



**Asia-Pacific
Economic Cooperation**


2013/SCSC/WKSP1/013

Overview of Building Codes, Building Energy Codes and Green Building Codes in China

Submitted by: China Academy of Building Research (CABR)



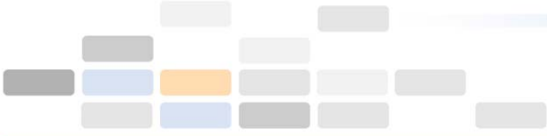

**Workshop on Sharing Experiences in the
Design and Implementation of Green
Building Codes
Lima, Peru
5-7 March 2013**



中國建築科學研究院
 China Academy of Building Research

March 6th 2013 Miraflores Hilton Hotel Lima, Peru
 A Joint APEC-ASEAN Workshop
 Sharing Experiences in the Design and Implementation of Green Building Codes

Overview of Building Codes, Building Energy Codes and Green Building Codes in China

Prof. XU WEI
Director of Institute of Building Environment and Energy Efficiency
China Academy of Building Research


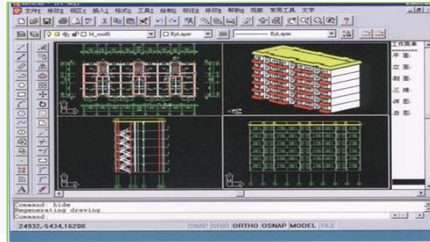

中國建築科學研究院
 China Academy of Building Research

China Academy of Building Research


- Founded in 1953
- 2179 research project completed
- More than 3000 researchers
- The turnover from main business was 7 billion RMB (1.2 billion USD) in 2012.

Main R&D field of CABR

- Building Machinery
- Foundation Engineering
- Building Structures
- Building Fire Prevention
- Building Materials
- Earthquake Engineering
- Building Software
- Building Physics and Energy system

China Academy of Building Research ²



中國建築科學研究院
 China Academy of Building Research

Main R&D field of CABR-IBEE Institute of Building Environment and Energy Efficiency

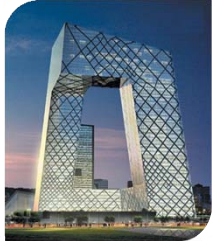
- Building acoustics
- Building lighting
- Building thermal environment
- Fenestration

- Central heating and heat metering
- HVAC equipment development and integration

- Renewable energy in building
- Building certification,
- Green building
- Energy management contract



中华人民共和国国家标准
GB
50189-2005
公共建筑节能设计标准
Design standard for energy efficiency of public buildings





China Academy of Building Research ³


中國建築科學研究院
 China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- China Building Law & Codes
- China Building Energy Codes & Standards Overview
- International Building Energy Codes & Standards Comparison Research
- Green Building Standards
- Incentive Policies of Green Building

China Academy of Building Research ⁴


 中國建築科學研究院
 China Academy of Building Research

China National Standardization system

China Standardization Law

- National Codes & Standards (Mandatory clause + Voluntary clause)
- Industry Codes & Standards (Mandatory clause + Voluntary clause)
- Local (Provincial) Codes & Standards (Mandatory or Voluntary)
- Society & Association Standards
- Corporation (Company) Standards

Mandatory: Health, personnel and property safety
 e.g: For the underground water source heat pump system, the water must be rejected into the same aquifer.

China Academy of Building Research ⁵


 中國建築科學研究院
 China Academy of Building Research

China National Standardization system

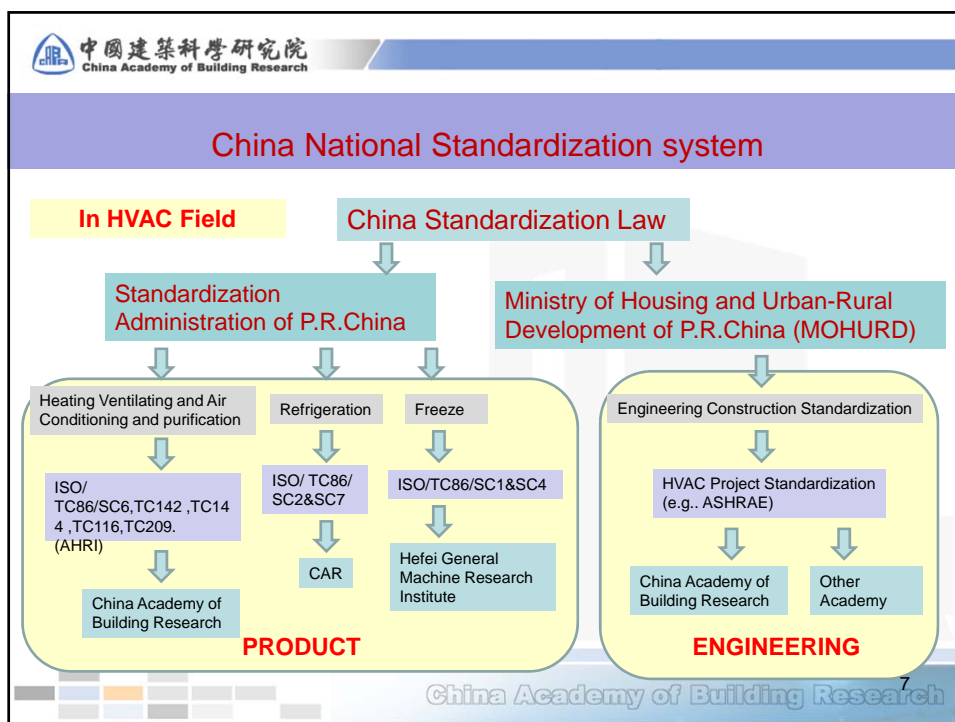
China


- Managed by the government
- Compiled by the leading academy (Institute)
- Codes and standards with Mandatory clauses + Voluntary clauses

U.S.





