China Real Estate Industry
Carbon Neutral Development Summit
中国房地产业碳达峰发展高峰论坛

碳中和愿景下中国可持续建筑演进展望

当代置业（中国）有限公司陈音

中国房地产业协会
CHINA REAL ESTATE ASSOCIATION
友绿网
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China Real Estate Industry
Carbon Neutral Development Summit

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中国房地产业协会
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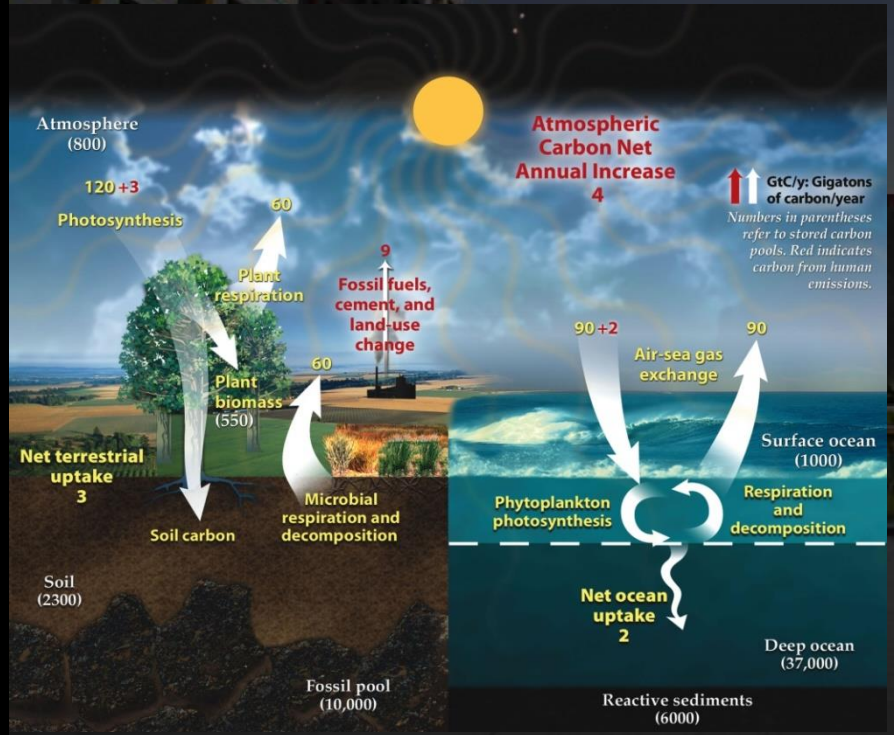
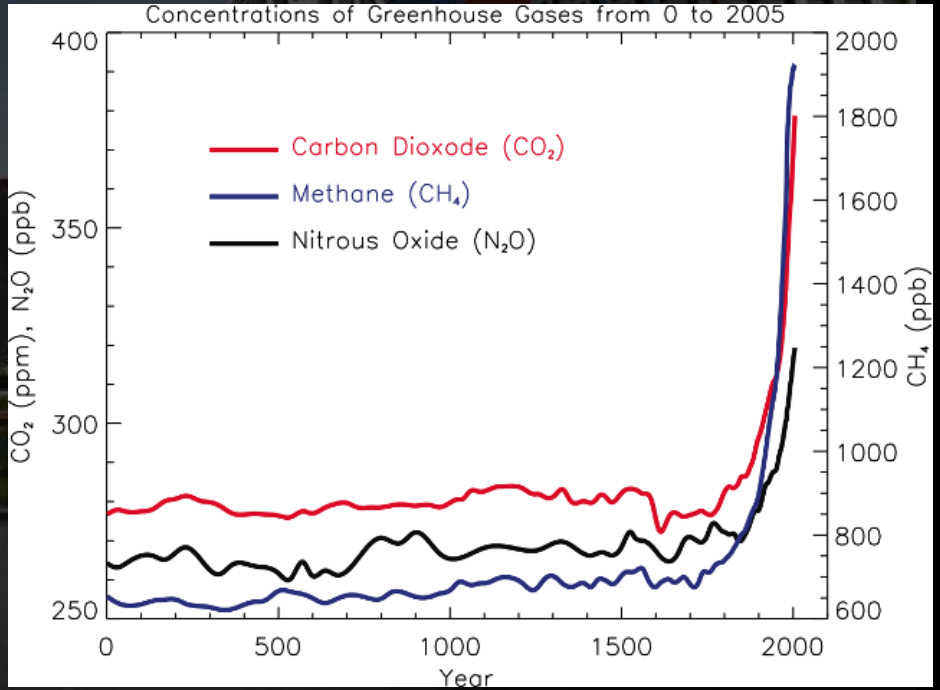
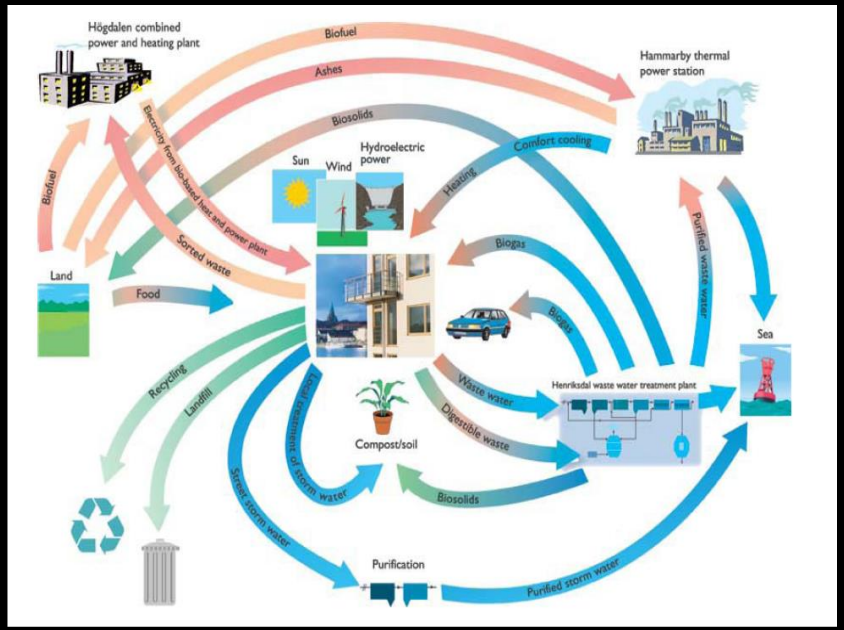
一、空前挑战：地球生态系统的碳循环与气候变化





