



SINGAPORE

LEADING THE WAY
FOR GREEN BUILDINGS
IN THE TROPICS

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Image courtesy of PARKROYAL on Pickering

INTRODUCTION

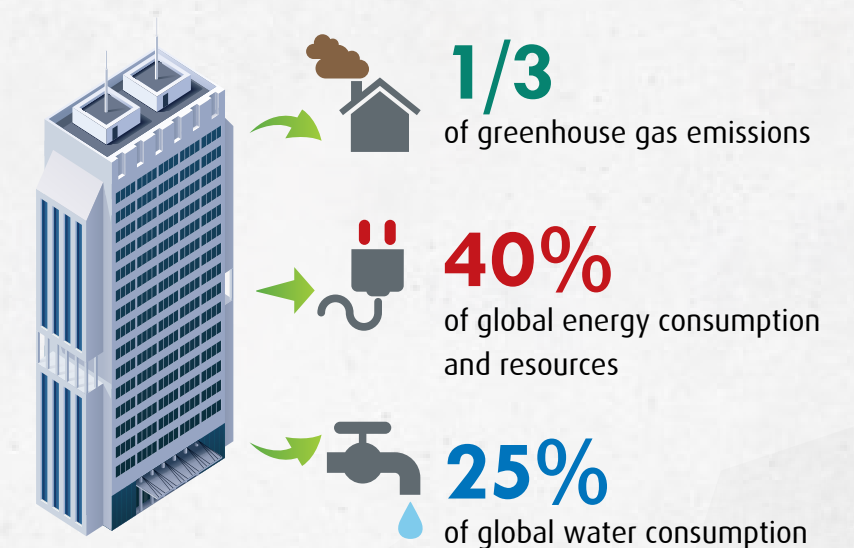
Come 2030, Singapore will be much greener than today when 80 per cent of its buildings is certified green - that is, energy and water efficient, with a high quality and healthy indoor environment, integrated with green spaces and constructed from eco-friendly materials.

This is the goal set by the Inter-Ministerial Committee on Sustainable Development (IMCSD) which charts Singapore's national sustainability strategies. To achieve this goal, the Building and Construction Authority (BCA) of Singapore has set out specific initiatives to lead Singapore's building and construction industry in greening our built environment.

In Singapore's densely built-up urban environment, with limited land space and few natural resources, greening buildings is vital to sustainability. It is one of the most effective ways for a city to reduce its carbon footprint in the long term, whether in terms of energy and water efficiency, waste reduction or the use of sustainable materials.

In 2005, BCA kick-started its drive to green Singapore's physical landscape by launching the BCA Green Mark: a rating system to evaluate a building's environmental impact and recognise its sustainability performance, designed specifically for buildings in the tropics.

Buildings account for:



The energy consumption in buildings can be reduced by 30% to 80% using proven and commercially available technologies.

Source: United Nations Environment Programme Report



Image courtesy of Kwan Sai Hoe, BCA Green Shots Competition 2013

Since its introduction, the Green Mark certification programme has undergone several revisions and has evolved to incorporate increasingly sophisticated methods of greening buildings. The standards it covers today include a greater variety of the building types and spaces, the higher emphasis on passive design, the use of sustainable construction materials and development of performance-based design and systems, amongst others. There is also greater focus on the needs and well-being of building occupants.

In 2006, the BCA introduced the first Green Building Masterplan, which brought together financial incentives, legislation, industry training programmes and a public outreach campaign to place green buildings in the forefront of industry and consumer awareness. The first Masterplan focused on greening new buildings.

In 2009, the second Green Building Masterplan was launched to bring existing buildings into the green fold, by having the public sector take the lead, spurring the private sector through the various incentive schemes and setting minimum legislated standards for existing buildings. The second masterplan also gave more prominence to Research and Development (R&D), and greater emphasis on profiling Singapore as an international leader in green building capability.

