



Federal Ministry for the  
Environment, Nature Conservation,  
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## Green Building 绿色建筑特刊

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# Foreword

Over the last decades, humanity has become more and more urbanized and this has increased our prosperity and our living standards. Especially in emerging countries like China, urbanization and economic and social progress are closely interconnected.

With their agglomeration of both producers and consumers, cities today are hubs of economic activity. This means that protecting cities from the effects of climate change is central to safeguarding our economic prosperity.

In the past years we have witnessed increased rainfall and storms affecting cities and realized that we have to make them fit for this challenge. For a long time, climate change has been seen as a phenomenon affecting only remote islands. However, a number of serious rain events in the last year have raised awareness of the vulnerability of cities to climate change in Germany too. Nor should we forget that two thirds of all cities with a population of more than 5 million are located in coastal areas at just above sea level.

However, because of their economic importance, cities themselves also contribute over-proportionately to climate change and therefore have the greatest interest in participating in mitigation efforts. In the past, governments too often set the wrong incentives in this regard, but around the world, this is changing. In relevant documents like the Paris Agreement, the New Urban Agenda and the Sustainable Development Goals, the role of cities in fighting climate change is being recognized.

The most important area here is probably the building sector, where energy efficiency, new technologies and standards are key to addressing cities' challenges for the future. The further development of these standards and their practical implementation is difficult, but I believe we are on the right track.

In China, with an urban population growth of approximately 13 million people per year, the urbanization rate will rise from about 55% (2014) to 70% (2030). This development poses major infrastructural challenges for China and is leading to an immense increase in urban greenhouse gas emissions and intensive conversion of agricultural land. In addition to promoting dynamic economic growth, the Chinese government



Source / 图片来源: Bundesregierung / Sandra Steins

**Gunther Adler**  
State Secretary 国务秘书  
German Federal Ministry for the Environment,  
Nature Conservation, Building and Nuclear Safety  
德国联邦环境、自然保护、建筑和核安全部

近些年来, 人类生活逐渐向城市转移, 生活水平和质量也愈发提高, 尤其是像中国这样的新兴国家, 城镇化进程是与经济和社会发展紧密联系的。

由于生产者和消费者的集聚效应, 如今的城市已成为经济活动的中心。因此, 城市层面的气候保护行动也是经济繁荣发展的重要保障。

过去的一段时间内, 强降雨、风暴等极端天气出现频率增加, 对城市带来了影响, 我们应该采取措施提高城市应对气候风险的能力。气候变化曾一度被认为仅对遥远的海岛有影响, 然而最近德国各地暴雨频增的现象引发了人们对于城市对气候变化的脆弱性的思考, 而且德国2/3人口超过500万的城市都位于海拔较低的滨海地区。

然而, 城市本身的经济地位重要, 也是温室气体排放的主要场所, 因此他们对减缓行动有强烈的兴趣。过去, 政府过去有一些不当的发展措施, 这些情况也逐渐在改变。在最近的巴黎气候协定、新城市议程和可持续发展目标等文件中, 城市对于气候保护的重要性逐渐明确。

最为重要的领域应该是建筑业, 该行业的高能效技术和标准可有效应对城市发展挑战。尽管标准提高后相应措施的实施会面临诸多困难, 但我认为我们的大方向是正确的。





*The Sino-German Mayors' Programme has been contributing to the exchange on sustainable urban development between both countries for more than 35 years*

中德市长项目为促进两国在可持续城市发展方面的交流合作已超过35年

Source / 图片来源: BMUB / Jessica Suplie

is taking decisive measures to deal with the environmental effects of urbanization and modernization on the country's cities.

To facilitate this, the Sino-German Urbanisation Partnership was jointly initiated by the Chinese and German governments. It is funded through the International Climate Initiative (IKI) of the German Federal Ministry for the Environment and Building (BMUB). This initiative addresses the economic, social, and environmental challenges created by fast-paced urbanization processes, and climate change impacts in both countries. In the last year, it advanced the political dialogue and cross-city and institutional exchange of experience to find joint solutions, build capacities and enable the countries to learn from each other. The exchange targets a reduction of CO<sub>2</sub> emissions, a more balanced urbanization development and an improved quality of life in cities. It aims at providing capacity building training for German and Chinese officials, municipal actors, urban planners, developers and other relevant stakeholders.

Cooperation like this will help both China and Germany in making their cities fit for climate change and minimizing the negative environmental effects of urbanization. Their work supports exchange, for instance of best practice experience between cities and provinces of the two countries on issues related to an integrated and sustainable urban development.

We understand that solutions have to be inclusive and while the framework has to be set at the national level, actions have to be taken at the local level. Both China and Germany are committed to this.

中国每年城市人口增长量约为1300万,城镇化率数据显示2014年为55%,预计到2030年会上升到70%。该发展趋势为中国基础设施的建设带来压力,并会导致城市温室气体排放量大幅增加以及农业用地的深度开发。在经济高速发展的同时,中国政府采取了一系列政策方案来应对城镇化、现代化对环境的影响。

在此背景下,由中德政府联合开展的“中德城镇化伙伴关系”项目应运而生,该项目的出资方为德国联邦环境、自然保护、建筑与核安全部的国际气候倡议。项目着重两国在高速城镇化过程中在经济、社会和环境层面所面临的挑战以及全球气候变化带来的影响。去年,该项目发起了双边政策对话,共同寻找解决方案,加强能力建设,以促进中德两国的相互学习。项目旨在实现气候减排、城市化进程的均衡发展 and 城市生活质量的提高,面向中德两国多个利益相关方展开能力建设培训,对象包括政府官员、市级代表、城市规划师、开发商等。

诸如此类的合作可帮助中德两国更好地应对气候变化并减少城镇化过程带来的负面影响。项目能促进两国在综合可持续城市发展的交流合作以及国家层面和省级优秀实例的共享学习。

我们理解应采取更为包容的整体解决方案,即国家层面提出政策框架,地方层面基于大的方针路线展开实际行动,这一点对于中德两国都非常重要。

# Green Building



## Smart City Development – Perspectives from Germany and China

### 智慧城市在德中两国的发展简析

In 2008, the concept of “smart city” was proposed by the company IBM, referring to three ‘I’s (instrumented, interconnected, intelligent) and providing solutions for instance in the field of transport, medical care, governance, power grid and water utilities. Over the past years, the concept has been further enriched with additional contents. Currently, a smart city often refers to an urban area that applies different types of information and communication technologies (ICT) such as the Internet of things (IoT), cloud computing, big data, geographic information systems (GIS) or machine to machine (M2M) communication to supply information that is used to optimize urban planning, construction and management, making community services and city operation more intelligent. ICT represents an inevitable element of smart cities, usually entailing various physical devices, networking components, applications and systems that enable the interaction between city dwellers and the digital world through modern computing. Therefore, ICT could enhance the cost and resource efficiency via intelligent management of urban flow and real-time response.

Due to differing development levels, various countries have identified different targets and scenarios for smart city development. In recent years, there has also been growing interest from Germany and China to realize smart city construction.

Germany follows the overall European Union policy framework for smart city development and has integrated sustainability in the smart city concept. According to the German Federal Ministry for Economic Affairs and Energy (BMWi), the strategic initiative “Industrie 4.0” revived in 2011 is a central focus of the Federal Government’s “Digital Agenda”. In two funding programmes entitled “Autonomics for Industrie 4.0” and “Smart Service World”, BMWi is already offering almost 100 million EUR to facilitate research and innovation in the field of industry 4.0. A series of smart city experiments has been carried out throughout cities in Germany, especially focusing on the energy, environment and transport sectors.

2008年, IBM公司首次提出了智慧城市的概念, 其核心理念为3I特征, 即感知化 (instrumented)、互联化 (interconnected) 和智能化 (intelligent), 为城市交通、医疗、政府管理、电网和供水等部门提供解决方案。过去的时间里, 智慧城市的概念不断被赋予新的内容, 如今可理解运用多种信息通信技术 (ICT) 提供信息, 例如物联网、云计算、大数据、地理信息系统 (GIS) 和机对机通信 (M2M) 技术, 以优化城市规划建设和管理, 从而使社区服务和城市运营更为智能化。信息通信技术是智慧城市中不可或缺的一环, 包括实体设备、网络部件、应用和系统等要素, 通过现代计算技术使人机交互成为可能。因此, 信息通信技术可利用城市流的智能管理和实时响应, 提高城市的经济成本和资源效率。



*Smart cities together with information & communication technology could enhance the cost and resource efficiency via intelligent management of urban flow and real-time response*

信息通信技术可利用城市流的智能管理和实时响应, 提高城市的经济成本和资源效率

Source / 图片来源: pexels.com

由于发展程度的差异, 各国对于智慧城市的发展制定了不同的目标和路线, 近年来, 德国和中国对该领域发展的关注度逐渐提高。

德国智慧城市建设围绕欧盟智慧城市建设的总体框架, 将可持续发展和智慧城市的理念进行了有机结合。德国联邦经济和能源部 (BMWi) 指出, 2011年提出的“工业4.0”概念是联邦政府数字议程的中心焦点, 在“自主的工业4.0” (Autonomics for Industrie 4.0) 和“智能服务世界” (Smart Service World) 两个资助计划中, 德国经济部已经提供了将



A typical good practice example can be found in the German city called Bottrop in the Ruhr area, which has turned itself into an urban laboratory for innovative technologies. "InnovationCity Ruhr" is a programme that aims at the urban renewal of energy-efficient restoration for a post-industrial district with the specific target of cutting CO<sub>2</sub> emissions by half until 2020. The German company Innovation City Management is the core coordinator for the programme. The firm moderates the innovation process and offers expertise in climate-optimized urban development. The energy-related modernization measures and the use of innovative technologies, such as cogeneration of heat and electricity, power storage and renewable energies, save resources and increase the energy efficiency of individual buildings in the communities. Linking the involved buildings by means of intelligent energy management systems leads to locally generated power and heat that can be supplied to surrounding houses. More than 300 projects have been running in the fields of action of living, mobility, working, city and energy. The "InnovationCity Ruhr" programme gained extensive public participation and has been supported by more than 20 thousand residents in the city. By 2020, the investment volume will reach 29 million EUR with about 40% government funding and another 60% from the private sector. Other examples in Germany include for instance an open database platform established by Berlin Partner for Business and Technology, as well as the "Smart City / Digitales Bonn" strategy jointly developed by the city of Bonn and the German software enterprise Axxessio.

While Germany leans its focus on urban energy transition, smart city projects in China tend to take advantage of ICT technology to improve urban governance efficiency. Since 2012, China has laid a political focus on smart city construction. Led by the State Council, relevant ministries and commissions, a series of policy instruments, guidelines and demonstration pilot programmes have been established to regulate and enhance smart city development in China. One of the latest official documents published were "Guidelines for Promoting the Healthy Development of Smart Cities" in 2016. Under the lead of several ministries, more than 400 pilot smart city programmes are being realized in China. In line with a government-led approach, smart city development follows a faster and larger-scale manner. An example worth mentioning is the public medical information service platform of the Chinese city Ningbo. It collected the information from all hospitals in its database "Cloud Hospital",

近1亿欧元来促进“工业4.0”领域内的研发和创新活动。一系列的智慧城市实验在德国各地展开,主要集中在能源、环境和交通领域。

德国智慧城市的一个典型优秀实践案例是“创新城市鲁尔区”,位于西北部小城博特罗普(Bottrop),这里正在转变成为一个创新科技的城市实验室。“创新城市鲁尔区”计划是实现后工业地区的节能型城市更新,并确立了2020年CO<sub>2</sub>排放量减半的具体目标。“创新城市管理”公司(Innovation City Management GmbH)是该计划的执行方,具体负责创新进程的协调并气候保护型城市发展提供专业咨询。能源节约型改造具体措施包含热电联产、储能、可再生能源等,从而能达到节约资源和提高社区建筑能效的效果,并且智慧能源管理系统将其中所有建筑的热电供应进行了联接,单幢建筑多余的热电能量生产可输送至邻近区域。该计划下在生活、交通、工作、城市和能源方面展开的项目达300多个。“创新城市鲁尔区”计划从最初就践行了广泛的公民参与,地方政府获得了2万个当地居民的支持签名。资金方面,预计到2020年,各方投入将约达2.9亿欧元,其中,约40%的项目资金来自政府拨款,60%来私营部门的投资。德国智慧城市的其他优秀实践案例包括柏林商业和技术合作伙伴建立的公开数据平台,波恩市政府和德国软件公司Axxessio联合发起的“智慧城市/数字波恩”战略。



*In the framework of the "InnovationCity Ruhr" programme more than 300 projects are being implemented in the fields of living, mobility, working, city and energy*  
“创新城市鲁尔区”计划下在生活、交通、工作、城市和能源方面展开的项目达300多个

Source / 图片来源: wir-lieben-bottrop.de

与德国注重城市能源转型的智慧城市项目实践不同,中国更倾向于利用智慧城市来提高城市管理效率。2012年,中国政府首次提出的关于智慧城市的指导性文件,由国务院牵头,相关各部委提出了一系

which simplified the process of public medical service for citizens. Unlike the practice examples in Germany, the main bodies responsible for smart city construction in China are mostly local governments. Gradually more and more public-private-partnership (PPP) models have been introduced in the smart city market in China. The internet company Alibaba and the electronics manufacturing company Foxconn have cooperated with the Hangzhou city government to provide a system solution called “ET City Brain” that incorporates artificial intelligence technology. It has been authorized and deployed for transportation management since September 2016 in Hangzhou. The related project equipped over 128 traffic signal intersections and reduced the transit time by around 15% and average trip time for road bridges by almost 5 minutes in a designated pilot area during a one-year testing period. According to Alibaba's Technology Steering Committee, the “ET City Brain” will continuously be upgraded in order to provide a better and more comprehensive performance for urban governance.