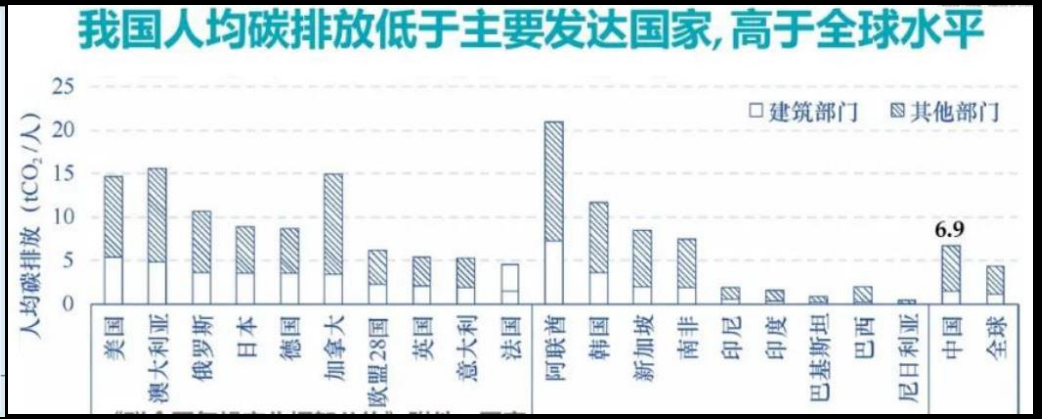
中国对控制气候变化进程的决定性承诺

2030年碳排放达到峰值；2060年实现碳中和——经济社会发展与碳排放解耦，由黑色能源驱动转为绿色能源驱动



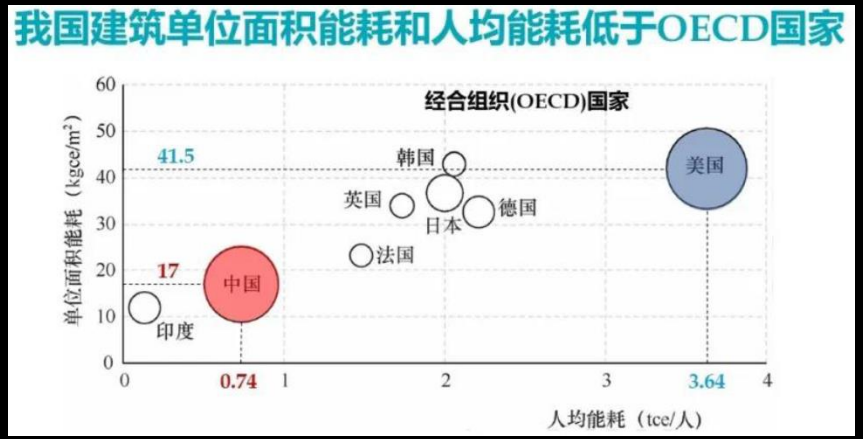
建筑行业的碳排放未达预期

- 建筑的物质性决定了建筑行业对资源、能源的严重依赖，且难有颠覆性的技术革命出现
- 有学者研究中国建筑碳达峰预计在2039年左右实现，晚于2030国家整体达峰时点
- 限于热力学定律的约束，物理原理节能技术的边界效益逐渐降低



