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# Green Mark Scheme in Singapore: A Comparative Analysis between Singapore and China

**Hongyuan Jia** Ph.D. Student

Faculty of Urban Construction and Environmental Engineering

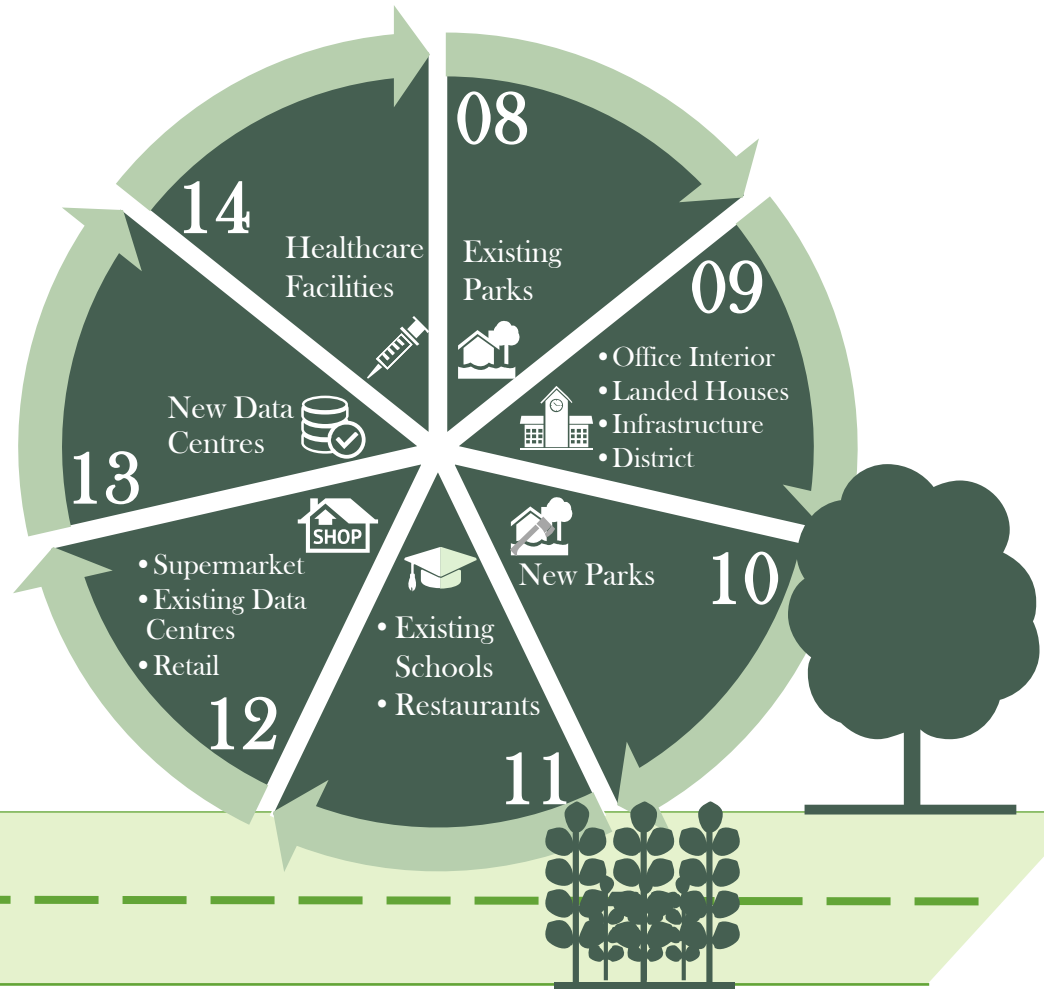
Chongqing University

Email: [Jiahony@Outlook.com](mailto:Jiahony@Outlook.com)

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# GMI RB/1.0 Green Mark Development Route



Singapore Building & Construction Authority (BCA) launched Green Mark (GM) Scheme in 2005.

Now, Green Mark Scheme was considerably extended into a big system including 17 different types of buildings

# GMI RB/1.0 Green Mark Incentives

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- **GM GFA Incentive**

- Introduced on April 2009. Only for Gold<sup>plus</sup> and Platinum project to grant additional floor area over and above the Master Plan Gross Plot Ratio (GPR) control

- **GMIS-DP (Design Prototype)**

- Introduced on December 2014 with \$5 million. The potential development should be in its preliminary concept design stage and target to achieve beyond Green Mark Platinum, demonstrating energy savings of at least 40% better than the current base code or equivalent.