By analyzing smart city practice examples in Germany and China, certain distinctions can be observed and summarized. The smart city projects in Germany are more closely aligned with the national strategy of “energy transition”. In addition, market-based instruments have played a major role in smart city development. The German projects were more specific and decentralized with flexible funding structures. In most cases, agencies are the core coordination body for the projects. In comparison, the smart city pilots in China are applied for infrastructure, aiming at improving integrative urban governance. Through governmental lead, the implementation force is stronger and can be scaled up in a rather short period time. Moreover, local governments realized the side-effects of a pure top-down approach. Private sector funding is getting more and more involved in the smart city market, especially when it comes to leading high-tech enterprises. However, most coordinators of smart city programmes in China are still local governments and public participation in the urban development process still needs to be strengthened.

In spite of the different development scenarios in China and Germany, high-tech enterprises in the smart city business from both countries have already actively approached each other for collaboration. At the CeBIT 2017 exhibition in Germany, the Chinese telecommunications enterprise ZTE has signed a cooperation agreement with a German agency called “Drei

列有关智慧城市发展的政策、方针以及试点项目，新近发布的文件有2016年八部委联合印发的《关于促进智慧城市健康发展的指导意见》，目前，中国各部委发起的智慧城市项目共有400余个。与德国相比，中国的智慧城市主要是由政府来主导建设，政府是执行主体，这种模式的优势是发展速度更快、规模也更大。该模式的一个典型案例可参考宁波市公共医疗信息服务平台，平台集合了市区所有医院的信息，“云医院”的建设大幅缓解了居民就医难的问题。然而，中国的智慧城市也逐渐的转型，通过PPP模式引入社会资本参与，比如阿里巴巴集团和富士康科技集团与杭州市政府合作开发一套“ET城市大脑”的系统解决方案，其中采用了人工智能技术。该系统在杭州市区进行了试点应用，接管128个信号灯路口，区域内通行时间减少15.3%，高架道路出行时间节省约5分钟。阿里巴巴技术委员会代表宣称，“ET城市大脑”将会不断更新，在未来会为城市治理带来更为全面的解决方案。



*Under the lead of several ministries, more than 400 pilot smart city programmes are being realized in China*

目前，中国各部委发起的智慧城市项目共有400余个

Source / 图片来源: alyun.com

通过对德中两国智慧城市典型项目的简析，我们可以发现两国的发展模式的一些区别。德国的智慧城市建设项和国家层面的“能源转型”战略联系紧密。市场在智慧城市建设中发挥着主导作用，项目运作的维度更小，呈散点式发展，而且有着相对较为灵活的资金结构。相比之下，中国的智慧城市项目集中在基础设施领域，偏向于城市综合管理的整体优化。政府主导的模式执行力更强并能在短时间内实现规模化发展。同时，地方政府也意识到从上到下治理模式的弊端，在智慧城市的市场中逐渐引入社会资本，尤其是高新技术企业的参与。然而，大多数情况下，中国智慧城市建设的主体仍是政府方，城市发展的公共参与程度亟待提高。

Gewinnt” to provide system solution service for the future smart city construction of the German cities of Rüsselsheim am Main, Kelsterbach und Raunheim. Meanwhile, in June 2017, the German company Bosch signed a strategic cooperation framework agreement with the Chinese city of Tianjin. The aim of the alliance is to explore possibilities for putting the “Smart Tianjin” initiative into practice and design a blueprint based on the experience from other international cities. Following the initial step of enterprise level cooperation, the market potential for smart city construction is very promising between China and Germany. Many complementary learning processes and business opportunities can be developed in the upcoming years.

尽管中德两国智慧城市的发展模式存在差异,两国的高新技术企业已经开始了在此方面的国际合作。在2017年的德国汉诺威工业博览会 (CeBIT) 上,中国企业中兴通讯与德国的Drei Gewinnt城市联盟签署了合作协议,致力于吕塞尔斯海姆 (Rüsselsheim am Main)、凯尔斯特巴赫 (Kelsterbach) 及劳恩海姆 (Raunheim) 三个城市的智慧城市综合性建设发展。同时,2017年6月,德国博世集团与天津签定了战略合作框架协议,旨在将“智慧天津”倡议付诸实践,并参考世界其他国家的经验为天津制定发展蓝图。中德企业探索引导的合作是两国智慧城市协作发展的重要一步,由此带来的互相学习交流和商业合作机会在未来逐步增加,市场发展前景广阔。

### Event Information / 活动信息

FENESTRATION BAU China, the leading trade fair for building systems solutions, high-end technologies and materials in the Asia-Pacific region, takes place in Beijing from October 31 to November 3, 2018.

In addition to existing and proved segments FENESTRATION BAU China 2018 will include new segments such as prefabrication materials, building chemistry, construction tools and energy-efficient and smart solutions/ building information modeling (BIM). Thus, the trade fair provides a complete overview of the market and is the most important meeting point for the future of the construction industry in China.

Inspired by the new segments, FENESTRATION BAU China will provide specific forums in the respective halls that address the different topics. Furthermore, the established supporting program, such as Talk to Architects, Talk to Technicians, Talk to Developers, and Talk to Distributors, including the theme forums BAU Congress China, WA Architecture Day, ATI Forum and Fenestration Days China will again help visitors to connect with experts and gain insights into market developments. The trade fair is supported by strong partners, including econet china.

More information is available at [www.bauchina.com](http://www.bauchina.com)

FENESTRATION BAU China 中国国际门窗幕墙博览会暨中国国际建筑系统及材料博览会是亚洲领先的高端技术和材料及建筑系统解决方案展会, 将于2018年10月31日至2018年11月3日在北京中国国际展览中心 (新馆) 举行。

除现有领域外, FBC 2018将会包括以下新领域包括装配式建筑材料、建筑用化学品、建筑工具、节能及智能解决方案、建筑信息化管理 (BIM) 等。因此, FBC 2018不仅提供了建筑领域的综合解决方案, 更契合了未来中国建筑行业的领先理念。

FBC将根据新领域的划分提供针对性的, 不同主题的论坛。此外, 在目前已有的展会配套活动中, 例如对话建筑师, 对话技术精英, 对话开发商, 对话经销商, 同时也包括了主题论坛BAU Congress China 中国国际建筑科技大会, WA中国建筑日, ATI论坛及FDC中国国际门窗幕墙高级研讨会将会继续帮助参展商、观众与业内专家深度探讨市场发展。此次展会亦得到了包括德中生态商务平台 (econet china) 在内的各大合作伙伴的有利支持。

更多信息请访问: [www.bauchina.com](http://www.bauchina.com)



## A Call for an Urban Energy Transition

A contribution by Susanne Schmelcher and Ang Ye, German Energy Agency (dena)

### 呼唤城市能源转型

来自德国能源署的Susanne Schmelcher和叶昂的客邀文章

On a rainy day in November last year, mayors of three Chinese cities made their way to the German city of Mannheim, a model city for climate protection in the center of the densely populated Rhine-Neckar Metropolitan Region. The visit was an important part of the dena (German Energy Agency) – CSUS (Chinese Society for Urban Studies) cooperation on Sino-German Eco-Cities, which centers on practical criteria relating to sustainable urban infrastructure as well as strategies and management instruments.

By learning the activities for reducing the carbon footprint and improving the energy efficiency of urban areas in Germany, the Chinese mayors need to examine the wide range of solutions available, as the situation in their own cities are different to those in the model city. In an interview with a German Journalist, Lian Guifeng, Mayor of Jizhou District of Tianjin City, mentioned that “in response to the growing demand of the public for a healthy ecological environment during the urbanization process, Tianjin seeks German know-how in terms of heating, energy efficient buildings as well as natural resource conservation and efficient utilization.” Song Keding, Deputy Secretary General of Xiangyang City, also added “public awareness and energy efficiency improvement are the challenges of environment and climate protection in Xiangyang. This is especially important for Xiangyang, since the ecological environment serves as integrated competitiveness to promote tourism.

#### Success on the urban level is what counts

As the examples show, every city has specific potentials and challenges. For this reason municipalities will find various socio-political, economic and financial framework conditions in the practical implementation of the aims and objectives set at national level. However, the implementation can only be successful if municipalities have the capacity to develop tailor made strategies for transforming their local infrastructures. Therefore, the urban energy transition must be considered across all political levels (federal, state and local) to empower local actors to act.

二零一七年十一月，由中国三个城市的领导组成的市长代表团来到德国曼海姆市进行参观考察，曼海姆市位于德国密集型都市圈莱茵-内卡都市区的中心地带，是环境与气候保护领域的模范城市。这次参观考察活动是中德生态城市合作项目的重要内容之一，这项由德国能源署和中国城市科学研究会共同合作实施的示范项目主要致力于促进城市基础设施的可持续发展，以及相关发展策略和管理方法的建立。

在考察学习德国城市在降低碳排放和提高城市区域能效的经验和技术的同时，来自中国的城市领导们也需要根据其各自城市的发展现状，对不同解决方案在本地实施的可行性进行研究。在访谈中，天津市蓟州区区长廉桂峰提到，为了积极响应人民群众对城市美好生态环境的需要，天津市希望在城市发展中借鉴德国在低能耗建筑发展、先进供暖技术以及自然资源保护和利用领域的先进知识和经验。湖北省襄阳市政府副秘书长宋克定也提到，襄阳市当前环境保护和生态建设最大的挑战是提升群众的环境保护意识，提高能源使用效率。尤为重要的是，通过改善生态环境增强襄阳市旅游业的竞争力。



As the largest river and mother river in Jizhou, Zhou River serves as important water way connecting Jizhou district and Tianjin city  
州河是天津市蓟州区境内最大的一条河流，历史上是连接蓟州区与天津方面的水上交通要道

Source / 图片来源: People's Government of Jizhou District

#### 在城市层面取得成功至关重要

如上述案例所示，每个城市依据其自身特点拥有不同的发展机遇和挑战。因此，在履行国家一级层面制



*The Liao Canal was excavated in Liao dynasty and runs through Jizhou district; it played historically an important role in the water transport*

辽运河于辽代挖掘，在几个历史朝代里都担当着漕运的重任。

Source / 图片来源: People's Government of Jizhou District

### Urban infrastructure as an interlinked network

Within the framework of the urban energy transition, infrastructure components can no longer be regarded individually. Instead, they have to be designed and used as a whole network. There is a need for an integrated approach to the relevant sectors of electricity, heat and mobility. This sector coupling is an important instrument for replacing the still dominating fossil fuels such as coal, oil, natural gas in heat supply and transport with renewable energies. The energy transition and climate protection as crosscutting issues must be addressed holistically by all the local actors. In order to promote the knowledge and acceptance of the local actors, appropriate participatory processes must be developed and transformation processes to moderate responsibilities, such as climate change management, need to be created. Furthermore, the exchanges of expertise, for example with the City Planning Department and the Transport Office, need to be promoted. In doing so, local structures with key players have to be taken into account. Pilot projects are a useful means in the process of testing and developing the future transformation path.

### Digitalization as enabler

The digitization of the urban energy transition is still at the beginning of its vast possibilities. Digitalization is an opportunity to enable, improve and accelerate energy transition tasks, thereby leading to more transparency in the use of energy, the facilitation of energy-saving behavior as well as the integration of renewable energy into the demand structures of a future sector linkage. The city of Emden in Germany has shown how this can be implemented today. They focus on an intelligent networking of regional production and local consumption

订的目标时，各个城市需要建立相应的社会政治、经济和财政框架。只有因地制宜，制订符合自身条件、用于改善当地基础设施的发展策略，城市才能成功完成国家级目标。因此，对能源转型的考虑应贯穿整个政策层面（联邦政府、州和地方），只有这样才能促进地方的参与。

### 城市基础设施作为互联网络

在城市能源转型的框架下，基础设施在规划设计和运行使用时不再是独立存在而是相互连接形成网络，其中重要的是通过有力的措施和手段衔接城市相关的电力、供暖和交通部门。不同部门之间的相互连接和合作，在可再生能源取代传统化石能源（煤炭、石油、天然气）的过程中发挥着重要的作用。能源转型和气候环境保护作为交叉问题，需要地方相关人员的全面参与。向地方参与者推广相关知识、提高他们的接受度，需要开展相应的公众参与活动、建立转型过程中的负责机制（如能源和气候保护管理体系）、促进不同领域（如城市规划部门和城市交通部门）专业人员的沟通交流。为了实施以上措施，需要考虑建立包括重要参与者的地方网络。在此，示范项目在试验和发展未来转型过程中有着重要的意义。

### 数字化作为推动者

城市能源转型的数字化尚处于发展的初始阶段，拥有众多发展潜力。在推动和促进能源加速转型的过程中，数字化可以增加能源使用的透明度、鼓励节能行为、促进可再生能源的利用。作为在这一领域的模范城市，德国埃姆登市一直以来致力于区域生产和本地消耗的智能连接以及先进网络技术和电网运行理念在当地的应用，例如使风能、电动交通和储存技术在智能电网中相互作用。埃姆登市同时建立数字平台，用于储存数据并进行系统性分析和评价，将区域光伏和风能发电厂、智能电表和智能家居应用、交通照明系统、充电站、气候预报和城市管理的数据库信息相互连接，由此可进一步优化经营模式、促进技术

as well as the use of innovative network technologies and grid operating concepts. Wind energy, electro mobility and storage technologies interact in an intelligent power grid.

