



Council  
on  
Tall Buildings  
and  
Urban Habitat

ILLINOIS INSTITUTE  
OF TECHNOLOGY

# The Changing Urban Landscape

**Antony Wood**

CTBUH Executive Director

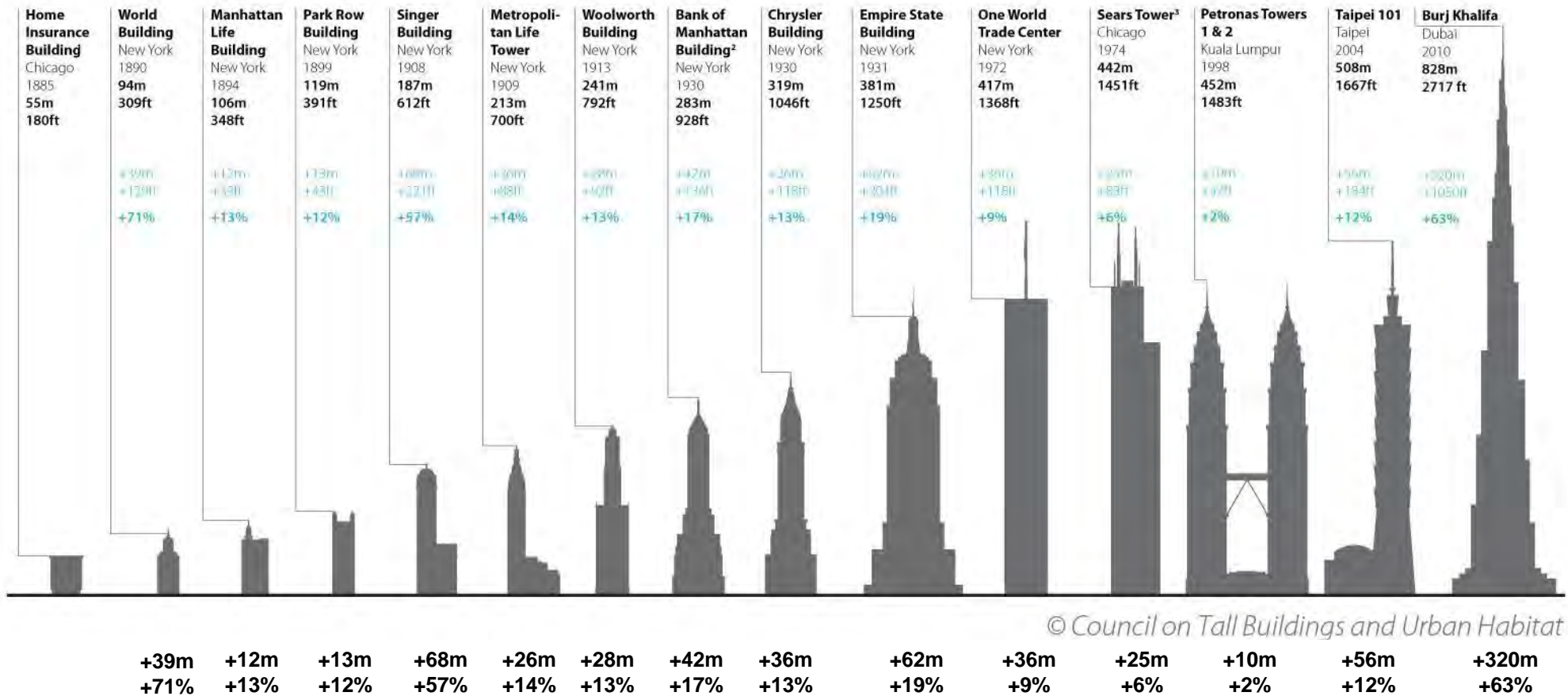
FPRF / NFPA

Washington DC, November 2013



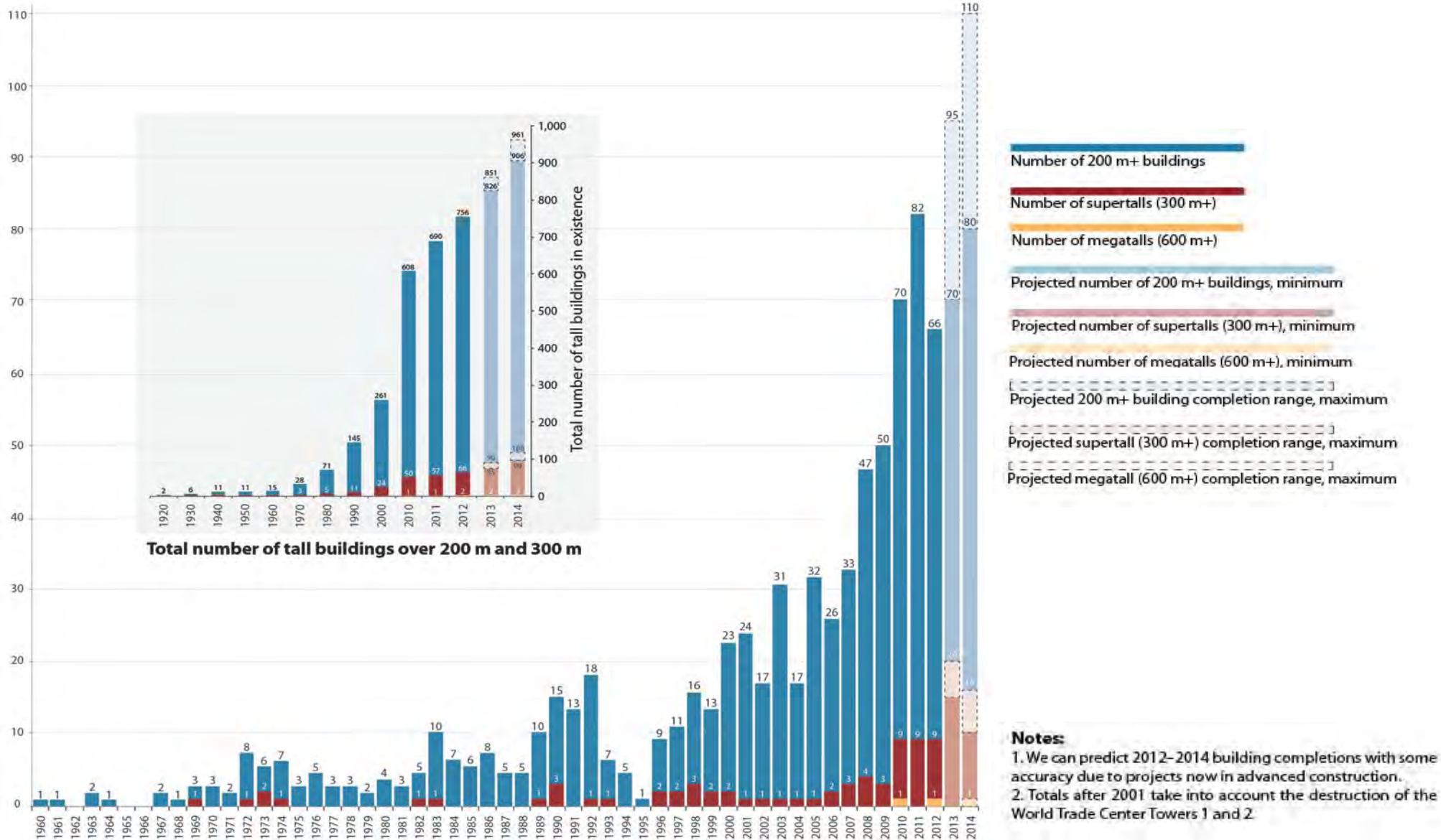
***Tall Trends***  
*in*  
***Cities***

# Tall Building Trend One: An Increase in Height

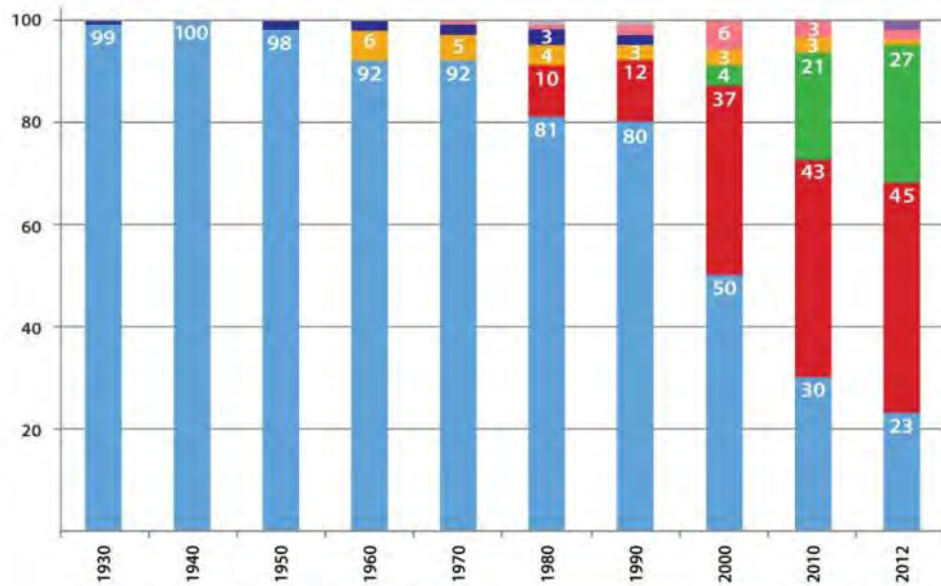


Incremental height changes in the World's Tallest Buildings (as of April 2013)

# Tall Building Trend Two: An Increase in Number



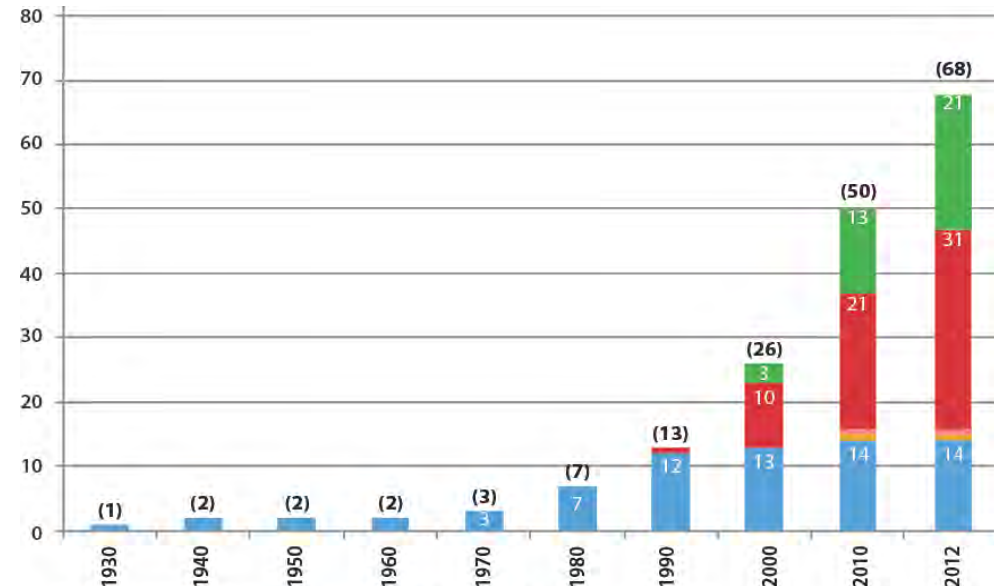
# Tall Building Trend Three: A Change in Location



100 tallest buildings by location



© CTBUH 2013



Supertall buildings (300m+) by location



© CTBUH 2013

Tallest Buildings by Location (as of January 2013)

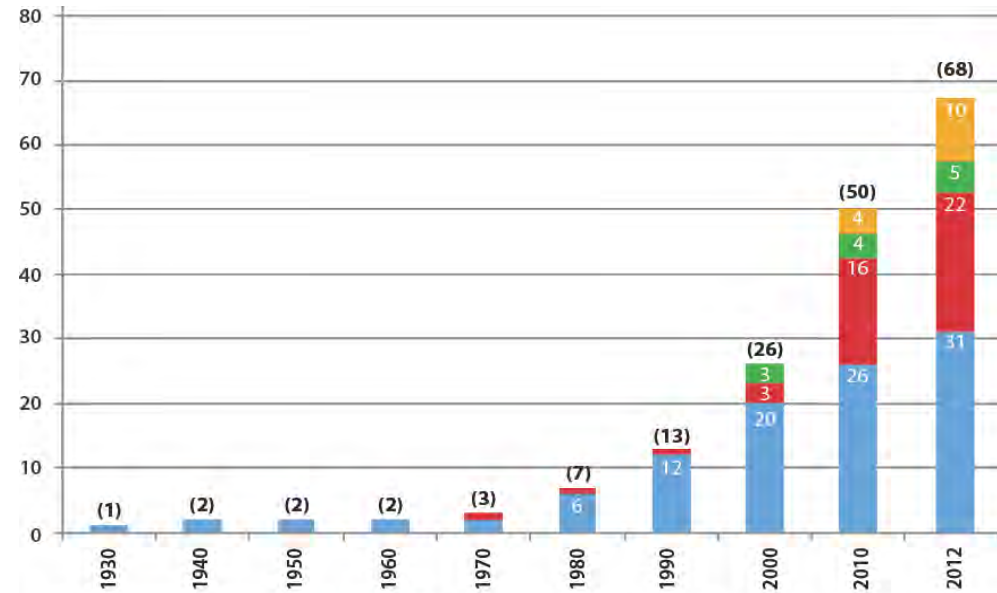
# Tall Building Trend Four: A Change in Function



100 tallest buildings by function



© CTBUH 2013



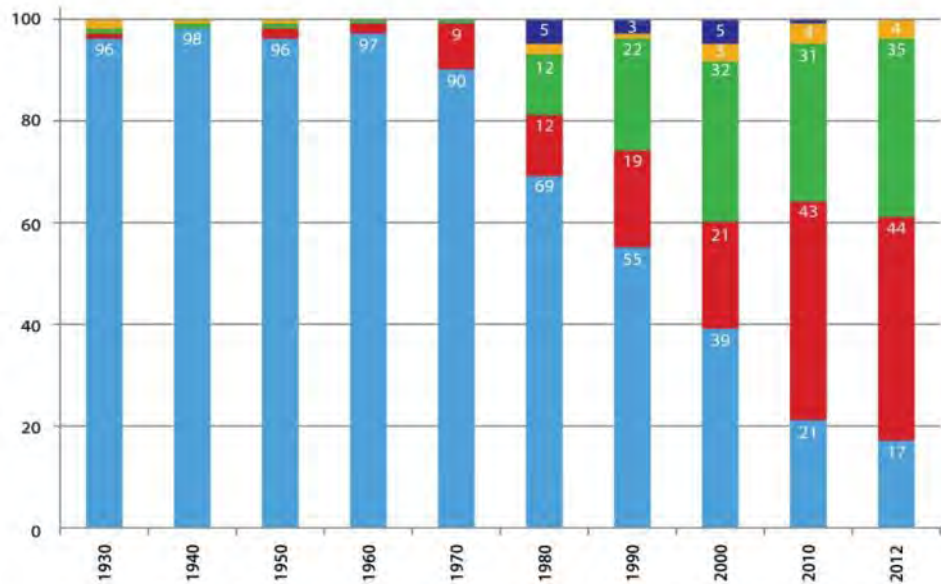
Supertall buildings (300m+) by function



© CTBUH 2013

Tallest Buildings by Function (as of January 2013)

