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Green Building

Developments in China's Green Building Sector – Enhanced Standards and Building Industrialization Trends 中国绿色建筑行业发展情况 — 更高标准与建筑产业化趋势

Urbanization is one of China's biggest challenges. In 1950, only 13 percent of the Chinese population lived in cities – this number is projected to increase to about 67 percent until 2030. While the Chinese building sector is responsible for economic growth, it also accounts for massive energy consumption. Projections suggest that China's building energy consumption will double until 2050. In order to reduce energy usage, China needs to implement measures that decarbonize the building sector.

China strengthens its standards framework for green buildings

In 2019, the Ministry of Housing and Urban-Rural Development (MOHURD) issued three standards that aim at upgrading the environmental performance of the green building sector. In August 2019, MOHURD implemented the third edition of the National Standard of Green Buildings Assessment. The National Technical Standard for Nearly Zero Energy Buildings (NZEBS) entered into force in September, while the National Standard for Building Carbon Emission Calculation was implemented in December 2019.

The newly revised National Standard of Green Buildings Assessment includes several scoring items such as "Occupant Convenience" and "Environmental Livability". "Resource Saving" is the most significant indicator that scores highest, whereas the remaining indices are weighted less in the evaluation. The assessment was improved by providing a smaller number of indicators compared to the previous version of 2014. Furthermore, the standard encompasses the Chinese Three Star Rating System for Green Buildings. If all prerequisite items are met, a building is awarded the basic grade. However, if the building is rated higher than 85 among scoring items, the three-star grade will be assigned. The evaluation for awarding grades will be done after the building is completed, however, it is possible to perform pre-assessments during the design stage.

The new Technical Standard for Nearly Zero Energy Buildings extends the scope to design, construction,

城市化是中国面临的巨大挑战之一。1950年中国仅有13%的人口居住在城市，预计到2030年这一数字将上升至67%。中国建筑行业的蓬勃发展虽然促进了经济增长，但同时也导致了巨大的能源消耗。据预测，到2050年，中国的建筑能耗将是如今的两倍。为减少能源消耗，中国必须采取措施使建筑行业“去碳化”。

中国正在强化绿色建筑标准框架

2019年，中国住房和城乡建设部颁布了三项标准，旨在提升绿色建筑行业环境性能。2019年8月，住建部推出了第三版《国家绿色建筑评价标准》。《近零能耗建筑技术标准》于9月份生效，《建筑碳排放计算标准》也于2019年12月开始实行。

新修订的《国家绿色建筑评价标准》包含多项诸如“生活便利”和“环境宜居”在内的评分项。“资源节约”作为分值最高的评分项成为最重要的指标，其他指标在评价中所占分值略低。与2014年的版本相比，该版评价标准通过减少指标数量而得到改进。此外，该标准还囊括了中国绿色建筑星级评价体系。当满足全部控制项要求时，建筑等级将被评为基本级。而如果评分超过85分，建筑将获得绿色建筑三星评价。绿色建筑等级评价通常将在建筑完工后进行，然而在建筑设计阶段进行预评价也是可行的。



The National Standard of Green Buildings Assessment clarifies the evaluation method and criteria for green buildings

国家标准《绿色建筑评价标准》明确了绿色建筑评价方法及评价指标
Source / 图片来源: 中国住房和城乡建设部 (MOHURD)

and testing while defining ultra-low-energy buildings, NZEBs and ZEBs in China, making it the country's most comprehensive standard on NZEBs. Nevertheless, an official definition for public buildings is not considered yet, only the energy-saving rate of 60 percent has been proposed as a specific request. For the first time, a standard contains targets on energy consumption control for NZEBs, ultra-low-energy buildings, and ZEBs. Besides, it includes several sub-national regulations for various climate zones in China: in the severe cold zones, energy consumption needs to be reduced by 70 percent, while in the zones where summer is hot and winter is hot, as well as summer is hot and winter is cold, demand must be lowered by about 60 percent.

Under the influence of national policies, local governments have launched additional NZEB standards, technical guidelines, and incentives. For the construction sector, NZEBs will play a crucial role in increasing energy efficiency. Currently, the market is rather small, however, the newly published policies offer a promising potential since the technological roadmap is becoming clearer and the market is developing rapidly. It is expected that 5,000 ZEBs will be built in China by the end of 2020 and the related industries will increase to an estimated volume of 100 billion CNY (13 billion EUR).

Another addition to China's green building regulatory framework is the new National Standard for Building Carbon Emission Calculation. It provides calculation methods of carbon emissions for each phase of a building's life cycle. Firstly, the construction and demolition phase, secondly, the production of building materials and transportation phase and thirdly, the operation phase. Adding up each stage's results shows the carbon output of the building's entire life cycle. To offer a standardized source of data, carbon emissions calculations should include the greenhouse gases listed in the Guidelines for National Greenhouse Gas Inventories, published by the Intergovernmental Panel on Climate Change. The corresponding carbon emissions calculations software provides businesses with an equal foundation for emissions assessment. Thus, it is not only possible to estimate the carbon emissions of newly constructed buildings but also those of the existing building stock. At the same time, the standard aims at shifting the focus on carbon emissions reduction towards the design phase of a building to encourage a lasting change in the construction sector. The three new standards complement previously released

新颁布的《近零能耗建筑技术标准》将内容范围扩展到设计、建造和测试,同时定义了中国的超低能耗建筑、近零能耗建筑和零能耗建筑,这使之成为全国近零能耗建筑领域最为全面的标准。但是关于公共建筑的官方定义尚未给出,只提出了60%的节能率作为具体要求。一项标准包含了近零能耗建筑、超低能耗建筑和零能耗建筑的能耗控制目标尚属首次。此外,该标准包含了多项针对中国不同气候带的地方性规定:在严寒地区,建筑能耗水平应较国家标准降低70%;而在夏热冬暖和夏热冬冷地区,建筑能耗水平应较国家标准降低约60%。



Projections suggest that China's building energy consumption will double until 2050

据预测,到2050年,中国的建筑能耗将是如今的两倍

Source / 图片来源: unsplash.com

受国家政策的影响,地方政府也推出了其他一系列近零能耗建筑附加标准、技术准则和激励措施。在建筑领域,近零能耗建筑将在能效提升方面扮演重要角色。虽然当前市场较小,然而随着技术线路图愈加清晰、市场发展愈发迅速,新颁布的各项政策将提供广阔的发展前景。预计到2020年底,中国将建成5000座零能耗建筑,相关行业产值将达到1000亿人民币(约130亿欧元)。

中国绿色建筑法规框架的另一则新增标准是《建筑碳排放计算标准》。它提供了整个建筑生命周期各个阶段的碳排放计算方法。首先是建造及拆除阶段,其次是建材生产及运输阶段,最后是运行阶段。各阶段计算结果累计则为建筑全生命期碳排放。为了提供标准化的数据来源,碳排放计算应包括联合国政府间气候变化专门委员会发布的《国家温室气体清单指南》中所列出的温室气体。相应的碳排放计算软件也为企业提供了平等的碳排放评估基础。因

guidelines such as the Green Building Evaluation Standard of 2006 that was the first attempt to create a local green building standard or the 2015 Passive Low-Energy Green Building Technical Guideline that provided a definition for low-energy buildings.

Building industrialization in China is advancing

Since the release of the 13th Five-Year Plan (FYP) for the Development of Building Energy Efficiency and Green Building (2016-2020) in China, the prefabricated buildings market has been accelerating and the industrialization of the construction sector advancing. With the outbreak of the novel coronavirus COVID-19 at the end of 2019, prefabricated buildings came into focus to aid Wuhan, the city with the highest number of cases, to construct a new hospital in an inconceivably short period. Two temporary hospitals have been built to cope with the rapid increase of infections. In Huoshenshan Hospital each unit is equipped with air-conditioning, televisions, electric lights and a cabinet that is linked to the hallway, giving staff the possibility to deliver medicine or daily necessities to the patients' rooms without entering. The hospital comprises a medical isolation zone, a living area for staff and a logistics area. This approach to the construction of prefabricated hospitals has already been pioneered in China during the SARS outbreak of 2003.

To provide incentives and guidance for the prefabricated buildings industry, the 13th FYP determines the energy efficiency of buildings along with the development goals of the green building sector. The plan suggests to further develop prefabrication technologies and speed up the construction of production plants. China aims to increase the use of prefabricated building materials to 30 percent in the following decade. In March 2019, MOHURD has carried out a pilot project for prefabricated buildings to further adjust and develop policies on a national scale. These policies are now put into practice like in Jinchengjiang prefabricated industrial building park in Hechi, Guangxi autonomous region, that is to be built in 2020.

Prefabricated buildings can be split into three main categories. Firstly, the modular type with almost fully factory-produced components; secondly, the panelized type with panel homes, partially built in a factory and assembled on site; thirdly, the hybrid type consisting of a combination of the other two types. The use of prefabricated buildings can not only reduce construction time by up to 60 percent

此, 不仅可以估算新建建筑物的碳排放, 已有建筑存量的碳排放同样也可以进行估算。与此同时, 该标准旨在将重点从降低碳排放转移到建筑设计阶段, 从而激发建筑行业的持久变革。这三项标准是对过往发布的相关指导准则的补充, 如2006年颁布的首次尝试创建本地绿色建筑标准的《绿色建筑评价标准》以及2015年定义了低能耗建筑的《被动式超低能耗绿色建筑技术导则》。

中国的建筑产业化正在加速推进

自《建筑节能与绿色建筑发展“十三五”规划》(2016-2020)颁布以来, 装配式建筑市场持续加速发展, 建筑行业的产业化步伐不断加快。随着2019年底新型冠状病毒的爆发, 为援助患病人数最多的武汉在极短时间内建造新医院, 装配式建筑进入了人们的视线。两家临时医院被短时间内建成以应对迅速攀升的感染人数。在火神山医院, 每个单元都配备了空调、电视、照明以及一个与走廊相连的隔间, 使工作人员可以在不进入病房的情况下将药品或日常必需品运送到病房。医院包括一个医疗隔离区、一个员工生活区和一个物流区。早在2003年非典疫情爆发时, 中国便开创性地使用了这种装配式医院建造方法。



Components of prefabricated buildings can be recycled and reused more easily

装配式建筑的组件可以更加方便地回收和再利用

Source / 图片来源: pixabay.com

为了给装配式建筑行业提供激励和指导, “十三五”规划明确了建筑能效以及绿色建筑领域发展目标。规划建议进一步发展装配式技术并加速生产工厂建设。中国计划在未来十年内将装配式建筑材料利用率提升至30%。2019年3月, 住房和城乡建设部开展

but also contributes to a more sustainable way of building. In contrast to non-prefabricated buildings, 50 percent of water, 50 percent of material quantity, and up to 60 percent of CO₂ emissions can be saved. Furthermore, parts of prefabricated buildings can be recycled and reused more easily while reducing the amount of construction waste.

