

A Warmer City in the Process of Development

— One-decade Social Growth of Shanghai Illuminated by Science & Technology

# 让城市在发展中更有温度

——科技之光映照上海社会发展十年路

上海新能源科技成果转化与产业促进中心 编著

李光明 江世亮 郑广宏 刘文波 主编



上海科学技术出版社

# 让城市在发展中更有温度

## ——科技之光映照上海社会发展十年路

A Warmer City in the Process of Development

——One-decade Social Growth of Shanghai Illuminated by Science & Technology

上海新能源科技成果转化与产业促进中心 编著  
李光明 江世亮 郑广宏 刘文波 主编

上海科学技术出版社



---

图书在版编目 (CIP) 数据

让城市在发展中更有温度: 科技之光映照上海社会发展十年路 / 上海新能源科技成果转化与产业促进中心编著. —上海: 上海科学技术出版社, 2017.9

ISBN 978-7-5478-3677-4

I. ①让… II. ①上… III. ①城市建设-研究-上海  
IV. ①F299.275.1

中国版本图书馆 CIP 数据核字 (2017) 第 194318 号

---

责任编辑 曾文 王亚芬

封面设计 戚永昌

让城市在发展中更有温度

——科技之光映照上海社会发展十年路

上海新能源科技成果转化与产业促进中心 编著

李光明 江世亮 郑广宏 刘文波 主编

---

上海世纪出版股份有限公司  
上海科学技术出版社 出版

(上海钦州南路 71 号 邮政编码 200235)

上海世纪出版股份有限公司发行中心发行

200001 上海福建中路 193 号 www.ewen.co

上海中华商务联合印刷有限公司印刷

开本 889×1194 1/16 印张 18.5 插页 4

字数: 400 千字

2017 年 9 月第 1 版 2017 年 9 月第 1 次印刷

ISBN 978-7-5478-3677-4 / F·11

定价: 128.00 元

---

本书如有缺页、错装或坏损等严重质量问题,  
请向承印厂联系调换

总顾问 General Counselor

万钢 Wan Gang

顾问 Counselors

寿子琪 刘 岩 Shou Ziqi and Liu Yan

审核 Revisers

秦文波 马兴发 Qin Wenbo and Ma Xingfa

主编 Chief Editors

李光明 江世亮 郑广宏 刘文波

Li Guangming, Jiang Shiliang, Zheng Guanghong and Liu Wenbo

校对 Proofreading

刘春华 刘华珍 姜耀鹏 Liu Chunhua, Liu Huazhen and Jiang Yaopeng

编委会（以姓氏拼音字母为序）

Compiling Group (according to the alphabetic order)

柴 梅 杜坤杰 房川军 黄联勇 姜 玲 考书建 柯 钰 李琦芬

马 蕾 祁凌云 任 奔 司慧萍 涂 明 王 磊 汪霄童 虞 俭

张珺婷 周建辉 朱昊辰 朱 刚 朱迈青

Chai Mei, Du Kunjie, Fang Chuanjun, Huang Lianying, Jiang Ling, Kao Shujian, Ke Yu, Li Qifen,

Ma Lei, Qi Lingyun, Ren Ben, Si Huiping, Tu Ming, Wang Lei, Wang Xiaotong, Yu Jian,

Zhang Juntong, Zhou Jianhui, Zhu Haochen, Zhu Gang and Zhu Maiqing

习近平总书记指出：“人民的需要和呼唤，是科技进步和创新的时代声音”。服务民生、惠及民生，是上海科技创新事业发展的出发点和落脚点。近年来，面向社会民生需求和超大型城市治理挑战，上海围绕城市建设与管理、公共安全、节能减排、生态环境、综合交通等社会相关领域，不断加大投入力度、着力开展前瞻布局、强化技术攻关、推广集成应用和综合示范，取得了明显成效。可以说，上海科技创新不断提升的同时，也为广大人民群众带来了实实在在的获得感。

President Xi Jinping points out that people's needs and aspirations are voices in the era of scientific and technological innovation. Shanghai has taken people's livelihood and welfare as the purpose and mission of its scientific innovation. In the face of challenges in meeting people's demands and managing a mega city, Shanghai has achieved tangible outcomes in urban construction, public security, energy conservation and emissions reduction, ecology and environment, and transportation by increasing investment, planning ahead, enhancing technology development, promoting application and demonstration. As Shanghai gets more innovative, people can feel the sense of harvest.