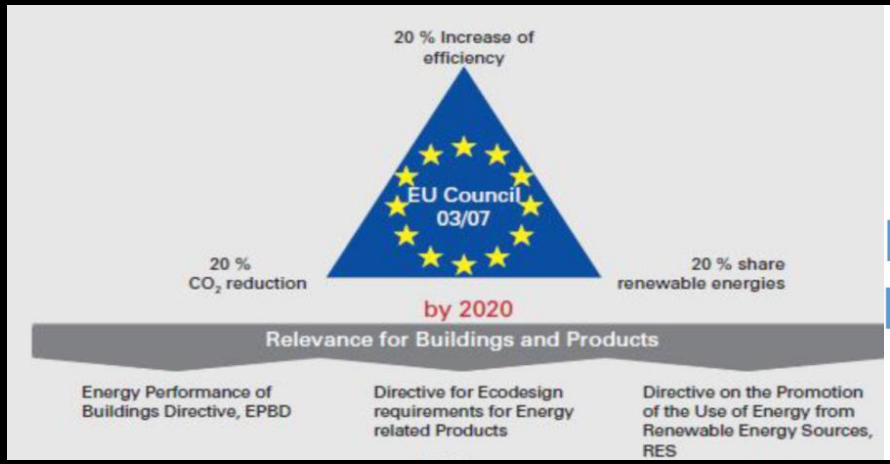
建筑行业的碳排放未达预期

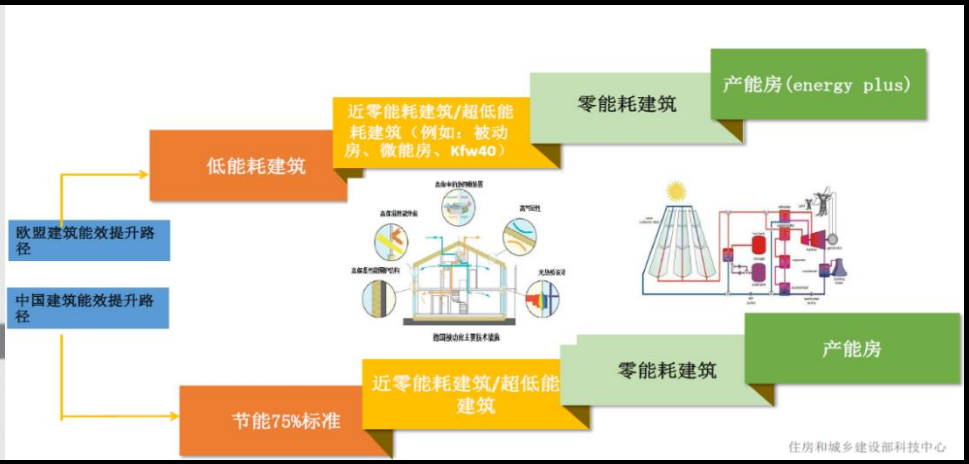
- 经济、社会发展水平与能源消耗正相关，美好生活需要能源消费支撑
- 中国的建筑总量、单位建筑面积能耗仍在继续增加
- 中国建筑节能的真实水平并不容乐观



中国建筑能效提升的技术路线

- 能源、能效与环境是绿色建筑的基石，可持续性（Sustainability）是绿色建筑的本质特征，零碳运营是绿色建筑的终极目标
- 完善亦或缺憾：2019版绿建标准的价值导向

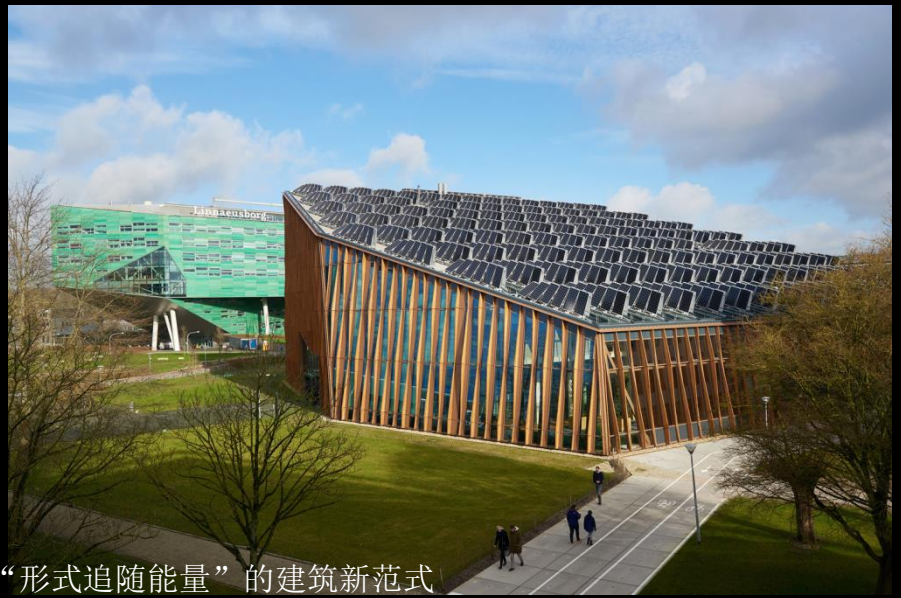




二、应对与展望

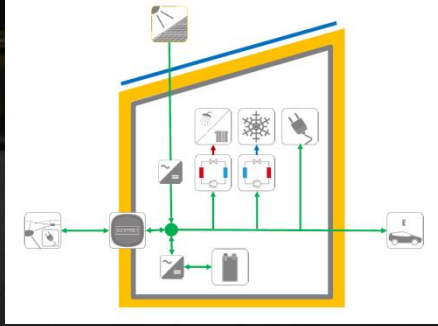
- 1、**理论** 建筑学与建筑设计的创新变革，“热力学将成为建筑的引擎”
- 未来建筑的范式有可能出现由“形式追随功能”到“形式追随能量”