Emden uses a digital platform that stores as much data as possible and systematically evaluates it. Regional photovoltaic and wind power plants, smart meter and smart home applications, traffic light systems, charging stations as well as weather forecasts and city administration data is networked. The platform should thus help to optimize business models and technologies to drive innovation. Such pilot projects are important to realize the idea of the networked city.

For this reason, dena continues to implement Sino-German pilot projects in cooperation with Chinese partners to realize the urban energy transition. Considering the common tasks of a world energy transition ahead, it is set to be another successful year for Sino-German cooperation.



*Located near the Han River, the Moon Bay Wetland Park is the largest park in Xiangyang with a length of 3000 meters*

襄阳市最大的公园，位于襄阳市西郊，汉江之滨，东西长近3000米

Source / 图片来源: Xiangyang City Planning Exhibition Hall

发展和创新。诸如此类的示范项目对实现城市互联的目标发挥着重要的作用。

因此，德国能源署将继续与中国合作伙伴一起，推动和实施中德示范项目，实现城市能源成功转型。面对未来世界能源转型的共同任务，中德合作将迎来又一个成功的一年。

### Transition of the heat sector

Integral planning of heat is an essential component of municipal action options. Cooperation and constant exchange with relevant actors, such as municipal utilities, housing associations and commercial enterprises is essential. The focus is on coordinated funding and supply strategies. Innovative technologies, which connect infrastructures with each other, are trend setting here. Local authorities are open to new technical solutions and new approaches and requirements for the energy transition.

### Transition of the mobility sector

Cities are actual existing experimental laboratories for new mobility concepts. Whether the city consists of short or long distances, the development of intermodal and multimodal concepts or the integration of electro mobility into the urban energy grid – attractive concepts of today's excessive demands of road traffic and emissions are available here. The integration and linking of these structures is a challenge for the future. As part of the urban energy transition, cities must offer multimodal and sustainable services to citizens' new demands.

**热力的转变：**热力整体规划是地方城市行动实施的基本组成部分，这其中必不可少的是各部门（市政设施、住房部门和企业）之间的合作和交流，其重点在于资金协调和供应策略。当前发展的趋势是采用先进技术用于基础设施互联。地方政府对于能源转型的新技术解决方案、新方法以及需求应持开放态度。

**交通的转变：**城市是试验新型交通理念的理想场所。无论距离长短，采用多式联运的方式、或引入电动交通整合进城市能源网络 – 当前已经存在一些应对城市过度的道路交通需求和排放的先进理念。如何将设施相互融合连接是未来进一步发展的挑战。作为城市能源转型的一部分，城市需要依据市民的需求提供可持续发展的多式联运服务。



## 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 as well as its rapid urbanization process during the past years has 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 third 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, whereof one square meter still requires four times more energy for heating and cooling than the European average.

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

In 2016, the Energy Efficiency Export Initiative of the Federal Ministry of Economic Affairs and Energy (BMWi) has been merged with the Renewable Energies Export Initiative, another successful programme, to achieve synergy effects. As a result, the activities of German Industry & Commerce Greater China (AHK Greater China) in the fields of renewable energies and energy efficiency supported by the BMWi are now being implemented within the framework of the Energy Export Initiative.

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,中国政府制定了单位GDP能耗累计降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1/3,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,平均每平方米用于供暖和制冷的能耗相当于欧洲的四倍。

为了进一步减少资源消耗,中国在未来几年预计会增加绿色建筑、低能耗项目和可再生能源在建筑中的整合,并且大量现有住宅和工业建筑将进行翻新。德国凭借全球著称的高质量技术产品和实践经验,尤其是绿色建筑和能效领域,可以为中国在可持续建筑及其相关服务方面提供具有前景的市场机会。

2016年,德国联邦经济与能源部的能源效率解决方案倡议项目与其另一个优秀的项目可再生能源解决方案倡议合并,以期达到协同效应。因此,德国工商大会大中华区(AHK)所有由联邦经济与能源部支持的可再生能源和能效方面的工作都在新的能源解决方案倡议项目框架下进行。



MITTELSTAND  
GLOBAL  
ENERGY SOLUTIONS  
MADE IN GERMANY



*The fast-growing building sector is responsible for roughly one third of primary energy demand in China*  
高速发展的建筑市场占有了中国近三分之一的一次能源消耗

Source / 图片来源: pixabay.com

Building on measures of previous years, AHK Greater China is implementing activities in the fields of energy efficiency and renewable energies and organizes business trips for German companies to China as well as fact-finding missions for Chinese decision makers to Germany.

Business trips, including one-day symposiums, provide German enterprises the opportunity to explore the business environment and market potential in China and to present their technologies and solutions to Chinese decision makers and stakeholders. Individual business-to-business matchmaking events and company visits are another integral part of the trip. Involved German companies receive a comprehensive target market analysis based on the topic of the programme.

In 2018, AHK Greater China organizes two business trips regarding building energy efficiency. One business trip will take place in North-China in September and a second trip will lead to Taiwan in the fourth quarter.

The International Energy Agency (IEA) suggests that China could save a significant amount of energy if it improves the envelopes of buildings. It estimates that products such as high-performance windows, mirror technologies (reflecting sunlight to prevent heat build-up in cities) and wall insulation for instance have great potential in China. Loss of energy from leaking windows and doors amounts to 20 percent of a household's total energy consumption. If China would implement a European standard in this sector, it could save up to 430 million tonnes of coal annually.

In addition, the abolition of conventional coal heating in several regions and stricter standards for boilers provide increased market and sales potential for German energy-efficient technologies and services in the heating sector, especially in North China. This region also provides promising opportunities for projects that incorporate renewables into the construction of buildings.

In this context, AHK Greater China is organizing a business trip focusing on energy-efficient building envelopes, heating systems and building-integrated photovoltaics for German companies from 17-20 September 2018 to Beijing and Hebei.

基于多年来的经验,德国工商大会在可再生能源和能效方面举办了若干活动、为德国企业组织了来华商务考察访问以及为中国决策者组织了赴德考察任务。商务考察访问,包括为期一天的研讨会,德国企业可以在此了解中国的商业环境和市场潜力并向中国的决策者和其它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此次行程不可或缺的一部分,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。

2018年,德国工商大会将会组织两次关于建筑能效的商务考察访问,一次将于9月在华北地区举办,另一次将于第四季度在台湾举办。



*Business trips include symposiums, individual business-to-business matchmakings and company visits*  
商务考察访问包括研讨会、B2B对接和公司拜访

国际能源署(IEA)认为,如果中国建筑物的围护结构进行改造,可以节省大量的能源,诸如高性能窗户、镜面技术(反射阳光以防止城市热量积聚)和墙体隔热保温等产品在中国具有巨大潜力。门窗密闭性不佳造成的能量损失达家庭总能耗的20%,如果中国在该方面能实施欧洲标准,每年可节约4.3亿吨煤炭。此外,一些地区废除了传统的燃煤取暖,并制定更严格的锅炉标准,这为德国供暖领域的节能技术和服务提供了更大的商业市场潜力,尤其是在中国的华北地区,该地区还为将可再生能源与建筑施工项目的整合提供了很好的机会。

在此背景下,德国工商大会将于2018年9月17日至20日组织北京和河北的商务考察访问,重点关注德国企业的节能建筑围护结构,供暖系统和建筑一体化光伏。

另一次商务考察访问将于11月19日至23日在台湾举行,台湾的建筑行业占能源消费总量的30%,其中约有40%的能源用于建筑物的制冷,另有35%用于照明。夏季制冷负荷约为冬季的1.4倍,并导致夏季月



The second business trip will take place in Taiwan from 19-23 November, where the building sector is responsible for 30 percent of total energy consumption. The majority of energy of about 40 percent is used for cooling of buildings – another 35 percent for lighting. The cooling load in summer is about 1.4 times higher than in winter and leads to regular energy bottlenecks during the summer months. Taiwan's population is therefore aware of the need for energy-saving measures and there is a great need for related products.

Participants will be able to present German solutions and technologies regarding insulation materials, ventilation and air-conditioning systems, thermal insulation glazing, lighting as well as energy management systems to local decision makers and stakeholders at a one-day symposium. Similar to the first trip in September, the delegation trip also includes organized business-to-business matchmakings and company visits.

For implementing the described programme of activities, AHK Greater China works closely together with the assigned consultants German Asia-Pacific Business Association (OAV) and Baden-Württemberg International (bw-i) 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 target market analyses and the two business trips to 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.

The linked 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. In order 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 supports German companies in this endeavor throughout the coming years, with its access to local stakeholders and building market expertise.

份的常规能源瓶颈。因此，台湾民众意识到节能措施的必要性，对相关产品的需求很大。

考察团参与者将能在为期一天的研讨会上向当地决策者和利益相关方介绍有关保温材料、通风和空调系统、隔热玻璃、照明以及能源管理系统的德国解决方案和技术。与9月的访问类似，考察团之旅还包括B2B对接和公司拜访。



1 to 1.5 billion square meters of living space are added annually in China  
中国每年新增居住面积为10至15亿平方米

Source / 图片来源: Carl Nenzen Loven / unsplash.com

从项目执行方来讲，德国工商大会与委派的咨询机构德国亚太商业协会和巴符州经济与科技合作公司紧密合作。除此之外，德国工商大会还和德国能源署以及德国国际合作机构等组织有多年的项目合作经验，其中包括中德能源对话等项目。

目标市场分析报告以及两次来华商务代表团可以把中德在建筑能效领域的利益相关方召集起来，并获得针对中国市场的建筑节能方案的综合信息。

能源解决方案倡议项目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。为了充分挖掘相应市场的潜力，项目在前期阶段就需要进行市场分析和调查、招聘专业人才、运用合适的市场战略以及选取可靠的合作伙伴。德国工商大会凭借其丰富的经验，愿意在未来竭力为促进中德两国企业在建筑能效领域的交流合作提供长期支持、帮助企业与地方其他利益相关方取得联系并获得最新的市场信息。



## Plus Energy Building for Advancing Sustainable Urban Development in China and Germany

A contribution by Alexandra Widrat, Dr. Marie Peters, Peter Sailer, Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) and Bao Yuqing, Zhou Ning, Beijing Uni-Construction Company (BUCC), Translated by Hou Jingyue, Rong Yu

### 产能房促进中国与德国的可持续城市深入发展

来自德国国际合作机构的Alexandra Widrat, Marie Peters博士, Peter Sailer; 北京住总集团的鲍宇清, 周宁的客邀文章, 翻译: 侯靖岳, 荣玉

The building sector accounts for almost 20% of energy-related greenhouse gas emissions worldwide, assigning global and regional importance to climate change mitigation in this sector. The last three decades have seen an active development of a multitude of mitigation options, including the advancement of low energy consumption and passive building standards.

While the gradual standardization of building approaches has recognized the contribution of building characteristics to sustainable urban energy management and thus sustainable urban development, a new green building paradigm that goes beyond self-sufficiency has emerged in recent years called “plus energy building”. The development of plus energy standards is particularly important with regard to advancing sustainable development in the face of increasing urbanization rates and the global increase in energy demand in the building sector.

Plus energy building, also commonly referred to as efficiency plus building, expands on the concepts of energy efficient building construction and retrofit by postulating generative ways of building and living. As such, the building serves as a net producer of energy, with buildings turning from consumers to active prosumers. According to the definition provided by the German Federal Ministry of Transport and Digital Infrastructure (BMVI), plus energy houses' primary energy consumption and end-use energy consumption are negative.

Based on the passive house standard, plus energy houses entail addi-

能源相关的全球温室气体排放有20%来自建筑行业, 因此, 为缓解全球与地区性气候变化, 该领域至关重要。在过去的三十年间, 各种缓解措施都得到了大力发展, 包括推广低能耗与被动式建筑标准。

在建筑节能技术逐步发展的过程中, 人们已经认识到建筑能效对可持续城市发展和能源管理的重要性。近几年来出现了一种超越了自给自足的新型绿色建筑模式: 产能房。鉴于目前城市化率的快速增长, 全球建筑领域的能源需求普遍提高, 产能房标准的发展意义重大。

产能房亦指能效增加的建筑。基于建造方法与生活方式的转变, 节能建筑的概念得到了拓展与更新。建筑本身将会成为能源的净生产者, 并由原来的单方面消耗转变为活跃的产消合一。根据德国联邦交通和数字基础设施部 (BMVI) 给出的定义, 产能房年一次能源消耗和年终端能源消耗应均为负值。



*Plus energy houses generate an overall energy amount through technology, such as solar photovoltaic power systems, which exceeds the building's own energy needs*

通过技术手段, 如太阳能光伏系统, 产能房可以在满足建筑自身需求的同时, 产生额外的能源。

Source / 图片来源: rolfdisch.de

tional power generating technologies, such as solar photovoltaic power generation technology, which allow for generation of an overall energy amount that exceeds the building's own energy needs.

