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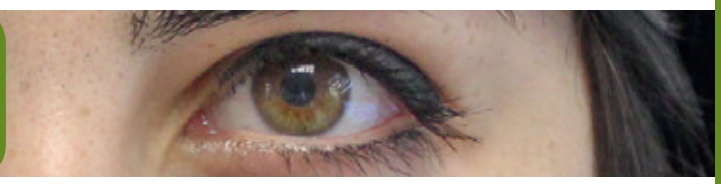
In Focus



Awakening from the Slumber: Post-Fukushima Nuclear Power Development in China

从沉睡中觉醒：后福岛时代中国核电的发展

Following the Fukushima Daiichi nuclear disaster in early 2011, many countries around the world were prompted to re-examine and re-evaluate their nuclear power strategies. After the accident in Japan, the Chinese government introduced a temporary moratorium on its nuclear power program. However, after adjusting its targets for nuclear power downwards, China soon raised the moratorium in October 2012. While traditional leaders in nuclear energy production have reduced their reliance on nuclear energy or have become stagnant in further research and development, China has added over ten new reactors with more than 20 GW of nuclear power capacity.

The impetus driving China's nuclear power program forward stems from two connected aspects: the country's electricity generation mix as well as its degrading environmental situation. The overwhelming part of China's electricity, close to 90 percent, is generated from burning fossil fuels, especially CO_2-laden coal. In contrast, the share of electricity generated from nuclear power plants only reached 2.4 percent last year. This leaves ample room to further accelerate domestic nuclear power production to reduce reliance on fossil fuels and promote energy security. To improve the dire outlook on its environmental situation, Chinese Premier Li Keqiang has announced a "War on Pollution", resulting in massively increased investments into clean energy sources. Besides renewable energies, China also views nuclear power as a clean alternative to replace fossil fuels and combat pollution. Moreover, nuclear power plants can be constructed close to major consumption centers in proximity to coastal areas, also providing additional advantages for cooling. Nuclear energy thus makes for a useful instrument in China's energy toolbox.

Continuing on the Path

Construction of China's first two nuclear power plants started in 1987, with operations first commencing in 1994. This, in turn, means that China, with a mean age of only around seven years, has one of the youngest

2011年早期发生在日本东部地区的大地震以及之后的福岛核反应堆灾难促使世界上许多国家重新审视和评估自己的核电战略。中国政府在日本事故发生后暂时停止了核电计划。但在调整核电目标后，中国很快于2012年10月取消了禁令。当传统核能生产国如日本已经减少对核能的依赖或者在进一步发展和研究中止步不前时，中国新增加了10个反应堆，核装机容量超过2000万千瓦。

促使中国发展核电项目源于两个相互关联的原因：国家的发电组合以及恶化的环境形势。中国电力压倒性的一部分（接近90%）是由化石燃料燃烧产生，尤其是负载二氧化碳的燃煤发电。相反，去年核电厂发电的比重只占达到2.4%。这为进一步加快国内核电生产、减少对化石燃料的依赖以及促进能源安全留下了足够的空间。为了改善严峻的环境形势，李克强总理向污染宣战，引发了清洁能源投资的大幅增长。除了像太阳能和风能这样的可再生能源，中国也视核能为化石能源的替代物以对抗污染。此外，核电厂可以紧邻沿海区域建造，因为它靠近主要消费和需求中心，并有冷却这一额外的优点。因此，核能成为中国能源工具箱中的有用工具。

Expansion of the Tianwan Nuclear Power Plant near Lianyungang in the eastern province of Jiangsu
江苏省东部连云港附近的田湾核电站扩建
Source / 图片来源: en.chinamining.com.cn

继续前行

中国最早的两个核电厂建于1987年，1994年投入商业运行。这意味着中国在短短7年时间内，拥有世界

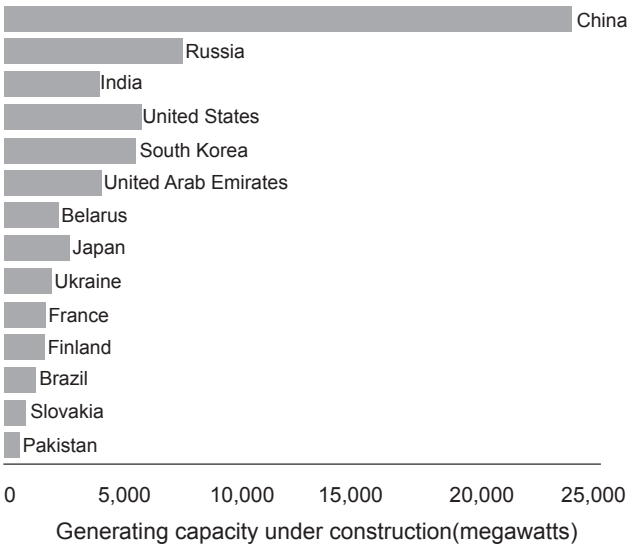
reactor fleets in the world. Still, China is looking to almost double the number of nuclear power plants in operation. In 2014, China still seemed to be in deep nuclear slumber: not a single project was approved and industry investment dropped by almost 7 percent. This year, however, officially marks the country's "nuclear awakening": besides six to eight new approved projects, a total of eight new reactors are scheduled to begin operations, the largest single-year increase in the history of China's nuclear power production. According to the International Atomic Energy Agency (IAEA), China has 28 nuclear power reactors operational and connected to the grid, with additional 24 under construction. China has therefore become the world's largest nuclear energy market in terms of reactors under construction. The country is set to pass Russia and South Korea this year, becoming the fourth-largest country in terms of nuclear power capacity in the world behind the US, France, and Japan.

China's Energy Development Strategy Action Plan 2014-2020 sets a 15 percent and 20 percent non-fossil fuel target for 2020 and 2030, respectively. Nuclear power is set to become an integral part in achieving these targets: although the government revised its former goals for nuclear power from 70-80 Gigawatt (GW) to 58 GW with an additional 30 GW under construction, nuclear energy is slated to become the fastest-growing primary energy source in China over the next couple of years. With a compound annual growth rate of over 15 percent from 2015-2020, nuclear energy grows more than twice as fast as renewable energies. Beijing's goal is to reach 150 GW of nuclear energy generation in 2030, which would then provide almost 10 percent of electricity. Nevertheless, China's post-Fukushima slowdown in approving and constructing nuclear reactors may mean that the eventual 2030 figure only reaches around 120 GW of generating capacity. The realization of China's long-term goal to generate 240 GW of nuclear power in 2050, translating to 15 percent of total electricity production, thus largely depends on the efforts made within the next few years in reaching its intermediate goals. It is therefore not surprising that the plan calls for a "timely launch" of new nuclear power reactors on China's eastern coast as well as feasibility studies for the construction of inland plants.

Going beyond China

In the context of the country's further nuclear power expansion, fast reactors are seen as the key technology for long-term use of nuclear energy. On 15 April 2015, approval was granted for the Fuqing nuclear

上最年轻的核反应堆。而且中国还在计划让运行核电站的数量翻倍。2014年，中国在核能领域似乎仍在沉睡:　没有一个项目被批准、行业投资下降了近7%。但今年正式标志着中国的"核觉醒"：除了新批准的6-8个项目，共8个新反应堆计划开始建造，创中国核电生产历史上最大的单年增幅。根据国际原子能机构的数据，中国有28个核电反应堆并入电网，正在建设的有24个。因此从在建核反应堆数量来说，中国已成为全球最大的核能市场。中国今年计划赶超俄罗斯和韩国，在装机容量上成为世界第四大国，仅次于美国、法国和日本。



Nuclear power capacity under construction 在建核电装机容量
Source / 图片来源: International Atomic Energy Agency 国际原子能机构

中国的能源发展战略行动计划2014-2020表明，到2020年中国非化石能源比例将达到15%，到2030年达到20%。核电将成为实现这些目标的一个组成部分：虽然政府调整了先前的目标，从70-80吉瓦降低至58吉瓦加上额外在建的30吉瓦，核能仍被认为是未来几年中国发展最快的主要能源来源。凭借着2015到2020年超过15%的复合年均增长率，核能的增长已经是可再生能源的两倍。北京2030年的目标是核能发电达到150吉瓦，提供近10%的电力。然而，后福岛时期对于核反应堆批准和修建的减缓意味着到2030年这一数据可能只会达到120吉瓦。因此，中国实现2050年核电发电达到240吉瓦（相当于总发电量的15%）的总目标很大程度上取决于中国近几年实现其中期目标的努力。这样，行动计划呼吁在中国东部沿海"及时推出"新的核反应堆以及对内陆工厂建设进行可行性研究也就不足为奇了。

走出中国

在中国进一步核电发展的背景下，快堆被视为长期使用核能的关键技术。2015年4月15日，福清核电项目

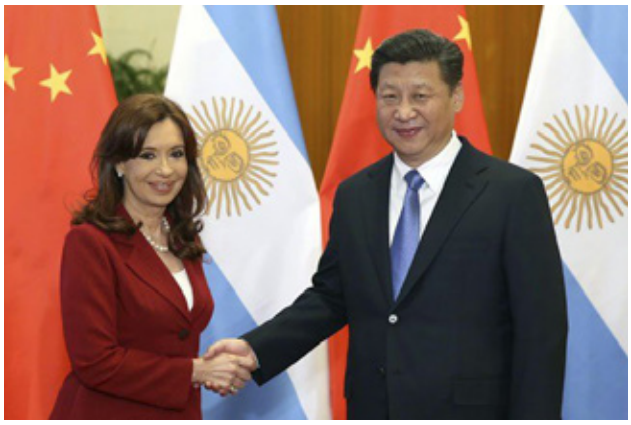
power project to commence operations by Premier Li Keqiang. Grid connection was achieved on 8 August 2015. Most noteworthy, however, is the fact that the project is the first to use the domestically-developed third-generation nuclear power reactor Hualong-1 technology. Besides extensive domestic use, the technology, jointly developed by the state-owned enterprises China National Nuclear Corporation and China General Nuclear Power Group, is expected to become an integral part in China's strategy to expand its nuclear industry beyond its own borders. With the global nuclear energy market for power plants that are either planned or under construction by 2030 expected to reach 1.2 trillion USD, Beijing is planning to become a world leader in the nuclear power industry by 2020. Consequently, China is increasingly looking abroad to seek new markets for its nuclear power technology.

In June 2014, Beijing signed a landmark agreement during Premier Li Keqiang's visit to the United Kingdom that allows for Chinese companies to own and operate Chinese-designed nuclear power plants in the country. On 21 August, Pakistani Prime Minister Sharif held a ceremony to mark the start of construction of two Hualong-1 nuclear reactors near the major port city of Karachi. China is funding Pakistan's nuclear power program with 6.5 billion USD and is involved in the construction of at least six nuclear power plants in the country. With the start of construction in Karachi, the Hualong-1 nuclear power reactor could see its first deployment outside of China. Concrete plans have also been made with Argentina. During Argentine President Kirchner's visit to China earlier this year, both countries signed an agreement to construct two nuclear power plants in the Latin American country, with China providing the majority of funding.