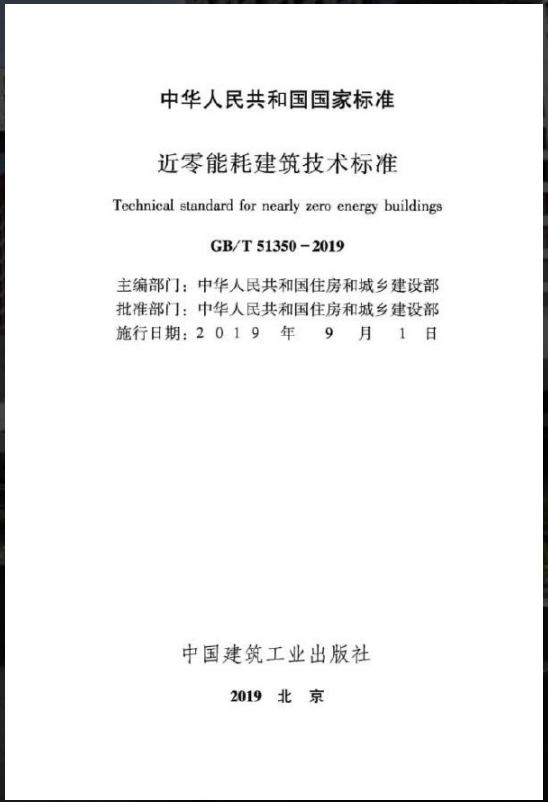
位于荷兰格罗宁根的欧洲能源学院形象展示了“形式追随能量”的建筑新范式



2、法规 强制执行的法定建筑节能标准更有利于实现建筑碳中和

- 碳中和目标需要顶层设计和标准先行
- 近零能耗建筑+建筑可再生能源法规可有力推动建筑碳中和
- 国标GB/T51366定义了建筑碳排放计算方法，其中有很多设定条件
- 统计口径的碳排放分析更有意义：ISO 16745定义的建筑碳排放分为三个范畴，CM1至CM3




中华人民共和国国家标准

近零能耗建筑技术标准

Technical standard for nearly zero energy buildings

GB/T 51350－2019

主编部门：中华人民共和国住房和城乡建设部
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中国建筑工业出版社