Indeed, over recent years, the success of BCA's Green Building Masterplan has been recognised not just locally but internationally. Singapore's expertise in green buildings is showcased in high profile multi-national developments such as the Sino-Singapore Tianjin Eco-City; in thought leadership centres such as the BCA Centre for Sustainable Buildings, a collaboration between BCA and the United Nations Environment Programme; and in gatherings such as the International Green Building Conference, hosted here annually.

Most recently, in June 2013, the BCA became the first government agency outside North America and Europe to receive the Alliance to Save Energy's International Star Award. Its commitment and leadership in green building development was also reflected in other international accolades such as the World Green Building Council's Government Leadership Award and Aspen Institute Energy and Environment (Government) Award.

Now, with all key initiatives under the second Green Building Masterplan successfully implemented, BCA is embarking on its third Green Building Masterplan as a further expansion of the previous masterplan. The new vision is to be a global leader in green buildings, with special expertise in the tropics and sub-tropics. The new strategy will guide the building and construction industry here in the development of "software", to match the "hardware" put in place earlier. This involves a paradigm shift in the consumption behaviour of building occupants, the development of industry knowledge, and the building of green building expertise which Singapore is ultimately poised to share with the rest of the world.

“

Singapore embarked on our green building journey as a commitment to our environment. In a short span of 8 years, the number of green buildings in Singapore had increased a hundred times from a mere 17 in 2005 to almost 1700 in 2013 through the BCA Green Mark certification programme and other various initiatives. There is also greater awareness of the benefits and strong business case of green buildings. We are encouraged by these positive results and will continue to review our plans in charting Singapore's leadership in green building advancement in the tropics.

– Dr John Keung, CEO of BCA



TAKING THE FIRST STEP

Sustainable urban planning has always occupied a prominent role in Singapore's development. However, prior to the 2000s, guidelines for sustainable buildings were scarce in the tropics and sub-tropics, and existing guidelines which originated primarily from the US and Europe did not necessarily apply in Singapore's climate.

Hence, in the mid-2000s, the Building and Construction Authority (BCA) began developing its own green building rating tool designed specifically for tropical and sub-tropical conditions: the Green Mark certification programme. The certification programme was launched in 2005 for voluntary participation, following consultations with industry players, some of whom had already ventured into green buildings.

The introduction of the certification programme was a bold initiative to move Singapore's building and construction industry towards environmentally-friendly buildings by providing a standard benchmark and guideline for the industry to follow when constructing new buildings or retrofitting existing buildings.



INTERNATIONAL COMPARABILITY

The BCA Green Mark has been described as the tropics' answer to the US-developed Leadership in Energy and Environmental Design (LEED) certification. It differs from other green building rating systems in these points:

- A stronger emphasis on energy efficiency;
- Tailored to tropical climates: heat gain and cooling of inner spaces with air-conditioning are key design considerations;
- High standards of measurement and verification instrumentations for air-conditioning chiller plants to ensure continual performance monitoring.

Unlike other rating systems administered by non-governmental organisations, BCA works closely with building owners to conduct regular follow-up sessions and post-occupation verifications. This is to ensure that design features are properly implemented and the building performs to the standards set under the BCA Green Mark.

Future versions of the Green Mark will continue to focus on total building energy consumption, while placing greater importance on internal environment quality and health, life cycle and environmental impact, and the consumption and behaviour of building occupants.

RECOGNISING FIRST MOVERS

Prior to the Green Mark, a number of players in the local construction industry had already begun integrating sustainability into their business practices for some time.

These included major developers such as CapitaLand Limited, City Developments Limited (CDL), the Housing and Development Board (HDB) and JTC Corporation. Many individual buildings, both new and existing, had also adopted sustainable design elements and operating practices.

Not surprisingly, these first movers were also among the first to be recognised by the Green Mark. CDL and CapitaLand received numerous Green Mark accolades – many of them Gold ratings – when the first Green Mark Award winners were announced.

One of the first buildings to clinch the highest Green Mark Platinum accolade is the National Library Building which later went on to win multiple awards for its environmentally friendly features.

Malaysian architect and ecologist Ken Yeang of international architecture firm TR Hamzah & Yeang, who was behind the National Library, says it was designed as a green building even before the launch of the Green Mark.

