



Viewpoint on Sustainable Architecture from Danish Architects

丹麦建筑师眼中的可持续建筑

2013年4月1日，第九届国际绿色建筑与建筑节能大会暨新技术与产品博览会在北京国际会议中心召开，期间设立丹麦馆，展示丹麦在绿色建筑方案、技术以及产品方面的成果。丹麦在可持续城市和建筑设计领域具有丰富的经验，他们的成果和经验对于中国的可持续发展具有很好的借鉴作用。

《建筑技艺》受丹麦大使馆的邀请，对此次活动进行了深度采访与报道。

谈到可持续建筑，也许在很多人的脑海里都会联想到有着绿色墙面或者屋顶，有着成排太阳能光伏电板或者太阳能热水器，抑或上面有着转动风车或者排风烟囱的建筑形象。虽然这些都是实现建筑节能的显性要素，但有了这些是不是真的就能实现可持续？在可持续建筑设计领域，我国目前存在哪些问题？到底什么样的建筑才是可持续建筑？要实现可持续性，我们应当从何入手？对于这些问题，来自丹麦BIG、SHL、HLA、PRO建筑师事务所的建筑师给出了他们的解答。



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可持续建筑的四要素

Four Elements of Sustainability

可持续发展的建筑包括四个要素：从环保的角度，它是否会对环境造成影响？从社会的角度，是否影响一个社区、一个地方、一种行为？从经济的角度，要花多少钱做建筑？从能耗的角度，要利用和消耗多少能源？这四个层面没有孰轻孰重之分。

我们尝试从一个很全面的角度来看待问题，看是否能给我们设计的建筑带来正面的影响。SHL 在电信系统、冷却水、雨水收集等技术方面做得不错，这些技术手段在设计过程中的实现就是一种对建筑本身的塑造。

当我们谈到塑造形体，它不只是设计一个体块，还要让这个形体符合其所处的环境，例如适当的倾斜以利于太阳能或风能的利用。当然我们也包括了对基地周围环境的设计，例如我们抬起建筑，设置一个开放的公共广场等。所以，当我们真正开始做设计之前希望尽可能多地考虑到问题，争取在能够实现的范围内做到最好。当然，我们并不能够满足一切，所以有时就像是一场战争，要在各个因素之间取舍。

When you talk about sustainability, you have to just seeing from the energy consumption point of view and it always has to include four elements; from environmental point, how does it affect the environment? Social point of view, it affects a neighborhood, a place, a kind of behaviorism, and of course the economical point of view, how much does it actually cost, this building, and for it to be sustainable, how much money do you spend on doing the building, and of course you have to look at the energy consumption; the use of energy.

You should try to look at it really from a very holistic point of view where we try to include all the information which we can get at once, let's look if we can do some passive design to the building. SHL is really good at all kinds of techniques, PV cells, water cooling, rainwater harvesting and stuff like that, but where you can really gain is actually to design the building before you add all these technical add ones afterwards, is actually the shaping of the building, because that is what will have the pure impact on the energy consumption of the building, but also have impact on the site surrounding it. when we talk about shaping, it's not just doing a shape, which sort of fits to the environment in terms of solar incline and wind, but also on the area around it, we sort of propose a public square to open up the building and these kind of things. So we really try to do the analysis as broad specters as possible to begin, and then we try to narrow down our effort to sort of gain the most benefit from what we do. We know that we can't always achieve everything, so sometimes it's sort of which battles we want to fight, so to speak, from project to project.

民主的方法

Democratic Approach

我们虽然根植于哥本哈根，但灵感却来自于世界各地，在不在丹麦并不重要，我们在北京或者在上海做项目的方法是相通的。我们真正感兴趣的是试图使建筑的综合评价更高，我们真正关注的是需求——什么才是这个项目真正的需求。SHL 非常喜欢用一种自称为“民主”的方法来做设计——最大程度地让建筑本身开放，能够最大化地邀请公众进入到建筑内部。否则建筑本身就会像纪念碑一样自己屹立在那，变成孤立的个体。同时我们始终牢记，只要你要建立一些东西，必定会带走一些东西，所以我们新建的项目必须回馈社会、环境和基地本身，这是我们作为建筑师所要做的关键所在。

We are in Copenhagen, but we get our inspiration from all over the world. So when we were off to Beijing, or right now we are doing projects in Shanghai, it's the same. It's nothing about us being necessarily Danish, it's what we think is it should be good and relevant architecture. That's what's interesting for us, what is actually the need, we try to look at the problems, and solve them.