Building industrialization not only saves resources but can also provide a solution to rapidly rising lease costs. For instance, Hong Kong is developing a living area, made of containers, that offers 500 beds to technology expats of the close by Science Park. Living in these container homes will be about 40 percent cheaper compared to the average rent in the city. The housing complex is built by stacking containers using cranes which relieves Hong Kong's aging construction workers by eliminating the need to work atop high scaffoldings.

New trends in the prefabricated building industry such as 3D printing entire buildings are pioneered as well. In 2014, when European and US engineers were merely experimenting with the possibilities of 3D printing for the building industry, ten houses, each 200 m² in size were constructed in only 24 hours using printing techniques in China. The materials for the print are obtainable from recycled construction components, creating a possibility to recycle construction waste. The fabrication of building components for on-site assembly is possible too. Prior to the building phase, the printer produces modular walls that are later connected on site. Since this innovative technology is developing continuously, the market is witnessing rapid growth. In 2020, the output of the 3D printing industry in China is expected to reach 2.77 billion EUR.

The described developments illustrate the dynamics of the green building sector in China. New standards redefine and extend the definition of green building, while at the same time emphasizing high-quality aspects throughout the life cycle of a building. Moreover, the trends and advanced developments for building industrialization further shift the focus onto efficiency and new technologies. China's strong commitment to the green building sector also gives rise to many opportunities for foreign companies in industries ranging from machinery or equipment for modular building and automation to energy-saving components as well as building information modeling. As China's green building sector continues to grow, the demand for these and other innovative and energy-efficient solutions is bound to surge.

了一个装配式建筑试点项目以进一步在全国范围内调整和制定相关政策。这些政策现已付诸实施，如广西壮族自治区河池市于2020年开工建设金城江装配式建筑工业园。

装配式建筑可以划分成三大类。第一类砌块型，其构件几乎全部来自工厂生产；第二类是带有面板房屋的板材型，部分在工厂生产并在现场组装；第三类混合型是以上两种类型的组合。装配式建筑的使用不仅可以减少高达60%的建造时间，而且有助于实现一种更加可持续的建筑方式。与非装配式建筑相比，装配式建筑可以节省50%的水、50%的建材，并减少高达60%的二氧化碳排放。此外，装配式建筑的组件可以更加方便地回收和再利用，同时减少了建筑垃圾。

建筑产业化不仅可以节约资源，而且可以为快速上升的租赁成本提供解决方案。例如香港正在开发一个由集装箱房屋构成的居住区，可在科技园附近为技术外派人员提供500张床位。与城市中的普通住宅相比，住在这种集装箱房屋中可以节省近40%的租金。该住宅区通过起重机将集装箱堆叠建造而成，这种方式通过减少必要的手脚架高处作业而有效缓解了香港高龄建筑工人的负担。

装配式建筑中诸如3D打印整栋建筑等新趋势也极具开创性。2014年，当欧美工程师还在建筑行业初试3D打印的可能性时，中国便运用3D打印技术在短短24个小时内建造了10座各200平方米的房屋。打印材料从回收的建筑组件中获得，为建筑废物回收创造了新的可能性。生产用于现场安装的建筑组件同样可行。在建造阶段开始之前，打印机便生产了可用于随后现场连接的模块化墙壁。随着这项创新型技术的不断发展，市场也处于快速发展阶段。2020年，中国3D打印行业产值预计将达到27.7亿欧元。

上述各类发展展示了中国绿色建筑领域的活力。新标准重新定义了绿色建筑并扩展了这一概念，同时强调了整个建筑生命周期的高质量要求。除此之外，建筑产业化趋势及其继续发展也进一步将重点转移到效率和新技术上。中国在绿色建筑领域的坚定决心也给予了外国公司众多机遇，不论是模块化建筑的机械和设备制造，还是节能组件的自动化，亦或是建筑信息模型等等。随着中国绿色建筑行业的持续增长，对此类以及其他创新型和节能方案的需求也必将激增。

Finding Solutions for Sustainable Urban Neighborhoods

A contribution by Susanne Schmelcher and Nana von Rottenburg, German Energy Agency (dena)

为可持续城市社区寻找解决方案

来自德国能源署的 Susanne Schmelcher和Nana von Rottenburg的客邀文章

Energy systems are being transformed worldwide and more and more renewable energies are being integrated within this process. One major challenge is, however, that the use of renewable energies is land-intensive. Especially land in urban areas is scarce and subject to high competition for its use. In addition, cities consume two-thirds of the world's energy, which obviously cannot be generated locally. This means that in urban areas the local energy system and the national energy system must form an integrated unit, which, through the implementation of the right interfaces, enables the use of local potentials to be maximized and the missing shares of climate-neutral energy to be provided from the region or even from very remote areas. Cities surely offer many climate-neutral potentials. For example, with the right technologies, environmental heat or waste heat generated from rivers, industrial processes, computer centers, underground railway shafts, or simply from groundwater or the ground can be made usable. In addition, urban energy systems provide a wide range of reliable and widespread infrastructures for electricity, heat, transport, and communication systems as well as a wide range of technologies for the provision, storage, and conversion of energy.

One solution is the use of sector and infrastructure coupling, through which the renewable potential is exponentially increased. Efficiency advantages and synergies can be achieved by bundling energy supply and distribution together with the management of energy use. Therefore, a toolbox of smart, efficient, and carbon-neutral solutions has to be developed, which will help to reach the goals of the Paris Agreement and provide liveable and resilient environments. Even though their starting points differ, many cities, urban districts, and industrial parks in Germany as well as in China are striving for the same results: sustainable solutions for local energy supply by increasing energy efficiency and making greater use of climate-neutral potentials. So there are already many examples from which we can learn in order to establish standardized solutions.

全世界的能源系统正在发生转变，越来越多的可再生能源在这一转变进程中被纳入能源系统之中。然而，一个重大的挑战是，可再生能源的使用需要大量的土地。城市地区的土地资源尤其稀缺且对其的使用竞争激烈。此外，城市消耗了世界上三分之二的能源，而它们显然无法为自身提供这些能源。这意味着在城市地区，地方能源系统和国家能源系统必须形成一个整体，通过实施合理的互联互通来最大限度地利用城市本身的潜力，并同时从周边甚至是偏远地区调动气候中和能源来弥补城市自身供应的不足。毫无疑问，城市具有很大的气候中和潜力。例如，借助正确的技术，来自河流、工业加工过程、计算机中心、地下铁路井、地下水或地面的环境热或废热都可以被利用。此外，城市能源系统还提供了一系列可靠和普及度高的电力、热力、交通和通信系统的基础设施以及广泛的能源供应、储存和转换技术。



Urban energy systems provide a wide range of reliable and widespread infrastructures for electricity, heat, transport, and communication systems

城市能源系统为电力、热力、运输和通讯系统提供了广泛而可靠的基础设施
Source / 图片来源: pexels.com

一种解决方案是利用部门和基础设施的联合，这使可再生能源的潜力成倍增加。通过将能源的供应与分配和能源的使用与管理捆绑在一起，可以实现效率优势和协同效应。因此，一个包含智能、高效和碳中和的解决方案的工具箱亟待开发。这将有助于实现《巴黎协定》的目标，并提供宜居和有韧性的环境。尽管出发点不同，但德国和中国的许多城市、城区和工业园区都正在努力实现同样的目标：通过提高能源效率和更优利用气候中和潜力，为当地的能源供应

Using urban variety as an opportunity

By doing so, we not only have to find ways for climate-friendly energy generation, but also for smart consumption patterns and how to combine them. In addition to private consumers of heat, electricity and fuels, industries, commerce, trade, and services are also key urban consumers. The broad spectrum of different energy applications, from industrial high-temperature processes to low-temperature room heating, enables efficient control of energy flows and the coupling of the respective energy sources while linking conventional combined heat and power (CHP) or the more complex "cascading" of waste heat.

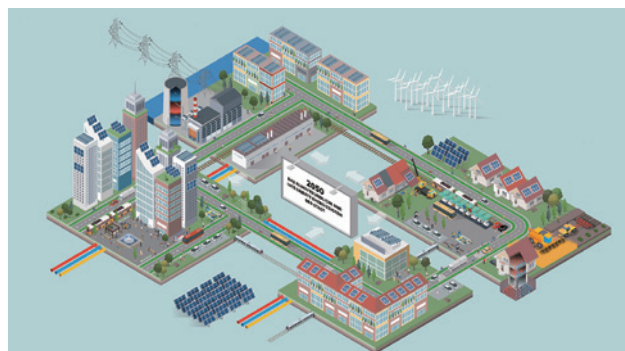
Moreover, energy distribution networks for the various media, parallel to the IT infrastructure and other supply infrastructures, are often combined and can exhibit a high degree of "meshing". At the same time, an increasing number of players – housing associations, cooperatives, contractors, or neighborhood operators – are taking an active role in the energy system in Germany. These players are no longer just energy consumers, but also contributors in the sense of "prosumers" energy producers and providers of flexible energy storage and load shifting potential. When we think of the electricity sector in Germany around two decades ago, for example, it was characterized by around 200 large generation plants and 200 large consumers. Today, around two million energy plants need to be coordinated, on both the generation and consumption side. Photovoltaic plants, wind energy plants, medium, and small CHP plants, the unpredictability of consumers with electric cars and heat pumps as well as prosumers, blur the boundaries between generation and use in all consumption sectors, in the industry as well as in building and the mobility sector.