"The fact that we were able to build such a green building was because of the foresight of our clients. It has to start from the building owner," says Dr Yeang.

"When we were planning for our permanent campus in the early 1990s, we wanted to have a green and sustainable campus," says Mr Chan Lee Mun, Principal and CEO of Nanyang Polytechnic, another early Green Mark Platinum project. "We focused on energy, water and pollution management, and built into the design various provisions for recycling and sustainable green practices. So when the Green Mark was introduced in 2005, a number of the fundamental requirements were already in place."



The National Library Building was one of the first buildings to clinch the highest BCA Green Mark Platinum accolade.

GREEN MARK CHAMPIONS

Expanding on the Green Mark Award, BCA introduced the Green Mark Champion Award in 2008 to recognise developers with a strong commitment towards corporate social responsibility and environmental sustainability.

Sustainability, according to Green Mark Platinum Champion winner City Developments Limited (CDL), is a matter of early vision and long term planning to get the basics in place. The organisation had launched its sustainability drive in the early 2000s in response to the demands of an international clientele.

“As an early advocate of green buildings, CDL welcomed the launch of BCA Green Mark as it provided much needed guidelines, direction and incentive to transform the industry by defining what constituted a green building and definitively grading it. Furthermore, it was important for Singapore to develop a certification programme that is relevant and tailored to the local environment and requirements. We were proud to be one of the first developers to support Green Mark and it remains an important mark of accomplishment to us. We have since set a minimum achievement of Green Mark Gold^{plus} for all new CDL developments,” says Mr Kwek Leng Joo, Managing Director for Singapore listed international property and hotel conglomerate City Developments Limited.

Other developers have also taken the initiative to go beyond the legislated requirements. CapitaLand, for example, has implemented a policy requiring its projects in Singapore to achieve at least Green Mark Gold^{plus} – two levels above the

mandatory requirement – and its overseas projects must at least achieve the certification level of a recognised green rating system, including BCA Green Mark.

“Being green is an extension of our ‘Building People’ credo – only by protecting the environment and considering the impact of our developments can we truly build people and enhance the quality of their lives,” says Mr Francis Wong Hooe Wai, Chairman of the CapitaLand Green Committee. “CapitaLand recognised that going green was the way forward long before green building ratings became mandatory in Singapore. We wanted to have first-mover advantage and set an example for other developers because real estate properties have a great impact on the environment and its surrounding community.”

Regional business space developer Ascendas, was among the three developers to be awarded the Green Mark Champion in 2012. “The award is a testament to our unwavering commitment to minimise the impact that our business operations have on the natural environment,” says Mr Tan Yew Chin, CEO of Ascendas Land. “It has also motivated us to look at more energy conservation projects for our existing buildings and deliver green, sustainable business space solutions to our customers while continuing to drive the real estate industry standards in the region.”

Other Green Mark Champions include the Housing and Development Board, the National University of Singapore, and most recently JTC Corporation.



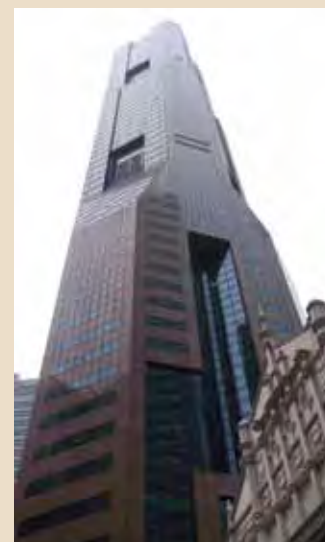
City Square Mall



The Glyndebourne



Quayside Isle



Republic Plaza

City Developments Limited received the BCA Green Mark Platinum Champion Award for its strong commitment towards sustainability. Some of its Green Mark Platinum projects include City Square Mall, Quayside Isle, Republic Plaza and The Glyndebourne.



The BCA Green Mark went beyond buildings to include districts. JTC's CleanTech Park won the BCA Platinum Green Mark for Districts Award in 2012.

