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In Focus

Engaging Stakeholders – A Networking Approach for Sharing Experiences and Facilitating Partnerships in the Chinese Carbon Market

吸引利益相关方 — 在中国碳市场上分享经验促进合作的交际方法

Although several German enterprises are already involved in the Chinese emissions trading pilot schemes, the market offers promising business opportunities and further potential for cooperation with Chinese enterprises and institutions. Due to their experience in more established emissions trading markets in other countries, German companies are willing to share their expertise with China in shaping the upcoming national emissions trading scheme (ETS). Mobilizing German companies and stakeholders and supporting their participation in the evolving Chinese emissions reduction and trading markets is therefore crucial.

Since the beginning of 2015, German Industry & Commerce Greater China Beijing (AHK Greater China Beijing) has been implementing the “Carbon Market Project” in China on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). The two-year project aims at engaging relevant stakeholders for emissions trading in China, consolidating interest among German companies in the Chinese carbon market and facilitating partnerships. The project builds on AHK Greater China Beijing’s large network of stakeholders in the field of emissions reduction and climate protection that has been in place since 2008 through a wide range of events and targeted activities supported by BMUB.

As part of the current project, AHK Greater China Beijing organized a series of eight networking meetings in Beijing 2015 and 2016. Meetings typically comprised of presentations by two experts followed by a discussion and networking session together with 25 to 30 selected participants. The meetings held included presentations from leading experts from the National Center for Climate Change Strategy & International Cooperation (NCSC) and the Energy Research Institute (ERI) at the National Development & Reform Commission (NDRC), who were part of China’s negotiation team for the COP21 Agreement in Paris. Also, speakers from institutions directly involved in implementing

尽管有些德国企业已加入了中国碳排放交易试点计划，市场仍然提供了广阔的商机和与中国的企业及机构进一步合作的潜在机会。由于他们有在其他国家已建立的碳排放交易市场上的经验，德国公司乐于在中国分享他们的专业知识，协助中国建设即将到来的全国碳排放交易市场（ETS）。因此，动员德国企业和利益相关方，并支持他们参与日新月异的中国减排交易市场是很重要的。

自2015年初以来，德国工商大会北京代表处（德国商会北京）在德国联邦环境、自然保护、建设和核安全部（BMUB）的支持下在中国开展了“碳市场项目”。这一为期两年的项目旨在吸引利益相关方参与中国碳交易市场，巩固德国企业对中国碳市场的兴趣，同时促进合作伙伴关系。这一项目是基于德国商会北京代表处自2008年以来通过联邦环境部支持的一系列有针对性的活动建立的在减排和气候保护领域的广泛关系网络。



Events typically comprised of presentations by two experts followed by a discussion and networking session together with 25 to 30 selected participants

活动通常包括两位专家的报告，25到30位专业观众的讨论环节和自由交流

作为该项目的重要组成部分，德国商会北京代表处于2015年至2016年举办了八次交流会议。会议通常包括两位专家的报告，25到30位专业观众的讨论环节和自由交流。

the ETS were invited, such as China Beijing Environment Exchange (CBEEEX), China Quality Certification Center (CQC), as well as leading think tanks and universities like the World Resources Institute (WRI), Innovation Center for Energy and Transportation (iCET), Carnegie-Tsinghua Center for Global Policy, Tianjin University of Science & Technology and Tsinghua University. In addition, senior experts from companies such as SinoCarbon Innovation & Investment, Bureau Veritas, China National Building Material Group and MotionECO actively contributed to the events.

The meetings presented a useful platform to facilitate exchange and further promote cooperation between German, Chinese and international stakeholders related to carbon markets in China. More than 200 representatives from enterprises, business associations and chambers of commerce, international organizations, NGOs, embassies, consultancies and academia attended the events. Besides the networking meetings, as part of the project, AHK Greater China Beijing has been regularly publishing its "Econet Monitor" magazine in German as well as in English and Chinese in order to support wider exchange of information on China's environmental and climate protection markets.

From ETS pilots towards a national ETS

Starting in mid-2013, the Chinese government began implementing its plans for an ETS by launching its first pilot project. There are now seven pilot schemes in the cities of Beijing, Tianjin, Shanghai, Shenzhen and Chongqing, as well as the provinces of Guangdong and Hubei.

During the past few years, the ETS pilots have developed quite heterogeneously. Whereas Beijing and Shenzhen include a large number of small emitters from diverse sectors, Hubei is characterized primarily by large industrial emitters, making up roughly half the trading volume of the Chinese carbon market. Shanghai is unique in that China's largest city has two standards for including enterprises: one designed for industrial enterprises, such as electricity and steel in addition to a non-industrial standard, involving, for example, shopping malls and commercial office buildings. Also, Shanghai and Guangdong are currently the only pilot schemes that include aviation in their trading schemes. The pilot ETS in Beijing that was launched back in November 2013 was the first project that initiated regional partnerships for emissions trading – for instance with the city of Chengde which is

已举办过的交流会邀请了来自各个单位的专家发言，其中有国家应对气候变化战略研究和国际合作中心 (NCSC)、发改委 (NDRC) 能源研究所 (ERI)，他们是中国参加第21届联合国气候变化大会的谈判组成员。同时，也有来自直接参与执行碳排放市场的机构的专家，如北京环交所 (CBEEEX)、中国质量认证中心 (CQC)，以及行业领先的智库和大学，如世界资源研究所 (WRI)、能源与交通创新中心 (iCET)、清华 — 卡耐基全球政策中心，天津科技大学和清华大学等。此外，来自企业的资深专家也曾多次在交流会上发言，如中创碳投、必维国际检验集团、中国建材集团和道兰环能等。



The meetings presented a useful platform to facilitate exchange and further promote cooperation between German, Chinese and international stakeholders

该交流会在中外重要相关人员之间搭建了促进交流及进一步推进合作的有效平台

该交流会在中国碳市场的中外重要相关人员之间搭建了促进交流及进一步推进合作的有效平台。超过200位来自企业、协会、商会、国际组织、非营利组织、使馆、咨询机构和科研单位的代表参与了这项活动。

除了交流会之外，碳市场项目同时也包括德国商会北京代表处定期出版的德语版和中英双语版的《Econet Monitor》杂志，该杂志旨在全面深入地交流关于中国环境和气候保护市场的信息。

从碳交易试点到全国碳交易体系

自2013年中，中国政府开始通过启动试点项目实施碳排放交易市场的计划。共有七个试点：北京市、天津市、上海市、深圳市、重庆市和广东省、湖北省。

在过去的几年里，碳交易试点的发展各有千秋。北京和深圳的碳交易市场上活跃着大量各个行业的小量

situated northeast of Beijing. In June 2016, Shenzhen's pilot scheme also linked its ETS with Baotou in the north Chinese autonomous region of Inner Mongolia – a city where much of the world's rare earth supply is refined.

By the end of January 2016, NDRC had declared the eight sectors that will be included in the national Chinese ETS that starts up in 2017. Apart from petrochemical, power, chemicals, construction materials, nonferrous metals, steel and papermaking industries, the aviation sector will form an integral part of the upcoming ETS.

So far, leading pilot ETS schemes such as Beijing and Shenzhen were able to acquire valuable practical experience that some other Chinese pilots are not able to offer. When it comes to establishing the features and regulations for the upcoming national ETS, it is therefore necessary to consider and build on the experience of the leading pilot projects, while at the same time developing an adoptable and suitable system for all seven existing pilot projects as well as other regions.

Efficient regulation and allocation mechanisms

China and other countries establishing an ETS need to avoid the build-up of a substantial surplus of emissions allowances, leading to low carbon prices and thus a weaker incentive to reduce emissions. As a result, suitable design features for the trading schemes as well as regulation measures need to be applied. In this context, in November 2015, AHK Greater China Beijing organized a networking meeting on the topic of efficient regulation mechanisms for a dynamic Chinese carbon market. At the meeting, experts informed participants about the experience gained with emissions trading pilots in China as well as potential regulation instruments, such as a carbon tax, and their effects on emissions trading.