- **GMIS-NB (New Building)**

- Introduced on December 2006 with \$20 million. For development achieved Gold rating with a GFA of at least 2,000 m<sup>2</sup>

- **GMIS-EBP (Existing Buildings and Premises)**

- Effective from October 2014. To provide a cash incentive amounting to up to 50% the Qualifying Costs incurred solely for the purposes of energy efficiency improvements in existing buildings and premises.

- **BREEF**

- Introduced on 2011. help building owners with the high upfront capital required for energy efficiency (EE) retrofits



# GMI RB/1.0 Achievements of Green Mark

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In 2012

**11%**

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As of 2012, a total of nearly 800 construction projects received GM certification, with a total floor area equivalent to 11% of Singapore total available land area.



# Promotion of Green Building in China

**20%**

In end of 2015, 20% of urban new buildings shall be green buildings

*(Green Building Action Plan, 2013/01)*

**50%**

In 2020, 50% of new buildings shall be green buildings

*(National new urbanization planning (2014-2020), 2014/03)*

**GBL  
2014**

GBL 2014 was published in April, 2014 and implemented in January 1<sup>st</sup>, 2015

*(Assessment standard for green building, 2014/04)*

**4.8 bn**

2020, the total consumption of primary energy shall be limited under 4.8 billion tons