2019 北 京

3、规划 从单体到住区，先进规划理念助力实现碳中和住区

- 小街区，密路网，围合式居住区规划的收益、代价和取舍
- 环境、邻里、私密、便利性、运营成本；朝向、采光、视野，套型

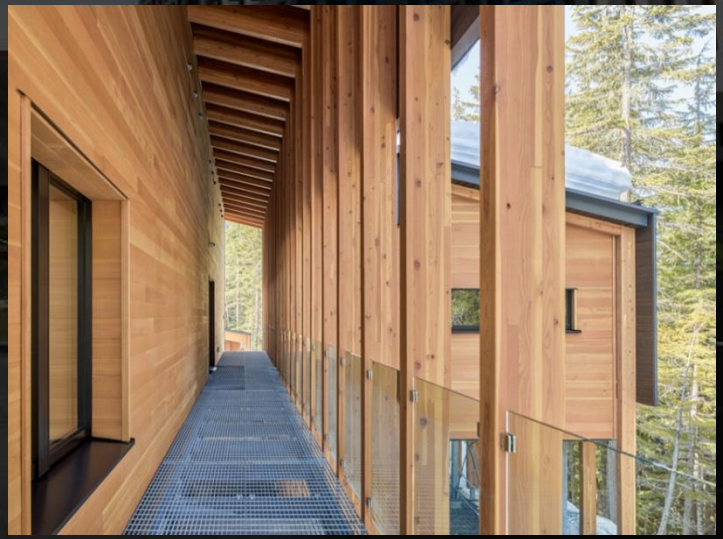

苏黎世围合式住宅


通州副中心“36m住区”规划


柏林百年住宅

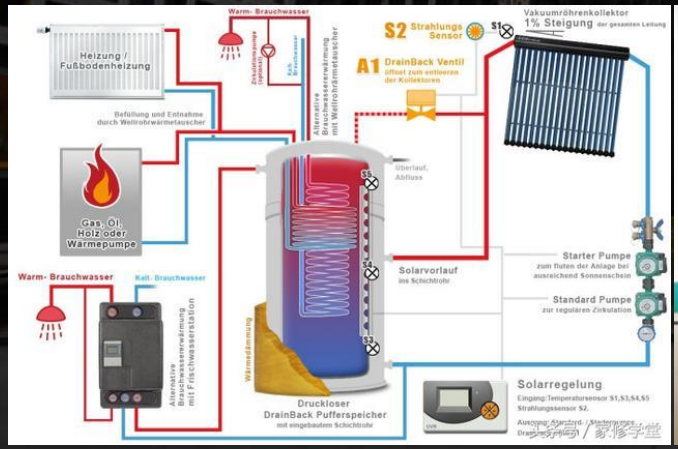
4、材料 建材与建造的低碳化，建筑全寿命周期评价

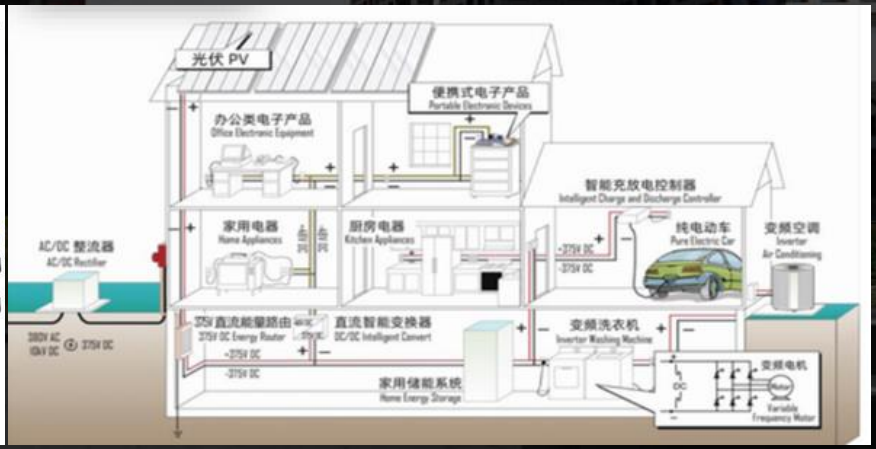
- 虽然ISO 16745标准定义的是建筑运营阶段碳排放的计量、报告和核证。但从达成碳中和目标的要求看，建材与建造阶段的碳排放也无法忽略
- 传统低蕴能建材（砖、木、石、生土等）的值得重新审视



5、能效 满足需求前提下的降低能耗

- 建筑和建筑能源需求的特征决定了它非常有利于利用低品位能源和可再生能源
- 低烟策略：热泵技术是最有潜力的建筑供能技术之一
- 全电化、直流化是建筑未来能源系统的发展方向