In addition, China has only recently reached an agreement with Kenya to construct the country's first nuclear power plant. A Memorandum of Understanding was signed in early September, with completion of the reactor being planned for 2025. Overall, China's "two-pronged" nuclear energy strategy closely resembles that for its renewable energy industry: domestically, the advancement of nuclear power empowers a clean, non-fossil fuel that can help to reduce CO_2 emissions in a considerable way and strengthen energy security at the same time. On the international level, a globally competitive nuclear industry helps China to promote nuclear power and take advantage of market opportunities to gain momentum in establishing the country as a world leader in terms of research, development, and application of nuclear energy technologies.

得到总理李克强的批准开始商业运作，2015年8月8日实现并网。而且最值得一提的是，它是第一个使用国内自主三代核电技术“华龙一号”的项目。除了大量使用国内技术，由国有企业中国核工业集团公司和中国广核集团联合开发的技术有望成为中国发展跨国核工业战略的一个组成部分。随着全球核能发电厂市场（计划或在建）到2030年预计将达到1.2万亿美元，北京因此正计划在2020年成为世界核电产业的领导者。中国也正在越来越多地寻求核电技术的海外新市场。

在2014年6月李克强总理访英期间，北京达成了具有里程碑意义的协议---允许中国公司在英国拥有并经营中国设计的核电站。就在几个星期前，8月21日，巴基斯坦总理谢里夫举行动工仪式，标志着中国在主要港口城市卡拉奇附近开始建造两个“华龙一号”核反应堆。中国正投入65亿美元资助巴基斯坦的核电计划，并在该国参与了至少六座核电厂建设。随着卡拉奇项目动工，“华龙一号”核电站反应堆首次在海外亮相。中国与阿根廷也达成了具体的计划。在今年早些时候阿根廷总统基什内尔访问中国期间，两国签署了一项协议，拟在拉美国家建造两座核电站，其中中国提供了大部分资金。



Argentine President Kirchner during her state visit to China in February 2015
2015年2月阿根廷总统基什内尔访华
Source / 图片来源: fmprc.gov.cn

此外，中国最近刚与肯尼亚达成协议，建造该国的第一座核电站。中国广核集团和肯尼亚核供电局已在九月初签订了谅解备忘录。核电站计划于2025年完工。总体而言，中国核能的“双管齐下”战略与新能源产业的类似：在国内，发展核能这种清洁的非化石燃料，能够很大程度上减少二氧化碳的排放，并同时加强能源安全。在国际层面，具有全球竞争力的核工业帮助中国推进核电发展，并利用市场机会的优势获得在核能技术研究，开发和应用方面世界领先的契机。

Building

The Passive House Today and Beyond 2015 – Developments and Trends

A contribution by Ludwig Rongen, Rongen Architekten

2015被动式房屋技术发展现状和未来趋势

来自隆恩建筑事务所的路德维希-隆恩教授的客邀文章

The first worldwide Passive House was built in Darmstadt (Germany) in 1991. At that time, hardly anyone believed that it is possible to build houses that provide comfortable temperatures and humidity conditions in winter and summer in Central Europe without any active heating system.

Today, the Passive House Standard is the globally-acknowledged, highest standard in energy saving building construction. More and more real estate entrepreneurs, project developers and politicians discover the Passive House and recognize its benefits.

In addition, the Passive House is an effective contribution to the urgently needed reduction of CO_2 emissions, thus adding to climate and environmental protection. It also contributes to improving the urban climate, presently a central issue for numerous Chinese cities.

Now, after international dissemination, Passive House development will continue onto the “Energy-Plus Building Standard”. By using renewable energies combined with storage technology, the Energy-Plus Building, with the Passive House Standard as its underlying basis, shows strong potential for the future development of the Standard. The primary goals of the emerging Energy-Plus Standard are energy consumption, producing energy by itself, and achieving a self-sufficient and sustainable energy system with reasonable cost.

In this vein, the German Passive House Institute (PHI) developed the newly introduced Passive House classes “Classic”, “Plus”, and “Premium”. In addition to the proven reduction of heat demand to 15 kWh per m², the valuation and use of renewable energies to cover total energy consumption is becoming increasingly important. Furthermore, Passive Houses, making use of renewable energies like wind and solar power, will very likely turn into net energy producers in the near future, avoiding fossil fuels altogether.

1991年，世界上第一座被动式房屋在达姆施塔特市（Darmstadt，德国）建成。在当时，几乎没有人相信，在中欧的冬季气候条件下，有一种建筑能够不依赖主动供暖却保持室内舒适的温度和湿度。

时至今日，被动式房屋标准早已被公认为世界上最高等级的建筑节能标准。越来越多的房地产开发商，工程开发商和政治家们发现了被动房屋的优势。

此外，被动式建筑能有效降低对地球大气层的二氧化碳排放量，从而在改善城市气候、气候与环境保护领域起到了积极的效果，而这恰恰是目前中国城镇化发展中面临的一个熟悉而又严峻的课题。

随着这项建筑节能标准和相应的工程技术在国际间的应用传播，被动式房屋技术在未来即将进入到另一个技术升级阶段，即Plusenergiehaus（非名称直译：能源补充型房屋）。通过结合利用可再生能源和能源存储技术，以被动房屋标准为基础的能源补充型房屋对未来的标准发展展现出强大的潜力。能源补充型标准的首要目标是能源的消耗，以合理的成本实现自给自足和可持续的能源系统。

Renewable Energy options for the new “Energy-Plus Building Standard”
新型“能源补充型房屋”的可再生能源选项
Source / 图片来源: Rongen Architekten 隆恩建筑事务所

Passive Houses as Energy-Optimized Buildings

However, resource and energy saving alone take not into account the rapid economic rise of developing nations, whose industries will still develop and whose populations have the same right as everyone else to improve their living conditions. Nevertheless, climate and environmental protection has become a global issue that needs to be addressed accordingly. A legally binding framework to reduce carbon emissions was decided in the form of the Kyoto Protocol. Measures to reduce indirect greenhouse gases, which destroy the ozone layer, are regulated by the Montreal Protocol.

All European countries agreed to increase building energy efficiency and reduce greenhouse gas emissions by 20 percent. The share of renewable energies in Europe shall be increased to an average of 20 percent. The problem of greenhouse gas emissions caused by buildings is addressed by reducing emissions from buildings by around 90 percent until 2050, based on 1990 levels.

Meanwhile, a quarter-century after realizing the first Passive House, the building standard has come to deliver highest standards in energy efficient building, even in cool and hot climates, thus making Passive Houses very comfortable to live in as they provide comfortable indoor climate conditions due to a constant supply of fresh air. Ground collectors, featuring pollen- and dust filters in the air supply system, can also preheat the air before it enters the building.

The indoor climate is always within optimal living conditions. Small temperature differences between the ambient air and the inner building surface create a high level of comfort. Draughts, caused by so-called katabatic winds due to cold surfaces, belong to the past. Adding to the comfort argument are economic arguments, such as minimal energy, maintenance, and operating costs.

Due to a continued decrease of Passive House supplemental costs within

这一技术发展的概念由德国达姆斯塔特被动房研究中心(PHI)提出,相应对被动式房屋认证等级细分为:“Classic经典标准”、“PLUS升级标准”和“Premium高级标准”。

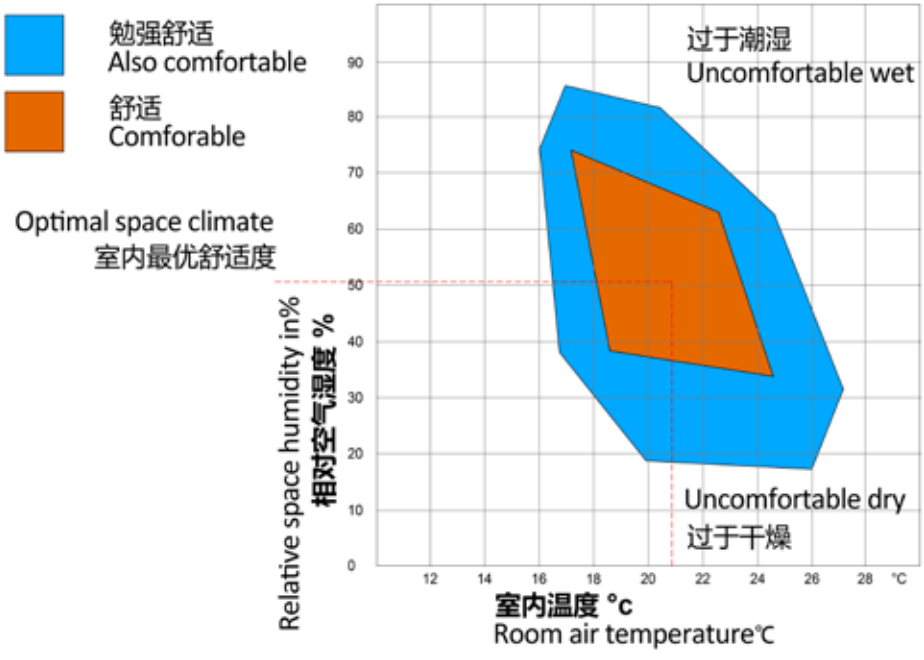
新版的认证等级的评估目标中,除了达到被动式节能标准(15千瓦时/平方米),可再生能源在房屋总能耗中的利用比例变得越来越重要。 此外,利用风能和太阳能等可再生能源的被动房屋,很可能在不久的将来成为纯能源生产者,完全避免化石燃料的使用。

被动房屋作为能源优化建筑

单纯的节能并没有考虑到发展中国家迅速的经济增长需求,他们仍处在工业发展初期,并且当地居民享有和其他人一样的权利进一步发展经济和改善生活条件。

然而,气候和环境保护已成为一个全球性的问题,需要加以解决。京都议定书制定了减少碳排放的法律框架。蒙特利尔议定书规定了间接减少破坏臭氧层的温室气体的措施。欧盟各国对建筑能效准则做出决议:将提高建筑物20%的能源使用效率;减少20%的温室气体排放;可再生能源的使用量平均提高20%。由建筑活动产生的温室气体排放量,承诺至2050年减少约90%(相对于1990年)。

距实现第一座被动房屋已过去25年的今天,建筑标准即使在寒冷和炎热气候也已达到节能建筑最高标



The Comfort Chart provides a clear overview over optimal indoor living conditions
空气舒适度衡量表表示理想室内生活条件
Source / 图片来源: Rongen Architekten 隆恩建筑事务所

the last years, crucial components, such as thermal insulation and triple glazed windows, have been able to enter serial production. Therefore, the payback period for Passive House supplemental costs has become very short in European countries. These experiences have also been gained with residential buildings for nearly 25 years and have been successfully and systematically transferred to non-residential buildings, such as schools, kindergartens, office buildings, nursing homes, hotels, and museums.

Due to its minimized energy demand, the Passive House standard has become the basis for the so called „Nearly Zero Energy Building", corresponding the European Building Directive 2010, making the standard compulsory for all public buildings from 2019 on, extending to all other buildings in 2021. Especially in emerging markets like China or other BRICS countries with already very high and rising energy demands, the Passive House represents both an economic and future-oriented building standard.

This notion also applies to the renovation of existing buildings. The "Nearly Zero Energy Building" offers reasonable lifecycle costs in the form of either a Cradle-to-Cradle (C2C) or Cradle-to-Grave (C2G) footprint approach. The C2G-principle already considers the potential environmental impact of products from their development for the entire life cycle.