With this in mind, the district level can be understood as being the smallest unit at which the interconnection of infrastructures, but also the linking between consumers and generators, can be applied. Projects that follow an integrated energy approach often take place at neighborhood levels, where one or more supply facility or infrastructure is developed into a neighborhood-specific supply concept and used in a holistically optimized way. Neighborhood-related supply can be provided for one or more types of energy and extended beyond the boundaries of one generation plant. In principle, most technologies for energy generation, storage, conversion, or use can also be applied in neighborhoods. These include, for exam-

提供可持续的解决方案。因此，我们有许多可以用来借鉴以建立标准化的解决方案的例子。

以“城市多样化”为契机

以“城市多样化”为契机，我们不仅要设法实现气候友好型的能源生产，还要实现智能消费模式以及这两者的结合。除了私人消费者对热、电、燃料的消耗外，工业、商业、贸易、服务业也是城市的主要消费群体。从工业高温工艺到低温室内供暖，对不同能源应用的范围十分广泛，这在连接传统的热电联产（CHP）或更复杂的余热“级联”的同时，也实现了对能源流的有效控制和各自能源的联合。此外，与IT基础设施和其他供应基础设施并行的用于各种介质的能源分配网络往往是组合在一起的，可以展现出高度的“网格化”。



By 2050, the integration of urban energy sectors will be advanced enough that renewable electricity from distant regions can make an important contribution to the decarbonization of urban centers
到2050年，城市能源各部门的整合将达到足够先进的标准，从而使偏远地区的可再生能源能为城市中心的脱碳化做出重要贡献

Source / 图片来源: dena 德国能源署

与此同时，越来越多的参与者，包括住房协会、合作企业、承包商或小区运营商，也在德国的能源系统中发挥着积极的作用。这些参与者不再仅仅是能源的消费者，也是“产消合一”意义上的能源生产者以及灵活储能和负荷转移潜力的提供者。以二十年前的德国电力行业为例，当时大约有200个大型发电站和200个大型用户。今天，大约有200万个能源发电厂需要在发电和用电间进行协调。光伏电站、风能电站、中型和小型热电联产电站、电动汽车和热泵的消费者以及生产性消费者的不可预测性，模糊了所有消费领域、工业领域以及建筑和移动领域的能源生产和使用之间的界限。

考虑到这一点，地区层面可被当作实施基础设施的互联以及能源消费者和生产者连接的最小单位。遵循综合能源利用方案的项目往往在社区层面实施，在这些项目里，一个或多个供应或基础设施被扩展为一个社区专属的供应概念并以整体优化的方式使

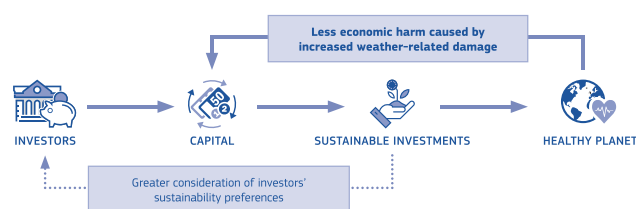
ple, decentralized power generation (area supply) or district heating or cooling supply, where distribution within the district is carried out via heating/cooling networks (also via connections from one building owner to another). There are concepts in which the energy is generated and distributed within or provided outside and delivered to the neighborhood as district heating or district cooling. A neighborhood can also have forms of use such as power to heat and power to gas as well as the use of bioenergy, even if the energy is generated outside the neighborhood. As a result of using and connecting all these different energy sources and users on a small scale, efficiency can be maximized and energy potentials fully exploited.

Financing sustainable urban neighborhood solutions

What must be considered is that the development and implementation of those smart infrastructures are also connected to rather vast investments that have to be provided by the cities and communities as well as local energy companies. Often, it is difficult to receive the necessary funding on the capital market. As “Green Finance” is becoming an increasingly important topic in the financial world and investors are looking for sustainable and green investment opportunities, this could be a new source for these planned investments. Essential for the creation of new and attractive financial products is the standardization of involved technologies, quality insurance in addition to reliable monitoring systems. On this basis, bundling of projects and the emission of Green Bonds become an option.

To overcome the existing obstacles, the EU Commission launched its EU Action Plan: Financing Sustainable Growth. The intention is to relocate cash flows into low-carbon and innovative investments and the provision of a reliable framework. As part of the Action Plan, the EU Taxonomy is a classification system that acts as a common language for the real economy and finance. It offers thresholds and criteria for smart and low carbon energy distribution systems that qualify as “green” within the taxonomy framework as well as for the production of renewable and efficient energy sources. By complying with the framework’s definitions, together with the criteria to connect investments to integrated and sustainable energy systems, it might become a very attractive investment opportunity and financial sources might become more accessible.

用。社区层面的能源供应不仅可以提供一种或多种类型的能源, 还可以扩展到一个发电厂的范围之外。原则上, 大多数的能源生产、储存、转换或使用技术也可以应用于社区。例如分散式发电 (区域供电) 或区域供热或供冷。区域供热或供冷可以通过供热/供冷网络 (或通过一个建筑业主与另一个建筑业主之间的连接) 实现。有的供应概念是在社区内完成能源的生产和分配, 有的是将在社区外生产的能源调动到社区内进行社区供热或供冷。社区也可能有多种能源使用形式, 如电变热、电变气以及生物能源等, 即使这些能源不是在街区内生产的。由于可以小范围利用和连接不同的能源源头和能源消费者, 可以将效率提升到最优, 充分发挥能源潜力。



Integrating sustainability considerations will mitigate the impact of natural disasters as well as environmental and social sustainability issues that can affect the economy and financial markets

将可持续性纳入考虑因素将减轻自然灾害以及环境和社会可持续性问题的影响, 这些可持续问题可能影响经济和金融市场

Source / 图片来源: EU Commission 欧盟委员会

为可持续城市街区的解决方案融资

我们还必须考虑到, 这些智能基础设施的开发和实施还依赖于城市、社区以及当地能源公司提供的大量投资。通常情况下, 这些设施的开发很难在资本市场获得必要的资金。随着“绿色金融”在金融界成为一个越来越重要的话题, 投资者也在寻找可持续发展和绿色投资机会, 这可能为这些计划投资带来新的希望。要推出新的、有吸引力的金融产品, 除了可靠的监控系统外, 相关技术的标准化、质量的保证也是必不可少的。在此基础上也可以尝试捆绑项目和发行绿色债券。

为攻克投资难题, 欧盟委员会推出了“欧盟行动计划”: 加大可持续增长融资。其目的是将现金流转移到低碳和创新投资中, 并规定一个可靠框架。作为该行动计划的一部分, 欧盟分类法是一个作为实体经济和金融的共同语言的分类系统。它为智能和低碳能源分配系统提供了门槛和标准, 这些系统在分类法框架内符合绿色标准, 分类法同时也为可再生能源和高效能源的生产提供了门槛和标准。通过遵守该框架所规范的定义以及将投资与集成可持续能源系统连接起来的标准, 这可能会成为一个非常有吸引力的投资机会, 融资将更变得容易。

Sustainable Support for German Building Expertise in China 德国建筑节能经验在中国发展的长期支持

China's economic growth, industrial development and its rapid urbanization process during the past years have led to a surge in energy demand. Within the framework of the 13th Five-Year Plan (2016-2020), the Chinese government set the target to reduce energy consumption per unit of GDP by another 15 percent by 2020, focusing on energy efficiency measures. Being responsible for roughly one-fifth of primary energy demand, the Chinese building sector offers great potential for reducing energy consumption. Annually 1 to 1.5 billion square meters of living space are added, where heating and cooling still require considerably higher amounts of energy than the European average.

In order to further reduce resource consumption, the number of green buildings, low-energy projects and the integration of renewable energy sources in buildings need to be increased in the coming years and numerous existing residential and industrial buildings are expected to be refurbished. As German companies enjoy a stellar reputation for their high-quality technical products and expertise across the globe, particularly in the field of green building and energy efficiency, they are provided with promising market opportunities for sustainable building technologies and services in China.

To help especially small and medium-sized enterprises (SMEs) to tap into such opportunities in China and other countries, the German Federal Ministry of Economic Affairs and Energy (BMWi) established its Energy Solutions Initiative in 2003. In the context of the initiative, AHK Greater China has successfully organized business trips to China as well as a wide range of fact-finding missions to Germany, in order to support Sino-German partnership development in the field of energy efficiency.

Through business trips, including one-day symposia, German enterprises are provided with the opportunity to explore the business environment and market potential in China along with the presentation of their technologies and solutions to Chinese decision-makers and stakeholders. Individual business-to-business matchmaking meetings and company visits are another integral part of the trip. Participating German companies receive a comprehensive target market analysis based on the topic of the program.

过去几年中国的经济增长、工业发展以及快速城镇化进程导致能源需求大幅增加。在“十三五”规划（2016-2020年）的框架下，中国政府制定了截止到2020年单位GDP能耗累计降低15%的目标，重点采取提高能效的措施。建筑行业约占中国总一次能源消耗量的1/5，因此该行业节能潜力巨大。每年总新增居住面积为10到15亿平方米，用于供暖和制冷的能耗都远高于欧洲平均水平。

为了进一步减少资源消耗，中国需要在未来几年增加绿色建筑、低能耗项目和可再生能源在建筑中的整合，并且对大量现有住宅和工业建筑进行翻新。德国凭借全球著称的高质量技术产品和专业知识，尤其是绿色建筑和能效领域，可以在中国的可持续建筑技术及服务方面获得具有前景的市场机会。



The fast-growing Chinese building sector is responsible for about one-fifth of primary energy demand

中国建筑行业的高速增长是导致其占总一次能源消耗量1/5的主要原因

Source / 图片来源: pexels.com

为了帮助德国企业，尤其是中小型企业，在中国和其他国家获得这些机会，德国联邦经济与能源部于2003年发起了德国能源解决方案倡议。在这项倡议的框架下，德国海外商会联盟·大中华区已经成功组织了一系列赴德考察以及来华商务考察代表团，以支持中德伙伴关系在能效领域的发展。

通过这些商务考察，包括为期一天的研讨会，德国企业可以了解中国的商业环境和市场潜力，并可以向中国的决策者和其他利益相关方展示他们的先进技术和解决方案。个性化的B2B对接以及公司拜访也是商务考察不可或缺的一部分，参访德企还可以免费获得相应主题的详尽的目标市场分析报告。

2020年，德国海外商会联盟·大中华区将组织一次关于建筑能效的商务考察访问。活动将于11月9日至

In 2020, AHK Greater China organizes a business trip focusing on building energy efficiency. Taking place from November 9 to 13, the trip leads to the South Chinese special administrative regions Hong Kong and Macao. In Hong Kong, buildings are responsible for 90 percent of total electricity consumption and account for about 60 percent of annual CO₂ emissions. Buildings, therefore, represent a key aspect of Hong Kong's energy and climate policies. To further increase energy efficiency in this sector, the government released the Energy Saving Plan for the Built Environment 2015-2025+ which aims at a reduction of energy usage of 40 percent compared to 2005. Due to lack of space for the installment of facilities, renewable energy only plays a minor role in the reduction of energy and carbon emissions. Therefore, the thorough implementation of strict energy-saving measures in the building sector can further increase efficiency and reduce emissions. In Macao, the rising demand for energy in buildings can be traced back to the gaming and hospitality sectors that have been influenced by the steady increase of tourists in recent years.

In 2015 and 2019, AHK Greater China, with the support of BMWi, organized technology showcases of selected building projects in Beijing. More than 200 participants from German and Chinese ministries, enterprises and organizations of the building sector in China, as well as media representatives, attended the event series, which was comprised of an on-site visit, expert symposium and an official award ceremony.

Based on the previous successful events, AHK Greater China organizes a third showcase this year to celebrate innovative German energy-efficient solutions in buildings in East China. Taking place on September 15 and 16, the showcase targets German companies that successfully implemented building projects with advanced energy-saving technologies in Chinese buildings together with a local partner. Additionally, the project aims to raise awareness and demonstrate to the Chinese public how German technologies, products, and services are already successfully applied in local building projects.