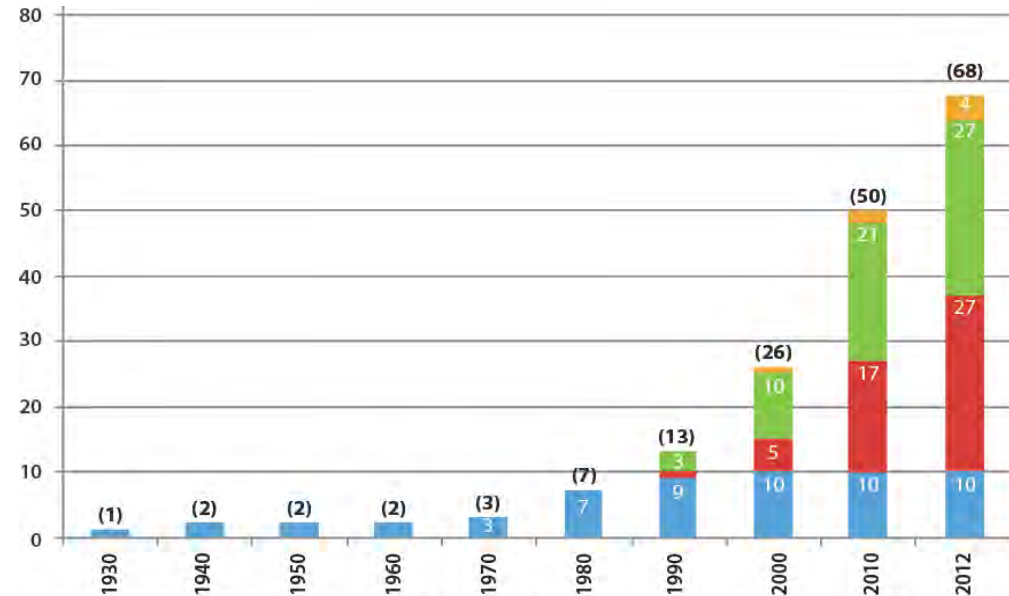
# Tall Building Trend Five: A Change in Material



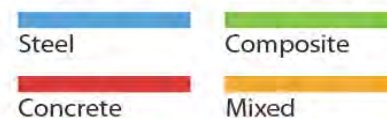
100 tallest buildings by structural material



© CTBUH 2013



Supertall buildings (300m+) by structural material



© CTBUH 2013

Tallest Buildings by Structural Material (as of January 2013)

# Tall Building Trend Six: A Change in Title / Motivation

**Pre-2000**



**Chrysler**



**Sears**

**Post-2000**



**Taipei 101**



**Chicago Spire**



**Transamerica**



**Petronas**



**Burj Dubai**



**Shanghai Tower**



# Tall Building Trend Seven: A Change in Aesthetics



**4 Times Square**



**Bahrain World Trade Center**



**Al Bahar Towers**



**Pearl River Tower**

***Drivers /  
Influencing factors***

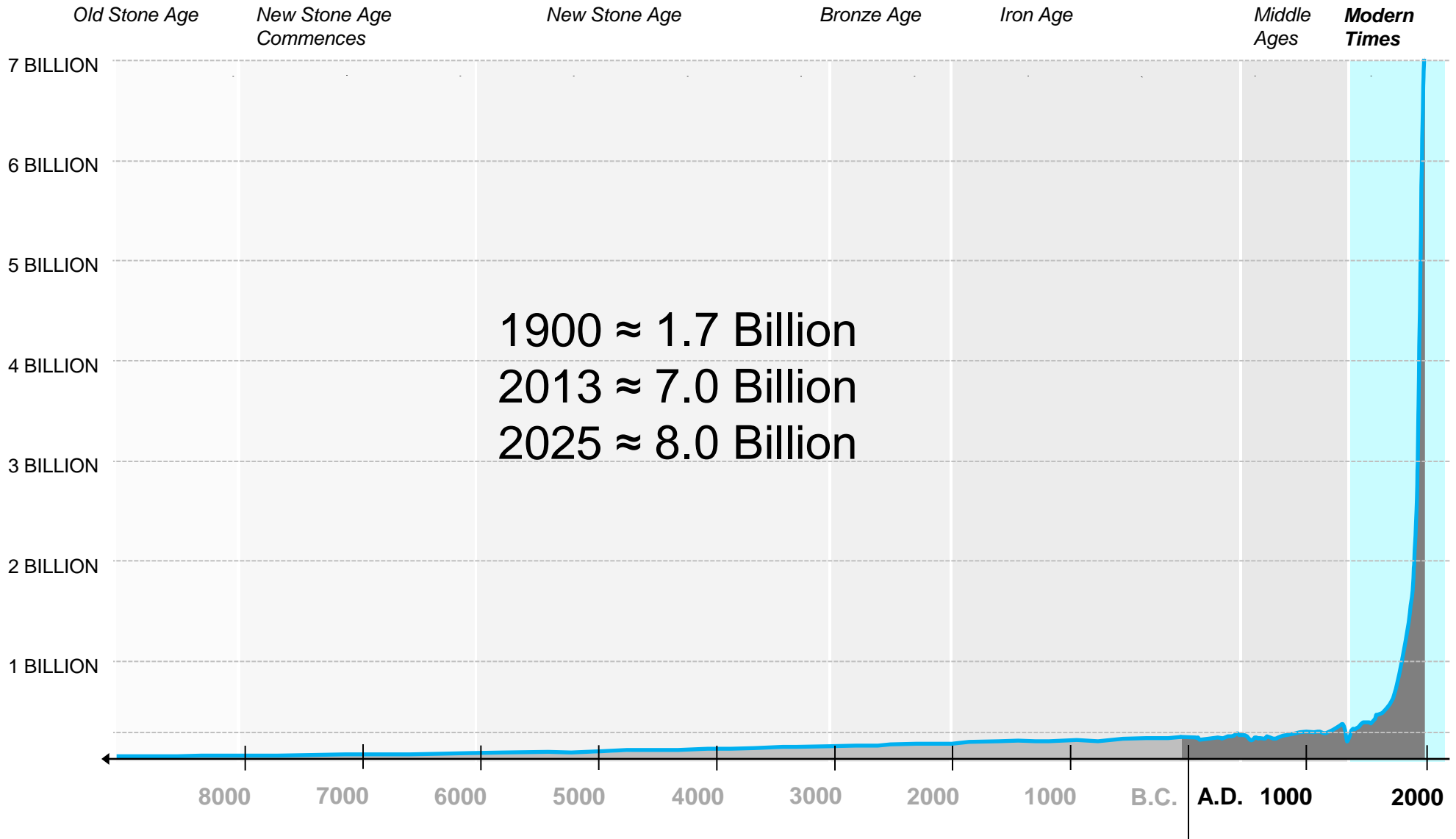
# Tall Building Driver One: Land Prices & Return on Investment



# Tall Building Driver Two: Global Icons



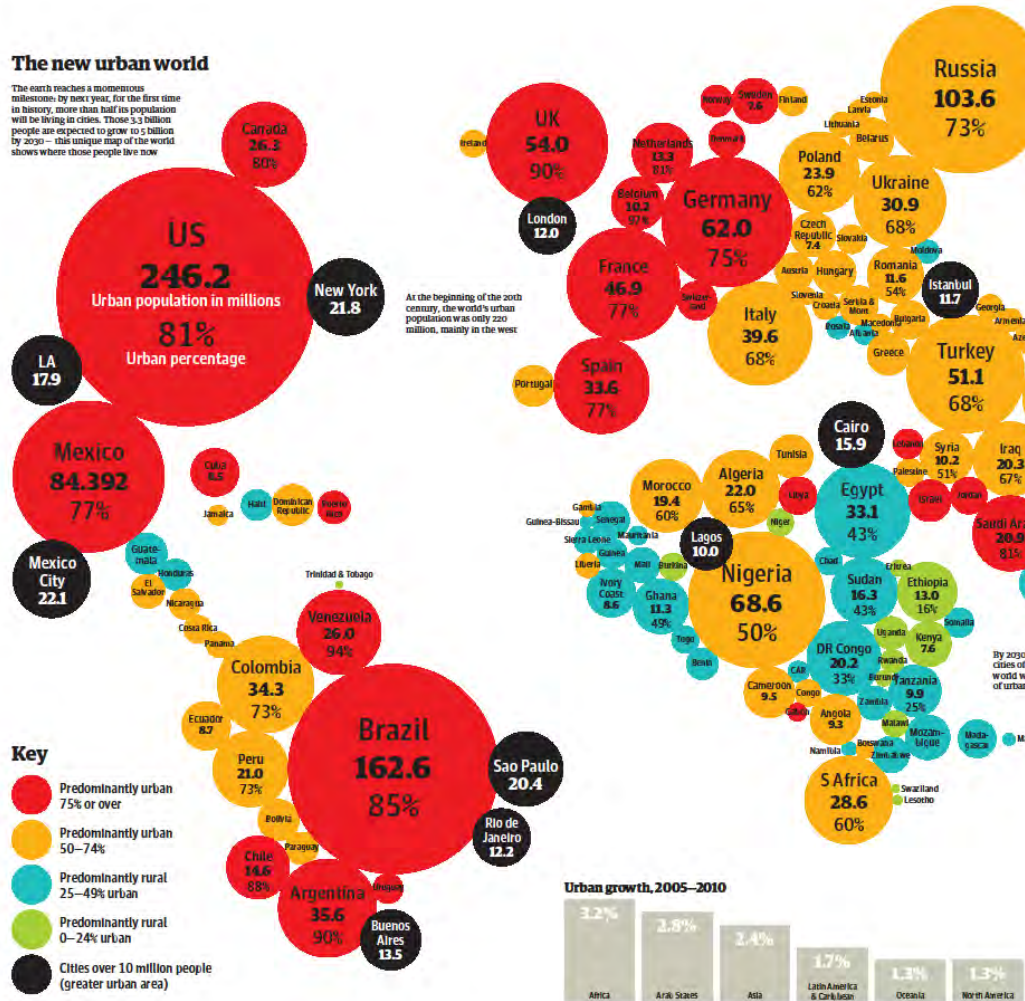
# Tall Building Driver Three: Population Growth



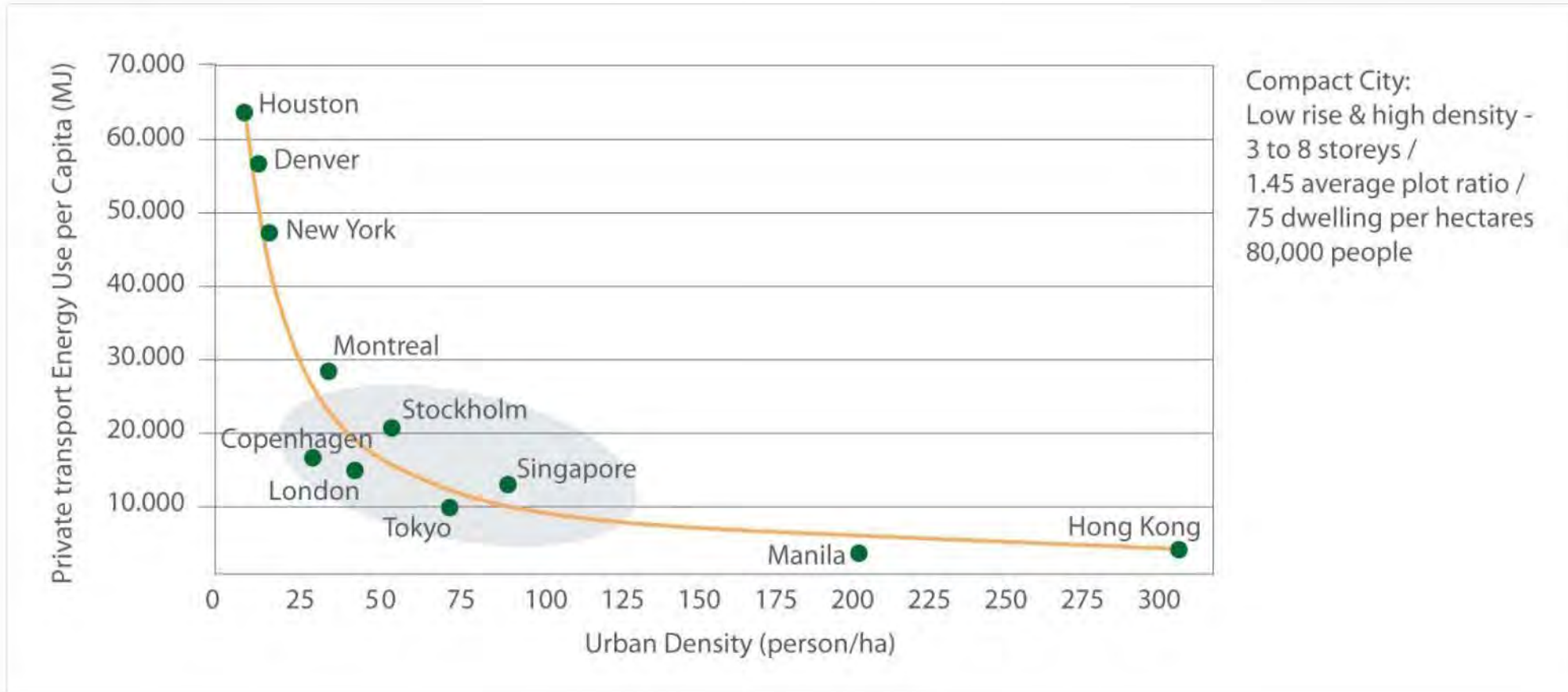
# Tall Building Driver Four: Urbanization

## The new urban world

The earth reaches a momentous milestone by next year, for the first time in history, more than half its population will be living in cities. Those 3.3 billion people are expected to grow to 5 billion by 2030 – this unique map of the world shows where those people live now



# Transport and Urban Density



Source: Newman, Peter and Jeffrey Kenworthy, Urban Design to Reduce Automobile Dependence, *Opolis: An International Journal of Suburban and Metropolitan Studies*: Vol. 2: No. 1, Article 3. <http://repositories.cdlib.org/cssd/opolis/vol2/iss1/art3>, (2006)

