 2012

Arup

BEAM Plus 綠建環評 as market and social driver

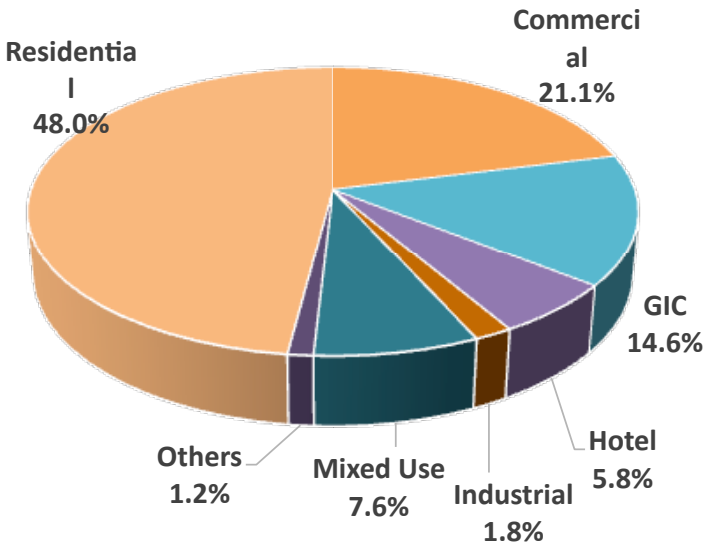
PLATINUM 鉑金級 NB 新建建築 V1.2 2014 HKGBC BEAM Plus 綠建環評

GOLD 金級 NB 新建建築 V1.2 2014 HKGBC BEAM Plus 綠建環評

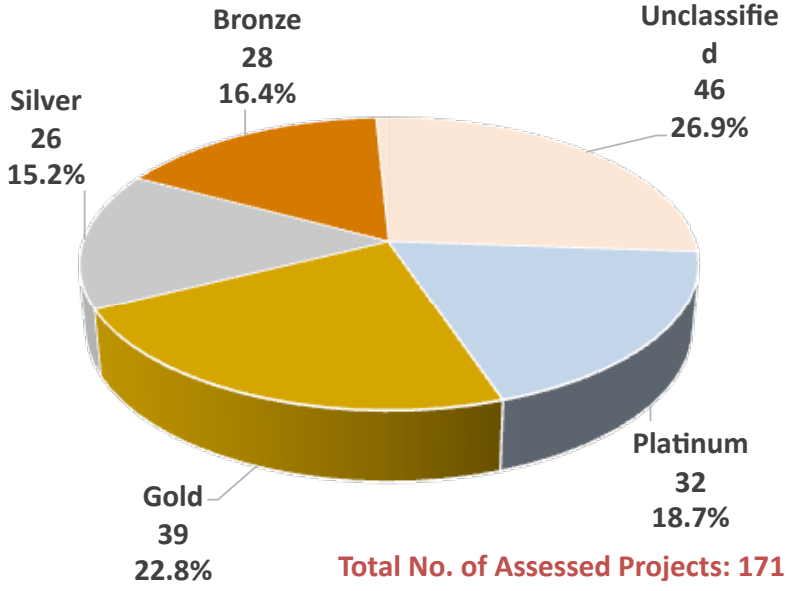
SILVER 銀級 NB 新建建築 V1.2 2014 HKGBC BEAM Plus 綠建環評