In SHL, we are very much interested in sort of what we call a democratic approach to architecture; to keep the building as open as possible, to invite the public in and so the building will not stand alone as some sort of a monument for itself, but always bear in mind that whenever you build something, you take away something. You take away a piece of land or site, so the building also has to give something back to a community or to a site, to the environment or such. So that's one of the key things that we use now as architects, is to investigate sort of how to open up architecture, how to make architecture relevant for people more than just the everyday users of the building.

BIM

BIM 系统是梦幻般的方式，可以使你的设计变得很高效。但是它在前期设计的时候是很不容易使用的，很多建筑师都会说：“哦，不，它是很死板的，用这个系统将会扼杀很多创造性”。但在许多项目中，我们同时用两条平行的方式来推进。在很多流线型的项目中会用到犀牛，也会用到很多矢量制图软件，比如 AI，CAD 等等；我们同时也在做 BIM 模型。当有了数字模型之后，我们就可以在竞赛阶段中非常高效地分析通风系统、日照系统、经济技术指标等等。不同于过去常规的竞赛阶段，这使得更多赢得比赛的概念成功地转化为实际的项目，从而有很多可持续发展的思想得以在现实中实施。此外，BIM 同时为我们提供了多专业共同合作的高效平台。例如在很多可持续评测体系中，首先会考虑建设成本，如果它是昂贵的，那么就是不可持续的。

BIM system is fantastic, you can monitor your building so fast and so efficient. But it did have some difficulties in the beginning, a lot of architects say "oh, no, no, it's too rigid, you cannot be creative with this system". In a lot of our projects, we work on two parallel tracks, so one is where you can say we work a lot with Rhino, more like organic 3D projects, still using Ultracut 2D as well, Adobe Chopchop. On the same track, we do BIM models. When we have models, in the competition we can do wind studies, light analysis, we can keep track on the gross net areas of the building very efficiently. Furthermore, it gives us a more easy transition between the competition stage to the project stage, which makes sure that a lot of the thoughts or ideas created through competitions have translated into projects, and thereby a lot of ideas of sustainability actually given or handed over, it also gives us a common language with the engineers and the architects who use testing of mass and structure. In a lot of the new sustainable measurement like the DNGP, we also put into account how much does the base of the building cost. If it's too expensive, it's not sustainable.

建筑物的生命周期

The Lifespan of the Building

丹麦的可持续产业已经发展得很好了。或许五年前或者十年前，每个人都在谈论，可持续性是什么？我们如何实现这一切？而今天，可持续是我们法律强制实施的一部分。

在中国，人们想要一个可持续发展的建筑，想要一个更好的城市，拥有更好的生活，希望把所有这些想法融入到建筑物中。这一想法面前最大的挑战就是成本，这和我们已经经历过的是一样的。在做建筑的时候，客户有很多这方面的想法，但一旦建筑建成就不再重视这些东西了，例如住宅建成后，他们开始出售公寓，然后就忘掉绿色建筑本身了，没有人关注建筑物本身的生命周期。我想现在还可以勉强这样，但是在未来，我们不可以只是无条件地使用地球上的能源，这样就会导致能源价格越来越高。当供电、供热、制冷的价格一路上升的时候，人们就会后悔当初应该多花点钱得到生命周期更长的建筑物

了。所以，尤其是在中国，这不只是建筑成本的问题，建筑物的生命周期将是越来越重要的问题。而当建筑物有了较低的能源需求之后，那么我们将会得到一个更好的将来。这是我们所发现的未来趋势之一，也是我们为什么要用不同的方式来说服我们的客户去做可持续建筑的根本原因。一个真正良好的环境，让人们多一点快乐，少一点生病，更好地生活和工作。其实就是这么简单。

Denmark is very high developed into sustainable industry. Five years ago, ten years ago, everybody was talking about, what is sustainability? What is it like? Using organic material? How do we implement all of this? Today, we don't even question it, we just do it, because it's part of our legislation that have to achieve this energy demands. In China, the client want a sustainable building, a better city, a better life, all of these thoughts put into a building. When you do buildings, private developers have all these ideas, once the buildings are done, they start selling the apartments, and forget sustainability.

