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Affordable Housing Under Shaping Dense Vertical Urbanism
创建密集垂直城市环境条件下的保障性住房

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Abstract | 摘要

Rapid urbanization causes major problems of urban sprawl and social stratification, and at the same time it opens up new opportunities of shaping dense vertical urbanism and searching for innovative models of affordable high-rise housing. To improve the quality of living remains a topical issue. Herewith, comfortable housing is one of the basic human needs. In that context it is of great interest to analyze the large-scale housing program of affordable housing construction in Hong Kong and Singapore. Having faced the problems of scarcity of land and overpopulation, active development of high-rise construction including high-rise public housing took place in these cities. It is concluded that the search for new forms of high-rise affordable housing is the best way forward for urban development, not only under the conditions of scarcity of land, but also in the fight against urban sprawl.

Keywords: Affordable Housing, Human Comfort, Quality of Living, Vertical Urbanism

快速城市化正在产生严重的问题：城市扩张和社会人口分级，同时也创造了新的机遇：创建密集垂直城市环境，寻找创新型高层经济适用房。人口生活质量提高的问题依然急迫。而舒适的住房是人类基本需求之一。因此，在香港和新加坡进行大规模的经济适用房项目可行性分析也体现了极大的兴趣。由于城市土地紧缺和人口密度过大的问题，这两个城市开始积极发展高层建筑的道路，其中包括公共住房。得出结论如下，寻找新型高层经济适用房不仅是土地紧缺，也是打击城市面积无节制扩张环境下城市最可靠发展道路。

关键词：负担得起的房子、人体舒适度、生活质量、垂直城市化

World urbanization goes forward rapidly. Between 1950 and 2007 the urban population increased four times and reached 49% of the world's population. In 2015 the urban population was 54% already. There are 34 megacities with over 10 million population (Figure 1) and 75 cities with the population of over 5 million. In general the trend to the enlargement of cities is clear. Compared to 2014 the number of cities with the population of over 1 million people has grown from 466 to 498.

The classification of the United Nations divides all countries in the world into three major groups according to their socio-economic development: developed countries, transition countries and developing countries.

Developed countries nowadays are characterized by the following trends: the highest urbanization level (urban population is about 74% of the whole population), low growth rate of urban population, and rapid aging of the population.

While in **transition countries** the urbanization level is quite high, in some cities population decline and rapid aging are observed.

世界城市化进程持续高速发展。1950年至2007年间，城市人口增长了四倍，达到全球人口总数的49%。2015年城市人口已经达到54%。居民人口超过1千万（图1）的大都市有34个，75个城市人口超过5百万。总体来说，还可以看到城市合并的趋势。与2014年相比，1百万以上人口城市数量从466个增加到了498个。

根据联合国分类办法，世界上所有国家按照社会经济发展水平分为3类：发达国家，经济转型国家和发展中国家。

发达国家如今具有以下趋势特征：达到最高城市化水平（74%人口居住在城市）；同时，城市人口增长速度慢；人口快速老龄化。

经济转型期国家城市化水平高，部分城市居民人口减少，人口快速老龄化。

发展中国家约44%的人口居住在城市。而且，部分地区（例如，非洲和亚洲）达到了最快的城市化速度。预期2050年亚非城市人口数量将增长到67%。据预测，2030年发展中国家60%城市人口是年龄低于18岁的年轻人。 但是，城市化是在贫困规模扩大的条件下发展的。超过30%的城市人口居住在贫民窟。而且，世界上现有的
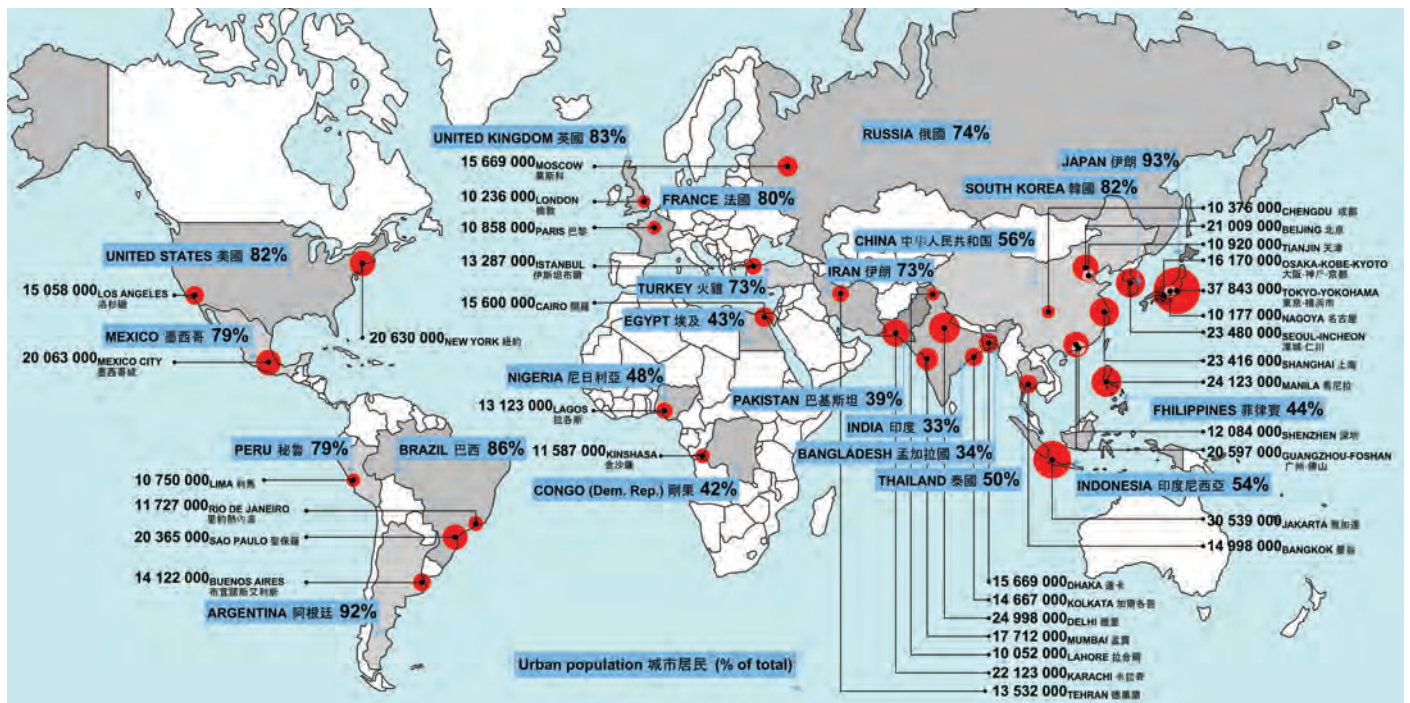
Figure 1. Megacities on the world map (Source: Elena Generalova)
图1. 世界地图上的大都市（来源：Elena Generalova）