The allocation of emission allowances can be done either through “grandfathering”, where allocation is based on historical emissions of enterprises – meaning the enterprises that emit most could receive more allowances – or through benchmarking, where the government and industry experts set a specific benchmark for emission output for industry-specific enterprises, for instance based on tons of carbon dioxide per product unit. Benchmarking thus offers the potential for a fairer system as it provides a consis-

排放企业，而湖北是以大型工业排放企业为主，它们占据了全国碳市场上将近一半的交易量。上海的独特之处在于，作为中国最大的城市，它对于参与碳交易的企业执行两种标准：一种是针对工业企业的，如电力、钢铁等，另一种是针对非工业企业的，如商场和办公楼等。同时只有上海和广东两个试点是把航空行业也纳入碳交易体系的。2013年11月启动的北京试点和位于北京东北方向的承德市开展了区域伙伴合作，这在全国是首例。2016年6月，深圳和最大的稀土工业基地内蒙古自治区包头市启动了碳交易区域合作。



Shanghai and Guangdong are the only pilot projects that include aviation in their trading schemes

只有上海和广东两个试点是把航空行业也纳入碳交易体系的

Source / 图片来源: Shanghai Environment and Energy Exchange

2016年1月底，发改委发布了关于切实做好全国碳排放权交易市场启动重点工作的通知，全国碳排放权交易市场第一阶段将涵盖石化、化工、建材、钢铁、有色、造纸、电力、航空等重点排放行业。

到目前为止，像北京和深圳这样领先的碳交易试点能够获得一些别的试点所不具有的宝贵实践经验。因此在全国碳排放交易体系即将来临之际，当涉及到建立规章制度时，很有必要参考领先的试点方案的经验，在此基础上将已有的七个试点方案因地制宜地推广到其他地区。

有效的调节和分配机制

中国和其他的国家建立碳排放交易体系时，应当避免大量多余的排放配额的累积，因为那样会导致碳价过低，降低了企业减排的积极性。因此，需要设计合适的碳交易方案，并执行监管措施。

在这样的背景下，德国商会北京代表处于2015年11月组织了主题为有效监管机制激发中国碳市场活力

tent allocation methodology for both new and existing market participants and rewards early action as well as upgrades in technology. Nevertheless, due to insufficient availability of data, grandfathering is still the more widely used method for allocation across technologically divergent industries in China.

Monitoring, reporting and verification

Apart from the significance of an accurate and fair allocation method for allowances, a suitable system for monitoring, reporting and verification (MRV) will be essential for an efficient and credible Chinese ETS. According to the NDRC, Chinese as well as foreign industrial enterprises meeting certain criteria are required to measure, monitor and report their carbon emissions under the upcoming national ETS. The data must be verified by a third party entity selected by the local DRCs that assume a key role for implementing a long-term MRV system. Therefore, enterprises need to prepare themselves as early as possible for China's national ETS and learn how to quantify their carbon emissions and train qualified validation personnel. Against this backdrop, AHK Greater China Beijing organized a networking meeting in August 2016. The discussions at the event indicated that there is still a substantial need for further capacity building and training measures in this regard – both for the companies covered by the ETS as well responsible authorities and third party verification bodies. Official training materials recently published by NDRC can provide support during this process. Experience has also shown that it is essential to maintain communication and keep the industry informed about developments regarding emissions trading and the accompanying MRV system, to focus on a manageable number of emitters and to regularly revise market rules to adapt them to market realities.

Market mechanisms for the transportation sector

Apart from discussing the developments and features of the ETS in China as a whole, some of the networking meetings focused on specific sectors: As a major user of energy, the environmental impact of the transportation sector in China and other countries is significant. The aviation sector for instance was able to successfully reduce its fuel consumption and carbon emissions during the past few years. However, when it comes to overall greenhouse gas emissions, the climate impact of the fast growing aviation sector remains high. Hence, in April 2016, AHK Greater China

的交流。在该会议上，专家们和听众分享了在中国碳排放交易试点中取得的经验和潜在调控手段如碳税的相关信息，以及它们对碳排放交易的影响。

碳排放的配额可以通过“祖父法”或者标杆法来进行分配。祖父法是基于企业的历史排放量分配，这意味着排放量大的企业能得到更多的配额，标杆法是由政府和行业专家为各个行业的企业设定一个排放标准，例如基于每产出单位的二氧化碳排放量。因此标杆法为一个更加公平的系统提供了可能性，它为新加入市场的企业和之前已存在的企业提供了一种一致的分配方法，同时奖励了前期行动和技术升级。然而由于数据可用性不足，祖父法仍然更为广泛地运用在中国技术上不同行业的配额分配中。

监测报告核查

准确而公平的分配方法对配额的重要意义不言而喻，除此之外，合适的监测、报告和核查（MRV）系统对于有效而可靠的中国碳排放交易体系也必不可少。根据发改委的要求，中外工业企业须按照特定的标准对他们的碳排放做好核算监测报告工作，为即将到来的全国碳排放交易体系做准备。企业完成核算与报告工作后，由地方主管部门选择第三方核查机构对企业的排放数据等进行核查，地方发改委也在监测报告核查机制的长期执行中承担了重要职责。因此，企业需要对全国碳排放交易体系早做准备，尽快熟悉和掌握核算方法及报告要求，确定专职核算与管理人员。在这样的背景下，德国商会北京代表处于2016年8月组织了以此为主题的交流。会上的讨论表明，无论是对于加入碳排放交易体系的企业，还是对于相关的主管部门和第三方核查机构来说，仍然有进一步加强能力建设和培训措施的实际需求。国家发改委近期公布的官方培训材料可在这一过程中提供支持。经验也表明，保持沟通以及让企业及时了解碳排放交易和相关监测报告核查机制的最新发展是十分必要的，需要专注于可控数量的排放企业，定期调整市场规则使他们适应市场现状。

运输领域的市场机制

除了讨论碳排放交易体系在中国的整体发展状况以外，交流会有时也会专注于某些特定的行业：作为用能大户，运输行业在中国和其他国家对环境的影响都十分显著。例如航空领域在过去几年中能够成功地减少燃油消耗和碳排放量。然而，当涉及到总体的温室气体排放，高速增长的航空领域对气候的影响仍然很大。

Beijing organized a networking meeting on opportunities for emissions reduction in the Chinese aviation sector and the implications of its integration into the national ETS. During the discussions it became clear that not all issues regarding the inclusion of the sector in the Chinese ETS have been sufficiently examined. For example, a suitable pricing structure and emission allowances allocation system still need to be determined and the collection of reliable carbon emissions data from air transportation and airports in China enhanced. The emissions reduction potential of biofuels in aviation was another topic discussed. The experts of the meeting concluded that there is still further need for research concerning the quality of biofuels and that pilot projects would be useful in this regard.

Another networking meeting in August 2015 focused on the market-based mechanisms for the promotion of electric vehicles. China is now considering the introduction of a credit scheme for vehicle manufacturers in order to support the further development of electric mobility, now that the government is gradually phasing out subsidies for this sector. According to the proposed scheme, car manufacturers that produce more than 50,000 vehicles per year can earn credits for low-emission vehicles. Automakers that fail to meet the set goals will have to buy credits from other car manufacturers or will be fined. The participants of the meeting all agreed that market-based incentives such as a credit scheme will increase market penetration for more innovative and efficient technologies, while also pointing out that the further expansion of the charging and grid infrastructure for electric vehicles needs to be in line with this development through a higher share of renewable energy.

Looking ahead

During the current transition from the pilot phase to a national ETS, developments in the Chinese carbon market on its way to becoming the world's largest ETS remain extremely interesting. AHK Greater China Beijing will continue its networking approach throughout the coming years. Further events and publications regarding emissions trading, as well as the environmental and climate protection sector in China, will support information exchange among German, Chinese and international stakeholders and facilitate business partnerships and cooperation in the Chinese market.

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德国商会北京代表处于2016年4月组织了关于中国航空领域的节能减排和纳入全国碳交易体系的交流会。讨论过程中逐渐明晰了一点,不是所有关于航空领域纳入全国碳交易体系的问题都充分地研究过了。比如说,仍需确定一个合适的定价结构和碳排放配额分配制度,以及要加强收集来自中国航空运输和机场的可靠排放数据。讨论的另一个话题是航空生物燃料的减排潜力。会议的专家认为,仍然有进一步研究生物燃料质量的需求,在这方面试点项目会很有用处。

2015年8月的另一次交流会重点在于促进电动汽车的市场机制。中国现在正在考虑为汽车厂商引入信贷制度,为了进一步支持电动汽车的发展,目前政府正在逐步取消这一行业的补贴。根据提议的方案,每年产量超过50000辆的汽车厂商可以获得低排放车辆信贷。未能达到设定目标的汽车厂商将不得不从其他汽车制造商那里购买信贷或面临罚款。参会人员一致认为,基于市场的激励手段如信贷制度能够为更多创新高效的技术增强市场渗透力,同时也指出,电动汽车的充电和电网基础设施的进一步扩张需要与可再生能源占比提升的发展趋势相匹配。



Starting up in 2017, the national Chinese ETS will involve eight sectors, including steel

2017年启动的全国碳排放交易市场将涵盖包括钢铁在内的八个重点行业

Source / 图片来源: pop-photo.com.cn

展望

在目前这个从试点阶段向全国碳交易体系过渡的时期,中国碳市场发展成为世界最大的碳排放交易体系的过程非常值得关注。在接下来的几年里,德国商会北京代表处将会继续运用各种交流方法。关于中国碳排放交易以及环境和气候保护的更多活动和刊物,将会支持中外各国利益相关者之间的信息交流,并促进在中国市场的商业伙伴关系和合作。

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Building

Green Hospital in Hainan – China's First DGNB Healthcare Accreditation

A contribution by Michael Pruss, VAMED Healthcare China

中国第一个获得DGNB认证的医疗健康类项目

来自奥美德国际医疗集团的Michael Pruss的客邀文章

"The newly opened Hainan Cancer Research Hospital received a LEED certification. What awards will our UNICARE hospital achieve in the future?" This challenging comment from a management executive opened the door for applying for a German Sustainable Building Council (DGNB) certification. It came as a positive surprise. For two years we had promoted building certifications and organized workshops with DGNB and green building experts for the planned Hainan UNICARE International Hospital in Haikou, the capital of Southern China's Hainan province. But we still couldn't achieve the final breakthrough until the mentioned fortunate incident at the beginning of 2016.