*(Energy Development Strategy Action Plan, 2014/06)*

**Peak**

In around 2030, carbon emissions of China reaches the peak

*(Sino-US Joint Statement on Climate Change, 2014/11)*

## GB/T 50378-2006

Land Conservation

Energy Conservation

Water Conservation

Material Conservation

Indoor Air Quality

Operation Management



## GB/T 50378-2014

Land Conservation

Energy Conservation

Water Conservation

Material Conservation

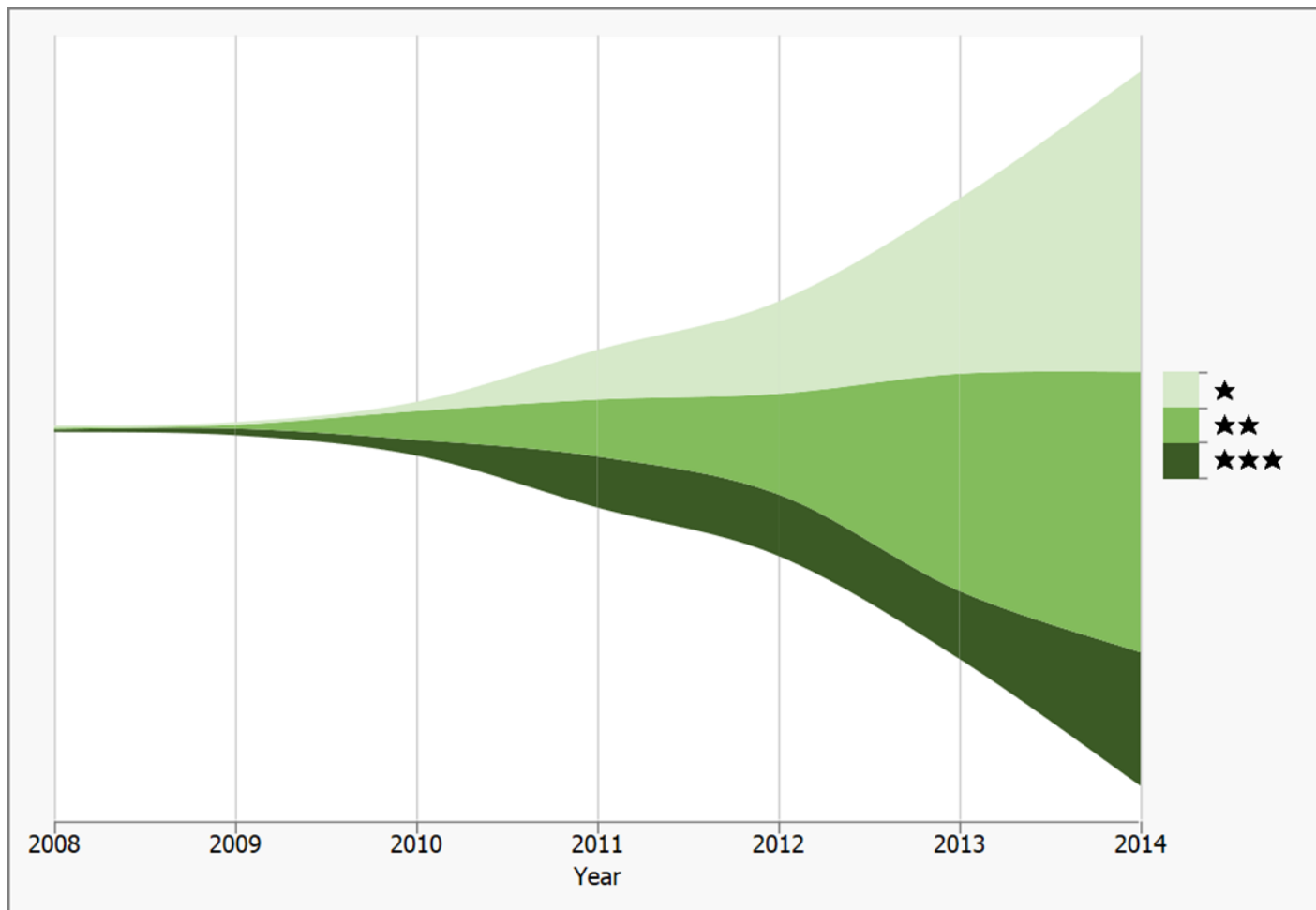
Indoor Air Quality

Construction Management

Operation

Innovation





By the end of 2014, China's total number of green building projects has reached **2538**, with an overall building area of **290** million m<sup>2</sup>

## Sino-Singapore Tianjin Eco-city



In 2007, a collaborative agreement was signed between the governments of China and Singapore to jointly develop a socially harmonious, environmentally friendly and resource-conserving city in China. The two governments co-founded the Sino-Singapore Tianjin Eco-City which aims to achieve 100% green buildings as one of its targets in the building development.

## Green Mark International for Use in China



In order to promote the development of Green Mark Scheme in China, BCA issued BCA Green Mark International for Residential Buildings for Use in China (version RB/1.0, referred to as GMI RB/1.0) in 2013, in which requirements on building envelope and other terms were modified according to the actual conditions in China to make it easier to use.

BCA Green Mark International for Residential  
Buildings

新加坡建设局绿色建筑标志国际版住宅建筑评定标准

Version 版本 RB/1.0

(For use in China 适用于中国项目)





Singapore Green  
Mark International



China Green  
Building Label

GMI RB/1.0



BCA GREEN MARK

GBL 2014





4

Platinum (90 and above)

Gold<sup>Plus</sup> (85 to <90)

Gold (75 to &lt;85)

Certified (50 to &lt;75)

3

★★★ (80 and above)

★★ (60 to &lt;80)

★ (50 to 60)

In GMI RB/1.0, **30** points in category 'Energy efficiency', and **20** points in other categories are the minimum requirements to be eligible for certification.

The design of the building development shall achieve not less than **40** scores in each category in GBL 2014,