In **developing countries** the urban population is about 44%. At the same time, in some regions (Africa and Asia in particular), the urbanization rate is the highest. In 2050 the urban population is expected to reach up to 67%. According to forecasts in 2030, in developing countries   60% of urban population will comprise young people under 18 years old. However, urbanization is happening along with the increasing levels of poverty. More than 30% of the urban population lives in slums. 26 of 34 existing megacities in the world are in developing countries.

Rapid urbanization is related to a number of negative processes. In the papers of UN-Habitat it is noted that the most notable consequences of these negative processes are the rapid growth of some cities along with the degradation of others, as well as the spread of urban areas and urban sprawl. Serious problems of uncontrolled urban growth include the expansion of suburban areas, low density urban development, high dependence on private cars, housing shortages, construction of informal settlements, social and territorial isolation of the population, poverty, crime, and other social ills. There remain such topical issues as poverty reduction and improving of life quality. At that, comfortable housing is one of the basic human needs and the lack of affordable housing and infrastructure degradation are common problems of modern cities.

This study offers to look at the **special features of shaping the affordable housing sector** in the context of comprehensive approach to the problems of large cities and urban sprawl. The ways of solving the problems are in searching for new, more sustainable urban development systems such as "compact cities." The terms "compact cities" and "smart growth" are combined by the principles of urban development. Such urban development implies compactness and efficient use of resources. As a result, a comfortable living environment is formed at all levels – "city," "house," and "apartment."

Principles are:

1. **State planning.** The inclusion of territorial planning in the public sector functions; forming the sector of affordable public housing that includes the criteria definition to identify categories of people requiring affordable housing; at national level the implementation of space-planning standards of affordable housing; search for flexible systems and forms of housing.

2. **High-density urban development.** High-density urban development including its active vertical development takes the lead in organizing a cost-effective distribution of urban resources.

3. **Mixed-uses. Th**is means that residential, commercial and production functions, personal services and recreational facilities should be located in one district. It has replaced the principle of distinct spatial zoning of cities for residential, industrial, business and recreational areas.

34个大都市中的26个正好就位于发展中国家。

快速城市化与一系列负面发展息息相关。联合国人居署出版刊物中指出，这些负面发展最明显的后果就是一些城市快速发展的同时其他城市开始衰落，以及城市面积的蔓延和无节制的增长。城市无节制扩张的严重问题包括：城市郊区扩大；城市建筑密度低；高度依赖个人汽车；住房紧缺；非正规居民区建设；人口社会和地区隔绝；贫困；犯罪和其他社会弊端。诸如消除贫困和改善居民生活质量此类的问题仍然很迫切。而舒适的住房是人类基本需求之一，经济适用房供应不足，基础设施退化都是现代城市的通病。

本文是研究综合解决大城市问题和延缓无节制扩张趋势的环境下**经济适用房领域组成特点**。解决途径应该从新型、更合理城市规划体系（如"紧凑型城市"）的方向中寻找。术语"紧凑型城市"或"精明增长"联合了城市建设的所有原则，包括布局紧凑、高效利用资源，最终形成"城市"，"门栋"，"房间"各级别舒适的居住环境。

此类原则包括：

1. **国家规划**。将地区规划纳入国家部门功能。形成国家保障性住房部门，包括：确定保障性住房需求级别认定标准；制定国家级别的保障性住房空间规划标准；寻找保障性住房弹性系统和分配形式。

2. **城市建设密集度高**。提高城市建设密集度，包括积极进行垂直发展对于经济有效地分配城市资源具有重要作用。

4. **The accessible city. Th**is principle is closely related to the previous one. Mixed-uses should encourage the emerging of densely-populated districts where everything needed is in walkable neighborhoods. Easy access is provided to a wide range of personal services, workplaces, municipal, cultural and educational facilities, etc.

5. **Typological housing diversity. B**uilding housing for different demographic groups, such as senior citizens, youth, young families, families with children, multi-generation families and so on.

6. **Mixed-income housing. C**lose living of various social groups with different income levels in one city area is necessary for decreasing social and class segregation.

7. **Housing development focused on public transport. C**reating the possibilities for reducing the use of private transport, the implementation of this principle is closely related to the housing density indicator. It has been proven that the increase of population density stimulates the efficiency of public transport.

8. **Integration of different means of public transport. A**ctive development of public transport of increased capacity, such as metro, light rail, and bus rapid transit. It should be kept in mind that public transport will work effectively only if pedestrian-friendly approaches to public transport stations are provided.

9. **Cost-effective and environmentally-friendly urban solutions. This is aim**ed at sustainable development (i.e., the use of eco-friendly building materials and structures, creation of an eco-climate, energy-efficient apartments, and public spaces, etc.). The introduction of modern "green" technologies and systems does not mean the economy cut of today only, but investment in the future.

The above mentioned principles are well known as they have been described in some research papers. However, we would like to analyze how these principles work in the real world of urban development. In this regard, great interest is given to the resulting analysis of large-scale public housing programs for the development of affordable housing in Hong Kong (launched in 1953) and Singapore (launched in 1960). The results show that to overcome housing crises, they relied on the development of **affordable public housing**. It is proposed to examine this experience and

consider it according to the listed principles of a city's "smart growth."

Singapore – HDB Communities

In Singapore "The Housing & Development Board" (HDB) set up in 1960 is responsible for public housing management. As a result, over 80% of Singapore's residential population lives in public housing, which amounts to over one million apartments. Initially, HDB-housing was meant for rental lease, but soon the policy changed and it was permitted to transfer the ownership of HDB apartments to private property. The government uses various instruments of financial support to make home ownership highly affordable and attractive for families with different income levels (e.g., public subsidies, soft loans, or savings in Central Provident Fund). As a result, nowadays about 80% of HDB residents own their HDB flat.