CONTINUOUS IMPROVEMENT

The Green Mark certification programme has been updated progressively over the years to incorporate increasingly advanced sustainability elements and requirements in its assessment criteria. The ongoing updates ensure that Singapore's green buildings remain on a similar high standing with international standards, and even ahead in some areas.

While BCA made revisions to its standards and masterplan, it is always in conversation with the industry. Beca Asia's Mr Lee Chuan Seng, who chairs BCA's Green Mark advisory committee, shares: “BCA has been very good at engaging the industry. It is very open to taking in feedback from industry members. Before they do something, they would consult the industry: What do you think of this?”

Its approach towards green building and the Green Mark system has been “very calibrated and measured”. BCA had to strike a balance between setting a stretched target for developers, consultants and contractors so that it made a meaningful difference, but was not impossible to achieve.

But we all agreed that the Green Mark standards must be continuously upgraded every year. In this fast-moving technological arena, what is innovative in the first year will become good in the second, and business as usual by the third.”

Over the years, the Green Mark has also been extended to a wide range of developments, including schools, restaurants, supermarkets and retail developments, among others. In addition, the Green Mark went beyond buildings to recognise environmentally-friendly and sustainable practices in the master planning, design and implementation of district developments.

Most recently launched in September 2013 is the Green Mark for Healthcare Facilities. In addition, BCA has collaborated with other government agencies to develop Green Mark certification programmes for parks, rail transit systems and data centres. This expansion will continue wherever there is opportunity to have more targeted sustainability rating systems, says BCA.

BCA also encourages Green Mark rated buildings to undergo re-assessment every three years to encourage building owners and operators to take a committed and long-term view of sustainability and integrate it into their daily operations. This will ensure continual performance of the building at an optimal level.



Pasir Ris Sports and Recreation Centre is the 1000th Green Mark building project.

Image courtesy of Singapore Sports Council

KEY MILESTONES OF SINGAPORE'S GREEN BUILDING JOURNEY

2012

- 1000th Green Mark building project and 100th Green Mark Platinum building project milestone
- Amendment of Building Control Act to require minimum environmental sustainability standards for existing buildings, the submission of energy consumption and building-related data by utility companies and building owners, and regular audits and compliance on the efficiency of the cooling systems in buildings

2009

- Opening of BCA Zero Energy Building
- Launch of Second Green Building Masterplan

2008

- Amendment of Building Control Act to impose minimum environmental standards on new buildings

2007

- Launch of Sustainable Construction Masterplan

2006

- Launch of First Green Building Masterplan

2005

- Launch of BCA Green Mark certification programme

THE BCA GREEN MARK CERTIFICATION PROGRAMMES

BCA Green Mark for Buildings

- BCA Green Mark for Non-Residential Buildings (New and Existing)
- BCA Green Mark for Residential Buildings (New and Existing)
- BCA Green Mark for Landed Houses
- BCA Green Mark for Existing Schools

BCA Green Mark (Beyond Buildings)

- BCA-NParks Green Mark for Parks (New and Existing)
- BCA-LTA Green Mark for Rapid Transit System
- BCA Green Mark for Infrastructure
- BCA Green Mark for Districts

BCA Green Mark (Within Buildings)

- BCA Green Mark for Office Interiors
- BCA Green Mark for Restaurants
- BCA Green Mark for Retail
- BCA Green Mark for Supermarkets
- BCA-IDA Green Mark for Data Centres
- BCA Green Mark for Healthcare Facilities