The UNICARE project, a joint-venture cooperation between Hainan International Airline Group (HNA) and Austrian VAMED Group, follows a lifecycle approach that considers the entire value chain from project development to facility management.

With today's rapid economic development, people's demands for high-standard medical services increase accordingly. HNA and VAMED are combining their expertise in health tourism, marketing, service culture (certified by Skytrax, HNA is the only private five-star airline in mainland China), as well as medical know-how and rehabilitation concepts. A suitable project location was found in the New Haikou City Centre, in close vicinity to HNA headquarters and Hainan government buildings, with views of the Central Park and the soon to be built 400 meters tall HNA towers.

"海口有一家新开业的医院拿到了LEED认证;我们的优联国际医院将来应该争取怎样一种认证呢?"高层管理者提出的这个具有挑战性的要求,为我们申请DGNB(德国Sustainable Building Council)认证开启了新的可能性。虽然两年来我们跟DGNB和绿色建筑专家们为海南优联国际医院的建筑认证成功做了大量推进工作,但是直到后来因为前面提到的2016年初发生的事件才有了进展。

优联国际医院项目是由海航健康医疗产业集团(海航集团的子公司)和奥地利奥美德国际医疗集团(费森尤斯旗下公司)共同合作的合资公司项目,该项目是一个全生命周期项目,包含从项目发展到运营管理的全产业链。

在当今经济快速发展的环境下,人们对于高品质医疗服务的需求也在增加。海航和奥美德发挥各自的优势及经验,包括健康旅游、市场营销、文化、服务(海南航空是中国唯一达到五星级航空的民营航空公司),以及健康医疗方面。在海口市中心我们找到一个合



To develop sustainable and high project standards, Hainan Airlines and VAMED had to go new ways when it comes to the planning and design of the hospital

为了满足可持续的、高标准的工程要求,海南航空和奥美德在策划和设计中共同进行了新的尝试

Source / 图片来源: VAMED

The joint-venture project includes the establishment and operation of a 70,000 m² private acute care hospital with 225 inpatient beds, as well as an intensive care unit (ICU) with 14 beds, a rehabilitation centre with 75 beds and an extensive outpatient area. The hospital will specialize in urology, plastic and restrictive surgery, otorhinolaryngology (ENT) and ophthalmology, gynaecology as well as obstetrics.

Based on a medical concept from VAMED, in cooperation with Medical University of Graz, the functional program is actively driving forward the medical in-house education of healthcare professionals and stimulates cooperation between Chinese and European healthcare institutions. Surgeons will be able to connect via telemedicine with experts from all over the world, from right inside the operating theatres.

In order to develop sustainable and high project standards, HNA and VAMED had to go new ways when it comes to the planning and design of UNICARE hospital.

Our initial considerations were as such: Following national standards from Europe would unnecessarily increase the investment volume, and their implementation in China would be more complex. On the other hand domestic standards would not provide an advantage over domestic healthcare competitors. A third alternative was an often applied model in Europe: Establishment of a project guideline by the hospital operator. The drawback here is however that a large effort has to be made for the creation of such a guideline. The solution on hand was therefore to go for a German DGNB building certification, customized for the Chinese market.

UNICARE hospital is aiming to achieve the first DGNB healthcare certification in China. The audit was combined with the Chinese Assessment Standard for Green Building. The initial evaluation and improvement proposals had been implemented into the building design.

The main focus of the DGNB auditor's report prepared by the international engineering firm AECOM includes: Occupational health and safety, noise reduction, efficient control of building systems, and water saving equipment. Special healthcare requirements are barrier-free designs for patients as well as easy cleaning and maintenance to guarantee maximum hospital hygiene.

适的位置 — 临近海航总部办公楼、海南省政府办公楼以及海口面积最大的商业中心, 可以看到红城湖公园, 在项目东边还有海航集团正在建设的一个高度超过400米的地标性建筑 — 海口塔。

合资医院面积为70,000平米, 设置了225张病床, 14张重症监护病床, 75张康复病床及相应的门急诊区。医院的门诊专科包括内科、外科、妇产科、儿科、眼科、耳鼻喉科、口腔科、泌尿外科、骨科、整形美容科、康复科。



At a very early stage, building systems and medical equipment are implemented into design

楼宇系统和医疗设备在早期就纳入了设计中

Source / 图片来源: VAMED

依据奥美德的医疗策划, 医院的功能设置将极大促进了院内临床培训和教育活动, 更提倡中国跟欧洲的医疗机构之间的合作交流。外科医生能通过远程医疗视频电话, 在手术室里跟全世界的外科医生专家进行沟通。

为了满足可持续的、高标准的工程要求, 海航和奥美德在策划和设计中共同进行了新的尝试。我们最初的设想是: 参照欧洲或其他发达国家的国际标准, 这显然造成高额投资成本, 并且要在中国实现起来也困难重重。另一方面, 采用国内的标准会使得与国内健康医疗行业其他竞争者相比缺乏竞争力。第三种方案是在欧洲更常用的一种方式: 由医院运营方建立一套项目标准。缺点是需要做很多创新上的尝试。最终采用的解决方

优联国际医院的目标是成为第一个在中国获得DGNB医疗健康类的认证的设施。评审过程结合中国绿色建筑评定标准。初步的评估和改进建议已经在设计中得以体现。DGNB认证专家的报告主要关注点(由AECOM执行)有: 职业健康及安全, 减噪, 大楼系统的高效控制, 节水设备。而医疗类的特殊要求是病人的无障碍设计及易清洁性和易维修性, 以最大保证医院的卫生方面要求。进行建设用材料采购时, 主要的产品只能选择包含在DGNB LCA (Life-Cycle

When purchasing building components, mainly products will be selected that are listed in the DGNB Life-Cycle Assessment (LCA) database, international Environmental Product Declaration (EPD) database or China Life Cycle database (CLCD). Those catalogues provide verified declarations with transparent documents and comparable information about the life-cycle environmental impact of products, in consideration of the cradle-to-grave concept.

Furthermore the DGNB is encouraging the reduction of volatile organic compounds (VOC). An indoor air quality test should be taken four weeks after completion of construction. At least 80% of all rooms should comply with $VOC \leq 500 \mu\text{g}/\text{m}^3$, formaldehyde $VOC \leq 60 \mu\text{g}/\text{m}^3$. This will significantly contribute to a healthy indoor environment and at same time protect staff, elderly and infants, as well as other patients.

A major challenge for the mutual project team from HNA, VAMED and the design institute China Construction Design International (CCDI) was to maintain the high design standards throughout the entire project value chain.

VAMED's designs are based on a detailed functional room program. In very early design phases, building systems and medical equipment are implemented into design. To compensate with local engineering practise, the project team organized several workshops in order to develop mutual agreeable solutions.

Surely there are many obstacles, but it is also important to emphasize the great opportunities that such projects in China provide. It is a very exciting experience to build a large scale private hospital facility with extensive services, state-of-the-art medical equipment, smart hospital signage, solar collectors and heat recovery, charging stations for electric cars, mechanical parking for bicycles, and many additional outstanding features.

The design of UNICARE hospital has very much benefited from the international project experience and the world-wide healthcare know-how. With a planned start of operations in 2018, this project will be a new best practise model and is heading to become China's first healthcare DGNB certification.