- Managed by the States & Societies.
- Compiled by the Societies.
- Technical Code (Law) + Recommended standards

China Academy of Building Research ⁶





中國建築科學研究院
China Academy of Building Research

Similarity:

- (1) PRC
- (2) Series number (number + year)
- (3) Chinese name and English name
- (4) Publication date, Implement date
- (5) Publication authority

China Academy of Building Research ⁹



中國建築科學研究院
China Academy of Building Research






Differences:

- (1) National Standards **VS** Construction Industry Standards (1,2,3 VS 4)
- (2) Approved by Ministry of Housing and Urban-Rural Development and General Administration of Quality Supervision, Inspection and Quarantine **VS** Approved by MOHURD (1,2,3 VS 4)
- (3) GB **VS** GB/T (1,2 VS 3)
GB=national standard T=recommend
- (4) English name: Code **VS** Standard

- National Codes & Standards (Mandatory clause + Voluntary clause)
- Industry Codes & Standards (Mandatory clause + Voluntary clause)

China Academy of Building Research ¹⁰


中國建築科學研究院
 China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- **China Building Law & Codes**
- China Building Energy Codes & Standards Overview
- International Building Energy Codes & Standards Comparison Research
- Green Building Standards
- Incentive Policies of Green Building

China Academy of Building Research 11


中國建築科學研究院
 China Academy of Building Research

Building Law of P.R.China

- Approved by People's Congress Standing Committee on Nov 1st 1997
- Revised on 2011.

Main Content

- Endowments
- project bidding and contracting
- construction supervision
- construction safety management
- construction engineering quality management,
- legal liability



China Academy of Building Research 12

中國建築科學研究院
China Academy of Building Research

China Building Codes



Code for design of building foundation	GB50007-2011
Load code for the design of building structures	GB50009-2012
Code for design of concrete structures	GB50010-2010
Code for seismic design of buildings	GB50011-2011
Code for design of building water supply and drainage	GB50015-2003
Code for fire protection design of buildings	GB50016-2006
Standard for lighting design of buildings	GB50034-2004
Design code for heating ventilation and air conditioning of civil buildings	GB50736-2012
etc	

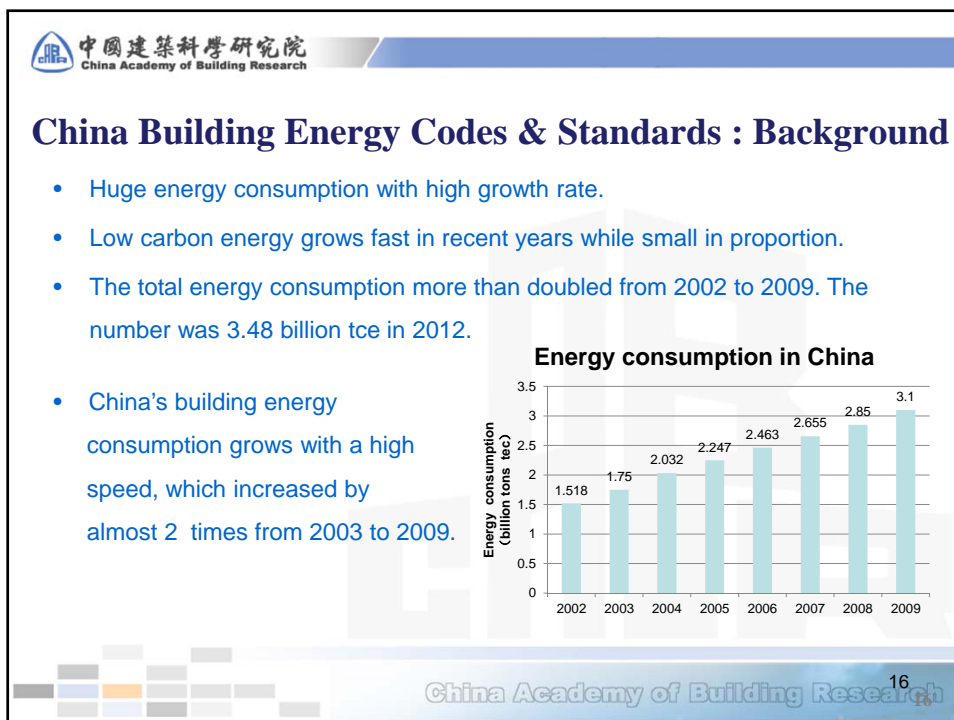
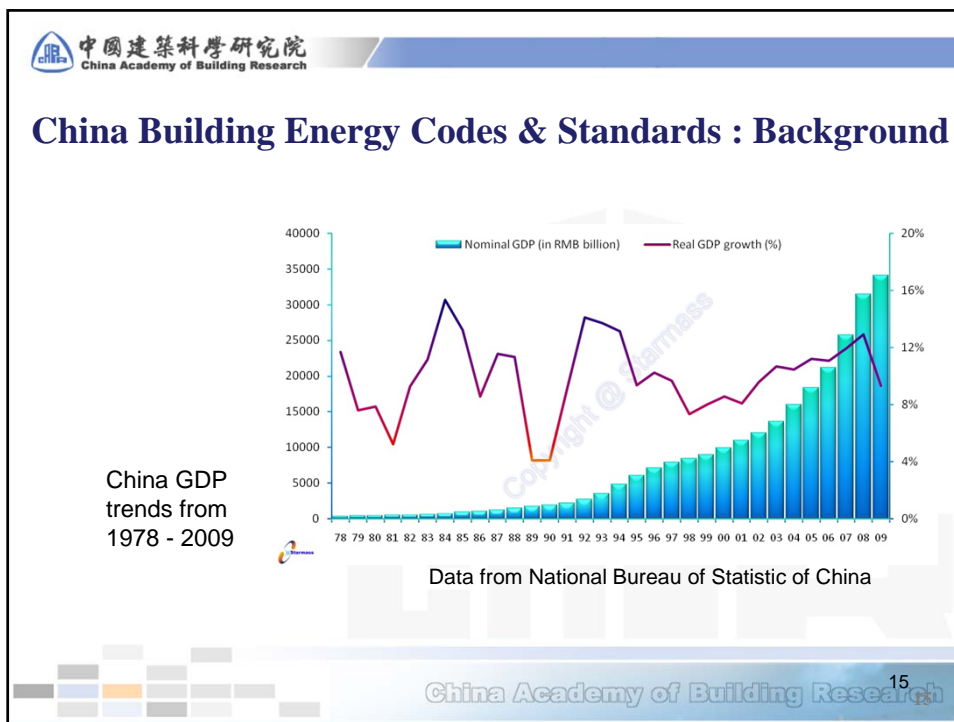
China Academy of Building Research 13