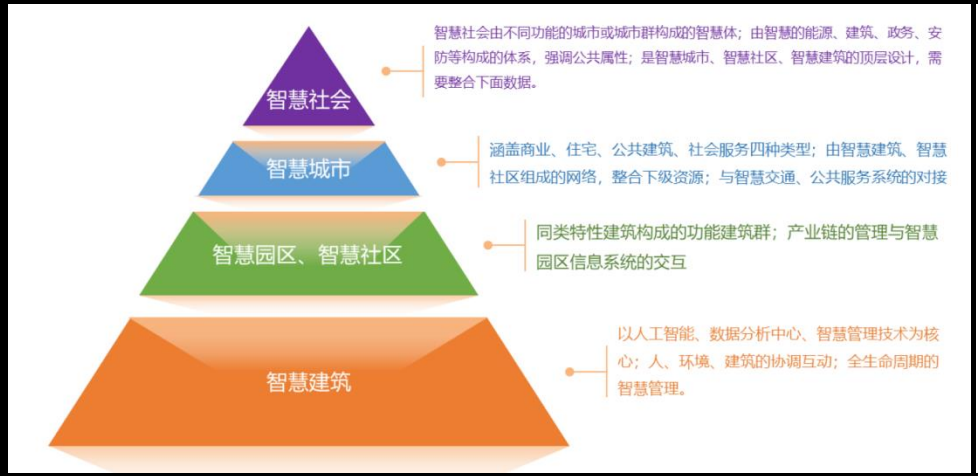


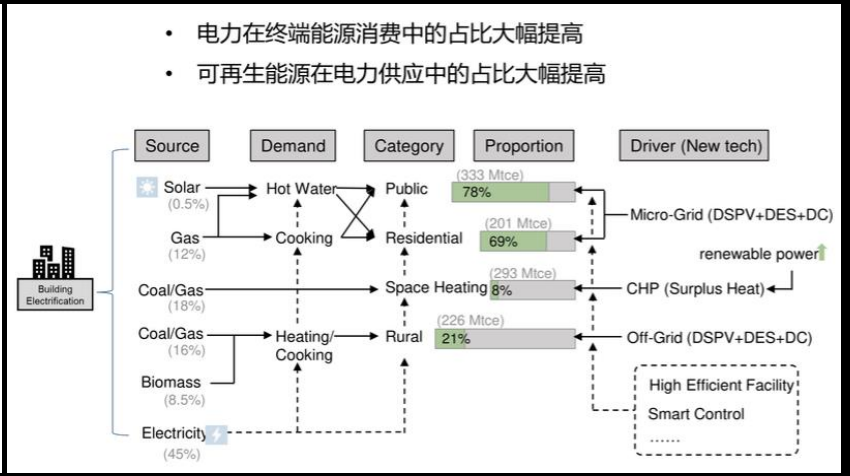
6、既有建筑节能改造

- 中国的建筑总量已超过670亿m2，若以碳中和的目标衡量，所有既有建筑都未达到理想节能状态
- 既有建筑的节能改造应探索市场化的推动措施

7、智慧建筑、智慧城市将有力支持碳中和目标

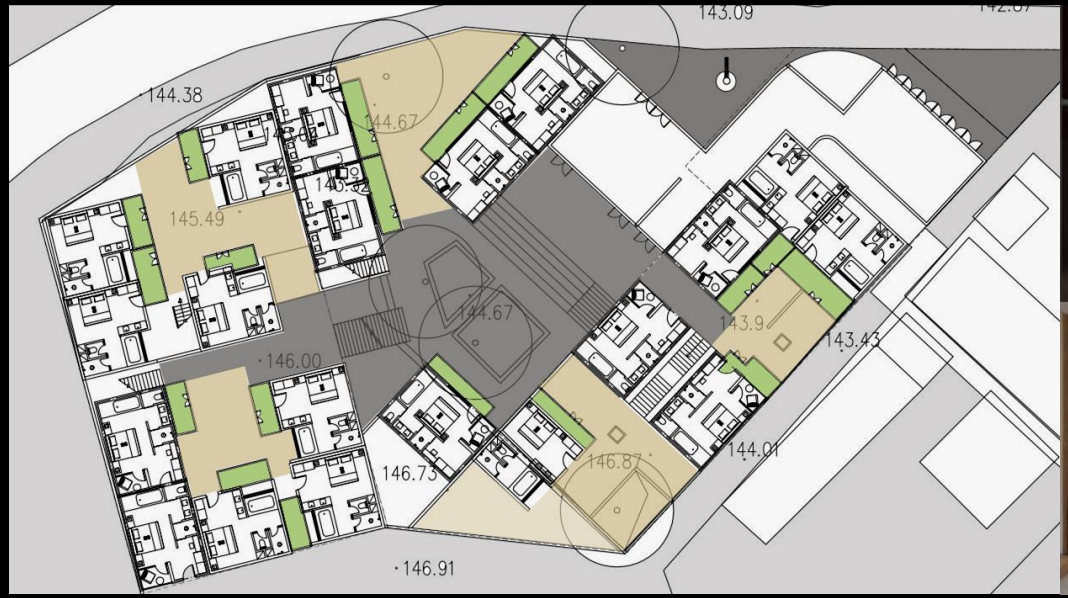
- 虚拟的数字世界仍是为实体的经济、社会和人服务的，BDT（建筑数字孪生）、SIM（城市信息模型）可以为能效管理提供有力支持，例如智能电网等
- 目前商业开发项目中，能够实施的大多属于智能建筑范畴；智慧建筑、智慧园区仍处在探索阶段；构建智慧城市可能是未来10年的目标