Through a competitive selection process, German companies will be nominated to present their projects to a broad audience, including experts, decision-makers and media representatives. An expert jury will choose the projects according to five key criteria: energy efficiency achieved, innovation, modernity, quality as a best practice project, and po-

13日举行, 目的地为位于中国南部的特别行政区香港和澳门。在香港, 建筑物占了总电力消耗量的90%, 约占年度二氧化碳排放量的60%。因而, 建筑也代表了香港能源和气候政策的关键一面。为了进一步提高该领域的能效, 特区政府颁布了“香港都市节能蓝图2015-2025+”, 目标是将能耗较2005年降低四成。由于香港可供设施安装的空间有限, 可再生能源在节能减排方面只起到较小的作用。因而, 在建筑领域全面实施严格的节能举措能在更大程度上促进节能减排。在澳门, 建筑物对能源的需求也日益加大, 原因主要在于近年来游客数量日渐增加从而对博彩业和酒店行业产生影响。



*In Hong Kong, 90 percent of electricity is used up by buildings
在香港, 建筑物消耗了90%的电力*

Source / 图片来源: pexels.com

在德国联邦经济与能源部的支持下, 德国海外商会联盟·大中华区曾在2015年和2019年在北京成功举办建筑节能项目展示活动。来自中德政府机构、中国建筑领域企业和机构的200多名与会者及媒体代表参加了一系列活动, 包括实地参观、专家研讨会和颁奖典礼。

基于往年活动取得的成功, 德国商会海外联盟·大中华区今年将组织第三次建筑节能项目展示活动, 以表彰德国创新型能效解决方案在华东地区建筑领域所取得的成就。活动将于9月15日至16日举行, 主要面向与中国伙伴合作成功地将先进节能技术运用到当地建筑项目中的德国企业。此外, 该项目旨在向中国公众展示德国技术、产品和服务在华东地区建筑项目中的成功应用, 并加强公众对此的认知程度。

通过紧张的评选, 提名的德国企业将有机会向众多专家、市场决策者以及媒体代表展示他们的项目。获奖项目由专家评审团将根据五项关键标准选出, 即能效实现、创新性、现代化程度、作为最佳实践项目的特质以及潜在的媒体关注度。为期一天半的活动包括实地参观考察、专业交流会、宣传入选优秀建筑

tential media interest. The one-and-a-half-day event includes on-site visits, a networking event, a feature in a bilingual German-Chinese brochure in which the awarded building projects are illustrated in detail and an award ceremony with decision-makers and key actors in East China's building sector.

For the successful implementation of energy-saving building plans of the Chinese government, innovative reference objects play a significant role due to their signal effect for other projects. In China, it is standard practice to first test new ideas and reforms in a small format before implementing them on a national scale. Energy-efficient technologies and building solutions, which can prove their usefulness in reference objects, can hope for potential nation-wide support and adoption. Showcase events, therefore, open-up promising opportunities for German companies in this sector, allowing them to possibly gain favorable access to the Chinese market.

The organized business trip to South China and the technology showcase in East China bring together relevant stakeholders and offer comprehensive information about the building sector in terms of opportunities for energy-efficient solutions for the Chinese market. A technological emphasis is, for instance, placed on sustainable design, building envelopes, systems for heating, cooling, ventilation, building automation and lighting as well as prefabricated building elements.

For implementing the described activities, AHK Greater China works closely together with the assigned consultant eclareon in Germany. Furthermore, AHK Greater China builds on synergies and close cooperation with other important players such as Deutsche Energie-Agentur (dena) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), which also accompanies the Sino-German Energy Dialogue and is responsible for implementing its measures.

The activities of the Energy Export Initiative provide in-depth knowledge and support to exploit the full potential that lies in the Chinese green building sector. To do so, a thorough market preparation, recruitment of qualified personnel as well as suitable market strategies and cooperation partners are key factors for success. As an experienced partner, AHK Greater China will support German companies in this endeavor with further activities throughout the coming years, with its access to local stakeholders and building market expertise.

节能项目的中德双语信息介绍手册以及由华东地区建筑领域的决策者和主要相关者参与的颁奖典礼。

创新型示范项目因其信号效应对中国节能建筑规划的成功实施有着极为重要的意义。在中国,在全国范围内推行新的设想和改革方案之前,先小规模地对其进行实践和测试,是一种常规做法。节能技术和建筑解决方案如能在示范项目中证明和展示其实用性,将有望在全国范围内得到支持和推广。因此,建筑节能项目展示活动为德国企业在这一领域提供了很好的平台,使他们有可能获得进入中国市场的有利机会。



In September 2020, AHK Greater China, with the support of BMWi, will organize a showcase event to celebrate innovative German energy efficiency solutions in buildings in East China
2020年9月,德国海外商会联盟·大中华区将在德国联邦经济与能源部的支持下举办德国创新型能效解决方案在华东地区建筑领域的成果展示活动

商务代表团的华南考察之旅以及华东地区的项目展示活动将把重要的利益相关方聚集在一起,并提供建筑行业关于能效解决方案在中国市场相关机遇的综合信息。技术重点为可持续性设计、建筑围护结构、供暖系统、制冷、通风、建筑自动化和照明系统以及装配式建筑构件等。

为举办上述活动,德国海外商会联盟·大中华区将与位于德国的指定顾问公司eclareon开展密切合作。除此之外,德国海外商会联盟·大中华区还与其他关键参与者建立协同关系与密切合作,例如德国能源署(dena)和德国国际合作机构(GIZ),后者也将陪同中德能源对话并负责相关措施的实施。

德国能源解决方案倡议框架下的一系列活动可以提供关于中国绿色建筑行业的深入知识和支持。为充分挖掘相应市场的潜力,前期详尽的市场分析和调查、专业人才的招聘、恰当的市场战略以及可靠的合作伙伴都是成功的关键因素。德国海外商会联盟·大中华区凭借其丰富的经验,将在未来通过更多活动竭力支持德国企业与中国当地利益相关者建立联系并提供建筑市场的专业信息。

Bamboo: A Building Material with Multiple Potentials

A contribution by Prof. Dr. Hartwig Künzle and Dr. Zujian Huang, Fraunhofer Institute for Building Physics IBP

竹材：一种具有多重潜力的建筑材料

来自弗劳恩霍夫建筑物理研究所Hartwig Künzle教授和黄祖坚博士的客邀文章

Population, resources, and environment are the three major issues facing human sustainable development and the building industry is required to push the search, development, and application of ecological materials. Bamboo, as a traditional building material, has received new attention in the context of today's forestry resources, material technology, and market demand.

Bamboo is a giant herb and one of the fastest-growing plants that normally takes 4-6 years to become exploitable. Bamboo forests show high yields and excellent ecological benefits. A hectare of bamboo forest absorbs 12 tons of CO₂ per year and stores 1,000 tons of water. It produces 35 percent more oxygen than wood forests of the same size. In China, the intensively managed Moso bamboo forests have an annual yield of 7-10 tons per hectare, higher than that of the naturally grown softwood forests (e.g., Norwegian spruce) or hardwood forests (e.g., American red oak). The unique fibrous tissue of bamboo provides excellent longitudinal mechanical strength, and the multilevel pore microstructure results in hygrothermal characteristics comparable to hardwood.

The world's bamboo forests grow mainly in tropical and subtropical climate zones in the Asia-Pacific (67 percent), Americas (30 percent), and Africa (3 percent). There are about 1,225 known bamboo species, of which a few have longer bamboo culms and larger culm diameters. At present, China holds about one fourth of the world's bamboo forest area, one third of the bamboo yield, and produces more than 85 percent of bamboo-based panels. China's international wood dependence has been hovering around 50 percent for many years prompting the search for alternatives. Modified bamboo products are considered ideal substitutes for wood-based building materials.

Industrial bamboo and construction applications

Raw bamboo as building material has several limitations. It bends during growth and the culm diameter is irregular, making it difficult to arrive at standard-

人口、资源和环境是人类发展所面临的三大问题。在建筑业，生态建材的找寻、研发与应用得到越来越多的关注。作为传统建筑材料的竹材，在当今林业资源、材料技术和市场需求背景下得到新的重视。

竹子属禾本科竹亚科，也是生长速度最快的植物之一，一般4-6年即可成材。竹林不但产量高，而且拥有优异的生态效益。一公顷竹林每年可吸收二氧化碳12吨，蓄水1000吨，可比同面积木林多生产35%的氧气。在中国，集约经营的毛竹林每公顷年产量高达7-10吨，高于自然生长的软木林（如挪威云杉）或者硬木林（如美国红橡木）。竹子独特的纤维组织使其具备优良的纵向力学强度，丰富的孔隙结构使其具有与硬木相当的湿热特性。

世界竹林资源广泛分布于亚太（67%）、美洲（30%）和非洲（3%）的热带、亚热带和温带地区。已知竹种大约有1225种，其中的少数具有较长竹秆和较大秆径。中国拥有约占世界总量1/4的竹林面积、1/3的产竹量、以及85%以上的竹材人造板产量。然而多年来，中国木材对外依存度一直徘徊在50%左右，这促使人们寻找替代材料，其中改性竹材被视为建筑木材的理想替代品。



Photo of the Moso bamboo (*Phyllostachys pubescens*) forest in Anji, Zhejiang, China

毛竹竹林照片，摄于中国浙江省安吉县

Source / 图片来源: Dr. Zujian Huang 黄祖坚博士

ized building products. The starch granules are rich in parenchyma cells, vascular bundles, and even in fibers of bamboo. Compared to timber, bamboo lacks certain natural preservatives, making it more susceptible to biological damage such as mold and insect infestation.

Advanced modification technology can improve this situation to a certain extent resulting in less vulnerable and more durable bamboo products. Since the 1970s, learning from timber processing technologies, China has successfully developed plybamboo in the 1980s, bamboo particleboard, bamboo oriented strand board and bamboo laminated lumber in the 1990s, bamboo scrimber in the 2000s and flattened bamboo board in the 2010s, which have been used in concrete formwork, load-bearing structures, furniture, and finishes in construction engineering.

The bamboo industry has gradually embraced modern material technology and industrial utilization. At present, China takes the lead in terms of industrial exploitation, production efficiency, product innovation, and production scales.

Research program: hygrothermal performance-oriented bamboo building envelope

As a hygroscopic and organic building material, the hygrothermal properties of bamboo products and the performance of bamboo constructions are governed by similar heat and moisture transfer characteristics as their timber peers. Since these characteristics have a key impact on the durability of building components as well as on energy consumption, indoor comfort, and hygiene, it is important to determine them precisely.

Germany has a very innovative timber construction industry as well as substantial building material R&D and moisture control research history, which is especially valuable as a role model for bamboo product research and development.