BRONZE 銅級 NB 新建建築 V1.2 2014 HKGBC BEAM Plus 綠建環評

Total No. of BEAM Plus Assessed Projects by Type



Total No. of BEAM Plus Assessed Projects by Rating



Total No. of Assessed Projects: 171

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Social drivers

Professional training and qualification

2600 BEAM Pro

60 BEAM Affiliates

36 BEAM Assessors

106 GB Faculty members

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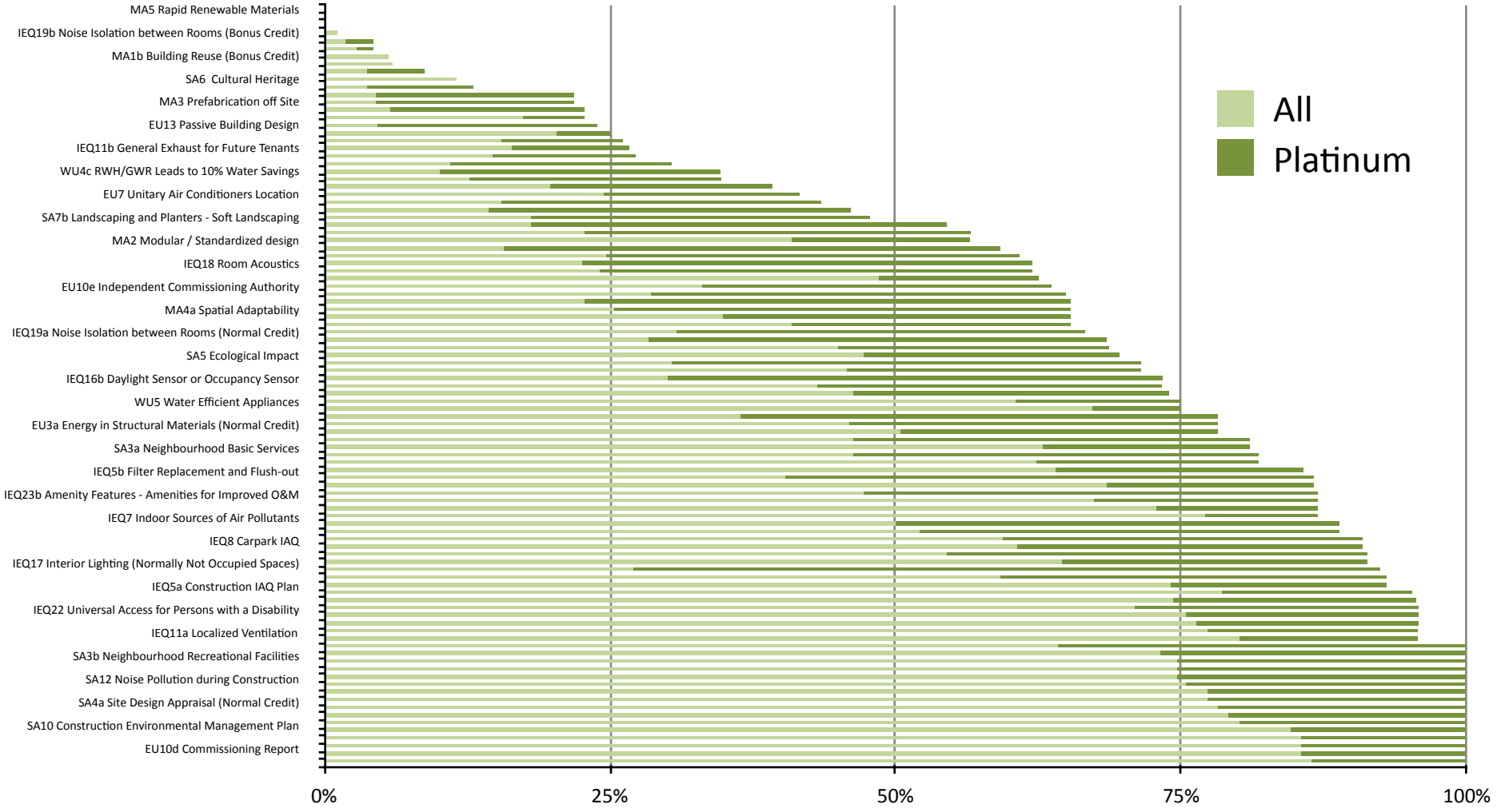
BEAM Plus 綠建環評

Scoring 110 projects



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Distribution

Urban Compaction 13/99

covers both indoor and outdoor issues, reduce impact to neighbourhood.

BEAM Plus Credits	All	Platinum
SA10 Construction Environmental Management Plan	80.0%	100.0%
SA11 Air Pollution during Construction	75.5%	100.0%
SA13 Water Pollution during Construction	75.5%	95.7%
SA12 Noise Pollution during Construction	74.5%	100.0%
SA14 Noise from Building Equipment	64.2%	100.0%
IEQ21 Indoor Vibration	62.4%	81.8%
SA9 Neighbourhood Daylight	50.5%	78.3%
IEQ20 Background Noise	45.8%	71.4%
SA15 Light Pollution	40.9%	65.2%
SA8a Microclimate around buildings – Wind Amplification	28.6%	65%
IEQ19a Noise Isolation between Rooms (Normal Credit)	30.8%	66.7%
SA8c Microclimate around buildings – Air Ventilation Assessment	19.8%	39.1%
IEQ19b Noise Isolation between Rooms (Bonus Credit)	1.1%	0.0%

- **Construction Environmental Management Plan**
- **Pollution management during construction**
- **Neighbourhood Daylight**

- **Micro-climate**
- **Noise Isolation**

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Liveability 34/99

covers health and social drivers, e.g. hygiene, security, standard of living, etc.