## + Total Scores

## + Weighted Total Scores



### Valid Tender Documents with a Site Verification



### Design Assessment



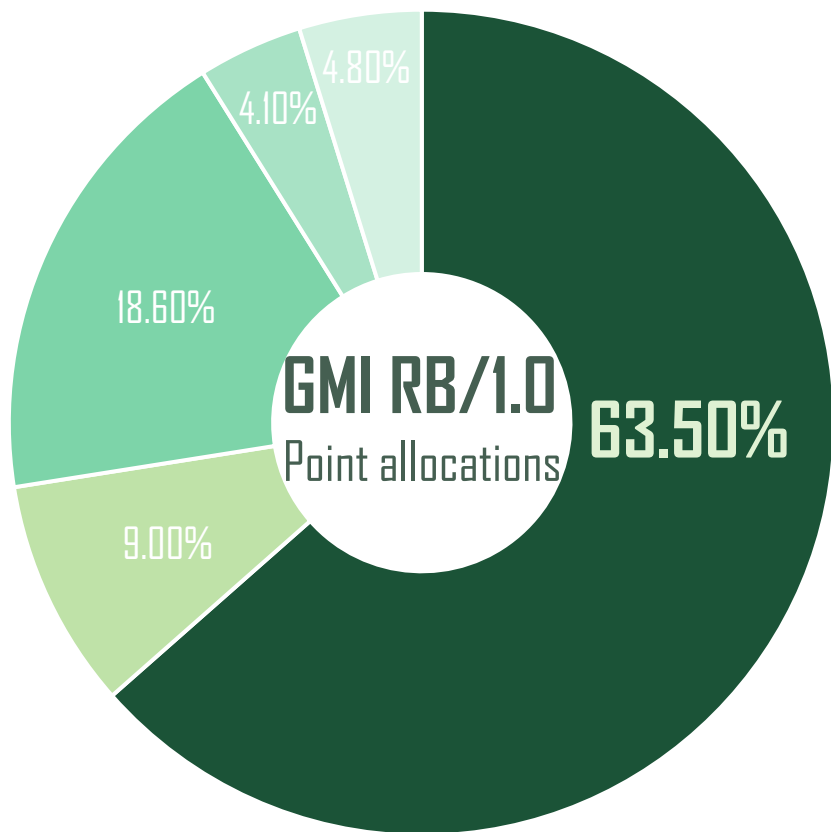
### Operation Assessment

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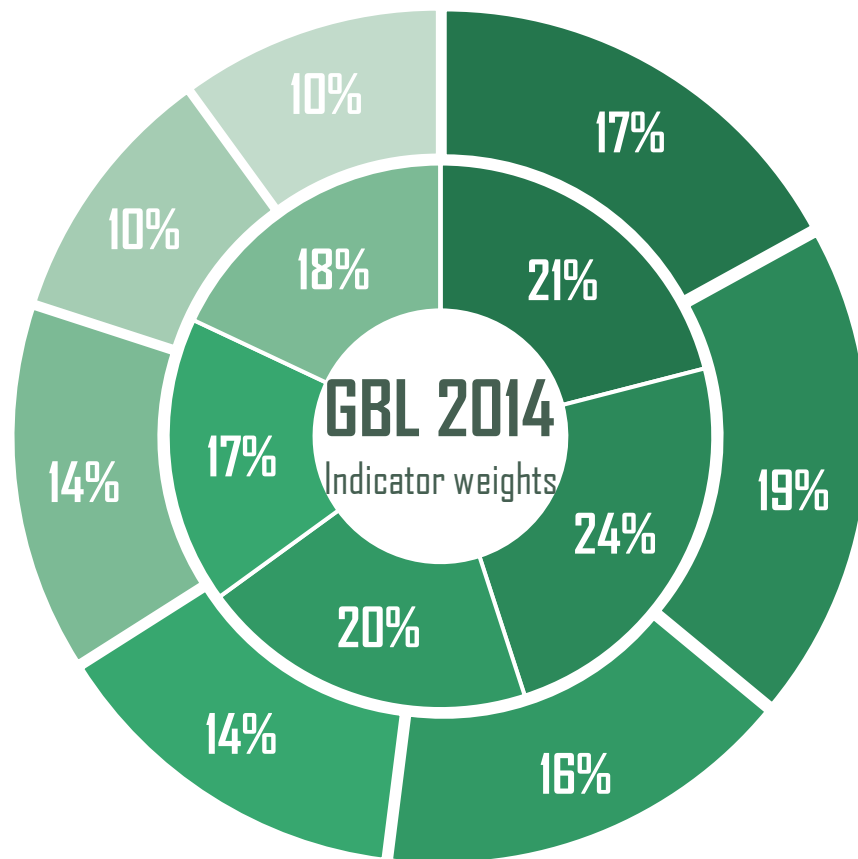
For projects certified by Green Mark, a site verification upon project completion would be conducted by BCA, including review of delivery records, updated documents on green features, building energy performance data and photographic evidences

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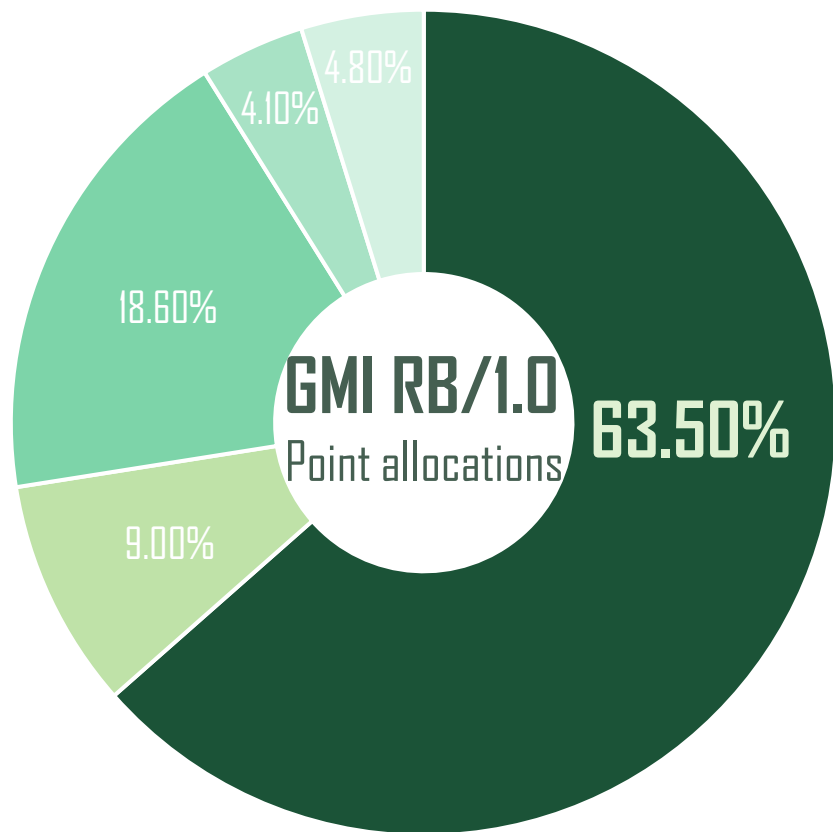
The operation assessment can be carried out after project completion at least one year