The research program 'hygrothermal performance-oriented bamboo building envelope' attempts to apply numerical models to predict the heat and moisture performance of bamboo-based building envelope assemblies in the same way as has been done successfully for moisture control design of timber structures around the world. The hygrothermal tool employed for this study is the WUFI model de-

工业化竹材和建筑应用

原竹作为建筑材料存在许多局限, 生长过程中会弯曲, 并且秆径不一, 难以成为标准化建筑材料, 且在薄壁细胞、维管束、甚至纤维中富含淀粉, 同时又缺乏木材所具有的某些天然毒素, 更容易受到霉菌和虫蚀等生物破坏。

现代材料技术的辅助为解决这些问题提供支持, 以提高竹材耐久性。自1970以来, 木材加工技术被借鉴于竹材的工业化利用研究, 中国先后开发了竹胶合板、竹刨花板及竹定向刨花板、竹集成材、竹重组材、整竹展平板等系列产品, 应用于建筑模板、承重结构、家具、饰面工程等领域。

中国的建筑竹材逐渐走向与现代材料技术结合轨道, 工业化利用水平、机械化程度、产品种类和生产规模均占领先地位。



Photos of typical bamboo panels

典型竹材照片

Source / 图片来源: Dr. Zujian Huang 黄祖坚博士

研究课题: 热湿性能导向的竹材建筑围护结构

作为吸湿性有机材料, 竹材及其构造表现出与木材产品相似的热湿传递特性。这些特性对建筑构件耐久性、乃至建筑系统能耗和室内舒适与卫生具有关键影响, 因此对其进行准确描述尤为重要。

德国拥有非常创新的木构建筑行业, 以及大量的建材研发和湿分控制研究历史, 这为竹产品研发提供了一个示范。

参照在世界各地成功实践的木构建筑湿分控制的做法, 研究课题“热湿性能导向的竹材建筑围护结构”尝试采用热湿模型来预测竹材建筑围护结构构件的热湿行为。其中采用的模拟工具为由Fraunhofer

veloped and maintained by Fraunhofer IBP. The study concentrates firstly on hygrothermal property tests for typical bamboo variants, and then on hygrothermal performance simulation for bamboo constructions under different indoor and outdoor conditions.

The initial comparison with timber shows that the basic properties, including the bulk density and open porosity of raw bamboo, are closer to hardwood than softwood. Most bamboo-based panels have higher bulk density and lower porosity, resulting in lower moisture storage and transport properties, but higher heat storage and transport properties than the reference timber.

The Fraunhofer IBP's Hygrothermics laboratory in Holzkirchen, Germany, has comprehensive indoor and outdoor testing fields and facilities. For decades, it has been conducting long-term tracking of building materials and components and has accumulated large amounts of data to verify and adapt its theoretical models and computer programs. These facilities will be used to elaborate on the hygrothermal properties and performance characteristics of advanced bamboo-based products during the project.

The next step involves the application of WUFI to evaluate the hygrothermal performance of various bamboo structures in different climates and exposure situations. Parametric simulation studies will be employed to arrive at a climate-specific building envelope design that is moisture tolerant as well as energy-efficient and sustainable.

This should help designers and developers to gain more confidence in the benefits and durability of bamboo building assemblies because the more widespread application of bamboo products will serve the environment as well as the people living in such houses.

Outlook

At present, the Fraunhofer Urban Ecological Development Project Center of Shanghai Jiaotong University will launch the Chinese version of WUFI in response to the needs of the Chinese market, and carry out relevant research issues aiming to achieve the adaptability of calculation methods and computer programs. For more information, please visit the Fraunhofer booth at the Beijing 2020 Architectural Design Expo in October 2020.

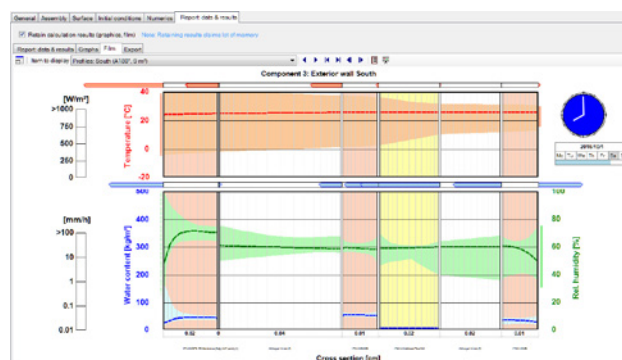
IBP研发和维护的WUFI。研究首先进行典型竹材的热湿性质测试, 然后开展竹材构造在不同室内外环境中的热湿性能模拟。

与相应木材产品初步的性质比较表明, 原竹基本物理性质(表观密度和孔隙率)更接近硬木。总体上, 竹材人造板与同类木材人造板相比, 表观密度高, 孔隙率低, 湿储存和传递性质低, 热储存和传递性质高。

位于德国霍尔茨基兴的Fraunhofer IBP建筑热湿学实验室, 具备完善的室内外测试场地和设施, 数十年来, 对材料、建筑构件和建筑系统进行长年跟踪实测, 积累了大量数据库基础, 对其模型和计算机程序提供验证和修正。在本课题执行期间, 这些设施将被用于详细探索竹材及其构造的热湿特性。

进一步工作中, 将应用WUFI评估不同室内和室外工况下各种竹材构造的湿热性能, 使用参数化模拟实现适应特定气候、更加耐久、节能和可持续的建筑围护结构设计。

这将有助于提升设计和开发人员对竹材构造优点和耐久性的信心, 因为“建筑用竹”的推广将会使环境以及居住在此类房屋中的人们受益。



WUFI screenshot of a dynamic simulation for heat and moisture transfer in a bamboo exterior wall

WUFI对一个竹材外墙热湿传递进行动态模拟的界面

Source / 图片来源: Fraunhofer Institute for Building Physics IBP 弗劳恩霍夫建筑物理研究所IBP

展望

目前, 上海交通大学弗劳恩霍夫城市生态发展项目中心将针对中国市场需求推出WUFI的中文版, 并开展相关基础参数和适应中国的基础性研究, 致力于解决相关研究方法和计算机程序在中国的适应性问题。详细信息请访问北京2020年10月建筑设计博览会弗劳恩霍夫展台。

Energy Efficiency Improvement of Biodiversity Facilities in China supported by KfW Development Bank

A contribution by Dr. Yanping Zhou, energydesign (Shanghai) Co. Ltd, Sylvie Dideron, Consultant on natural resources & environmental education and Dr. Dirk Schwede, EGS-plan international GmbH

德国复兴信贷银行支持的中国生物多样性保护项目能效改进

来自德国设能建筑咨询(上海)有限公司周宴平博士、自然资源与环境教育顾问Sylvie Dideron女士以及德国EGS-plan公司Dirk Schwede博士的客邀文章

The Sino-German Financial Cooperation (FC) is the longest standing international cooperation in the sector of natural resource conservation and management in the People's Republic of China besides the World Bank programs. Since the mid-1990s, the German Government has, through the KfW Development Bank, supported the efforts by the Chinese Government to stabilize ecologically endangered areas through plantation, rehabilitation or protection of forests and their sustainable management.

By the 2010s, the Sino-German cooperation in the field of natural resources conservation has adopted new orientations to better fit the evolving context. At present, the financial cooperation with China focusses on environmental as well as climate protection and contributes to the protection of global public goods with German experiences and financing. Therefore, FC with China is also in the interest of Germany.

Since 2009, the investments in environmental and climate protection, made by KfW on behalf of the German Federal Government, are financed exclusively by so-called FC-promotional loans. By this means, only interest-bearing, repayable loans from KfW-funds and without the addition of German budget funds are employed. The loans finance investments in climate, environmental, and resource protection projects.

Concretely, the objectives of FC-projects are, inter alia, to improve biodiversity protection and sustainable management of local ecosystems. Project activities include nature experience and education about a sustainable environment and thereby entail the construction of related infrastructure in the protected areas or parks where the projects are located. The project implementers – and borrowers – are local (i.e. provincial or municipal) organizations in charge of the management and administration of these areas and parks.

The constructions strive to comply with international best practices in terms of environment-friendly building, these are:

中德财政合作是继世界银行项目之后中国自然资源保护和管理领域历史最悠久的国际合作项目。自1990年代中期以来,德国政府一直通过德国复兴信贷银行资金支持中国政府在生态濒危地区植树造林、恢复植被、保护森林,及可持续性环境管理的一系列努力。

到2010年代,中德在自然资源保护领域调整了合作方向,以更好地适应不断变化的环境。目前,德国与中国的财政合作侧重于环境和气候保护,并借助德国的经验和资金,以致力于保护全球公共资源。因此,中德财政合作也符合德国的国家利益。

自2009年以来,德国复兴信贷银行代表德国联邦政府投资的环境与气候保护项目,其资金全部由中德财政合作项目的促进性贷款提供。这些还本付息的专项贷款用于投资气候、环境和资源保护项目,同时还不增加德国联邦政府的财政预算。

具体而言,中德财政合作项旨在保护生物多样性、改善生态环境和当地生态系统的可持续性管理水平。项目的行动举措包括自然体验和可持续环境教育,因此需要在项目所在地的自然保护区或自然公园内建设相关基础设施。作为借款方的项目实施者,是负责保护区或公园行政管理的当地省级或市级机构。

这些建筑力求遵照对环境友好的国际最佳实践标准进行建造,技术亮点包括:

- 因地制宜地结合基础设施和景观设计
- 最大限度地使用天然材料
- 应用绿色建筑理念和节能方案
- 减少能源消耗
- 利用替代能源,如风能和太阳能
- 确保基础设施维护的便利性和可持续性

德国设能建筑咨询(上海)有限公司应邀作为德国三家顾问公司GFA consulting group GmbH, GITEC-IGIP GmbH和 DFS Deutsche Forstservice GmbH

- Integration of the infrastructure into the landscape
- Utmost use of natural materials
- Application of “green building” and energy efficiency concepts
- Reduction of energy consumption
- Utilization of alternative sources of energy such as wind and solar energy
- Ensure easy and sustainable maintenance of the infrastructure

Energy design Shanghai has been invited to contribute to three of such projects namely Yulin Sand Land Treatment and Biodiversity Conservation project in Shaanxi province, Chizhou-Xinghua Biodiversity and Development project in Anhui province, and Xining Greening and Environmental Protection project in Qinghai province. Energydesign Shanghai provided services as a member of the technical assistance teams of GFA consulting group GmbH, GITEC-IGIP GmbH, and DFS Deutsche Forstservice GmbH. This article shares the results of this cooperation and identifies perspectives for the future.

Energy efficiency buildings: a path to sensitization of the public for environmental protection?

The energy concept has been developed to achieve higher energy efficiency and functionality of the buildings. Optimal solutions were considered regarding both investment and operation costs as well as the most recent renewable energy technologies. The concept of integrated energy system development has been applied to consider factors such as climate, specific building operation, boundary characteristics, users' comfort, and wellbeing.

Dynamic computational building analyses were conducted using advanced techniques and tools for simulations of dynamic thermal building, electric light, daylight, solar photovoltaic (PV), and thermal conditions. The quantitative analysis includes extensive variants comparison, progressive sensitivity study, along with estimates of investment, operation, and maintenance costs.

The proposed optimal solutions were screened versus their performances in terms of energy, costs, functional features, the ease of construction and

的技术援助团队, 分别参与了陕西榆林沙地治理与生物多样性保护项目、安徽池州杏花村生物多样性保护和发展项目和青海西宁绿化与环境保护项目。本文将分享三个项目的合作成果, 并探讨未来的前景。



The project in Xining includes education about a sustainable environment and relevant building construction

西宁项目包括可持续性环境教育及相关建筑施工

Source / 图片来源: energydesign (Shanghai) Co. Ltd 设能建筑咨询(上海)有限公司

节能建筑: 提高公众环保意识的途径?