China has been going so fast and focusing on the building cost, because when the market is growing like this, you can always sell and make money to get a new one and sell again, so nobody was focusing on lifespan. Now, I think people are like ok, maybe in the future, we cannot just use all the energy in the world, and the way to do that is to make it more expensive. When prices go up on electricity, heating, cooling, then people thought if we add a little more money in the beginning or we design buildings that can last longer. So especially in China, more and more important, it's not just the building cost, but is the lifespan of the building. If the buildings have a lower energy demand, then people maybe get better life. It is one of the trends we've seen, and that is sort of why we try to convince the client through different actions. Design a building which will actually create a really good environment could make people more happiness, less sickness, better life and working. It's very simple once you think about it.



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可持续建筑

Sustainable Building

可持续建筑应该像灵魂一样存在于建筑中，如果从建筑当中把它拿走，建筑就会变得丑陋。因此，我们不仅做设计工具软件，还创新工作流程来适应可持续建筑的发展。

The sustainable building is a part of the building and if you take away the sustainability out of the building, it will become ugly. We have made software, but we also made new processes, how we actually work with knowledge as the book called.

可持续设计过程

Good Process

当我们开始方案设计之前，首先谈论建设的愿景是什么，寻找可持续设计的侧重点，如水的影响、能耗问题或材料的环保问题。下一步我们才开始真正进入绘图阶段。因为一旦开始绘图就很难再修改，所以第一步是非常重要的，这是正确的设计过程。我们不仅着眼于建筑基地，还注重周围的基地。通过我们的设计提升环境，营造高质量的场所，这正是我们一直追求的。

When we start drawing before, we are talking about what is the vision of building. And 9/10 times it has sustainability as one of the goals and we need very specific to find out what kind of sustainability are they looking for, for example water, energy or materials. As soon as people start to draw, it is difficult to be changed. So it's very important for us to talk about something important, that's a good process.

So we not only focus on our site but also focus on surrounding environment. We do not just take money from clients but also to support the other architects. When we design, we hope bring more quality to this site, this is what we definitely want to do.

基于中国现状的可持续发展挑战

Big Challenge on Sustainable Building based on the Chinese Situation

一个真正的城市应该能够激励你，并使你快乐。在我来到北京这两天，发现人和人面对面的交流很少，都是带着围巾匆匆赶路。因此设计的重点应是建筑与建筑之间的空间，设计时不仅要考虑建筑内的空间，同时也要考虑建筑周围的空间。当建筑具有较好的空间与较低的能耗，城市才会更美好。

I think a real city should inspire you and make you happy. When I've only been here for two days, but what I have seen is that people run with handkerchiefs without meet and talk. This is about the environment between the buildings. We start design the buildings, not only for the space within the building, but also for space around the building. You have much prosperity to get both low energy consumption and good space of building, and the city will be better.



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控制能量消耗

Realize the Efficient Utilization of Energy

对于可持续性建筑，我们认为最重要的是控制能量消耗，更加精益地利用能源来达到低碳。中国的很多建筑有很高的能量消耗。如果我们可以设置更多的能量计量装置，实现分户计量就可以节省更多的能量。因为每个人的使用需求和个人对室温的喜好不一样，所以不能统一采用一个温度。新建的建筑也需要通过尽可能地采用被动式节能手段采用更节能的材料来实现能源的节约使用。除此之外，我们还要致力于提升室内小气候品质、利用太阳能、以及采用其他的主动节能措施。

2025 年哥本哈根将成为低碳之都，虽然我们现在没有足够的信心和勇气在中国打造这样一个绿色城市，但我们将尽最大努力来减少中国城市的能量消耗。正如我们所看到的南京绿色灯塔项目， $25\text{kW}\cdot\text{h}/\text{m}^2$ 的能耗包括供热、致冷、通风、热水、强电，在中国国内很难找到相同能量消耗的建筑。我们主要使用被动式节能，包括寻找最佳朝向、遮阳、建筑材料、平面布局来充分利用自然能源，这些手段可减少 66% 的能量消耗。

When it comes to sustainable buildings we consider both passive and active design parameters. Energy control is essential to reach efficient utilisation of energy. As is well known, in China, a large number of buildings consume large amounts of energy. However, just by installing metering devices and applying household metering systems, you can achieve significant energy savings. Take heating and air conditioning systems for example, each individual has different preferences and requirements, and it would be more energy efficient to have a system where each household can control the temperature and pay per consumption.