中國建築科學研究院
China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- China Building Law & Codes
- **China Building Energy Codes & Standards Overview**
- International Building Energy Codes & Standards Comparison Research
- Green Building Standards
- Incentive Policies of Green Building

China Academy of Building Research 14



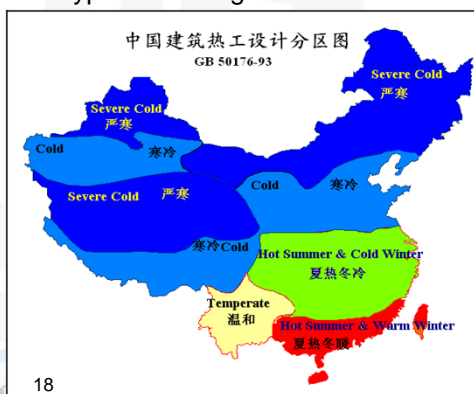
China Building Energy Codes & Standards : Background

- According to the forecast of Chinese Academy of Engineering(CAE), China's energy consumption will reach 7.9 billion tons tec in 2020 if it keeps the increasing with 8.9% every year.
- So China must use more energy efficiency technologies and renewable energy in buildings.



China Building Energy Codes & Standards : Start

- MOUHRD had started to organize the building energy efficiency work since 1980's
- Principle of considering the region & type of building
 - North -> Central -> South
 - Residential -> Public
 - New Construction -> Retrofit



中國建築科學研究院
China Academy of Building Research

Building Classification

```

graph TD
    Building[建筑 Building] --> Civil[民用建筑 Civil Building]
    Building --> Industrial[工业建筑 Industrial Building]
    Civil --> Residential[居住建筑 Residential building]
    Civil --> Public[公共建筑 Public Building]
        
```

- Residential Building:
 - House, apartment, dormitory, the residential part in mixing building, nursery, kindergarten, etc.
- Public Building:
 - Office Building
 - Shopping, Finance Building
 - Hotel and place of entertainment
 - Buildings for education, science, culture, Gymnasium and public health services
 - Buildings for communication, post and broadcasting
 - Buildings for transportation (Airport, Train station, etc.)

• Building includes Civil Building and Industrial Building

• Civil Building includes Residential Building and Public Building

19

中國建築科學研究院
China Academy of Building Research

China Building Energy Codes & Standards

UDC
中华人民共和国行业标准
JGJ
JGJ 26-2010
备案号: J 997-2010

严寒和寒冷地区居住建筑节能设计标准
Design standard for energy efficiency of residential buildings in severe cold and cold zones

Latest version.
Implementing on
Aug.1st, 2010

2010-03-18 发布 2010-08-01 实施
中华人民共和国住房和城乡建设部 发布

中华人民共和国行业标准
夏热冬冷地区居住建筑节能设计标准
Design Standard for Energy Efficiency of Residential Buildings in Hot Summer and Cold Winter Zone

Latest version.
Implementing on
Aug.1st, 2010

JGJ 134-2001
J 114-2001

UDC
中华人民共和国国家标准
GB
GB 50189-2005

公共建筑节能设计标准
Design standard for energy efficiency of public buildings

Implementing on Jul
1st, 2005;
Under revised

2005-04-04 发布 2005-07-01 实施
中华人民共和国住房和城乡建设部 联合发布
中华人民共和国国家质量监督检验检疫总局

For residential building: Based on climate zone.

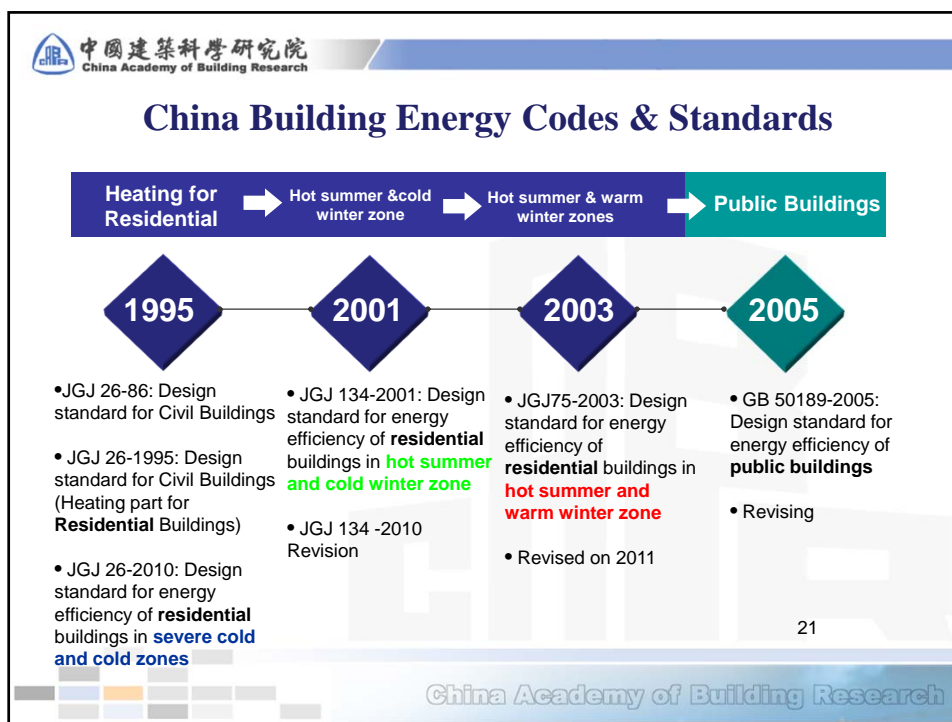
For Public building: Not based on climate zone.

