Council on Tall Buildings and Urban Habitat

Cities to | 从城市到

MEGACITIES 巨型城市

Shaping Dense Vertical Urbanism | 构建高密度的垂直城市主义

A collection of state-of-the-art, multi-disciplinary papers on urban design, sustainable cities, and tall buildings

多学科背景下的城市设计、可持续城市发展与高层建筑最新成果汇总

Volume I

第一卷

Editors (编者): Antony Wood (安东尼・伍德), David Malott (大卫・马洛特), & Jingtang He (何镜堂)

Bibliographic Reference:
Wood, A., Malott, D. & He, J. (eds.) (2016) ***Cities to Megacities: Shaping Dense Vertical Urbanism: A collection of state-of-the-art, multi-disciplinary papers on urban design, sustainable cities, and tall buildings, Volume I.*** Proceedings of the CTBUH 2016 International Conference; Shenzhen, Guangzhou, Hong Kong, China, 16–21 October 2016." Council on Tall Buildings and Urban Habitat: Chicago.

Editors: Antony Wood, David Malott & Jingtang He
Coordination: Jessica Rinkel & Peng Du
Editorial Support: Jason Gabel, Daniel Safarik, Benjamin Mandel & Rachel Knowles
Layout & Design: Annan Shehadi & Kristen Dobbins
Translation Support: Xia Sun, Liwen Kang & Jing Cui

First published 2016 by the Council on Tall Buildings and Urban Habitat

Printed and bound by Shanghai Zero Ad. Co., Ltd. in China

Library of Congress Cataloging-in-Publication Data
A catalog record has been requested for this book

ISBN 978-0-939493-51-7

CTBUH Global Headquarters
The Monroe Building
104 South Michigan Avenue, Suite 620
Chicago, IL 60603, USA
Phone: +1 (312) 283-5599
Email: info@ctbuh.org
www.ctbuh.org
www.skyscrapercenter.com

Asia Headquarters
College of Architecture and Urban Planning (CAUP)
Tongji University
1239 Si Ping Road, Yangpu District
Shanghai 200092, China
Phone: +86 21 65982972
Email: china@ctbuh.org

Research & Academic Office
Iuav University of Venice
Dorsoduro 2006
30123 Venice, Italy
Phone: +39 041 257 1276
Email: research@ctbuh.org

Chicago Research & Academic Office
S. R. Crown Hall
Illinois Institute of Technology
3360 South State Street
Chicago, IL 60616
Phone: +1 (312) 567 3487
Email: academic@ctbuh.org

参考文献:
Wood, A., Malott, D. & 何镜堂 (eds.) (2016) 从城市到巨型城市：构建高密度的垂直城市主义：多学科背景下的城市设计、可持续城市发展与高层建筑最新成果汇总，第一卷。CTBUH 2016年国际会议论文集，深圳，广州，香港，中国，2016年10月16–21日。世界高层建筑与都市人居学会(CTBUH)：芝加哥。

编者: 安东尼・伍德、大卫・马洛特 & 何镜堂
协调: Jessica Rinkel & 杜鹏
编辑支持: Jason Gabel, Daniel Safarik, Benjamin Mandel & Rachel Knowles
排版 & 设计: Annan Shehadi & Kristen Dobbins
翻译支持: 孙霞、 康力文 & 崔婧

2016年由世界高层建筑与都市人居学会首次出版

美国国会图书馆图书在版编目（CIP）数据
学会已要求为本书进行档案编目

ISBN 978-0-939493-51-7

CTBUH全球总部
The Monroe Building
104 South Michigan Avenue, Suite 620
Chicago, IL 60603, USA
电话: +1 (312) 283–5599
电子邮箱: info@ctbuh.org
www.ctbuh.org
www.skyscrapercenter.com

CTBUH亚洲总部办公室
同济大学建筑与城市规划学院
中国上海市杨浦区四平路1239号 邮编200092
电话: +86 21 65982972
电子邮件: china@ctbuh.org

CTBUH研究办公室
威尼斯建筑大学
意大利威尼斯30123，Dorsoduro 2006
电话: +39 041 257 1276
电子邮件: research@ctbuh.org

CTBUH芝加哥学术与研究办公室
伊利诺伊理工大学 S. R. 克朗楼
3360 South State Street
Chicago, IL 60616
电话: +1 (312) 567 3487
电子邮箱: academic@ctbuh.org

Cities to Megacities: Shaping Dense Vertical Urbanism
从城市到巨型城市：构建高密度的垂直城市主义

As the world continues to urbanize at an unprecedented rate, cities around the globe are proliferating, expanding, and merging to form a new urban typology – the megacity. Against a backdrop of the world's urban population growing by a million new urban inhabitants every week, cities must cope with the strain of that growth in new and unconventional ways. Unsurprisingly, this has resulted in a host of challenges that must be addressed, including: inadequate infrastructure provision, energy production obstacles, social inequity, pollution, quality of life issues, and a loss of heritage and identity amid unbridled redevelopment. These challenges, which are common around the globe yet magnified in megacities due to their unique circumstances, should be seen as a litmus test for the great ideas of our time and a call to action for bold new paradigms in urban development.

This collection of papers was originally presented at the CTBUH 2016 Conference, which took place progressively across Shenzhen, Guangzhou, and Hong Kong. There is perhaps nowhere on the planet that demonstrates the impact of urbanization as markedly as these cities in China's Pearl River Delta. Surpassing Tokyo as the world's largest single continual urban conurbation of 42 million in 2010, the megacity is set to grow to 120 million inhabitants by 2050. In so many ways – physically, culturally, and economically – the three teeming metropolises, and others in the region, are merging into, effectively, one super-linked urban whole, with a network of ultra-connected, modern infrastructure.

The publication thus examines the phenomenon of dense vertical urbanism and the technological innovations that are driving new cities, building forms, functions, materials, and construction techniques. Volume I considers the larger economic, social, and urban-scale considerations of megacities and dense vertical urbanism, while Volume II focuses on specific advances in technical subjects, engineering, data modeling, and façade performance, among other topics, that are facilitating today's megacities.

随着世界继续以前所未有的速度进行城市化进程，全球的城市都在激增、扩张并融合为一个新的城市类型——巨型城市。在世界的城市人口每周增长一百万城市居民的背景下，城市必须以一种新的、不同寻常的方式应对这种压力。不出意外的是，这带来了大量亟待迎接的挑战，其中包括：基础设施供给不足、能源生产障碍、社会不公正、污染、生活质量下降以及在无节制的再开发中城市遗产及特质丢失等问题。这些挑战在全球范围内都很普遍，但因为特殊的环境，在巨型城市中表现得尤为突出，应被视为我们这个时代伟大思想的试金石和城市发展大胆新范例的试验场。

这套论文集是在CTBUH 2016年深圳、广州、香港会议上首次发布的。世界上也许不会有其它地区能像中国的珠江三角洲的城市集群一样诠释剧烈的城市化所带来的影响。2010年珠三角地区人口已达到4200万，超越日本东京成为世界上最大的单一连续的城市集群，而这一地区在2050年有望达到1.2亿居住人口。在自然、文化和经济等许多方面——这三座巨型城市和该地区其它城市一起，通过高度连接和现代化的基础设施网络，高效地融合成为了紧密相连的城市整体。

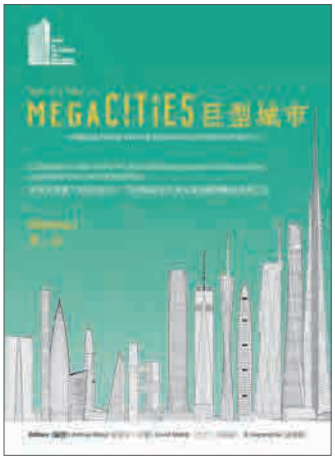
论文集出版物因此分析了高密度的垂直城市主义现象和驱动新城市、建筑形式、功能、材料和施工技术的技术创新。第一卷关注巨型城市和高密度垂直城市主义宽泛的经济、社会和城市尺度问题，而第二卷则聚焦促进当今巨型城市发展的新技术、工程、数据模型、幕墙性能及其它议题。

Please note that this proceeding is a two-volume series, and can be purchased at **https://store.ctbuh.org**
请注意该论文集共有两卷，可以在 **https://store.ctbuh.org** 购买

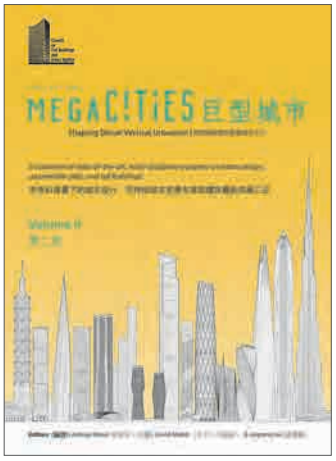
Cities to Megacities: Shaping Dense Vertical Urbanism Volume I & II
从城市到巨型城市：构建高密度的垂直城市主义 第一卷 & 第二卷

Wood, A., Malott, D. & He, J. (eds.) (2016) ***Cities to Megacities: Shaping Dense Vertical Urbanism.*** Council on Tall Buildings and Urban Habitat: Chicago.
安东尼・伍德、大卫・马洛特、何镜堂(编者)(2016) ***从城市到巨型城市：构建高密度的垂直城市主义。*** 世界高层建筑与都市人居学会：芝加哥。

Volume I (第一卷), ISBN: 978-0-939493-51-7. 670 pages (页), Hardback (精装).
Volume II (第二卷), ISBN: 978-0-939493-52-4. 662 pages (页), Hardback (精装).