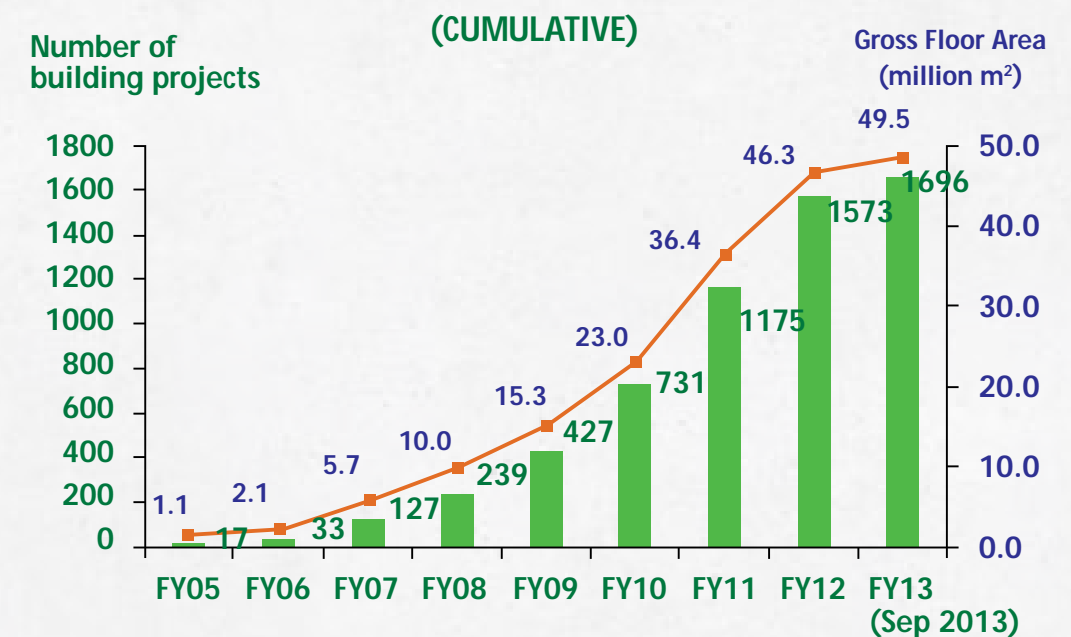
Treehouse



THE GREEN BUILDING MASTERPLAN

The number of Green Mark certified buildings in Singapore has increased exponentially over the years. As of 1 September 2013, about eight and a half years after the introduction of the certification programme, Singapore has more than 1,650 Green Mark certified building projects totaling some 49 million square metres and accounting for 21 percent of total existing building floor space.

GREEN MARK BUILDING PROJECTS IN SINGAPORE



THE FIRST GREEN BUILDING MASTERPLAN: GREENING NEW DEVELOPMENTS

The first Green Building Masterplan concentrated on driving the green building agenda in the industry, and making green building the norm for new projects.

A \$20 million Green Mark Incentive Scheme for New Buildings was launched in 2006 offering cash incentives to developers, building owners, project architects and M&E engineers who achieved at least a Green Mark Gold rating or higher in the design and construction of new buildings. The scheme was so popular that by 2010, the fund had been fully committed.

In 2007, the Sustainable Construction Masterplan and the \$50 million Ministry of National Development (MND) Research Fund for the Built Environment were introduced. The former created a framework for sustainable methods of construction, while the latter, administered by BCA, provided support for applied R&D in the building sector.

One of the earliest and most significant steps in accelerating Singapore's green building agenda was the change to the Building Control Act in April 2008 which made the Green Mark certification mandatory for all new buildings and existing buildings undergoing major retrofits. The Second Green Building Masterplan was rolled out shortly afterward.

"Although it was challenging to get industry buy-in in the early years of Green Mark, we had to change mindsets. The industry needed to be persuaded to make environmental sustainability a cornerstone in the design of buildings. While there was a price tag to green when the certification programme started in 2005, we needed to convince them that going green made business sense," says Dr John Keung, CEO of BCA.

BCA achieved this by introducing Singapore's first Green Building Masterplan in 2006. The masterplan looked beyond certifying green buildings to building industry capability as well as research and development in environmental sustainability. It also aimed to help the industry move towards green building standards in new developments by using a combination of legislation and incentive schemes to gain industry buy-in.

In 2009, the masterplan was reformulated and strengthened with a focus on bringing existing buildings up to Green Mark standards. The third masterplan is underway, this time aiming to encourage green behaviour in the occupants of both new and existing buildings.