通过制定节能方案可以实现建筑的高能效和高性能。在综合考虑投资成本、运营费用、最新的可再生能源技术后, 研究出最优化的解决措施。一体化能源系统方案则是整合了诸如气候条件、特定的建筑运行条件、边界条件、用户的舒适度、健康影响等多种因素开发而成。

工程师利用先进的技术和工具对动态热负荷、照明、自然光、太阳能光伏和热舒适条件进行动态模拟和分析。定量分析包括大量的设计变量比较、敏感性分析、投资成本、运营和维护费用估算。

通过分析比较能耗、成本、功能性、施工和运营便利性、市场可及性等因素, 最佳解决方案得以筛选出来, 并将分析和筛选结果提交给客户和项目管理办公室进行讨论, 以决定哪些建议措施可以被采纳应用。

我们对空间内的供热、空调通风系统也进行了研究和优化, 从而大大降低了能源需求。通过能源和照明组合模型可以看到, 相较于设计院的设计, 仅是调整窗墙比、建筑围护结构的传热系数U值及太阳能得热系数G值、使用更高效的LED灯具以及相关控件, 就可以节约大量能源。这些触手可及的果实不仅可以显著降低建筑使用期限内的运营成本, 还可以减少初期投资, 或大幅降低投资回收期。我们的调查发现和优化措施已经被客户和项目经理广泛接受。仅

operation, and market accessibility. Afterward, the results of the analysis and screening were presented and discussed with the client – the Project Management Office (PMO) – to decide which of the proposed measures can be adopted.

Space heating, cooling, and ventilation systems have been studied and optimized too, leading to a drastic reduction in energy demand. The holistic energy and daylight combined model reveals the potentials of significant savings, by mere adjustment of the Window-Wall-Ratio (WWR), U/G values of the building envelope, more efficient LED luminaires, and related controls, based on the current design provided by design companies. These low-hanging fruits can not only significantly lessen the operation cost in the facilities' lifetime, but also reduce the investment in the first place or show a rather rapid return on investment. The findings and optimization measures appear to be widely accepted by clients or project managers. Solely by carefully thinking and conducting a variant analysis, the energy demand can be reduced by an average of 25 percent.

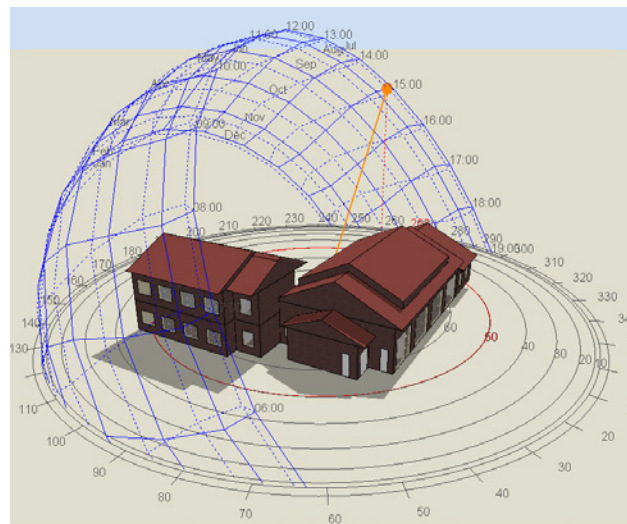
Through modeling, we vary the values of different factors to illustrate the potentials and to progressively optimize the energy performances (see figure). The results of the modeling show energy saving potentials that can be achieved for the three projects through optimizations of WWR, Lighting Power Density (LPD), and insulation thickness and material.

Furthermore, the possibility to use alternative sources of energy, such as wind, geothermal and solar energy, was studied to reduce the consumption of fossil fuel, which is considered as a crucial part of the integrated energy supply hub. Studies show that favorable wind and solar resources can offer abundant natural energy and power to the facilities in the three project locations, particularly in Yulin and Xining, which lie in an arid and cold continental climate. Power from the grid may only serve as a backup energy supply and could even be redundant.

Despite the perspective of savings in terms of energy and costs, design companies and PMOs face difficulties in the adoption of the proposed measures. The concerns put forward are time constraints, low utilization of infrastructure, the efforts required to adopt technologies that are not yet common in relatively remote areas, supposedly more important financial demands, and design and operation complexity. The use of natural materials for external walls – such as

仅通过缜密的方案和设计变量分析, 即可实现项目的能源需求平均降低25%。

模拟过程中, 我们调整不同变量因素的数值, 从而发现建筑节能潜力, 并逐步优化能耗表现 (如下图)。模拟结果表明, 通过优化窗墙比、照明功率密度以及保温层厚度和保温材料, 各项目均可实现显著的节能降耗。



Energy simulation model of an environmental education center building
环境教育中心建筑的能源模型

Source / 图片来源: energydesign (Shanghai) Co. Ltd 设能建筑咨询(上海)有限公司

此外, 我们还研究了利用风能、地热能 and 太阳能等替代能源, 以减少化石燃料消耗的可能性, 这些被认为是综合能源供应枢纽的重要组成部分。研究表明, 适宜的风能和太阳能可以为三个项目所在地的建筑提供丰富的自然能源和电力, 特别是对处于干旱寒冷的大陆气候下的榆林和西宁来说, 电网供应的电力可以仅作为备用, 甚至完全用不到。

尽管既节约能源又节约成本, 但设计院和项目管理办公室仍未全部采纳我们提出的建议措施。他们的顾虑包括工程进度受限、基础设施利用率低、采用偏远地区尚不常见的技术所需付出的努力。可能更重要的是, 财务成本增加、设计和运营的复杂性加大。同样表现在外墙和保温材料的选择上, 例如使用天然材料的木结构代替混凝土框架、及天然材料的保温层, 出于上述类似的原因, 我们的建议未被采纳。

本质上, 采用节能环保措施的主要障碍是客户和设计院对这些材料、技术以及节能建筑的基本原理缺乏了解。客户非常谨慎且不愿在当地尝试使用这些“新”技术, 尽管它们已在欧洲和中国其他地区流行并被广泛应用, 鲜受限制。因此, 客户和设计院更为保守地预测他们不熟悉的技术可能带来的风险, 而并未考虑其优势带来的益处。

wooden frames instead of concrete – and insulation was also declined due to similar reasons.

In essence, a major obstacle in the adoption of energy-saving and environment-friendly approaches to construction is the lack of familiarity of the clients and design institutions with these materials, technologies, and very principles of energy-efficient buildings. While the clients are careful and reluctant to make a local attempt with the “new” technologies, they are already popular and widely applied in Europe and other parts of China, and occasionally resisted. Thus, conservative projections focus on the risks that unfamiliar technologies could pose, rather than considering the advantages.

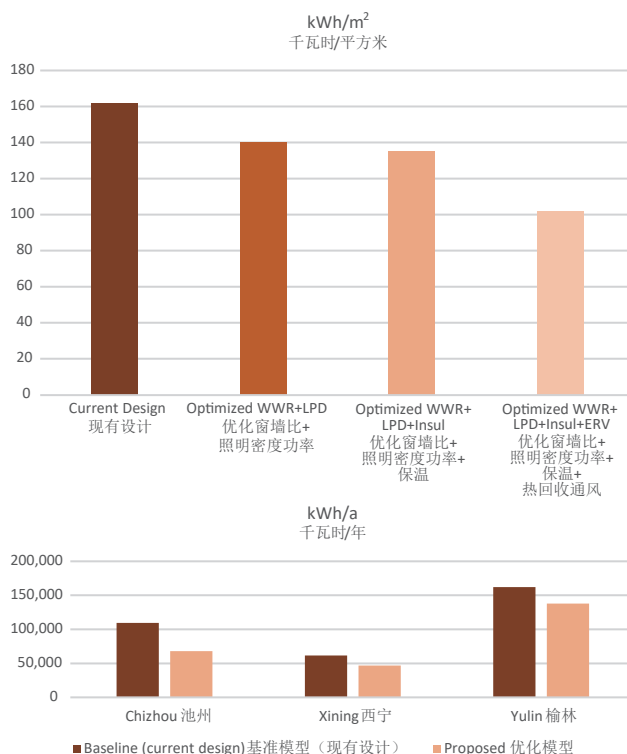
Since the objectives of the projects are biodiversity conservation and environmental education, it is already a huge and successful step forward if the clients are ready to implement some of the recommendations. For example, the small-scale renewable energy technologies, e.g., PV, and optimization of lighting, improvement of WWR, or utilization of thicker layers of insulation materials, turn out to be relatively acceptable and easy to implement to the local team. Current projects are moving towards this direction.

Perspectives for future projects

Thorough and careful analyses have huge potential for energy saving, reducing environmental impact, and bringing down investment and operation costs for KfW projects. Therefore, in China's context, planning sufficient time for the optimization of the energy system and for reducing the impact on the environment to the greatest extent possible is not only plausible but necessary. Currently, this stage is, however, missing in many similar projects in China. Compliance with national norms can only achieve minimum requirements but not substantially improve the energy efficiency of buildings. Ignoring or skipping the effort of design optimizations prior to construction will inevitably result in more severe adverse effects during operation both in financial and functional terms.

Adoption and application of renewable energy technologies in Chinese rural areas still have a long way to go. Adequate capacity building and awareness-raising of project managers through enhanced explanation and communication can help to bridge the gap in knowledge transfer. Proper local incentives and subsidy programs on renewable energy utilization could motivate and facilitate the application of energy-efficient building in the country.

由于这些项目的目标是保护生物多样性和环境教育，因此，客户听取了我们的部分建议并准备实施，这已经是成功地迈出了一大步。例如小规模地采用可再生能源技术，例如光伏，以及优化照明、改善窗墙比、增加保温层厚度等，这对于当地团队来说是相对容易接受和且易于实施的。目前项目正朝着这个方向往前推进。



Energy use per conditioned building area

建筑空调区的能源消耗

Source / 图片来源: energydesign (Shanghai) Co. Ltd 设能建筑咨询(上海)有限公司

未来项目的前景

对于德国复兴信贷银行支持的项目来说，深入细致的分析在节能、环保、降低投资和运营成本方面发挥着巨大的作用。因此，在中国的现状下，规划足够的时间来优化能源系统，尽可能减少对环境的影响，不仅是合理的，而且是必要的。然而，目前中国的许多类似项目都缺少这一阶段。按照国标设计只能满足最低要求，而不能大幅度提高建筑能效。在施工开始前忽视或跳过设计的优化环节，将不可避免地产生更不利的负面影响，无论是在运营费用还是在建筑性能方面。

中国偏远地区接受和应用可再生能源技术还有很长的路要走。通过加强信息传播和交流，对项目经理进行充分的能力建设和意识提升，将有助于弥补知识转移的差距。地方政府出台适当的可再生能源利用奖励和补贴计划，可以激励和促进节能建筑在国内的推广。

Flexibility is Key – Why the DGNB System International Fits into every Context

A contribution by Witold Buenger, German Sustainable Building Council (DGNB)

灵活适应性成为关键 — 为何DGNB国际认证体系可以适用于全球多样化场景

来自德国可持续建筑协会 (DGNB) 的Witold Buenger的客邀文章

Sustainability is a universal value but the precise manner a sustainable building has to be designed and built varies in every country. The DGNB has developed an international certification system that can be applied globally. The criteria cover all the different parameters of a building and they relate to universal dimensions of sustainability: people as a focal point, circular economy, design quality, climate action, support of the SDGs, and innovation in general. But how do you translate a system that makes sustainability tangible with concrete benchmarks, for a completely different context?