### The development of plus energy buildings in Germany

In line with the EU Energy Performance of Buildings Directive, which targets a cut in overall energy consumption of a building by 20% below 1990-levels by 2020, the German Federal Government's Climate Protection Plan 2050 has laid out its goal of achieving a climate-neutral building stock by 2050. While the low energy house or passive house has already been the statutory minimum standard for more than 15 years, further incentives for using energy-generating building techniques have been stipulated in the new plan. These endeavors have been supported by the formulation of a model specification standard – the “Efficiency-House Plus” standard (German: Effizienzhaus Plus) in 2011.

Primarily, the government has advanced the plus energy building development according to this standard through research initiatives and funding programs. Most notably, the nationwide research initiative “ZukunftBAU – Effizienzhaus Plus”, initiated in 2011 by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) and the Fraunhofer Information Center for Planning and Building (Fraunhofer IRB) promotes the building and evaluation of energy plus model building projects that achieve the Efficiency-House Plus standard. To date, the initiative comprises of 37 residential buildings, of which 36 were newly constructed and one being retrofitted.

The research and building focus has gradually shifted from single-family houses to multi-storey apartment buildings and building districts. To this end, the initiative expanded its research and building efforts towards non-residential plus energy buildings in 2015, particularly in the educational building sector. The initiative consists of a network of more than 100 partners from the building and systems engineering sector, which push for successful market adoption of the building concepts all across Germany.

### From passive to plus energy in China

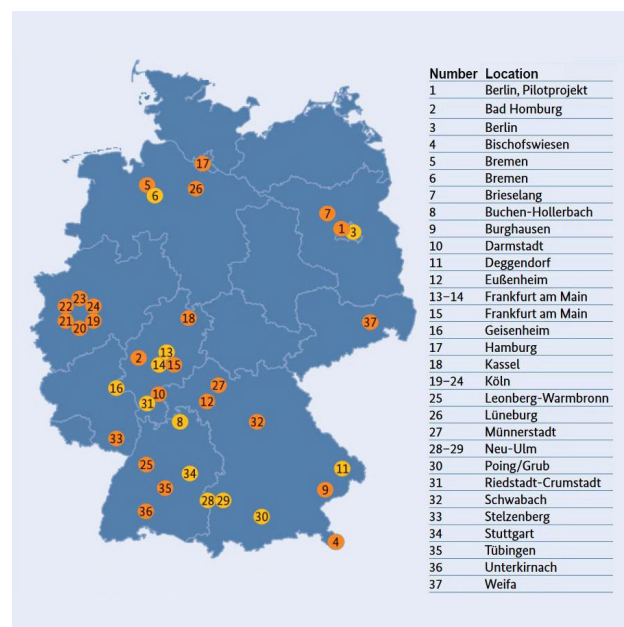
Whereas Germany has already advanced the discursive as well as practical introduction of plus energy

产能房以被动房标准为基础,增加了提高可再生能源供应的技术,如太阳能光伏发电技术,以保证建筑在自给自足的情况下仍可产生多余的能源。

### 德国产能房发展情况

根据欧盟建筑能源性能指标,与1990年相比,2020年节能建筑的能源总消耗量应降低20%。德国联邦政府发布的《气候保护规划2050》则确立了要在2050年实现气候中立型建筑的目标。尽管在超过15年的时间里,低能耗建筑与被动房已经达到法定最低标准,但在新规划中仍制定了诸多激励措施,以促进使用产能建筑技术,这也得到了2011年起草的“节能建筑+标准”这一示范模型的支持。

以该标准为基础,政府通过研究举措与资助计划,推进了产能房的发展。值得注意的是,2011年,德国联邦环境、自然保护、建筑与核安全部(BMUB),联邦建筑、城市和空间发展研究所(BBSR)与弗劳恩霍夫建筑信息中心(Fraunhofer IRB)联合发起了全国性研究计划“未来的建筑—节能建筑+”,推动示范型产能房的建设与评价,以达到节能建筑+标准。迄今为止,该计划共涵盖37个住宅楼,其中36个为新建建筑,1个为改造建筑。



Location of demonstration projects of the German Federal Government's research initiative ZukunftBAU – Effizienzhaus Plus  
联邦政府研究示范项目“未来的建筑—节能建筑+”所在地

Source / 图片来源: BMUB

研究与建设的焦点已经逐渐从单户住宅转移到多层公寓楼与建筑群。2015年,该计划加强了对非住宅



building, the use of plus energy building is still in its infancy in China. Rather, China's current efforts for energy-efficient building still focus on the wider promotion of passive house construction, which was introduced to China by Germany during the World Expo 2010 in Shanghai and has been implemented in several pilot projects, such as "Water Front" in Qinhuangdao, "Xingfubao" in Urumqi, "Stream Tree Garden" in Harbin, "Xinhua Curtain Wall Office Building" in Hebei Province, or "Landsea Bruck Passive House" in Changxing.

Following the announcement of Secretary General Xi Jinping at the climate conference COP21 in Paris in 2015 that China will reach carbon emission peak by 2030 and is striving to increase the non-fossil energy share of primary energy consumption to around 20%, passive house construction has become ever more important.

Thus, passive houses developed from being mere pilot projects to larger-scale demonstration projects, along with the establishment and gradual improvement of a passive house standard system.

In February 2017, the Chinese Ministry of Housing and Urban-Rural Development (MoHURD) issued the 13th Five-Year Plan for Building Energy Efficiency and Green Building Development, which regards raising building energy efficiency as its main goal, requiring that "the energy efficiency of new urban buildings shall be increased by 20% compared to 2015. By 2020, more than 10 million square meters demonstration projects of ultra-low energy consumption buildings and near zero energy consumption buildings shall be completed".

Given the innovative potential that plus energy building presents for reducing urban-generated greenhouse gas emissions significantly, while also securing a sustainable energy supply and thus reaching the target of policy directives, introductory political measures directed at advancing research, development and gradually stronger market adoption of plus energy building are being called for in China.

### Plus energy building applied

At present, plus energy buildings are being researched and piloted in various countries throughout the world. In Germany, Australia, Norway and other countries, pilot single-family buildings have been built. Apple Park in the United States has also adopted a net zero

type energy building's research and construction, especially in the school building field. This plan is jointly initiated by 100+ partners from the building and engineering fields, successfully promoting the market application of energy building concepts in various parts of Germany.

### 在中国的发展：从被动房到产能房

尽管在德国已经对产能房开展了广泛的讨论与实践，但在中国却仍处于起步阶段。相反的，在节能建筑领域，中国目前仍致力于推动被动房的建设。

自2010年上海世博会以来，被动房的概念由德国引入中国，并在秦皇岛“在水一方”项目，乌鲁木齐“幸福堡”项目，哈尔滨“溪树庭院”项目，河北新华幕墙办公楼项目，长兴“布鲁克酒店”项目中实施。



More than 10 million m<sup>2</sup> building projects of ultra-low and near zero energy consumption shall be completed by 2020 in China  
中国将在2020年前完成1000多万平方米的超低能耗和近零能耗建筑项目  
Source / 图片来源: BMUB

根据习近平总书记在2015年巴黎气候变化大会上的承诺，中国将在2030年达到碳排放峰值并争取实现非化石能源占一次能源消费比重20%左右，推进被动房的建设变得日益重要。因此，被动房将由最初的试点项目发展为更大规模的示范工程，并逐步建立并完善其标准体系。

2017年2月，住建部印发《建筑节能与绿色建筑发展“十三五”规划》，将提高建筑能效作为其主要目标，要求“城镇新建建筑能效水平比2015年提高20%，到2020年，建设超低能耗、近零能耗建筑示范项目1000万平方米以上。”



energy construction concept close to that of active plus energy houses, achieving being 100% powered by renewable energy, of which more than 90% are supplied by its own solar equipment.

China, where the industrial and technical conditions for plus energy house building are already given, has not yet seen the construction of a plus energy house. Exceptions are two Sino-German cooperation projects, which are developing pilot constructions, including the “C-House” by the universities TU Braunschweig in Germany and Southeast University in Nanjing, China, as well as a plus energy house in Rizhao, Shandong Province in China, envisioned by the GIZ Urban Nexus Project (2013-2014) together with MoHURD and the Rizhao Bureau of Housing and Urban-Rural Development (Rizhao HURD).

Whereas plus energy building is technologically similar to low- or zero energy building, there are several challenges that remain to be resolved not only in China but worldwide before plus energy houses can become a new building standard.

First, the key point to its construction is enough space to install renewable energy technologies such as photovoltaic technology and to find ways of technical integration of different technologies. As far as the building structure is concerned, buildings with large shape coefficient, such as single-family and low-rise buildings, can be built as plus energy buildings more easily. In China, however, the building stock comprises majorly of multi-story high-rise buildings with comparably less surface to install renewable technologies.

Second, the use and transmission of excess energy, for instance feeding electricity into the grid, house-internal energy storage or the interlinkage with other household consumers such as electric cars, need to be considered. Questions thus arise about technically outdated energy distribution systems, about business models for energy producers (house owners) when



*The C-House, as envisioned by the Sino-German research project TUBSEU, is set to enter the Solar Decathlon Competition 2018 in Dezhou, China*

中国东南大学与德国布伦瑞克工业大学联合研究项目C-House概念图。2018年，C-House将参加在中国德州举办的中国国际太阳能十项全能竞赛。之后，该设计概念预计会投入大规模生产。

Source / 图片来源: tubseu.com

产能房可显著减少城市温室气体排放，同时保证能源的可持续供应，以此实现政策目标。考虑到以上潜力，中国需要确定基本的政策措施，以推进产能房的研究、发展并逐步加强其市场应用。

### 产能房的应用

目前，世界多国都对产能房进行了研究与试点。德国、澳大利亚、挪威等国已经建成了独栋性质的试点建筑。美国的苹果“飞船”总部大楼也采用了与产能房接近的近零能耗建筑理念，实现了100%的可再生能源供电，其中90%以上由建筑自身的太阳能设备供应。尽管国内目前已经具备产能房的产业基础与技术条件，但除了两个中德合作试点项目：德国布伦瑞克工业大学与中国东南大学共同研发的“C-House”，德国国际合作机构城市关系项目（2013-2014）与住房和城乡建设部以及日照市住房和城乡建设局共同设计的日照产能房外，产能房在中国还没有其他正式的应用案例。

产能房在技术上与低能耗、零能耗建筑是一脉相承的，但在其成为新的建筑标准前，仍有不少问题与挑战需要在中国以及世界范围内解决。首先，建设产能房的核心问题是需要足够的空间来安装可再生能源技术设备（如光伏技术）并找到融合不同技术的集成方法。考虑到建筑结构，独栋、低层等体形系数较大

feeding into the grid, or about how to best combine energy supply from renewable and non-renewable sources.

Third, new building technologies, such as proactive ventilation in plus energy houses, require changes in the living habits of its inhabitants. The question of how to live in a plus energy house to make best use of its energy-saving attributes and how to educate people about it remains an issue that needs to be discussed internationally. Thus, technical discussions and regulatory guidance are necessary.

Jointly developed plus energy projects, such as the C-House and the planned building in Rizhao, present first significant strides taken in mutual development of energy-generating urban infrastructure systems between China and Germany.

The state of discussion in both countries demonstrates the relevance of further knowledge exchange for advancing and instituting technologies and political strategies that will substantially contribute to reducing the environmental impacts of urban living and building. Joint project initiatives need to function as a basis for upscaling innovation efforts and creating enabling backing structures for market entry. In this regard, cross-cultural learning and cooperation are of special importance for harnessing local context knowledge and ensuring successful adoption of new progressive technological paradigms, such as that of plus energy buildings.

的建筑更容易被建造为产能房。然而,中国的建筑多为多层、高层,因此,可用于安装可再生能源技术的建筑面积相对较少。

第二,需要考虑如何利用、传送过剩的能源(例如:将其输入到电网,家庭内部储存,或者将该能源与家庭中其他耗能元件相联系,如电动车等)。这些方面均存在诸多问题,比如技术上过时的能源分配系统,能源生产者(房屋所有者)进入电网时的补偿,以及如何将可再生能源与不可再生能源的能源供应结合起来等。

第三,居民需要改变其生活习惯,以适应产能房中的新建筑技术,如主动通风。如何在产能房中生活,并有效利用其节能属性,同时给予居民相关指导,这些都是应在国际范围内讨论的课题。因此,技术讨论与监管指导十分必要。

中德合作的“C-House”和日照产能房项目在产能型城市基础设施系统的共同开发方面首次取得了重大进展,这一结果表明,两国在改进技术与落实政治战略方面的进一步知识交流,将有助于持续减少城市生活和建筑对环境造成的影响。合作项目需要发挥其基石作用,加强创新,并为进入市场奠定坚实的基础。在这方面,跨文化学习与合作、对于当地环境知识的有效利用以及新型先进技术(如产能房)的成功落实不可或缺。

The “Efficiency House Plus with Electro Mobility”, the Federal Government’s plus energy building pilot project in Berlin. Inaugurated in December 2011, the pilot project served to test the at the time newly established “Efficiency-House Plus” standard, while also exploring the possibilities for synergy creation between plus energy buildings and electro mobility. The excess energy produced can be fed into the public grid, or be stored to be made available for electric vehicles.