The C2C approach has as its goal a zero-waste economy cycle and not to "waste" the product at the end of its lifecycle, but instead to incorporate it into the overarching production cycle. Besides an extensive application of renewable energies as well as responsibly using water resources, keeping energy consumption for buildings during their lifecycle as low as possible is crucial.

In the context of energy efficiency, "Passive Energy Gains", a key component in keeping energy usage down, are achieved by

- solar energy that passes through transparent and translucent elements into the building

准，这使得被动房屋能持续提供新鲜空气，保证舒适室内环境，打造宜居生活。室外空气首先进入防花粉、防粉尘过滤设备进行过滤，之后进入地热交换器完成空气预热，之后持续供给进入室内。

室内空气总是维持在最佳宜居环境。周围空气与房屋内部表面的微小温差产生了很强的舒适感。而在过去，由室内采暖（制冷）设备产生的局部剧烈温差，借助"热空气向冷表面下沉"的温控模式将成为历史。

对被动式房屋优点的论述，除了舒适性的角度，当然还有经济成本角度。被动式房屋带来极低的能耗成本、极低的维护和运营成本。近年来被动房屋后续成本持续减少，关键部分如保温层和三层玻璃窗已能投入系列生产。因此在欧洲国家，被动房的后续成本回收期都非常短。

被动式建筑技术已经累积近25年的住宅类建筑项目经验，同时对学校，幼儿园，行政中心，疗养院，宾馆，博物馆等非住宅建筑完成了大量工程实践。

被动式房屋技术，是以最大程度降低建筑自身能耗需求为基础原理，从而成为实现"近零能耗建筑"的基础技术框架。

根据《2010欧盟建筑法规》规定：自2019年，欧盟范围对所有公共类新建建筑；自2021年，欧盟范围对所有新建建筑将强制执行"近零能耗建筑"节能标准。

1 100% Renewable Energy Use
2 Water Stewardship clean water output
3 Social Responsibility positive impact on community
4 Material Reutilization recyclability / compostability
5 Material Health impact on human & environmental

1.100%使用可再生能源
2. 污水资源管理
3. 公众积极的社会责任感
4. 废弃物回收利用 & 采用可降解材料
5. 采用健康、环保型材料

The Principle of Cradle-to-Cradle(C2C)
"从摇篮至摇篮"理念
Source / 图片来源: Rongen Architekten 隆恩建筑事务所

- heat recovery of technical appliances as well as computers or lighting
- and from the emission of heat by the residents themselves.

In the case of Passive Houses, energy demands are clearly defined, both for heating and for cooling:

- heat demand ≤ 15 kWh/m²a or heating load ≤ 10 W/m²
- cool demand ≤ 15 kWh/m²
- primary energy consumption ≤ 120 kWh/m²
- n50 value ≤ 0.6 h-1

These requirements are generally achieved under the following conditions:

- very low heat transfer through the building envelope due to low U-values for the opaque building envelope (≤ 0.15 W/m²K)
- U-values for the windows (≤ 0.85 W/m²K after implementation)
- thermal bridge free design / thermal bridge supplement (UWB ≤ 0.01 W/m²K)
- very low ventilation heat losses achieved by air tightness of the building envelope (n50 value ≤ 0.6 h-1), a ventilation system with heat recovery (≥ 75%), and auxiliary electric power consumption for the mechanical ventilation system (≤ 0.45 Wh/m³)

Already established, locally based design principles are prerequisites for energy-optimized building. Principles such as “building construction orientated to the sun” or “away from the sun” for heating and cooling, respectively, are still valid.

A well-designed and well-built Passive House does not automatically equal a “High Tech House”. On the contrary, it resembles a “Low Tech House”: the more intelligent the design, the smaller the technical efforts necessary to eventually reach the Passive House Standard and the lower the supplemental costs when compared to a standard building.

Experiences in Europe have shown that Passive Houses have significantly less construction mistakes and, in turn, structural damages, than regular buildings, adding to reduced renovating costs in the long term. This provides further reason why customers, in particular in China, are interested in Passive Houses as a meaningful housing option.

在中国或其他金砖国家这样的新兴市场，经济高速发展带来巨量能源需求,同时也将带动能源价格继续大幅上涨。从能源经济角度，被动式房屋这一趋势性建筑类型将带来更多优势。这一概念也适用于现有建筑物的改造。

“接近零能耗建筑”传达的是对最低生命循环成本的探索，积极寻找“从摇篮进入摇篮（C2C）”理论与“从摇篮进入坟墓”（C2G）理论之间的平衡。所谓的C2G原则（“从摇篮到坟墓”）是指：产品在生产阶段就必须考虑到完整的物质循环周期。

C2C原则的零废弃经济循环目标，不在于减少工业废弃物，而是将工业产品的废弃物再次转换为生物养分。除了广泛利用可再生能源和节约使用水资源，还必须要在建筑的生命周期里尽可能保持低能耗。在能效背景下，人们可以通过以下途径实现保持能源效益的关键部分“被动式能源获取”：

- 利用建筑构件作为载体传导到室内的太阳辐射能
- 利用照明设备和办公或其他家电设备运作产生的热能
- 利用建筑物中人体体温的热能

被动式房屋标准用于采暖和制冷对能源利用的界定值为：

- 供暖需求≤15 kWh/m²a 或 热负荷≤ 10 W/m²
- 制冷需求≤ 15 kWh/m²a
- 总起始能耗需求≤ 120 kWh/m²a
- n50 值 ≤ 0.6 h-1

这些要求一般要在以下条件实现：

- 建筑围护结构采用低U值不透明结构，对热能进行低损耗传输。(≤ 0.15 W/m²K)
- 窗户的U值（实施后）≤ 0.85 W/m²K
- 无热桥施工或热桥界定值UWB ≤ 0.01 W/m²K
- 极低的通风热损耗。通过以下技术手段实现：建筑维护结构的高密封性能，空气压力测试

However, especially energy-efficient lighting solutions for the building should not be neglected, considering electric power demand and the overall energy balance. Additionally, individually adjustable "intelligent glasses" can protract active cooling with only minimal additional cost.

Combining Aesthetics and Energy Saving in one Building Standard

If architects feel only limited responsibility toward the building's aesthetics or only have modest influence in the design process itself, a loss of "building culture" becomes more likely. When supporters of the Passive House Standard argue that high aesthetical requirements lead to increased costs, they help to promote losses in building culture, too. A task for the architectural profession is thus to combine cost- and energy efficiency with high quality design choices in one building. The steadily rising number of well-designed, cost-efficient, and aesthetically-pleasing Passive Houses serves as proof.

A creative handling of shaping the building in regards to its technical elements is also required. Despite the increased insulation thickness, the integration of solar panels, and other visible components, such as the mechanical ventilation system, an aesthetic Passive House can still be achieved. Both architects and the industry have provided innovative and intelligent solutions to address these challenges.

The design quality, crucial in influencing approaches toward future Passive House design, is also an important element within the Passive House Standard. Design principles that affect energy consumption and local factors should be incorporated into the design process very early on in order to avoid additional costs. A potential investor should thus decide before preliminary design if the building should conform to the Passive House Standard or not.

Modifying the final design documentation to a Passive House feasible design is in most cases not economically justifiable. Only if an experienced Passive House designer is involved from the beginning of the preliminary design can the construction of a cost-optimized Passive House, while also providing high quality aesthetics, be possible.

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n50≤0.6/h-1，采用热回收率至少达到75%的新风设备，通风设备运行起始辅助用电≤ 0.45 Wh/m³

因地制宜的设计原则是能源优化建筑的先决条件。"靠近阳光"（利于取暖）或是"远离阳光"（利于遮荫）是有效的原则。设计一座合格的被动式房屋并非追求达到"高科技建筑"，相反是"低科技建筑"：它意味着更智能的设计，为达到被动房标准较小的技术投入和以更低的成本建成达标建筑。

在欧洲的经验长期证明：被动式建筑是施工过程中比常规建筑发生更少的施工错误，施工事故、破坏。长期来看比普通建筑减少检修成本。这也是中国越来越多的委托方和客户对被动式建筑感兴趣的原因。考虑到整体能耗平衡，建筑节能照明不容忽视。此外，独立调节的"智能眼镜"可以用最小的附加成本进行主动制冷。

美学与节能相结合的建筑标准

如果建筑师只是把建筑的审美当成一个任务或是在设计过程中影响力有限，就很有可能导致建筑文化的流失。一些被动式房屋标准拥护者认为，高审美要求导致成本增加，这同样会导致建筑文化的损失。因此，建筑行业的任务是将成本和能源效率与高质量的设计合而为一。越来越多的被动房屋可作为精心设计、成本合理、审美优质的例证。

对技术元素的组合应用无疑是极具创造性的工作：尽管增厚了保温墙，集成太阳能电路板，和其它可见部件如机械通风设备，被动房仍能达到审美要求。建筑师和业界提出了创新的、智慧的解决方案，以应对这些挑战。

设计质量对未来被动房屋设计具有关键影响，它也是被动房屋标准的一个重要因素。设计原则影响能源消耗，如果在设计过程的早期引入本地因素可以避免额外成本。因此潜在投资者应在初步设计前决定自己的房子是否要符合被动房屋标准。如果在设计的最后阶段才修改得符合被动房屋标准，这样在通常情况下是不经济的。只有当有经验的被动房屋设计师在设计过程的早期一开始就介入设计，这样才可能建造出一座成本优化，审美优质的被动房屋。

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Passive House Buildings in China – Introducing a New Building Concept for Challenging Environments

A contribution by Matthias Matschewski, Peter Ruge Architekten

被动房屋在中国——引入建筑新理念应对环境挑战

来自Peter Ruge建筑事务所的Matthias Matschewski的客邀文章

The Potential of the Passive House Standard for China

A third of the world's CO_2 emissions are created by the operation of buildings. To reduce pollution and meet the objectives of global climate protection, research has been conducted to achieve a highly energy efficient method of building construction as well as its implementation. Applying a central holistic approach to limit the primary energy demand of a building for heating, cooling, lighting and equipment to 120 kWh per m^2a, a passive house features an optimized building envelope and efficient ventilation system to meet stringent requirements.

Tested and approved in Germany and other parts of Europe in a temperate climate, the passive house as a residential building is a new introduction to the warm, humid and subtropical climate of southern China. This is insofar significant as more than half of the global building energy consumption does not come from the heating of buildings, but from their cooling. The central energy load case for comfort in buildings in summer is the situation of the weather, with outside temperatures of up to and exceeding 40 degrees Celsius as well as a humidity higher than 90 percent. In winter, the temperature rarely falls below the freezing point. The challenge of creating a highly energy efficient building according to the passive house standard in light of these particularly adverse weather conditions was brought to Berlin-based architects Peter Ruge Architekten in 2011, a company with many years of expertise in the field of sustainable construction and an extensive portfolio of already certified sustainable buildings.