Volume I 第一卷
Pages (页码): 1–670



Volume II 第二卷
Pages (页码): 671–1332

Contents
目录

Volume I | 第一卷

Chapter 1: Rethinking the City | 第一章：反思城市

Chapter 2: Rethinking the Skyscraper | 第二章：反思摩天大楼

Chapter 3: Tall Buildings and the Public Realm | 第三章：高层建筑与公共领域

Chapter 4: Transit Oriented Development and Other Urban Infrastructure | 第四章：以公共交通为导向的开发(TOD)和其他城市基础设施

Volume II | 第二卷

Chapter 10: Data and Digital Modelling | 第十章：数据和数字化建模

Chapter 11: Changing Office Typologies | 第十一章：改变办公模式

Chapter 12: Energy Issues & Intelligent Systems Integration | 第十二章：能源问题&智能系统整合

Chapter 13: Progressive Vertical Transport | 第十三章：不断发展的垂直交通

Chapter 14: Façade Performance | 第十四章：立面性能

Chapter 15: Façade Systems | 第十五章：立面系统

Chapter 16: Advanced Construction and Project Management Practices | 第十六章：先进的施工和项目管理实践

Chapter 17: Wind and Geotechnic Engineering | 第十七章：风和岩土工程

Chapter 18: Structural Engineering - Materials, Performance and Techniques | 第十八章：结构工程–材料、性能和技术

Chapter 19: Structural Engineering - Case Studies | 第十九章：结构工程–案例研究

Appendices | 附录

Introduction | 引言

Megacities: Setting the Scene
巨型城市：全景呈现

Daniel Safarik, Shawn Ursini & Antony Wood, *CTBUH*

Anyone concerned with the development of human civilization in the 21st Century will likely have heard the term "megacity." It is – as it should be – increasingly prevalent in both mainstream and academic discussions of the great trends of our time: urbanization, rising technological and physical connectivity, increasingly polarized extremes of wealth and poverty, environmental degradation, and climate change. It is a subject as large and far-reaching as its name implies. This introduction sets the scene on how megacities and the built environment are growing together, and examines the implications for those who plan, design, develop and operate tall buildings and urban infrastructure.

What is a Megacity?

In order to rationalize the data CTBUH collects – predominantly on skyscrapers and large urban developments – with that collected by other organizations, first a definition that reflects a distillation of the prominent literature on the subject should be set forth:

A megacity is an urban agglomeration with a total population of 10 million people or greater, consisting of a continuous built-up area that encompasses one or more city centers and suburban areas, economically and functionally linked to those centers.

A megacity is typically, though not always, polycentric, with multiple nodes of concentrated urban activity and high-density development, rather than being centered around one large primary central business district (CBD). Indeed, a telltale sign of a megacity, and an indicator of its polycentric nature, is the tendency of residents and urban planners alike to refer to more than one "CBD." Even if there is a consensus about the location of the "center of town," development and transportation patterns strongly suggest otherwise; it should be thought of as an interwoven web, rather than a series of concentric zones.

The polycentric pattern is often the result of established urban centers traditionally separated by distance and their own identities eventually merging together through a continuous spread of urban and suburban development. A key aspect of the megacity is that these linkages of urbanity fuse the agglomeration together, not only physically, but also economically, functionally, and often, culturally.

In a megacity, the extent of urban development spread will not be described by a single radius or a compact, circular shape; in other words, it is asymmetrical and polymorphic. This is due to a variety of factors, including but not limited to; uneven development patterns, geographic obstacles, transport corridors and political boundaries. While green spaces and "undeveloped" land may separate urban centers, this does not necessarily indicate that there is

每一个关注21世纪人类文明发展的人或许都听说过“巨型城市”这个词。自然而然地，我们所处时代的发展大势也逐步成为了大众主流与学术人群都会探讨的普遍议题：城镇化、热门的技术连通与物理连结、日益两极化的贫富悬殊差距、环境恶化以及气候变化。这个议题自身的内涵就如同其命名一样宏大深远。本文将着重探讨巨型城市与城市环境共同发展的过程，检视其对高层建筑与城市基础设施建设的规划者、设计者、开发者与运营者而言意味着什么。

“巨型城市”的定义

为了合理处理CTBUH收集到的数据和其他组织收集到的数据（前者主要来源为“摩天大楼中心”数据资料库以及大型城市项目数据），我们首先要阐明“巨型城市”的定义，该定义从重要文献中提炼所得：

“巨型城市”即城市群的集合，总人口规模在1000万及以上，由包含了一个或多个城市中心与近郊地区的区域接连拼合而成，各中心与近郊地区在经济或职能层面与其余中心互相关联。

一个有代表性的巨型城市一般（但并非必然）存在多个城市中心，拥有若干连结着集中性城市活动与高密度发展的交汇点，而非仅仅围绕着唯一的大型城市中心区域（CBD）。实际上，巨型城市所体现的某种迹象与这种多中心化的本质标志着城市居民与城市规划者趋同的心理倾向——对“CBD”有着更大的需求。即使人们对“城镇中心”的地理位置达成了共识，却也对城市发展与交通

a definitive economic, cultural or political division between cities and their relationship within a megacity. In other words, there may be considerable amounts of open space contained within a megacity (See Figure 1). Open spaces could be the result of geological features such as mountains and bodies of water, military installations or protected greenbelts. Meanwhile, "leapfrog" development has a tendency to create long, narrow strands of development along transportation routes, which then fill in perpendicularly to those corridors over time.

For the purposes of the 45 megacities noted in this study (See Figure 2), it should be clearly noted that the cited population, area and density figures are the result of existing political boundaries which can dilute density numbers, because they may encompass open spaces and adjacent hinterlands *potentially available* for future development lying beyond highly built-up areas. For example, if a district, county, prefecture or other political jurisdiction adjoins a heavily built-up area, and a distinctly dense tendril of urban land penetrates into what is otherwise a rural political unit, along a watercourse, highway or railway, the entire surrounding political unit is typically counted in area and population figures. Thus, the "Los Angeles" megacity in this study extends all the way through open desert to the Colorado River and the border with Arizona, because the political entity of Riverside County, California — heavily urbanized in the west and sparsely populated in the east — is included.

In step with the theme and site of the CTBUH 2016 Conference, the primary benchmark for a megacity in this study is the Pearl River Delta region of southern China, the world's largest megacity (Figure 3). Drawing a line around the boundaries of the Pearl River Delta's urban centers would encompass a span of up to 367 km from southwest to northeast (that is, from the southwestern-most corner of Jiangmen to the northeastern-most corner of Huizhou) and 331 km from northwest to southeast (that is, from the northwestern-most corner of Zhaoqing to the southeastern-most corner of Hong Kong). This boundary would give an area of 56,217 km^2, which would actually rank it 127th on the list of *country* areas around the world, just below Croatia, and above Costa Rica, Denmark, and Israel, for sheer size. It also would be the 12th largest country in terms of gross domestic product (GDP), lying between South Korea and Australia on the GDP per capita scale. Thus, as we can see, the Pearl River Delta megacity is comparable to numerous countries in terms of physical size, and far greater than many in terms of attributable economic output.