# Tall Building Driver Five: Changing Social Demographics

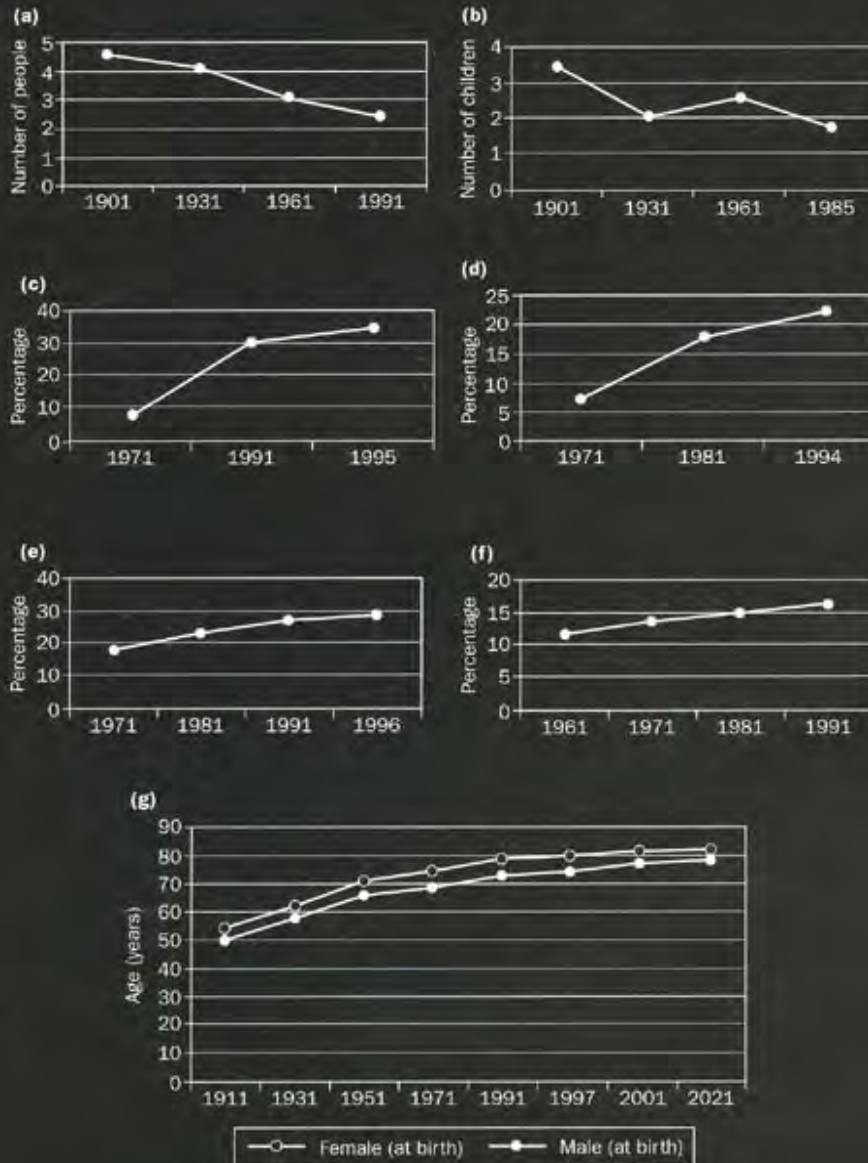
The U.K.

## Factors:

- longer life expectancy
- smaller household size
- (single person households, divorce rate, children outside marriage, etc)

## Results:

- a government demand of 2.6 million new homes by 2020
- An annual requirement of 189,000 new homes



▶ Chart 2.8a: Household size

▶ Chart 2.8b: Number of children per woman

▶ Chart 2.8c: Percentage of children born outside marriage

▶ Chart 2.8d: Percentage of lone parent households (as percentage of all families with dependent children)

▶ Chart 2.8e: Percentage of single person households

▶ Chart 2.8f: Percentage elderly (over 65)

▶ Chart 2.8g: Expectation of life at birth, by gender

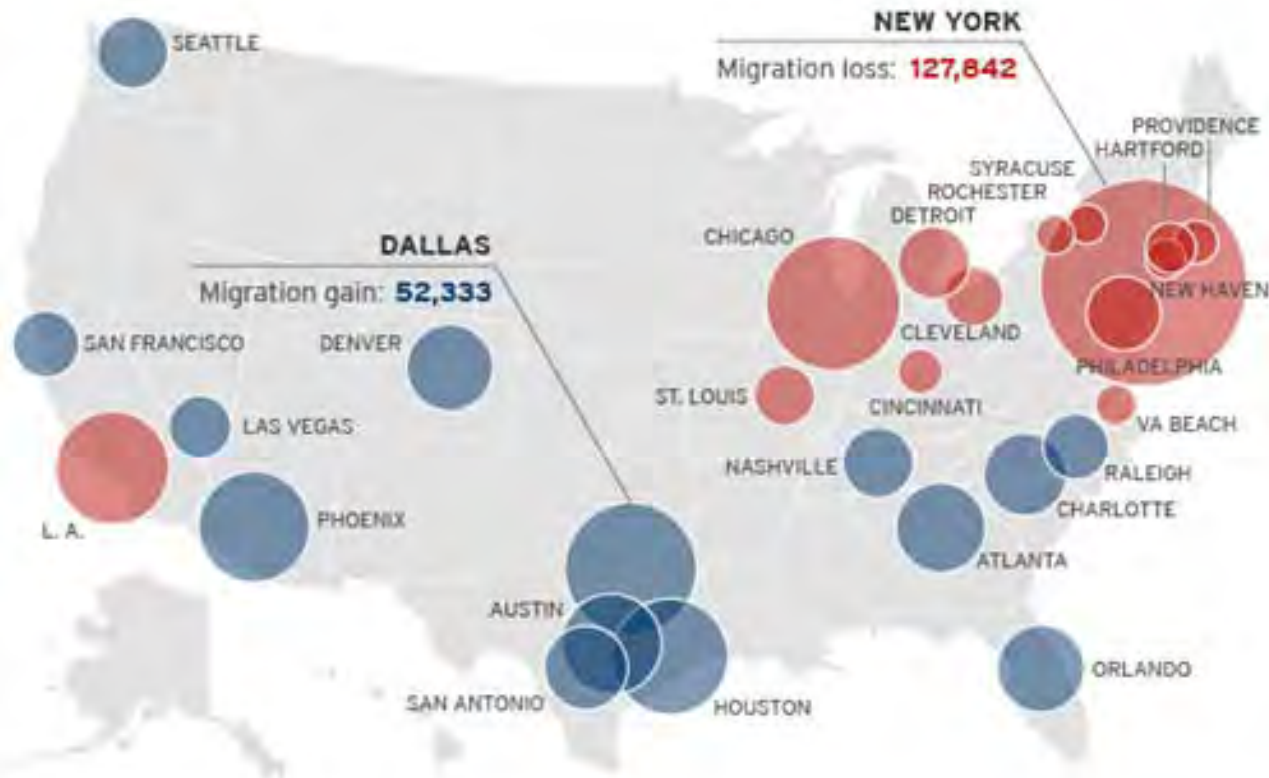
Source: Office for National Statistics (2000)



# Tall Building Driver Six: Population Shifts

## Greatest Domestic In- and Out-Migration Metro Areas, 2011-2012

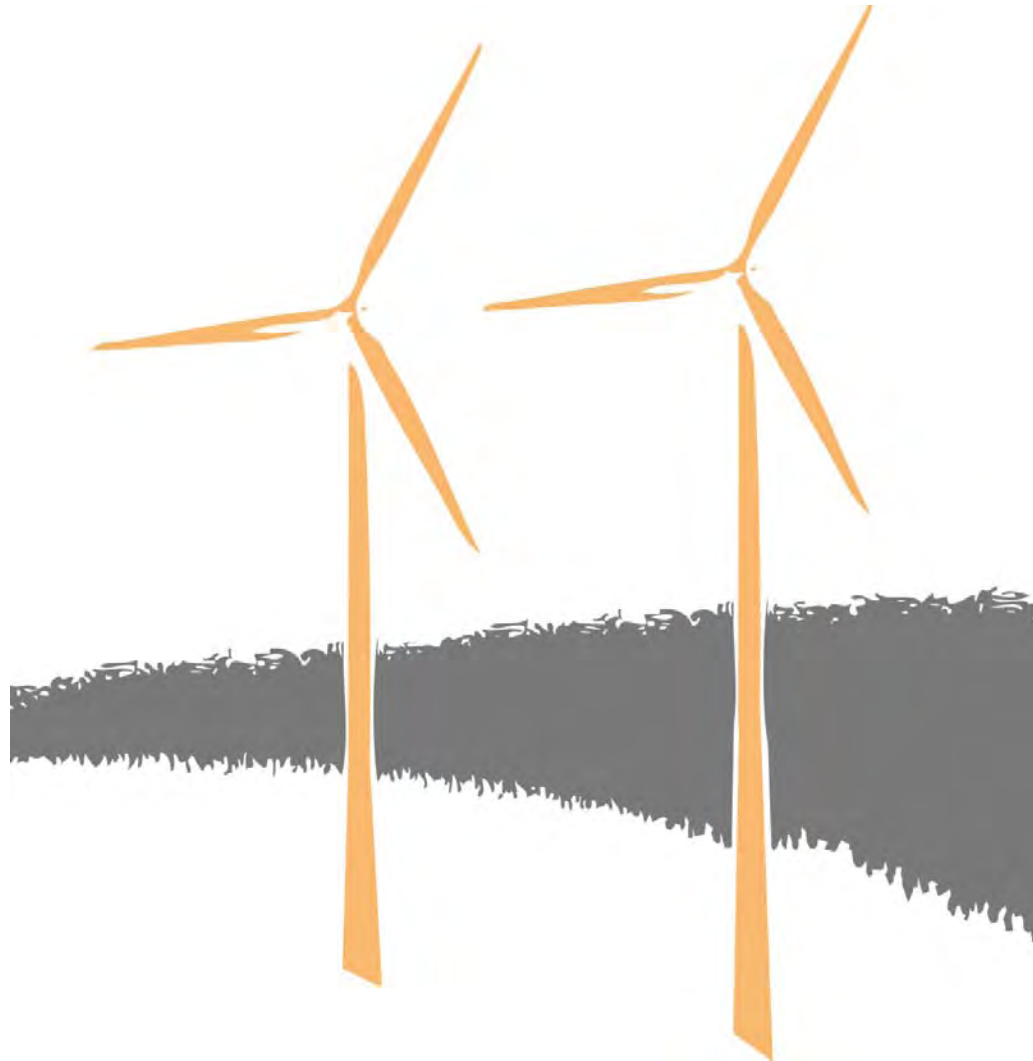
Circles are sized by number of migrants to or from each metro area. Red indicates out-migration; blue indicates in-migration.



## USA Pop. Growth / Immigration

- 0.9% per annum (world average = 1.09%)
- $0.9\% \times 3.2 \text{ million people} = 280,000$  urban growth annually
- Not equal across cities. Rust belt to Sun-belt, etc.

# Tall Building Driver Seven: Energy, Sustainability & Climate Change



***Tall Buildings and Place:  
The Shortfall of Tall?***



## Shortfall 1: The Commercial Design Approach

1958. Seagram Building, New York,  
Mies van der Rohe & Philip Johnson



Tall building-scape, Jakarta



Tall building-scape, Seoul



## Shortfall 2: The Iconic - Sculptural Design Approach

2007. RAK Financial City, Ras Al Khaimah,  
UAE, Rakeen

# The Extreme Iconic-Sculptural Design Approach: A Tall Building Menagerie?

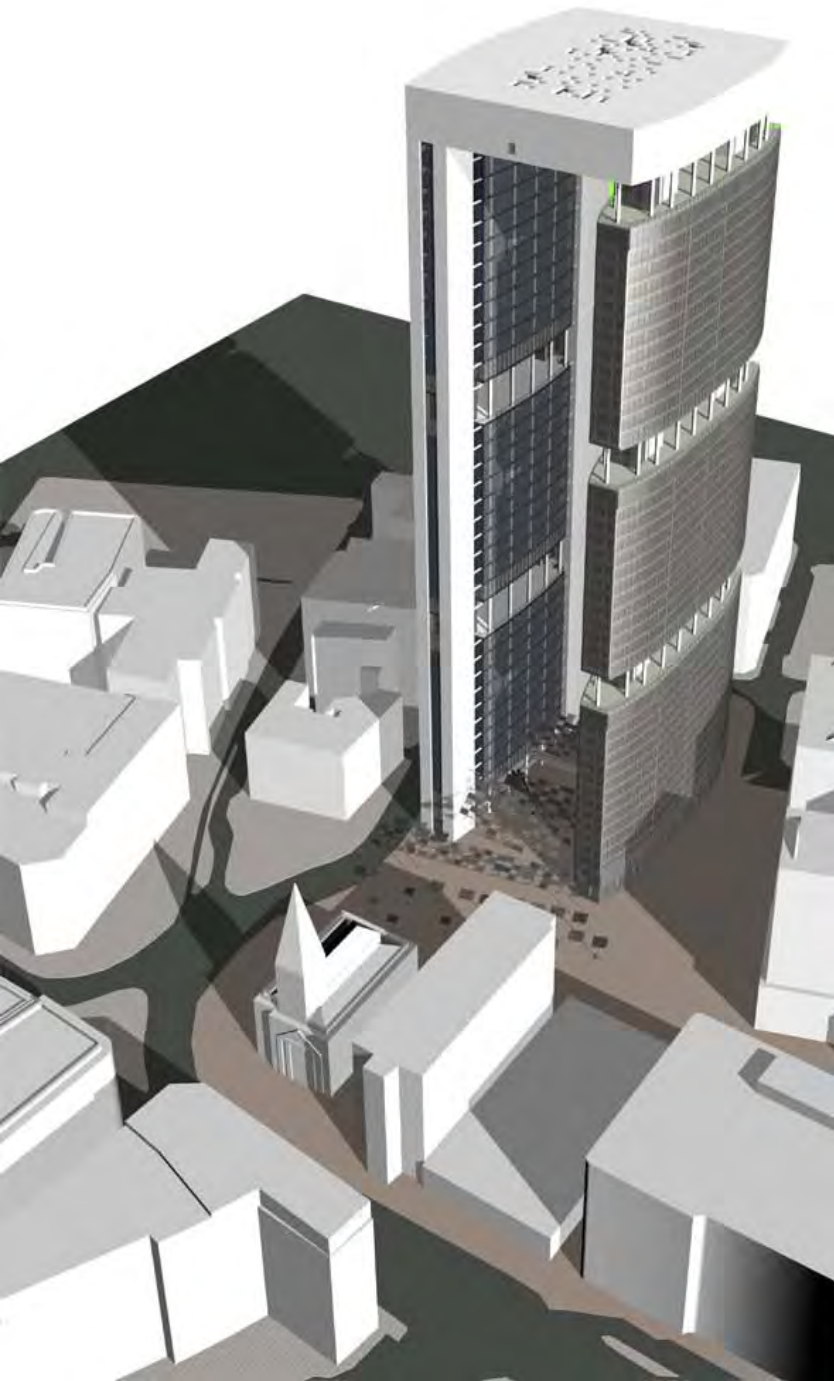


***New Paradigms in High Rise Design:  
A New Vernacular for the  
Skyscraper?***

***10 Design Principles***



Design Principle 1: Tall Buildings should relate to the **physical** characteristics of place.