Tailor-made for the Climate

Passive House Bruck is the core of the R&D Center of the Chinese real estate developer Landsea, located west of Shanghai in Changxing. The aim of the architects was to construct a first pilot project for energy efficient residential buildings in a warm, humid climate. Within the span of two years, the architects planned the project in numerous energy efficient op-

在中国设立被动房标准的潜力

全世界二氧化碳排放量有三分之一是由建筑物所产生的。为了降低这种污染，并达到全球气候保护目标，人们一直在研究并实践房屋建筑的高能效方案。被动式房屋的特征是出色的建筑围护结构，高效严格的热回收通风系统，全面集中的方法，使建筑物的采暖，制冷，照明及设备能源需求降至120kWh / m^2a，从而满足严格的要求。在德国和其他处于温带气候的欧洲地区，被动式房屋都经过测试和认证，但是被动式房屋在温暖，潮湿的亚热带气候地区（如中国南部）还是一个新事物。此举意义重大，因为全球超过一半的建筑耗能主要不是用于采暖而是制冷。在中国南部，保证建筑物夏天舒适度的耗能主要在于天气状况，因其室外40度的高温和超过90%的湿度。冬季气温则很少降到零度以下。面对如此特殊的恶劣天气，在此建设高效节能的被动式房屋的挑战在2011年被带到了位于德国柏林的Peter Ruge建筑事务所。该事务所在可持续建筑领域积累了多年经验，在全球都有广泛认证的可持续建筑项目。

Passive House Bruck represents an energy efficient approach for challenging environmental conditions
被动房屋布鲁克展示了具有挑战性环境条件下提高能效的方法
Source / 图片来源: Jan Siefke

timization steps to establish a detailed design stage. The five-storey building houses a total of 36 one-bedroom apartments, six two-room executive suites and four three-bedroom model flats over an area of 2.200 square metres. The residential apartments are designed in a way that offers interested families a try-out period in order to experience a sustainable living environment first hand. Passive House Bruck was completed and officially opened in the summer of 2014 and has become the first residential building to be certified in the moist and warm climate of South China as a passive house by the German Passive House Institute (PHI), achieving a 95-percent energy savings rate compared to conventional Chinese residential buildings and a primary energy consumption of only 106 kWh per m²a.

The biggest challenge in designing and realising the passive house project was the warm and humid climate of South China. The objective pursued by the architects' concept recognizes this fact: The excellent thermal insulation of the building minimizes the energy transferred through the exterior walls. To further protect the opaque and transparent parts of the outer shell from intense direct and reflected solar radiation, a shading band with vertical terracotta bars was set up to cover the thermal outer shell. On the south side of the building, this band was then replaced with specially-shaped soffits on the window elements to provide the residents with an unobstructed view from the apartments in order to dispense with interior artificial light for as long as possible.

During optimization measures of the shading system, the entire building was rotated by 45 degrees to achieve an optimal south orientation with the goal of further increasing the efficiency of shading elements significantly. To ensure a smooth and professional construction of the building envelope, special attention was paid early on to the design process, especially in evaluating the state of locally available site construction technology with the overall aim of minimizing thermal bridging through execution errors, reducing costs and offering future users maximum comfort.

Passive Building Technologies

Just as for the façade, the building technologies used were designed specifically for the project, with planning having been carried out in close cooperation with the engineers of the PHI. Cooling and dehumidifying the air supply in South China's summers is decisive for the climatic comfort in the interior of the building, rep-

根据当地气候来“量身定制”

被动式房屋布鲁克是著名中国房地产开发集团朗诗集团的旗舰项目，也是其设立在西上海长兴研发中心的核心项目。建筑师的目标是实现首个在潮湿温暖气候条件下的节能试点项目。在接下来的两年里，建筑师规划了许多高能效的节能细节，促使被动房一直进行到详细设计阶段。这座公寓大楼共五层，建筑面积2200平方米，由36间一室的员工公寓、6间两室的行政套房和4间三卧室的样板公寓组成。Peter Ruge建筑事务所设计了样板公寓，从而使得对可持续建筑的优点感兴趣的中国家庭有机会暂时入住这一建筑。布鲁克已于2014年八月竣工并举行了盛大的开幕仪式。被动式房屋布鲁克是首次在具有潮湿、温暖气候的华南对这一类型房屋进行的尝试，相比传统住宅，它可以节省95%的能耗，一次能源消耗仅有106 kWh/m²a,同时还获得了德国被动房研究所的认证。

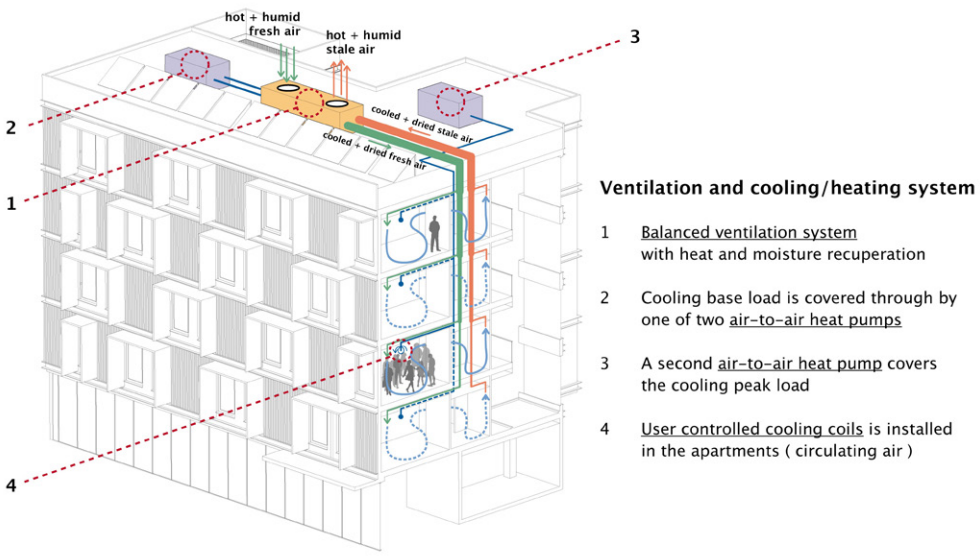
对Peter Ruge建筑事务所来说，在被动房项目设计和施工阶段的最大的挑战即是南方温暖潮湿的气候。建筑师根据实际情况来形成设计概念：出色的建筑物围护结构最大限度了减少了热能在外墙部分的损失。高度绝缘立面的封闭区域，则通过彩色赤陶杆遮蔽物，对建筑物的外壳提供保护，使其免受强烈日光的伤害。在南面，这些遮蔽物被替换成固定的遮阳元素,对玻璃幕墙提供保护,一方面保证居民可以透过窗户对室外一览无遗，另一方面保证室内的亮度，减少人造光的使用，保证房子的能源消耗平衡。

为了对遮阳元素进一步优化，在设计阶段，整个建筑被旋转了45度。如此，南面的遮阳部件的效率也得到了显著的提升。另外，为了确保建筑围护结构在建造过程时简单易懂但又严谨专业，设计阶段建筑师在设计早期就会特别注意对当地现有建造技术的研究，如此来保证在建设时最大限度地减少热桥，降低成本，并为未来用户提供舒适度。

被动式建筑技术

外立面的建造技术也是特地为该项目而设计的。过程中，建筑师与德国被动房研究所的工程师们密切合作。中国南部在夏天的制冷和除湿送风是决定建筑舒适度的主要能源消耗。再一次，被动式房屋最重要的概念就是极大限度降低能源消耗：该建筑的围护结构能保证气密性以及控制通风系统对热度和湿度的恢复。在夏季，炎热和潮湿的新鲜空气进入建筑之前已经用凉爽干燥的空气降温。因此，一旦空气被

resenting a major factor in terms of energy intensity. Again, the passive house concept allows for an energy efficient environment: the building's airtight envelope provides a controlled intake and exhaust system resulting in highly-efficient heat and humidity recovery. In summer, the hot and humid fresh air is tempered down by using the cooler and dryer exhaust air before it enters the building. Active energy needs are therefore reduced considerably. In total, there are three main ventilation devices providing fresh air to different areas of the building. Additional required cooling and dehumidification is provided centrally via two air heat pumps on the roof. If necessary, users have the option to request recirculation units with additional cooling power to be installed in their apartments for a limited period of time. In terms of heating, a solar thermal system mounted on the roof provides almost the entire year's supply of domestic hot water heating.



The innovative ventilation and cooling system provides for a comfortable indoor experience
创新的通风冷却系统提供了舒适的室内体验
Source / 图片来源: Peter Ruge Architekten

Energy efficient building in South China presents a challenging environment for all parties involved. With the realization of the Passive House Bruck pilot project, a highly energy efficient way of constructing buildings in China's South has been demonstrated. According to Peter Ruge, the Passive House Bruck provides an innovative example that global energy-saving knowledge and local Chinese culture can stimulate each other architecturally through an integrated, trans-disciplinary and intercultural design approach. This was also recognized by renowned institutions: besides having received a gold certification from the German Sustainable Building Council (DNGB) this year, the project was also awarded with the gold medal of the World Green Design Awards 2014 for its innovative building design.

Besides Peter Ruge Architekten and the client Landsea Europe R&D, partners involved in the project include: Shanghai Landsea Planning & Architecture Design, Passive House Institute, Drees & Sommer Sustainable Engineering Consulting, Energydesign (Shanghai), Deutsche Energie-Agentur, Jiangsu Nantong Erjian Group and Ingenieurbüro Meyer-Olbersleben

带到室内，冷却的能量在很大程度上仍然存留在建筑内，活性能量需求显著降低。三个主要通风系统为建筑物的不同区域提供新鲜空气。额外配置的冷却/除湿装置，也通过屋顶上的两个空气源热泵，引入新鲜的空气。如果需要的话，每个用户可以在有限时间内，通过额外安装在公寓的冷却热循环来调节室内的温度。安装在屋顶的太阳能系统，可以覆盖几乎整年的热水供热来源。

在中国南方,节能建筑对各方都是极大的挑战。被动式房屋布鲁克这个试点项目的竣工，证明了在中国南方实现高能效且视觉美观的建筑的可行性。Peter Ruge认为，随着被动式房屋布鲁克的实现，各种证据都表明了，全球节能的研究成果和中国当地文化，这两者相互促进得实现了这个建筑。此建筑设计是一个综合性，跨学科和跨文化的过程，该项目可为在不同气候区建设被动房项目起到示范性的作用。作为中国南部第一个被动房，该项目由德国达姆施塔特被动房研究所认证，证实2014年夏天该项目的耗能仅为106千瓦时/平方米。此外，它成为中国获得DGNB（德国可持续建筑委员会）金牌认证的第一项目，Peter Ruge 建筑事务所也因此获得了2014年世界绿色建筑设计奖金奖。

除了Peter Ruge建筑事务所和朗诗欧洲技术有限公司以外，其他参与此项目的合作伙伴有：上海朗诗建筑规划设计有限公司，被动房研究院，迪索工程咨询有限公司，设能建筑咨询（上海）有限公司，德国能源署，江苏南通二建集团以及迈耶欧博雷本工程师事务所

Energy

Energy Saving and Emission Reduction of Buildings in Rural Beijing – The Case of the 'Beijing Low Energy Consumption Rural Housing Pilot Project'

A contribution by Feng Weiping, Manager of Beijing New Landscape

北京农村建筑节能减排——以“北京农村低能耗农宅示范工程”为例

来自北京新地时空信息咨询有限责任公司的冯卫平的客邀文章

According to statistics, there still exist almost 4.000 farming villages with millions of farmers in and around Beijing, although the urbanization rate has reached 86 percent. Most residential buildings in rural Beijing are detached houses with poor thermal insulation, with coal being the major fuel used for household-based heating during winter.