回顾上海推进社会领域科技创新的发展历程，能够深刻感受到三个明显特征：**一是需求导向**。社会领域的科技创新更注重回应国际大都市人们生活最迫切的需求和关切点，“想人民之所想，急人民之所急”，着力通过科技创新力量的释放，让人们能够享受清洁的水和空气、安全的生活空间、舒适的住房、便捷的交通等等。**二是前瞻布局**。社会领域的科技产生的价值往往体现在社会效益上，存在“市场失效”现象，这需要政府来“补位”。多年来，上海始终面向城市未来发展的重大需求，强化重大项目超前布局，优化政策环境，实现科技创新资源的有效配置，提高科技创新对民生领域的支撑和引领作用。**三是协同创新**。上海社会领域科技创新的突破与推进，依赖于原始创新能力、成果转化能力和集成应用能力的同步提升，也需要科技、产业、环保、住建等多个部门协同配合，“单兵作战”往往难以胜任，多主体、多领域形成“合力”，开展“大兵团”协同攻关是该领域科技创新成功的重要保障。

Shanghai's efforts to facilitate scientific innovation are characterized by three features. First, demand-oriented. The most urgent needs of people living in an international metropolis are the priority in innovation so that they can have access to clean water and air, safe living space, comfortable

housing, and easy commuting. Second, planning ahead. As the value of innovation for society is usually overlooked in the market, the government needs to step in to fill that gap. Shanghai has been addressing its significant need for future development by planning key projects in advance and optimizing the policy environment to effectively allocate innovation resources for technologies to support social development. Third, innovation synergy. The progress in scientific innovation in society depends on the synergy of capabilities in original innovation, research commercialization, and integrated application. It also requires collaboration among multiple agencies in science, industry, environment, and construction. As no single agency can do it alone, synergy across multiple agencies and fields guarantees successful innovation.

《让城市在发展中更有温度——科技之光映照上海社会发展十年路》是一本以十年为期，反映上海社会发展领域科技创新实践的成果汇编集，重点展现了2006—2015年本市社会发展领域的科技创新成果。本书因应当下国家大力推动的“一带一路”倡议，致力于与更多发展中国家分享上海在社会发展领域的科技创新实践和成果，不断提升上海科技创新中心的国际影响力。

*A Warmer City in the Process of Development—One-decade Social Growth of Shanghai Illuminated by Science & Technology* is a collection of innovation outcomes in the field of social development from 2006 to 2015. Responding to the “Belt and Road” Initiative that the country is launching, this collection is committed to sharing with more developing countries Shanghai’s practices and outcomes of innovation in social development, and increasing the city’s international influence as a science and technology innovation center.

今天的上海，正深入贯彻落实创新驱动发展战略，加快建设具有全球影响力的科技创新中心；未来的上海，将成为更具活力的创新之城、更富魅力的人文之城、更可持续的生态之城。科技，将始终关注民生，始终秉承让城市更美好的追求。亦借本书出版之际，再次呼吁广大科技工作者积极投身到民生科技的主战场，为提高社会发展水平、改善人民生活、谋求民生福祉作出新的更大贡献。

Shanghai is implementing its innovation-driven strategy to accelerate its development into a science and technology innovation center with global influence, and will grow into a city of innovation, culture and eco-friendliness. People’s livelihood and their aspirations for a better city will, as always, be the focus of technological development. I wish to take the opportunity of the collection’s publication to call upon professionals in the field of science and technology to dedicate themselves to greater contributions to a better society, livelihood, and welfare.