2004. "Building As Frame"  
Annette Ward  
University of Nottingham



Design Principle 2: Tall Buildings should relate to the **environmental** characteristics of place (Light, Wind, Air, Sun, Rain)



## Light

2003. "The Sun Splice"

Thomas Pickford

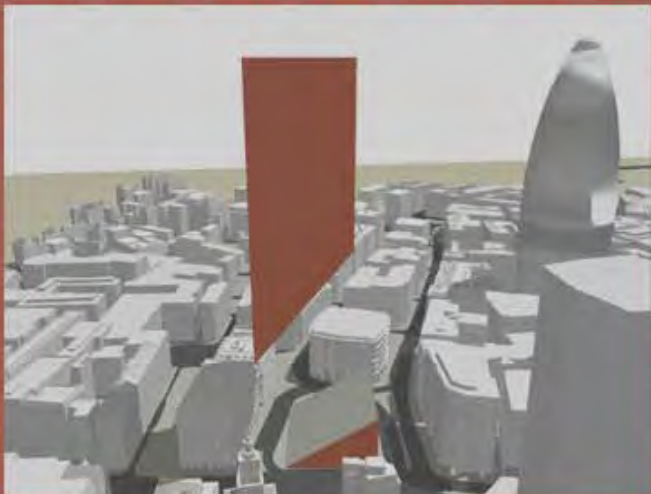
University of Nottingham

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18

19

ISO 200



17A

18

18A

19

19A

20

0206

24

21

19

ISO 200



20

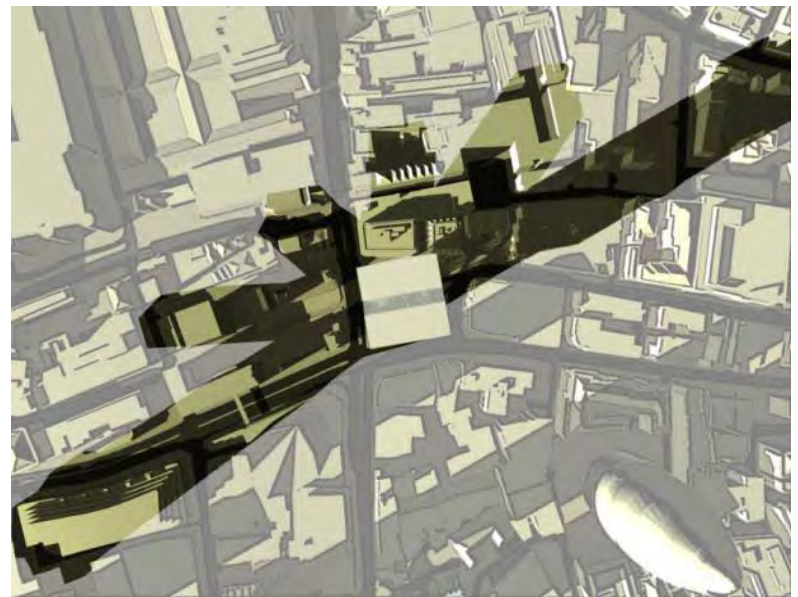
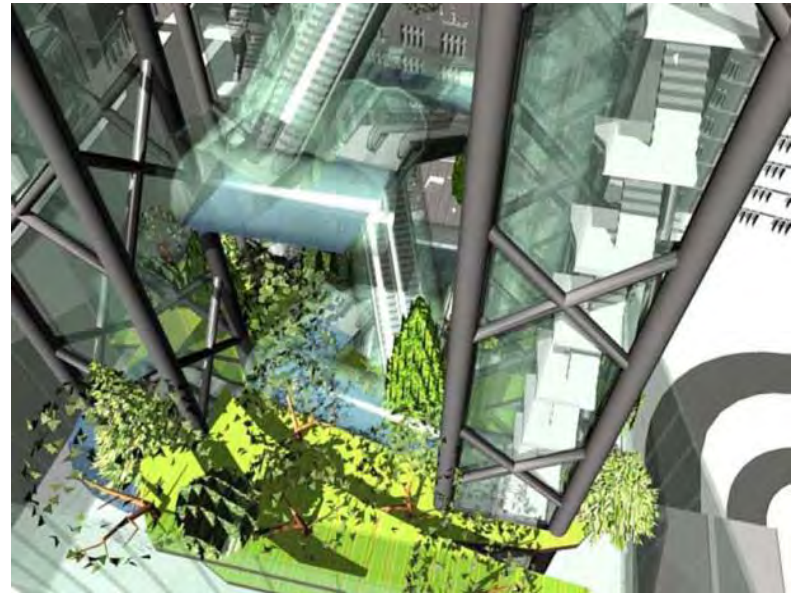
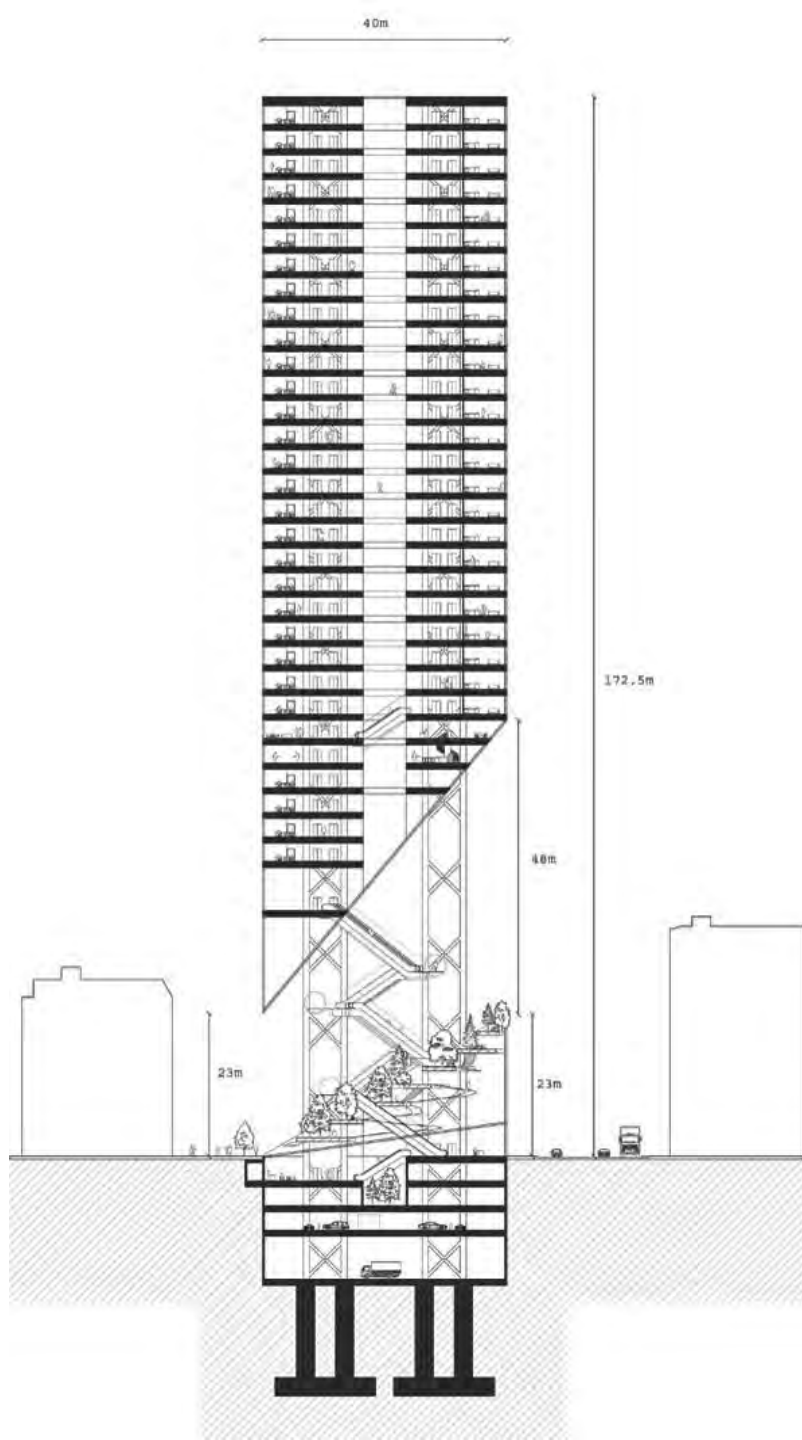
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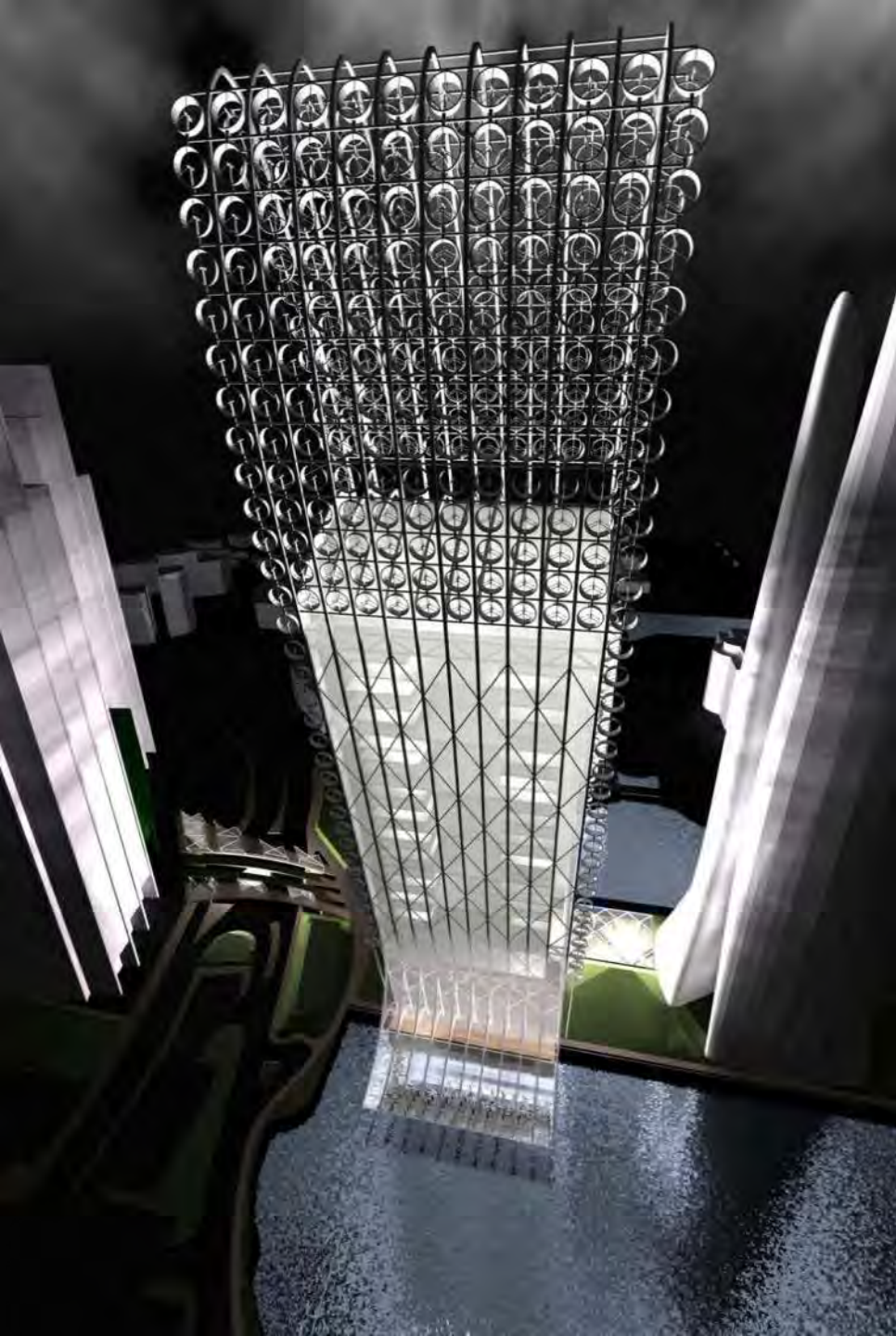
21

18A

19

19A



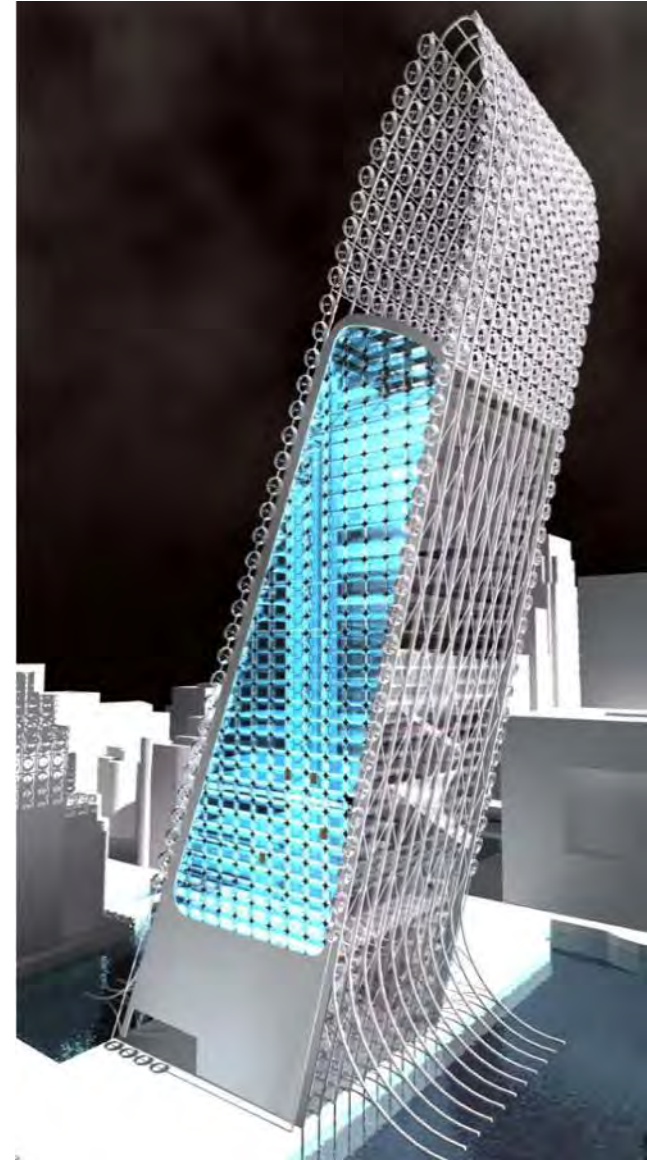


## Wind

2007. "Wind Farm"

Adam Chambers & Alex Dale-Jones

University of Nottingham



# Harnessing Wind in Tall Buildings?

$$P = 0.5 \rho V^3 T$$

where  $P$  = Turbine Wind Power,  $\rho$  = air density,  $V$  = Wind Velocity,  
 $T$  = Time