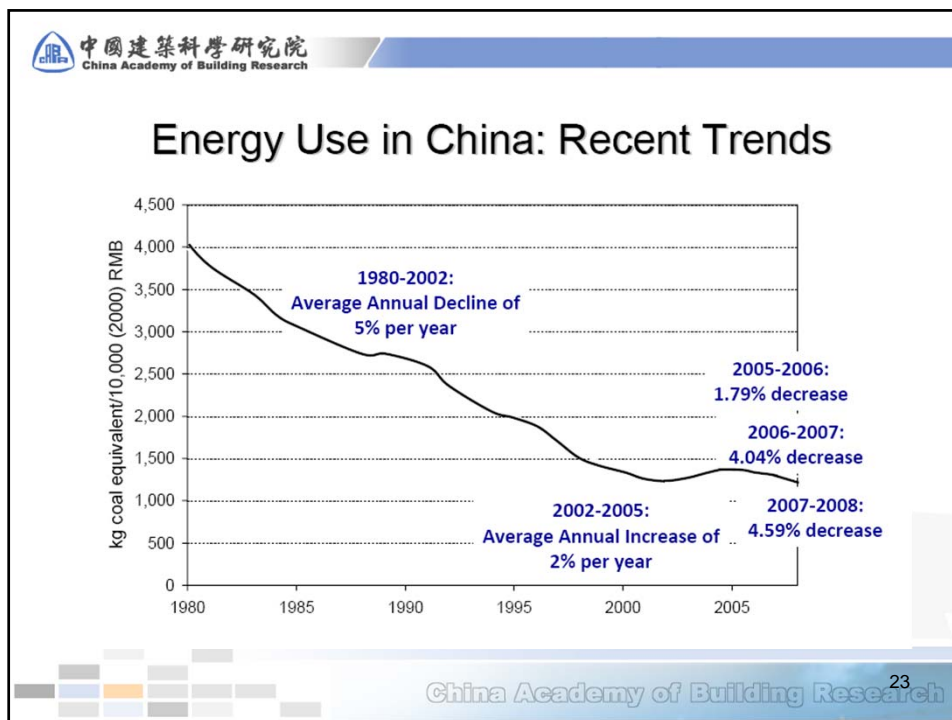
中华人民共和国行业标准
夏热冬暖地区居住建筑节能设计标准
Design standard for energy efficiency of residential buildings in hot summer and warm winter zone

Implementing on
Oct.1st, 2003
Under revised

JGJ 75-2003
J 275-2003

China Academy of Building Research



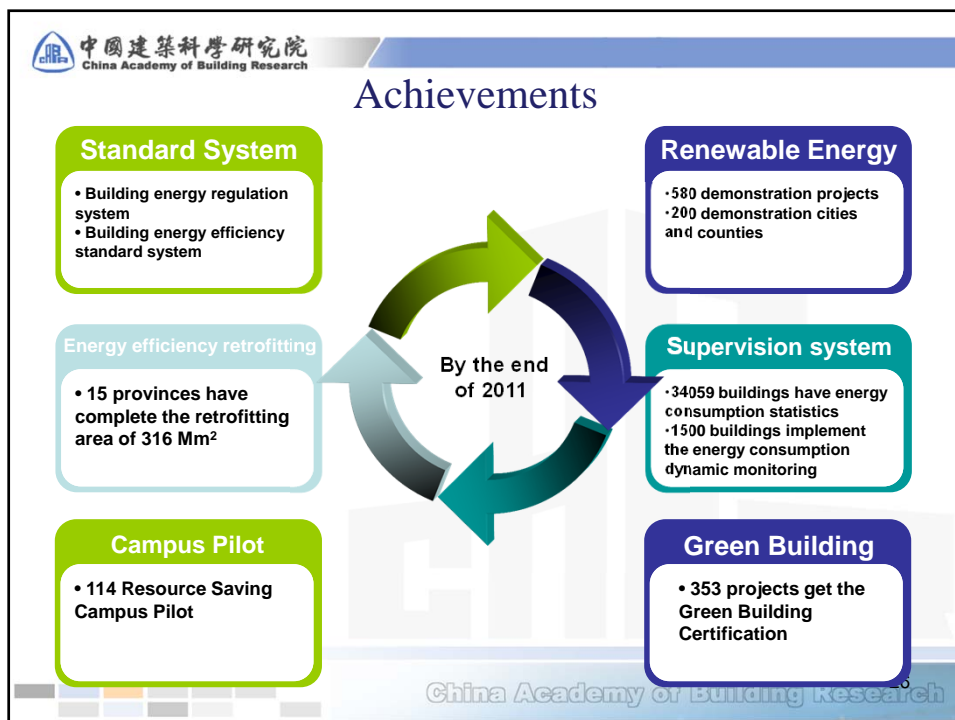
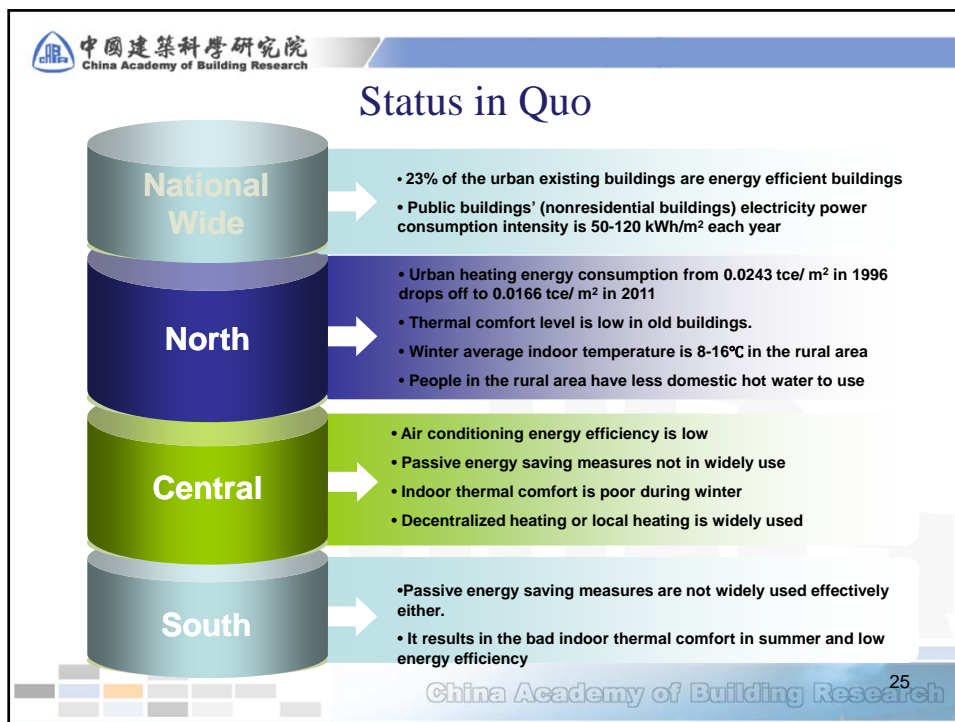