At first, all HDB-housing was built by the state. However, since 2005 the Design, Build and Sell Scheme has been implemented. A private developer may design, build and sell apartments that can be applied to the home buying government support system. It stimulates competitiveness, while improving the quality and diversity of affordable housing.

Every five years, HDB carries out a large-scale sample survey of households. A number of parameters are examined, such as the demographic characteristics of the residential population, household composition, economic characteristics of households, satisfaction with physical living environment, satisfaction and usage of estate facilities, residential mobility and housing aspirations, and social well-being of HDB communities, etc. The monitoring is required for determining the direction of public housing development. The data received is the basis for new projects' development.

The affordable housing market in Singapore is created under the conditions of land scarcity. It stimulates the search for various models of a dense vertical urban environment. Singapore's experience breaks the stereotype that high-rise housing is expensive and apartments in skyscrapers are for rich people only. In Singapore, the framework of the strategy for providing mass market consumers with affordable and comfortable housing and the design of high-rise residential complexes is actively developed (Figure 2).

3. **土地混合使用。**这意味着，在同一个区域内应该设计生活、商业、生产区域，生活服务和休闲地点。这个原则用于替代城市生活、工业、商业、娱乐区域硬性分区原则。

4. **城市环境可用性。**这个原则与前一条土地混合使用紧密联系，应该促进高密度人口小区的形成，所有必要配套设施均位于步行可到达区域。轻松获得社会生活和公共服务，教育与文化设施，工作地点等广泛的组合。

5. **住房类型多元化。**针对不同人群建设不同的住房（老人，年轻人，年轻家庭，有孩子的家庭，几代人组成的家庭等）

6. **收入水平不同人群住房。**收入水平存在差异的人群共同居住在同一个区域内必须减少社会阶层隔离。

7. **适用于公共交通的建设。**为减少个人交通工具出行创造条件。该原则的执行与建筑密度水平紧密关联。已经证实，随着人口密度的提高，公共交通的有效性也会随着提高。

Figure 2. High-rise HDB complexes in Singapore: 1 – Pinnacle@Duxton; 2 – City View@Boon Keng, 3 – Peak@Toa Payoh, 4 – Natura Loft@Bishan, 5 – Park Central@Ang Mo Kio (Source: Elena Generalova)
图2. 新加坡高层公共房屋（HDB）：1 – Pinnacle@Duxton; 2 – City View@Boon Keng, 3 – Peak@Toa Payoh, 4 – Natura Loft@Bishan, 5 – Park Central@Ang Mo Kio（来源：Elena Generalova）

Figure 3. Types of HDB flats in Singapore. (Source: http://www.hdb.gov.sg/cs/infoweb/residential/buying-a-flat/new/types-of-flats; illustration source: Elena Generalova)

图3. 新加坡公共房屋套间设计类型。（来源：http://www.hdb.gov.sg/cs/infoweb/residential/buying-a-flat/new/types-of-flats; 图解来源：Elena Generalova）

The Housing and Development Board introduced the new town planning concept of building new towns across Singapore. Nowadays there are 23 "HDB Towns" and 3 estates. Each new town is designed to be comfortable and completely self-sustainable. There are workplaces including industrial enterprises. Educational, health care and sport facilities, recreation areas and multi-story parking structures are also provided.

Public housing in Singapore is designed according to the principle of multi-story and high-rise residential complexes with well-developed public service systems. That is all needed for a healthy lifestyle and social interaction (i.e., children's playgrounds, wellness stations for people of all age groups, public spaces and community facilities, precinct pavilions, barbeque areas, pergolas, and green areas, etc.). On the first floor there are childcare facilities. Schools and utility centers are built in walkable neighborhoods.

Particular attention should be paid to the distinct comfort standard of HDB public housing. There are six types of flats: 2-room Flexi, 3-room, 4-room, 5-room, 3Gen (designed for multi-generation households), and Executive Flat. These planning schemes are not just guidelines for area and the number of bedrooms and bathrooms (Figure 3). Such an indicator as the HDB Resident Population by Flat Type is of special interest. According to statistics in 2013 most HDB-residents lived in 4-room flats at 41.1%, followed by 5-room flats with 26.6%, and 3-room flats with 19.3%.

8. **整合各类公共交通工具**。积极发展大容量公共交通 – 地铁，轻轨和快速公交。同时，必须谨记，公共交通有效运行的前提条件是为行人建设到达车站的便利通道，以及居民区的混合使用。

9. **生态与节能**。这是持续发展方针：应用生态环保设计和建筑材料，创建健康的微环境，房屋和公共空间节能等等。运用现代化"绿色"技术和系统，这不仅是今天的节省，也是对未来的贡献。

上述原则众所周知，也在一系列研究中也进行了报道。然而，必须分析这些原则在真实的城市建设条件下的应用情况。因此，香港（开始实施时间1953年）和新加坡（开始实施时间1960年）大规模公共保障性住房项目实施成果分析表现出了广泛的兴趣。结果显示，为了走出住房危机，他们努力创建了发达的**公共保障性住房**部门。建议全方位研究这方面的经验，按照上述城市"精明增长"原则逐条进行研究。

新加坡 – HDB组屋

新加坡国家住房管理机关是成立于1960年的建屋发展局"The Housing & Development Board"（HDB）。新加坡80%的人口居住在国家住房中。房屋数量超过1百万。最初HDB住房是用来出租的，但是很快政策改变了，HDB房屋允许买卖。为了让收入水平各异的家庭能够买得起房屋，政府应用各类财政支持手段：

政府补助；优惠贷款；中央储蓄基金存款。最终现在约80%的HDB居民已成为房屋的所有人。

最初所有的HDB房屋均由政府承建。而，2005年以后开始执行公私合作制 – Design, Build and Sell Scheme。私人开发展可以设计、建造和销售国家房屋购买支持系统内的房屋。该举措促进了竞争、提高了保障性住房的质量和样式。