- Energy efficiency
- Environment protection
- Other green features
- Water efficiency
- Indoor environment quality



- Land saving
- Water saving
- Indoor environment
- Operation management
- Energy saving
- Material saving
- Construction management



■ Energy efficiency

■ Water efficiency

■ Environment protection

■ Indoor environment quality

■ Other green features



## Extremely Uneven Distribution

Total Point Allocated = **145**Green Mark Max Score = **120**

## Bonus Points



20 points for solar energy and other renewable energy (in Energy efficiency)



7 points for self-cleaning façade system, infiltration trenches and etc.(in Other green Features)

**GM Highlights Energy  
Efficiency Requirements**



**Fusel Energy Shortage  
in Singapore**



**Petroleum  
Shortage**



**Coal  
Shortage**



**Rich in Solar Energy**





## Approximately Even Distributed



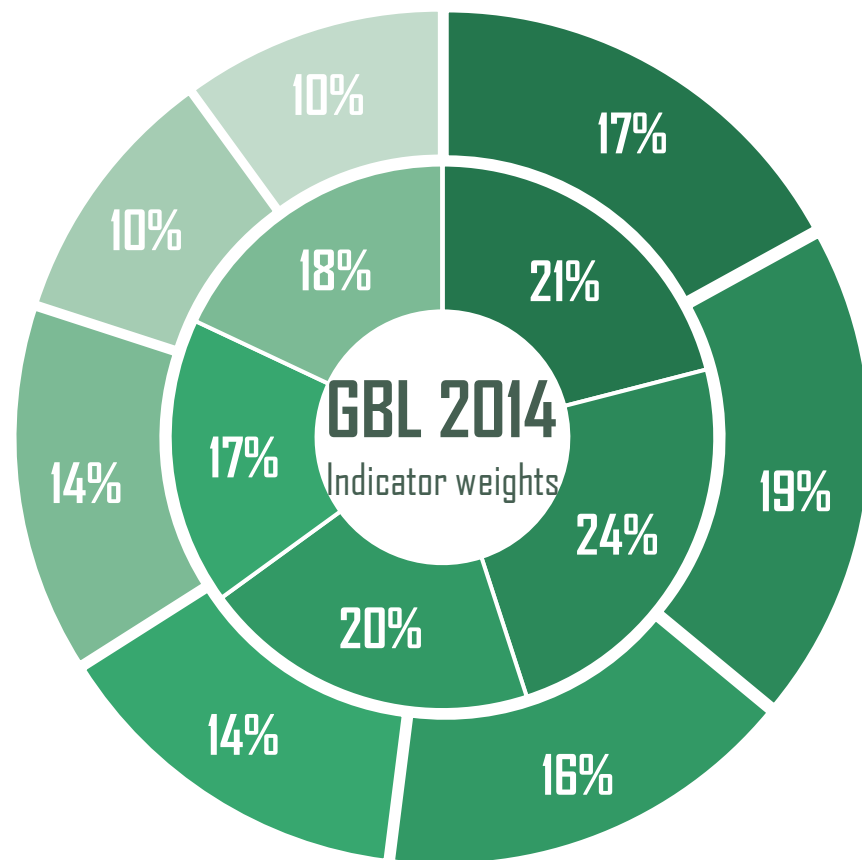
Different categories in different assessment stages



## Bonus Points



Up to 10 bonus scores can be achieved in category 'Innovation'



■ Land saving

■ Water saving

■ Indoor environment

■ Operation management

■ Energy saving

■ Material saving

■ Construction management



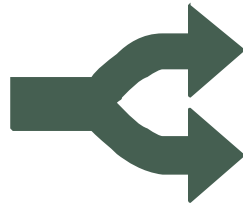
Overall Consideration  
General Balanced