While many studies consider the Pearl River Delta and Hong Kong to be separate urban entities, due to Hong Kong's special administrative status within the People's Republic of China, this study includes Hong Kong, as all indicators point to the former British colony becoming more integrated with mainland China, and more to the point, with its immediate neighbors. The fact that it is currently a Special Administrative Region with a quasi-national boundary, a different

Figure 1. Example of an undeveloped space comprised of mountains and farms within an urbanized area, in this case, Los Angeles. (Source: CC BY-SA Doc Searls)
图1. 城市化地区中，由山和农田组成的未开发空间，此处的例子为洛杉矶。（来源：CC BY-SA Doc Searls）

运输的布局却有着完全不同的提议——它们应当被设计为相互交织的城市内网出发点，而非一片同心地带。

多中心格局通常是建立在传统的城市中心的基础上的。它们相隔一段距离、拥有自己的特性，最终通过城市和郊区的不断蔓延而融合在一起。巨型城市的关键要素是这些都市联系不仅在经济、功能方面且更多的是文化方面聚集在了一起。

在巨型城市之中，城市扩张的范围并不会以单个半径或某个约定好的圆形区域来界定，换言之，就是城市扩张的范围是非匀称和多形态的。这一点是多种因素形成的结果，包括但不限于：发展格局的差异、地域性障碍、交通走廊与行政边界（图1）。虽然绿地与“荒地”会将不同的城市中心分隔开来，但这未必意味着各城市之间的经济、文化与政治必然会发生分化，它们在同一个巨型城市之中的之间的关系会分裂。也就是说，在一个巨型城市的空间之中可能存在着相当数量的开阔地带。这些开阔地带可能是地质特征的产物，如山峦与各种水体、军事设施或受保护的绿化地带。与此同时，“蛙跳式”的城市扩张倾向于沿着交通运输路线建造出某些狭长带状的建设区域，随着时间推移，它们渐渐地呈垂直状填满了这些交通走廊。

为了阐明这项研究所提到的45个巨型城市的目的（图2），我们应当明确一点，文中所引用的人口、面积与密集度的数据均基于现有的行政边界，这或许会淡化密集度的数据，因为该边界可能包含开阔地带与远离建筑密集区的周边偏僻地区。举例来说，倘若一个区、县、地方行政区或其它行政辖地正好毗邻某个建筑高度密集的区域，其中某片城镇的郊区地表长满了茂密卷须植物，这些植物沿着河道、高速公路或铁路生长，蔓延到了本来属于某个行政区划的乡村地带，那么周围所有行政区划的地域面积与人口数据通常也被计入其中。可见，此项研究中的巨型城市“洛杉矶”的面积范围已包含了那片绵延至科罗拉多河的开阔沙漠，也包含了与亚利桑那交界的区域，因为河畔县、加利福尼亚、西部高度城镇化的区域以及东部人口稀少的区域均被纳入了“洛杉矶”的行政实体范围中。

随着2016年CTBUH大会主题与网站的确定，这项关于巨型城市的研究有一个重要的基准问题：全球最大规模的巨型城市，中国华南地区的珠江三角洲区域（图3）。当我们在珠江三角洲的城市中心附近描画出边界线的时候，我们会发现由西南至西北间的边界跨度达到367公里（即从江门市最西南角的位置到惠州市最西北角的位置），由西北到东南的跨度达到331公里（即从肇庆最西北角的位置到香港最东南角的位置）。

Garden City, Megacity: Rethinking Cities for the Age of Global Warming | 花园型超大城市：全球变暖时代背景下反思城市

Mun Summ Wong | 黄文森
Founding Director |创始董事

WOHA Architects
WOHA建筑事务所

Singapore
新加坡

Mun Summ Wong is the co-Founding Director of WOHA, an internationally-acclaimed architectural practice in Singapore. Wong graduated from the National University of Singapore (NUS) in 1989 and is now a Professor in Practice at his alma mater. WOHA received the 2007 Aga Khan Award for Architecture for its first tropical high-rise tower, 1 Moulmein Rise in Singapore and more recently, the 2015 CTBUH Urban Habitat Award, for the PARKROYAL on Pickering hotel.

黄文森是国际知名的新加坡WOHA建筑事务所的联合创始董事。他于1989年毕业于新加坡国立大学（NUS），如今是该校的一名实践型教授。WOHA凭借新加坡的首座热带高层住宅1 Moulmein Rise荣获2007年阿迦汗建筑奖（Aga Khan Award），皮克林宾乐雅酒店（PARKROYAL on Pickering hotel）则让该事务所荣获2015年世界高层建筑与都市人居学会颁发的都市人居奖（CTBUH Urban Habitat Award）。

Richard Hassell
Founding Director |创始董事

WOHA Architects
WOHA建筑事务所

Singapore
新加坡

Richard Hassell graduated from the University of Western Australia in 1989, and was awarded a Master of Architecture degree from RMIT University, Melbourne, in 2002. Together with Wong, WOHA conducted a Design Studio at the Singapore University of Technology and Design in 2016. Hassell has served as a Board Member of DesignSingapore Council, the Board of Architects as well as the Building and Construction Authority of Singapore.

理查德•哈塞尔于1989年毕业于西澳大利亚大学，2002年获得墨尔本皇家理工大学建筑学硕士学位。2016年，他与黄文森共同主持新加坡科技设计大学（Singapore University of Technology and Design）设计工作室的工作。哈塞尔是新加坡设计委员会（DesignSingapore Council）、建筑师董事会和新加坡建筑建设管理局（Building and Construction Authority of Singapore）的董事会成员。

Alina Yeo
Associate |合伙人

WOHA Architects
WOHA建筑事务所

Singapore
新加坡

Alina Yeo has been associated with WOHA for the past 12 years. She first joined WOHA as an intern in 2002 before returning permanently upon completion of her Master of Architecture in 2005 from the National University of Singapore and was made Associate in October 2014. Yeo's portfolio with WOHA encompasses design and project management, including institutional and high-rise condominiums. She was instrumental in the design of the School of the Arts, has authored numerous published papers and leads in many of WOHA's design competitions, monographic exhibitions, research work and building contract matters.

在过去的12年中，Alina Yeo一直服务于WOHA。在2002年初次加入WOHA时，她还是一名实习生。2005年，在获得新加坡国立大学的建筑学硕士学位之后，她立即重返WOHA，并于2014年10月成为合伙人。Alina Yeo在WOHA的工作包含设计和项目管理，如机构和高层公寓。她在新加坡艺术学院的设计中发挥了重要作用，已撰写并发表了多篇论文，曾主持过WOHA的众多设计竞赛、专题展览、研究和建筑合同事宜等工作。

Abstract | 摘要

This paper proposes an alternative to the continuing implementation of unsustainable 20th century urban planning models. By using WOHA's mini-city projects and proposals as prototypes – energy-efficient vertical landscapes with sky villages and sky parks – the paper presents a compelling manifesto for densely settled, yet comprehensively green, and ultimately self-sufficient, cities of the future. The author responds to the alarming urban crisis that now threatens all large cities around the globe, and urges the universal reinstatement of a mutually beneficial coexistence between human beings and the natural environment. WOHA's projects prioritize the re-creation of ecosystems, and have also reintegrated public space and civic culture within the increasingly unpleasant urban fabric of our overcrowded cities. WOHA's scalable prototypes offer a radical model for megacity planning: not just for the newly massive cities of Asia, but for other such cities around the world.

Keywords: Architecture, Climate, Green Walls, Sky Garden, Skybridges and Sustainability

这篇文章提出与一直以来实行的可持续的20世纪城市规划模型不同的另一种方式。以WOHA建筑事务所的迷你城市项目和方案——有空中村落和空中花园的高效节能垂直景观为原型，这篇文章展示了对高密度居住，以及全方位绿化、本质上的自持、未来城市的有力宣言。作者回应了现在威胁着全球所有大城市的令人担忧的城市危机，并倡导回溯普世的人与自然环境互利共存的状态。WOHA建筑事务所的项目将生态系统的再造放在首位，也在城市肌理变得越来越不适宜的过度拥挤的城市里将公共空间和市民文化重新融合。WOHA建筑事务所的可塑原型为巨型城市规划提供了激进的模式：不仅对新的大规模亚洲城市适用，也对全球范围里这样的城市适用。

关键词：建筑、气候、绿墙、空中花园、空中天桥、可持续性

Introduction

Cities are growing at a phenomenal rate, with the number of megacities in the world having more than tripled in the past 25 years. The rush toward urbanization is expected to continue, with population and land-use growth projected to add 2.5 billion people to the world's urban population by 2050, 90 percent of which would be concentrated in Asia and Africa. Caught in an unprecedented growth spurt, these cities are undergoing an "urban puberty" phase and are rapidly outgrowing their infrastructure. Contributing about 70 percent of the world's carbon emissions, cities are causing an escalating rise in global temperatures that will lead to inevitable crisis if governments, urban planners and architects fail to urgently rethink the way that cities are planned.