中國建築科學研究院
China Academy of Building Research

Laws and Regulations

- Law of the People's Republic of China on Conserving Energy
- Law of the People's Republic of China on Renewable Energies
- Regulation on Civil Building Energy Conservation.
- 12th Five Year Plan for the National Economy and Social Development
- Long-term Planning on Renewable Energy Development
- 12th Five Year Energy Saving and Emission Reduction Comprehensive Work Program

China Academy of Building Research 24





中國建築科學研究院
China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- China Building Law & Codes
- China Building Energy Codes & Standards Overview
- **International Building Energy Codes & Standards Comparison Research**
- Green Building Standards
- Incentive Policies of Green Building

China Academy of Building Research 27



中國建築科學研究院
China Academy of Building Research

Background


International:

- Low-carbon and sustainable development
- Building energy efficiency codes upgrade
- Zero-Energy Building.

Domestic:

- Building energy efficiency codes upgrade
- Building energy efficiency VS Cost effective

China Academy of Building Research 28


中國建築科學研究院
 China Academy of Building Research

Comparison Economies

China Experts:

CHINA CONSTRUCTION INDUSTRY ASSOCIATION

China-U.S. Clean Energy Research Center experts in China


CABR

Asia-pacific Partnership experts in China

China-German BEE collaboration








29

China Academy of Building Research


中國建築科學研究院
 China Academy of Building Research

Comparison Economies

International Organizations

	ASHRAE		
	PNNL		
	EF China sustainable energy program		
	CIBSE		
	BRE		
	SHASE		
	REHVA		

North America:

- U.S.

Europe:

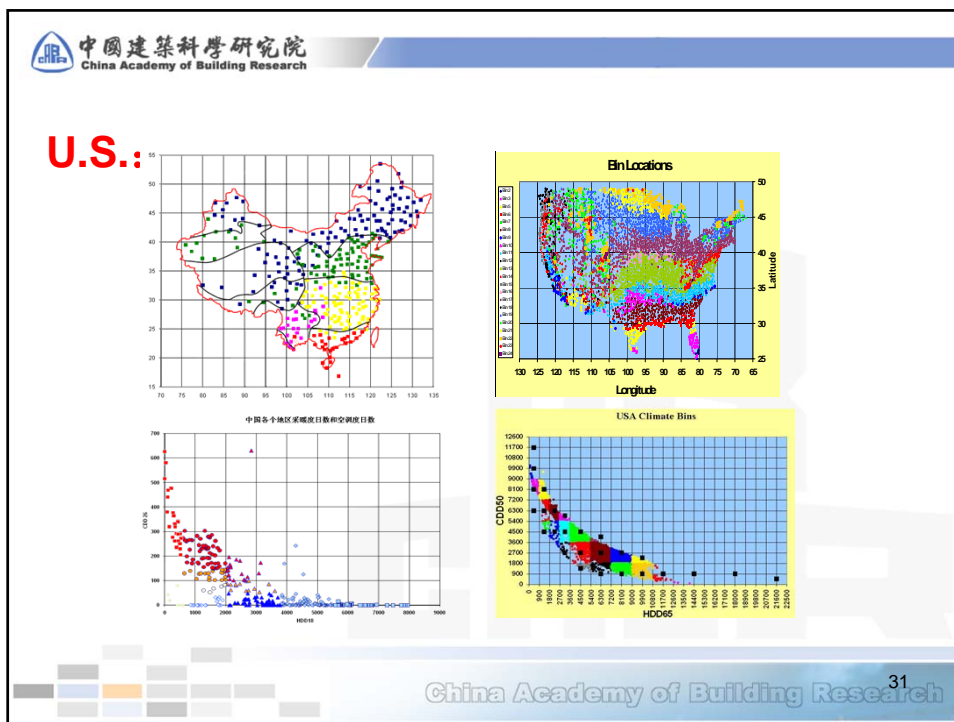
- EPBD
- UK
- Germany
- Denmark

Asia:

- Japan

30

China Academy of Building Research



中國建築科學研究院
China Academy of Building Research

EU:

- ◆ Energy Performance of Building Directive 2002
- ◆ Energy Performance of Building Directive 2010

Energy Performance of Buildings Directive II

COMMISSION OF THE EUROPEAN COMMUNITIES

Bromels, 13.11.2008
COM(2008) 759 final
2008/0223 (COD)

Proposal for a
DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
on the energy performance of buildings
(recast)

1.2. EU policy objectives and the buildings sector

In January 2007, the Commission proposed a comprehensive climate and energy package¹ containing targets of 20-20-20% reduction of energy consumption and greenhouse gas emissions, and increased share of renewables by 2020. This was endorsed by the 2007 Spring European Council. These targets have been adopted in the light of the mounting scientific evidence of climate change, high energy prices and the growing import energy dependency and its possible geo-political repercussions. The reduction of energy consumption can clearly make a significant contribution to achieving these targets. The buildings sector provides many cost-efficient opportunities for action, while at the same time contributing to the welfare of EU citizens.