**Bahrain World Trade Center, 2008**

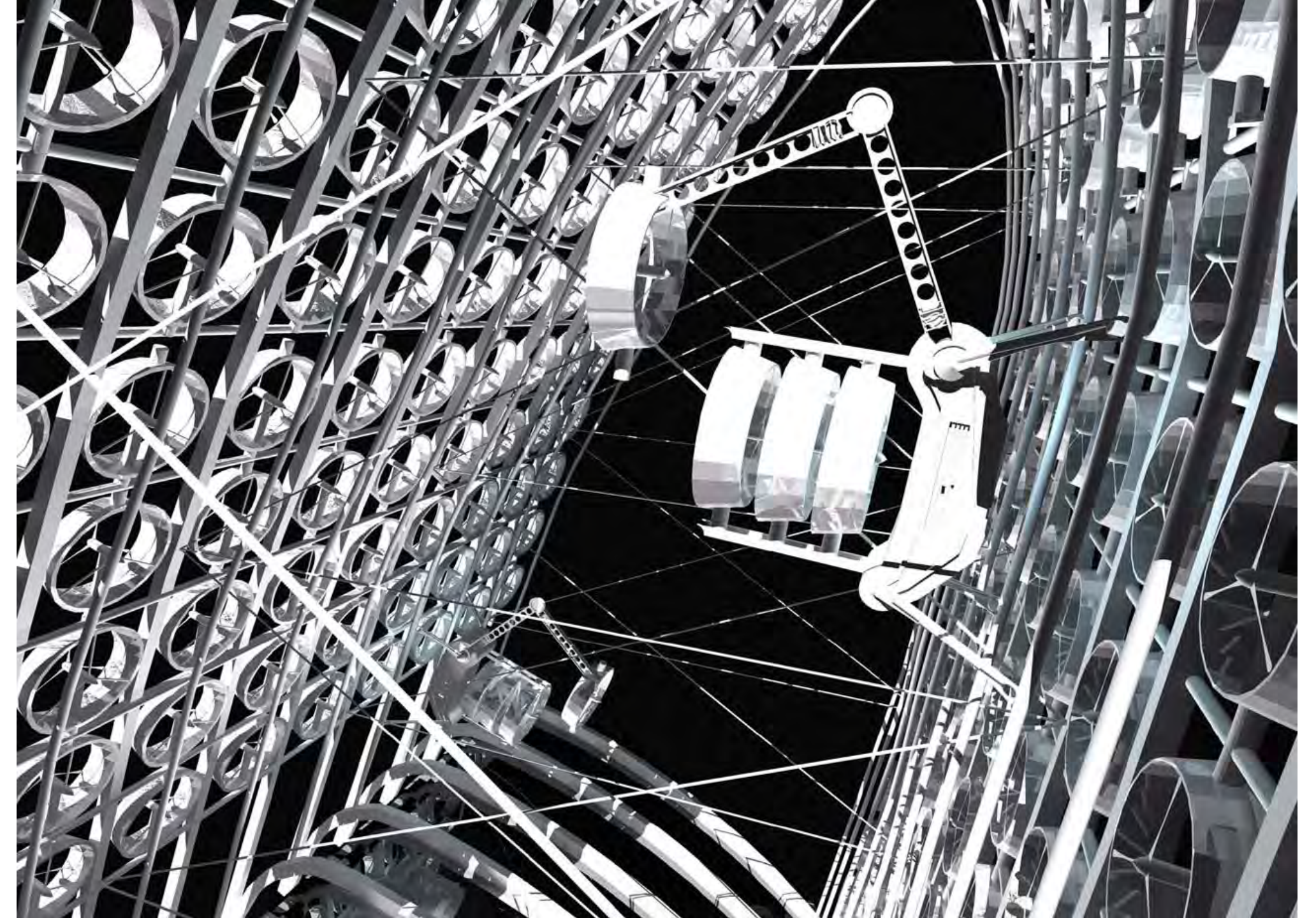


**Strata, London 2010**



**Pearl River Tower, Guangzhou, 2013**

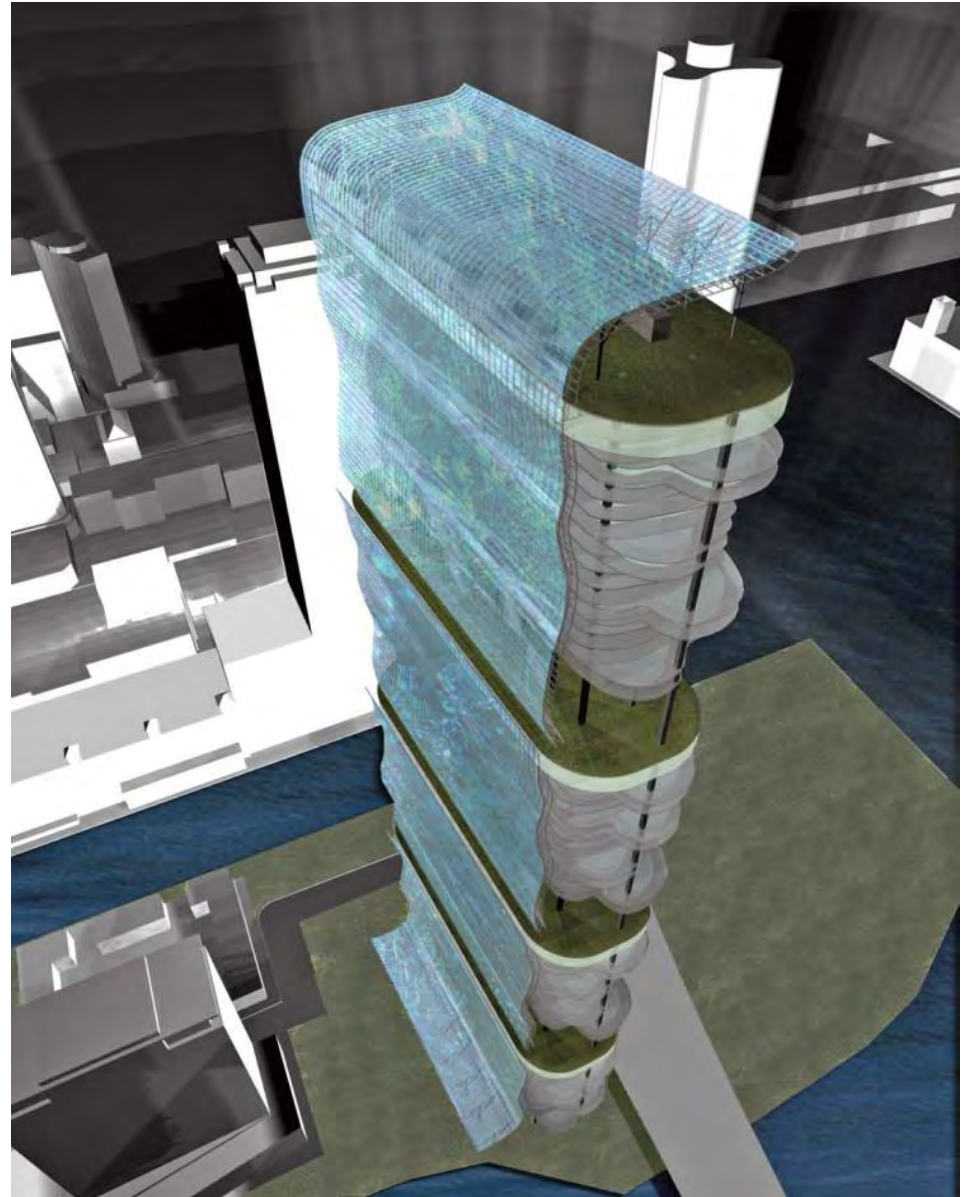


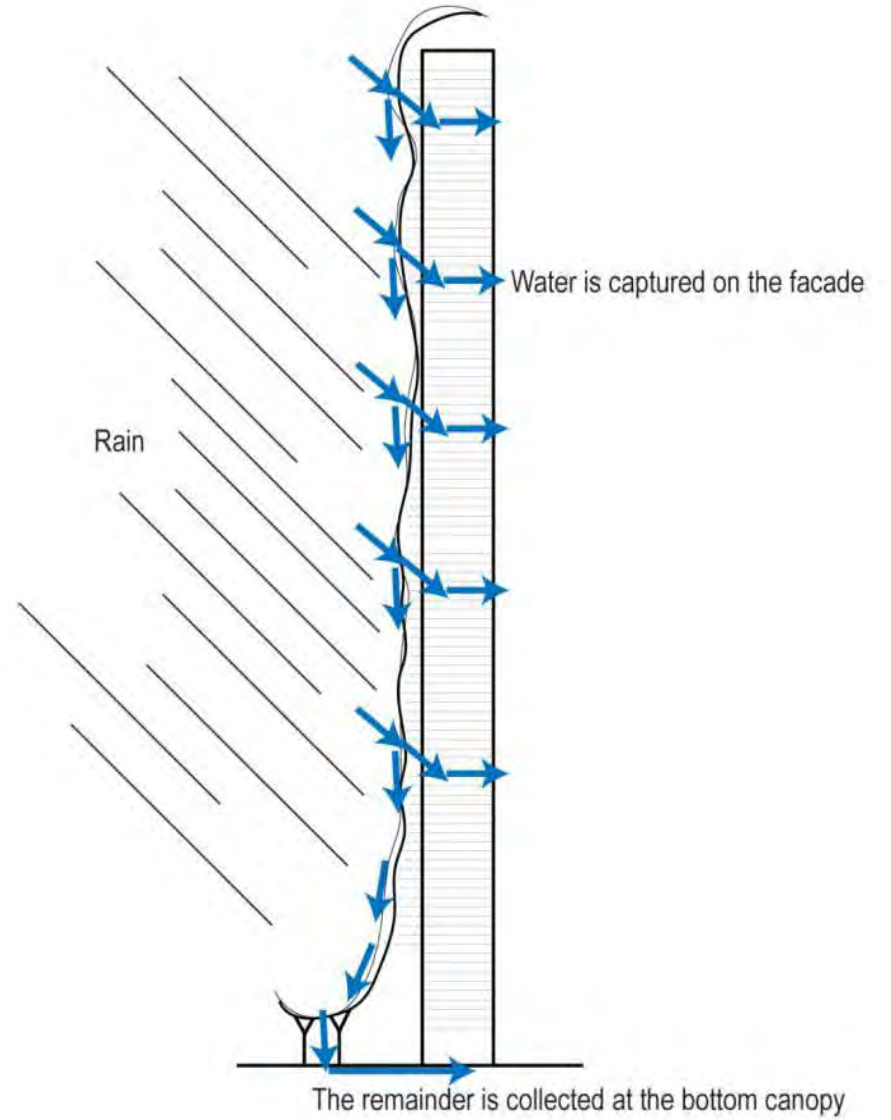
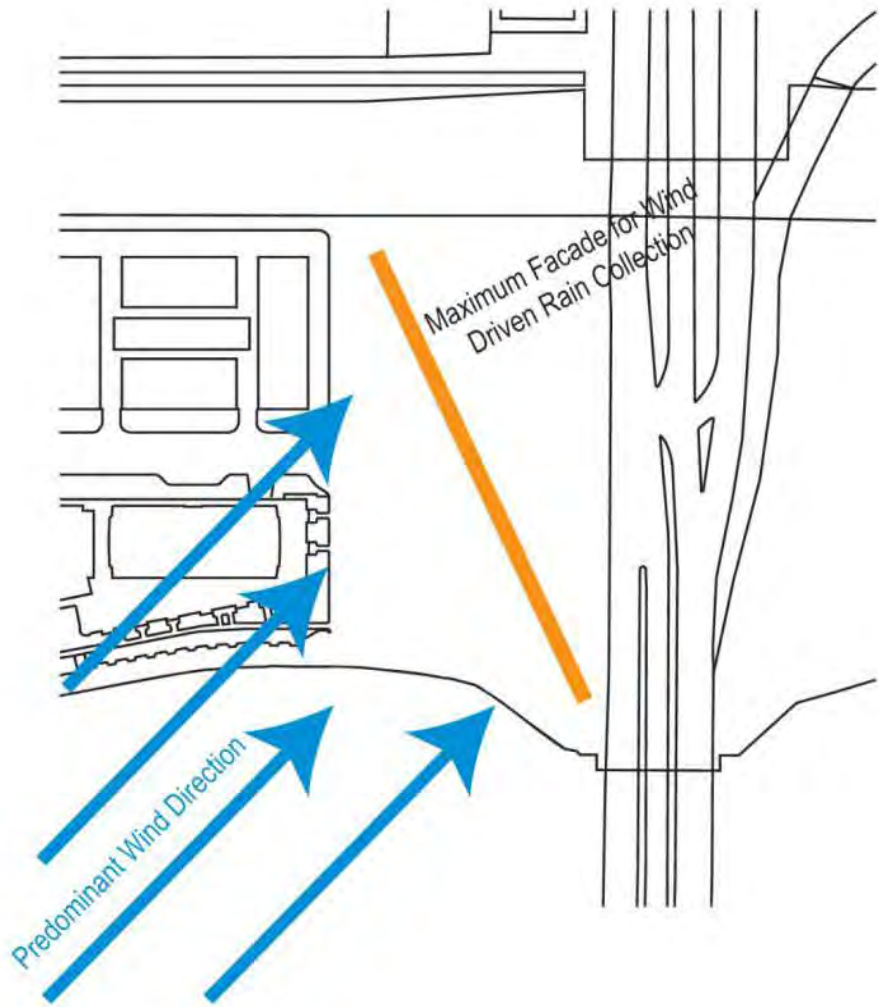


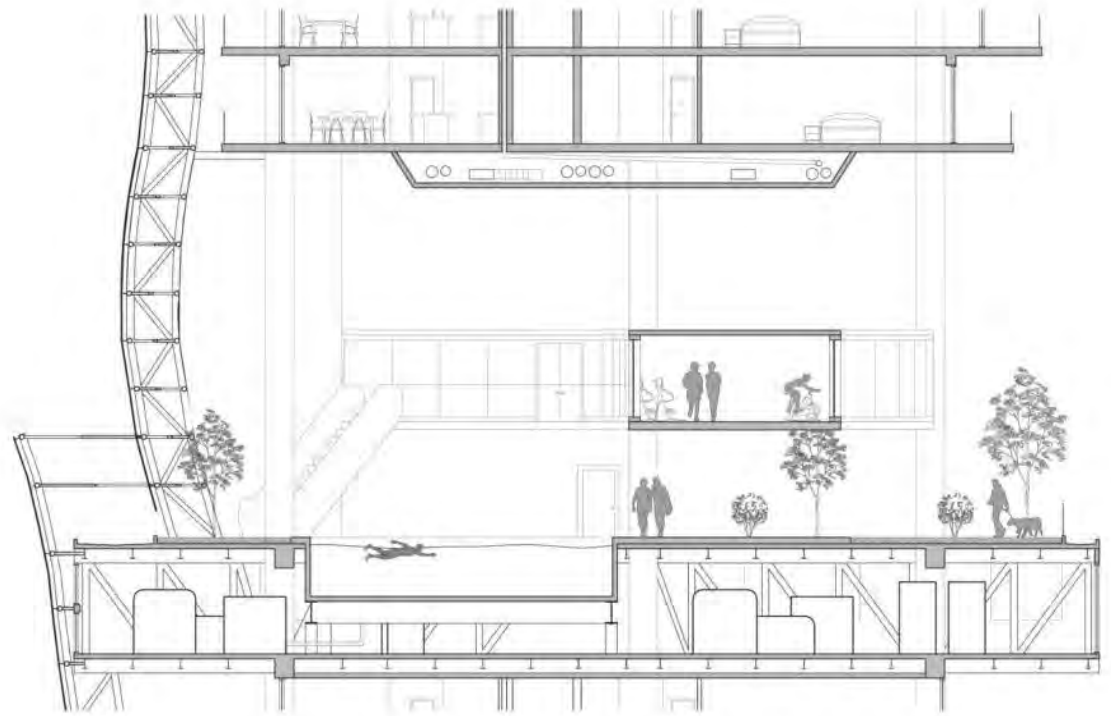
# Water

2007. "The Chicago Aquifer"

Steve Henry & Hannah Cho, Illinois Institute of Technology







Design Principle 3: Tall Buildings should relate to the **cultural** characteristics of place.