三、当代置业对未来居住的探索——两个案例

- 低影响开发——房山区度假酒店项目
- 低技术策略应用：使用本地材料、回收材料降低环境影响，使用可再生能源减少碳排放

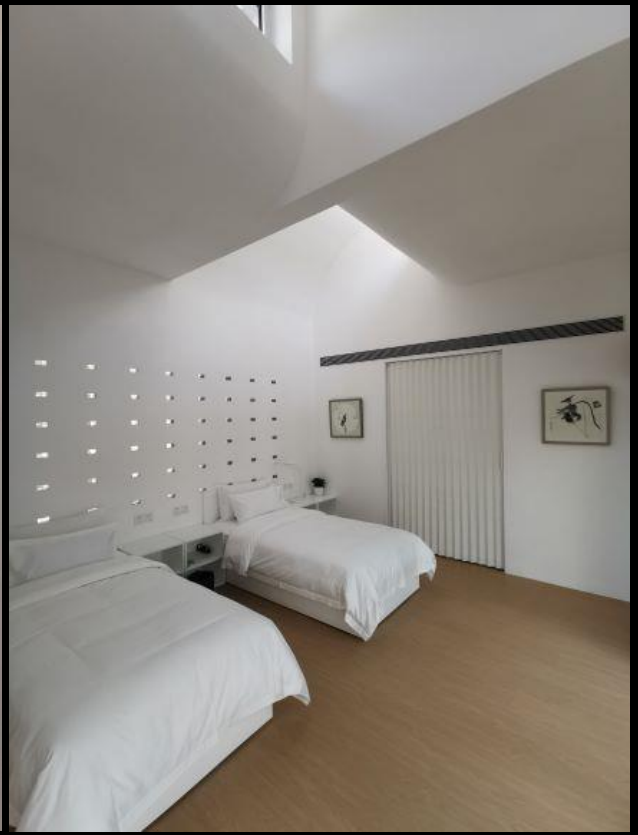


房山区度假酒店项目

- 被动设计：建造可持续的低碳建筑
- 夏季以通风、遮阳，半室外灰空间等被动设计保证室内舒适温度，辅以空调降温；冬季采用低温辐射供暖系统




自然采光：让更多的光线进入室内

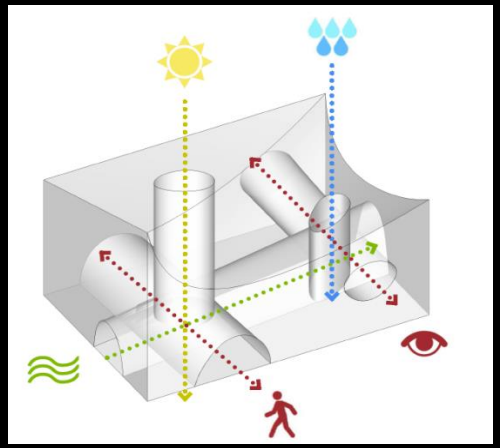


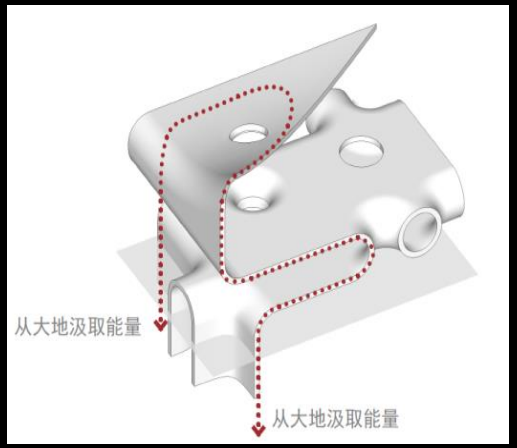
通州当代府——居住综合体

- 住区业态包括住宅、写字楼、商业，还有一座建筑艺术博物馆
- 以数字社区为建设目标，博物馆的设计标准为碳中和建筑

博物馆的设计以“能量流动”作为建筑形态生成的创意

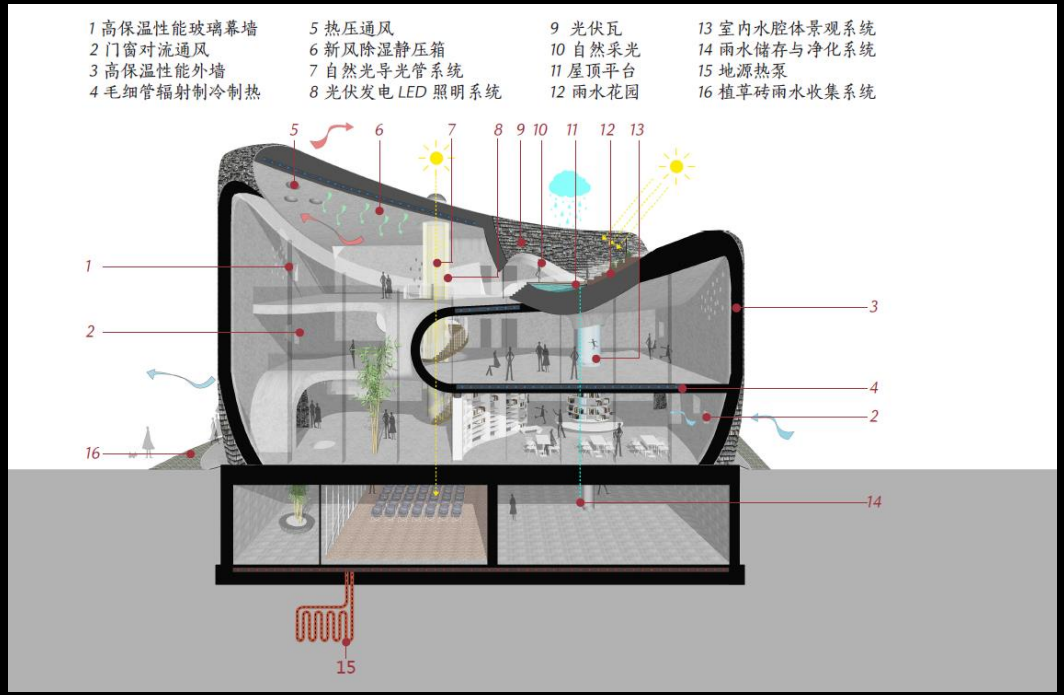
- 以超低能耗为建筑物理模型，以主动式建筑策略实现舒适健康、节约能源、环境友好的三重目标
- 主动式建筑策略——基于环境感知的智能化控制，让建筑系统与室内外环境动态适应
- 采暖、制冷、通风、照明系统的选择要求以最高能效方案实现
- 可再生能源主要以屋顶的光伏发电系统

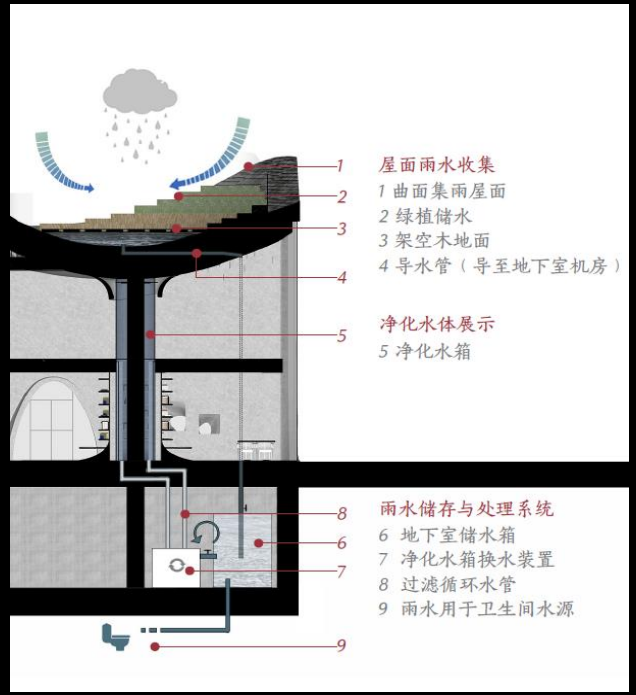




博物馆以零碳建筑为目标

- 基础是超低能耗被动设计，辅以光伏发电可再生能源系统，整栋建筑实现净零能耗





当代博物馆已获得多项先进建筑标准认证

- 主动建筑国际联盟对通州建筑艺术博物馆的主动建筑认证评定以及超低能耗建筑、PHI、健康建筑等认证
- 在室内环境、节约水资源等方面做到优秀；在光环境优化、可再生能源利用方面还有提升空间

DIPLOMA

This building has been designed and evaluated in accordance with the Active House vision, with specific focus of creating a building with good indoor comfort, low use of energy and with a minimum impact on the environment.