China Academy of Building Research 32

中國建築科學研究院
China Academy of Building Research

UK: BUILDING REGULATIONS-PART I

The Building Regulations 2000
Conservation of fuel and power

L1A Conservation of fuel and power in new dwellings

L1B Conservation of fuel and power in existing dwellings

L2A Conservation of fuel and power in new buildings other than dwellings

L2B Conservation of fuel and power in existing buildings other than dwellings

Coming into effect 1 October 2010

ONLINE VERSION

China Academy of Building Research 33

中國建築科學研究院
China Academy of Building Research

Japan

Criteria for Clients on the Rationalization of Energy Use for Buildings (CCREUB)

Design and Construction Guidelines on the Rationalization of Energy Use for Houses (DCGREUH)

Criteria for Clients on the Rationalization of Energy Use for Houses (CCREUH)

PAL = $\frac{\text{周边区域年负荷 (MJ/年)}}{\text{周边区域面积 (m}^2\text{)}}$

CEC = $\frac{\text{实际年能耗量 (MJ/年)}}{\text{计算年能耗量 (MJ/年)}}$

PAL (Perimeter Annual Load):

CEC (Coefficient of Energy Consumption):

180
160
140
120
100
80
60
40
20
0

0 1 2 3 4 5 6 7 8

热损失系数 (W/mK)

— I地域 (札幌)
— II地域 (盛岡)
— III地域 (仙台)
— M地域 (東京)
— V地域 (鹿児島)

昭和55年基準
平成4年基準
平成11年基準
R2000年基準

China Academy of Building Research 34

International collaboration

Date	Location	Organization	Meeting TOPIC
August-10	US-ASHRAE headquarter	ASHRAE	China-US building energy efficiency codes and standards workshop
March-11	China-CABR headquarter		China-US building energy efficiency and carbon emission workshop
October-11	UK-BRE headquarter	BRE	China-UK building energy codes and standards seminar
	UK-CIBSE headquarter	CIBSE	China-UK building energy codes and standards seminar
	Belgium, Brussels	REHVA	REHVA Technical Seminar on Buildings Related EU Regulations and Projects
	Belgium, Brussels	European Commission-Directorate-General for Energy.	China-EU Building Energy Policies Workshop
August-12	US.Richland	PNNL	Building Codes
	US.DC	USGBC	LEED V3
	US.DC	USDOE	Federal Energy Management Program
	US.San Franciscio	LBNL	ASHRAE 90.1

35




中國建築科學研究院
 China Academy of Building Research

Outcome

(1) Research and Comparison on International Building energy codes & Standards

(2) Suggestions to MOHURD



- More clear goal of energy saving
- Mid-long term planning
- Advanced design guide
- More content in the code (eg. Renewable energy)
- More detailed climate zones
- Adjust the calculation baseline according to the situation now

37

China Academy of Building Research


中國建築科學研究院
 China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- China Building Law & Codes
- China Building Energy Codes & Standards Overview
- International Building Energy Codes & Standards Comparison Research
- **Green Building Standards**
- Incentive Policies of Green Building

38

China Academy of Building Research

中國建築科學研究院
China Academy of Building Research

Green Building

- Certification based on the National Standard
Evaluation Standard for Green Building
 - Management System
 - Technical System
- Feature
- Related Organizations



Under Revising , the new version will be 2013

39

中國建築科學研究院
China Academy of Building Research

Green Building

Management system

- 2007, Regulation on green building evaluation, MOC. (now is MOHURD)
- 2009, Regulation on one star & two star green building evaluation , MOHURD.





40

中國建築科學研究院
China Academy of Building Research

Green Building

Technical system

- 2006, National Standard Evaluation standard for green building
- 2007, Specific technical guideline for green building evaluation
- 2008, Additional regulations of Specific technical guideline for green building evaluation (Design part)
- 2009, Additional regulations of Specific technical guideline for green building evaluation (Operation part)



41

中國建築科學研究院
China Academy of Building Research

Green Building

Evaluation system

Grade	Basic Requirements	General Requirements						Priority Requirements (Preference)
		Land efficiency	Energy efficiency	Water efficiency	Material efficiency	IAQ	O&M	
		6	10	6	5	6	3	12
★	Conform	3	4	3	3	3	1	0
★★	Conform	4	6	4	3	4	2	5
★★★	Conform	5	8	5	4	5	2	8

42

China Academy of Building Research

中國建築科學研究院
China Academy of Building Research

Green Building



Certification of Green Building Design Label



住房和城乡建设部
2008-3



Certification of Green Building Design Label

43

China Academy of Building Research

中國建築科學研究院
China Academy of Building Research

Green Building Certified Process

```

    graph TD
      A[Submit document & Pay registration fee] --> B[Format Checkup]
      B -- Fail --> B1[Announcement of Format Checkup]
      B -- Pass --> C[Pay accreditation fees]
      C --> D[Examined by Green Building Accreditation Committee]
      D -- Fail --> D1[Announcement of Examination by the Committee]
      D -- Pass --> E[Post to the public & Remark]
      E -- Objection could not be solved --> E1[Judged by the Management Organization]
      E -- Unanimity --> F[Proclaim & Issue]
      G[Authorized by MOUHRD] --> D
    
```

44

China Academy of Building Research


 中國建築科學研究院
 China Academy of Building Research

Green Building

- Management Organizations
 - MOHURD-CSTC
 - Ministry of Housing and Urban-Rural Development (MOHURD)
 - Center of Science and Technology of Construction “Green Building Label” Management Office
 - CSUS-GBC
 - Chinese Society for Urban Studies
 - Green Building Center
- Professional Organization
 - China Green Building Council
 - China Academy of Building Research