寿子琪

Shou Ziqi

上海市科学技术委员会主任

Director of Shanghai Science and Technology Committee

2017年6月于上海

June, 2017, Shanghai

## 正是这些社会发展成果，让我们感同身受： 生活更便利了，城市更宜居了

Achievements in Social Development

Make A Better City and A Better Life

围绕上海城市社会发展壮阔叙事的枝枝叶叶，以十年为期编一本集亮点和成果的汇总是从上个十年（1996—2005）开始的，这一集的时间跨度是2006—2015年。在做这件事的过程中，编写者越来越有感觉，好像觉得自己是在触摸这座城市跳动的最敏感的神经。其实说到上海这十年的城市社会发展变化，每个市民最有发言权，很多人都在说上海变大了，变得更开阔了、更亮了、更干净了、更有生活情调了。其实，总结为一句话就是上海变得更适合人居了，而更适合人居正是城市社会发展的更高境界。

Every decade after 1996 has witnessed a collection of highlights and accomplishments taking place in the development of Shanghai society. The first collection embraces every step that Shanghai has made in its social development from 1996 to 2005, and the second collection will span across the decade after 2005. As the editor, I felt that I was experiencing every subtle change that had happened in this city during the compilation of this book, but it is each citizen that has more say over changes occurred in social development in the last ten years. Many people say that Shanghai is getting larger with wider view, becoming brighter, cleaner and more life-appealing. In a word, Shanghai is emerging as a more livable city, which is exactly the ultimate goal of the development of urban society.

事非经过不知难。回顾这十年上海发生的变化，很值得让人回味和惊叹：这十年是首个在中国举办的世界博览会进入筹办冲刺到成功举办乃至世博效应的延续期；这十年是上海这座特大型城市继续接受城市安全运行考验并交出满意答卷的攻坚期；这十年也是绿色、生态、低碳等可持续发展理念成为社会共识的积淀期；这十年更是上海城市建设和发展更以人为本，更注重市民的衣食住行感受，城人关系更臻协调的和谐期；当然也是上海为接下来的十年继续回应和破解特大型城市如何健康安全有效运行这一尚无答案的举世难题继续攻坚克难的关键期。

One will never appreciate the difficulty of an undertaking until he has experienced it himself, thus it is so memorable and impressive to look back upon the last decade, during which Shanghai has seen the first World Expo held successfully in China from preparation to the end, and the Expo effect is still carrying on. Shanghai, as a mega city, has entered a critical stage in dealing with the challenges posed by urban safety operations. Sustainable development concepts such as green, ecology and low carbon

have gained social consensus and been widely accepted. Shanghai urban construction and development have been more people-oriented and laid more emphasis on basic necessities of citizen life, which helps to create a more harmonious relationship between city and citizens. Above all, the last decade is a crucial period that lays groundwork for the next decade to respond and solve the world challenge, the safety operation of mega cities.

历数这十年上海在社会发展中结下的果实，即便是很不完全的统计，也可以列举出成百上千项，其中还有许多堪称重量级的破纪录成果。

According to incomplete statistics, hundreds of achievements have been made in the development of Shanghai society in the past ten years, many of which are heavyweight record-breakers.

譬如上海中心大厦建设。环评公示的数据显示：上海中心主楼顶层布置了 72 台 10 千瓦的风力发电设备，综合节能率大于 60%；绿化率达到 31.1%，室内环境达标率 100%；有效利用建筑及雨污水资源，实现非传统水源利用率不低于 40%，可再循环材料利用率超过 10%。可以说，上海中心不仅创下了建筑史上的诸多之最，而且它还成为了全球可持续发展设计理念的引领者。

Take the construction of Shanghai Tower as an instance. The statistics released by China Environment Impact Assessment shows that the tower is equipped with 72 wind electric power generation facilities, 31.1% of green coverage rate, 100% compliance rate of indoor environment and more than 60% of overall energy-saving rate. In addition, the unconventional water resource utilization rate is not less than 40% in virtue of effective use of rain and sewage resources of buildings, and the utilization rate of recyclable materials is more than 10%. Not only does Shanghai Tower embrace many records in the history of architecture, but it also takes the initiative in the design concept of sustainable development all over the world.