MOMA BUILDING & ARTS MUSEUM

Name of the project

YIYUAN EAST ROAD, TONGZHOU DISTRICT, BEIJING, CHINA

Address

The design of the above building has been carried out by:

MODERN LAND CO., LTD.

Developer

ZHUANG Weimin

Architect

JIA Zhaokai, LI Binbi, XU Qing, CUI Xiaogang, WANG Lei

Engineer

The design of the project has been evaluated in accordance with the Active House Specification and verified. Thereby the building has received the Active House Diploma and are allowed to use the Active House Label.

The verification has been carried out by:

AMDI SCHMIDT WORM, ARKITEMA CONSULT

Verifier

The building are included in a group of buildings that are approved to use the world wide quality stamp for comfortable and sustainable buildings.

29 MARCH 2018

Date

On behalf of the Active House Alliance

ACTIVE HOUSE LABEL

PROJECT INFORMATION

Project name: MOMA Building Arts Museum

Address: Yiyuan East Road, Tongzhou District, Beijing, China

Owner/investor: MOMA

Architect: Zhuang Weimin

Insert picture of project

Figure 1. Night front view (South) Figure 2. Bird view

Insert description of project

MOMA Building Arts Museum is the latest development by MOMA (Modern Land), one of the greenest property developers in China. The project's vision is a master piece demonstrating MOMA's 18 years efforts and achievements in low-energy, comfortable and healthy buildings, and create integration of building arts and technologies, integration of nature and building, and integration of srcture and equipment. The core technologies include 1) super insulation wall and roof, high perfromance windows, air tightness and thermal bridge control that meet passive house standard, 2) cutting-edge energy efficient HVAC technolgies such as ground source heat pump, radiant floor slab and chilled ceiling for both heting and cooling, dedicated outdoor air system with PM2.5 air purification and humidity control, as well as ground tunnel outdoor air precool and preheat, air heat recovery and demand controled ventilaion, and 3) others including LED lights powered by rooftop PV panels, abundant daylights with glare control at musuems and light tubes to the underground space, natural ventilation, rain water harvesting and reuse, etc. The building is also equipped with a robust building management system (BMS) for building system perfromance monitoring, control, optimization, metering and display, for example daylight and motion sensoring based lighting control, and radiant floor and chilled ceiling condensation prevention by accurate monitoring and control of room temperatuers and humidities.

Technical parameters:

Site area: 601 m²

Gross floor area: 1603 m², B1 464 m², L1–L3 1139 m²,

Building height: 13m

Function: Exhibition, auditorium, salon, cafe

Designed building life: 50 years

ACTIVE HOUSE LABEL

Active House – Indoor environment evaluation

Input parameters

Description of room	Museum L2
Date of calculation (DD/MM/YY)	19/03/2018
Is the space mechanically cooled?	Yes
What is the outdoor CO2 concentration	400

Results

Thermal environment	
Maximum operative temperature	3
Minimum operative temperature	3
Indoor air quality	
Standard fresh air supply, overall	2
Standard fresh air supply, summer	2
Standard fresh air supply, winter	2

Active House – Indoor environment evaluation

Input parameters

Description of room	Museum L3
Date of calculation (DD/MM/YY)	19/03/2018
Is the space mechanically cooled?	Yes
What is the outdoor CO2 concentration	400

Results

Thermal environment	
Maximum operative temperature	3
Minimum operative temperature	3
Indoor air quality	
Standard fresh air supply, overall	1
Standard fresh air supply, summer	1
Standard fresh air supply, winter	1

ACTIVE HOUSE LABEL

activehouse

RADAR

Insert radar result

Radar

Project

Ref

Results

Comfort

1.1 Daylight: 2.7 %

1.2 Thermal environment: Good level

1.3 Indoor air quality: < 750 ppm

Energy

2.1 Energy demand: 61.8 kWh/m²

2.2 Energy supply: 35.0 kWh/m²

2.3 Primary energy: 98.2 kWh/m²

Environment

3.1 Environmental loads: Good level

3.2 Freshwater: 42 % savings

3.3 Sust. construction: Better level

Contact information

Home owner(s) / client(s): MOMA

Architect: Zhuang Weimin

Engineer: Jia Zhaokai

Certified by: And More

Print

Results

Project informations

中国在2060实现碳中和是一个极具雄心的目标，对抑制全球气候变化具有决定性意义

建筑业对社会资源、能源的消费占据主导地位，降低碳排放任重道远

建筑作为能源的消费终端，具有主体分散、低密度、多品类等特征，更需要全社会的共同参与，共同努力降低碳排放

碳中和建筑的技术路线已远超出节能的概念，在建筑全寿命周期的各个阶段都还有巨大潜力

谢 谢！