Since 2001, the authors have designed and built a series of prototypes as part of a process of urban re-evaluation, adopting the Asian megacity as an ideal testing ground for new urban typologies and architectural strategies. Re-imagining the early 20th Century Garden

引言

城市正以惊人的速度发展——在过去的25年中，全球大城市的数量已经增长了三倍多。随着人口的增长和城市用地的增加，城市化热潮预计将一直持续下去。到2050年，全球城市人口预计将增加25亿，其中亚洲和非洲占90%。这种史无前例的增长将使这些城市经历“城市青春期”，扩张速度要高于基础设施的开发速度。在全球二氧化碳排放中，约有70%来自城市地区。如果政府机构、城市规划者和建筑师们对城市的规划方式不再予以考虑，因城市发展而导致的全球气候急剧上升将不可避免地给人类带来危机。

自2001年以来，我们将亚洲大城市作为新的城市类别和建筑策略的理想测试范本，设计并打造了一系列原型，作为城市重新评估过程的一部分。我们对20世纪初的花园城市进行了重构，认为兼具社交生活与可持续性的高密度垂直21世纪超大城市是唯一的解决途径。“花园型超大城市”以一系列“宏观建筑风格，微观城市风格”策略为基础，从根本上加强土地利用率，增加绿色空间，并全面考量特定气候环境

City, The authors propose that a multi-layered, high-density, high-amenity 21st Century Mega City that is dense and vertical, yet sociable and sustainable, is the only way forward. The "Garden City Mega City" is built on a series of "Macro-Architecture Micro-Urbanism" strategies that radically intensify land use, multiply green space, and integrate climate-specific solutions to reduce the environmental impact of cities and improve the quality of life for people.

Layering Cities

Over the last two centuries – as towns became cities and cities became megacities – land has been taken for granted, as an infinite horizontal site for building, farming and mining. The combined effects of land exploitation, exploding megacity populations, rapid urbanization and economic growth have led to the degradation of land quality and quantity, the depletion of non-renewable energy sources, and the rise of global warming. Land scarcity is also reflected in the competition to meet the conflicting needs of a city, resulting in high land costs and stark trade-offs between various land uses.

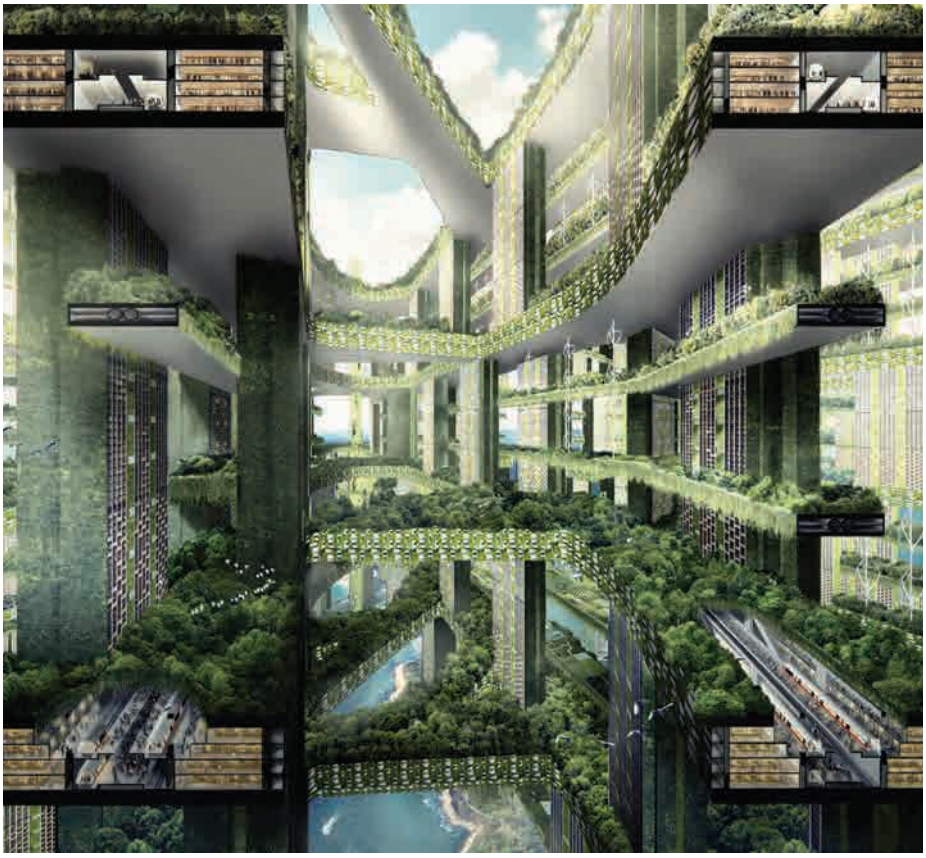


Figure 2. The layered approach introduces multiple ground levels of various functions at strategic horizons in the sky (Source: WOHA)
图2. 该分层法引入了整体布置的空中地平线上功能各异的“多样地表面”（来源：WOHA）

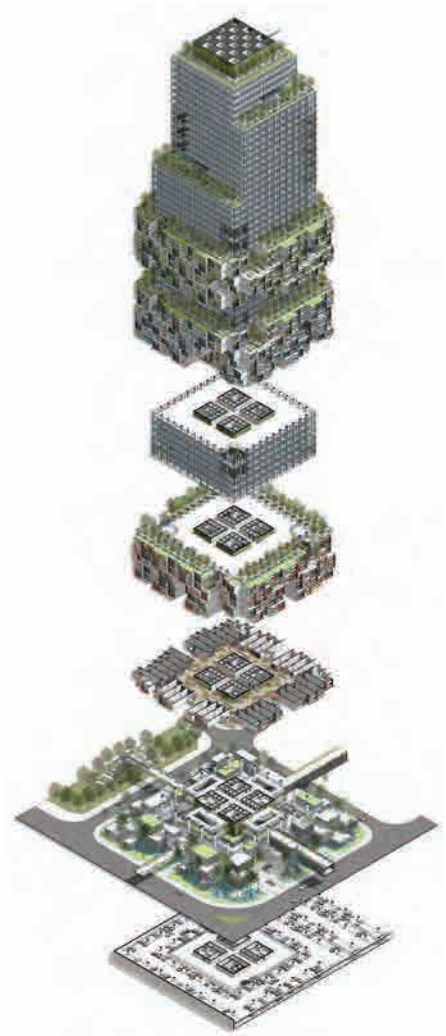


Figure 1. Axonometric diagram of the Layered City (Source: WOHA)
图1. 分层城市轴测图（来源：WOHA）

The authors propose visualizing a city in terms of layers – as a three-dimensional matrix, rather than as a two-dimensional grid (Figure 1). This calls for innovative land use solutions that involve a re-planning of cities – vertically, not horizontally. On top of reclaiming, restoring, and re-energizing our existing land, new land must be created. The use of land needs to be intensified by layering urban (and rural) environments – residential, recreational, commercial, agricultural, and infrastructural – above and below the existing ground level of the city.

These strategies for "Layering Cities" aim at offering a good quality of life for people by creating highly dense urban environments that are also highly vibrant, humane and resilient in the sustainable long term. The layered approach introduces "Multiple Ground Levels" of various functions at strategic horizons in the sky (Figure 2). This achieves "High-Density, High-Amenity" developments where civic, community and green spaces are multiplied over the same limited land area. Complementary programs of the right proportions are also integrated into vertical, mixed-use "Cities within Cities" that generate a 24/7 live-work-play vibrancy. To ensure human-scaled "Domesticated Structures," the authors' designs take references from the surrounding

下的解决方案，从而减少城市对环境的影响，改善人们生活质量。

分层城市

在过去的两个世纪，随着城镇成为城市，城市成为特大城市，土地理所当然地被认为是建筑、农业和矿业完美的水平用地。土地开发、大城市人口爆炸、快速城市化和经济增长的联合效应导致土地质量和数量退化、不可再生能源耗竭、全球变暖加剧等问题。土地稀缺也反映在为了满足城市冲突性需求而产生的竞争上，进而导致土地成本高昂，而且必须明确地权衡土地的各种用途。

我们认为，应从分层的角度看待城市——它是一个三维矩阵，而非二维网格（图1）。这就要求我们采用创新的土地利用方案，包括重新对城市进行垂直而非水平规划。除了返还、恢复并加强利用现有土地，还必须开发出新的用地。土地的利用必须通过将城市（和农村）环境（住宅、休闲、商业、农业、基础设施用地）分层的方式，在城市现有地表面的基础上进行加强。

“分层城市”策略旨在通过创建极为活跃、极其人性化、适应性强的高密度城市环境，为人们提供良好的生活品质，实现长期可持续发展。这种分层方法引入了空中战略地平线上功能各异的“多地表面”

Changing Market Forces and Their Impacts on Tall Building Planning and Design: A Case Study

市场趋势的变化及其对高层建筑规划设计的影响/案例研究

Ro Shroff | 罗史洛夫
Senior Vice President | 资深副总裁

CallisonRTKL
凯里森RTKL

Seattle, USA
西雅图，美国

A graduate of Illinois Institute of Technology, Ro Shroff is a Senior Vice President of CallisonRTKL and has been associated with the firm for over 22 years. As the firm's appointed lead for Tall Buildings, he is responsible for design, client management and business development in global markets, specifically China and South Asia. Current tall building projects under his direction include Imperial 3 / 355m (Mumbai, India), Chongqing WTC / 325m (Chongqing), Yintai International Plaza / 240m (Chengdu, China), Meixi Lake Towers / 260m (Changsha, China) and Alta Monte / 260m (Mumbai, India).