Passive energy saving design methods should widely be applied to all new architectural buildings. This will reduce the energy consumption and improve the indoor climate and well-being for its residents. In addition active design parameters, e.g. utilisation of solar energy, should be installed to cover the energy use.

We are presently working on several low energy building projects in China. The Urban Planning and Exhibition centre in Nanjing is named The Lighthouse in Nanjing, as it when completed will operate with very low energy consumption. Together with the architects COWI has designed the building to operate with 25 kWh per square meter including heating, cooling, ventilation, hot water and electricity. This simulation shows that we, compared to local building regulations, have reduced the energy consumption by 60 percent just by applying passive parameters like orientation, room utilisation, daylight optimisation and control the heat transmission.

可考虑的城市开发设计

Considerable Urban Exploitation

在城市规划方面，我们致力于创造更加绿色环保的环境。我们深入探究了人们在哪儿居住、工作、购物。很多国家的城市规划建造了“环保城市”，数量如此庞大以至于我们甚至都忘记了“环保城市”的定义。所以我们的规划设计并不称之为“环保城市设计”而称之为“可考虑的城市开发设计”。在张家港的规划方案中，我们引入了“5min 城市”的概念，即人们居住、工作、购物的路程所花费的时间不超过 5min。各个区域职能被链接在一起，所以人们不需要交通工具，因此可以省去很多汽油，减少空气污染。中国城市的空气污染很严重，中国的 90% 的能源供给都来自于不可再生能源，而中国政府也致力于减少这一部分能源所占的比例，我们应该在每一个层面上都尽我们最大的努力来减少能源消耗和保护环境。

On the city planning level, we are inspired by Copenhagen's vision of being zero carbon in 2025, when we focus on creating a green friendly city environment. In the urban development project Zhang Jia Gang COWI introduced the concept of a "five minutes city", which means people live, work and go shopping with a distance of around five minutes walking. Each function is linked to set people free from vehicles and thereby saving energy and reducing pollution.

China faces serious air pollution and 90 per cent of the present energy supply is from fossil fuels. The Government is committed to this problem but all levels of the society should apply solution and make its best efforts to reduce the energy consumption and protect the environment.



管轶群

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采访 朱晓琳 《建筑技艺》杂志 副主编

中国问题之一：通过技术来弥补设计的先天不足

现在很多建筑师做建筑，往往是形态优先，追求极度的个性化语言，追求眼球效应，全然不顾结构和节能要求的合理性，然后再把一些所谓的绿色技术叠加在建筑上，给建筑穿上“绿色外衣”，比如某个部位设太阳能光伏板，某个墙面采用垂直绿化，某个立面采用双层可呼吸式幕墙等等。这种通过“节能技术的拼盘”来弥补设计先天不足的模式是很不科学的。

真正意义上的绿色建筑在设计出发点上应该是“由内而外”的，在设计要素上是“融为一体”的，技术手段上是“先被动，后主动”的。《论语》里孔子说“发乎情，止乎礼”。对于我们绿色建筑设计来说，这个“情”就是对节能环保的终极关注，而“礼”就是对节能技术的合理运用。但现在的情况经常是“情不发，礼不止”。

中国问题之二：技术成功了，建筑倒退了

在科技不发达的阶段，由于受到建造技术的制约，没有很好的技术手段来做强势的弥补，工匠们就因地制宜地采用“低技术”的手段，用被动式节能的方式去适应气候，最大限度地创造了居住的舒适性，同时也造就了我国各地丰富的建筑形式。同时许多传统民居采用“低造价”的策略，大量回收使用废弃砖瓦，用于新建、改建项目，可持续的理念深入人心。而如今再去看看我们的城市，从南到北千城一面，大拆大建极度浪费。

这也反映出一个有意思的命题：建造技术的飞速进步给建筑师的创作带来极大自由，反而扼杀了建筑的丰富性。技术本身是无辜的，建筑师的创作态度却是罪魁祸首。所以，我们应该从地域性出发，善用、慎用技术手段，学会“止于礼”。用技术和金钱堆出来的建筑，不一定是好建筑。我们也没有资本和理由去挥霍技术与金钱。