又如科技创新园区建设。上海自 1984 年建设漕河泾经济技术开发区、1992 年建设张江高科技园区以来，经过 30 年的时间，上海科技创新基地快速发展，形成了数量众多、各具特色、功能多元的发展格局。2011 年，国务院批复张江高新区建设国家自主创新示范区，经过三轮扩区，目前张江高新区已形成“一区二十二园”的格局，面积达 531 平方公里，基本囊括了全市 17 个区县各类科技创新集聚区域。目前张江国家自主创新示范区已成为上海科技创新的主要载体。就成效来看，目前上海的科技创新园区已实现了创新要素、创新成果、创新产业和创新服务的集聚效应。上海这十年在社会发展领域取得的一大批成果也与各类科技创新园区的贡献密不可分。上海在建设科技创新园区方面的经验和做法也很值得分享。

Another example is the construction of sci-tech innovation parks. In 1984 and 1992, Caohejing Hi-Tech Park and Zhangjiang Hi-Tech Park were set up respectively. After a thirty-year-evolution, Shanghai sci-tech innovation parks have experienced rapid development and formed a pattern with large quantities, distinctive features and diversified functions. Since the official apply of the State Council on establishing National Innovation Demonstration Zone in Zhangjiang Hi-tech District, the District has gone through three expansions and now embraces 22 parks with an area of 531 km<sup>2</sup>, basically covering all kinds of regional sci-tech agglomeration in 17 districts and counties. At present, National Innovation Demonstration Zone in Zhangjiang Hi-tech District plays the role of main carrier in the field of sci-

tech innovation in Shanghai, generating agglomeration effect of innovative elements, innovative results, innovative industries and innovative services. Actually, what have been accomplished in the social development during the last decade cannot be separated from the contributions made by different sci-tech innovation parks. How Shanghai builds its sci-tech innovation parks is valuable experience worth of sharing.

再如崇明生态岛建设。可贵的是，崇明生态岛建设的蓝图一直在更新中，按照新近公布的《崇明世界级生态岛发展“十三五”规划》，到2020年，崇明要形成现代化生态岛基本框架。此外，生态环境建设取得显著成效，水体、植被、土壤、大气等生态环境要素品质不断提升，森林覆盖率达到30%，自然湿地保有率达到43%。被称为世界试验田的崇明生态岛建设在这十年朝着构建上海、长三角乃至全国重要的生态屏障这一既定目标迈出了坚实的几大步，成为上海城市和社会发展的名片。

And the last example is Chongming Eco-Island. It is inspiring to see that the blue print of the island construction has been updating. In the newly released Thirteenth Five Year Plan on Developing Chongming Island into A World-Class Eco-Island, it is projected to build a basic framework of modern ecological island by 2020. In addition, ecological environment development has achieved predominant outcomes in the continuous improvement of ecological environment including water, vegetation, soil and air. On the island, forest cover rate has reached 30%, and the wetland retention rate is 43%. In the last decade, as a world trial in eco-island development, Chongming Island has made significant progress in building itself as an important ecological barrier for Shanghai, Yangtze River Delta, and even for China, representing urban and social development in Shanghai.

目前崇明生态岛建设的现状，按照韩正书记在今年全国两会上海代表团会议上所做的介绍，崇明岛已成为自然鸟类的博物馆，在此停留的候鸟已从过去的十几种上升到上百种，每到春秋天的南迁北移时，场面非常壮观。

In the Shanghai delegation meeting of the National People's Conference (NPC) and the Chinese People's Political Consultative Conference (CPPCC) this year, Han Zheng, Secretary of CPC Shanghai Municipal Committee said that in the past, Chongming Island only had dozens of migratory birds staying around, and now it has become a museum housing hundreds kinds of birds, showing a spectacular view of birds migrating every spring and autumn.

翻开本成果集，近200项本市社会发展领域的创新成果一一展现在你面前，这些创新成果涉及城市建设发展、能源科技创新、高效便捷出行、城市安全运行、世博科技创新、崇明生态岛建设等专题，相信其中有不少是你熟悉的，因为其中很多成果已经直接惠及市民，但肯定还有不少是你不熟悉的。无论是你熟悉还是不熟悉的，这些成果中的每一项（每项文字表述只有寥寥数百字）的背后其实都有故事，上海这座特大城市的建设者、管理者用他们的汗水、智慧、拼搏和合作精神浇灌出了美丽上海的城市建设和发展之树。

As you open this book, there are nearly 200 innovation outcomes in the field of social development in Shanghai unfolding before your eyes, such as development of urban construction, energy technology innovation, efficient and convenient travel, urban safety operation, marine science and technology

innovation, Expo technology innovation, and Chongming Eco-Island development. Most of these achievements are no strangers to you as they have been directly beneficial to citizens, while there are still quite a few that you know little about. But in any case, we cannot ignore the stories behind any of the achievements though they are recorded with few words. It is the hard work, ingenuity, struggle and cooperation of the constructors and administrators of this mega city that makes outstanding achievements in the urban construction and development of Shanghai.