评估)数据库中的产品,国际EPD(环保产品宣告)数据库或者CLCD中国Life-Cycle数据库中的产品。这些数据库给出了不同的产品关于Life-Cycle对于环境影响的公开透明的数据及可比较的信息。此外,DGNB鼓励减少VOC(挥发性有机物)的排放。应该在建造完成4周后进行室内空气质量检测。至少80%的房间应该满足VOC排放量低于 $500 \mu\text{g}/\text{m}^3$,甲醛低于 $60 \mu\text{g}/\text{m}^3$ 。这会明显有助于健康的室内环境并有利于员工,病人和婴幼儿的健康。

对于海航,奥美德,以及国内设计院悉地国际组成的项目团队,最关键的挑战是在整个项目价值链中保证最高设计标准。奥美德的设计师基于详细的功能布局。医疗设备等在早期就纳入了设计中。结合国内设计师的经验,多次召开工作讨论会以达成双方意见一致的解决方案。



With a planned start of operations in 2018, the project will be a new best practise model and is heading to become China's first healthcare DGNB certification

我们的项目将在2018年初投入运营,其将成为我们新的最佳实践项目,也将成为中国的第一个医疗类获得德国DGNB认证的项目

Source / 图片来源: HNA

当然存在一些困难,但我还是想提到中国有大量类似项目可以开发。建造如此大规模的具有新概念、新理念的医疗设施不能不说是一次相当难忘的经历,它有着高品质服务、先进医疗设备、智能医院标识、太阳能集热器和热回收、电动汽车充电站和自行车机械式停车等等突出的技术特色。

优联国际医院的设计相当程度上得益于从奥美德长期以来无数国际项目建设中积累的知识和经验,以及全球医疗机构运营中积累的经验。我们的项目将在2018年初投入运营,其将成为我们新的最佳实践项目,也将成为中国的第一个医疗类获得德国DGNB认证的项目。

Energy

Shenzhen's Road to Sustainable Transport in the field of New Energy Vehicles and Charging Infrastructure

A contribution by Johannes Lauer and Wolfgang Dickhaut, HafenCity University Hamburg

深圳在新能源汽车和充电基础设施领域的可持续发展道路

来自汉堡港口城市大学的Johannes Lauer和Wolfgang Dickhaut的客邀文章

Electric mobility provides a strategic technological solution towards sustainable transportation systems - particularly for China's urban growth. Therefore, the Chinese government is pushing the rapid development of New Energy Vehicles (NEV). China's cities suffer from high levels of air pollution, and NEVs are needed in order to reduce carbon emissions by 40-45% by 2020, compared to 2005 levels. 88 Chinese cities and 26 provinces are part of the Chinese NEV demonstration regions. These regions serve as test sites for NEV policies and instruments. Besides Beijing and Shanghai, Shenzhen is one of the top cities for NEV development.

Founded in 1980 as China's first special economic zone, Shenzhen is well known for its rapid and successful development. The implementation of NEVs in public transport is connected with low-carbon plans that follow the guidelines of the 13th Five-Year Plan (2016-2020). The 35-year-old megacity has more than 11 million inhabitants and approximately 3.3 million cars, as of the end of 2014. Shenzhen's transportation circulation system is used by 10 million people per day. Among them, 6 million travel by bus, 3 million by metro and 1.2 million by taxi. Buses and taxis account for 1.1% of all vehicles in Shenzhen, but they are responsible for 20% of traffic-related air pollution. For that reason, the municipal leaders decided to start with the promotion and application of electric vehicles in the public transport sector. Today, the megacity is a global pioneer in this sector. Within the last year, Shenzhen promoted the number of NEVs from 10,000 to 52,000 NEVs until June 2016. This number includes 6,634 new energy buses, 4,265 pure electric taxis, 1,158 pure electric commuter coaches, 9,067 pure electric logistic vehicles, 7,958 new energy leasing vehicles, 22,727 new energy private cars and 120 others. After setting up the national charging standard, end of 2015, Shenzhen has built 166 charging stations, 1,832 fast charging piles for buses, 2,365 public fast charging

电动汽车提供了可持续交通系统的战略性技术解决方案,特别是对中国城市发展来说。因此中国政府正在大力推进新能源汽车(NEV)的高速发展。中国城市遭受着严重的空气污染,为了达到2020年比2005年降低40-45%的碳排放的目标,需要推广新能源汽车。中国26个省的88个城市成为了新能源汽车推广示范地区。这些试点起到测试新能源汽车政策工具的作用。除了北京和上海之外,深圳也是新能源汽车发展最好的城市之一。



E-taxis at public charging station with more than 230 AC- and DC-charging piles and solar roofs in Shenzhen

电动出租车在深圳一个有230多个直流和交流充电桩以及太阳能屋顶的公共充电站里

Source / 图片来源: Valentin Roscher, 2016

作为1980年建立的中国首个经济特区,深圳以其经济高速增长而出名。使用新能源汽车作为公共交通工具是遵循了“十三五”规划(2016-2020)中低碳发展规划。截至2014年底,这座35岁的特大城市有超过1100万的人口和约330万辆车。每天有1000万人使用深圳的交通运输系统。其中600万人乘公交,300万人乘地铁,120万人乘出租车。公交和出租车占深圳所有车辆的1.1%,但它们造成了交通相关空气污染的20%。因此,市政府领导决定在公共交通领域开始推广应用电动汽车。目前在这一领域,特大城市是全球的先行者。在过去的一年中,截至2016年6月,深圳将新能源汽车的数量从1万提高到了5.2万。其中包括6634辆新能源公交车,4265辆纯电动出

piles and more than 20,000 slow charging piles. Until 2020 Shenzhen will construct 26 big size charging stations for buses with up to 700 fast charging piles per station. In the future, nearly all gasoline cars will be replaced or banned in the city.

Policies, instruments and development

Shenzhen has an open NEV development strategy and comprehensive policy support. That means the development of hybrid-, fuel cell- and full electric vehicles can be government-funded. The municipal government set up the 'Shenzhen Leading Group Office of Promotion and Application of New Energy Vehicles' (SZLGO) as responsible policymaker for NEV and charging infrastructure development. The SZLGO is guided by the Shenzhen Development and Reform Commission. The target for 2020 is no CO₂ emissions in the public transport sector, connected with a gradual transformation towards commercial and private NEVs. While the public transport sector and municipal fleets receive different subsidies depending on the vehicle length, range or NEV-type, private enterprises and private persons can benefit from various financial and tax advantages, depending on the range and NEV-type. Private NEV buyers and private companies receive state and local subsidies upwards of 114,000 CNY (17,900 USD) per vehicle. To support the NEV-production of local producers in this field, no other Chinese city offers more subsidies for NEV users. Besides the push of charging infrastructure development, there are other non-monetary incentives and restrictions. With a limit of 80,000 car number plates per year, Shenzhen government started a car plate lottery for gasoline cars. Car number plates for NEVs have no limitation. Motorized bicycles were prohibited more than 10 years ago. Lifestyles in using electric bicycles are very popular. Based on the legally binding policy structure, the table on the right summarizes various instruments that can be identified for the development of municipal NEV and charging infrastructure.

However, in existing and new development areas there were many constraints recently. The lack of charging infrastructure, imperfect auxiliary facilities, incomplete supporting policies, inadequate business models, insufficient enterprise innovation or a lack of highly skilled labour were identified as main constraints by municipal leaders. To overcome these bottleneck constraints, in January 2015 the Shenzhen municipal government formulated very ambitious policies to improve municipal instruments for future NEV

租车, 1158辆纯电动通勤班车, 9067辆纯电动物流车, 7958辆新能源租赁车, 22727辆新能源私家车和120辆其他类型车辆。在2015年底设立国家充电标准之后, 深圳建造了166个充电站, 1832个公交快充桩, 2365个公用快充桩和2万多个慢充桩。到2020年, 深圳将建造26个大型公交充电站, 每个充电站有多达700个快速充电桩。深圳市是全球领先的应用和推广电动汽车的城市之一。未来这里所有的汽油车基本上会替换成新能源车。

政策、工具和发展

深圳有开放的新能源发展战略和全面的政策支持。这意味着混合动力车, 燃料电池车和纯电动车都能得到政府的支持。市政府还专门成立了“深圳市新能源汽车推广应用领导小组办公室”(SZLGO), 负责关于新能源汽车和充电基础设施发展的政策制定工作。该办公室是在深圳市发改委的指导下成立的, 同时得到了深圳市科技创新委员会、负责实施的市交通运输委员会和市财政委员会的支持。2020年的目标是在公共交通领域实现二氧化碳零排放, 进而逐步过渡到商用和私人的新能源汽车。公共交通和市政用车根据它的车辆长度、范围和新能源类型可以得到不同的补贴, 同时商用和个人用户根据他们的范围和新能源类型可以得到各种财政税收补贴。新能源汽车私人购买者和商户可以得到每辆车超过11.4万元(17900美元)的国家和地方补贴。为了支持本地新能源汽车厂商, 没有别的中国城市为新能源汽车用户提供更多的补贴。除了推动充电基础设施的建设, 还有其他非货币激励和限制。深圳政府开始对汽油车限购摇号,

Category	Instrument	Category	Instrument
Public transport	Subsidy for public transport companies (e-bus and e-taxi)	Charging infrastructure	Construction of public charging piles
Municipal fleets and logistics	NEVs for the municipal fleet (sanitation, police) and logistics		Construction of large-scale bus charging stations
New business models	E-carsharing and other innovative rental services		Public parking lots (existing > 10%, new 30%)
NEV purchase incentive and other monetary incentives	National and local subsidy to private and commercial buyer		Residence area parking lots (existing > 5%, new 30%)
	Tax incentives	Penalties	National charging standard
	Toll road privilege		Number plate restriction for fuel vehicles
	Privilege for accident insurance	Other infrastructure	Prohibition of motorized bicycles
Non-monetary incentives	Privilege for parking		Low carbon detection system
	No number plate restriction for NEVs	NEV innovation system and industry development	Guidelines for the power supply network companies network
	NEV service platform		Technology research center
Environmental protection	Monitoring and security system		Creation of attractive frameworks for NEV manufacturing and battery technology
	Battery recycling		Development of key technologies
			Industrial cluster promotion

Instruments for NEV and charging infrastructure development in Shenzhen
深圳市新能源汽车和充电基础设施发展的政策工具

Source / 图片来源: Own compilation

development. These policies are covered by a 5 billion CNY (804 million USD) fund in the form of a municipal incentive and subsidy to enhance full electric vehicles, a citywide charging network and a unified charging standard. This funding is connected to the two-year high-tech plan by the National Development and Reform Commission (NDRC) to create globally competitive homegrown brands in six industries, including electric cars. According to Shenzhen's working plan to develop NEVs, the plan is based on three principles: successful demonstration and promotion, rapid industry development, as well as the steady development of charging infrastructure, planning instruments and business models.