Source / 图片来源: forschungsinitiative.de

“节能建筑+与电动交通”是联邦政府在柏林推行的产能房试点项目。2011年12月,德国总理安格拉·默克尔启动该项目,用于测试当时新建立的“节能建筑+标准”,同时探索在产能房与电动交通之间实现协同作用的可能性。产能房产生的多余能源可存入公共电网,或储存起来供电动车使用。能源,建造的增量成本将由节约的能源来补偿。

## econet china: A Platform for Sino-German Cooperation in Sustainability 德中生态商务平台: 中德可持续发展领域合作平台

China's most important multilateral event of the year, the Belt and Road Forum for International Cooperation, took place in Beijing in spring 2017. Released by the National Development and Reform Commission (NDRC), the outline on "Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road" has put a clear emphasis on the promotion of cooperation in the fields of environmental protection industries, sustainable energy sources, conserving eco-environment and in general jointly making the Silk Road an environmentally compatible initiative. The investments implemented over the next decades will set the course on the scale of conserving eco-environment, promoting renewable energy sources and protecting bio-diversity while enhancing sustainable growth.

Throughout 2017, econet china continued its role as an advisory service and consulting institution for promoting German technologies and services for sustainability in China, focusing on smart urbanization, energy efficiency and sustainable development. Over the past ten years, econet china has been actively engaged in cooperation with industry partners involved in various fields. Through regular salons, public seminars, customized trainings and various project visits to Germany and China as well as publications, econet china has established a successful cooperation platform between the two countries in the fields of green building, renewable energy and environmental protection.

With the latest development of "sponge cities" in China, which was proposed by President Xi Jinping, econet china jointly organized a theme workshop with the Rainwater Management Training Center Kefenrod from Germany in Shanghai in the second half of 2017. The event aimed at bringing together German solution providers in the field of rainwater engineering and water resource management in order to share their advanced technologies and over three decades of project engineering experience in Europe, as well as offering opportunities for German and Chinese industry stakeholders to exchange on potential collaborations. Chinese experts and decision makers from local governmental authorities, municipal engineering and construction entities as well as design institutes participated. The Shanghai workshop has been an integral part of an event series on Sino-German Sponge City Engineering Technology, with additional workshops held in Wuhan and Xi'an during the last quarter of 2017.

中国去年最重要的多边活动“一带一路”国际合作高峰论坛于2017年春季在北京举行。由中国国家发展改革委员会主导发布的《推动共建丝绸之路经济带和21世纪海上丝绸之路的愿景与行动》明确强调了促进环保产业、可持续能源、生态环境保护方面的合作,表明了“一带一路”对环境保护的重视。今后几十年的发展投资资金将会着重于保护生态环境、促进可再生能源发展、保护生物多样性等方面,以实现可持续发展。

整个2017年, econet china 继续发挥其作为推广德国在中国的可持续发展领域技术知识的咨询机构的职能, 重点关注智能城市化, 能源效率和可持续发展。在过去的十年来一直积极与各个领域行业伙伴合作, 通过定期举办沙龙、公开讲座、定制培训、赴德项目考察、大型研讨会、出版物等各种形式, econet china在中德两国间于绿色建筑, 可再生能源和环保领域建立了成功的合作平台。



*Sponge City Engineering Technology Workshop in Shanghai in November 2017*

海绵城市工程技术研讨会于2017年11月在上海举行

随着习近平主席提出的中国“海绵城市”的最新发展, econet china于2017年下半年在上海携手德国Kefenrod雨水管理培训中心联合举办主题研讨会。此次活动旨在汇集德国雨水工程和水资源管理领域的解决方案供应商, 共同分享他们的先进技术和三十多年来在欧洲的项目工程经验, 同时也为德国和中国的行业利益相关者提供了交流潜在合作的机会。来自市建委、海绵办、市政工程研究院、道路隧桥施工企业以及海绵城市技术相关企业的行业内人员参加了会议。上海研讨会是中德海绵城市工程技术系列活动的一部分, 2017年第四季度在武汉和西安举办了更多的此类研讨会。



Moreover, econet china has been invited by the Wuppertal Institute for Climate, Environment and Energy to engage in the EU-funded SWITCH-Asia project “Sus-Build”, aiming at fostering sustainable building practices among small and medium-sized enterprises (SMEs) in Chongqing and Yunnan province in western China. In this framework, econet china and Chongqing Building Energy Efficiency Association co-hosted the EU-China Dialogue on Building Energy Efficiency Technologies in Chongqing in summer 2017. The forum brought together more than 60 representatives from leading European building technology enterprises, local energy service companies (ESCOs) and organizations from both countries in order to provide an exchange on China’s ongoing ESCO practices for existing building renovation.

In November 2017, econet china signed a Memorandum of Understanding with MMU BAU Fenestration, a joint venture of Messe München, to become a partner of FENESTRATION BAU China, the newly joined trade fair on windows, doors and façades. econet china has already supported the BAU Congress China in recent years and welcomes this new development to join with Fenestration China, a very established trade fair in this field. The partnership with FENESTRATION BAU China covers showcasing projects and marketing efforts and will enable econet china to provide its partners and German companies in the building industry with new ways to explore the Chinese market in the coming years.

This year, the econet china team, supported by the German Federal Ministry for Economic Affairs and Energy (BMWi), is looking forward to welcoming again German business delegations in the framework of the Energy Export Initiative. A business trip to North-China will focus on energy-efficient building envelopes, heating systems and building-integrated photovoltaics. Another trip to Eastern China will center on the theme of industry energy efficiency and using renewable energies for self-sufficiency. New green solution providers and topics will be addressed regarding the emerging challenges and opportunities of the Chinese market. In in-depth one-on-one meetings between the visiting German companies and major design institutes, developers and government agencies, German companies will be able to network with key market players to guarantee better positioning of their products and technologies prior to market entry. Moreover, two business delegations will be organized in the field of energy efficiency and waste water treatment in 2018. econet china is looking forward to working together with additional interested industry practitioners to further facilitate and strengthen Sino-German cooperation on sustainability.



*EU-China Dialogue on Building Energy Efficiency Technologies in Chongqing in June 2017*

2017年6月中欧建筑节能技术对话会重庆站

此外,德国乌珀塔尔气候、环境和能源研究所还邀请econet china参与由欧盟资助的SWITCH-Asia项目“SusBuild”,旨在推动可持续建筑在重庆市和云南省的中小微企业中的实施。在此框架下,econet china与中国重庆建筑节能协会共同主办了2017年夏季重庆中欧建筑节能技术对话会。来自欧洲领先的建筑技术公司、当地的能源服务公司和中德两国组织的60多位代表,就中国目前的既有建筑改造的能源服务公司实践进行了交流。

2017年11月,econet china与中联慕尼黑国际会展有限公司,亦即慕尼黑国际博览集团的合资企业签署谅解备忘录,econet china成为新近成立的中国国际门窗幕墙博览会FENESTRATION BAU China的合作伙伴。econet china近几年来已经为中国国际建筑科技大会BAU Congress提供了支持,并非常期待它和Fenestration China共同组建成现在的FENESTRATION BAU China的发展。与FENESTRATION BAU China的合作关系涵盖了展示项目和市场营销,并使econet china能够为建筑行业的合作伙伴和德国公司提供未来几年探索中国市场的新途径。

今年,econet china团队将在由德国联邦经济与能源部资助的“德国能源解决方案”项目框架下接待来自德国的商务代表团,华北地区的商务团侧重于节能建筑围护结构,供暖系统和建筑一体化光伏发电。华东地区的另一商务团访问以工业领域能效和利用可再生能源实现能源自给为主题。该项目将针对中国市场目前正面临的机遇和挑战提出新的绿色解决方案与主题。在来访德国企业与主要设计单位、开发商和政府机构进行深入的一对一会谈后,德国企业将能够与重要的市场参与者保持联系,以保证在进入市场之前更好地定位他们的产品和技术。此外,2018年将在能源效率和废水处理领域组织两个商务代表团。econet china期待与其他有兴趣的行业从业者共同努力,进一步促进和加强中德在可持续性方面的合作。

## Typha – A New Building Material with multiple Environmental and Practical Advantages

A contribution by M.Eng. Christoph Mitterer, Fraunhofer Institute for Building Physics IBP

### 一种具有多环境价值和实用优势的新型建筑材料 — 香蒲

来自弗劳恩霍夫建筑物理研究所的IBP M.Eng. Christoph Mitterer的客邀文章

Germany holds an international leading position in the bio-based economy. The "National Research Strategy Bioeconomy 2030" is currently setting the stage for a bio-based transformation in industry and society. At the same time, the Chinese government aims to conclude with the 13th Five-Year Plan (2016-2020) technological progress, improving the environment and increasing prosperity in the population and calls biotechnology a key to greater innovation.

The bio-based transformation gains increased attention in architecture and in the construction industry, too. However, it would fall short just to replace conventional construction materials with those from renewable resources. In fact, it is crucial to embrace the concept of sustainable material cycle systems, from cradle to cradle, which are regionally enrooted and make use of the plants' characteristics for the creation of smart construction materials. The development of a new construction material made from cattail (Latin: Typha) with multiple environmental and practical advantages is a positive example in this regard.

Because of its enormous growth rate and yield, the plant Typha is optimally suited as raw material for industrial use. The crop stock grows in resilient, natural monocultures with an annual production rate of 15 to 20 tons of dry matter per hectare, which corresponds to four or five times the amount evergreen forests produce. Typha crops create ecologically precious wetlands, which fulfil various important functions like the absorption of nutrients and CO<sub>2</sub>. The leaves of Typha angustifolia have a fibre-reinforced supporting tissue filled with soft open-cell spongy tissue, providing for a rather unique combination of good mechanical as well as good thermal performance. Due to the combination of the tensile strength of the stem fiber and the elastic sponge-like tissue, leaves are tear and break resistant, flexible and maintain their shape even in dried condition. These characteristics provide a remarkable load-bearing capacity and insulation properties. The plant's structure entails a particular suitability of the Typha leaf mass for creating innovative building materials.

德国在生物经济领域处于国际领先地位，“德国国家生物经济研发战略2030”为工业和社会的生物技术转型奠定了基础。中国政府也力图在以十三五规划（2016-2020）的技术发展之基础上，改善环境，促进人口繁荣，加快生物技术创新。

生物转化技术在建筑和工程领域也受到越来越多的关注。然而，仅仅用可再生资源替代传统的建筑材料还远远不够。事实上，采用从摇篮到摇篮的可持续材料循环系统是非常重要的，该方案得到了区域性的广泛应用，并根据植物的特性创造了智能建筑材料。在这方面，开发由香蒲（拉丁文：Typha）制成的具有多种环境和应用优势的新型建筑材料是一个正面范例。



*Typha crops create ecologically precious wetlands, which fulfil various important functions like the absorption of nutrients and CO<sub>2</sub>.  
香蒲作物创造珍贵的生态湿地，履行多种重要功能，如吸收营养物质和二氧化碳*

Source / 图片来源: Typha Technik

香蒲的生长速度快而且产量高，因此非常适合作为工业原材料。它的根茎增长强劲，在自然单一栽培条件下，每公顷干物质年产量为15至20吨，相当于常绿林产量的四至五倍。香蒲作物创造珍贵的生态湿地，履行多种重要功能，如吸收营养物质和二氧化碳。香蒲叶的纤维增强支持组织充满了软开孔海绵组织，将良好的机械性能和保温性能以一种独特的方式结合在一起。由于结合了茎纤维和弹性海绵状组织的拉伸强度，叶片具有抗撕裂和抗断裂性，即使在干燥



## The smart biological advantages of Typha for environment and agriculture

The Typha plant thrives well at humid locations with low to very high nutrient contents and in full sunshine. Since only a minimum of water management is necessary the plantation scarcely needs care during the year. After the establishment of stock, reproduction is done vegetative via stolons. The cultivation does not cause any problems such as soil fatigue or other inconveniences.

The cultivation of Typha can provide environmental benefits with regard to stabilization and renaturation of rewetted fenlands. The wet use of fens ensures the natural functions of peatland, like retention of nutrients and water. Also, the important function of peatlands regarding soil carbon sequestration is restored. The fen therefore provides a suitable, sustainable alternative land use for the future.

By rewetting dried fens, Typha cultivation will absorb carbon dioxide instead of the current release of large quantities of CO<sub>2</sub>. In Germany, the share of dried fenland areas in carbon dioxide emission is approximately 4% of the total emission. Complete rewetting would reduce carbon-dioxide emissions in the same range as a 40% reduction of emissions from passenger car traffic.

Typha plantations are also used for water regeneration. The main polluters of waters such as household and industrial sewage, from communal and private sewage treatment plants, as well as fertilizer surplus from agriculture, serve as important nutrient deliverers. The nutrient quantity withdrawn from the soil by the harvest of the aerial biomass is considerable. Up to 80% of the nutrients added to the system can be incorporated this way. At the end of the vegetation period and at the time of harvest, the largest part of the nutrients accumulated during the year is already stored in the rhizomes. After the dieback of the rhizomes, the nutrients are not re-mineralized due to the lack of oxygen in the swamped soil, thus becoming low-moor humus permanently.