当然，如果要用几个关键词来概括这十年上海社会发展特色的话，创新、安全、绿色、民生等应该是出现频率最高的。

To sum up the characteristics of the development of Shanghai society in the last decade, I would like to use several high-frequency key words: innovation, safety, green and livelihood.

至于写作方式，这一版较第一版有一个明显的不同，除了每项成果的介绍更加言简意赅，在数百字以内的篇幅概要点出该项成果的背景、创新点和成果转化前景，多数情况下配有相应的图片以加强直观视觉感受外，还增加了该成果研发单位的信息。这样这本成果集又有了某种科技成果转化地图的资料功用。这一看似小小的调整其实是反映了一个大趋势的变化：即因应“一带一路”和“走出去”大趋势带来的变化和需求。

Compared with the first collection, the second one is distinctively featured in the content. First, the introduction to each accomplishment is more concise in hundreds of Chinese characters covering backgrounds, innovation and prospects of achievement transformation. Second, most introductions come with relevant pictures so as to highlight the visual sensation. In addition to the above two points, the second collection version also gives information of research affiliation, which turns the collection into material resources for the transformation of sci-tech products into map. This small adjustment reveals a major shift in response to the changes and demands brought by the dominant trend of the “Belt and Road” Initiative and the “Go Global” strategy.

“一带一路”沿线国家对许多和他们国家经济技术发展水平相应的实用性技术有强烈的需求，出版者将同步推出本成果集的英文版，并且在一开始就有这样的意识实在是搭准了脉。尽管这其中更多是商业行为，但是从上海作为全球试验田的层面分析，上海这些年来的社会发展实践（无论成功或失败）也理应为世界提供一些可选择的方案。其实上海（或者中国）早就有世界建筑市场之称，上海这些年建造的桥梁、隧道、公路、高楼以及难以计数的大型社会发展工程，由此所形成的经验和结出的创新之果应该让更多人分享。

Since countries along the “Belt and Road” have intensive demand for practical technologies that in line with their economic technology development, it's farsighted for the publisher to decide to launch an English version of this collection at the same time. Out of consideration for commercial benefits though, it is the high time that Shanghai, as a world trial, provide options in social development practices (achievements or failures) for the rest of the world. As a matter of fact, Shanghai (or China) has already been known as the market embracing world architectures, and it has carried out numerous large social development projects like bridges, tunnels, highways and tall buildings in the past years, and it should bear the responsibility to share these experiences and innovations with more countries.

“绿色技术银行”建设是这方面的一个最新案例。2015年，中国在联合国发展峰会上提出建设“绿色技术银行”的倡议，其核心是促进先进技术向其他发展中国家转移，一方面以绿色技术“走出去”支撑科技强国建设，另一方面带动绿色技术国际转移转化，推动实现2030年可持续发展议程目标，为全球科技创新驱动可持续发展作出贡献。2016年4月，国家科技部正式提出建设“绿色技术银行”，并在上海组织实施。上海市科委多次研商形成“绿色技术银行”建设方案：以技术服务、金融服务和价值实现为功能定位，构建“绿色技术信息平台”、“绿色技术转化平台”和“绿色技术金融平台”。三大平台将协同发展，辐射带动全市、全国乃至全球“一带一路”国家绿色技术转移转化。2016年11月，首个“绿色技术银行”试点工作在上海虹口区启动。