One of the main challenges identified by the government was the inadequate integration of charging facilities in urban planning. For that reason, land for charging facilities could not be guaranteed and investment was constricted. Furthermore, there is a shortage of land for construction and it is almost impossible that undeveloped land can be used for charging infrastructure. This inhibits investment in charging facility construction. Therefore, policymaker decided the constructions of slow charging facilities should cover no less than 5% of parking in existing residential areas, and no less than 10% of parking in existing public parking lots. For new buildings there should be no less than 30%, connected to the green-building standard.

Shenzhen's construction land is still expanding and sustainable solutions are needed. Several new urban development projects that integrate electric mobility from the beginning stages of the planning process were started in recent years. Transit oriented development (TOD) strategies, a city of short distances and green transport concepts have been used as examples from international good practice cities like Copenhagen or Seoul. The 'International Low-Carbon City' (ILCC) in Longgang District, in cooperation with the EU or 'Qianhai Shenzhen-Hongkong Modern Service Industry Cooperation Zone of Shenzhen', are popular examples, but are still under construction. The German firm GMP Architects is involved in the planning of Qianhai Bay's Integrated Transport Hub of Shenzhen Metro. Low carbon transport systems and a high rate of charging facilities will be implemented there. According to urban planners from Shenzhen, there are five ways to integrate charging infrastructure in urban planning: the creation of statutory plans for new construction areas, the addition into public parking space, the alteration of residential area planning, an addition to fuel stations without changing the land use policy

每年限发8万个车牌。对新能源汽车的车牌号没有限制。深圳在十来年前开始禁行摩托车,使用电动自行车出行的方式十分受欢迎。基于具有法律约束力的政策结构,12页表格总结了关于深圳市新能源汽车和充电基础设施发展的各种政策工具。

然而,最近在已有的和新增的区域有很多发展限制。市政府领导认为主要有以下几个制约因素:充电设施建设滞后、激励引导机制不到位、配套政策不完善、商业模式创新不足,产业规模需要进一步扩大、自主创新能力仍需提升、企业组织结构有待优化、人才吸引力亟待增强。为了克服这些瓶颈,2015年1月深圳市政府制定了为加强支持未来新能源汽车发展的雄心勃勃的政策。市政府设立50亿资金(8.04亿美元)作为激励和补贴手段,支持纯电动汽车、全城充电网络和统一收费标准。这一专项资金和发改委编制印发的《增强制造业核心竞争力三年行动计划(2015-2017年)》以及6个重点领域关键技术产业化实施方案(其中包括电动汽车)紧密联系。根据深圳市新能源汽车发展工作方案,发展基础在于示范推广成效显著,产业实现快速发展,新能源汽车充电设施网络建设稳步推进,投资运营模式不断优化。

政府认为面临的主要挑战之一是新能源汽车充电基础设施纳入城市规划的建设有待完善。充电基础设施建设用地不能得到很好的保证,投资有所收缩。此外,建设用地短缺,几乎不可能在未开发的土地上建设充电基础设施。这抑制了充电设施建设投资。因此政策制定者决定慢充设施应不低于现有住宅区停车场的5%,且不低于现有公共停车场的10%。对于新建建筑应不低于30%,达到绿色建筑标准。

深圳的建设用地仍在扩大,需要可持续性的解决方案。近期开始了一些新的城市建设项目,从城市规划的开始阶段就整合了电动汽车。以公共交通为导向的开发(TOD)策略,以短途交通绿色出行为主的城市规划方案已在国际上有很好的实例,如哥本哈根和首尔。与欧盟合作打造的深圳龙岗区“国际低碳城”(ILCC)以及“前海深港现代服务业合作区”是很受欢迎的案例,不过它们仍在建设中。德国GMP建筑师事务所参与了深圳地铁前海湾综合交通枢纽规划。这里使用了低碳交通系统和大量充电设备。根据深圳城市规划人员的说法,有五种将充电基础设施整合到城市规划的方法:为新建区创建法定规划,增加到公共停车场,改变住宅区的规划,在不改变土地使用政策的情况下增加到加油站,或是征用临时用地。深圳市新能源汽车推广应用领导小组办公室试图加快建设过程,让充电运营商不需要申请土地使用规划许可。

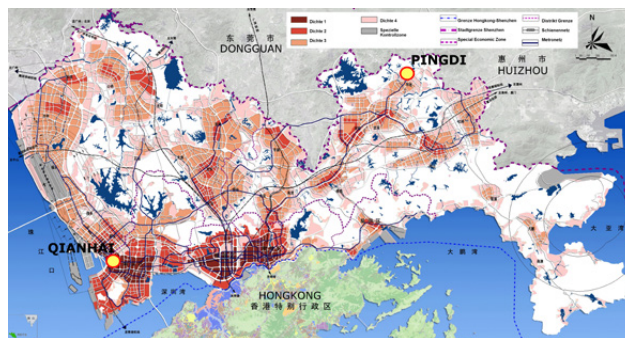
or the expropriation of temporary land. The SZLGO tries to fasten the construction process while charging operators do not need to apply for approval of land use planning. Since the market for charging infrastructure was opened for private companies, there are more than 45 listed companies until October of 2016. Besides the biggest state-owned provider Potevio, Chinese start-up companies such as UEEE Inc. gain attention as service-providers for construction and maintenance of charging facilities.

Conclusion

Shenzhen is a leading city as a test laboratory for NEV policies, instruments and development worldwide. Investments in NEV and charging facilities as a driver for industrial development are exemplary. The megacity focuses on sustainable transport solutions, where comprehensive NEV strategies are seen as a complementary instrument to make private and public transport cleaner. Vehicles should not be replaced 1:1 from fossil fuel to NEV. Using a mix of restrictions for gasoline cars and incentives for NEVs and charging infrastructure, the municipal leaders place pressure on district authorities, industry and private individuals to implement this technology. If municipal leaders follow the target to promote public transport introduced in 2010, NEVs in the form of e-carsharing or other new rental systems can be used to reduce traffic congestion, while limiting harmful emissions. The use of green energy is rising, but as long as nuclear power is considered 'clean' energy, it is difficult to compare emissions reductions successes with similar programs in countries that do not consider nuclear power 'clean', for example, in Germany. Stakeholders, planners and the scientific community have to consider how electric mobility changes the urban landscape. Fast growing Chinese megacities have the opportunity to take a leading position in the field of electric mobility. Shenzhen can be a best practice for other megacities and many instruments such as the law to integrate charging facilities in existing and new buildings or the car number plate restriction for gasoline vehicles. The challenge is to change citizens' transportation preferences while finding the balance between economic development and environmental protection.

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自从充电基础设施市场对私营企业开放以来,截至2016年10月共有超过45家运营商备案。除了最大的国有运营商中国普天之外,中国的一些初创公司如“聚电”作为建设及维护充电设施的服务提供商获得了关注。



Shenzhen land use density map (2010-2020) including the location of Qianhai zone and Pingdi subdistrict

深圳建设用地布局规划图 (2010-2020) 包括前海区和坪地镇

Source / 图片来源: Shenzhen Municipality (2010), translated with own illustrations

总结

深圳作为新能源汽车政策、措施和发展的试验田是一个世界领先的城市。以对新能源汽车和充电设施的投资作为产业发展的驱动力,这一点具有示范作用。这个特大城市专注于可持续交通解决方案,新能源汽车的综合性策略被视为使得私人 and 公共交通更加清洁的补充措施。汽车并不会1:1地从燃油汽车替换为新能源汽车。通过对燃油车的限制以及对新能源汽车和充电基础设施的激励手段,市政府领导对区政府、从业者和个人施加了使用这些技术的压力。如果按照市领导2010年引入的促进公共交通的目标,新能源汽车以汽车分时租赁或其他新型租用模式使用可以在限制有害物排放的同时减轻交通拥堵。人们越来越多地使用绿色能源,但只要继续把核电看作是“清洁”能源,成功减排量就很难跟那些不把核电认为是“清洁”能源的国家如德国相比。利益相关者、规划者和研究者需要考虑电动汽车如何改变城市面貌。高速增长的中国大城市有机会在电动汽车的领域占据领先地位。深圳可以作为其他大城市的榜样,包括它的很多政策工具如将充电设施结合到已有和新建建筑的法规,或燃油汽车车牌限购等。面临的挑战是改变市民的出行偏好,同时找到经济发展和环境保护之间的平衡点。

本文是汉堡港口城市大学的环保城市和基础设施规划工作组和德国联邦交通与数字基础设施部 (BMVI) 支持的国际研究项目“中德电动汽车研究” (SINGER) 的一部分。

Environment

“Sponge City” Engineering in China

A contribution by Y. T. Tzeng, Wisy Rainwater Engineering (Shanghai) Co., Ltd.