BCA GREEN MARK



Energy



Water



Indoor environment



Outdoor environment




Site




Material




Innovation


Category	Credit	GMI RB/1.0	GBL 2014
 <b>Energy</b>	Thermal performance	✓	✓
	HVAC	✓	✓
	Efficient lighting	✓	✓
	Equipment efficiency	✓	✓
	Passive design	✓	✓
	Renewable energy	✓	✓




Category	Credit	GMI RB/1.0	GBL 2014
 <b>Water</b>	Water management planning	✗	✓
	Water monitor	✓	✓
	Water efficient fittings	✓	✓
	Irrigation system	✓	✓
	Non-traditional water utilization	✓	✓





Category	Credit	GMI RB/1.0	GBL 2014
 <b>Indoor environment</b>	Noise insulation	✓	✓
	Natural ventilation	✓	✓
	Daylighting	✓	✓
	Thermal comfort	✓	✓
	Indoor air pollutants	✓	✓
	Shading	✗	✓
	Indoor air quality in wet areas	✓	✗

Category	Credit	GMI RB/1.0	GBL 2014
 <b>Outdoor environment</b>	Urban heat island control	✗	✓
	Greenery	✓	✓
	Public services access	✓	✓
	Public transport	✓	✓
	Noise control	✗	✓



Category	Credit	GMI RB/1.0	GBL 2014
 <b>Site</b>	Site ecology	✗	✓
	Site safety	✗	✓
	Sustainable construction	✓	✓
	Land use per captia	✗	✓



Category	Credit	GMI RB/1.0	GBL 2014
 <b>Material</b>	Sustainable material	✓	✓
	High performance structure	✗	✓
	Low impact structure	✗	✓
	Concrete	✓	✓
	Minimum decoration	✗	✓
 <b>Innovation</b>	Green features and innovations	✓	✓





## Both cover life cycle of building development



## Requirements on land use

GBL 2014 has a specific category on requirements about land conservation, such as restrictions on residential land per capita index.

Singapore attaches great importance to efficient and intensive land use.

However, its land use policies are issued by other government departments, such as Singapore Land Authority (SLA), and therefore BCA did not take requirements on land use in the preparation of Green Mark Scheme.







## Quantitative indicators

GMI RB/1.0 contains much more distinctive quantitative indicators than GBL 2014, which to a certain extent, simplify the assessment process of GM.

- EEI (Energy Efficiency Index)

To measure the energy consumption of public facilities

- GnP (Greenery Provision)

To comprehensive evaluate the afforestation of the development

- CUI (Concrete Usage Index)

To encourage designs with efficient use of concrete for building components

$$CUI = \text{Concrete Volume in m}^3 / \text{Constructed Floor Area in m}^2$$





## New energy development and utilization

### GMI RB/1.0



1 point for 3 kWp (kilo Watt peak) of solar energy (Up to 20 points).

1 point for every 1% replacement of electricity (for common facilities) by renewable energy

As for utilization of other kind renewable energy, developers shall coordinate with BCA and the points scored are based on the EEI and replacement percentage of electricity by renewable energy source.


### GBL 2014



4 points for system that provides no less than 20% of domestic hot water by renewable energy (Up to 10 points). GBL 2014 encourages all kinds of renewable energy utilization



### Lack concern of China conditions in GMI

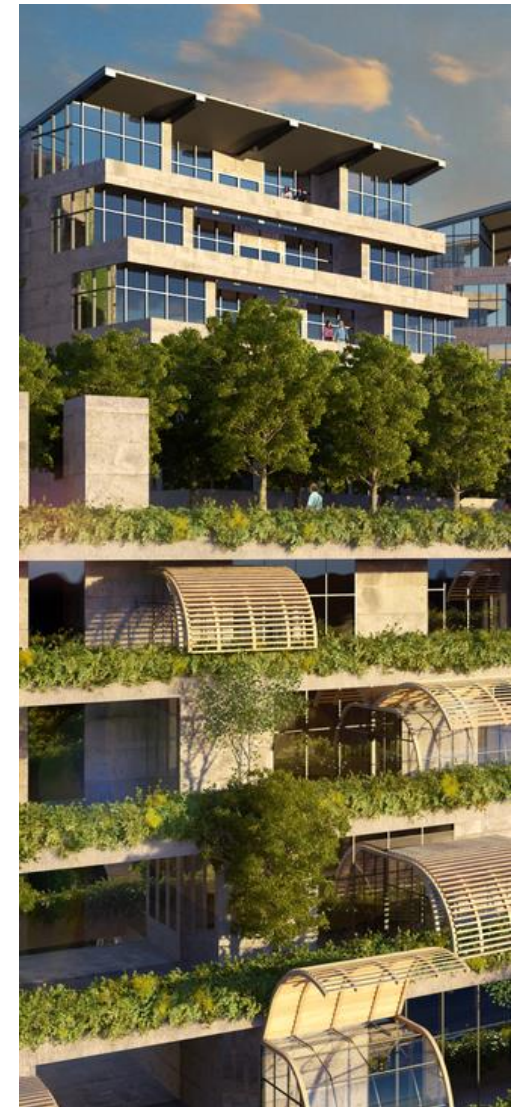
 Great attention is paid to achieve good natural ventilation for better indoor comfort. An area-weighted average wind velocity of not less than 0.60 m/s within the unit is set as a prerequisite requirement for Green Mark Platinum certification.