BEAM Plus Credits	All	Platinu
IEQ6 Outdoor Sources of Air Pollutants	78.5%	95.2%
IEQ4 Refuse Room Deodourising	78.2%	**100.0%**
IEQ11a Localized Ventilation	77.3%	95.7%
SA4a Site Design Appraisal (Normal Credit)	77.3%	**100.0%**
IEQ7 Indoor Sources of Air Pollutants	77.1%	87.0%
IEQ1 Security Design	74.5%	**100.0%**
IEQ2 Drainage Design to Avoid Transmitting Bacteria	74.5%	**100.0%**
SA2b Availability of Public Transport	74.3%	95.5%
IEQ5a Construction IAQ Plan	74.0%	92.9%
SA3b Neighbourhood Recreational Facilities	73.1%	**100.0%**
IEQ3 Legionnaires' Disease Prevention	68.5%	86.7%
IEQ14b Thermal Comfort in NV Premises - Performance with air-conditioning	67.1%	75.0%
IEQ17 Interior Lighting (Normally Not Occupied Spaces)	64.5%	91.3%
IEQ5b Filter Replacement and Flush-out	64.0%	85.7%
SA3a Neighbourhood Basic Services	63.0%	81.0%
IEQ23a Amenity Features - Amenities for the Benefit of Bldg Users	60.6%	90.9%
IEQ8 Carpark IAQ	59.3%	90.9%
IEQ13a Thermal Comfort in AC Premises - Temperature	59.2%	92.9%
IEQ23b Amenity Features for Improved O&M	47.3%	87.0%
IEQ12a Adequate Ventilation for Common Areas	46.2%	81.8%
IEQ9 Increased Ventilation	43.1%	73.3%
IEQ16a Interior Lighting (Occupied) (Normal Credit)	40.4%	86.7%
SA7a Landscaping and Planters – Hard Landscaping	30.5%	71.4%
IEQ10 Natural Ventilation	27%	92.3%
SA4b Site Design Appraisal (Bonus Credit)	22.7%	65.2%
IEQ18 Room Acoustics	22.6%	61.9%
SA7b Landscaping and Planters - Soft Landscaping	18.2%	47.8%
IEQ14a Thermal Comfort in NV Premises - Performance with Natural	18.1%	54.5%
IEQ11b General Exhaust for Future Tenants	16.4%	26.7%
IEQ15 Natural Lighting	14.7%	27.3%
IEQ13b Thermal Comfort in AC Premises - Room Air Distribution	14.3%	46.2%
IEQ12b Natural Ventilation for Common Areas	5.7%	22.7%
SA8b Microclimate - Elevated Temperatures	**2.7%**	**4.3%**
SA1 Contaminated Land Assessment and Rehabilitation	**0.0%**	**0.0%**

- **IEQ**
- **Site Design Appraisal**
- **Security Design**
- **Drainage Design**
- **Availability of Public Transport**
  Neighbourhood Amenities

- **Micro-climate**
- **Natural Ventilation**
- **Culture Heritage**
- **Natural Lighting**
- **Soft Landscaping**
- **General Exhaust for future tenants**

Social Sustainability 5/99

some credits covered under liveability; possible additions: workers' rights and safety, harmonious community, social and cultural impacts of development, etc.

BEAM Plus Credits	All	Platinum
IEQ22 Universal Access for Persons with a Disability	70.9%	95.7%
SA5 Ecological Impact	47.3%	69.6%
SA3c Making on-site Facilities Available for Public Use	24.1%	61.9%
SA6 Cultural Heritage	11.5%	N/A
IA2 Conduct a Significant Social Engagement Exercise	0.0%	0.0%

- **Universal Access for Persons with Disability**

- **Cultural Heritage**
- **Community Engagement**

Economic sustainability: financial sustainability, green payback, life cycle cost, asset value, economic growth of community.