The high content of polyphenols in Typha plants makes them resistant to weathering and, accordingly, biologically resistant to microbial and insect infestation. As a result, no pesticides or insecticides are required to care for crop stands.

The existence of nutrient-rich ground is sufficient to provide enough minerals for the plant. Typha is one of



*The Typha plant's structure entails a particular suitability of its leaf mass for creating innovative building materials*

香蒲的结构使得它的叶块特别适合用来制造新型建筑材料

Source / 图片来源: Typha Technik

条件下也具有柔韧性并能保持其形状。这些特性提供了卓越的承载能力和绝缘性能。该植物结构使得香蒲叶块特别适合用来制造新型建筑材料。

## 香蒲在环境和农业方面的智能生物优势

香蒲喜好生长在日照充足的潮湿地区,营养成分含量可高可低。由于只需最低限度的水管理,种植园整年几乎不需要特别照顾。建立了一定的库存后,可通过匍匐茎进行繁殖。种植香蒲不会造成如土体疲劳或其他问题。

香蒲的种植可使沼泽恢复湿润,复原并稳定它的生态环境,从而提供环境收益。沼泽的湿地利用保证了泥炭地的自然功能,如保留营养物质和水分。此外,泥炭地对土壤固碳的重要作用得以恢复。因此,沼泽提供了一个适宜未来发展的可持续的土地利用方案。通过使干燥的沼泽恢复湿润,香蒲种植将吸收二氧化碳,而不是目前的释放大量二氧化碳。在德国,干燥的沼泽地区排放的二氧化碳占约总排放量的4%。使它完全恢复湿润可减少的二氧化碳排放量相当于减少40%的客运交通排放。

香蒲种植园也可用于水再生。主要的污水排放来源包括生活和工业污水、市政及私人污水处理厂和农业化肥剩余等,它们排放的污水富含营养物质。通



the few cultures that allow natural, site-appropriate, stabilizing use of fens. This means that fields which are not lucrative for conventional farming can be turned into economically viable agricultural land. It also means that Typha cultivation does not compete with food production, in contrast to many other renewable insulating or building materials, such as hemp or cotton.



*Typha cultivation does not compete with food production, in contrast to many other renewable insulating or building materials, such as hemp or cotton*

香蒲种植和食物生产不冲突，和其他许多可再生隔热建筑材料如棉麻等形成鲜明对比

Source / 图片来源: Typha Technik

### Development of a new building material

The special suitability of the leaf mass of Typha for the production of innovative building materials is due to its intrinsic structural characteristics:

- Low raw density of about 40-60 kg/m<sup>3</sup> due to a spongy tissue filling the leaf chambers
- Low thermal conductivity of the sponge fabric of approx. 0.032 W/(mK), which enables the development of a building material with good insulating properties
- A complex and yet stable tissue, that provides the high compressive and tensile strength of the leaf in the direction of their axes, which determines the strength properties of the product

Research work at the Fraunhofer Institute for Building Physics in Germany in cooperation with the inventor Werner Theuerkorn from the company Typha Technik resulted in a series of products, among which mainly a mineral based, isotropic Typha panel material is particularly interesting.

This product called "Typhaboard" contains only plant ingredients and a purely mineral-based adhesive without

过吸收生物质从土壤中提取的营养物质数量可观，高达80%的营养物质是以这种方式融入到生态系统里。等到植物成熟并进入收获阶段，一年中累积的大部分营养物质已经储存在根茎中。在顶梢枯死后，由于沼泽土壤中缺乏氧气，营养物质不再矿化，从而永久变成低沼地腐殖质。

香蒲植物中高含量的多酚使其耐受风化，相应地能抵抗微生物腐蚀和虫害。因此不需使用农药或杀虫剂来保护植株。富含营养的土地可以为植物提供足够的矿物质。香蒲是为数不多的能够顺其自然、因地制宜、稳定地利用沼泽的植物之一。这意味着，对于传统农业来说没有经济价值的土地可以变成有利可图的农业用地。这也意味着香蒲种植和食物生产不冲突，和其他许多可再生隔热建筑材料如棉麻等形成鲜明对比。

### 开发新型建筑材料

由于以下内在结构特性，香蒲叶块特别适合用来制造新型建筑材料：

- 叶纤维中充满海绵组织使得原始密度低至每立方米40-60千克
- 海绵组织0.032W/(mK)的低导热系数使它可用于开发具有良好隔热性能的建筑材料
- 复杂而又稳定的组织结构使它可沿叶脉高强度压缩和拉伸，从而决定产品的强度性能

通过德国弗劳恩霍夫建筑物理研究所与Typha Technik公司的创始人Werner Theuerkorn的合作研究，开发出了一系列产品，其中矿物质各向同性粘合剂香蒲面板材料，特别引人注目。这种名为“香蒲板”的产品仅含有植物成分和纯矿物质粘合剂，不含其他添加剂，因此它是完全可分解的。同时，它的高收益率还体现在：沿面板平面的抗压强度、导热系数、蒸汽扩散性以及防止夏季过热的热惰性。此外它还具有许多其他正面特性，例如：

- 具有高度抗霉菌生长能力的可再生建筑材料
- 火灾防护和噪音控制
- 加工简易，适用各种常用工具

further additives. Thus, it is completely compostable. At the same time, it features a beneficial ratio of compressive strength along the panel plane, thermal conductivity, vapour diffusion properties, as well as thermal inertia for summertime heat protection. Moreover, it possesses a lot of other positive properties, such as:

- Renewable building material with a very high resistance to mould growth
- Good protection against fire and noise control
- Simple processability with all common tools
- Relatively diffusion open and capillary active
- Low energy consumption during production
- Recyclability

In various demonstration projects, the Typhaboard has been applied and tested in Germany. One of the first practical applications aimed at the restoration of an old half-timber-framed building. With the bio-based board, as infill between the timber frames and as an additional inside insulation layer, a slender exterior wall construction with a high energy-saving quality was realized. The Typhaboard is applied successfully for interior insulation of masonry as well, where its hygric properties and the resulting fault tolerance helped to avoid the application of a vapour barrier. It has also been used for a sauna house, a modern wood-frame construction, which nearly meets the "cradle to cradle" demands. Finally with the Typhaboard, a small building has been established as a self-supporting construction as show-case for the EXPO2016 in Milano.

"The establishment of the value creation chain of the Typhaboard from cultivation and harvesting of the raw material to production and distribution of this new construction material is crucial," says Sabine Lamprecht, CEO of a Fraunhofer spin-off for accelerated commercialisation of Typhaboard. "Even though we are concentrating on the European market in the first step, we see great potential also in China, since the Typha plant is prevalent in China, too."

On request of the Government of Fujin City in Heilongjiang Province the Typhaboard expert Werner Theuerkorn was invited to visit Fujin in November 2017. Staff of the Sanhuanpao Nature Reserve Man-

- 相对易于扩散, 具有毛细活性
- 生产时低能耗
- 可回收再利用

在德国香蒲板已在很多示范项目中通过测试, 得以应用。首次实践应用之一是一个修复老旧半木构架建筑的项目。采用生物基质板作为木框之间的填充物以及附加的内部保温层, 实现了具有高节能质量的轻薄外墙结构。香蒲板也成功应用于砌体的内部保温, 它的湿润性和由此产生的容错性可有助于减少使用防潮层。它还被用于现代木框结构的桑拿房, 基本上能满足“从摇篮到摇篮”的要求。一座使用香蒲板搭建的小型建筑作为自承结构的案例在2016米兰世博会上展出。

"从原材料的培育和收获到这种新型建筑材料的生产和分销, 建立香蒲板的价值创造链是至关重要的," Sabine Lamprecht说, 她是弗劳恩霍夫为加速香蒲板商业化而成立的创新公司的首席执行官。"尽管我们目前专注于欧洲市场, 但我们也看到了中国市场的巨大潜力, 因为香蒲种植在中国也很普遍。" 应黑龙江省富锦市政府的邀请, 香蒲板专家 Werner Theuerkorn于2017年11月访问了富锦市。



Containing only plant ingredients and a mineral-based adhesive, the "Typhaboard" is completely compostable  
 “香蒲板”仅含有植物成分和纯矿物质粘合剂, 是完全可分解的  
 Source / 图片来源: Typha Technik



agement Bureau of Fujin, and Fujin Wetland Biodiversity Conservation Project co-financed by the German Government through KfW, representatives from the Heilongjiang Wetland Center, and an interested investor from Beijing participated in a fact-finding workshop. Subsequent field visits revealed that Typha variety in the Fujin Wetland Park is not very suitable as raw material for Typhaboard; but there is a large potential to convert sub-optimal rice fields to Typha plantations.

The Director of the Heilongjiang Wetland Center underlined that this is fully in line with the priority program of the government of Heilongjiang and the State Forestry Administration to convert farmland back to wetland. Based on a rough cost estimate it was agreed by all participants that an industrial Typhaboard production line has great prospect to become a competitive building and insulation material in the PR of China and could help Fujin to diversify its agricultural production by a value-added product.

Professor Shengquan Che, Vice Dean at the Department of Landscape architecture at Shanghai Jiao Tong University conducted already a lot of research with the Typha plant in China. In his latest investigation about the water purification it was found that Typha has obvious absorption effects on  $\text{NH}_4^+$  nitrogen, while having different effects on  $\text{NH}_4^+$  nitrogen at its different growth stages. The strongest influence occurs in the vegetative growth stage. Additionally, Typha has significant absorption effects on total phosphorus, but no significant effect on water hardness.

The Fraunhofer IBP steps up the cooperation with Jiao Tong University and is going to establish a so called Fraunhofer Project Center for research in the field of eco urban development. Research with Typha plantation as a solution for sponge city concepts as well as a renewable resource for new construction materials are subject of a long list of topics for joint research.



*With the use of Typha, exterior wall construction with a high energy-saving quality can be realized*  
香蒲板的使用可大幅提高外墙的节能质量  
Source / 图片来源: Bruno Franchi

富锦市三环泡湿地自然保护区管理局代表、德国复兴信贷银行资助的富锦湿地生态多样性保护项目、黑龙江省湿地保护管理中心代表以及北京的其他投资方共同出席了立项研讨会,虽然实地考察调研结果显示富锦湿地公园的多种香蒲都不适合制造香蒲板,但将该处次优的稻田转化为香蒲种植潜力巨大。

黑龙江省湿地保护管理中心主任表示该想法与黑龙江省政府和国家林业局大力推进的退耕还湿的理念相符。经过粗略估算,参会代表达成共识,工业香蒲板生产线对于中国建筑隔热保温市场有广阔前景,并能有效提高富锦市的农业产品的附加值和多样性。

上海交通大学农业与生物学院副院长车生泉教授对中国的香蒲种植进行了大量研究,他近期的一份有关水质净化的调查报告显示,香蒲对水中的铵态氮( $\text{NH}_4^+$ )吸收作用明显,并且在不同生长时期呈现出不同强度的吸收效果,其中营养生长时期的影响最强。另外,香蒲对水中磷含量的吸收效果显著,但对水硬度影响较弱。上海交大与弗劳恩霍夫研究所将设立弗劳恩霍夫研究项目中心,共同研究城市生态发展方面的课题,其中香蒲种植作为海绵城市建设和可持续新型建材的重要原料是其诸多联合研究方向之一。



## New Ways for Operational Optimization of Buildings – The Digital Test Bench

A contribution by Dr. Dirk Schwede, Dr. Yanping Zhou, Joseph van der Elst, energydesign (Shanghai) Co., Ltd. and Dr.-Ing. Stefan Plesser, synavision GmbH

### 建筑运行优化的新方法 — 使用数字测试平台提高建筑运行质量

来自设能建筑咨询(上海)有限公司Dirk Schwede博士, 周宴平博士, Joseph van der Elst; 德国Synavision GmbH公司Stefan Plesser博士的客邀文章

Today almost 20% of the electricity consumed in China is used in residential and commercial buildings alone. This share steadily increased from 18.3% in 2014 to 19.6% in 2016, in absolute numbers reaching 1039.44 TWh. In 2016 the consumption in residential and commercial buildings has been growing with significant rates. Especially in the non-residential building sector the energy demand is rising steeply. This is due to the still high construction volumes of new public, commercial and industrial buildings – an additional 700 million m<sup>2</sup> have been built yearly between 2010 and 2015 – and an increasing equipping with energy intensive technical services systems in these market segments.

New urban infrastructures, such as hospitals, administrative buildings and airports, are being built driven by the government's development strategy. The life-cycle cost of these buildings will be a burden on the public budgets in the years to come. Although the commercial construction sector is growing with lower rates than in its boom years, it is still expanding in most of China's cities. On the other hand, vacancies are high and office rents are expected to fall in the first and second tier cities. In a growing competition for tenants, reliable performance and operation costs are increasingly moving into the focus of the market stakeholders. In the industry sector, besides operation cost, the operation quality is paramount, with industrial processes increasingly demanding controlled indoor environmental conditions.