The climate in China differs from region to region because of the country's highly complex topography. It is extremely difficult for some regions in China to meet the requirements.

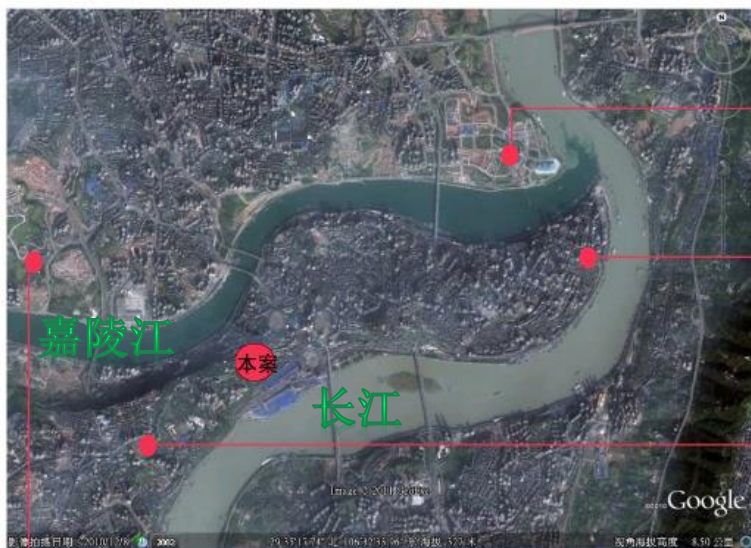


- A building development under construction in Chongqing, China applying for certification of GMI RB/1.0 and GBL 2014.
- Green Mark Certified level as a mandatory requirement from the Singapore BCA.
- Floor area: 27200 m<sup>2</sup>
- Total building area: 48300 m<sup>2</sup>

Green Building Consultant: Chongqing University



本案位于重庆市渝中区，鹅岭正街。本案区位属于重庆渝中区中心区域，交通四通八达，进入主城中心商业、休闲、娱乐、工作区都十分便利。



鸿恩寺森林公园  
直线距离3.26公里



江北嘴中央商务区 (CBD)  
直线距离3.94公里



解放碑中心购物广场  
直线距离4.2公里



大坪正街  
直线距离2.49公里



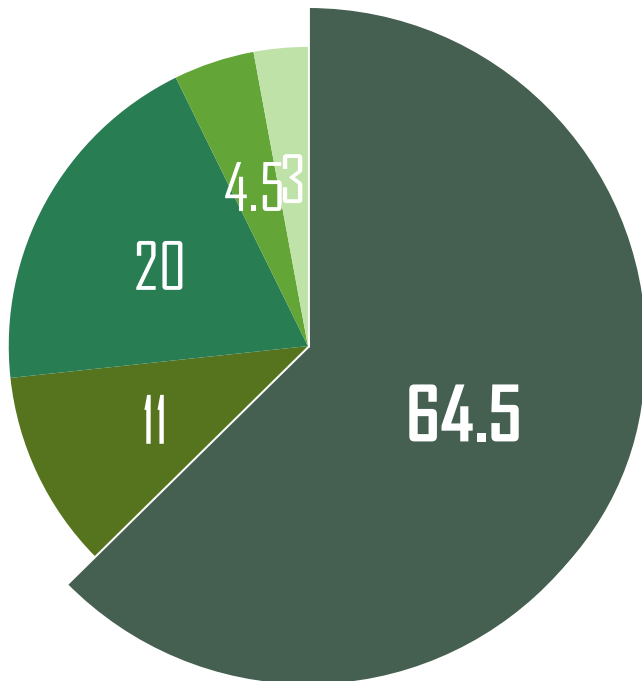




Total Points:

**103** > 90 (Green Mark Platinum)

- GM Highlights Energy Efficiency Requirements
- Fuses Energy Shortage in Singapore