罗・史洛夫毕业于美国伊利诺伊理工大学。作为凯里森RTKL资深副总裁并有二十二年的经验，罗监督并指导中国及东南亚市场的高层建筑项目。现任监督的项目有Imperial 3/355米（印度孟买）、重庆WTC/325米（中国重庆）、银泰国际/240米（中国成都）、梅溪湖高楼/260米（中国长沙）及Atla Monte/260米（印度孟买）。

Abstract | 摘要

This paper articulates how changing market conditions and other variables impact the design process for tall buildings in general and a 355m tall luxury residential tower in the city of Mumbai, India, in particular. Although the contents define the design evolutions in some detail, specifically regarding architectural and structural explorations, the major thrust of this expose is to evaluate how fast-evolving markets, regulatory constraints and shifting economic conditions radically affect the design and construction of such projects and create new paradigms of the design process.

Keywords: Building Codes, Construction, Economics

此文件清楚地表达印度孟买的商业市场及其他因素是如何影响到当地的高楼及355米的豪华住宅设计。此方案设计的推力除了来自于建筑细部及结构的研究优化，最主要的目的是评估当地市场的快速成长，法规限制，及经济体系的动向是否会影响到项目整体的设计。

关键词：建筑规范、施工、经济学

Precursors

The project started with a design concept commissioned by one of India's premiere development companies in 2012 for an iconic luxury residential tower. Designed by Smith Gill, the architectural firm renowned for the one-kilometer-high Jeddah Tower, the 116-story, 400-meter-plus tower (Figure 1 & 2) was designed on Western typologies and depicted an organic footprint and a highly textured façade. There was much discussion about the tower's ability to "confuse the wind" and how the design represented global sensibilities and world-class architecture.

The win was short-lived as the client subsequently and in quick succession dropped the design due to investor pressure for an even more "iconic" presence in the city. The preferred alternative concept was a vertically undulating tower that would stand out among the city's cacophonous skyline. As conceptualized by a local firm of repute, the tower cantilevered and recessed up to 18 meters, and the design was soon given the green light by stakeholders. However, it was immediately delayed by the city's regulatory institutions, especially the government-appointed High Rise Committee, a collection of academic and lay experts who summarily reject non-traditional methodologies or any cantilevers over 2 meters.

背景

最开始是在2012年，由一家知名的印度开发公司委托设计一座标志性的豪华住宅高楼。 该住宅楼由史密斯和吉尔建筑事务所设计，该事务所曾设计了著名的高达一千米的吉达塔。这座住宅高楼共116层，高度超过400米（图1、2），属于西方建筑类型，底部简洁，大楼正面极有质感。外界很多人都在讨论这座高楼可以“混乱风向”，以及这种设计代表了全球鉴赏力水平和世界级建筑水平。

然而，好景不长，委托人后来紧接着就否定了这一设计，因为投资人想要一座在该城市更具有”标志性”的存在。 他们更中意的构想则是一座垂直波状高楼，它将高高耸立在这个喧嚣的城市的上空。 根据当地知名公司的构思，大楼悬臂梁伸出和凹进部分长达18米，这一设计很快得到股东们的通过。 但是，这个设计却被城市监管机构拦了下来，尤其是政府任命的高层建筑委员会，集合了一批学究和外行，对于非传统方法学和任何超过两米的悬臂梁统统说不。

欢迎来到孟买，一个有两千万人口，2500亿美元GPD的混乱之都。这是一个金融巨头缩影，超级富有，然而基础设施崩坏，交通堵塞令人窒息，并且人口极其密集。 这是第三世界国家的一个大都市，被称为伟大的人类之都，并象征着企业家精神，但它经常被拿来和它的中国对手上海做不利比较。

Welcome to Mumbai, a chaotic city of 20 million with a GDP of $250 billion that is at once the epitome of financial brawn, uber-wealth, crumbling infrastructure, choking traffic and extreme density. A third-world metropolis that boasts great human capital and entrepreneurial spirit, the city often negatively suffers comparisons to its Chinese counterpart, Shanghai.

Midway through the design process, CallisonRTKL was appointed as the primary design consultant to bring in a world-class aura to this fledgling concept, endowing the tower with grace and finesse and imbuing it with global sensibilities, while retaining the approved design direction. The client instituted a new team of local and international consultants and restarted the design in early 2015.

This is a case study examining how the design continues to morph and evolve given the vicissitudes of market demands, competition from similar inventories, political influences, financial wherewithal and fluctuations and most importantly technological, constructability, delivery and logistical challenges. Although the paper articulates the evolution of some of the design features and components of the tower, it is secondary to the notion of how design, especially in the supertall arena, continually evolves and re-invents to accommodate and respond to market variables.

Context

To evaluate how this and other iconic supertall towers (almost exclusively in the luxury residential arena) in this bustling city continue to flourish and stagnate at the same time, it is important to understand the political and regulatory implications of how such developments are initiated. Clearly, Mumbai is not representative of this country of over a billion people that has more than 50 cities with populations of over one million. It is a unique anomaly and amalgam of extreme paucity of land, highly inflated real estate and buying power, teeming slums with abject poverty, a raucous political system (often undermined by underworld "dons"), a thriving stock market and multi-national investment on par with other global cities.

For the longest time, the city's Floor Area Ratio (FAR) was limited to less than 1.0 and influenced by political rather than pragmatic constraints. With no place to grow or expand due to its Manhattan-like island configuration, it made little sense to restrict height and development to keep pace with a burgeoning population. This led to haphazard growth and the proliferation of squatters and slums. Ultimately, logic prevailed and two initiatives allowed development to expand with varying success rates. The first was to move manufacturing and industry—essentially defunct cotton mills—out of the city's confines, thus allowing large tracts of

Figure 1. Adrian Smith + Gordon Gill Architecture concept (Source: AS+GG)
图1. Adrian Smith + Gordon Gill Architecture建筑事务所概念（来源：AS+GG）

Figure 2. Adrian Smith + Gordon Gill Architecture concept (Source: AS+GG)
图2. Adrian Smith + Gordon Gill Architecture建筑事务所概念（来源：AS+GG）

在设计途中，CallisonRTKL被任命为首席设计顾问，为这一新手构思带来世界级的光环，赋予这座高楼优雅和灵巧，并为它注入国际鉴赏水平，同时保留它已通过的设计方向。 该项目委托人组织了一只由当地和国际专家组成的队伍，在2015年年初开始重新设计。

这个个案分析阐述了，时刻变化的市场需求，类似建筑库存的竞争，政治因素，金融手段和资金波动，尤其科技，施工能力，交付和后勤方面的挑战，是如何使建筑设计不断改变和演化的。 尽管本文阐述了一些设计特征和塔楼组成部分的演化，然而了解设计、尤其是在超高层领域的设计，是如何不断演变和进行再创造以适应和应对市场变量，更加重要。

条件及影响

要评估这座大楼和其他标志性超高层建筑（几乎都是在豪华住宅类型）在这座喧嚣的城市里为何在蓬勃发展的同时却又停滞不前，就要先了解政治和建筑法规因素是如何影响这类工程的展开的。 在这个人口超过十亿的国家，有五十个城市人口超过了一百万，显然，孟买不是这个国家的代表城市。 这是一个独一无二的产物，一个复杂的集合体。这里土地极其匮乏，房地产市场和购买力高度膨胀，贫民窟随处可见，各政党吵闹不休（还常常受制于地下黑手党大佬们），股市蓬勃兴旺，还拥有与其他全球都市相当的跨国投资。

在史上最长一段时间内，孟买的容积率一直限制在1.0以下，这主要是因为政治因素而不是实用限制。 由于孟买外形和曼哈顿类似，是一个半岛，它没有任何地方可以扩张，因此，要解决不断飙升的人口数字问题，限制建筑物的高度是毫无道理的。这导致了城市的任意发展，非法占用公地和贫民窟随处可见。 最终，逻辑取胜，两个倡议实现了发展扩张，但成功率各不相同。 第一个是将制造业，尤其是一些关闭的棉纺厂，移出城市边界，从而空出孟买中心的大面积区域，用来建造豪华的购物中心和商业办公区域，打造一个全新的中心商务区。这样一来，就十分不利于孟买南部尖端地区原有的”市中心”的发展。 另一个倡议叫做贫民窟改造授权方案。该方案为开发商建造高密度或豪华住宅大楼提供额外激励措施，即负责为现有棚户区居民解决生活问题，为他们在排列密集的、30层高楼上提供永久住房。 “压力阀”开启了，人们又可以在250平方英尺户型的新城市街区的附近大肆开发高层住宅楼。这让人们想起了美国二十世纪六十年代Pruitt Igoes和Cabrini Greens的两则失败社会案例。

正在制定中的新倡议包括更高的容积率（提高到5），开发权利转移（在转移过程

What's Next?: How Do We Make Vertical Urban Design?