Research by the China Academy of Building Research indicates that district heating in Beijing as well as scattered coal combustion in its surrounding rural areas directly impacted air quality by releasing 8.400 tons of particulate matter 2.5 (PM2.5), with winter heating in rural Beijing having contributed 2.320 tons PM2.5. Reducing coal usage in winter and identifying alternatives such as increasingly switching to more clean energy options have thus become central aspects in controlling Beijing's air pollution.

The Beijing Municipal Government has implemented two important policies for rural energy saving and emission reduction and providing fiscal subsidies, namely the "Rural Household Anti-seismic & Energy Saving Policy" as well as the "Coal Reduction and Clean Air Action Plan". However, several issues and constraints have manifested during the implementation of both policies:

- Due to its limited nature, fiscal subsidies cannot cover all villages and households. A total of 1.46 million households in rural Beijing consume 4.5 million tons of coal every year for winter heating. Overall, coal usage has been reduced by over 1 million tons, with 600.000 tons of alternative energy having been used instead since the municipal government had implemented its Coal Reduction and Replacement – Clean Air Action Plan in

据统计，尽管城镇化率已达86%，北京现在仍有将近4000个村庄，数百万农民。北京农户多为独立农宅，保温节能性能差，冬季分户取暖，燃料以煤炭为主。

中国建筑科学研究院研究表明：北京集中供暖和周边农村地区散煤燃烧对大气环境中PM2.5的一次来源贡献量共计8400t左右，北京周边农村地区采暖对大气环境中PM2.5总量贡献为2320t左右。所以，减少并替代冬季供暖用煤，使用清洁能源，对于北京大气治理工作十分重要。

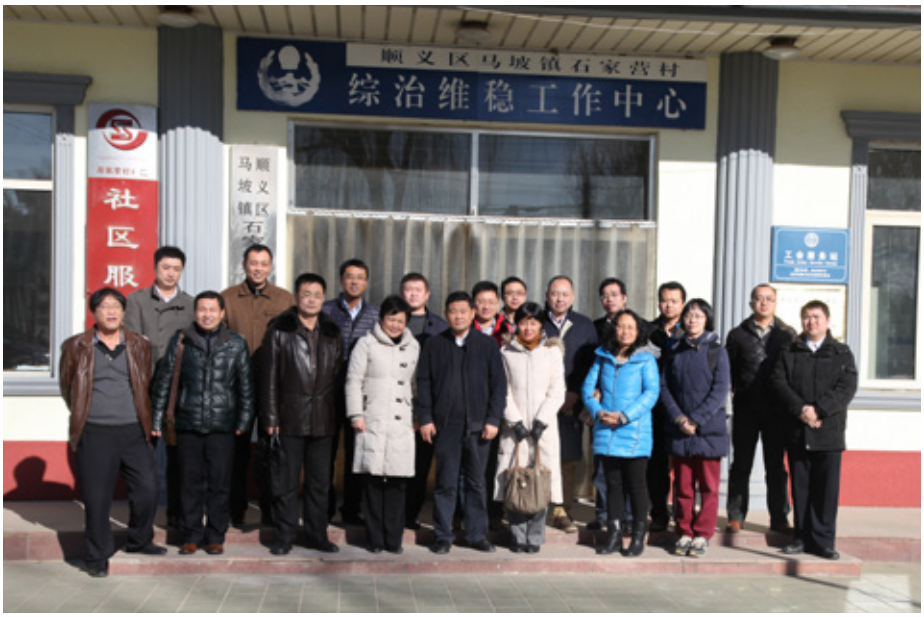
北京市政府大力支持以下两项农村节能减排政策并予以财政补贴：农民住宅抗震节能改造；减煤换煤——清洁空气行动计划，但执行过程中仍存在以下问题：

- 村庄和农户数量众多，财政补贴的范围有限。北京农村总计146万户，每年用于冬季采暖的煤炭约450万吨，市政府从2013年开始启动农村清洁空气行动计划，减少煤炭达116万吨，用其他能源替代煤炭

State of the building in Beijing's Shunyi District after roof-sealing has been finished
北京顺义区示范房屋封顶后状态
Source / 图片来源: Feng Weiping 冯卫平

2013. Nevertheless, there are still over two million tons of coal that need to be substituted by cleaner energy sources.

- Low awareness and limited financial resources are central issues that have been hindering farmers to take relevant actions to reduce coal usage and promote clean energy alternatives. Thus, most farmers find it difficult to proactively restructure their houses for energy saving with only limited own and governmental subsidies available.



Participants attending the project launch event on 21 January 2015
项目启动会参会人员合影，2015年1月21日
Source / 图片来源: Feng Weiping 冯卫平

- With increased investment by the municipal government on rural Beijing energy saving and emission reduction, new techniques, products, construction technologies and engineering methods are constantly emerging. Still, low cost and effective technologies still need to be identified, selected and made applicable.

- Effective standards to measure energy efficiency for rural housing construction and operation still need to be put in place. Buildings in Beijing's urban areas have adopted green design and operation standards, but respective standards for energy efficiency and clear guidance for energy saving and emission reduction still have not been established or are insufficient.

- Technical assistance and services need to be improved in the areas of rural housing design, material selection, construction and monitoring measures for energy saving and emission reduction. Energy saving design in particular is crucial for improving the energy efficiency of buildings, especially when the main consideration of farmers in rural areas is the investment into building materials rather than technology and research.

Demand for energy saving and coal replacement in rural Beijing is immense. To rapidly promote energy efficiency and clean energy alternatives, actions should focus on the fast and continued implementation of government policies, mobilizing farmers, develop-

60多万吨。目前还有200多万吨煤炭需要被削减或替代。

- 农民较为落后的思想意识和有限的经济收入，阻碍了他们投入减煤换煤的具体行动。煤炭采暖是北京农村的一种习惯和传统。大多数农民缺乏稳定的收入来源，如果不是政府支持，他们很难主动对自家房屋进行节能改造。

- 低成本且有效的技术需要进一步进行筛选。随着北京加大农村地区节能减排的政策性投入，新的技术、产品、施工工艺和工程做法不断涌现出来。人们需要对低成本且有效的技术进一步筛选并投入使用。

- 农宅建设和运营缺乏能效标准。北京城市建筑执行了绿色建筑的设计和运行标准，但农村建筑没有能效标准，节能减排的推行缺乏引导。

- 农宅在建筑设计、选材用材、施工建设、节能检测、排放监测等方面缺少技术支持与服务。尤其节能设计对建筑能效的提升起到关键作用，但是在农村，人们更看重建筑实物的投入，对科研和技术的投入则缺乏关注。

北京农村建筑节能和燃煤替代性供暖需求量大面广，应尽快持续地落实政府的政策，调动农民的积极性，通过政府和农民的配合，推动农村形成绿色建筑市场和清洁能源市场，通过市场机制促进节能减排。

ing markets for green buildings and clean energies through government-farmer collaboration and further promoting market mechanisms.

In this vein, the 'Beijing Low Energy Consumption Rural Housing Pilot Project', supported by the United Nations Development Programme and Global Environment Facility (UNDP-GEF), presents a feasible option for saving energy and reducing emission from rural buildings. As part of the project, a 208 square metres, two-floor rural house in Shijiaying Village in Beijing's Shunyi District was completed in August of this year after a four-month long construction phase, with the overall project running until October 2015.

The constructed building uses a grillage shear wall system with insulation and an integrated structure. A new approach of using wallboards on site instead of traditional procedures such as bricklaying and mortar coating is applied. Additionally, insulation materials are combined with the wallboard, adding an extra layer of external insulation material is consequently not needed. This further strengthens structural integrity and anti-seismic characteristics of the building better than a conventional brick-concrete structure.

In terms of energy efficiency, the project has adopted a solar photo-thermal plus double source heat pump for heating, cooling and water heating. The system can achieve a higher degree of solar photo-thermal efficiency, thus saving electricity and reducing emissions. Furthermore, a solar PV-system has been installed on the roof of the building to generate "green power" from solar radiation.

With the goal of minimizing emissions and costs, wall materials, windows, doors and roof materials are all purchased nearby and installed on site. Increased air tightness, reduced heating demand and increased building energy efficiency are achieved by reducing the heat transfer coefficient and constructing a warm corridor with a high degree of solar radiation within the building.

The pilot house has achieved Beijing's residential building energy saving design standards and provides an innovative concept in terms of improving building energy efficiency and the application of renewable energies. Construction work has finished with the instalment of specific devices still ongoing. Upon completion, the experiences gathered and technologies used in this project have the potential to be replicated throughout Beijing, Tianjin and the Hebei region.

Workers during the installation of the grillage shear wall system
工人们正在按装网格墙体系
Source / 图片来源: Feng Weiping 冯卫平

下面以"北京农村低能耗农宅示范工程"为例，探索农屋改造节能减排的可行方案。项目获得了联合国开发署、全球环境基金小额赠款计划支持。该项目是在北京市顺义区石家营村新建一栋208平方米的二层农宅，2015年4月正式开工，经过4个月的建设，土建工程在2015年8月竣工，全部工程将在2015年10月竣工。它的技术创新体现在以下几点：

首先，使用了保温与结构一体化网格墙体系，这种体系首次在北京应用。该体系以整体墙板现场组装的方式告别过去的砌砖、抹砂浆等工序；在生产过程中融入了保温材料，不用再做外保温粘贴；它的抗震性能要优于砖混结构，适合在农村推广。

其次，该项目选取了太阳能光热+双源热泵系统来进行供暖、制冷和供生活热水，该系统利用太阳能光热效率更高，cop值（能效比）也更高，从而节省用电、减少排放。同时在阳光房屋顶安装光伏发电系统，利用太阳辐射产生绿色电能。

再有，项目墙体、门窗和屋面材料等均为就近采购、现场组装。通过降低它们的传热系数（k值），从而增加房屋气密性，降低供热负荷，提高建筑能效，为此还加设了暖廊和阳光房。

上述举措，使得房屋达到了北京居住建筑75节能设计标准，在建筑能效和可再生能源利用方面均做出了创新。对北京农村而言，这个项目技术先进，具有多方面的示范作用。它的土建工程已竣工，专项工程正在实施中，工程全部完工后，可在京津冀地区推广其先进经验和技术。

Environment

Beijing's "Cycling Task" – An Evaluation of the First Pilot Phase of Developing Bike-Sharing

A contribution by Kerstin Geppert, Berlin Free University

北京的"骑行任务"——自行车分享模式首期评估

来自柏林自由大学的葛凯琳的客邀文章

Beijing has been experimenting with the introduction of a citywide bike-sharing system since June 2012. After a three year pilot period, it is time to evaluate the system's success. Has it been able to fulfill local authorities' expectations? Which further measures would need to be taken in order to make a lasting impact? The following article documents the experiences Beijing has made with the introduction of bike-sharing and provides answers to both questions.

What expectations were connected with the introduction of bike-sharing in 2012?