45

China Academy of Building Research


 中國建築科學研究院
 China Academy of Building Research

China Green Building Council


 CHiNAGBC



Specialty Groups

CGBC secretariat

Local Branch

Younger Committee

46

China Academy of Building Research


中國建築科學研究院
 China Academy of Building Research

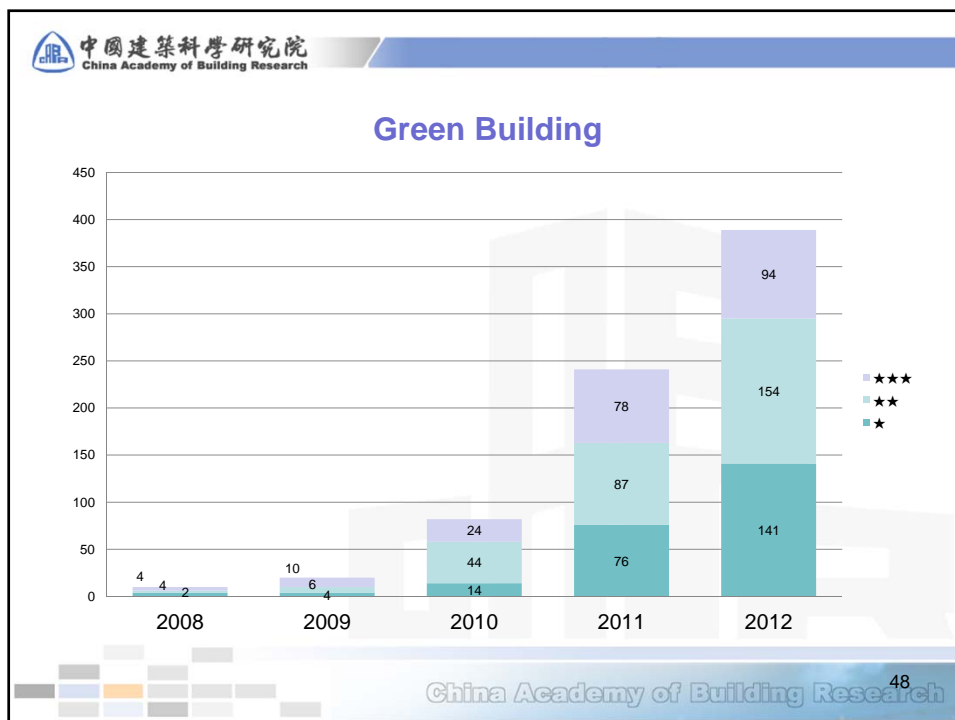
China Green Building Council

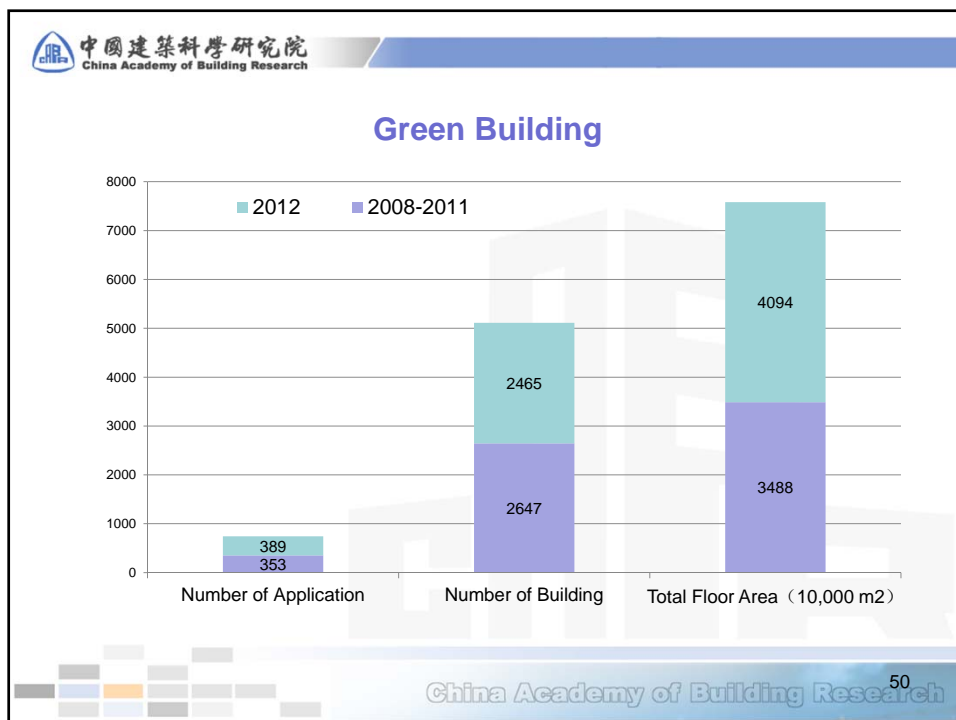
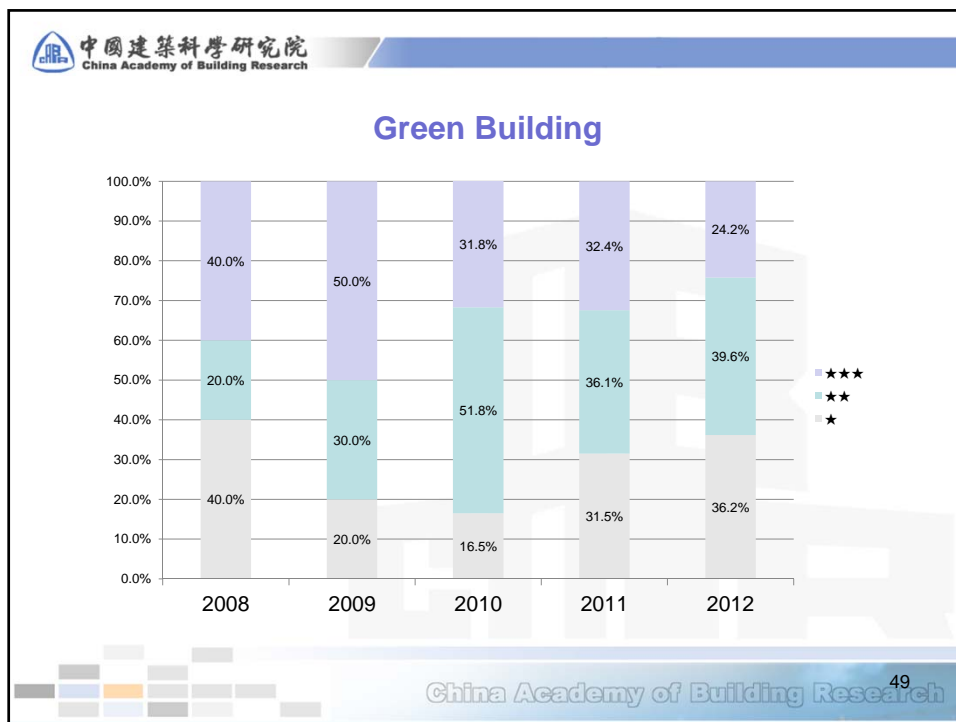