下一步是什么？我们如何开展垂直城市设计?

Winy Maas
Director | 联合创始人

MVRDV
MVRDV建筑事务所

Rotterdam, Netherlands
鹿特丹，荷兰

Winy Maas Prof. Ir. Ing FRIBA HAIA (1959, Schijndel, The Netherlands) is an architect, urban designer and landscape architect and one of the co-founding directors of the globally operating architecture and urban planning firm MVRDV, based in Rotterdam, Netherlands, known for projects such as the Expo 2000, the vision for greater Paris, Grand Paris Plus Petit, and more recently the Market Hall in Rotterdam. He is furthermore professor at and director of The Why Factory, a research institute for the future city, founded in 2008 at TU Delft.

英国皇家建筑学院教授韦尼·马斯（1959年出生于荷兰斯海恩德尔）是建筑师、城市设计师、景观设计师以及全球运营的建筑与城市规划公司MVRDV的主要合伙人之一。MVRDV总部位于荷兰鹿特丹，并因其作品享誉建筑界，包括2000年汉诺威世博会荷兰馆，展望巴黎面貌的Grand Paris Plus Petti项目，以及最近鹿特丹的Market Hall 市集住宅。他也在自己于2008年在荷兰代尔夫特大学创办的关于未来城市的研究机构:The Why Factory从事教授和主管工作。

Abstract | 摘要

It seems sometimes as if the further away from the ground we rise, the more architectonic and less urban our buildings become. Skyscrapers have always been about power, but they should also be about society. As our global society increasingly becomes an urban one, then development of skyscrapers should be taking a critical new direction. The question is not, how many skyscrapers can we build, and how high? The questions are: How do we make vertical urban design? How do we take those facets we value the most about our urban villages – informality, flexibility, human scale, evolutionary growth – and incorporate these into vertical cities? How do we validate programs to deal with them in the context of local culture, instead of merely "attacking" localities with monotonous tower blocks? What's next for the planetary skyline, which is inextricable with the question, what's next for life on this planet?

Keywords: Architecture, Sustainability, Urban Design, Urban Planning

对我们的建筑而言，似乎在离地面越远的时候会变得越关注建筑学，也越脱离城市。摩天大楼一直都与能力相关，但同时它们也应该关注社会。随着我们的全球化社会逐渐转变为以城市为主体，摩天大楼的发展应该转向关键的新方向。因此问题的关键不在于我们建造多少和多高的摩天大楼？问题在于，我们应该如何开展垂直城市的设计？我们如何把我们认为城中村最有价值的方面：自主性、灵活性、人性化的尺度和演进式的增长整合到垂直城市的设计中去？我们怎样达成从当地文脉的角度来处理垂直设计，而不仅仅是以单调的高楼大厦来"攻占"地方？这个星球的天际线未来会是什么样的，接下来不可避免的问题就是，这个地球上的生命会面临怎样的未来？

关键词：建筑、可持续性、城市设计、城市规划

Introduction

At the beginning of the third millennium, the world is denser than ever before. It is inhabited by more and more people, who want to consume more, who want to live with more space and comfort, and who can move around more. Such a world seeks space, almost desperately, for manufacturing, living, water, energy production, oxygen, ecological compensation, safety, and buffers, owing to the increased likelihood of natural disaster due to climate change.

Against this hypothesis, there are two possible scenarios. The status quo reaction to the need for space in an increasingly crowded world has been to create introverted, isolated, monolithic towers – 3D extrusions of 2D thinking – which create no more of a community connection than flying above the city does. We can continue with the introverted 2D city – or we can react to, investigate, explore, and analyze it. This leads us to something much more appealing and sustainable – the concepts of the Vertical Village and the Porous City, which make a 3D city. This is a community of porous towers, in

引言

二十一世纪初，世界人口密度空前暴涨。人口增加的同时，人们的消费欲也随之增长，对舒适和宽裕的居住空间、活动空间的需求也有了很大提高。同时，气候的反常变化，各种自然灾害的发生几率大大增加，也使得这个世界急需拓展更大的空间，以供人们正常的生活起居、饮食耕作、安保消费、自由转圜。

如何在日益拥挤的世界中另觅空间？为实现此需求，有两种可行的解决方案。其宗旨是建立向内发展的，独立的巨塔式构架一即在日常的二维城市发展体系上，深挖掘开拓三维空间体系一一这就像是在城市上空凌空构架各群体间的交通体系一样。也许以此，我们便可以现有的二维模式的城市架构为基础，进一步对其研究、探索、解析。该类方案最终为我们呈现的，是一个别具吸引力和可持续性的概念一一垂直村落和多孔道城市，该两者构成了一个三维化城市。它属于多孔道巨塔构架的一部分，具有固有的联通性一一这样的塔式构架能够向世界开放，并促使与千年来存在的低地势，高密度的村落相同的社群意识的产生。

which connectivity is inherent to the design – such towers "want" to do nothing but open up to the world, and foster the same sense of community that low-lying, high-density villages have done for millennia.

The Vertical Village

In order to create fully functioning communities in the sky, we need to think about not just the physical connections between people and the places they inhabit, but how spaces are programmed, and how they are interlinked. If the old thinking about communities was formerly confined to a 2D city plan, the new thinking should be about validating new programs that can deal with the context of local culture.

For example, in space-starved Taipei, it is common practice to build informal additions on top of existing buildings as families expand and needs change (Figure 1). The authorities' first reaction is to regard these as "illegal" and dangerous additions, and to have them demolished. But what if we decided to accommodate this organic trend, this clear expression of a need, instead of trying to legislate it away (Figure 2)?

We need to find ways to build for programs that the 2D city plan never anticipated, because it was always assumed that there would be more space on which to build. It is all too common today to see projects in which one function is stacked above another, and this is called a "mixed-use" building or a "city in a city." But in reality, there is very little mixing going on. A more holistic approach is needed.

Let's take a look at some projects that suggest ways to intensify use of the city, but also make it more livable.

Pig City

This project (Figure 3) explores a possible transformation of the skyscraper, which, rather than being a frozen typology, instead becomes a way of looking at the future and responding to the new needs of society.

This concept arose at a moment when crises such as Swine Fever and Foot and Mouth Disease were raising serious questions about pork production and consumption, and fighting these problems cost governments huge sums of money. Here again, two opposing reactions could be imagined. Either we change our consumption pattern and become instant vegetarians, or we change the production methods and demand organic farming. But is there space?

Figure 1. Additions on top of existing buildings in Taipei (Source: MVRDV)
图1. 台北现有建筑物顶部添加物（来源：MVRDV建筑事务所）

Figure 2. Additions on top of existing buildings in Taipei showing MVRDV intervention (Source: MVRDV)
图2. MVRDV设计后的台北现有建筑物顶部添加物（来源：MVRDV建筑事务所）

垂直村落

为了在天空建造功能健全的社群，我们不仅需要考虑人与其居住地之间的实体连接，而且要考虑空间的规划、各空间互联的问题。如果说之前对于社群的考虑只需局限于对二维城市的规划，那么该新方案的设计必须确保能够协调各种不同的地域文化。

例如，在空间匮乏的台北，居民通常会在其居住建筑顶部搭建非正式建筑，以适应其家庭人员增加或变更的需要（图1）。权威专家表示，这属于非法建筑，极具危险性，必须予以拆除。但是，与其将之视为非法建筑而彻底革除，我们是否能够转换态度和思维方式，想方设法适应该环境中人们的这种自然需求呢（图2）？

我们需要寻找的，是在普通的二维城市规划中构建前所未有的建筑计划，因为我们普遍认为，只要修建新建筑就会有新的空间。而在当今社会，我们也经常见到堆叠式的建筑，即被称为"多功用型"建筑或"城中城"。但实际上，该类建筑根本难以发挥其预期功用。所以，我们的新规划应当整体布局，从大处着眼。