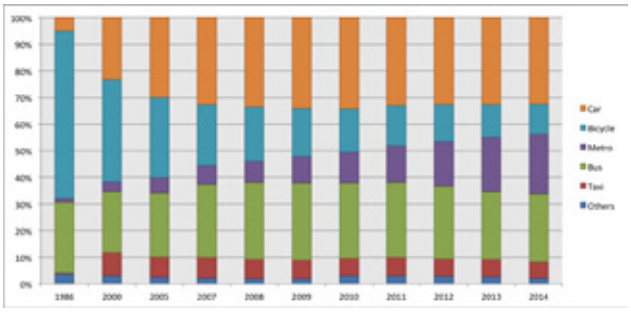
Since the 1980s, bicycle use in Chinese cities has rapidly decreased, with Beijing experiencing the most striking decline. Bicycle use in the Chinese capital dropped from 63 percent in 1986 to 15 percent in 2011, while during the same period the number of trips made by car grew from 5 to 33 percent. Socio-economic developments have left an impact on urban planning decisions. The city has opted for a car-centric development pattern. As a result, the radius of the Chinese capital has swollen exponentially. Daily travel distances have become longer and are often unsuited to cycling.

This is where the introduction of bike-sharing is expected to make a difference. The municipal government seeks to reverse the declining number of daily bicycle trips, and bike-sharing was introduced as a concrete means towards this end. It describes a system where bicycles can be rented at various locations along the city's main transport hubs, with every first hour being free of charge. Compared to riding one's own bicycle, bike-sharing can be used for one-way trips. After having handed back the bicycle at their preferred rental station, users are free to change to other transport modes when returning home or travelling further. Its flexible character hence allows citizens to reconsider cycling for parts of their daily commutes in a megacity like Beijing.

自2012年6月以来北京在全城尝试推广自行车分享系统。经过三年的试行期，现在是时候评估该系统的成绩了。它是否满足了当地政府的期望？还需采取哪些进一步措施来保持长期成效？下文将详细说明北京引进自行车分享模式后取得的经验，以及对上述两个问题作出回答。

2012年引进自行车分享模式有哪些期望？

上世纪80年代以来，中国城市的自行车使用量大幅减少，同时北京经历了最显著的下降。中国首都的自行车使用率从1986年的63%下降到2011年的15%，与此同时汽车出行率从5%上升到33%。社会经济的发展对城市规划决定产生了影响。城市选择了一种以汽车为中心的发展模式。这造成的结果是，首都的城市半径呈指数状膨胀。每日出行路程变得越来越长并且不适合骑行。



Transport modal share development in Beijing between 1986 and 2014
北京1986至2014年的交通工具比例发展
Source / 图片来源: Beijing Transportation Research Center 北京交通发展研究中心

这就是期望通过引进自行车分享模式做出改变的地方。市政府试图扭转每日自行车出行数不断下降的趋势，自行车分享模式作为达到这一目的具体手段被引进。它描绘了这样一套体系，可以在沿城市主干道的多个地点租借自行车，开始的一小时免费。与骑自己的自行车相比，自行车分享模式可适用于单程出行。在合适的租借点归还了自行车之后，人们完全可以换别的交通工具回家或是继续出行。它的灵活机动性使

Beijing is about to surpass its installation goal

At the start of the pilot phase, Beijing formulated a goal of constructing 1.000 rental stations equipped with a total of 50.000 public bicycles by 2015. According to statistics from the China Sustainable Transportation Center, 1.645 docking stations have been installed and equipped with a total of 49.417 bicycles as of May 2015. The two central eastern districts Chaoyang and Dongcheng have played an active part in bike-sharing from the very beginning, and stand out for a particularly high number of rental stations. As of September 2015, a total of 13 districts are part of the system.

The quick set-up of Beijing's bike-sharing system has been possible due to a smooth cooperation between city and district level governments. The municipal government finances the construction of bike-sharing stations and furnishes them with bicycles. The municipal authority is also responsible for the project's management and coordination. District governments that have an interest in developing bike-sharing programs generally agree to take over charge of the system's operation and maintenance in the long term.

While it is clearly good news that Beijing is about to surpass its installation goals by 2015, the system's success will need to be measured against actual travel behavior. Recent monitoring results by the Beijing Transportation Research Center indicate that the introduction of bike-sharing has not yet been able to reverse the declining number of daily bicycle trips. In 2014, the modal share for cycling experienced a further downswing of 4 percent, settling on an all time low of 11 percent.

How can Beijing attract more people to cycling?

Given the consistent decline in bicycle use, what actions can be taken to increase the impact bike-sharing can have during its second implementation phase? Or asked differently, how can Beijing attract more people to cycling? The following section presents five concrete ways forward:

Up-scale the number of rental stations & diversify their locations: It would be desirable for Beijing to expand its bike-sharing system throughout the coming years at a similar pace as during the previous pilot phase. Evidence from more mature bike-sharing systems in China suggests that users would benefit from a denser agglomeration of rental stations. The next phase of Beijing's bike-sharing system should also offer its users higher diversity in terms of location of the

得市民重新考虑将自行车纳入他们在北京这样的大都市里的每日通勤中。

Distribution of public bike-sharing stations across Beijing
北京公共自行车分享站的分布
Source / 图片来源: bjjtw.gov.cn

北京将超出预计目标

在试行期开始，北京表达了要在2015年建成1000个租借点并总共配备50000辆公共自行车的目标。根据中国可持续交通中心的统计，截至2015年5月北京已安装了1645个停置点并总共配备了49417辆自行车。东边的两个核心区域朝阳区和东城区从一开始就在自行车分享模式中发挥了积极作用，坚持大量建造租借站。自2015年9月起，所有13区都要纳入这一体系。能快速建立起北京自行车分享系统，这要归功于市级和区级政府的顺利合作。市政府负担建设自行车分享站的经费以及配备自行车。市政府同时也负责管理和协调施工。有兴趣发展自行车分享项目的区政府基本上都同意负责系统的操作运行和长期维护。北京将在2015年超出预定目标，这显然是一个好消息，但这一系统的成绩需要通过实际驾驶行为来检验。北京交通发展研究中心最近的监控结果表明，引进自行车分享还没能扭转每日自行车出行数的下降。2014年，自行车在所有交通工具中所占比例进一步下降了4%，达到11%的历史最低点。

北京怎样能吸引更多人骑自行车？

考虑到不断下降的自行车使用率，可以在第二个实行阶段采取哪些行动来增加自行车分享的影响力？或者换句话说，北京怎样能吸引更多人骑自行车？下面这段介绍了五个具体的方法：

提高租借站的数量及丰富它们的位置

首先，北京在接下来的几年中仍将会以和之前试行期近似的速度继续扩张自行车分享系统。从更成熟的自

rental sites. In addition to public transport stops, bicycle docking stations could also be placed adjacent to shops, offices and schools.

Improve the system's quality management: User feedback suggests that there is room for improvement with regard to the system's operation and maintenance. For instance, popular bike rental stations quickly run the risk of lacking either bicycles or free parking slots. The system would benefit from more frequent services rebalancing bicycles among docking stations. Bicycles and rental technologies could similarly profit from more regular check-ups.

Remove barriers to registration and service: Not all bicycle rental stations are authorized to register new customers and although the majority of them were deliberately erected in immediate proximity to public transport stops, service desks at metro stations are not prepared to handle new customer applications. Since the electronic user card for bike-sharing is very similar to the rechargeable transport card commonly used in Beijing, service staff could be trained to handle registration processes for the city's bike-share system.

Secure permanent funding: The two latter improvement measures fall into the competence area of district governments, who are responsible for the system's operation and maintenance. Yet, with the system's growing size and age, district governments will need to prepare for cost surges even in the absence of additional improvement measures. Again, one potential solution to permanently secure funding can be derived from the example of other successful bike-sharing systems in China. Taiyuan (Shanxi province) and Hangzhou (Zhejiang province) decided to fully integrate bike-sharing into their public transport system.

Guarantee a safe cycling environment: A safe cycling environment is just as essential to the long-term sustainability of Beijing's bike-sharing system as its expansion and quality. Cycling lanes have often been ignored during new road construction. Cyclists have even been banned from riding on central transport axes. Furthermore, urban traffic regulations are not adequately enforced and violations often go unpunished. Consequently, it is not rare to see motorcycles and cars veering onto bike lanes in Beijing. A safe cycling infrastructure and incentives that are capable of persuading people to follow existing traffic laws will be imperative for Beijing's bicycle culture to recover in the future.

行车分享系统得出的证据表明，使用者会从更密集的租借站中受益。北京自行车分享系统的下一阶段应给使用者提供更加丰富多样化的租借地点选择。除了公共交通车站，自行车停靠站也可以放置在商店、办公室和学校附近。

改进系统质量管理

北京自行车分享系统鼓励使用者在线留言，评价他们的使用经验。反馈说明在系统的运行和维护方面有改进的空间。比如说，受欢迎的自行车租借站很快就容易缺少自行车或者缺少免费停车位。在停靠站之间经常性地平衡自行车数量会对系统有好处。更多的定期检查有利于自行车和租借技术。

排除注册和服务的障碍

不是所有的自行车租借站都有权注册新用户，尽管它们中大部分都谨慎地建在紧邻公交站的地方，但公交地铁站里的服务设施却并不能用来处理新顾客申请。因为自行车分享的电子用户卡和北京常用的可充值交通卡很接近，应培训工作人员处理城市自行车分享系统的注册过程。

持续资金保障

后两种改进措施可归入对系统运行维护负责的区政府的能力范围。然而，随着系统规模和年限的增长，区政府要做好没有额外改善措施的情况下成本激增的准备。可行的一种方法是从中国别的自行车分享系统成功案例中找出提供持续资金保障的解决方案。比如说，山西太原和浙江杭州决定将自行车分享完全融入他们的公共交通系统中。

保证安全骑行环境

最后同样重要的是，一个安全的骑行环境是北京自行车分享系统长期可持续地发展和保证质量的关键。自行车道在新建道路时经常被忽略。骑行者甚至被禁止在中央交通轴线上骑车。此外，人们不能严格遵守城市交通规则，违规行为也没有惩罚。因此，摩托车和汽车占用自行车道的现象在北京并不少见。安全的基础设施和激励措施能够使人们遵守现有交通法规，这对北京以后恢复自行车文化是必不可少的。

葛凯琳是柏林自由大学环境政策研究中心的博士候选人。这篇客邀文章基于她即将发表的文章《中国自行车的再发明？北京引进自行车分享的经验》。

Politics

China's Intended Nationally Determined Contribution – Paving a Greener Road Towards Paris?

中国国家自主贡献——通往巴黎的绿色之路?

On 30 June 2015, China submitted its Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC). A country's INDC describes the actions and measures it is willing to commit to in order to achieve its set goals and target within the broader framework of the planned agreement during the 21st United Nations Climate Change Conference to be held in Paris in December 2015. Thus, it is no exaggeration to describe INDCs as the core of this year's climate conference. It is therefore important to highlight the environmental and economic context that had influenced the conceptualization of China's INDC in major ways.