CINAGBC

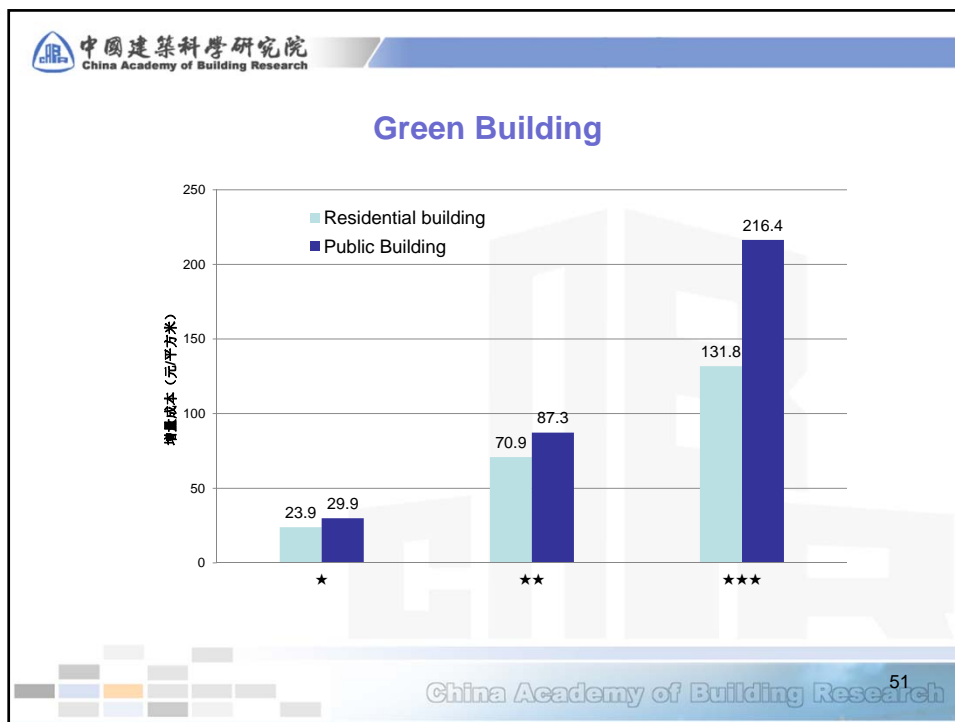
- **Specialty Groups**
 - Green Industrial Building
 - Green Industry
 - Green Intelligent Building
 - Green Building Structure
 - Green Building Technology
 - Green Construction
 - Green Humanity
 - Policy & Regulation
 - Green Building Plan & Design
 - Green Campus
 - Green Building Material
 - Marsh & Solid Greening
 - Green Public Building
 - Green Theory and Practice
- **Local Branch**
 - 10 provinces
 - 5 cities
- **Younger Committee**

47

China Academy of Building Research







中國建築科學研究院
China Academy of Building Research

Contents

- China National Standardization (codes & standards) system
- China Building Law & Codes
- China Building Energy Codes & Standards Overview
- International Building Energy Codes & Standards Comparison Research
- Green Building Standards
- Incentive Policies of Green Building

China Academy of Building Research 52


 中國建築科學研究院
 China Academy of Building Research

Incentive Policies of Green Building

Ministry of Science and Technology, 2006.

<National Outline for Medium and Long Term S&T Development 2006-2020>

The key research topics include green building design technology, building energy-saving technology and equipment, building integrated renewable energy devices technology, exquisite construction and green construction technology and equipment, energy-saving and green building materials and building energy-saving technical standard.

Leading by the outline, more than 300 million USD are supporting the R&D of building energy efficiency and green building in the 11th Five Year Plan in China from the central government.

53

China Academy of Building Research


 中國建築科學研究院
 China Academy of Building Research

Incentive Policies of Green Building



Nov 2009. Copenhagen.

Carbon emission per GDP intensity decrease 40% to 45% in 2020 compared with 2005

54

China Academy of Building Research

2012 Award criteria: ¥45/
 中國建築科學研究院
 China Academy of Building Research
 for two-star green building, ¥80/
 71

Incentive Policies of Green Building

Implementing opinions on accelerate Green Building development

2012-167. by Ministry of Finance and Ministry of Housing and Urban-Rural Development

(1) Subsidy: **¥45/(7 USD)** for two-star green building, **¥80/(13 USD)** for three-star green building. (large city as Beijing and Shanghai have city-level subsidy besides the central government subsidy)

(2) subsidy for the green ecological district meet the necessary requirements. **The subsidy benchmark is ¥50,000,000. (8,000,000 USD)**



55

China Academy of Building Research

中國建築科學研究院
 China Academy of Building Research

Incentive Policies of Green Building

Green Building Action Plan


2013-No.1. by State Council

Main Objective

- 1 billion m2 new green building in 12th Five Year Plan (2011-2015)
- By the end of 2015, 20% of urban building are green building.
- Heat metering and energy efficiency retrofit, 400 million m2 in northern cold and severe cold area.
- Residential building energy efficiency retrofit, 50 million m2 in hot summer and cold winter area.
- Public building and Intuitional office building retrofit 120 million m2.
- Rural area, building retrofit 400,000 units.

56

China Academy of Building Research


 中國建築科學研究院
 China Academy of Building Research

Incentive Policies of Green Building

Green Building Action Plan

2013-No.1. by State Council

Three kinds of buildings must comply with green building standards since 2014.

- Invested by the government. including government offices, schools, hospitals, museums, science museums, stadiums;
- Indemnificatory apartment in provincial capital and special cities
- large public buildings which with single building area over 20,000 square meters

including the airport, railway stations, hotels, restaurants, shopping malls, office.

57

China Academy of Building Research



 中國建築科學研究院
 China Academy of Building Research

CONCLUSION

- Standardization management structure of China.
- Mandatory building energy codes have a very positive impact responding to climate change and global warming in building sector. It also work as the most important part of green building.
- Voluntary green building with the financial incentives will growing quickly in the future. In a certain time, some cities could make it implement mandatory.

58

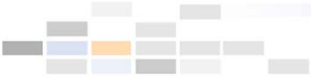
China Academy of Building Research



中國建築科學研究院
China Academy of Building Research

Thank you

Prof. XU WEI
Director of Institute of Building Environment and Energy Efficiency
China Academy of Building Research
86-10-84270181
xuwei19@126.com



China Academy of Building Research ⁵⁹