中国的海绵城市工程

来自葳西雨水工程(上海)有限公司的曾誉录的客邀文章

Climate change and urbanization resulted in increasing disasters such as flooding and water shortage in cities around the world. China experienced economic growth and urbanization much faster than many other countries. As a result, problems are more acute and happen on a much larger scale. The Chinese government recognized the need for action and officially announced policies and support measures for so-called “sponge cities” in the first half of 2015, in order to prevent flooding and better utilize rainwater.

Special ways are needed to cure the “city disease”. Some engineers insist on natural and green methods, which are in most cases expensive, slow and not suitable for all Chinese cities. China is not short of engineers, nor skilled craftsman. However, the country still lacks know-how and direction when it comes to sponge city engineering.

Even some European consulting firms recently stated, that it is not possible to save Chinese cities such as Tianjin or Wuhan from floods nor from pollution by sponge city engineering, or to protect the city centers in particular from flood disasters. By contrast, the German company Wisy AG developed some advanced products and several ways of engineering, which can direct the way for the Chinese people and show economically viable solutions for curing the described city diseases in a simple way, also as far as city centers are concerned.

When planning a rainwater harvesting system, several issues need to be considered:

For instance, rainwater should never go below ground level before filtration. Once unfiltered water is allowed to go underground, cleaning becomes difficult, clogging occurs, leading to the whole system failing and becoming obsolete. Therefore only clear water and submersible pumps should be underground.

Rainwater in Chinese cities is dirty and consists of various garbage items. Regular cleaning is inevitable

气候变化与都市化在世界各地的城市造成了水患与干旱问题。中国的经济成长与都市化比其他国家都快得多,以至于问题比较尖锐,而且规模大很多。中国政府认定问题所在,需要采取行动,所以在2015年上半年推出了海绵城市工程的政策并大力支持,以求解决内涝问题,并且更好的利用雨水。

治疗所谓的“都市病”需要特殊的方式。有些工程界人士坚持用自然的或绿色的方法,通常代价较高,收效缓慢,也不一定适合所有中国城市。中国不缺工程师,不缺技术人才,但是仍需要海绵工程的技术与方向指引。最近甚至有些欧洲的顾问公司都认定海绵工程无法解决天津或武汉等市区淹水问题或污染问题,尤其是无法防止市区中心淹水。相较之下,德国的葳西公司发展出了一些先进的产品与特殊的海绵工程设计,为中国市场提供了正确的方向与价格低廉的工程方法,简单的解决了都市病的问题,甚至市中心淹水也可以解决了。



China still lacks know-how and direction for sponge city engineering
中国仍需要海绵工程的技术与方向指引

Source / 图片来源: news.163.com

设计雨水回收系统的时候必须注意以下几个问题:

雨水没有过滤之前千万不要进入地下。未过滤的雨水进入地下,清理垃圾很困难,造成堵塞,系统失效,变成废弃系统。所以德式雨水回收在地面以下只有2种东西:清水+潜水泵。

in most cases, in order to prevent the serious problems that come with clogging. All German rainwater harvesting systems are intended to be self-cleaning, use no or very little electric power and require no or very few manpower interventions. It is also important to consider the fact that every rainwater harvesting system automatically represents a flood prevention system.

Any engineered infiltration system costs a lot of money. Once infiltrated, rainwater goes beyond control and cannot be re-used. Therefore infiltration shall be done only after storage tanks are full and water overflows. Permeable bricks and road surface layers can be a disadvantage in this regard.

Rainwater should never be over-purified, as it is often the case in China. Since harvested rainwater is usually used for toilet flushing and irrigation, over-emphasizing water quality will mislead engineers to apply unnecessary sterilizing equipment. Water quality is an issue in rainwater re-use, not when it comes to the harvesting process itself.

In addition, the cost of the rainwater harvested should be kept as low as possible and should never exceed that of the city's tap water.

All rainwater harvesting systems are designed to purify water. If the purified water is sent to a dirty reservoir, purification becomes meaningless. Therefore the reservoir interior must be made easily accessible, with wide and comfortable ladders or staircases, so that inspection and cleaning becomes easy. Underground reservoirs must be kept illuminated, well-ventilated, to keep them absolutely clean.

Not less than 80% of the system's budget should be spent on storage of rainwater: Sponge engineering involves basically storage space, reservoirs, pools and tanks. Government budget should be spent to build storage space. The whole budget should be spent on storage space, except for some necessary equipment such as pumps, controls and piping.

Sponge engineering systems should last for more than 10 years: Permeable bricks and asphalt highway surfaces shall not be used due to the short life-span, as they can be clogged by mud in a short period of time. Plastic films for storage of rainwater in water blocks, as applied in many Chinese cities, can also leak easily. These are not engineering materials and should be avoided. Sponge city engineering projects should last for many decades and therefore also shall be designed to last.

中国城市雨水大多很脏, 含有各种垃圾, 所以必须清掏垃圾, 避免堵塞。良好的雨水回收系统应该是完全不需要清掏或很少需要清掏。德国所有的雨水回收系统都不需要用电, 或用电很少, 也不需要人工清掏, 或很少需要人工照顾。最重要的一点是考虑清楚: 每一个雨水回收系统都是一个防止内涝的系统。

此外, 雨水回收的总成本必须维持很低, 千万不要超过自来水价格。任何雨水下渗系统都需要花不少钱。雨水一旦下渗就失去控制, 无法回用。所以雨水没有蓄水之前千万不要下渗, 必须是蓄水池满了, 自然溢流下渗。就此而言, 透水砖与透水路面是一种缺失。



硬化路面是最佳的雨水回收地点, 雨水流到路边水沟或草地, 经过草地净化, 供应农业工业商业用水, 是中国北方缺水省份逐渐脱贫致富的最好机会, 因为地球暖化, 暴雨逐年增加, 干旱会逐渐改善, 关键是如何收集雨水。每公里可以回收8000吨-16000吨。

Road surfaces represent useful catchment areas for harvesting rainwater

硬化路面是最佳的雨水回收地点

Source / 图片来源: Wisy

雨水回收过程不应该过度净化, 因为雨水一般是冲厕或绿化用。如果过度重视水质问题, 可能误导设计人员, 在杀菌设备投入太多经费。水质问题是回用时候考虑的问题 (依照用途而定) 不是回收过程的问题。有的雨水回收系统都是为了净化雨水。如果净化的雨水送到肮脏的蓄水池去保存, 净化就失去了意义。所以蓄水池必须设有宽大的楼梯阶梯, 方便进出, 管理人员入内检查或清理垃圾都很容易。地下水池必须光线明亮, 空气流通, 保证蓄水绝对干净。

雨水回收系统的预算必须保证至少80%用于蓄水空间。海绵工程基本上就是蓄水空间、蓄水槽、各种水池、水箱。政府预算应该用于建设蓄水空间。除了少数必须的设备譬如水泵、水管、控制系统, 其他钱应该尽量用于蓄水空间。

海绵工程项目至少应该耐用10年以上。透水砖与透水路面不应该使用, 因为寿命太短, 没多久就被泥沙堵塞失效。许多城市使用的PP模块, 使用塑料膜蓄水, 容易漏水, 也不应该使用。这些材料不是工程材料, 应该避免。海绵城市工程应该是百年工程, 必须经久耐用。

Politics

Are Chinese Investors still Interested in Europe's Solar & Wind Sectors?

A contribution by Dr. Olivia Gippner, London School of Economics & Political Science and Wiebke Rabe, Hertie School of Governance

中国投资者对欧洲的太阳能和风能产业仍然有兴趣吗？

来自伦敦政治经济学院的Olivia Gippner博士和赫尔梯行政学院的Wiebke Rabe的客邀文章

Chinese outward foreign direct investment (FDI) has been rising exponentially since 2007. According to the United Nations Conference on Trade and Development (UNCTAD), it overtook inward FDI flows in 2015, reaching USD 140 billion. In 2015, Li Keqiang promised that China will invest an additional 1 trillion USD globally in the next ten years. In Europe, the energy sector was the biggest recipient of Chinese FDI, followed by the automotive, agricultural and real estate sectors in the period between 2000 and 2014. This article will reflect on the present state of Chinese FDI in the European solar and wind sectors, and conclude with some recommendations for European and German stakeholders.