下面，让我们看几个能够同时加强城市功用并且保证宜居性的规划方案。

猪城

这项计划（图3）使得摩天大楼的转型成为可能，它不是一种老朽的象征主义，而是一种真正能够预见未来，并适应社会新需求的方法。

猪城的概念来源于猪瘟、手足口病等疾病的爆发所带来的问题。该类疾病的爆发为猪肉产销模式带来巨大争议，同时政府也为应对疾病爆发投入了大量金钱。问题需要解决，对此，可以想见又会有两种不同的应对方式，一是我们转变自己的消费方式，立即成为完全的素食主义者，二是改变现有的生产模式，进行有机耕作。但是，有足够的空间吗？

这项计划提出了一种垂直的，再生性肉食（及能源）生产体系，反映了建筑所应具有的社会功用。建筑不是单纯地建造楼房。建筑应该能够严格应对当前的挑战，并适应变化。建筑应不仅仅与特定的环境相关联，还应与广泛程度上的动态变化相关联：气候，迁徙，农业等等。这才是建筑所应该担负的职责。

中国山

随着中国城市人口的增加，住房供给和相关置业需要占用的空间超出了可供应量。这提供了怎样的可能性呢？中国山的城市化融合了城市的个性化与集中责任制，将建筑与城市化相联系，并使城市化构架向景观性建筑转化（图4）。中国山是一种理想的、对未来社会革新至关重要的城市规划模型。

Raffles City Chongqing Conservatory: Studies For a New Bridging Building Type | 水晶廊桥：横向塔楼新建筑类型的演变

Jeffrey Huggins
Associate Principal | 副总裁

Safdie Architects
萨夫迪建筑事务所

Sommerville, United States
Sommerville，美国

Jeff Huggins joined Safdie Architects in 2006 and became an Associate Principal in 2013. He currently serves as project manager for the façades and commercial tower components of the Chongqing Chaotianmen project. His previous work as project architect includes the Colombo Residential Towers in Colombo, Sri Lanka; Chongqing Eling Residences in Chongqing, China; and the Marina Bay Sands Integrated Resort, in Singapore. Following the design development of Marina Bay Sands in Boston, he relocated to the firm's Singapore office for three years as resident design architect for the hotel towers.

Jeff Huggins于2006年加入萨夫迪建筑事务所，并于2013年成为合伙人。他目前担任项目经理，负责重庆朝天门项目的建筑立面及商业大楼组件。他之前作为项目建筑师完成的作品包括斯里兰卡科伦坡的科伦坡住宅大楼、中国重庆的重庆鹅岭住宅区及新加坡的滨海湾金沙综合度假胜区。在波士顿的滨海湾金沙项目的设计开发之后，他前往公司的新加坡分部，在那里任职三年，担任酒店大楼的住宅设计建筑师。

Abstract | 摘要

One of the outgrowths of dense vertical urbanism is the challenge of interconnecting tall buildings at multiple levels in the sky. In order to have the super-connected urban whole, pathways between the vertical nodes must be equally advanced along with technological breakthroughs that allow towers to grow vertically. The "Conservatory" At Raffles City in Chongqing, China is a new invention of the horizontal tower. It provides a fully enclosed mixed-use program while linking vertical towers together, creating a new type of three-dimensional building matrix.

Keywords: Life Safety, Mixed-Use, Sky Garden, Structure, Vertical Urbanism

密集垂直都市生活的产物之一，就是在空中实现高层建筑多楼层互连的挑战。为实现完整的超级互连城市，垂直节点之间的路径必须与大楼垂直增长的技术突破同步发展。中国重庆来福士广场的"暖房"是卧式楼的一项新发明。它既是一个全封闭混合用途项目，又将垂直大楼连接了起来，创造了一种全新类型的三维建筑矩阵。

关键词：生命安全、混合用途、空中花园、结构、垂直城市化

Introduction

One of the outgrowths of dense vertical urbanism is the challenge of interconnecting the towers that have developed as the main response to higher density. In order to have a super-connected urban whole, the pathways between these vertical nodes must be equally advanced alongside the technological breakthroughs that allow for the ever increasing heights of the tower. In response, Safdie Architects has designed the "Conservatory" at Raffles City in Chongqing, China. A building unto itself, the Conservatory is a horizontal tower that links multiple buildings. The Conservatory is an evolution from the Marina Bay Sands SkyPark, in that it provides a fully enclosed mixed-use program while linking the project's vertical towers together, thus creating a new type of three-dimensional building matrix (Figures 1 & 2).

The 280m long structure houses four main programmatic uses: public observatory, residential clubhouse, hotel lobby, and F&B destination. The Conservatory provides the dual function of housing these programs, as well as acting as a horizontal conduit linking the many towers together. It provides much of the same type of connectivity one would find at podium level or below grade, but here with new meaning, and new opportunity, located 250m above ground level.

As an emerging building type spawned from dense urban environments, the Conservatory

项目简介

密集的垂直城市化发展所面临的挑战之一是，如何将所开发的主体建筑相互连接起来从而提高建筑密度。为了将城市建筑的上层部分连接起来形成整体，这些垂直节点均必须采取具有技术性突破的方法，以便应对建筑高度不断增加的城市化环境。鉴此，萨夫迪建筑公司设计了位于中国重庆莱佛士广场的"水晶廊桥"。就建筑本身形态而言，它是一个连接多个建筑的横向塔楼。水晶廊桥项目，是我们在滨海湾金沙酒店空中花园基础上的进一步发展。作为封闭的室内空间，它不仅提供了多项综合性功能，同时连接了数个垂直塔楼。水晶廊桥创造了一种新型三维建筑形态（图1、2）。

水晶廊桥总长280米，主要提供四种功能：公共观景台、住宅会所、酒店大堂和餐饮设施。水晶廊桥兼具双重作用，既可以容纳上述业态功能，又可以作为横向媒介将众多塔楼连接起来。相似的综合连接体，人们在裙楼楼层或地下楼层已经司空见惯；但水晶廊桥的设计，让我们有能力在距离地面250米的空中实现相同功能，因此它意义深远，令人耳目一新。

作为一种新兴建筑类型，诞生于高密度城市环境的水晶廊桥面临着巨大的技术性挑战，比寻常的摩天大楼要复杂得多。接下来会具体介绍针对此项目的创造性解决方案，包括结构、立面挂板、环境舒适性、消防疏散和生命安全、垂直交通和业态布局等方面。

Figure 1. View of Raffles City Chongqing looking toward the city (Source: Safdie Architects)
图1. 重庆来福士广场面向城区的景观（来源：萨夫迪建筑师事务所）

Figure 2. View of Raffles City Chongqing from podium (Source: Safdie Architects)
图2. 自裙楼看到的重庆来福士广场风光（来源：萨夫迪建筑师事务所）

faces more technical challenges than a typical skyscraper. Presented here are the inventions that were crafted to tackle the requirements of structure, cladding, environmental comfort, egress and life-safety, vertical transportation, and programmatic distribution.

Program

The Raffles City Chongqing project is located at the confluence of the Yangtze and Jialing Rivers in the Yuzhong central district of the city. Overlooking the Chaotianmen public plaza and historical heart of the city, the site is truly one of a kind. Filling the site is a podium building of six above-grade stories, which houses some 200,000sm of retail space, as well as subway, bus, and ferry terminals. A public park and private residential gardens are created over the podium, with direct access from the city on the southern end of the site. Emanating from the podium are eight towers: six southern towers reaching 250m and two northern towers topping out at 350m. The towers are a mix of uses, comprised of residences (T1256), luxury residences (T3N),

项目业态

莱佛士城重庆项目坐落于城市核心部位渝中区，直面长江与嘉陵江交汇口。项目基地可以俯瞰朝天门广场和具有历史意义的城市核心区域，得天独厚的地理优势，独一无二。建筑底部为地上六层的裙楼，可以容纳200,000平米的商业设施，同时集地铁站、公交换乘站、渡轮码头等多种公共交通方式于一体。与此同时，裙楼顶部设置了公共公园和私人住宅花园，可以从项目南侧直接前往。裙楼向上坐落着八座塔楼：南侧六座塔楼高达250米，北侧两座塔楼高达350米。塔楼为综合体设