每五年HDB都会进行大规模的住户抽样调查。全方位的综合分析将得出一系列的数据：常住人口特征；住户人员组成；住户经济状况；居住环境质量满意度；公共服务满意度；流动性；社会福利等。该监控是确定国家住房发展方向必须的措施。获得的资料是建设新项目的基础。

新加坡保障性住房市场的形成是在土地严重紧缺的条件下进行的。这也成为了寻找不同紧凑型垂直城市环境的动力。新加坡的经验打破了长久以来的固定模式，高层建筑是造价高昂的享受，而摩天大楼的房屋只是富人专属。新加坡大众保障性和舒适住房战略框架下正积极发展高层居民建筑的设计和建设（图2）。

为建设HDB住房制定了一套全新的城市规划理念 – 全新加坡从无到有的新"城市"建设。现在有23个"HDB Towns"和3个estates。结构设计旨在建造舒适和自给自足式住房：工作地点（包括工业企业），教育、卫生机构，体育设施，休闲区，多层停车场等。

新加坡的国家住房按照具有发达公共服务系统的多层和高层居民建筑标准设计。这是健康生活方式和社会交际最基本的：儿童乐园，不同年龄人群运动区域，集体活动亭子和平台，烧烤区，休闲凉亭，绿地等。房屋一层开设育儿机构（幼儿园和俱乐部）。学校和社区中心修建在步行可到达范围内。

应特别注意的是国家HDB房屋舒适度存在明确的标准。房屋包括6中不同类型：2-room Flexi，3-room，4-room，5-room，3Gen（适用于三代和两代人以上家庭）以及Executive Flat。每种不同的类型不仅制定了建议面积、卧室和浴室数量，还有设计平面图（图3）。诸如HDB Resident Population by Flat Type的数据也表现出了兴趣。根据2013年统计数据，大部分居民居住在4-room flats– 41,1%; in 5-room flats – 26,6%; in 3-room flats – 19,3%。

HDB房屋户型多样性探索一直在继续。可以举一个例子，SkyVille @ Dawson组屋是新加坡看待国家住房的新眼光。居住在大组屋人们的社区归属感问题也得到了解决。sky villages将大楼按照高度划分成

Figure 4. SkyVille @ Dawson (47 floors, 960 flats), WOHA Architects (Source: http://www.woha.net/#SkyVille@Dawson)
图4. SkyVille@Dawson（47层，960个套间），WOHA建筑事务所（来源：http://www.woha.net/#SkyVille@Dawson）

The search for new typological diversity of HDB-flats goes on. As an example, the complex SkyVille @ Dawson should be considered; it is a new look at public housing in Singapore. The problem of creating a sense of community among people who live in a huge complex is solved. The height of towers is divided into 11-story blocks ("sky villages") by a naturally ventilated community terrace and garden. Each sky village has 80 apartments. One of the key elements of the concept is the flexible open-plan design. Such flats have no internal load-bearing walls. This fact allows taking various space-planning decisions according to the requirements of residents, the size of a family and its lifestyle. Three space-planning options are offered for 5-room flats (Figure 4).

The elderly population of Singapore is paid special attention to. Experts study the problem of population aging. A special government program (Senior Priority Scheme) and the typology of apartments (2-room Flexi) have been created. While building residential complexes for the elderly, the problem of combining small apartments with the system of social support and health care is solved. The social service hub for elderly residents is built nearby. At the same time they try to avoid the problems of large and rather isolated communities of elderly people. Space-planning decisions for residential complexes

that allow mixing the different age groups are searched for. For example the residential complex SkyTerrace @ Dawson solves the problem of multi-generation families. The complex consists of 5 towers. The towers are connected by Green Bridges that have community functions. A key innovation is the combination of large apartments, loft units and small studio apartments. These apartments can be used independently or combined. The combination of apartments opens up additional opportunities for large families or allows developing a home-office (Figure 5).

In Singapore they try not to create rich and poor neighborhoods. Besides, the Ethnic Integration Policy was adopted in 1989. The Singapore Permanent Resident Quota was implemented to better integrate SPR families into the local community. The Ethnic Integration Policy helps to maintain a good ethnic mix in HDB towns, thereby helping to promote racial integration and harmony.

All HDB residential areas are characterized by a developed public transport infrastructure. The Government encourages the use of public transport. Singapore's Metro (79 stations) provides fast, cost-effective and very comfortable access to any part of the island-city along with comfortable bus service. Light Rail Transit (LRT) is developing rapidly.

11层楼房的公共空间的创意值得推荐。这个概念当中最重要的元素是房屋的弹性规划。房屋内部无承重墙设计能够让居民按照家庭人员数量和生活方式来选个不同的规划方案。对于5-room flats有3种规划方案（图4）。

新加坡老年居民备受关注。专家一直在研究人口老化的问题。对于这类人群设计了专门的国家项目(Senior Priority Scheme – SPS)以及房屋类型2-room Flexi。 老年人住宅区建设的同时解决了小户型与社会支持和医疗养老服务结合的难题。附近修建专门的社区服务中心。同时，尽量避免形成大型单独老年人社区导致的问题。正在寻求居住社区空间规划方案，让不同年龄人口共同生活。例如，SkyTerrace@Dawson社区解决了由几代人组成家庭的问题。该社区由5栋大楼组成。各个大楼通过绿色廊桥连接，同时赋予其公共职能。关键创新是大户型阁楼（L形户型）和小户型公寓（ 长条形户型）。这些房屋可以独立使用或者合并使用。房屋合并给大家庭或家庭办公创造了更多的条件（图5）。

新加坡尽量不修建富人区和贫民区。除此之外，1989年还通过了"民族一体化政策"。也就是说，每套住房、每个小区都是新加坡的人口缩影。这样能够保存多元文化特色，并保证HDB Towns内部不同民族群体均衡与和谐的相处。

所有HDB居民区的特色是发达的公共交通设施。国家政府多方鼓励使用公共交通。新加坡地铁（79站）是抵达这个城市岛国任何地点最快捷、经济和舒适的方式。与地铁不相上下的是舒适的公交车。新加坡也正在积极发展轻轨 – LRT。新加坡现有三条轻轨线。这三条线都位

Figure 5. SkyTerrace @ Dawson, SCDA Architects (Source: http://www.scdaarchitects.com)
图5. SkyTerrace @ Dawson，SCDA建筑事务所（来源：http://www.scdaarchitects.com）

Figure 6. Light Rail Transit (LRT) in Singapore, Punggol LRT Line (Source: Elena Generalova)
图6. Light Rail Transit (LRT) in Singapore, Punggol LRT Line（来源： Elena Generalova）

There are three lines of LRT in Singapore. The lines run on viaducts and link to MRT stations (Figure 6).