The renewable energy sector, in particular wind and solar, are some of the most attractive destinations for Chinese foreign investment. Between 2009 and 2014, Chinese companies carried out 238 projects in the European Union – 194 in the solar sector and 44 in the wind energy sector. Greenfield investments were the dominant form of entry (88 percent). Germany was the main destination (47 percent), followed by Luxembourg, Italy, the Netherlands, Spain and the United Kingdom. While the number of investments in European wind and solar industries decreased after 2011 and 2012, today there is renewed interest from Chinese firms. In the wind sector, this interest relates to the potential of offshore wind, where Chinese companies can become suppliers of components. In the solar sector, investments relate to energy storage technologies, in particular batteries.

The solar sector and consolidation of Chinese presence in Europe

Only recently has solar energy seen a growing market in China, as manufacturing was initially developed to meet rising demand in Europe and North America. In 2008, China became the largest producer of solar photovoltaic (PV) modules in the world. Its cheap, low-quality solar cells flooded the international and

2007年以来中国的对外直接投资以指数增长。根据联合国贸易和发展会议（贸发会议），它在2015年超过了外商对华直接投资，达到了1400亿美元。2015年，李克强总理承诺未来十年内中国将会在全球增加1万亿美元的对外投资。从2000年到2014年，欧洲能源领域接受了最多中国对外直接投资，接下来是汽车、农业和房地产行业。本文将分析太阳能和风能领域中国对欧直接投资的现状，并对欧洲和德国的利益相关者总结一些建议。

可再生能源领域，特别是风能和太阳能，是中国对外投资最具有吸引力的目标之一。从2009年到2014年，中国企业在欧盟开展了238个项目，194个在太阳能行业，44个在风能行业。绿地投资占88%，是进入的主导形式。德国是投资的主要目标国，占47%，接下来是卢森堡、意大利、荷兰、西班牙和英国。虽然2011年、2012年后，对欧洲风能和太阳能的投资数额有所下降，但现今又有了新的来自中国公司的投资兴趣。在风能领域，中国公司主要对成为海上风电相关零件供应商的潜在机会感兴趣。在太阳能领域，中国公司主要对关于储能技术，特别是电池方面的机会感兴趣。



The renewable energy sector, in particular wind and solar, are some of the most attractive destinations for Chinese foreign investment
可再生能源领域，特别是风能和太阳能，是中国对外投资最具有吸引力的目标之一

Source / 图片来源: hjenglish.com

domestic market, bankrupting European and other Chinese companies. As preferential policies in Western countries diminished in 2013 and the United States and the European Union introduced anti-dumping measures against Chinese solar PV, the Chinese solar sector found itself struggling to deal with increasing overcapacity.

In this context, interest in investment grew and many European solar companies were bought by Chinese investors. Some examples were the takeover of solar PV producers Avancis and CTF Solar by China National Building Materials Group Corporation (CNBM) and Hanergy's takeover of German Solibro in 2012 and 2014, respectively. In these cases, the German companies were taken over shortly before filing for bankruptcy, and were sometimes purchased below their market price.

The motivation for such mergers and acquisitions and other forms of foreign direct investment in the solar sector are, on the one hand, "market-seeking" to reduce domestic overcapacities, but also "technology-seeking", a good example being thin-film solar cells. CNBM's primary goal was the acquisition of CIGS thin-film solar cells technology, because producing CIGS cells without know-how is almost impossible.

For equipment manufacturers, investment decisions are often related to host countries' industry, which explains why Germany is very appealing for Chinese companies. In the past, Chinese companies used to buy components from Germany, creating a certain degree of dependence. Now the same Chinese companies are trying to internalize German technologies through FDI, incorporating them into their own value chain to reduce costs and risks. As a consequence, the European solar PV producer market has shrunk considerably, and Chinese companies have consolidated world markets and technological know-how.

China's emerging wind industry

In 2000, China's installed wind power capacity produced merely 344MW and China's wind power industry was strongly dependent on the import of foreign technologies. However, China's wind power experienced unprecedented growth due to energy security, environmental and technological drivers. It has also been motivated by the relative affordability of wind (as compared to solar energy) and the goal of building up internationally competitive enterprises. Chinese governments at different administrative levels offered financial incentives, promoted supply and



In 2008, China became the largest producer of solar photovoltaic modules in the world

2008年中国成为全世界太阳能光伏组件最大的生产商

Source / 图片来源: nopic.com

太阳能产业发展以及中国进军欧洲

太阳能产业直到近期才在中国呈现出不断增长的市场,制造业发展最初是为了满足欧洲和北美的需求增长。2008年中国成为全世界太阳能光伏(PV)组件最大的生产商。它的廉价太阳能电池冲击了国际国内市场,使得欧洲和中国其他公司破产。随着2013年西方国家的优惠政策减少,以及美国和欧盟出台了针对中国太阳能光伏的反倾销措施,中国太阳能行业发现自身面临着日益严重的产能过剩问题。

在这一背景下,对外投资的兴趣高涨,很多欧洲太阳能公司被中国投资者收购。例如2014年太阳能光伏组件生产商Avancis和CTF太阳能公司被中国建材集团(CNBM)收购,2012年德国Solibro公司被汉能集团收购。在这些案例中,德国公司在临近申请破产时被收购,有时收购价低于他们的市场价。

太阳能行业这种兼并和收购以及其他形式的对外直接投资的动机一方面来源于“寻找市场”,消耗国内过剩的产能,另一方面来源于“寻找技术”,一个很好的例子是薄膜太阳能电池。中国建材集团的主要目标是收购CIGS薄膜太阳能电池技术,因为要生产CIGS电池没有专业技术几乎是不可能的。

对于设备生产商来说,投资决策往往与东道国的产业发展相关,这就解释了德国对中国的公司那么有吸引力的原因。过去中国公司习惯于从德国购买零件,这就产生了一定程度的依赖性。现在这些中国公司正在试图通过对外直接投资的方式,将德国技术融入到自己的价值链中,来降低成本和风险。结果是欧洲太阳能光伏发电市场大幅萎缩,中国企业巩固了在世界市场和技术上的地位。

demand side subsidies, and furthered technological upgrading. In 2015, China's newly-installed wind power capacity amounted to 30GW and China's Xinjiang Goldwind Science & Technology Corporation became the world's leading company for newly-installed wind power capacities, surpassing the top European companies like Vestas, Siemens, Gamesa and Enercon, and the US firm, General Electric. In line with its domestic rise, outward direct investment into foreign wind industries increased significantly all over the world and Chinese wind companies today seriously challenge the technological competitiveness of established European firms.

Internationalization of China's wind industry in Europe

China's outward investments into the European wind industry started after 2009. Today, investments in wind energy are diverse in terms of target countries, investors, and their motivations. Chinese investors include state-owned and privately-owned companies and they invest in countries ranging from Western Europe (such as Denmark, Germany, Ireland, the Netherlands, Spain and the United Kingdom) to Central and Eastern European countries (such as Poland, Serbia, Bulgaria and Romania).

There are four main motivations for Chinese wind companies to invest in Europe:

- Chinese companies aim to upgrade their technological know-how through joint-development contracts or the acquisition of foreign companies. Xinjiang Goldwind acquired a 70 percent stake in the German wind-turbine maker Vensys AG in 2008. Goldwind thereby gained access to a permanent-magnet direct-drive technology for wind generators, which is particularly crucial for offshore wind energy due to its greater resilience and lower weight.
- Chinese investments into the European wind industry are motivated by Research and Development (R&D) opportunities. The Chinese company Envision Energy installed a 3MW turbine in 2015 at a national test center in Denmark. The environment at the test site is regarded to offer optimal conditions of average wind speed and is therefore seen as very suitable to make power curves. Other companies, such as CSIC Haizhuang in Denmark, have also opened R&D centers in Europe.
- Internationalizing in Europe is seen as a way to improve the image of Chinese wind technologies. By

中国的风能产业正在兴起

2000年时中国的风电装机容量只有344MW,同时中国的风电产业强烈依赖于外国技术进口。然而由于能源安全、环境和技术方面的推动力,中国的风电产业经历了前所未有的增长。增长动力还包括风能成本相对合理(和太阳能相比),以及建设具有国际竞争力的企业的目标。中国各个行政级别的政府提供了优惠政策,促进供给侧和需求侧的补贴,加强技术升级。2015年中国的新增风电装机容量达到30GW,新疆金风科技股份有限公司成为新增风电装机容量世界领先的公司,超过欧洲的顶级公司如维斯塔斯、西门子、歌美飒、Enercon和美国通用电气公司。随着中国风能公司在国内日益壮大,他们对世界各国风能产业的直接投资显著增加了,如今他们对欧洲老牌公司的技术竞争力构成了严肃挑战。



China's wind power experienced unprecedented growth due to energy security, environmental and technological drivers
由于能源安全、环境和技术方面的推动力,中国的风电产业经历了前所未有的增长

Source / 图片来源: sunoasis.com.cn

中国风能产业在欧洲的国际化

2009年之后中国开始了对欧洲风能产业的投资。现在,对风能的投资涵盖了不同的目标国、不同的投资者和动机。中国投资者包括国有和民营企业,他们的投资目标国从西欧(如丹麦、德国、爱尔兰、荷兰、西班牙和英国)到中欧和东欧国家(如波兰、塞尔维亚、保加利亚和罗马尼亚)。

中国风能企业在欧洲投资的动机主要有以下四点:

- 中国公司希望通过联合开发协议或收购外国公司来提升自己的技术水平。2008年新疆金风科技收购了德国风力涡轮制造商Vensys公司70%的股份。金风科技从而有机会获得永磁直驱式风力发电机的核心技术,这对海上风电尤为关键,因为它弹性强、重量轻。

carrying out tests in Europe and making use of European expertise, companies hope to gain international certification, addressing the still existing quality concerns about Chinese wind technologies.