One of the latest cases is the building of “Bank of Green Technology”. In 2015, China initiated this proposal at The United Nations Development Summit, for the purpose of promoting the transfer of advanced technologies to other developing countries. On the one hand, it aims to help build powerful nation of science and technology by exporting green technology, on the other hand, to help green technology go global to drive the implementation of sustainable development agenda by 2030 so as to make contributions to sustainable development driven by global sci-tech innovations. In April 2016, Ministry of Science and Technology officially announced to build “Bank of Green Technology” in Shanghai. After repeated studies and discussions, Shanghai Science and Technology Committee drew up the development project of establishing green technology information platform, green technology transformation platform and green technology finance platform based on the functional orientation of technical service, financial service and value realization. The three platforms will work together to radiate Shanghai, China and countries along the “Belt and Road”, playing a leading role in the transfer and transformation of national green technology. Last November, the first trial of “Bank of Green Technology” was launched in Hongkou District, Shanghai.

“绿色技术银行”具有典型的全球视野、中国特色、上海追求。上海这十年的社会发展科创成果每一桩每一件都是有强烈的破解自身发展难题的针对性，这也是上海能推动这个“绿色技术银行”的底气所在。

“Bank of Green Technology” is provided with typical global perspective, Chinese characteristics and Shanghai pursuit. Each achievement made in the field of social development over the past decade is highly targeted at tackling challenges in its development, which makes Shanghai a competent city to launch “Bank of Green Technology”.

中国是当今世界最大的发展中国家，上海又是中国人口密度最高、社会发展和科技教育水平最高的特大型城市，上海的一举一动一定会牵动世界。从这个意义上讲，梳理近十年这座城市的社会发展走过的路，盘点我们的成果、经验和不足，既是未来发展之必须，也是留下痕迹以为世人评说、借鉴。如能达到这些效果，编者的目的就达到了。

China is the world’s largest developing country, and Shanghai is the most densely populated city in China. It enjoys the highest level of social development and sci-tech education, thus its every move is of

significance for the whole world. In this sense, it is necessary to review every step in the development of Shanghai society over the last decade, to conclude our achievements, experiences and imperfections not only for the future development but also for comments and references. And this is also what the editors expect to achieve.

编 者

Editors

2017 年 4 月 30 日

April 30, 2017



# 目录

Contents

序.....	1
Preface	
前言.....	1
Introduction	
城市建设发展篇——世界城市实验室交出的答卷.....	1
Urban Construction Development: Answering Sheets from World Urban Lab	
能源科技创新篇——能源创新，三箭齐发 .....	59
Energy Technology Innovation: Energy Innovation from Three Aspects	
生态环境保护篇——绿色发展，上海全力以赴.....	109
Ecological Environment Protection: Shanghai Strives to Achieve Green Development	
绿色高效出行篇——交通智能化正在成为现实.....	147
Green and Efficient Transportation: Traffic Intelligence is Coming True	
城市安全运行篇——宜未雨而绸缪，毋临渴而掘井.....	173
City Safe Operation: Preparing Ourselves in Advance	
世博科技集成示范篇——绿色生态城市见雏形.....	213
Expo Technology Integration Demonstration: The Embryonic Form of Green Ecological City	
崇明生态岛科技示范篇——努力建成全球绿色城市样本.....	255
Demonstration of Sci-technologies in Chongming Eco-island: Striving to be a Sample of Global Green City	
后记 .....	276
Postscript	



# 城市建设发展篇

——世界城市实验室交出的答卷

Urban Construction Development: Answering Sheets from World Urban Lab

有人说伴随着中国 30 多年来的改革开放，全世界的建筑资源都向中国聚拢，中国成了世界的建筑工地，此话不虚。以上海为例，这座城市如今的地铁运营长度已经傲立世界，并且设计、建设记录不断被刷新。但如果回望最近十年这座城市在城市建设发展上所取得的绩效时，人们会突然领悟到，有“世界建筑工地”之称的上海已悄然升级为世界城市建设发展的实验室。

It is said that the thirty-year reform and opening-up has made China a magnet attracting world architecture resources and a world construction site. It is true if we take a look at Shanghai. The city now enjoys the longest metro operation mileage worldwide, and is no stranger to new records in the field of design and construction. But it won't down on us that Shanghai is emerging as a world laboratory of the development of urban construction until we review what have been achieved in the development of Shanghai construction during the last ten years.