The context of China's INDC

Heavy reliance on coal-fired power generation has not only fueled China's rise to the second-largest economy in the world, but also established the country as the leading nation in terms of greenhouse gas emissions, by itself responsible for over 25 percent of global emissions. A degrading environmental situation, combined with the country being most severely affected by the adverse impacts of climate change as well as a push towards a new, less resource-based and efficient growth model, had made China's INDC submission one of the most anticipated climate announcements of the year. The context of China's INDC also becomes clearer when looking at recent achievements and policy initiatives to curb emissions and promote greener growth: the country has reduced its carbon emissions per unit of GDP by a third compared to 2005, increased the share of non-fossil fuels in primary energy consumption to over 11 percent and invested massively in clean energies, resulting in 2.5 times the hydro, 3 times the nuclear, 90 times the wind, and 400 times the solar power capacity when compared to 2005 levels.

Within the last two years, the Chinese authorities have also passed a series of key laws and plans: in September 2013, the Air Pollution Control Action Plan, with the overall aim of reducing particulate matter (PM) 10 and PM2.5 density in key cities and regions, was intro-

2015年6月30日，中国向联合国气候变化框架公约(UNFCCC) 提交了国家自主贡献 (INDC) 文件。国家自主贡献文件描述了为达到其在计划于2015年12月在巴黎举行的第21届联合国气候变化大会协议的广泛框架内设定的目标愿意承诺采取的行动和措施。因此毫不夸张地说，国家自主贡献是今年气候大会的重中之重。因此重点分析主要影响中国国家自主贡献计划的环境和经济背景是十分重要的。

Melting icebergs in Antarctica
南极冰川正在融化
Source / 图片来源: pixelio.de / M. Helmich

中国国家自主贡献的背景

对燃煤发电的严重依赖不仅推动中国成为世界第二大经济体，也使得中国造成全球25%以上的排放，在温室气体排放方面居于前列。令人堪忧的环境状况，结合国家受到环境变化最严重的不利影响，以及向新型节约资源高效增长模式转变的压力，使得中国提交的国家自主贡献文件成为年度最受期待的气候公告之一。当人们看到最近的成果和遏制排放、促进绿色增长的政策时，中国国家自主贡献的背景也变得越发清晰：国家每单位GDP碳排放量比2005年减少了三分之一，一次能源消费中非化石燃料所占的比重增加了11%以上，大力投资清洁能源，使得它们的电容量和2005年相比，水力是2.5倍，核能是3倍，风能是90倍，太阳能是400倍。

duced. Together with the new Environmental Protection Law, which came into effect in January 2015 and brought with it stricter penalties and drastically improved emission control mechanisms, both measures aim to reduce the burden on the environment and promote sustainable economic development. Lastly, the Water Pollution Control Action Plan, introduced in April of this year, sets ambitious targets for improving water quality standards throughout the country. Overall, stricter environmental standards are expected to lead to more growth opportunities for relevant "green industries", such as clean energy.

Detailing Beijing's INDC

China has identified four key actions it wants to achieve by 2030:

- A peak of emissions around 2030 and making the best efforts to peak early
- Lower emissions per unit of GDP by 60 percent to 65 percent from the 2005 level
- Increase the share of non-fossil fuels in primary energy consumption to around 20 percent
- Raise the forest stock volume by around 4.5 billion cubic meters compared to the 2005 level

When examining China's key actions, the ambitious target of increasing the forest stock alone would result in additional forest cover several times that of the size of the United Kingdom. However, most significant is the aim of reducing emissions per unit of GDP by two thirds compared to 2005 levels. China's GDP per capita is projected to grow five times by 2030, relative to 2005. However, implementation of the INDC would restrict the increase of China's energy-related emissions to twice its 2005 level, indicating a decoupling of economic expansion from a growth in carbon emissions. With energy-related emissions being the major source of the country's total carbon emissions, limiting energy intensity through lowering emissions per unit of GDP is crucial in enabling the transition towards a low-carbon path of development. To achieve this milestone, the government has included a list detailing a wide range of actions. A large part of these policies has already been introduced, like the Energy Development Strategic Action Plan in late 2014. Besides restrictions on coal consumption that limit energy growth to 3.5 percent each year until 2020, the plan sets a 15 percent target for clean energies to be achieved by 2020. China's goal to peak emissions in 2030 was announced in November 2014, when China and the US presented key parts of their respective agendas to combat climate change.

As part of its INDC, China lists "improving ecological red lines" as a key part of regional strategies on climate

在过去的两年内，中国政府通过了一系列关键法律法规：2013年9月颁布了大气污染防治行动计划，以减少颗粒物PM10和PM2.5在重点城市和地区的密度为总体目标。连同于2015年1月生效的、惩处更严、大幅完善排放控制机制的新环境保护法一起，两项政策都是为了减轻环境负担，促进经济可持续发展。最后还有今年4月颁布的水污染防治行动计划，为提高全国水质标准设立了雄心勃勃的目标。总体而言，更为严格的环境标准预计能带来更多"绿色产业"相关的增长机会如清洁能源。

北京国家自主贡献的细节

中国确定了4个2030年要完成的关键行动：

- 2030年达到排放峰值，努力早日达到峰值
- 比2005年每单位GDP排放量下降60%到65%
- 一次能源消费中非化石燃料的比重达到20%左右
- 森林蓄积量比2005年增加45亿立方米

考察上述关键行动的话，单单增加森林蓄积量的宏伟目标就要使森林覆盖面达到几个英国那么大。然而最重要的目标是每单位GDP排放量比2005年下降三分之二。2030年中国的人均GDP预计将达到2005年的五倍。然而，国家自主贡献文件的实施将把能源相关排放的增长限制在2005年的两倍，这表明经济增长与碳排放增长脱钩。能源相关排放是国家总碳排放的主要来源，通过降低每单位GDP排放量来限制能源强度是走向低碳发展道路的关键一步。为实现这一里程碑，政府列出了详细的大范围行动。这些政策中的很大一部分已经发布了，如在2014年底发布的能源发展战略行动计划。除了限制煤炭消耗，即到2020年能源增长限制在每年3.5%以内，该计划还设定了到2020年清洁能源达到15%的目标。2014年11月宣布了2030年达到排放峰值的目标，当时中美两国提出了各自应对气候变化议程的关键部分。

	2005-20	2020-30	2030-40	2040-50
Annual average rate of decrease of CO_2 intensity per unit of GDP	3.9%	4.4%	6.3%	9.2%
Annual average newly installed non-fossil power generation capacity (GW), among which	41.5	62.8	79.6	90.1
Wind power (GW)	13.9	23.0	31.0	35.0
Solar power (GW)	7.0	24.5	33.0	40.8
Nuclear power (GW)	3.4	9.0	9.3	10.5

Chinese efforts to reduce carbon intensity and promote clean energy
中国大力减排，促进清洁能源发展
Source / 图片来源: International Center for Climate Governance
国际气候治理中心

作为国家自主贡献的一部分，中国列出了"改善生态红线"作为气候变化区域战略的重要部分。它在水资源和管理背景下尤为明显。中国仅有世界淡水资源的

change. This becomes especially apparent in the context of water resources and management. Possessing only 6 percent of the world's freshwater resources, China suffers severe water issues as two-thirds of its cities are characterized by water shortages, with over one third of all rivers being severely polluted. Moreover, 15 percent of urban water reservoirs do not meet national standards. In 2011, Beijing has introduced its most stringent water action plan to date, known as the "3 Red Lines" water policies. Fully implemented in 2012, these policies have set up targets for water use and efficiency as well as water quality improvement on a regional and national scale, with the overall aim of addressing regional water availability imbalances and strengthen sustainable water usage.

Assessing China's INDC

China and the US are the largest carbon emitters in the world. Thus, it is only natural that attention is paid to whether Beijing is doing its part to reduce global emission levels in a meaningful and fair way to keep global temperature rise below the critical 2°C threshold. On the political level, the China-US summit last November between Chinese President Xi Jinping and US President Obama as well as the visit of Premier Li Keqiang to Paris this summer demonstrated China's willingness to come to a binding agreement later this year. Together with this new activeness in the area of climate diplomacy, the Chinese INDC submission in June has helped to build momentum towards a new international climate agreement.

On the implementation level, China's INDC does represent an accelerated approach when compared to its previous pledge under the 2009 Copenhagen Accord. If the Chinese government can realize its proposed targets for 2030, in particular peaking emissions by 2030 and drastically reducing energy intensity, it will contribute to a solid underlying framework to limit global temperature rise to 2°C. If China were to accelerate the pace of decarbonization even further, it would align its long-term economic development with the international goal of keeping the worldwide temperature increase manageable. China's experience on its low-carbon development path would also serve as a demonstration and reference for other developing countries. In summary, Beijing's INDC demonstrates the country's overall determination to take serious action on climate change through controlling emissions and strengthen adaptation capacities. The Chinese INDC can thus be seen as an important milestone towards a binding Paris Climate Accord in December of this year.

6%，它遭受着严重的水资源问题，表现为三分之二的城市水资源短缺，超过三分之一的河流受到严重污染。此外，15%的城市水库达不到国家标准。2011年北京颁布了最严格的水资源行动计划，被称为"三条红线"水政策。这些政策在2012年全面实施，设定了区域和国家范围内的水资源利用和效率以及水质改善的目标，总体目标是解决区域水资源供给失衡问题以及加强可持续水资源利用。

中国国家自主贡献评估

中美两国是世界上最大的碳排放国。因此显而易见地，北京的行为会备受关注，关于它是否尽其所能降低全球排放水平，保持全球温度上升在2°C以内。在政治层面，去年11月中国主席习近平和美国总统奥巴马的峰会以及今年夏天李克强总理访问巴黎表明了中国愿意于今年年底达成协议。同区域气候外交的这些新举措一起，6月的中国国家自主贡献的提交有助于建立新的国际气候协定的良好势头。

Chinese Premier Li Keqiang meeting French President Hollande during his visit to Paris earlier this year
中国总理李克强今年造访巴黎，与法国总统奥朗德会面
Source / 图片来源: english.gov.cn

在执行层面，中国国家自主贡献代表了比之前2009年哥本哈根协议中承诺的更加进取的方案。如果中国政府能实现它承诺2030年将达到的目标，尤其是2030年达到排放峰值和大幅降低能源强度，这将为限制全球温度上升在2°C以内建立一个坚实的基本框架。如果中国进一步加快脱碳步伐，这将使其长期的经济发展与保持全球范围内温度上升的国际目标一致。中国在低碳发展道路上的经验也将成为其他发展中国家的榜样和借鉴。总的来说，北京的国家自主贡献表明了它通过控制排放和加强适应能力来对气候变化采取行动的决心。因此中国国家自主贡献可以看作是今年12月达成巴黎气候协定的一个重要里程碑。

Research Institutions as Key Actors in Beijing's Climate Policy Decision-Making

A contribution by Josef Falko Loher, University of Vienna

研究机构在北京气候政策决策中的关键作用

来自维也纳大学的陆凡乐的客邀文章

Looking at decision-making processes in China's urban climate change politics from the outside, one can easily get the impression that governmental agencies function as the sole key actors in a traditionally centralized governance system. This is certainly right to the extent that no policies or regulations could be drafted and passed without city governments' approval. However, there is one group which has become an increasingly crucial actor in urban climate politics over the past years: Research institutions and universities. Many research institutions act as semi-official extensions of government organizations in policy formulation. They not only function as expertise and capacity holders in the city's climate politics, but also appear as the city government's representatives in international cooperation.