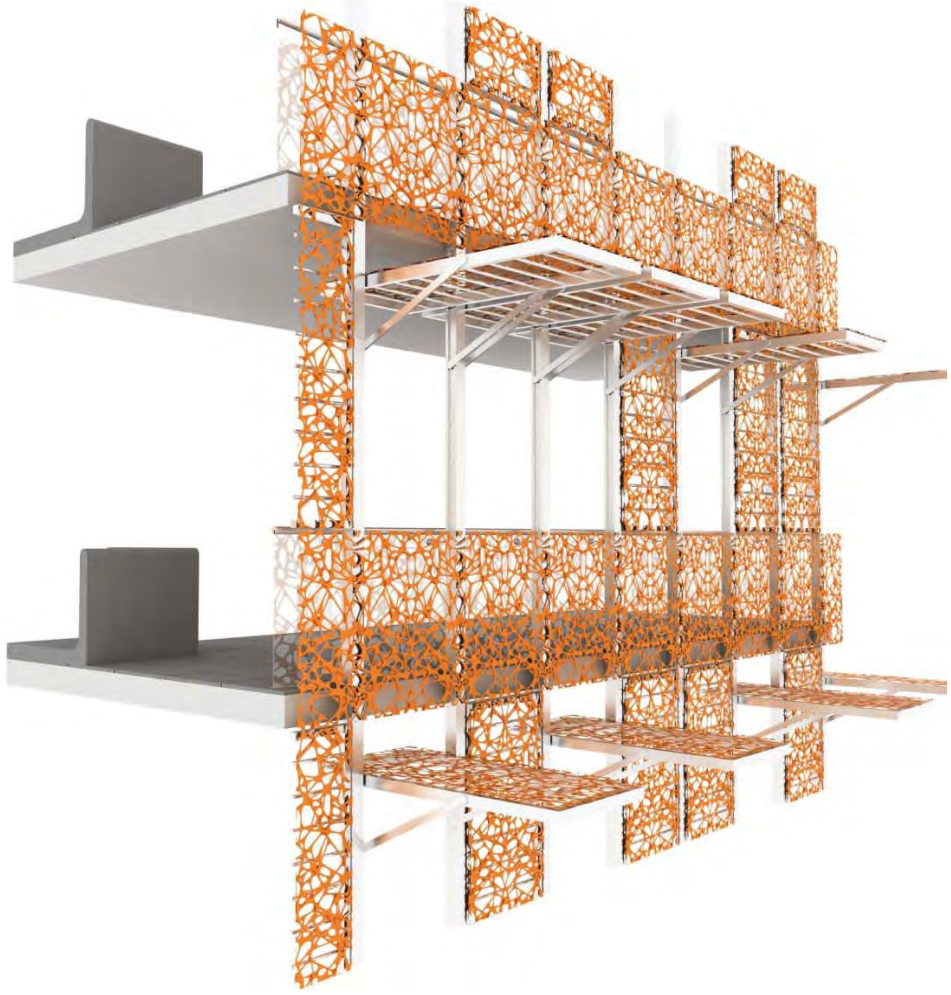
2009. "Swadeshi Tower (Textile Tower)," Mumbai  
Nishant Modi & Hiren Patel  
Illinois Institute of Technology



- 1) Integrate a dhobi ghat system within the high-rise to wash and dry the clothes of surrounding towers and neighborhood.
- 2) Revive an existing textile market culture at the base of the site.
- 3) Integrate a clothes drying system within the skin of the tower.
- 4) Incorporate the terrace as not only an outdoor balcony, but a semi-outdoor space with tubs for clothes washing.
- 5) Provide an open space at top of tower for kite flying.



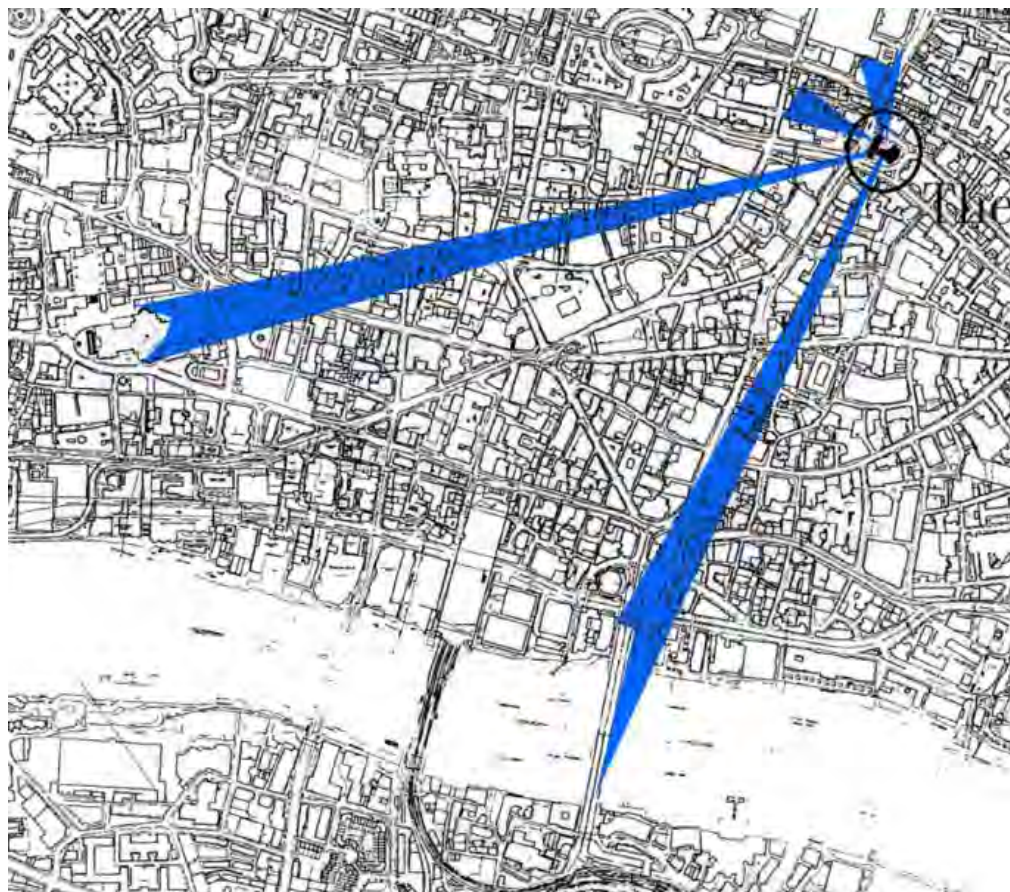




Design Principle 4: Tall Buildings should **Vary with height**  
– in form, texture, scale (and program) – not be just  
vertical extrusions of an efficient floor plan



2003. "SkyBox version 1"  
Eva Young, University of Nottingham





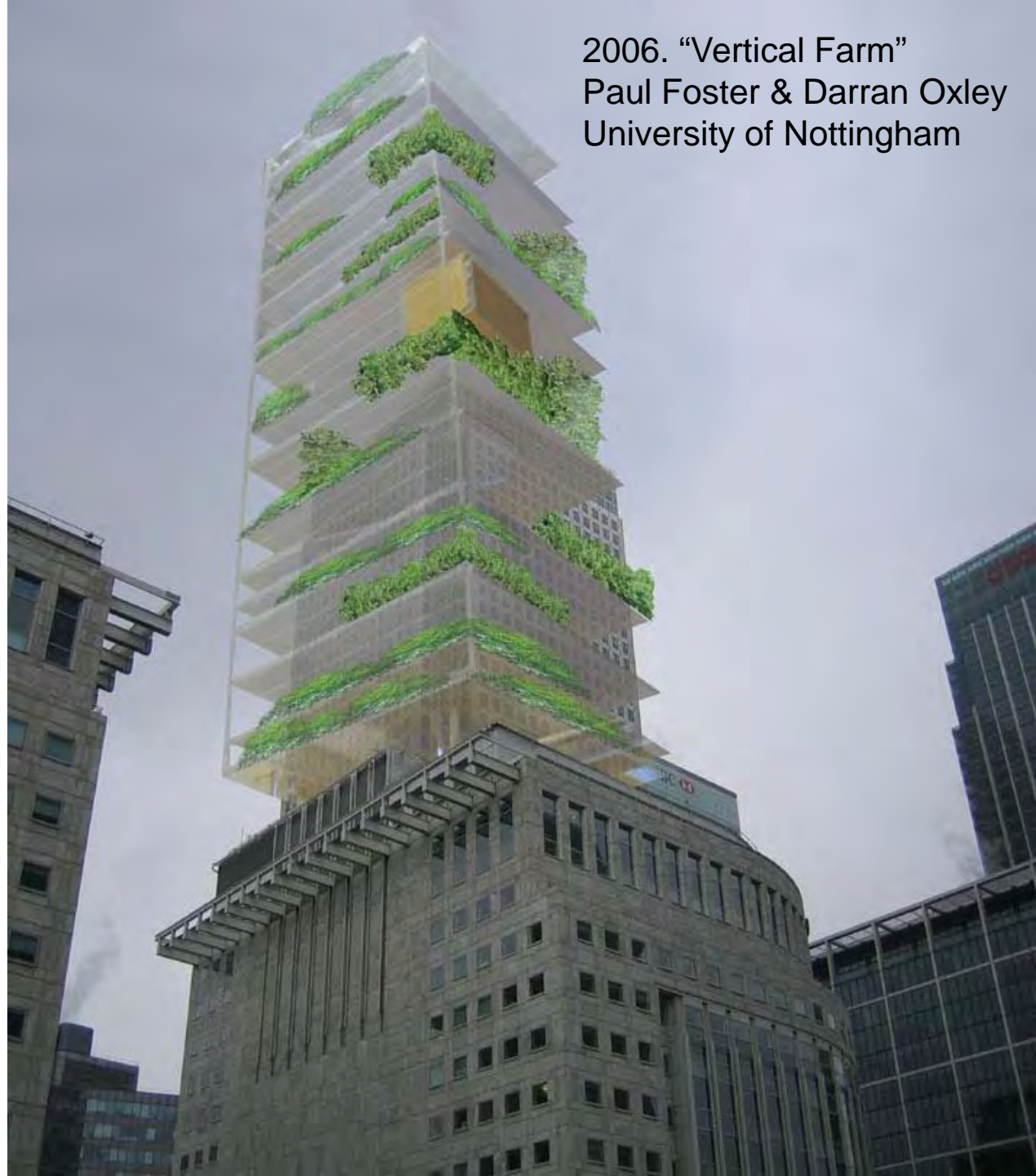


Design Principle 5: Accommodate **new and multiple functions** – bringing all aspects of the city into the sky

Conceptual Diagram  
Tall Building as “City  
in the Sky”

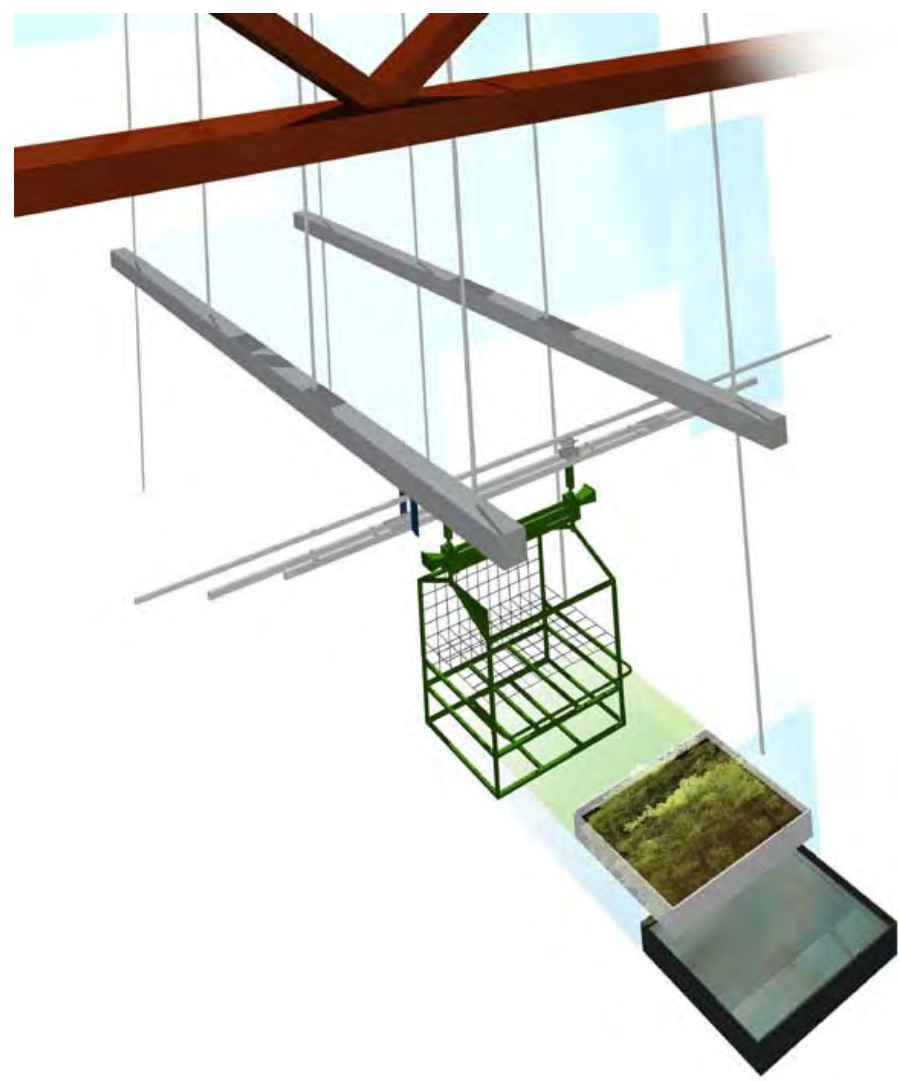
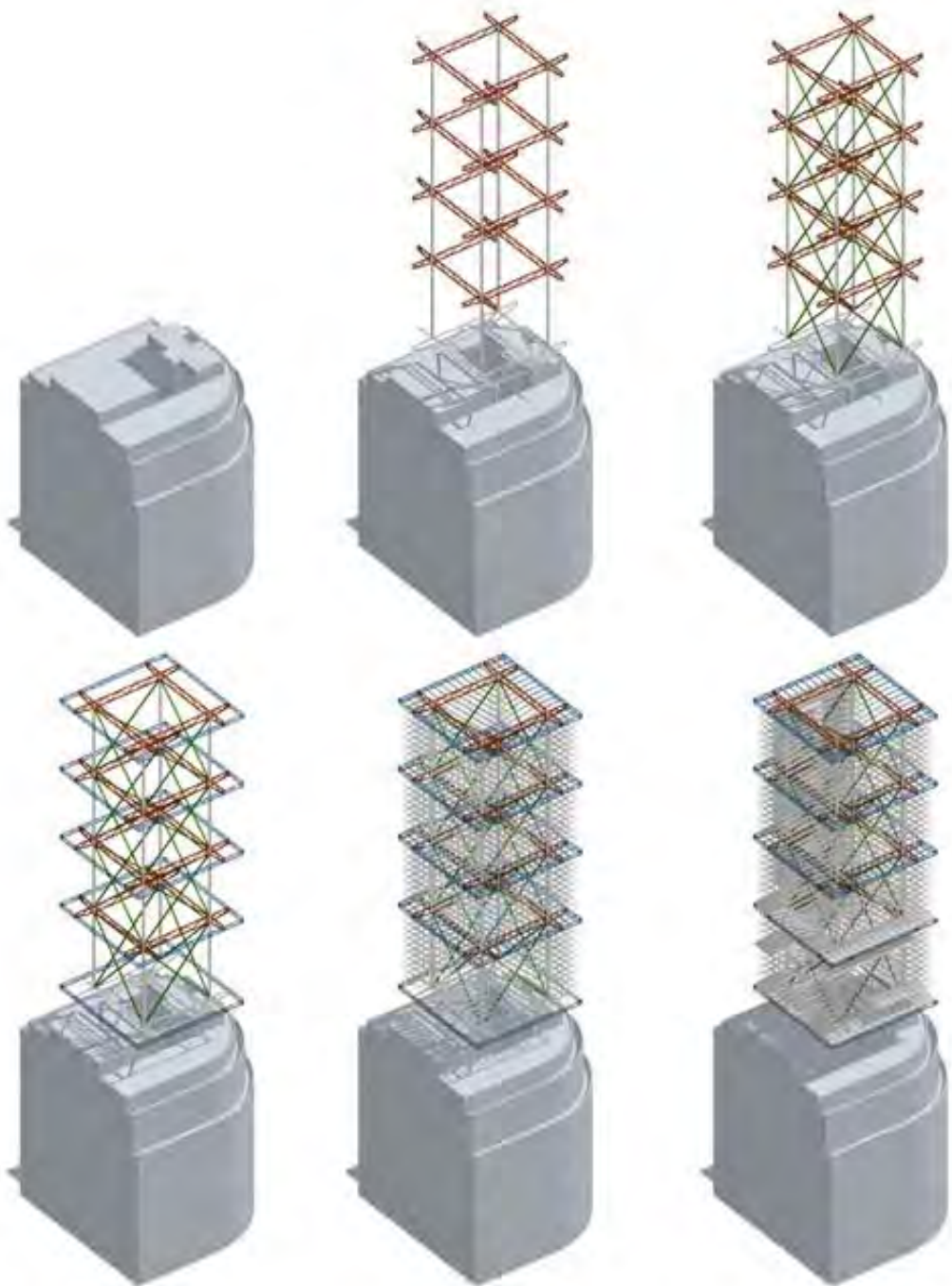