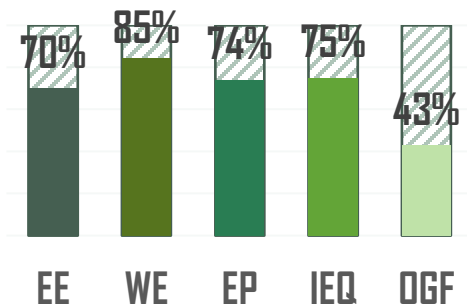
Energy efficiency (EE)




Water efficiency (WE)

Environmental protection (EP)

Indoor environmental quality (IEQ)

Other green features (OGF)



Indicators	Values	Requirements	GM Scores
 <b>GnP</b>	13.2	1.0 $\leq$ GnP < 2.0, 1 point 2.0 $\leq$ GnP < 2.5, 2 points 2.5 $\leq$ GnP < 3.0, 3 points GnP $\geq$ 3.0, 4 points	4
 <b>CUI</b>	0.305	$\leq$ 0.35 for Platinum award	5
 <b>EEI</b>	32.47	Bonus credit	1

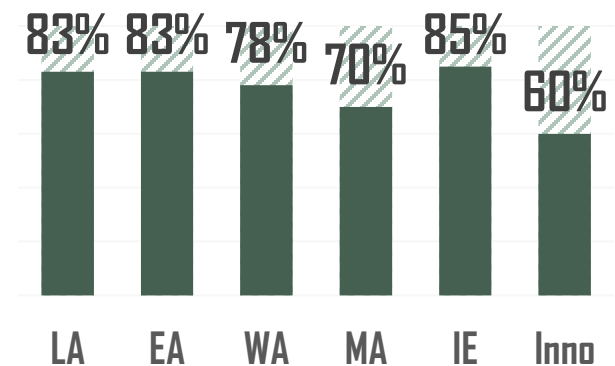
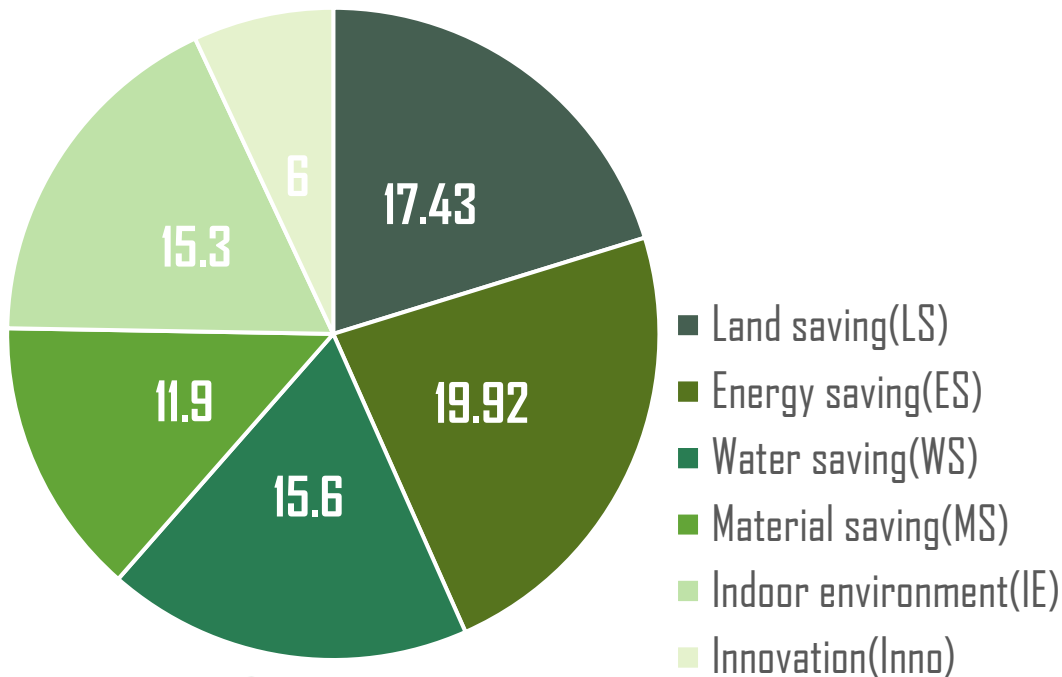




Total Points:

**86.15** > 80 (Green Building 3-Star Label)

- Overall consideration, general balanced





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# Thanks !

**Hongyuan Jia** Ph.D. Student

Faculty of Urban Construction and Environmental Engineering

Chongqing University

Email: [Jiahony@Outlook.com](mailto:Jiahony@Outlook.com)