Covered walkways are the so called architectural landmark of Singapore's living environment. This architectural element exists due to the acute need from protection from the scorching sunshine and pouring rains. Such networks of covered walkways and crossings are constructed in all residential areas. Moving on to enhancing the walking experience for pedestrians, all MRT and LRT stations will be connected by covered walkways to nearby schools and healthcare facilities by 2018 (Figure 7).

A lot of effort is taken to create the living environment in HDB Towns according to the principle of Smart and Sustainable Living. The HDB GreenPrint program was launched in 2012. Its main goal is to guide greener HDB town development and extend the concept of green and sustainable lifestyles in HDB communities. The HDB GreenPrint introduces sustainability initiatives in areas: Waste Management (Pneumatic Waste Conveyance System); Energy Conservation (Solar Photo Voltaic system); Elevator Energy Regeneration System; Light Emitting Diode lighting in streets, on stairs, in halls and lift lobbies; Water Conservation (Rainwater Harvesting System) and its use for technical purposes; Green Commuting (Cycling Path Network); and Greenery (Use of Greenery on Roof Tops and Facades for Cooling).

The given facts prove that Singapore applies a comprehensive approach to the development of affordable public housing as an integral part of urban policy based on the principles of a city "Smart growth."

Hong Kong – shaping dense vertical urbanism

Hong Kong, officially Hong Kong Special Administrative Region of the People's Republic of China, is one of the leading financial centers of Asia and the whole world. In December of 1953 a great fire destroyed homes of over 50 000 people. It prompted the development of public housing. Hong Kong Housing Authority (HA) and the Hong Kong Housing Society (HKHS) are the major organizations that are responsible for public construction and public property management. Nowadays, about

Figure 7. The accessible city of Singapore (Source: Elena Generalova)
图7. 新加坡城市环境实用性（来源： Elena Generalova）

于地面上的高架桥上，与地铁车站相互连接（图6）。

新加坡居住环境的特有名片是封闭式人行天桥。这个规划元素是避免烈日和暴雨迫切的需求决定的。这种天桥网已经覆盖了所有居民区。天桥也可以通往公共交通站点。持续完善居民区内的无障碍人行道的同时，计划在2018年前将所有地铁站与最近的学校和医疗机构通过封闭式走廊连接起来（图7）。

投入很多精力构建Smart and Sustainable Living原则HDB Towns居住环境。2012年启动了HDB GreenPrint综合项目。主要任务是实现HDB社区绿色和可持续发展生活方式的理念。项目要点：废物处理 – 引进气动垃圾收集系统；节能 – 安装太阳能光伏系统、节能电梯、LED路灯、楼梯和电梯走廊照明；节水 – 应用雨水收集并用于技术目标的系统；Green Commuting – 积极发展社区内自行车出行；Greenery － 房屋屋顶和正面绿化用于冷却房屋墙面和周边环境。

上述资料证明，新加坡正全方位的构建保障性国家住房，并将此作为城市"精明增长"建设政策不可缺少的要素。

香港 – 构建密集垂直城市环境

香港是中国的特别行政区，亚洲和世界主要金融中心之一。推动公共房屋发展的是1953年的一场大火，它导致5万多人一夜之间流离失所。现在香港公共不动产的建设和管理主要由两个机构负责：香港房屋委员会（HA）和香港房屋协会（HKHS）。如今，大约有30%的居民生活在公共房屋中。

应特别指出的是老旧危房改造计划(Estate Redevelopment and Rehabilitation)也属于HKHS职权范围。这个计划十分迫切，

30% of Hong Kong's population lives in public rental housing.

It should be noted that HKHS realizes the program of Estate Redevelopment and Rehabilitation. This program is considered to be extremely important, as according to statistics of 2013, 33% of all public housing was built over 30 years ago. Public housing is rehabilitated in accordance with the principle of "preserve, don't destruct" that helps to take care of the neighbor relations and support the existing communities.

Public housing in Hong Kong was formed under rapid population growth and land scarcity. The situation was complicated by an uneven, undulating topography. For example, a large part of Hong Kong Island (over 75%) is still undeveloped because it is dominated by steep, hilly terrain, which makes it the home of some rather unusual methods of transport up and down the slopes. That is why after a long search Hong Kong has developed high-rise public housing complexes.

New public housing is built along with public facilities: shopping centers, catering companies, schools, kindergartens, and public service facilities, etc. For the redevelopment of old public objects, new social, cultural and community facilities are provided in order to strengthen the existing communities. On account of population aging in Hong Kong the concept of "universal design" for public housing was adopted. The concept involves the development of buildings and living environment taking into account the people's needs at different stages of life. The main goal is to form a barrier-free, safe and comfortable living environment at all levels: from a flat to the arranged local area.

The types of flats in Hong Kong public residential complexes differ much from Singapore's standards. In order to understand special features of this typology it is necessary to trace the historical background of public apartment developments.