这十年来，上海在城市建设发展方面不再满足于刷新最大、最长、最高、最深的纪录，而更着力于提供一批更绿色、更集约、更智能的特大城市建设发展的技术和工艺规范。例如说到上海中心已不仅仅只是作为上海超高层建筑史上新的里程碑被人记住，而是因其采用的一系列绿色可持续发展技术，使她成为世界超高层建筑新生代的典范，其先进的产能、供能、用能、蓄能、节能技术，并用物联网将微电网、微热网和基于物联网的信息网联系在一起，为高层建筑的分布式供能推广、能源保障和多能源综合最优利用提供了样板。

Nonetheless, Shanghai won't stop at being a record-breaker in urban construction over the past decade. It will make more dedicated efforts to provide the development of mega city construction with technologies and process specification that are more environmental-friendly, intensive and intelligent. For example, Shanghai Tower is not only a new milestone in the history of super high-rise building construction in Shanghai, but also serves as an excellent example for its new counterparts all over the world for its adoption of a series of green and sustainable development technologies. Shanghai Tower is equipped with advanced technologies of capacity, energy supply, energy efficiency, energy storage and energy saving, and it also applies Internet of things to connect micro-grids, micro-heating network and information network based on the Internet of things, which provides a model for high-rise building construction in extension of distributed energy supply, energy security and optimal utilization of integrated energies.

同样，上海城市建设者充分意识到建筑工程工业化建造关键技术与示范具有根本性意义。近十年来，相关的建筑工程工业化建造关键技术已在沪、京、津、广等地逾 400 万平方米的示范项目得到推广应用。类似的大型复杂轨道交通地下枢纽施工关键技术研究、超高层建筑施工技术集成体系与示范应用等，这些上升到规范的“尚方宝剑”就是上海广大建设者、管理者向世人交出的答卷。

Similarly, the Shanghai city builders are fully aware of the fundamental importance of demonstration of key technology of the industrialization of architectural engineering construction. In the recent decade, this technology has been applied widely in more than 4 million m<sup>2</sup> of demonstration projects among Shanghai, Beijing, Tianjin and Guangdong. Other standardized applications such as key technology research of large and complex construction of underground hub for rail traffic and integration system and demonstration application of high-rise building construction are clouds that the builders and administrators of Shanghai delivered to this world.

（江世亮执笔）

(Written by Jiang Shiliang)

# 为超高层建筑施工技术立规

## To Impose Regulations on Super High-rise Building Construction

### 超高层建筑施工技术集成体系与应用

### Integrated System and Application of Super High-rise Building Construction Technology

上海作为远东国际大都市和中国对外开放的窗口，土地资源一直比较稀缺，对发展超高层建筑的需求也非常迫切。上海浅层地基松软，承载力低，发展更大规模的超高层建筑有赖于基础工程技术的突破。造型新颖的超高层建筑结构施工和安装的难度越来越大，建造过程中存在的不可预测因素日益增多，对数字化建造技术的创新发展提出了更高的要求。目前上海超高层建筑施工还是一项劳动密集型工作，生产效率低，工程难度大，而本集成技术的开发应用，极大地促进了超高层建筑的开发水平和生产力的提高，有效地缓解了人类活动空间不断扩大与土地不可再生之间的矛盾，是上海市建筑业的一次突破性发展。

Shanghai, as an east international metropolis in the Far East and a showcase of China's opening up, is a city of scarce land resources and thus sees urgent demand for super high-rise buildings. Due to the soft shallow ground with poor bearing capacity, larger scale of super high-rise building construction depends on breakthroughs in foundation engineering technology. As the construction and installation of super high-rise building structure featured unique design are becoming more and more difficult, the unpredictable factors in the construction process are growing, which puts forward more strict requirements for the innovation and development of the digital construction technology. At present, super high-rise construction in Shanghai is labor intensive, inefficient and has great difficulties. Given this situation, the development and application of this integral technology can significantly improve the development level of super high-rise building and the productivity, and mitigate the contradiction between increasing human demand for activity space and non-renewable land resources, which can be regarded as a breakthrough of construction industry in Shanghai.