Suboptimal operation of buildings, far below optimal performance, is obviously

目前,中国大约有20%的电量用在了住宅及商业建筑上。这一部分用电量从2014年的18.3%稳定增长到了2016年的19.6%。截止2016年,住宅与商业用电的总量达到了1039.44TWh。这一数据已经大幅度增加,特别是在非居住建筑部分,因为公共设施、商业和工业建筑的不断修建—从2010至2015年间,每年约有7亿平米的新增非居住建筑,以及耗能的技术服务系统持续增加,能源需求因此急剧加大。

依据政府发展规划政策,城市新建了许多公共基础设施,例如医院、行政大楼和机场等。这些基础设施的生命周期成本将在未来对公共预算造成一定的压力。尽管商业建筑已经比黄金时期减缓了修建速度,但在中国大部分城市依旧持续扩张。另一方面,空置率增高,一二线城市办公楼的租金预期会降低。在愈渐激烈的出租竞争中,建筑的表现和运行成本逐渐成为了利益相关者的关注重点。对于工业领域来说,随着工业过程中越来越重视室内环境,除运行成本之外,建筑的运行质量被认为是最重要的。



*Especially in the non-residential building sector the energy demand is rising steeply*  
尤其在非住宅建筑领域,能源需求急速增加  
Source / 图片来源: energydesign

wasting significant amounts of delivered energy. In the case of fully conditioned volumes in humid areas or energy intensive industrial process for example, 30% or more of the energy and thereby resulting costs could be saved, if the systems were optimized for efficient operation and energy flow management.

The traditional way of optimizing building operation is through regular energy audits and monitoring of measured performance parameters supervised by building management personnel. In this process the measured consumption figures are compared to benchmarks and performance indicators, such as system temperatures or air flow rates, are checked against their respective set-point design conditions. However, such a procedure is expensive and cumbersome, as it needs to be performed repetitively and as it involves the review of a vast amount of data points, diagrams and systems' performance. Above all, energy audits and monitoring require qualified personnel, familiar with the complex buildings' services systems and motivated to identify optimization potential. The bottom line is that due to its resulting high cost building owners are deterred from auditing their building outside of singular pilot or research related projects. Since the Chinese building stock is large and further growing, comprehensive building performance audits and monitoring cannot be scaled up enough to reach a significant overall effect. Using conventional approaches, it will not be possible to realize a substantial market penetration of energy optimization which is necessary for a visible impact on the national energy demand curve, although significant saving potentials obviously exist.

The digital test bench by synavision is following a different approach. It is not the consequential performance indicators of the buildings' energy behaviour which are monitored and analysed, but the causal functional indicators of the building services as such. Similar as standard plugin testing for cars, performed automatically at the general inspection for millions of

一般性能的建筑, 远远低于优良建筑的表现, 会导致其消耗更多的能源。例如在潮湿地区完全依靠空调的建筑, 或者在耗能高的工业过程中, 如果系统经过了针对性的能源优化, 30%或更多的能源及相应的能源成本是可以被节省的。

优化建筑运营的传统方法是进行能源审计, 以及由专门的能源管理人员进行能耗监测。在这个过程中, 监测到的数据会与行业基准和指标进行比较, 例如系统温度或者空气流速及流量的数据, 会与其相对应的设计设定值比对。然而, 传统的流程成本较高, 并且步骤繁琐, 因为过程需要被不断重复, 需要查看的数据、图表, 及系统工作量巨大。除此之外, 能源审计和监测要求熟悉复杂系统并乐于寻找潜在优化可能的专业人员。结果便是, 除了试点项目或者研究性项目以外, 高昂的审计费用让投资方望而却步。由于中国建筑群体的数量巨大并且依然在持续增长, 导致全面的建筑性能审计和监测无法跟进, 进而不能达到期待的全局效果。仅仅采用传统方法无法实现能源优化的市场渗透, 尽管它有显著可预见的节能潜力, 且对国家总体能源需求曲线有明显的影晌。

Synavision推出的能源数字测试平台则采用不同的方法。数字平台测试并不是监测和分析后建筑能源



*Ventilation system on the roof of an industrial building*

工业建筑屋顶的通风系统

Source / 图片来源: energydesign





*The test system has been successfully applied in the SkyLoop office building at Stuttgart Airport City*

该测试系统已经成功应用与斯图加特机场SkyLoop办公建筑

Source / 图片来源: Flughafen Stuttgart

cars, the cloud-based digital test bench is automatically validating the functions of the Building Management Systems (BMS) and connected services. A digital specification of the intended behaviour of the technical systems in the building is compared to the state of operation using data already available in BMS' status reports. Any deviation of the actual state from the digital specification indicates a lack of operational optimization. This information can be used to identify settings to readjust in order to realise the existing saving potentials.

The described approach can be used in all phases of a building's life cycle. For first commissioning it identifies wrong settings of the installed technical components, hydraulic malfunction and software problems. The second point of time is usually before expiration date of technical systems' warranty. During regular operation a test bench report can be used to regularly check and adjust operation settings or even to validate the service level of the facility management team. Finally, this diagnosis is particularly useful when the building owner decides to re-commission the BMS or implement a BMS at a later stage of the building's life cycle. It then serves as basis for re-design, let it be the whole system architecture setting the logics between sensors, controllers and actuators or the sole software layer integrating existing as well as new sensors and controllers.

The results of the performance checks not only show the quality of operation as a chart with one easy to

性能的结果性指标,而是普通功能指标。就像汽车常规的插件测试一样,在成百上千的汽车普通检查中自动运行,这个云端的数字测试平台也会自动检查BMS系统及其他服务项目的运行情况。建筑技术系统的期望性能将会与BMS的运行情况数据进行比较。任何的性能期望和实际状态之间的偏差表明了这个建筑需要运营系统上的优化。这些信息可以用来分析出哪些设定需要调整,以便实现存在的节能潜力。

这种方法可以使用在建筑生命周期的任意时段。对于第一次调试来说,此时使用数字测试平台能够辨别出导致技术部件、水力系统故障,及系统软件问题的错误设定。第二个使用的时间节点通常是在技术服务系统保修期结束之前。在通常的建筑运行期间,数字测试平台报告可以被用来定期检查和调试运行设定,或者用来验证设施管理人员的服务水平。此外,这种诊断在业主决定再次调试BMS、或者决定在建筑生命周期的后期阶段使用BMS系统的时候尤其有用。这个诊断之后会作为重新设计的基础,成为传感器、调节器和执行器之间逻辑的整体系统架构,或者一个单独的软件层整合现有传感器、新传感器和调节器。

这种性能检查结果以一个带有易读指示的图表展现每个系统的运行质量。同时,结果也以详细的图表方式呈现,方便仔细研究任意一个故障的原因。所有的



read single indicator for each system but also provide in-depth-plots to allow digging down to the very cause of any malfunction. All results can either be printed as report or shown on a web-based dashboard, which also allows continuous supervision of the building performance.

synavision is utilizing an active functional specification, based on digitally described operation rules, which may already have been developed in the conception and design phase of the building and its HVAC systems. The active functional specification is well structured and comprehensible and can work with today's digital building information models (BIM) and any common BMS. If changes in the building occur the specification can be adjusted to the design change.

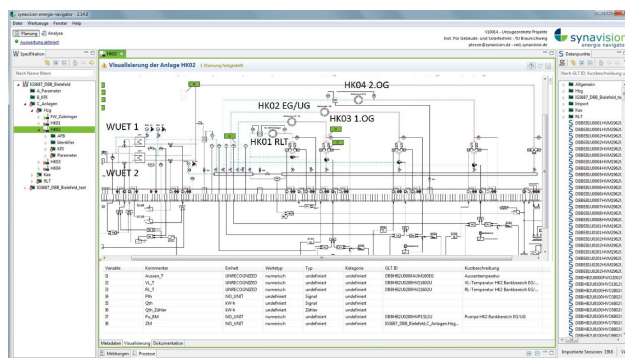
For existing buildings the active functional specification can be modelled based on the available BMS documentation and parametrised through review of the original design documents or through reengineering of optimized building operation regimes. Thus, the programming and resetting of the building systems is not done in a try-and-error strategy for a complex system of interconnected components but based on a skilfully engineered digital functional specification of the building services systems. Thereby the outcome is transparent, robust and reliable, so that efficiency optimization can be realized.

Besides the design, sizing and technology of building services systems and the quality of the building structure, the quality of buildings' and systems' operation is paramount for day-to-day energy efficiency, reliable building performance and long term economic viability. Simple settings, such as lighting controls, set point temperatures and operation times of the ventilation systems as well as sophisticated control strategies need to be supervised to ensure perfect performance. synavision's cloud-based approach allows for fast application, in usually less than 4 weeks, with little effort from building owners and on-site personnel. Implementing this innovative technology eliminates the need for installations, interruption of operation and site visits. Another advantage is the generation of a quick return on investment within one year.

In any case the effort and cost for building performance improvements are well invested. The digital test bench approach to enhance building performance quality is a highly efficient and robust alternative to conventional energy audit services.

结果都可以用报告的方式打印出来,或者以基于网络的数据可视化模块呈现。后者可以持续支持以后的建筑性能监管。

Synavision使用一种主动的功能性规范(基于数字化描述的运行规则)。这种规范可能已经在建筑和HVAC系统的概念和设计阶段就完成了。这种全面的方法可以与现在的BIM技术和任何常见的BMS系统合用。如果建筑自身有任何的改变, Synavision的规范也可以相应地变化与之适应。



Screen shot of a functional specification of a heating system

供暖系统功能性规范的屏幕截图

Source / 图片来源: synavision

对于即有建筑来说,主动功能性规范可以根据现有的BMS文档进行建模,通过最初的设计文件,或性能优化的再设计进行参数化。所以,对于联动组件的复杂系统,其设计与重置不是以试错法完成的,而是依据一个建筑服务系统成熟的工程数字化规范来完成的。正因为其结果都是透明的、有力的、和可靠的,因此效率优化是可以被实现的。

除了建筑服务系统的设计、选型、技术和建筑构造的质量,建筑和系统的运行对于日常的能耗效率,可靠的建筑表现和长期经济可行性是最重要的。简单的设定,比如灯光控制、温度设置和新风系统的运行时间,以及复杂的控制策略等是需要被监测的,以便保证完美的整体表现。Synavision云端化的方法能够实现快速的应用,通常短于4周,并且要求业主和驻场人员很少的参与,该创新技术的不再需要安装,不再干扰正常运行,也不再需要实地勘察。另外一个优势为,成本收益回报时间缩短到少于1年。

任何情况下,在建筑性能提升上投入的精力和花费都是值得的。除了传统能源审计服务之外,本文介绍的数字化测试平台在提升建筑性能和质量方面,是一个高效、鲁棒性强的替代方法。

## New Version of the DGNB System: A Global Benchmark for Sustainability

A contribution by Felix Jansen, German Sustainable Building Council (DGNB)

### DGNB 系统新版本: 可持续性方面的全球标杆

来自德国可持续建筑委员会 (DGNB) 的Felix Jansen的客邀文章

The number of buildings that have been constructed in China in the last 15 years equals the total number of buildings that already exist in Europe. Construction volumes remain high and the demand for green or sustainable buildings is growing. This is where the DGNB certification system developed by the German Sustainable Building Council comes into play. It serves as a quality standard for projects reflecting "Made in Germany" levels of sustainability.

The scope of the DGNB System's sustainability concept is extremely broad and goes beyond the traditional focus of green buildings. It pays equal regard to all fundamental aspects of sustainable construction, namely the six key areas of ecology, economy, socio-cultural and functional aspects, technology, processes and location. Assessments are not carried out for specific measures in a building, as is the case with rating systems, but rather they look at the overall performance of the building as a whole.

For the DGNB, the main motivation has to be to build better, quality-assured buildings. To place greater emphasis on this, an updated version of the DGNB System has been developed in recent months, simultaneously setting new building certification benchmarks, including on an international level. In mid-2018 there will be a guide published of how to use the new version in an international context and thus the version will be applicable for the Chinese market.

Specific recognition is now given to developers and building owners who address sustainability factors early on, including on a holistic level. More emphasis is now also placed on climate protection and circular economy. The system has been optimised so it can be used more as a planning tool, also rewarding innovation and it applies equally to nine different types of building uses.

#### Promoting new thinking beyond the comfort zone

One of the most important changes that have been made to the DGNB System is that it specifically promotes new and innovative solutions. For the first time, the new DGNB System addresses this in 18 of

中国在最近15年来新建的建筑总量已经是整个欧洲已有建筑物数量的总和。在建造数量居高不下的同时,对绿色或可持续建筑的需求也在日益增长。这也正是由德国可持续建筑委员会建立的DGNB认证体系能够大展身手的领域。这一认证可用于体现项目在可持续性方面拥有“德国制造”水平的质量标准。

DGNB体系的可持续性概念范围非常广泛,并非仅限于传统意义上的绿色建筑。它包含了可持续性建筑的各个重要方面,在能源、经济、社会文化和功能方面、技术、过程和区位等六大关键领域给予了同等的重视。它并不像简单的打分系统那样针对建筑物中的某一特定方面进行评估,而是将建筑物视作一个整体来考虑其总体性能。



*The DGNB System's concept pays equal regard to all fundamental aspects of sustainable construction*

DGNB体系的概念对可持续性建筑的各个重要方面都给予了同等的重视  
Source / 图片来源: Hefei Gezhouba Real Estate Development

对于DGNB来说,最主要的出发点是建造更好、更有质量保证的建筑物。为了进一步加强这一点,最近几个月来,DGNB体系的更新版本已经开发出来,其中设立了新的建筑认证标杆,里面还包括了国际层面上的新标杆。在2018年年中,还将会出版一本如何在国际范围内使用这一新版本的指南,这样新版本也将适用于中国市场。

现在将会对那些更早注重可持续因素——包括在整体上——的开发商和业主给予特别的认可。另外,现在也将更为重视气候保护和循环经济。新版本的体系已经过优化,能够更多地用作规划工具,同时也能够奖励创新,并同等适用于九种不同类型的建筑用途。



the 37 criteria by providing so-called innovation capacities. The aim is to actively motivate people to pursue the best possible solutions for projects because they simply make the best sense. This can result in a new idea receiving equal consideration in the assessment, even though it may not yet be covered by the criteria.