The first blocks of public housing (6–7 floors) were built in 1954. In each block the apartments were grouped in two rows with access from an open gallery. There was no water supply and sewerage in the apartments. The residents could use only shared toilets and bathrooms located on each floor. An apartment-room was 11.15 m2 and was to accommodate five adults, 2.23 m2 for each resident (Figure 8). Then, a number of typological planning decisions were taken for residential blocks. Nowadays the average living area per resident is 7–10 m2.
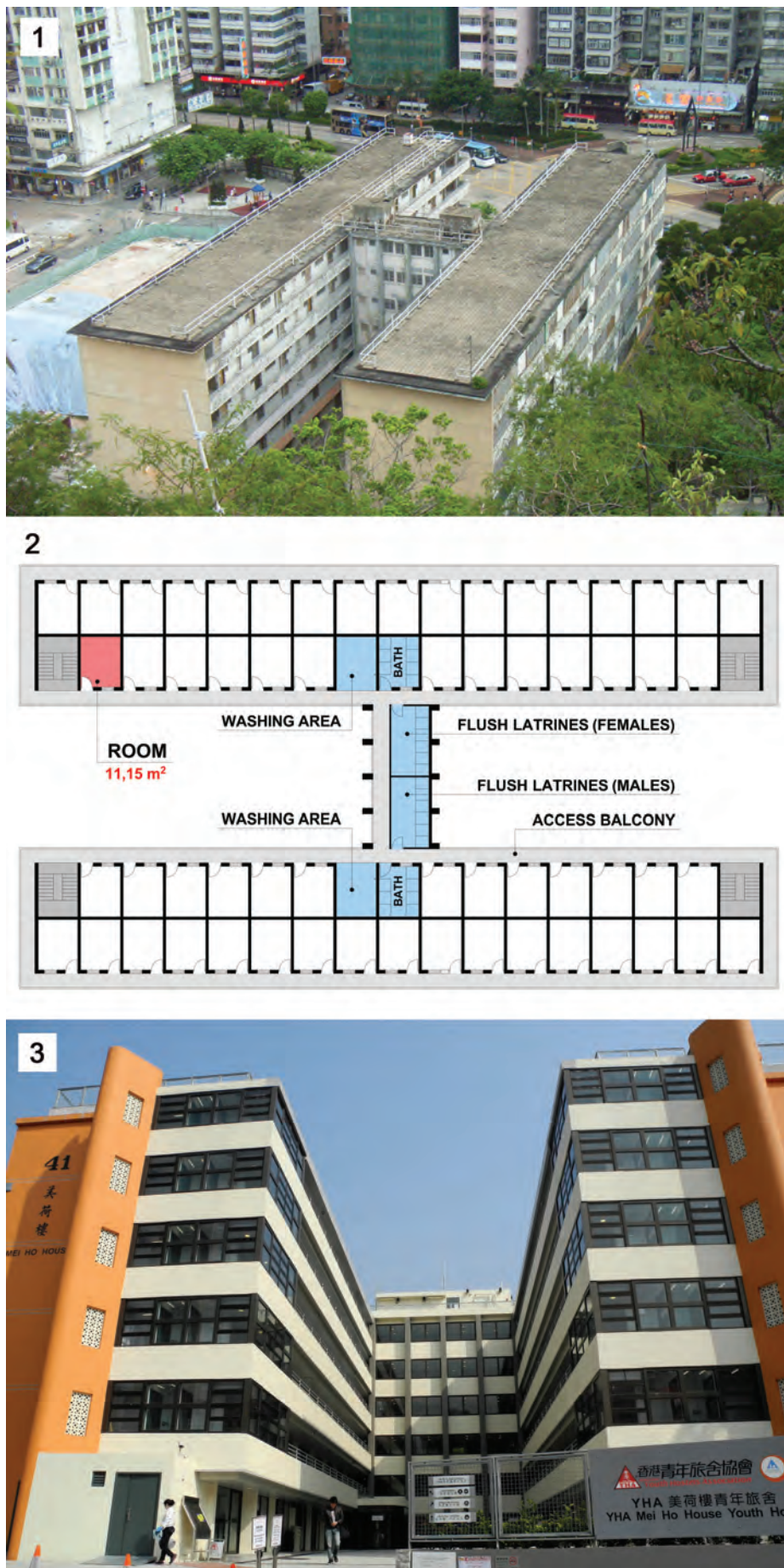

Figure 8. The first blocks of public housing in Hong Kong: 1, 2 – Mei Ho House is the last remaining example of a "Mark I" in 2009, before renovation; 3 – Mei Ho House in 2013, after renovation (Source: https://en.wikipedia.org/wiki/Mei_Ho_House)

图8. 香港公共房屋首批套间: 1, 2 – Mei Ho House（美荷楼） – 保存下来的最后一个Mark I居民房实例，2009 年，改造之前; 3 – Mei Ho House 2013年改造之后（来源: https://en.wikipedia.org/wiki/Mei_Ho_House）
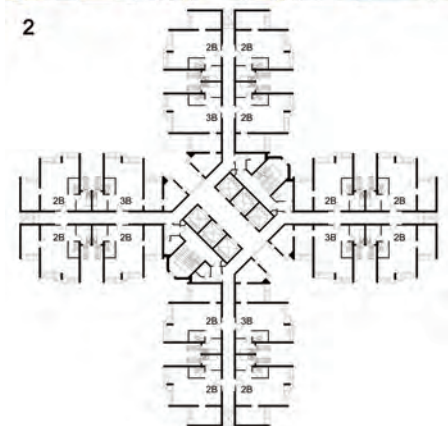
因为根据2013年数据33%的公共房屋年限超过30年。现在正按照"保存而非破坏"的原则对公共房屋进行长期的改造，这也有助于爱惜邻里关系，支持已有社区。

香港公共房屋是在人口急速增长和土地资源紧缺的条件下建设起来的。复杂的丘陵地形也加剧了这种情形。例如，香港半岛上大部分面积（75%以上）尚未开发，这些地方都是陡峭的山坡。正因为这样，经过了对此类房屋优化解决方案漫长的寻找道路，香港最终形成了高层公共房屋结构体系。

正在修建的新公共房屋将配套公共设施 – 商场、公共餐饮企业、学校、幼儿园、生活服务机构等。公共不动产老旧房屋改造工程中会添加新的社会和文化生活服务设施，加强现有社区内的联系，赋予其更多的生活能量。

近年来，由于香港人口老龄化，制定并通过了公共房屋"多功能设计"的构想，将设计内部能够满足人群不同生命阶段各种需求生活环境的楼房。主要任务是构建从房屋到周边设施各种条件下无障碍、安全和舒适的生活环境。

香港公共房屋内的户型与新加坡的标准大相径庭。为了理解户型分类的特点，必须研究公共房屋转型的历史道路。

第一批公共房屋（6–7层）修建于1954年。每栋楼房的房屋被分为两列，中间有走廊相连。房屋内没有水管和排水系统。只能使用每个楼层的公共厕所和浴室。套

间内房间面积11.15平米，适用于五个成人居住，每位居民平均面积仅2.23平米（图8）。后来设计并应用了一系列居民房设计标准解决方案。到今天，人均居住面积为7,0 – 10,0 平米。