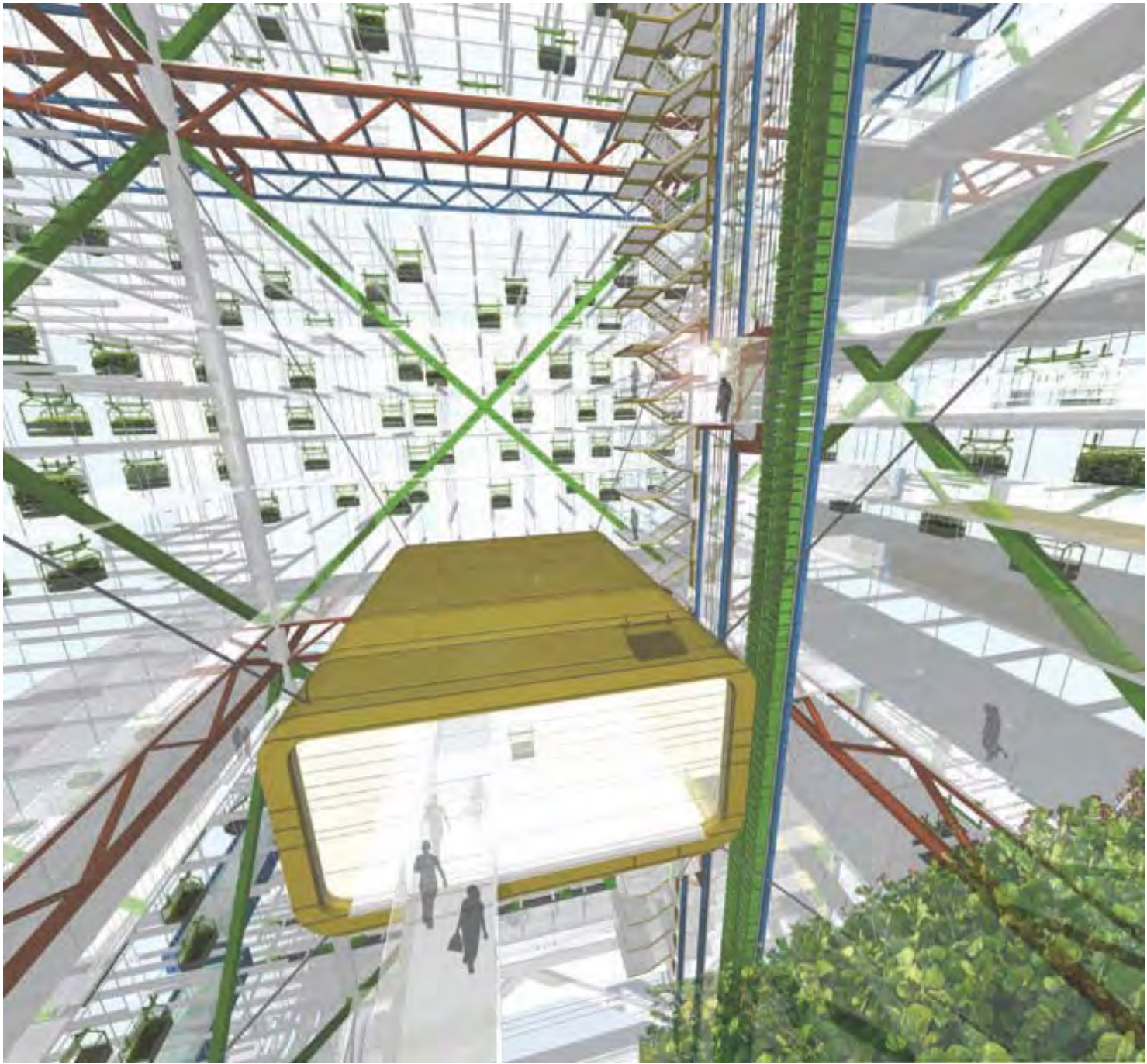
2006. “Vertical Farm”  
Paul Foster & Darran Oxley  
University of Nottingham











Design Principle 6: Tall Buildings should provide  
**significant communal, open, recreational space**



**Commerzbank** Frankfurt,  
Germany

# Commerzbank Frankfurt, Germany



**View of high-level sky garden**

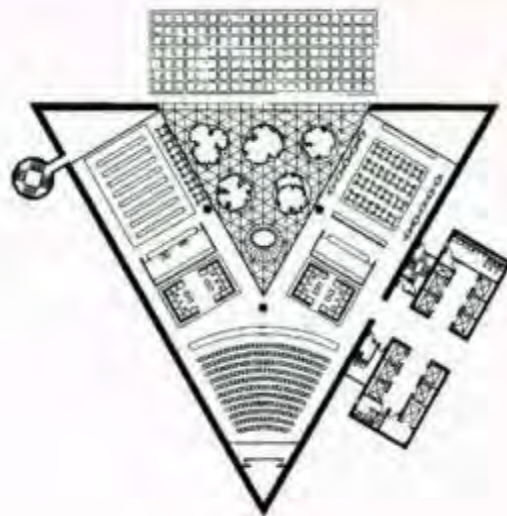
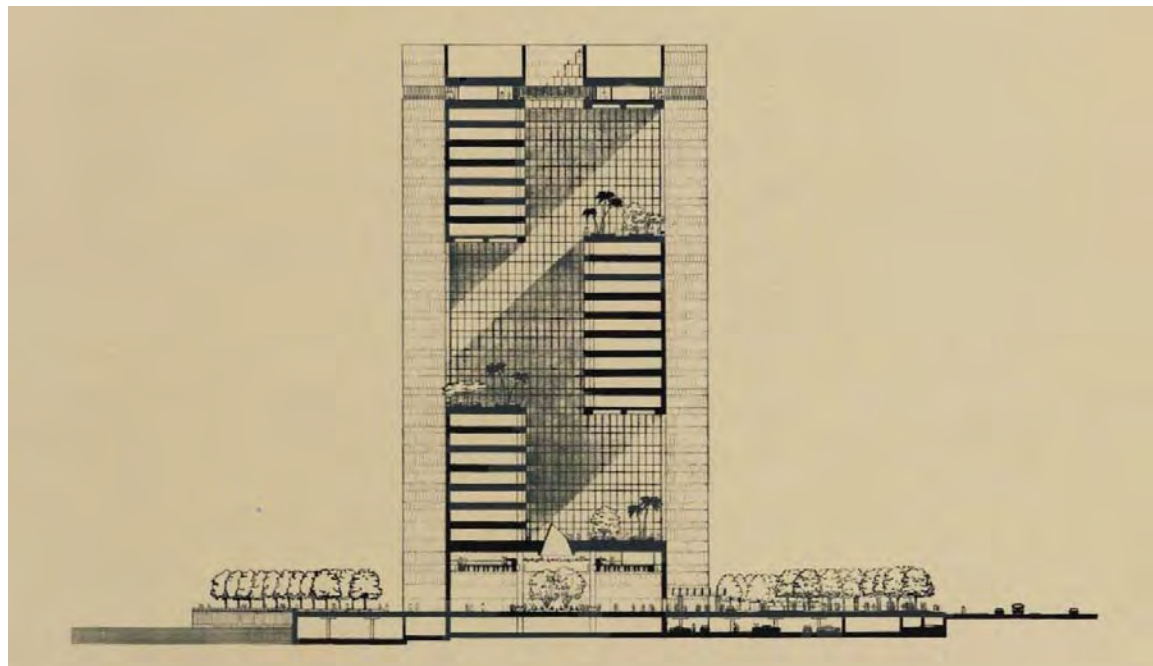
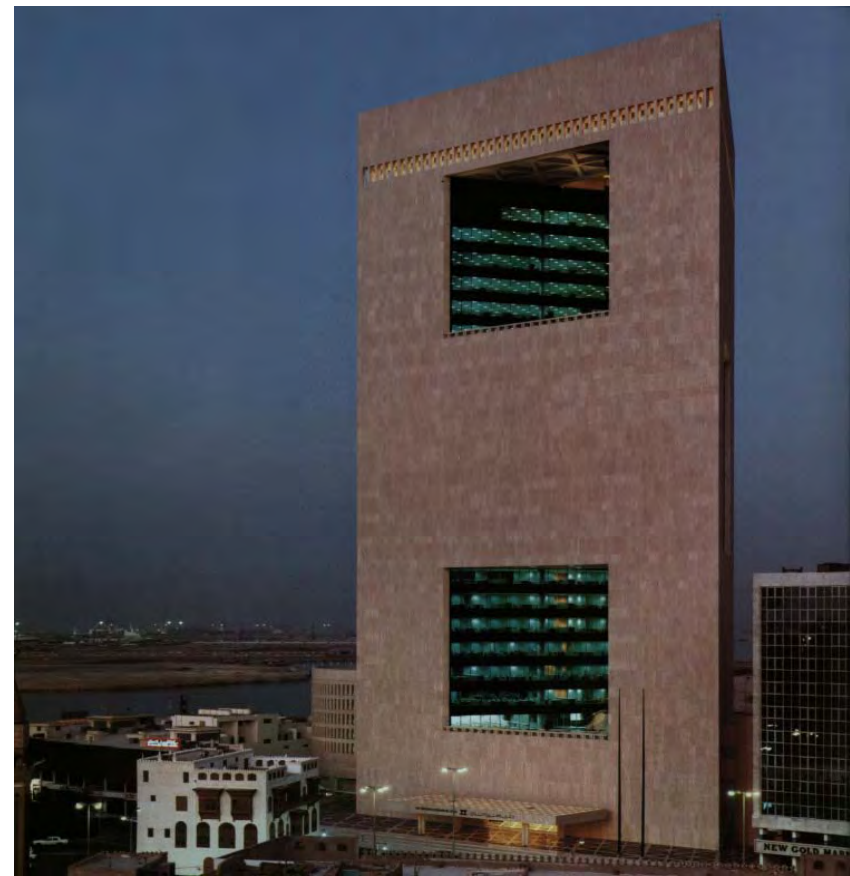


**Inward facing office**

Design Principle 8: Tall Buildings should introduce more **facade opacity** (and variation / texture) in skin/envelope



1984. National Commercial Bank,  
Jeddah. SOM Architects





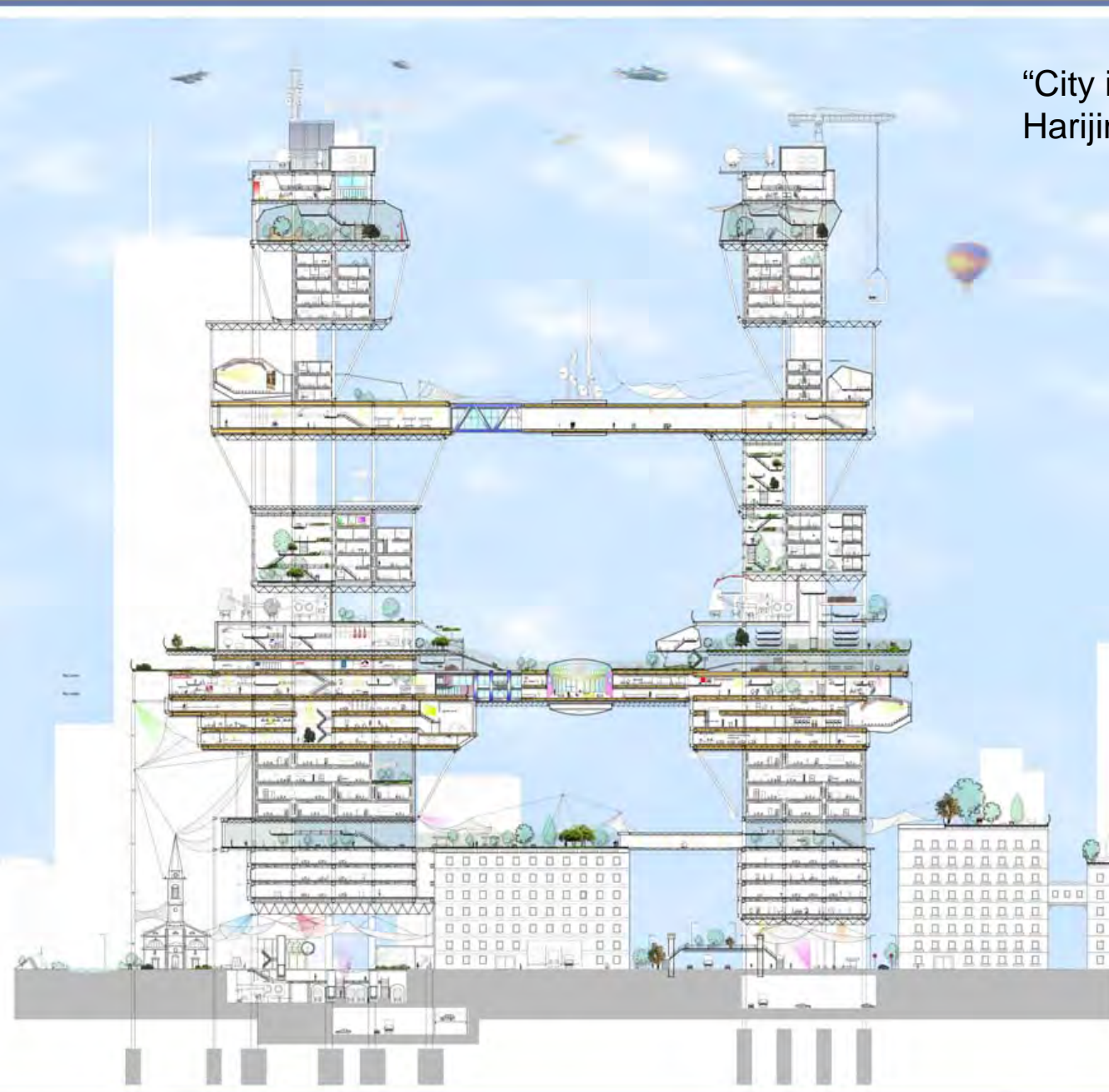


Design Principle 9: Embrace **organic vegetation**  
as an essential part of the material palette