"A first step in transforming the DGNB system for Germany into a globally applicable system was to dispense with German DIN standards", says Johannes Kreißig, Managing Director of DGNB GmbH. In the international context, these could be replaced by comparable and compatible EN or ISO standards without compromising quality requirements. In this way the DGNB criteria targets remain constant and only methods regarding target fulfillments vary. If appropriate standards are not available, generally valid concepts based on physical principles can also serve as a starting point for guidelines. Hence, many criteria are equipped with technical appendixes that provide data for calculations or simulations. This material is not country-specific and naturally may work for different parts of the world.

All criteria have their own predefined weighting factors and shares in the total performance. Nevertheless, it is always possible that a criterion may not only fail to reflect a local peculiarity but also turn out as inappropriate in its weighting. Dealing with energy or water is different in the cold north of China than in the latitudes with hot summers and mild winters, so the weighting within the overall performance should be different as well. If an auditor discovers disproportionate concerns, standards, or weighting, the adaptation sheet can be used, and an adjustment suggested.

The DGNB certified projects throughout China show that sustainability can be implemented globally and hand in hand with buildings that protect the environment all over the world and enhance the local society with future proven values.

现今, 可持续发展已经成了一种普适的价值观。但对于每个国家, 可持续建筑的设计和建造都必须通过不同的、因地制宜的方式才能得到确切的实现。DGNB (德国可持续建筑委员会) 成功开发了可以在全球范围内适用的国际认证体系。其标准涵盖了建筑项目中各种不同的指标和参数, 并且紧紧围绕着可持续发展最具普适性的价值主题: 以人为本, 促进循环经济, 呈现高品质设计, 采取气候行动, 以可持续发展目标 (SDGs) 为导向并支持创新。那么, 这样的一个认证体系, 将如何在全球多样化的场景下, 把可持续性通过具体且标准化的形式予以呈现呢?

正如DGNB GmbH董事总经理Johannes Kreißig所说: “将德国DGNB认证体系转化为全球适用的评价标准, 第一步就是要跳脱出德国DIN标准的原有框架”。为了适用于国际范围内的多元场景, 在不影响项目质量要求的前提下, 可以选用更具比对性和兼容性的EN或ISO标准作为代替。通过这样的方式, 可以保证DGNB致力于达成的目标质量保持不变, 只是实现目标的方法有所改变。假若在适当的标准也缺失的情况下, 仍可以把物理原理中普遍适用的概念作为准则的起点, 进行可持续性的评价。因此, 在DGNB众多的标准中都配备了技术附录, 这些附录可以为计算或模拟提供数据参考。这些内容不再特定于针对某个单一的国家或地区, 将同样可以灵活适用于世界各地。

在DGNB认证体系中, 所有的标准都有其预定义的权重因子, 并在总体绩效中占有一定份额。然而, 评价准则也有可能无法反映部分地区的当地特征, 或者在权重设置方面存在问题。比如, 与夏热冬暖的低纬度地区相比, 在中国北方的寒冷地区处理能源和水的工艺方式会大有不同。那么, 相关标准在整体绩效中的权重也应有所调整。如果审核师发现标准或者权重中出现不相称的问题, 可以随时使用适配性反馈表提出相关的调整建议。

DGNB在全中国范围内的认证经验表明, 这样的可持续性是可以全球范围内实施并相互传播的: 可以通过倡导可持续建筑促进全球环境保护, 同时为当地社会增添未来可期的新价值。

Future Fields of Urban Development

A contribution by Peter Sailer

城市发展的未来领域

来自翟翊的客邀文章

Cities as structures of human activities are never completed. There are always changes and adjustments. This allows the integration of technical innovations, which have improved the quality of people's lives and living standards, and potential for future growth. The aim of this article is to highlight some aspects of urban development that will become even more important in the future.

In the past, technical innovations were primarily infrastructure measures that were characterized by long life cycles, but with the increase in information and communication technologies in people's lives and their increased use in cities these cycles of renewal are becoming shorter and shorter. This imposes a dilemma on cities and their planners if they want to remain competitive in the future. Therefore, among other things, cities need adequate areas and infrastructures, which mainly have to correspond to the respective state of the art. However, this provision is not free of charge – investment costs for the introduction of new infrastructures are enormous at the beginning – and renewal must always be weighed against the other municipal tasks.

The technological development of cities must also be sustainable. It is not only socially and ecologically important to develop and implement long-term sustainable strategies. Financial sustainability must ensure that cities do not fall into an innovation dilemma, as they are not disposable items that can be renewed and exchanged at short notice. Especially when it comes to the use of technological aids, an open-ended assessment of their actual benefits is required as to whether they will benefit both the individual citizens and the “operation of the city”.

Efficiency increases in the area of electricity and heat supply are a sub-area in which extensive experiences have been built up globally. However, it should also be noted that, especially with regard to technical aspects, society is often not yet ready to accept innovations that replace traditional or established processes and technologies. Here, prices are not the only decisive factor for the implemen-

城市作为人类活动的形态，从未完工。它处于一个不断变化和调整的过程中。这个过程中可以整合技术创新，以提高生活质量和标准，且具有未来改良的潜力。本文的目的是点明城市发展中，在未来将获取更多重要性的各个方面。

过去，技术更新主要是体现在基础设施的措施中，以实现较长的使用寿命，但是随着人们生活中信息和交流技术的不断发展，以及其在城市中越来越多的应用，使得更新的周期变得越来越短。如果城市及其规划者想在未来保持竞争力，这会使他们陷入一种局促。为此，他们不但始终需要足够的土地和基础设施，这些也必须在很大程度上与相应的技术水平相契合。但是这种供应不是免费的，建立新基础设施的投资成本在初期是巨大的，并且一项更新也始终必须与其他行政任务之间相权衡。

城市的技术发展也必须是可持续的。制定和实施长期稳妥的战略，不仅仅局限于社会性和生态性的视角上。融资的可持续性必须确保城市不会陷入创新的困局中，因为城市不是可以在短期内能进行更新或更换的一次性物品。尤其是在使用技术性的辅助工具时，需要对它们的实际收益进行开放式的评估，以确定它们是否会对每个公民和“城市运营”均有利。



Shifting infrastructures underground increases their resilience (Beijing, Chaoyang District)

将基础设施转移到地下可以增强其适应力（北京市朝阳区）

Source / 图片来源: Peter Sailer

电力和供热领域的效率提高是一个其中的领域，在此方面全球都已经积累了丰富的经验。不过还应注意，特别是在技术上，城市社会在多种意义上尚未准备好接受替代传统或既定流程的技术更新。在这

tation of new and more economical technologies if they have to be accompanied by necessary changes in users' behavior (e.g. concepts for room ventilation or circular economy) or if additional investments are required. The tendency that can then be observed is that preference is given to established technologies or processes in order to achieve viable solutions for all sides. But even in such a case, the potential can be seen: Every innovation or upgrade is an improvement over the status quo and thus to be supported in terms of resource efficiency and the sustainability efforts of society – if only as an intermediate step in planning and technological development. In accordance with the motto “less is more”, under the given conditions the correct use of established structures should be superior to over-engineering in the medium term.

For urban planning, this means that it must be foresighted. Large-scale land-use planning as in the 1970s no longer corresponds to a modern view of flexible land use concepts. However, superordinate decision-makers should not work towards small-scale land use that is imposed on the lower levels. Rather, the mix of differently sized units of space has to be ensured in order to be able to anticipate future changes in demand via the flexibility of existing and future spaces as far as possible.

This flexibility is also required in residential construction. Large-scale projects of apartments with different floor plans and equipment standards can also be used to implement cross-subsidies for social housing construction, thus contributing to a potential (partial) relief for public budgets and also ensuring that all different social groups participate in the development of the city.

Especially in areas predominantly characterized by residential use, ground floor zones were often defined by the fact that the businesses located there were only partially successful. The conversion into residential units often does not result in greater occupancy of the quarters or satisfactory returns for the real estate industry. The recent changes in the use of vacant apartments in daycare centers, social facilities, or co-working spaces show that rethinking is taking place. Far-reaching changes in the use certainly result in conflicts with residents and affected citizens. But especially against this background, an increase in the permissible values of land use allows gradual densification of the cities. In addition

方面,成本并不能作为实施新的更经济技术的唯一决定因素,特别是在必须伴随着必要的行为改变(例如房间通风或循环经济的方案)或需要额外投资的情况。所以现实中往往倾向于优先选择那些已有的技术或程序,以便为所有方面实现稳妥的解决方案。但是即使在这种情况下,也能够识别根本的潜力:每一项更新或升级都是对现状的改善,因此在资源效率和社会的可持续发展方面(即使只是在规划阶段和技术的中间步骤)都应该得到支持。秉承“少即是多”的座右铭,在现有条件下,从中期来说正确使用已建立的结构可能会比过度技术化更合理。



Residential districts, built decades ago are predestined for refurbishment approaches on a district level (Beijing, Chaoyang District)
几十年前建造的住宅区注定要在小区层面上开展翻新工程(北京市朝阳区)
Source / 图片来源: Peter Sailer

对于城市规划,这意味着必须在此方面有前瞻性。1970年代的大尺度土地利用规划不再适用于现代灵活的土地利用方案视点。当然上级的决策者不再应该强行为下个层级的小尺度土地利用而操心。相反,必须确保不同尺度的空间单元的混合,以便能以现状和未来空间的灵活性,来尽可能地适应未来需求的变化。

在住宅建造中也需要这种灵活性。具有不同楼层平面结构和设备标准的大型住宅项目可以在交叉补贴的过程中,也把单个住宅单元纳入住宅补贴,从而有助于(部分)减轻公共预算,并确保所有市民群体参与到城市的发展中。

特别是在住宅为主的区域,进驻住宅底层的商业通常只有一部分能成功运营。而把它们改建为住宅单元则通常不会吸引更多人居,也不会让房地产获得令人满意的收益。在最近的实践中,把空置的公寓重新利用为日托中心,社会设施或共享办公场所等实践表明了人们思想的转变。当然空间功能的转变所产生的深刻变化,肯定会导致与其他居民以及直接受影响居民之间的矛盾。但增加建筑允许的利用方式,不仅可以

to the activation of previously vacant or undeveloped plots, any need for protection must be appropriately assessed, especially in areas preloaded by emissions.