20世纪90年代选定了规划方案的标准化方向。开始积极使用以使用复杂程度各异的大型预制件为基础的预制建筑技术：完整的前面板，半预制楼板，楼梯，大型预制件 – 厨房和浴室，垃圾通道，电梯井等。设计出了标准的工程系统组件（供气，供水和排水），用于从房屋正面外部搭建。Harmony Blocks的设计和应用可认为是真正的突破。2000年应用了新的标准模块New Harmony 1（图9）。

如今住房模块化设计(Modular Flat Design)是最为紧迫的问题。他能最大限度的优化典型结构元件的数量，为建设不同组成结构的居民大楼创造条件，灵活考虑具体修建地段的城市建设特点。总共设计出了4种住房单元（图10）。从已有的系列类型中可以看出，香港的房屋已经完全可以称得上世界上最紧凑的房屋之一了。

大量精力投入到居民公用出租房的发展与建设战略(Senior Citizen Residences (SEN) Scheme)。基本原则是为年龄逐渐老去的人们创造居家式的舒适生活条件ageing in place。主要任务：整合同一楼房中的居住与服务，探索公共和私人生活之间平衡最大化，保障安全，契合不同健康状况（从健康到衰弱）等等。除居住房屋之外，还规划了所有舒适生活的必要条件：医疗服务、游泳池、健身房、多功能

Figure 9. 1 – Choi Tak Estate; 2 – New Harmony 1 Block Type (40 floors, 16–20 apartments on each floor, 800 apartments in a building) – floor plan (Source: Elena Generalova)
图9. 1 – Choi Tak Estate; 2 – New Harmony 1 Block Type（40 层，每层楼16–20个套间，楼房内有800个套间）– 楼层规划（来源：Elena Generalova）

In 1990 it was decided to standardize the space-planning. They began to use prefabricated building construction systems that were based on prefabricated components of varying degrees of complexity: precast façades, semi-precast slabs, precast staircases, volumetric bathrooms and kitchens, refuse chutes, and elevator shafts, etc. There were developed some standard engineering systems (gas, water supply and sewerage) to be installed outside on a house façade. The development and use of "Harmony Blocks" is considered to be the real breakthrough. In 2000 a new block type "New Harmony 1" was introduced (Figure 9).

Today, Modular Flat Design is considered to be the most relevant approach to the apartment layout. It makes it possible to optimize the number of typological structural elements and build residential towers of different shape taking into account carefully the individual characteristics of a particular site development. Four types of residential cells were developed (Figure 10). As it is seen from the described typology, for the right reasons apartments in Hong Kong are considered to be some of the smallest in the world.
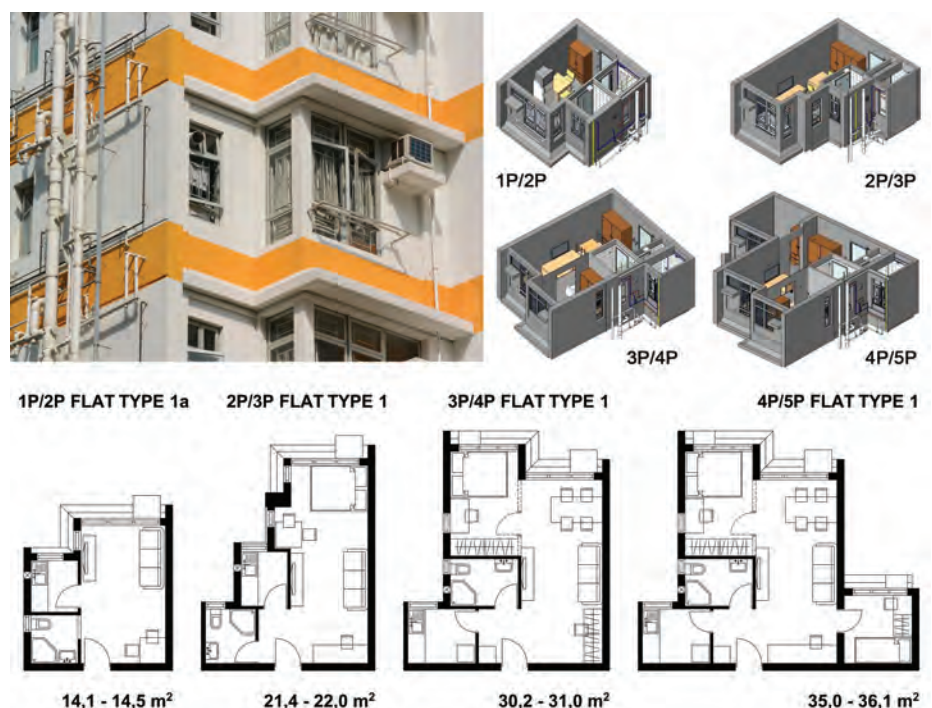

Figure 10. Design of the Public Housing Flats by the Hong Kong Housing Authority. Four types of Modular Flat Design: 1-Person/2-Person, 2-Person/3-Person; 3-Person/4-Person; 4-Person/5-Person (Source: Elena Generalova, floor plan source: http://www.legco.gov.hk/yr14-15/english/panels/hg/papers/hg20150706cb1-1037-1-e.pdf)
图10. 香港公共房屋套间的户型。Modular Flat Design基础上设计的四种户型：1P/2P；2P/3P；3P/4P；4P/5P（来源：Elena Generalova, floor plan source: http://www.legco.gov.hk/yr14-15/english/panels/hg/papers/hg20150706cb1-1037-1-e.pdf）

Figure 11. Hong Kong Housing Society. Senior Citizen Residences Scheme. Jolly Place (Source: Elena Generalova)

图11. 香港房屋协会. 长者安居乐住屋计划. Jolly Place（来源： Elena Generalova）

Much attention is paid to Senior Citizen Residences Scheme. The basic concept is "ageing in place," which means creating comfortable living conditions for older people. The main goals are: integration of housing and services under the same roof, searching for the ideal balance between public and private life, and security, suitability for people of different health conditions (from healthy to frail), etc. Besides apartments everything needed for comfortable living is provided: medical services, a swimming pool, a gym, multipurpose lounges and green areas, a library, a restaurant and so on. The philosophy "housing with care" becomes true as living environments are equipped with specially designed facilities that adjust to the changing needs of the elderly (Figure 11).