THE SECOND GREEN BUILDING MASTERPLAN: GREENING EXISTING BUILDINGS

The second Green Building Masterplan, unveiled in 2009, focused on greening existing buildings. To achieve this, it followed six strategic thrusts:

THE SECOND GREEN BUILDING MASTERPLAN
strategic thrusts



Having the public sector set an example

Since 2009, all new public sector buildings with air-conditioned floor areas of more than 5,000 square metres must achieve the Green Mark Platinum rating. Furthermore, existing public sector buildings with air-conditioned floor areas of more than 10,000 square metres must be retrofitted to achieve the Green Mark Gold^{Plus} rating by 2020. To help meet this target, a Guaranteed Energy Savings Performance contract was developed for public sector agencies. Under this contract, when agencies engage an accredited Energy Services Company (ESCO) to carry out an energy audit and implement energy savings measures, they will enjoy a guarantee on energy efficiency and savings, as well as stepped-up maintenance and monitoring by the ESCO.

Separate from these requirements, various government agencies and government-linked corporations have also taken the lead in committing themselves to environmentally sustainable operating practices. The JTC Corporation, Singapore’s primary developer of industrial projects, actively incorporates green building strategies and eco-friendly features in its projects, an initiative which won it the BCA Green Mark Champion Award for 2013.

“As Singapore’s leading industrial infrastructure specialist, it is crucial for JTC to play an active leadership role in environmental sustainability and stewardship,” says Mr Png Cheong Boon, CEO of JTC. “Sustainability is a key consideration in our master plans and developments, and we are continuously stepping up on our efforts to address environmental challenges in a pragmatic manner.”

Incentivising the private sector

A series of Green Mark Incentive Schemes were introduced to encourage the industry to build green and retrofit less environmentally-friendly buildings. These schemes targeted every stage of the building process, from the design and construction of new buildings, to the upgrading and retrofit of existing buildings.

Mr Lee Eng Lock, winner of the Champion of Energy Efficiency in Buildings Award from the American Council for an Energy-Efficient Economy (ACEEE) 2012 and technical director at energy services firm Trane Singapore, says the policies have been very helpful in encouraging building owners to get on board and set higher green building targets.

Building owners, for example, have benefitted from grants and schemes that make it easier for them to engage energy services companies to do energy audits and retrofits.

“It was tough at the start to convince building owners. But in the past few years, the industry is more aware. There is a lot more marketing and education about the importance of an energy efficient building so owners are more aware and receptive,” he says. Today, some of these owners are pushing for even higher standards on their own, he notes.

Incentives and Financing Schemes Under the Second Green Building Masterplan (2009-2013)