- Buying projects in Europe and operating them with Chinese technologies is assumed to be one of the most efficient ways to expand and export own technologies and counter the economic slowdown at home. In 2011, Sinovel Wind Group Corporation has signed a contract with the Irish company Mainstream Renewable Power to build 1GW wind energy projects in Ireland supplied with Chinese technologies.

Are European wind industries in decline?

European companies are still amongst the top developers for wind technologies, such as Adwen, Enercon, Gamesa, Siemens and Vestas. However, also in the wind sector dramatic transformations are taking place. Experts predict that investments by Chinese wind companies in Europe will continue to increase – as will their competitive advantage. The combination of the Chinese government's efforts to build up whole value chains at home, to develop its upstream industries and technological advantages in line with its 'Made in China 2025'-strategy, and its advantageous processing capabilities of rare earths (which are crucial components for direct-drive permanent magnet generators), will mean that the European wind industry is likely to face fiercer competition in the future.

Pull-factors in Europe

Many investments in Europe's wind and solar industries by Chinese investors are successful and lead to fruitful projects and cooperation on both sides. However, engaging in overseas investment is still a difficult undertaking for many Chinese companies.

The vast range of different regulatory and policy frameworks in each European member state, as well as the varying local business conditions and administrative procedures, require long learning timelines and in-depth preliminary research by Chinese investors. Companies perceive complex bureaucracies as hampering factors. Preferential renewable energy policies, such as in Germany and Bulgaria, have also attracted Chinese companies. Once subsidies stop or change, solar investors in particular are likely to move to a different country.

- 中国对欧洲风能产业投资的重要动机是研发机会。中国远景能源公司2015年在位于丹麦的国家测试中心安装了3MW的风力发电涡轮机。测试现场的环境被视为提供平均风速的最佳条件,因此人们认为这里非常适合制造功率曲线。其他公司如中船重工海装风电也在丹麦开设了研发中心。
- 在欧洲的国际化发展被视为中国风能技术提高形象的手段。通过在欧洲进行测试并使用欧洲的专业技术,中国企业希望获得国际认证,打消关于中国风能技术质量上的顾虑。
- 在欧洲购买项目并使用中国的技术运营被认为是出口自有技术和应对国内经济放缓的最有效的方法之一。2011年华锐风电公司和爱尔兰公司 Mainstream Renewable Power签署了一项协议,双方将在爱尔兰开发1GW的风能项目,由中方提供技术。

欧洲的风能产业是否在衰退?

欧洲企业仍然处于风能技术的领先地位,如Adwen、Enercon、歌美飒、西门子和维斯塔斯。然而风能领域正在悄然发生剧变。专家预测中国风能企业在欧洲的投资将持续增加,他们的竞争优势也会日益见长。综合考虑中国政府在国内建立完整价值链并发展上游产业的努力、“中国制造2025”战略的技术优势、优秀的稀土加工能力(这是永磁直驱式发电机的关键部件),这些因素意味着欧洲风能产业在未来很可能面对着更激烈的竞争。

欧洲的拉动因素

许多中国投资者对欧洲风能和太阳能产业的投资很成功,使得双方的合作项目硕果累累。然而,对很多中国企业来说从事海外投资仍然是一项困难的任务。

每个欧盟成员国的政策及监管框架大相径庭,他们当地的商业条件和行政程序也截然不同,这需要中国投资者长时间的学习和深入的研究。企业将复杂的官僚主义视为阻碍因素。如在德国和保加利亚等地对可再生能源的优惠政策吸引了中国公司。一旦补贴停止或有变动,尤其是太阳能行业的投资者很可能转向别的国家。

企业在做投资决策时也考虑中国和东道国之间关系的稳定性,比如说通过双边投资协议(在27个欧盟成员国里)。东道国的经济实力和进入其他欧洲市场的能力也被认为是有利条件。

Companies also consider the stability of the relationship between China and the host country in their investment decisions, say, through a bilateral investment treaty (in place for 27 EU member states). A host country's economic strength and the possibility of access to other European markets are also mentioned as favorable conditions.

Finally, the Chinese overseas community plays an important role. Romania, for example, has a history of Chinese FDI predating the financial crisis. In September 2016, almost 12,000 companies with Chinese participation were registered in Romania, making up about 6 percent of all foreign investors. Strong networks, good infrastructure and highly qualified workers are expected to attract more Chinese investments.

There are several implications of the rising presence of Chinese investors in European renewable sectors.

At the policy level:

- The EU-China bilateral investment treaty will need to find a balance between ensuring competitiveness of European enterprises (in particular in light of large Chinese subsidies) and international climate goals.
- Stable economic and political conditions are crucial. Chambers of commerce should be providing guidance on the impact of Brexit on the European investment climate.

At the company level:

- Chinese companies should have clear investment strategies in terms of target industries and investment types. In that way, support in the form of information on host country conditions and industries can be offered in a target-oriented way.
- Long-term relationships should be built between Chinese and European companies, or European companies need to make clear assessments on the investor's identity before engaging in any deal.

This article received inputs from the discussions of the workshop "Chinese energy innovation – going out to Europe", organized by the Dahrendorf Forum and the Yicai Research Institute in Beijing on 26 September 2016. The article was amended from a previous version published as a Policy Brief by the "Dahrendorf Forum – Debating Europe", a joint initiative by the Hertie School of Governance, the London School of Economics & Political Science and Stiftung Mercator.



European companies are still amongst the top developers for wind technologies but will likely face fiercer competition in the future
欧洲企业仍然处于风能技术的领先地位但很可能面对着更激烈的竞争
Source / 图片来源: intelligentliving.co

最后, 中国的海外社区也扮演了重要的角色。如罗马尼亚在金融危机前有中国对外直接投资的历史。截至2016年9月中国投资了将近1.2万家在罗马尼亚注册的公司, 占有海外投资者的6%。强大的社交网络、良好的基础设施和高素质工人预计将吸引更多中国投资。

中国投资者在欧洲可再生能源领域崛起有几个影响。

在政治层面:

- 中欧双边投资协定需要在保证欧洲企业竞争力(特别是面对中国大额补贴)和国际气候目标之间找到平衡。
- 稳定的经济和政治条件至关重要。商会应就英国脱欧对欧洲投资环境的影响提供指导。

在企业层面:

- 中国企业要对目标产业和投资类型有明确的投资策略。那样人们才能目标明确地提供关于东道国条件和行业的信息支持。
- 应在中欧企业之间建立长期关系, 或欧洲企业需要在从事任何交易之前对投资者的身份特性做出明确评估。

本文汲取了“中国能源创新 — 走向欧洲”研讨会讨论的素材, 这是由Dahrendorf论坛和第一财经研究院于2016年9月26日在北京共同举办的。本文在之前作为“Dahrendorf论坛 — 欧洲讨论”的政策概述出版的版本上进行了修改, 这是一项由赫尔梯行政学院、伦敦政治经济学院和墨卡托基金会共同主办的活动。

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第十三届国际绿色建筑与建筑节能大会暨新技术与产品博览会
北京, 中国·2017年3月21日 - 3月22日
chinagb.net

Clean Energy Expo China 2017
Beijing, China · 29.03.2017 - 31.03.2017
中国国际清洁能源博览会
北京, 中国·2017年3月29日 - 3月31日
www.ceecintl.com

11th International Photovoltaic Power Generation Conference & Exhibition
Shanghai, China · 19.04.2017 - 21.04.2017
第十一届国际太阳能产业及光伏工程(上海)展览会暨论坛
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中国环博会
上海, 中国·2017年5月4日 - 5月6日
ie-expo.com

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上海, 中国·2017年6月7日 - 6月9日
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