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Resource & Environment 47/99

BEAM Plus Credits	All	Platinu
EU11a O&M Manual	86.4%	100.0%
EU10c Ensure Full Commissioning	85.5%	100.0%
EU10d Commissioning Report	85.5%	100.0%
EU11b Energy Management Manual	85.5%	100.0%
EU10a Commissioning Specification	84.5%	100.0%
EU10b Commissioning Plan	80.0%	95.7%
MA8a Ozone Depleting Substances - Refrigerants	79.1%	100.0%
EU12 Metering	77.3%	100.0%
WU6 Reducing Sewage Discharge	76.4%	95.7%
MA8b Ozone Depleting Materials	72.7%	87.0%
EU11c Training and O&M Facilities	67.3%	87.0%
WU5 Water Efficient Appliances	60.5%	75.0%
MA9 Regional materials	54.5%	91.3%
EU4 Carpark Ventilation	52.0%	88.9%
EU5 Carpark Lighting	50.0%	88.9%
EU8 Clothes Drying Facilities	48.5%	62.5%
WU1 Reduce Potable Water Use	46.4%	73.9%
EU2 Reduce Peak Electricity Demand	46.3%	81.0%
EU3a Energy in Structural Materials (normal credit)	45.9%	78.3%
EU9 Energy Efficient Appliances	44.9%	68.8%
MA2 Modular / Standardized Design	40.9%	56.5%
MA6 FSC Products	36.4%	78.3%
MA4c Structural Adaptability	34.9%	65.2%
EU10e Independent Commissioning Authority	33.0%	63.6%
IEQ16b Daylight Sensor or Occupancy Sensor	30.0%	73.3%
WU3 Irrigation	28.4%	68.4%
MA4a Spatial Adaptability	25.5%	65.2%
MA4b Flexible Engineering Services	24.5%	60.9%
EU7 Unitary Air Conditioners Location	24.4%	41.7%
MA7a Recycled Materials – Exterior Works	22.7%	56.5%
MA10 Demolition Waste Recycle	20.3%	25.0%
SA2a Elimination of Private Car Parks	17.4%	22.7%
EU1 Reduce Annual kWh Consumption	15.6%	59.1%
MA7b Recycled Materials - Building Structure	15.5%	26.1%
WU4a Rainwater Harvesting	15.5%	43.5%
MA11 Construction Waste Recycle	12.7%	34.8%
EU3b Energy in Structural Materials (Bonus Credit)	11.0%	30.4%
WU4c RWH/GWR Leads to 10% Water Savings	10.0%	34.8%
MA1a Building Reuse (Normal Credits)	6.0%	**0.0%**
MA1b Building Reuse (Bonus Credit)	5.6%	**0.0%**
EU13 Passive Building Design	4.6%	23.8%
EU6 Renewable Energy	4.5%	21.7%
MA3 Prefabrication off Site	4.5%	21.7%
MA7c Recycled Materials - Interior Components	3.6%	13.0%
WU2 Water Leakage Monitoring	3.6%	8.7%
WU4b Grey Water Recycling	1.8%	4.3%
MA5 Rapid Renewable Materials	**0.0%**	**0.0%**

- Testing & Commissioning
- Energy Management Manual
- Metering provisions
- Use of non-CFC refrigerants
- Reduction of sewage

- Rapidly renewable materials
- Grey water Recycling
- Building Reuse
- Prefabrication
- Passive Design
- Renewable Energy

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Energy Reduction of Green Buildings

Rating Achieved	%	Average % of Annual Energy Reduction
Platinum	28	30
Gold	21	23
Silver	10	17
Bronze	23	14

Data as at July 2013

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Green Neighbourhood Development

Green Building + **Green Building** ≠ **Sustainable Community**

- **Holistic view of development** to create a sustainable community
- **New tool** in **Neighbourhood Development**
- Embracing high-density community and neighbourhood elements, **social sustainability, quality of open space**

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BEAM Plus Neighbourhood

a new rating tool for compact urban community and neighbourhood development

community aspects

facilities for a sustainable lifestyle

diverse housing types

continuation and enhancing local business

CSR policy

site aspects

accessibility to green and blue spaces

material aspects

shared compose station/waste to energy plant

energy aspects

district cooling/combined heat and power

water use

conservation of wetlands

storm water management and flood mitigation

outdoor environmental quality

outdoor thermal comfort

visual quality for recreational space

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Conclusion

- Similar to many cities, Hong Kong faces the same challenges of climate change, population growth and habitability demand ;
- Compact urbanism preserves **nature,** promotes **public transport, mobility** and provides **convenience and sustainability**;
- **Air pollution, waste management** and **shortage of land** pose grave challenges to liveability and sustainability;
- Building sector has a key role in meeting **habitability demand** and reducing **energy consumption, emission** and **combat climate change**;
- **Labelling** is a **good social driver** for market transformation towards liveability and sustainability;
- Extending the scope to **social sustainability** and **existing buildings**;
- Calling to go beyond buildings to **green communities and neighbourhood development**.

thank you

See you at **WSBE 2017** in **Hong Kong**

Acknowledgements

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