Design Principle 10: Introduce physical, circulatory and programmatic connections – **skybridges**

“City in the Sky / Skybridges”  
Harijinder Singh, University of Nottingham





1908 - *The Cosmopolis of the Future*. Harry Petit. From *King's Views of New York*



1927 - *Metropolis*. Erich Kettelhut. Still from Fritz Lang's film



1997 - *The Fifth Element*. Luc Besson. Still from film





2009. Linked Hybrid, Beijing, China. Steven Holl Architects



2010. Marina Bay Sands  
Singapore  
Moshe Safdie Architects



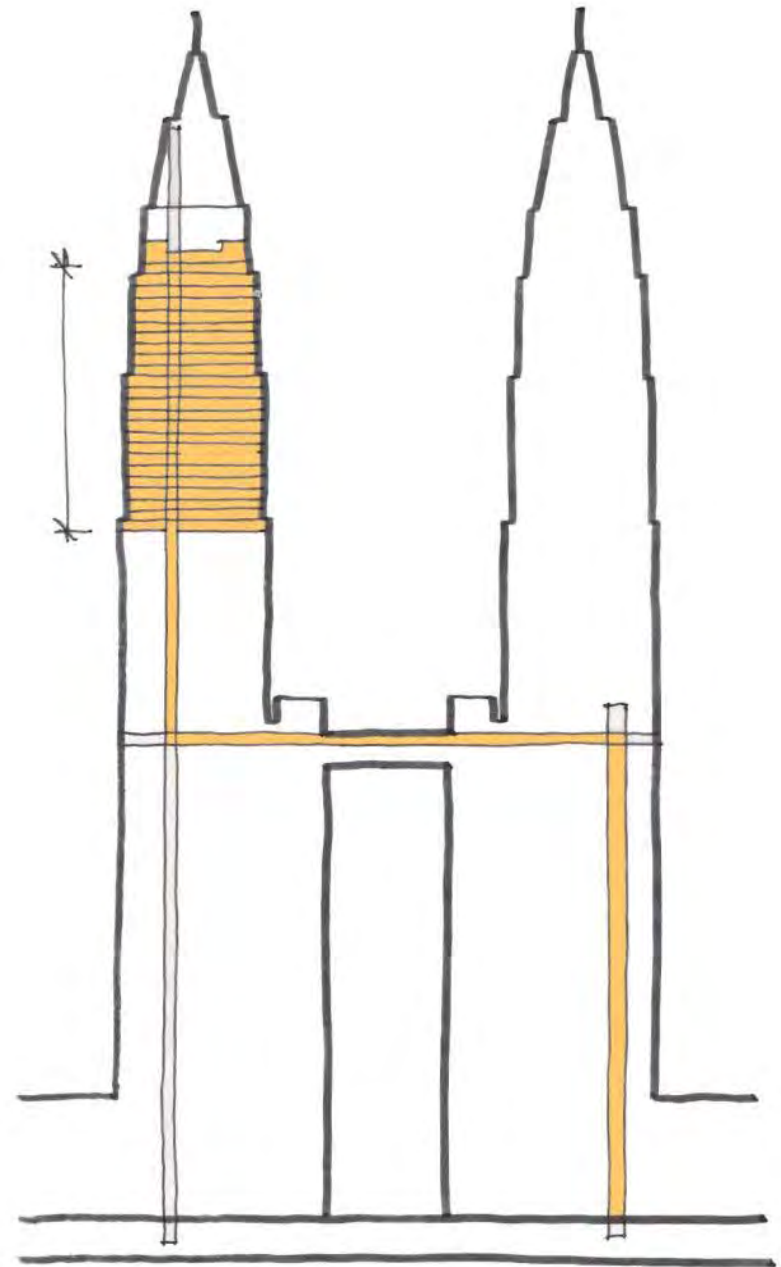


2009. The Pinnacle @ Duxton  
Singapore  
ARC Studio



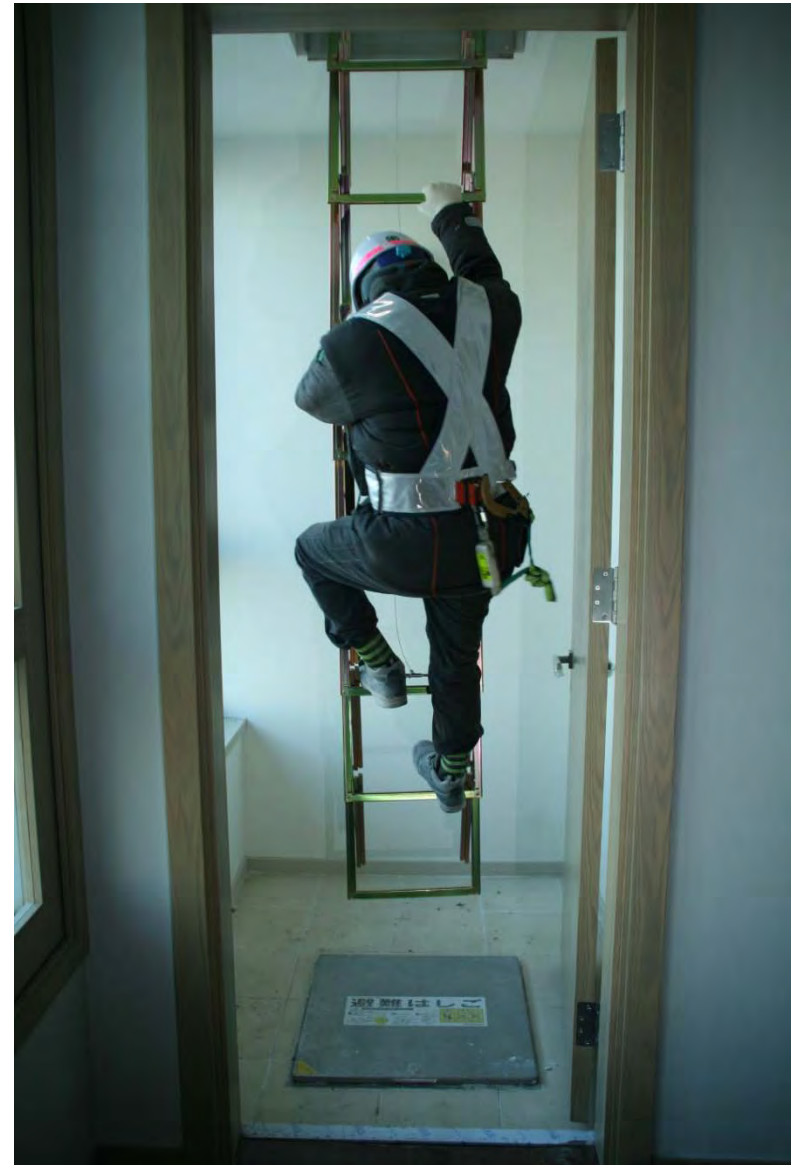


1998 - *Petronas Towers,*  
*Kuala Lumpur.*  
Cesar Pelli

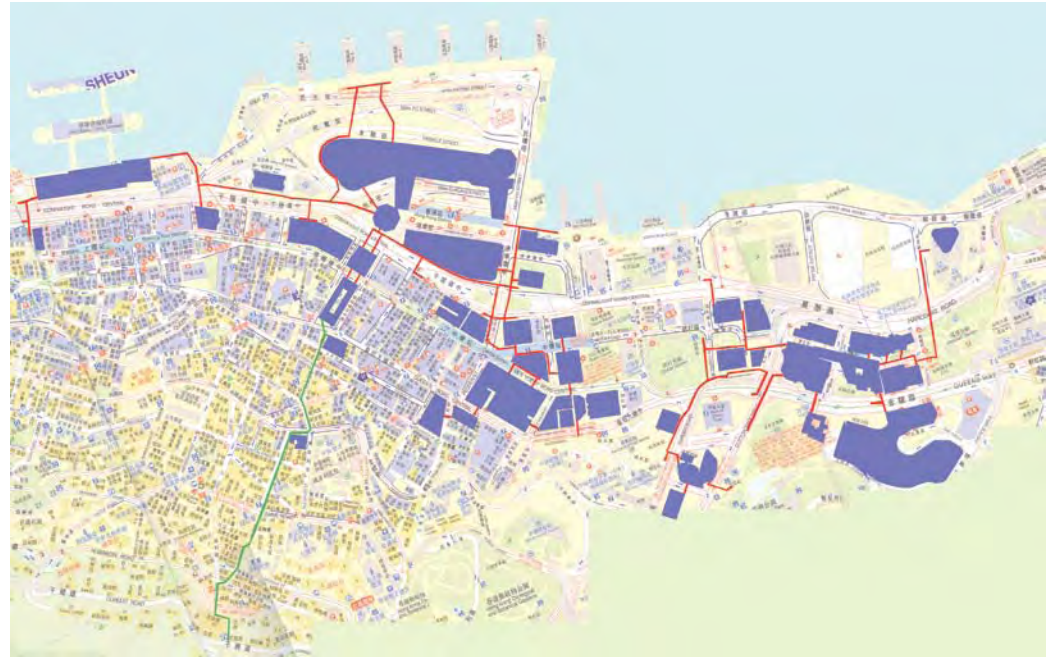


# Cross Cultures

## Differing Cultural Attitudes towards Fire Safety



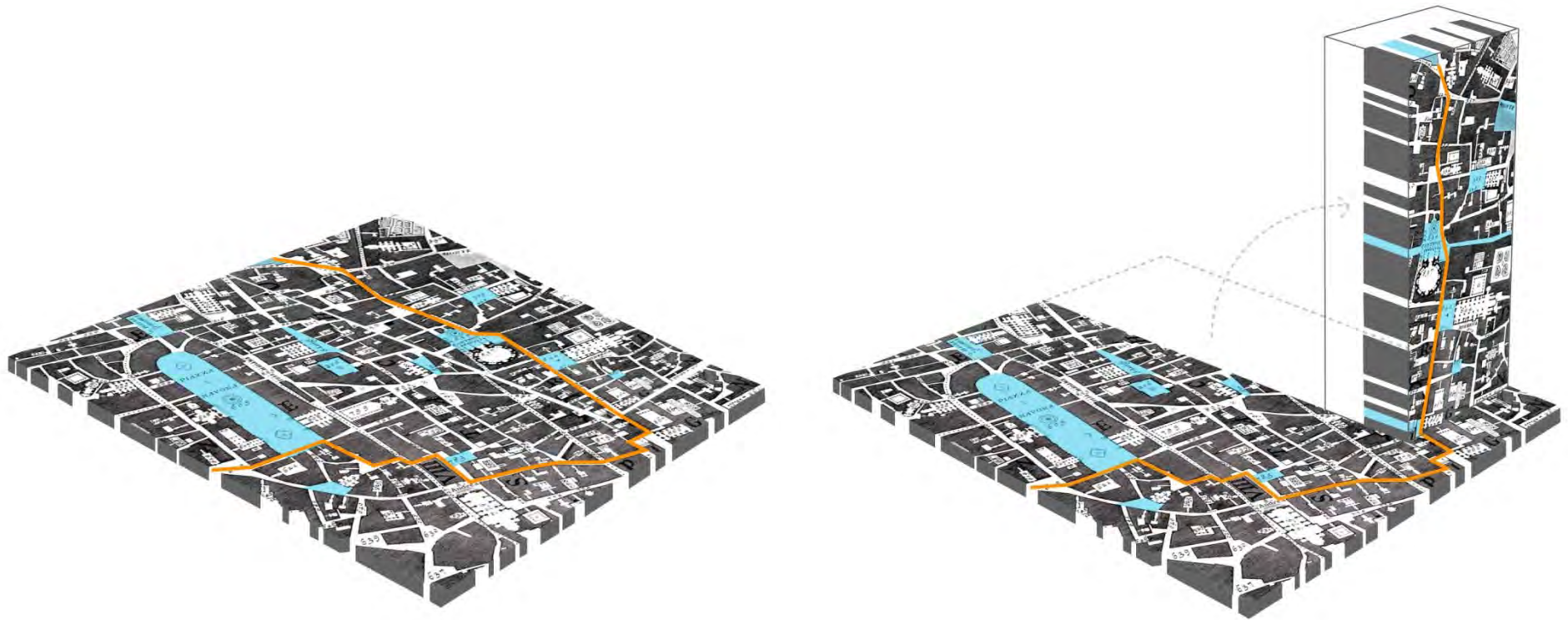
## Urban Enrichment – Hong Kong





What is needed?..... A new regulatory, political & financial model for urban development.....

# The horizontal 2-dimensional planning model flipped vertical into 3- Dimensions.....



Source: Pomeroy, J. (2009) "The Skycourt – A comparison of Four Case Studies,"  
*CTBUH Journal*, Issue 1, p. 35.



# A new Vernacular for the Skyscraper, for Cities?

Future Tall Buildings should.....

1. Relate to the **physical** characteristics of place
2. Relate to the **environmental** characteristics of place
3. Relate to the **cultural** characteristics of place
4. **Vary with height** – in form, texture, scale (and program) – not be just vertical extrusions of an efficient floor plan
5. Accommodate **new and multiple functions** – bringing all aspects of the city into the sky
6. Provide significant **communal, open, recreational space**
7. Maximize **layers of usage** on all systems and materials
8. Introduce more **facade opacity** (and variation / texture) in skin/envelope
9. Embrace **organic vegetation** as an essential part of the material palette
10. Introduce physical, circulatory and programmatic connections – **skybridges**

What is needed?..... A new regulatory, political / financial model for developing vertical cities

# The Future of Sustainable Cities?





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