### Introduction of a bonus system

For the first time, the DGNB is introducing bonuses for a total of 16 criteria and in the case of “over fulfilment”. These will have a positive impact on certification outcomes. The aim is to reward novel solutions that support the principles of circular economy or make a particularly significant contribution to climate protection and other United Nations Agenda 2030 Sustainable Development Goals.

### Focusing on circular economy

Encouraging people to devote resources consciously has also been a key concern of the DGNB from the beginning. It is important to think about the future when selecting materials and deciding how different elements within materials will be used. Similarly, it is important to consider possible changes that will be made to a building during use. When selecting the materials to be applied in a building it is also necessary to consider that one day it may be disassembled or reclaimed. The DGNB certification system thus plays an important role in ensuring that material cycles are put in place so that products can be re-used or reclaimed, along the lines of cradle-to-cradle principles. These ideas can be incorporated in new business models and become part of responsible, future-centric product development. The DGNB System is therefore the first of its kind to make circular economy principles an assessable and measurable aspect of buildings.

### Fundamentally revised criteria

The two previous “Life Cycle Assessment” criteria have been merged into one. Greater emphasis is now placed on encouraging early and continual consideration of life cycle factors, even as early as the planning stage. With the criterion “Life Cycle Cost”, the benchmarks have been comprehensively overhauled. A number of new indicators have also been introduced to encourage the early and ongoing consideration of the results of life cycle impact assessments, especially during planning.

### 超越惯有观念, 推动新的思维

新的DGNB体系包含的最重要变化之一是它特别强调推动新颖的创新方案。新的DGNB体系第一次正式提出系统地鼓励创新能力, 在37项标准中的18项之中论述了这一问题。其目的是积极鼓励人们为项目寻求那些最具意义的最佳方案。这有助于在评估中对新想法给予同等考虑, 即便这些新想法可能没有被这项标准现有的要求所涵盖。



*The German Centre in Taicang achieved a DGNB Gold Certificate in 2017  
位于太仓的德国中心在2017年赢得了DGNB金质认证  
Source / 图片来源: German Centre Taicang*

### 奖励系统介绍

DGNB有史以来第一次在总计达16项标准方面, 对“超额实现”引入了奖励机制。这对认证结果将会产生积极影响。其目的是奖励那些能够支持循环经济、或能够在气候保护和联合国“2030年可持续发展目标议程”其他方面做出贡献的创新解决方案。

### 关注循环经济

鼓励人们自觉将资源投入循环经济是DGNB从一开始便关注的一个重点。在选择材料和决定在材料中使用何种原料时, 充分考虑未来前景具有十分重要的意义。同样的, 对建筑使用过程中可能发生的改造加以考虑也具有重要意义。当选择建筑所用材料时, 有必要考虑到将来有一天建筑会被拆除, 或者材料可能会需要回收。DGNB认证体系将确保材料能够能合理利用, 从而实现“摇篮到摇篮”原则下的产品重复利用和回收。这些想法均能够整合进入新的商业模式之中, 成为可靠的、面向未来的产品开发的一部分。从这个角度来看, DGNB体系将是类似体系中将循环经济原则作为建筑物可评估、可测量方面的开创者。

### 经过重大修订的标准

将以往的两项“生命周期评估”标准合二为一。现在更加重视鼓励人们对生命周期因素进行尽早和持续的考虑。“生命周期成本”这项标准中, 对平分标准进行了全面的修改。同时还引入了一些新指标, 鼓励对

According to the DGNB's understanding of quality, the "Indoor Air Quality" criterion remains an all-or-nothing factor, acting as a reminder that measurements in this regard should be taken. Following the revision, the requirements have been tightened and target values for formaldehyde have been further reduced. This makes the DGNB System the most stringent system worldwide. Bonus points are also awarded for special measures aimed at protecting non-smokers and reducing fine particulate matter generated by photocopiers and printers.

The previous criterion "Adaptability of Technical Systems" has been completely reworked and is now called "Use and Integration of Building Technology". The aim is to promote building concepts that make the best possible use of low-tech solutions and integrate regenerative energy into required technical systems. It should also be possible to adapt buildings to changing usage requirements and technical innovations with the least possible cost and effort.

With the "Immissions Control" criterion, which will be considered for all types of building use in the future, the issue of light pollution has now been included. The "Mobility Infrastructure" criterion will reward car sharing and joint transportation, as well as the preparatory equipping of electric vehicles for bidirectional charging.

All four criteria affecting "Site Quality" have been adapted, encouraging people to actively consider the positive contributions buildings can make to the district and neighbourhood around them. Recognition will be given to novel options offered to the people who use buildings, or third parties (e.g. urban farming), as well as robust building methods that consider different environmental hazards.

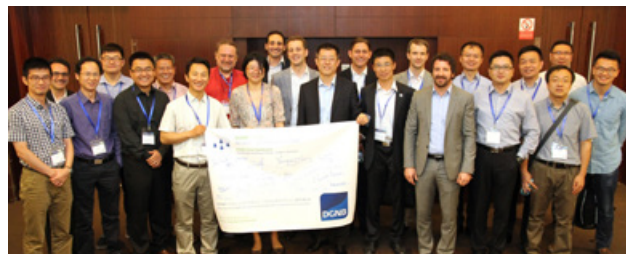
### DGNB certified projects in China

In recent years, DGNB made some remarkable progress in the Chinese building sector. 14 projects in China have already been certified or pre-certified by the DGNB. These include new residential buildings and offices as well as laboratory buildings, mixed-used buildings, tenant fit-outs and interiors.

Also the number of trained DGNB experts in China constantly grew over the last years. Around 300 Chinese persons already have successfully completed their education as DGNB Consultants or Registered Professionals.

生命周期影响评估的结果进行早期且持续的考虑，尤其是在计划阶段。

根据DGNB对于质量的理解，“室内空气质量”这项标准仍是认证的一项强制要求，这也是在提醒人们室内空气质量测量的重要性。这次修订后，相关要求有所提高，甲醛的目标值被进一步降低。这使得DGNB成为了世界范围内最为严格的体系。对于在保护非吸烟者和降低复印机/打印机产生细微颗粒方面采取的特殊措施，也将授予奖励分数。以往的“技术系统适应性”标准已完全重新制订，现在被称为“建筑技术的适用和整合”。这项标准的目的在于推广那些尽可能利用低科技方案并将再生能源整合到建筑所需技术系统的建筑概念。同时有可能用于对建筑进行改造以在最小成本和工程量的前提下改变其使用要求和技术方案。



*Around 300 Chinese persons already acquired their education as DGNB Consultants or Registered Professionals*

已有逾300名中国的专业人员通过培训成为DGNB咨询师

Source / 图片来源: DGNB

“排放控制”这项标准将未来在所有类型建筑物适用过程纳入关注和考虑的范畴，当下光污染的问题也收入到了新体系中。“交通设施”标准将会对那些拼车出行和联合运输，以及那些电动车辆双向充电预备设备的提供进行奖励。

影响“区位质量”的全部四项标准均已进行了修订，鼓励人们主动考虑建筑物对周边区域和社区能够做出的积极贡献。将对那些能够为使用建筑的人们、或第三方（如城市农业）提供新颖选择的创新方案。同时，那些考虑了不同环境危害的稳固的建筑方式也会得到更多的认可。

### 中国的 DGNB 认证项目

最近几年来，DGNB在中国建筑业市场上取得了很大的进展。中国已有14个项目获得了DGNB的认证或预认证。这些项目中包括了新的住宅建筑项目、写字楼项目、实验室建筑项目、多用途建筑项目以及内部装修等。同时，在中国通过培训的DGNB专家人数也在过去几年来不断增加。大约已有300名中国的专业人员通过培训成为DGNB咨询师。



## Fairs & Events 展会与活动

China Clean Energy Week 2018  
Beijing, China 25.03.2018 - 31.03.2018  
2018清洁能源推广周  
北京, 中国 · 2018年3月25日 - 3月31日  
[www.chinacleanenergyweek.cn](http://www.chinacleanenergyweek.cn)

14th Intl. Conference on Green and Energy-Efficient  
Building & New Technologies and Products Expo  
Zhuhai, China 02.04.2018 - 03.04.2018  
第十四届国际绿色建筑与建筑节能大会暨新技术与产品博览会  
珠海, 中国 · 2018年4月2日 - 4月3日  
[chinagb.net](http://chinagb.net)

Greener Heating 2018  
International Conference and Exhibition  
Qingdao, China 16.04.2018 - 19.04.2018  
绿色供热年度大会  
青岛, 中国 · 2018年4月16日 - 4月19日  
[meteringchina.com/event/GH2018EN/](http://meteringchina.com/event/GH2018EN/)

ISH China & CIHE 2018  
China International Trade Fair for Heating, Ventilation,  
Air-Conditioning, Sanitation & Home Comfort Systems  
Beijing, China 22.05.2018 - 24.05.2018  
中国国际供热通风空调、卫浴及舒适家居系统展览会  
北京, 中国 · 2018年5月22日 - 5月24日  
[ishc-cihe.com](http://ishc-cihe.com)

5th China International Building Energy Efficiency and  
Green Building Technology & Equipment Expo  
Beijing, China 10.06.2018 - 12.06.2018  
第五届北京国际建筑节能暨绿色建筑技术与装备博览会  
北京, 中国 · 2018年6月10日 - 6月12日  
[bj.cibes.com.cn](http://bj.cibes.com.cn)

FENESTRATION BAU China 2018  
Beijing, China 31.10.2018 - 03.11.2018  
中国国际门窗幕墙博览会暨中国国际建筑系统及材料博览会  
北京, 中国 · 2018年10月31日 - 11月3日  
[bauchina.com](http://bauchina.com)

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#### 参考网站:

[www.china.ahk.de](http://www.china.ahk.de)

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### Green Technologies & Energy 绿色科技及能源

ESCO Committee of China Energy Conservation Association  
中国节能协会节能服务产业委员会  
emca.cn

Alternative Energy 替代能源网  
alternative-energy-news.info

China Energy Web 中国能源网  
china5e.com

China Greentech Initiative 中国绿色科技  
china-greentech.com

China Renewable Energy Society (CRES) 中国可再生能源学会  
cres.org.cn

China Renewable Energy Centre 国家可再生能源中心  
cnrec.org.cn

German Energy Agency 德国能源署  
dena.de

German Federal Ministry for Economic Affairs and Energy  
(BMWi) 德国联邦经济和能源部  
bmwi.de

Energy Efficiency Export Initiative 能效解决方案倡议  
efficiency-from-germany.info

Renewable Energies Export Initiative 可再生能源解决方案倡议  
export-erneuerbare.de

Europe-China Clean Energy Centre 中欧清洁能源中心  
ec2.org.cn/en

RETech 回收技术  
retech-germany.net

Renewable Energy World 可再生能源世界研讨会暨博览会  
renewableenergyworld.com

Renewables International 国际可再生能源  
renewablesinternational.net

### Environment 环境

German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)  
德国联邦环境、自然保护、建设和反应堆安全部  
bmub.bund.de

Federal Agency for Nature Conservation 联邦自然保护局  
bfn.de

Sustainable China 可持续发展的中国  
nachhaltiges-china.de

Federal Environmental Agency 德国联邦环境局  
umweltbundesamt.de

The Guardian 卫报  
guardian.co.uk/environment

### Climate Protection & CDM 气候保护与清洁发展机制

CDM in China 中国清洁发展机制  
cdm.ccchina.gov.cn

China Climate Change Info-Net 中国气候变化信息网  
en.ccchina.gov.cn

Chinese Renewable Energy Industries Association (CREIA)  
中国可再生能源行业协会  
creia.net

Climate Focus 气候聚焦  
climatefocus.com

Climate Works Foundation 气候工作基金会  
climateworks.org

CO2 Trade 二氧化碳交易  
co2-handel.de

German Emissions Trading Authority  
德国温室气体排放量交易处  
dehst.de

United Nations – CDM 联合国-清洁发展机制  
cdm.unfccc.int

JIKO BMUB 德国联邦环境部 联合履约处  
jiko-bmub.de

KfW Carbon Fund 德国复兴信贷银行碳基金  
kfw.de/carbonfund

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Asian Development Bank 亚洲开发银行  
adb.org/publications

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International Energy Agency 国际能源机构  
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World Bank - East Asia & Pacific 世界银行-东亚及太平洋地区  
blogs.worldbank.org/eastasiapacific

### Economy, Finance & Law 经济、金融与法律

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english.caijing.com.cn

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