Research institutions and universities are well-integrated into the city's climate politics structure

The institutional structure in Beijing's climate decision-making is complex and multi-faceted. With the Beijing Municipal Commission of Development and Reform (BDRC) functioning as the key government agency coordinating climate change decision-making, multiple Bureaus (or Commissions), such as the Beijing Municipal Bureau of Environmental Protection (BEP), the Beijing Municipal Commission of Transport (BCT) or the Beijing Municipal Commission of Urban Planning (BCUP), are in charge of respective policy fields. Research institutions can now exist either independently or be affiliated with one division. A division might also be collaborating with more than one research institution at a time. Moreover, there are also several national research institutions which operate on the city level. All these features lead to the fact that the number of involved research institutions is immense.

Who is out there and what are they working on?

Closely cooperating with the BDRC on various policies are several researchers and departments within Tsinghua University. Tsinghua participated in the creation of Beijing's emission trading scheme (ETS) as well as several national climate policies. Another organiza-

当人们从外部观察中国城市气候变化政策的决策过程，很容易感觉到政府部门在传统的集中管制体系中起到了唯一关键作用。这当然在一定程度上是对的，如果没有市政府的批准，所有政策和规定都不能起草并通过。然而，在过去的几年中，有一个群体在城市气候政策中扮演了越来越重要的角色：大学和研究机构。很多研究机构在政策制定中起到了一个“半官方”的政府部门延展作用。他们不仅为城市气候政策提供专业知识和能力，同时也在国际合作中充当政府的代表。

The Opening Ceremony of the BCCRC in February 2015
2015年2月北京市应对气候变化研究中心揭牌仪式
Source / 图片来源: bjpc.gov.cn

研究机构和大学融入城市气候政策结构

北京气候决策过程中的制度结构有其复杂性和多面性。北京市发展和改革委员会（BDRC）作为关键的政府部门，在气候变化决策中起到协调的作用，同时多个机关或委员会如北京市环境保护局（BEP）、北京市交通委员会（BCT）及北京市规划委员会（BCUP）负责各自的政策领域。现在研究机构可以独立存在，也可以附属于上述机关单位。一个机关单位也可以同时和多个研究机构协同作用。此外，还有若干国家研究机构在城市层面运行。所有的这些特点导致了所涉及的研究机构数量巨大这一实际情况。

他们是谁，工作为何？

清华大学的一些研究人员及部门与发改委在政策上有紧密合作。清华参与制定了北京市排放交易体系（ETS）以及一些国家气候政策。另一个隶属于发改委的组织机构是北京市应对气候变化研究中心

tion subordinated to the BDRC is the Beijing Climate Change Countermeasure Research Center (BCCCRC), an organization newly established in February 2015. The center works hand in hand with national research institutions and is entrusted with research for laws and regulations. A third research center closely cooperating with the BDRC is the Energy Saving and Environmental Protection Center (BEEC), exemplifying the government's emphasis on energy saving as a key task in the city's climate policy. Besides BDRC, the BEP also cooperates with various research institutions: The Beijing Municipal Research Institute of Environmental Protection (BMRIEP) with more than 300 employees works on local regulations, such as the Water Pollution Prevention Law, the Air Pollution Prevention Law as well as the Energy Saving and Climate Change Plan within Beijing's 12th Five-Year-Plan (2011-2015). As a second example, the China Automotive Technology and Research Center (CATARC) provides BEP with policy drafts on phase VI vehicle emission standards. The BCT as a third important government agency closely cooperates with the Beijing Transportation Research Center (BTRC). The BTRC, in turn, participates in drafting the upcoming congestion charging policy, which will be issued within the next months.

Research institutions function as the government's extended arm in decision-making

All these research institutions and universities possess valuable expertise in technical issues, which they can fruitfully invest in the framework of specific policies and regulations. Here, a distinct division of labor between government agencies and research institutions can be observed: Whereas government officials coordinate the involvement of stakeholders and the general drafting of regulations, experts from institutes consult officials on technical issues and often work on specific contents or even entire regulations. The interaction between both sides is hierarchical, but based on long-term cooperation and mutual trust. As many insiders to decision-making processes report, drafts are elaborated on in a respective, trustful and pragmatic way.

Bringing international expertise into policy-making processes

Research institutions take on an important role in closely cooperating with international (development) organizations, which bring in technical expertise and contacts from the global research world. In this vein, research institutions act as a communicative interface between international organizations and government

（BCCCRC），它是于2015年2月新近成立的。该中心和国家科研机构携手合作，受委托进行法律法规的研究。还有一个和发改委紧密合作的研究中心是北京市节能环保中心（BEEC），它在城市气候政策中一个重要任务是政府的节能重点工作。除发改委外，市环保局也和若干研究机构有合作：北京市环境保护科学研究院（BMRIEP）有300多职工，他们致力于地方法规，如：北京市实施《中华人民共和国水污染防治法》办法，北京市实施《中华人民共和国大气污染防治法》办法，以及北京市“十二五”时期节能降耗及应对气候变化方案（2011-2015）。另一个例子是中国汽车技术研究中心(CATARC)，他们为环保局提供第六阶段机动车排放标准政策草案。同样作为重要的政府部门的交委会和北京交通发展研究中心(BTRC)有紧密合作。该中心也参与起草将于未来几月发布的交通拥堵收费政策。

The BEEC's headquarters in Beijing with solar panels located on the roof and front of the building
顶部和前面装有太阳能电池板的北京市节能环保中心总部大楼
Source / 图片来源: bbtdc.com

研究机构在决策中辅助政府发挥作用

所有这些研究机构和大学在技术问题上掌握宝贵的专业知识，使得他们能有成效地投资具体的政策和法规框架。人们可以观察到政府部门和研究机构的明确分工：政府官员协调利益相关者以及总体起草法规，机构专家则为官员提供技术咨询，同时通常为法规的特定部分甚至整体内容工作。双方的互动有层级关系，但基于长期合作和相互信任。按很多内部人士关于决策过程的说法，起草工作在诚实互信的环境中详细设计而成。

在决策过程中引入国际专业知识

研究机构在与国际组织的紧密合作中承担重要角色，从全球科研界引入专业技术和人员。在这点上，研究机构充当了国际组织和政府机构的沟通桥梁。北京交通拥堵收费政策的起草过程就可以作为一个很好

agencies. Here, the policy drafting process around congestion charging schemes in Beijing can be stated as a good example: BTRC – as BCT's key partner – cooperated closely with German Gesellschaft für Internationale Zusammenarbeit (GIZ), Energy Foundation (EF) and other organizations. Within the frame of research trips to Europe, joint workshops and continuous exchange, international experts reported on best-practice examples and offered recommendations. BTRC profited from the international expertise, but remained the main drafter of the congestion charging policy. The BCT was reported to have followed most of the BTRC's and foreign organizations' joint input.

Research institutions as facilitators of international cooperation outside of China

Research institutions also occupy another key role in the city's climate policy arena. They participate in workshops and events organized by international climate networks, such as ICLEI – Local Governments for Sustainability. There they function as a bridge between the city government and international organizations as well as other cities. As cooperating partners of such networks, research institutions may even help to convince local governments to sign Memoranda of Understanding and thus facilitate international dialogue. As with policy-making networks in the city, such cooperation is based on trust and long-term relations and might take time to prosper. One example of research institutions' involvement in such cooperation is a Korean-Chinese exchange on urban green technology policies initiated by ICLEI. Several representatives of Beijing's universities and research centers joined workshops to promote green technology transfers between both countries and push forward a city-to-city platform with the involvement of private sector stakeholders.

Summary

When trying to understand the dynamics of climate governance in Beijing, the role of research institutions cannot be overemphasized: There are various organizations operating on different levels with more or less fixed relationships to city commissions. Overall, research institutions hold key capacities and expertise in drafting local regulations and policies on behalf of and in cooperation with BDRC or single divisions. Moreover, they possess the capacity of bringing international organizations into decision-making processes in addition to representing the city government within international networks.

的例子：北京交通发展研究中心作为北京市交通委员会的重要合作伙伴，与德国国际合作机构（GIZ），能源基金会（EF）和其它组织机构开展了紧密合作。在欧洲研究之旅、联合工作组和持续交流的框架中，国际专家报告了最佳实践案例并提出建议。北京交通发展研究中心从国际合作中汲取专业经验，但保持交通拥堵收费政策的主起草人身份。据报道北京交通委员会听取了大部分北京交通发展研究中心和国际组织机构的建议。

研究机构促进海外国际合作

研究机构在城市气候政策舞台上还扮演了另外一个重要角色。他们参与国际气候圈组织的工作组和活动，如ICLEI——倡导地方政府可持续发展国际理事会。他们起到市政府和国际组织机构以及其他城市之间的桥梁作用。作为这类交流网络的合作伙伴，研究机构甚至能帮助劝说地方政府签署谅解备忘录，从而促进国际对话。同样在城市决策网络中，这种合作基于信任和长期关系，可能需要时间来发展壮大。研究机构参与这种国际合作的例子有由ICLEI倡议的韩中城市绿色技术政策交流。一些北京的大学和研究中心的代表参与了工作组，以促进两国间的绿色技术转移，同时推进建设一个有私人领域利益相关者参与的城市对城市平台。

Participants at the first Korea-China Experts Joint Workshop on Green Technology Policy in Seoul
第一届韩中绿色技术政策专家联合工作组参与人员于首尔
Source / 图片来源：eastasia.iclei.org

总结

要想了解北京气候治理的动态，研究机构的作用怎么强调也不过分：各种组织机构在不同层面上运作，他们或多或少和城市委员会有固定的关系。总体而言，研究机构在代表或协助北京发改委或机关单位起草地方法律法规方面拥有关键能力和专业知识。此外，他们有能力将国际组织带入决策过程，以及在国际交际网络中代表城市政府。

Fairs & Events 展会与活动

China Wind Power 2015
Beijing, China · 14.10.2015 - 16.10.2015
2015北京国际风能大会
北京，中国·2015年10月14日 - 10月16日
chinawind.org.cn/cwp2015/index_en.asp
dong.wen@sh.china.ahk.de

Shanghai International Exhibition on Biomass Energy Utilization and Technology
Shanghai, China · 14.10.2015 - 16.10.2015
2015上海国际生物质能利用及技术展览会
上海，中国·2015年10月14日 - 10月16日
www.heatecchina.com

Eco Expo Asia
Hong Kong, China · 28.10.2015 - 31.10.2015
亚洲生态博览会
香港，中国·2015年10月28日 - 10月31日
ecoexpoasia.com/tc

EPTES 2015 - Environmental Protection Technology and Equipment Show
Shanghai, China · 03.11.2015 - 07.11.2015
EPTES-2015工业环保技术与设备展
上海，中国·2015年11月3日 - 11月7日
eptes.ciif-expo.com

NEAS 2015 - New Energy Auto Show
Shanghai, China · 03.11.2015 - 07.11.2015
NEAS 2015 – 新能源汽车展
上海，中国·2015年11月3日 - 11月7日
neas.ciif-expo.com/en
dong.wen@sh.china.ahk.de

China International Energy Conservation Expo
Beijing, China · 18.11.2015 – 20.11.2015
中国国际节能博览会
北京，中国·2015年11月18日 - 11月20日
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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 能效出口倡议
efficiency-from-germany.info

Renewable Energies Export Initiative 出口计划网
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
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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

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