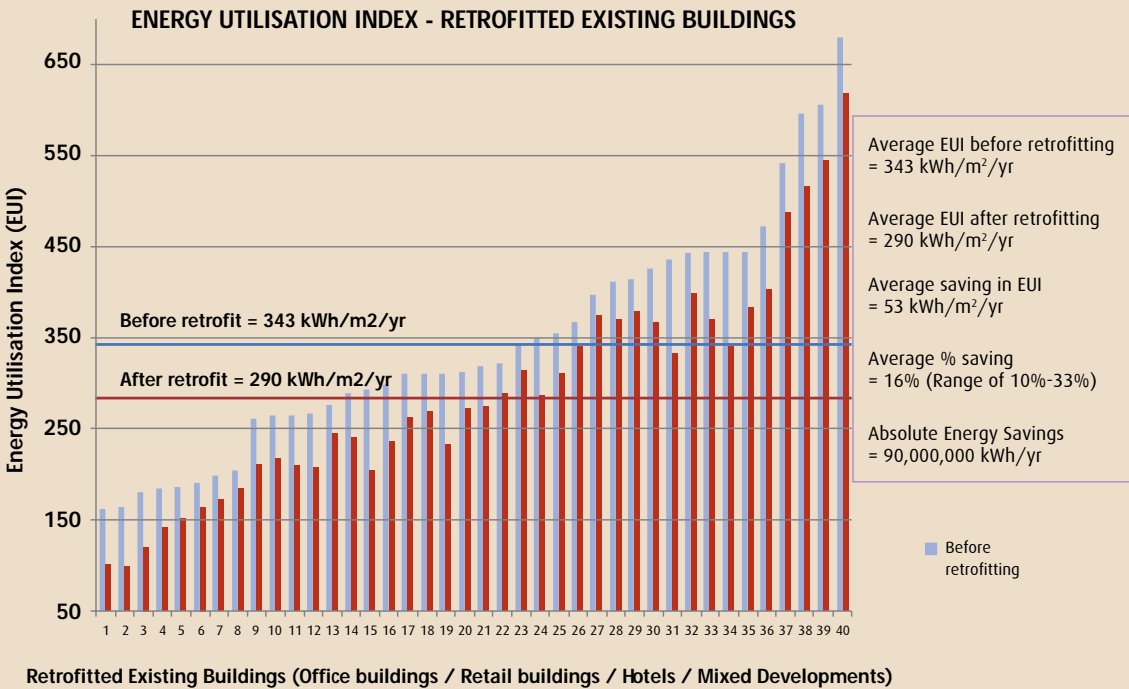
- **\$100 million Green Mark Incentive Scheme for Existing Buildings**
Launched in 2009, the scheme provided cash incentives for the purchase of energy efficient equipment and energy audit to determine the efficiency of air-conditioning chiller plants. It was subsequently enhanced in July 2012, with a higher co-funding rate and funding cap. The scope was also widened to include the cost of installing energy efficient equipment and engaging professional services.
- **Green Mark Gross Floor Area Incentive Scheme**
Developed by BCA and Urban Redevelopment Authority (URA), the scheme allows building owners of new private developments to apply for additional floor area if their development achieves the Green Mark Platinum or Gold^{Plus} rating.
- **\$5 million Green Mark Incentive Scheme for Design Prototype**
The funding provides for the engagement of Environmentally Sustainable Design (ESD) consultants to conduct collaborative design workshops and assist in simulation studies to optimise the design of green buildings.
- **Building Retrofit Energy Efficiency Financing (BREEF) Scheme**
The scheme provides credit facilities for commercial building owners, management corporations and Energy Services Companies (ESCO) to carry out energy efficiency retrofits under an Energy Performance Contract (EPC) arrangement. Participating financial institutions also issue loans for the purchase and installation of energy efficient equipment, with BCA co-sharing half of the risk of any loan default.

DRIVERS TO RETROFIT EXISTING BUILDINGS

By retrofitting existing buildings, building owners and tenants can look forward to improving their energy efficiency, cutting down their operating expenses and increasing the capital value of their properties.

This is supported by findings from a study by BCA and the National University of Singapore, which showed that the retrofitting of commercial buildings can lead to average expected savings in operating expenses of up to 13.5% and up to 2.7% increase in capital value, with an average payback period of about 6.3 years after the retrofit.

In 2013, BCA also conducted a study on 40 existing commercial buildings comprising hotels, office and retail buildings, and mixed developments which had undergone retrofitting to achieve the Green Mark Gold, Gold^{Plus} or Platinum rating. Results showed that owners of these 40 buildings saved a total of 90 GWh in energy, amounting to \$24 million each year after retrofitting.



THE BUSINESS CASE: INTERNATIONAL PLAZA'S COST-SAVING RETROFIT

In July 2012, International Plaza, a 36-year-old mixed-use development in Singapore's Central Business District, commenced a S\$3.7 million retrofit to increase its energy efficiency. Its four chillers were upgraded and fluorescent lights in common areas were changed to energy-saving LEDs.

When the retrofit was completed one year later, International Plaza was awarded the BCA Green Mark Gold^{plus} and, more importantly, reduced its S\$2 to S\$3 million annual utility bill. In addition, a BCA grant was awarded to help offset some of the retrofitting cost.

"The electricity cost was getting ridiculously high, and 60 percent of it came from the chillers," says Mr Sivakunal Samuel, the chairman of the International Plaza Management Committee Strata Title and the leader of the retrofitting initiative.

Six months into the process, the cost savings began to emerge. "So far, we are saving about S\$400,000 a year on utilities, which we are passing on to our owners and tenants via the sinking fund," says Mr Samuel. Just changing the lighting in the common areas, he adds, led to a 20 per cent reduction in lighting-related electricity bills.