Many thanks to all the CTBUH 2016 Conference Sponsors
非常感谢所有CTBUH 2016会议的赞助商

Diamond Sponsors | 钻石级赞助商

شركة جدة الإقتصادية
JEDDAH ECONOMIC COMPANY

新世界發展
New World Development

PACE

鹏瑞集团
PARKLAND GROUP

中国平安
PING AN

新鴻基地產
Sun Hung Kai Properties

Platinum Sponsors | 铂金级赞助商

ARCADIS

CSCEC

KONE

OTIS

Schindler

太古地产
SWIRE PROPERTIES

Tencent WE HOME
Shenzhen HQ Project Team

thyssenkrupp

trosifol™
world of interlayers

WSP
PARSONS BRINCKERHOFF

Gold Sponsors | 黄金级赞助商

Aedas

ARQUITECTONICA

CAPOL 華陽國際

CCDI

Gensler

Hongkong Land

JLL
仲量聯行

KPF

R&F 富力地产
R&F PROPERTIES

华南理工大学建筑设计研究院
ARCHITECTURAL DESIGN & RESEARCH INSTITUTE OF SCUT

深業置地
SHUM YIP LAND

SOM

TAIPEI 101

Thornton Tomasetti

Turner

UL

WOODS BAGOT

Silver+ Sponsors | 白银级+ 赞助商

AIT

DESIMONE

FARRELLS

HASSELL

JENSEN HUGHES

MMOSER ASSOCIATES

MORI BUILDING

Pelli Clarke Pelli Architects

RLB Rider Levett Bucknall

Silver Sponsors | 白银级赞助商

ARUP

BASE

BATESSMART

Construction Specialties™

DOW CORNING

FXFOWLE

GOETTSCH PARTNERS

HENN

LERA
Leslie E. Robertson Associates

PEI COBB FREED & PARTNERS

RAMBOLL

STUDOR

TISHMAN SPEYER

Supporting & Media Partners | 支持单位与媒体支持单位

AIA|HKIA

全國工商聯房地產商會
CRECCHKAI

Urban Land Institute
Asia Pacific 亚太区

建筑技艺
Architecture Technique

同济大学出版社
TONGJI UNIVERSITY PRESS

Index of Papers by Author and Company
论文索引（按作者与公司）

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

X

Y

Z

As the world continues to urbanize at an unprecedented rate, cities around the globe are proliferating, expanding, and merging to form a new urban typology – the megacity. Against a backdrop of the world's urban population growing by a million new urban inhabitants every week, cities must cope with the strain of that growth in new and unconventional ways. Unsurprisingly, this has resulted in a host of challenges that must be addressed, including: inadequate infrastructure provision, energy production obstacles, social inequity, pollution, quality of life issues, and a loss of heritage and identity amid unbridled redevelopment. These challenges, which are common around the globe yet magnified in megacities due to their unique circumstances, should be seen as a litmus test for the great ideas of our time and a call to action for bold new paradigms in urban development.

This collection of papers was originally presented at the CTBUH 2016 Conference, which took place progressively across Shenzhen, Guangzhou, and Hong Kong. There is perhaps nowhere on the planet that demonstrates the impact of urbanization as markedly as these cities in China's Pearl River Delta. Surpassing Tokyo as the world's largest single continual urban conurbation of 42 million in 2010, the megacity is set to grow to 120 million inhabitants by 2050. In so many ways – physically, culturally, and economically – the three teeming metropolises, and others in the region, are merging into, effectively, one super-linked urban whole, with a network of ultra-connected, modern infrastructure.

The publication thus examines the phenomenon of dense vertical urbanism and the technological innovations that are driving new cities, building forms, functions, materials, and construction techniques. Volume I considers the larger economic, social, and urban-scale considerations of megacities and dense vertical urbanism, while Volume II focuses on specific advances in technical subjects, engineering, data modeling, and façade performance, among other topics, that are facilitating today's megacities.

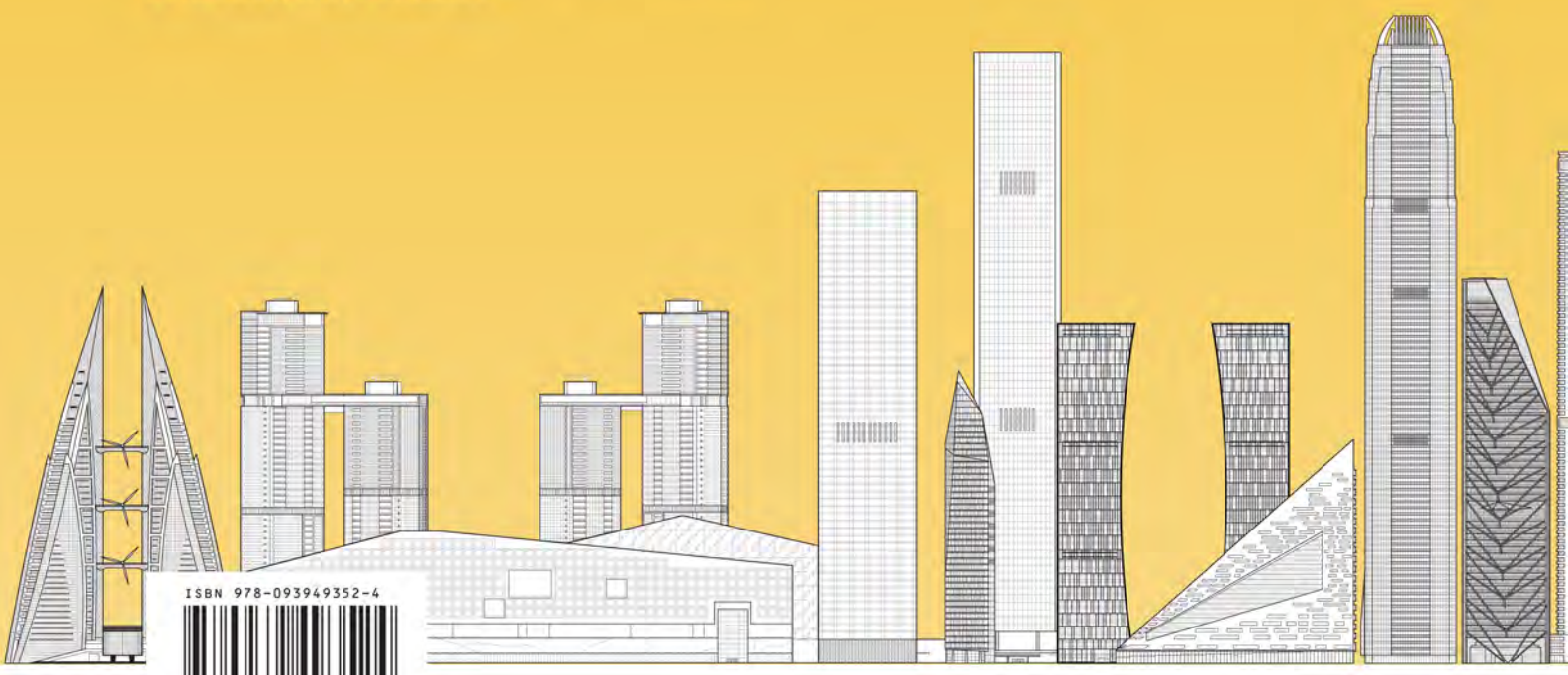
随着世界继续以前所未有的速度进行城市化进程，全球的城市都在激增、扩张并融合为一个新的城市类型——巨型城市。在世界的城市人口每周增长一百万城市居民的背景下，城市必须以一种新的、不同寻常的方式应对这种压力。不出意外的是，这带来了大量亟待迎接的挑战，其中包括：基础设施供给不足、能源生产障碍、社会不公正、污染、生活质量下降以及在无节制的再开发中城市遗产及特质丢失等问题。这些挑战在全球范围内都很普遍，但因为特殊的环境，在巨型城市中表现得尤为突出，应被视为我们这个时代伟大思想的试金石和城市发展大胆新范例的试验场。

这套论文集是在CTBUH 2016年深圳、广州、香港会议上首次发布的。世界上也许不会有其它地区能像中国的珠江三角洲的城市集群一样诠释剧烈的城市化所带来的影响。2010年珠三角地区人口已达到4200万，超越日本东京成为世界上最大的单一连续的城市集群，而这一地区在2050年有望达到1.2亿居住人口。在自然、文化和经济等许多方面——这三座巨型城市和该地区其它城市一起，通过高度连接和现代化的基础设施网络，高效地融合成为了紧密相连的城市整体。

论文集出版物因此分析了高密度的垂直城市主义现象和驱动新城市、建筑形式、功能、材料和施工技术的技术创新。第一卷关注巨型城市和高密度垂直城市主义宽泛的经济、社会和城市尺度问题，而第二卷则聚焦促进当今巨型城市发展的新技术、工程、数据模型、幕墙性能及其它议题。

Council on Tall Buildings and Urban Habitat

www.ctbuh.org
www.skyscrapercenter.com



ISBN 978-093949352-4

9 780939 493524