中国问题之三：被忽视的社会意义上的可持续

我们认为可持续包含两层基本涵义：

一个是生态意义上的可持续性，一个是社会意义上的可持续性。生态意义上的可持续性主要关乎技术层面，社会层面的可持续性主要关乎社会关系及使用者的意识层面。两者相比，我们认为社会层面的可持续性对当下中国来说更为重要，而这一点恰恰是中国城市化进程中容易被忽视的问题。

这里面也包含两个层面的问题：第一，持续快速的城市现代化进程与经济全球化进程摧毁了传统社会关系与社区活力。如何重建社区活力，恢复邻里关系将成为重大的可持续课题。第二，使用者意识层面的可持续观念是实现可持续发展的关键，比如垃圾分类、节约用水用电、绿色出行等等。一个技术上再成功的节能建筑，如果使用者没有节能意识，还是不可持续的。

解决之道：泛绿色

我们提出“泛绿色”的理念，包含以下几点：

- 1) 强调可持续的生态与社会两方面。
- 2) 控制从设计、建造到后期运营维护的全过程。
- 3) 合理运用节能技术，注意技术的均衡性与统一性。

可持续建筑的发展是一个持续渐进的过程，是一个取决于全民环保意识逐步发展的过程。现阶段我们更需要的不是追求局部的“深绿”，而是尝试将朴素而简单的绿色理念与实践均衡地“泛化”到建筑单体的每个要素，“泛化”到建造运营的每个阶段，“泛化”到每个社会机构与个体的心中。



Kai-Uwe Bergmann

BIG建筑事务所合作伙伴，业务发展总监

采访 张萃 《建筑技艺》杂志特约记者

“革命”与“进化”

Revolution & Evolution

“革命”，意味着推翻之前的所有东西，重新再开始，而“进化”则不同，它是从过去中学习借鉴，在过去值得保留的基础上建造，以实现进一步的提升。相比于革命，我们更感兴趣的是进化。我们相信可持续的策略包含这一概念，即从过去学习，进而建造更美好的未来。

When you do a revolution, you are saying everything which came before were no good, you are trying to do something new, in evolution, you are learning from the past, you are building on the good things of the past to become better. We believe that a sustainable approach is one in which we learn from our past and we build on and become better.

创意是将创新和需求相结合

Innovation & Need

当我们设计一个建筑的时候，不是在设计形式，而是在设计一个能够良好运行的项目，就好比准备一场演出，项目好似音乐家手中的小提琴，它是一种非常精准的乐器。你可能制造的是噪音，也可能是好的音乐，我们感兴趣的就是如何创造出能够“演奏音乐”的建筑，在这种情况下使各方面实现平衡，这才是我们称之为成功的建筑。

Creativity is one in which you are able to connect innovation and need. So when are designing a building, we are not designing a form, we are designing for the project or a building to perform, what we are actually doing is to create a performance that in which the project is an instrument, like a violin in the hand of a musician, it is an instrument which is highly tuned. You can make it sound like noise, or you can make music, what we are interested in is to create buildings or projects which are able to create music, because everything is in balance and everything is finely tuned. This for us is a successful project.

可持续建筑设计

Sustainable Architecture

可持续建筑是生活品质的提高，是经济、能源、需求等各方面的平衡。从城市规划到单体建筑，我认为应该从不同层次和更广的角度去看待设计过程。我们对不同项目的不同数据进行分析，如气候条件、功能需求、经济解决策略等，然后进行过滤。这就是为什么我们的项目都不一样，在不同的地方根据不同的需求呈现不同的造型，而不会将一种模式照搬。

Sustainable architecture is one in which the quality of life is raised, and everything is in balance, the balance of economy, of energy, and of need, so when all these things are in balance, that is what we call sustainability.

I think everything from the level of the city or urban planning to the level of the individual people who are using the buildings, I think it is important to think in those broad terms, both from the citizens to individual, I think this is going into our thinking when we are designing. We are looking at many different perspectives, and always filtering, any project with different data, it could be what is the climate of this project, what is the program of this project, what is the financial solution of this project. That is why our projects look different for different places and different programs, we do not take the same project and create in different places, because we feel the building perform differently, so if they perform differently, they look different. **AT**