Flexible (subsequent) usage concepts and mixes can lead to lively and actively used urban structures: If sites of do-it-yourself stores lose their attractiveness these spaces would be available and particularly suitable for urban logistics centers. Against the background of a further increase in e-commerce and the bridging of the “last mile” by the respective online retailers themselves, spatial potential can be activated at a short notice and serve as incubators for further development. Their proximity to customers also enables new delivery concepts with more efficient vehicles.

In terms of transport, the problems (transport policy and construction) caused by history offer a large number of spatial potentials that can easily activate efficiency (e.g. Highline Park in New York, Cheonggyecheon Urban Renewal Project in Seoul). Public transport is particularly the case, which is often in short of demand, especially in rural areas, yet the government has to provide basic services as an obligation. Under this circumstance, the use of demand-driven vehicles leads to better utilization of public transport. The flexibility of transport capacity can, in fact, increase operating frequencies. In order to become more attractive than motorized private vehicles, it is necessary to offer higher frequencies in public transport and tailor the allocation of stops to pedestrians' needs. This offers potential users flexibility similar to using their vehicle: travel to individual destinations according to their schedule. Cities have to respond by providing appropriate priority lanes, spaces for transport hubs, or, for example, spaces for pedestrians.

Visions for urban development and their implementation can have an effective impact on urban development once private capital can be channeled and guided by governments. It can give the respective city long-term competitive advantages due to rapid development. But only if changes are seen as something positive and obvious challenges are accepted. In conjunction with the local government, private investors must also be aware of their influences. Visions can inspire, convictions can change, both together can have lasting positive effects on urban development.

激活以前闲置或未开发的空地, 还可以使城市逐渐变得更为紧凑, 因此在这个背景下, 特别是那些原本遭受污染的地区, 可在重新利用后受到相应的保护。



Deliveries currently sorted open air (Beijing, Chaoyang District)
快递物品目前露天分拣 (北京市朝阳区)

Source / 图片来源: Peter Sailer

灵活的 (重新) 利用方案以及各种利用方式的组合可以让现有的城市结构更充满活力: 如果大型家装商场失去其吸引力, 它就会成为一个可用空间, 比如特别适合作为靠近城市的物流中心。在网上贸易的进一步增长, 和各个在线零售商自己弥合贸易的“最后一英里”的背景下, 就能在短期内激活可利用的空间潜力, 并把它作为其所在地区进一步发展的孵化器。出于它们与客户之间的近距离, 也就能利用新的更高效交通工具的运输方案。

在交通领域, 在过去的 (交通政策和建造) 错误中, 提供了巨量且易于释放的效率和空间潜力 (例如高线公园 (纽约), 清溪川城市更新项目 (首尔))。特别是在近程公共交通领域, 尤其是在农村地区, 公共交通领域经常缺乏需求, 但却仍然有必须提供基本服务的义务, 这里就能根据具体情况使用需求为导向的车辆, 提高公共交通的利用率。这种对运量的调节, 是为了更好地扩展服务的频率。为了不让私家车变得更具吸引力, 就需要在公共交通中提供更高的服务频率以及符合步行者需求的停靠点, 这为潜在用户提供了与自己驾驶私家车同等的灵活性: 根据自己的时间安排前往各个目的地。城市也必须通过提供适当的优先车道, 作为公交枢纽的土地或步行交通区域来做出响应。

城市发展的愿景及其实施与私人资本的结合, 可以对城市发展产生有效的影响, 在政府积极的主导下, 以这种结合产生的快速发展行动, 赋予每个城市更长远竞争优势。但实现这些, 需要将变化视为积极的事情, 并且准备好接受显著的挑战。与地方政府合作, 私人投资者还必须明晰他们影响力的可能范围。发展愿景可以鼓舞人心, 也可以改变信念, 两者都可以对城市发展产生持久的积极影响。

As for energy efficiency, additional to individual buildings, planning heating systems, and regulations at the regional/district level in order to provide areal integrated plans for heating provision increase resource efficiency. However, this must not be done out of pure belief in technology but must also ensure economically viable solutions. Climate protection is not the only issue in urban development. Its acceptance can only be increased through tangible and measurable advantages. To achieve collective rethinking, sustainability must first of all be financially attractive to the residents!

The current buzzword “Smart City” is not only the driver of technological modernization measures. In addition to the possible digitization of urban infrastructures (traffic control, surveillance of public space, installation of systems for measuring environmental data, intelligent meters and sensors, charging solutions, etc.), cities also have the opportunity to raise their inherent creative capital without class differences and to support and promote not only economic but also social and innovative potentials in their development. Being previously only available to a certain group of people, infrastructures and advancement opportunities can now be communalized. As China is well engaged in the global smart city movement in terms of collecting parameters of urban life, this should be the base for a global discussion on how to tap into the potentials of digital infrastructures for a better urban life. The proper combination of different data sets, as well as the conclusions, are drawn to act towards more energy and climate-friendly cities, will be a decades-long task where a balance between technological potentials and social acceptance needs to be found. Direction has to be carefully given now with effects justifying the means in the long run.

In times of widespread implementation of working from home, from a real estate perspective questions on the future of work inevitably arise when it comes to the value-based use of existing office space infrastructures – which happens in the constant rhythm of recurring discussions. At the beginning of the millennium when the use of the Internet begins to spread, it was pointed out that this would result in the decline of inner cities and public spaces. However, the development of mobile end devices showed the opposite. Due to the almost

除了个别建筑物的能源效率外, 还可以在整個建设区的层面应用规定, 以便通过区域的供电方案来支持联合供电供暖方案的要求。但这不能仅仅出于对技术的信念, 还必须是稳妥的经济可行的解决方案。气候保护不仅是城市发展中的主要问题。对它的接受度, 只有通过有形、可衡量的优势来增加。为了实现集体的思维转变, 可持续性首先必须为居民带来经济上的兴趣!



A mixed-use residential area that awaits upgrading (Beijing, Chaoyang District)

亟待升级改造的多功能住宅区 (北京市朝阳区)

Source / 图片来源: Peter Sailer

当前流行的“智慧城市”概念, 不仅是技术现代化措施的驱动力。除了可能实现城市基础设施的技术现代化外 (交通引导、公共空间监控、安装用于测量环境数据的系统、智能计数和传感器、充电解决方案等), 城市还能通过共同化以前仅局限于特定人群的服务、机会、基础设施和发展机会, 以在没有阶级差异的情况下提高其自身的创造力, 不仅支持和促进其发展中的经济潜力, 也注重其社会和创新潜力。鉴于中国在智慧城市参数采集方面正全面投入到全球智慧城市运动中, 这应当作为全球探讨如何利用数字化基础设施创造更美好的城市生活的基础。对不同数据集和结论的恰当组合将推动城市的能源和气候友好化, 而如何在技术潜力和社会认可间找到平衡, 也将是一项长达数十年的任务。这需要找到一个能够从长远角度证明其方法有效的正确方向。

在广泛的工作都能在居家“工作场所”完成的时代, 当涉及到对现状办公空间基础设施价值为导向的利用时, 不可避免地会从房地产的角度提出未来工作方式问题, 并且被不断重复地讨论着。当本世纪初, 随着互联网开始广泛普及时, 人们指出这将导致中心城区的死寂、公共空间的荒凉, 然而随着移动终端设备发展所带来的变革过程, 却显示出相反的发展, 即由于其几乎随处的可用性, 并没有使中心城区变得死寂, 而恰恰是在中心城区把部分办公转变成了更具活力的公共场所。

ubiquitous availability of the internet, there was no extinction of the inner cities but a partial relocation of activities into public spaces – including working.

If the idea that business trips are no longer necessary due to the Internet and that companies can basically settle down regardless of locations is applied to those days, then it is justified nowadays as well. However, the tendency can still be discerned that spatial infrastructures continue to form in individual clusters based on the existing infrastructures. Since respective companies settle through simplified information exchange, the presence of appropriately trained workers, and the resulting “cafeteria effect”, through a corresponding increased demand they hope to benefit from the closeness to the competition (cf. e.g. Cairncross, The Death of Distance, Boston, 2001). Communication channels/media that exist today can certainly replace business trips to a certain extent – but personal contact and strengthening interpersonal relationships as the basis of economic cooperation cannot yet be replaced.

Nevertheless, from a global perspective, the question to what extent technological progress makes cities more efficient if social contact is only electronically cultivated due to the general tendency that more and more people live alone and face-to-face contacts are taking place less and less, is now more important than ever. Less technology means more social competence and social cohesion – the glue that defines cities and is the basis of a successful business.

Urban planning in the digital age is undoubtedly not unwilling to learn, but here too it shows that practiced and established administrative processes – without speaking of traditional approaches – sometimes require little food for thought in order to face new developments and to act in a future-oriented manner. Through new models of public participation, valuable information can be obtained quickly and easily, which shall speed up responses in times of rapid global change.

This article summarizes thoughts that were subject to the discussion during the MBA course “International Real Estate Management” at the Biberach University of Applied sciences and the reflection of the author’s work.

如果人们继续抱着那些曾经合理的想法不放，比如由于互联网的产生而不再需要商务旅行，并且公司的选址无所谓在何处，并还将这些想法应用到今天，那他有秉持观点的权力。不过事实上仍存在一种趋势，即现有的基础设施继续在各个行业中形成空间聚落，因为选址在聚落中的公司能通过简化的信息交换、利用当地经过适当培训的劳动力，并从因此而产生的“食堂效应”中受益，且通过相应增长的需求优势，从与竞争者的近距离中获益（参见Cairncross, The Death of Distance, Boston, 2001）。当今存在的沟通渠道/媒体肯定可以在一定程度上替代商务旅行，但目前尚不能替代个人之间的联系，以及加强人际关系作为经济合作的基础。



Technical infrastructure to primarily manage traffic flow (Beijing, Dongcheng District)

主要用于管理交通流量的技术基础设施（北京市东城区）

Source / 图片来源: Peter Sailer

但是从全球的角度来看，当代的问题比以往任何时候都更加重要，如果由于普遍可观察到的社会的孤独化，社会联系仅仅通过电子方式进行，并且面对面的接触变得越来越少，那么技术进步到底在多大程度上提高了城市的效率。技术含量越少，社会能力和社会凝聚力就越高，而这是城市的基础，是成功开展经济活动的基础。

数字时代的城市规划无疑是不断需要学习的过程，在这里也能看到，实践和现存的行政程序（不谈论传统的方法）有时需要一些思考才能面对新的发展，并以面向未来的方式行动。通过公众参与的新模式，可以快速、轻松地获取有价值的信息，这在全球快速变化的时代能帮助加快响应的速度。

此文总结了在比伯拉赫大学的MBA课程“国际房地产管理”中所探讨的论点，也反映了笔者研究中的核心思想。

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