Public housing in Hong Kong is built across the city along with private options. The development of the transport system is a part of the urban policy. It is linked to residential housing development. The main means of public transport are the metro (104 stations) and buses. In the New Territories there is Hong Kong's Light Rail connecting the two satellite cities Tuen Mun and Yuen Long.

Hong Kong is often called **a city without ground** and an experimental platform for shaping a new typology that is the super dense vertical urban environment. Pedestrian Hong Kong is an extensive network of pedestrian bridges, tunnels and walkways. They come from the city transport hubs and separate the city traffic from pedestrians. Transport hubs are often included in stylobate

parts of residential complexes. Some researchers talk about creating a special type of Hong Kong residential complex, the Podium Tower (podium-type building typology). This typology allows combining a large number of apartments, service facilities and public transport in one object without making any negative impact on comfortable living environment (Figure 12).

HKHA controls over 1,100 residential blocks. Public housing blocks account for 45% of total energy consumed by all residential buildings in Hong Kong. Therefore, effective energy conversation management is very important for the ecology of Hong Kong and in many respects it coincides with Singapore's approach to the problem. Energy consumption reduction takes place due to the introduction of LED lighting, lifts with regenerative power, photovoltaic systems, and rainwater harvesting systems, etc. On the territory of residential complexes, vertical wind turbines and wind-solar hybrid Renewable Light Poles with LED lights are installed. It is obligatory to introduce green areas in public residential complexes (not less than 20% of area and up to 30% in large complexes).

Measures for noise protection under dense urban development are of great interest. Noise barriers on highways are modernized. Low-noise materials are used on local roads. Acoustic balconies and adjustable "acoustic windows" are constructed for protecting apartments from noise.

The historical development of public housing in Hong Kong demonstrates the

休息和绿化带、图书馆、餐厅和很多其他设施。体现出housing with care的哲学，居住环境中充分考虑居民不断变化的需求专门配备了各种便利条件（图11）。

香港的公共房屋与私人房屋一起在全境内开展建设。交通系统的发展是城市建设方针的一部分，与住房建设改善理念相辅相成。主要的公共交通方式是地铁（104站）和公共汽车。新建区域内有轻轨线路Hong Kong's Light Rail运行，将香港卫星城Tuen Mun and Yuen Long（元朗和屯门）相互连接在一起。

香港经常被人们称为**没有地面的城市**（Hong Kong is a city without ground）和新型超高密度垂直城市环境建设的试验场。香港的人行通道是一个广阔的人行天桥、隧道和步道网络。交通站点大部分都属于居民区的一部分。一部分研究者说到建立特殊形式的香港居民区Podium Tower。这种形式能让大量的套间集中在紧凑的楼房中，充分发挥公共交通的功能，又不损害舒适生活环境（图12）。

Hong Kong Housing Authority监管着1100多栋多住户房屋。全香港所有居民楼45% 的用电都来自公共多住户房屋。因此改善公共房屋住宅区内能源利用率对于香港的生态环境具有重大的意义，很大程度上与新加坡的方式相契合。降低能耗需要依托：LED照明，再生传动电梯，太阳能光伏板，雨水收集系统等。住宅区内安装垂直旋转轴风力发电机和LED灯风能−太阳能混合安装。公共住宅区绿化也是必然的（不少于住宅区面积的20%，大型住宅区内达30%）。

高密度建筑中防噪措施也体现出了极大的兴趣。公路旁隔音屏障改造，使用"静

Figure 12. Podium Tower in Hong Kong: 1 – Park Central; 2 – Tseung Kwan O Area 56 Development Complex; 3 – The Grandiose Complex; 4 – Tseung Kwan O Plaza (Source: Elena Generalovalova)

图12. 香港Podium Tower: 1 – 将军澳中心; 2 –将军澳56区开发复杂; 3 – 君傲湾; 4 – 将军澳广场（来源： Elena Generalovalova）

government's ability to be quickly responsive to the slightest socio-economic changes in the society and change the development strategy. It is evident that there is a constant search for better models of affordable public housing, their testing and implementation.

Conclusions

Someone may say that these examples are not illustrative for big states. Since, Singapore is a city state with a population of 5,624,000 people and Hong Kong is a city and a special economic zone of China with a population of 7,246,000 people. However, when answering the question whether it is necessary for big states to follow the examples of Singapore and Hong Kong, it can be confidently said that their experience should be carefully studied and changed in accordance with individual characteristics and traditions.

It is evident that there are different conditions in the countries that are interested in improving the quality of life of their population. Naturally, it is impossible to create a **single model** or find a **universal approach**. Nevertheless, there are some common principles described above which are to be guided while creating comfortable living environment for different segments of the population. At national level a comprehensive approach to the problem is necessary by working out the **basic typology of affordable public housing**. Public authorities should develop some kind of **comfort standard** for this type of housing. They should control and direct the changes in the space-planning standards, examine economic conditions, check if their actions correspond to the latest achievements in architecture and construction, and develop industry and technology in this direction.

音"路面，运用居民房屋防噪隔音阳台和可调式隔音窗。

香港公共房屋历史发展道路见证了政府对社会经济变化的敏锐反应并调整发展战略的能力。显而易见，持续探索更加现代化的保障性公共住房模式，其测试和实施的过程仍在继续。

结论

有人会说，这并不是大国的经典案例。因为，新加坡是一个人口5 624 000人的城市国家，而香港是人口7 246 000人的城市和中国特别经济区。但是，大国是否需要向新加坡和香港学习呢？可以很自信的回答，必须仔细研究他们的经验，并通过他们各自的特点和传统反应出给的看法。

毋庸置疑，想提升居民生活质量不同国家的条件都相去甚远这是一个不争的事实。当然，不可能建立**统一的模型**或找到**万能的方法**。可是，还是存在一些不同人口阶层创造舒适生活环境可借鉴的共同原则（上文描述的）。从国家层面设计出必须的"**公共保障性住房基本模式**"的综合方法是必不可少的。国家机关应制定出一个此类不动产的**舒适标准**：监督并指导空间规划方案中的修改，考量自身经济能力的匹配度，不断对比自身行为和土木工程领域最新成就，发展选择方向范围内的产业和技术。

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