As part of the retrofit, an electronic display showing month-on-month electricity and water savings was installed on the second floor for owners and tenants to keep track of utility consumption. "When people can see the results of the retrofit for themselves, they gain a better understanding of how it actually benefits them," says Mr Samuel.



The importance of R&D

R&D is central to encouraging the industry to adopt green building technology, not least because it helps to strengthen the business case. It is crucial both in the development of new sustainable products, and in the quantification of how those products perform.

"Only R&D can quantify and objectively measure the performance of green buildings," says Dr Nirmal Kishnani, the programme director for the National University of Singapore's Master of Science in Integrated Sustainable Design.

Between 2008 and 2012, Dr Kishnani led a study on post-occupancy in Green Mark certified buildings. The study, which was carried out in collaboration with BCA, involved an in-depth review of 11 buildings across various Green Mark

tiers including non-certified buildings, with the primary aim of gathering information on how buildings performed after receiving the certification.

"The findings of R&D affect everything about green buildings from policy to building practices to how design is approached at the drawing board stage," he says.

BCA therefore emphasises green building R&D through a variety of initiatives. It actively collaborates with the industry, academia and other government agencies through the form of grant calls, inter-agency coordination and Memorandum of Understandings (MoUs) with other institutions. Funding is also provided to support applied R&D in the building sector.

INITIATIVES TO ENCOURAGE R&D

R&D Grant Calls

Between 2007 and 2013, BCA launched six R&D grant calls that adopted a public-private partnership approach and focused on developing innovative green building solutions. In September 2013, a \$20 million Energy Innovation Research Programme was launched together with the National Research Foundation, supporting Institutes of Higher Learning (IHLs), research centres and small and medium enterprises in developing cost-effective solutions for building retrofits in the tropics.

Funding Support

By April 2013, 61 R&D projects were awarded funding support, out of which 39 were green building related projects with a total of \$28 million in funding. BCA was involved in 18 research projects as either the project lead or project collaborator. These projects included BCA's Zero Energy Building, which integrates high-energy efficiency design and operating methods for a retrofitted existing building, and the Samwoh Eco-Green Building, which is constructed entirely from recycled concrete aggregates. Most recently, a \$5 million innovation grant for green buildings was introduced to help the entire industry value chain conduct smaller-scale R&D projects with near term commercialisation potential. These efforts will provide

more opportunities for the public sector, the industry and the IHLs to collaborate and push for breakthrough green building innovations.

Inter-Agency Collaboration

The inter-agency Green Building R&D Workgroup was established in 2010 to co-ordinate green building R&D. This workgroup is chaired by BCA and includes senior representatives from key technical participating agencies. In 2011, the workgroup released the Green Building R&D Framework to guide R&D grant calls for green buildings.

International Collaboration

In November 2012, BCA signed a MoU with the Lawrence Berkeley National Laboratory, a US Department of Energy laboratory, to collaborate on the sharing of advanced building technologies and their FLEXLAB initiative – a facility for low energy experiments related to buildings. BCA will be developing a similar FLEXLAB facility at BCA Academy, which will allow various building systems to be plug 'n' play for testing in the tropical climate, while enabling quick turnaround of experiments.



BCA signed a Memorandum of Understanding with the Lawrence Berkeley National Laboratory



THE BCA ZERO ENERGY BUILDING

In 2009, BCA opened its flagship R&D project, the Zero Energy Building (ZEB) at Braddell Road. The ZEB is the first such building in Southeast Asia which achieves a net zero energy consumption annually despite an increasing load year-on-year. This is the result of a focused collaboration between green building experts within the industry.

Retrofitted from an existing building in the BCA Academy, the ZEB is designed by award-winning architectural practice DP Architects and engineered by international consultancy Beca.

It is fitted with energy efficient technological innovations developed by the National University of Singapore (NUS), including advanced ventilation and photovoltaic systems.

Beca Asia's emeritus chairman Lee Chuan Seng recalls how the firm had to take the research by NUS and convert them into designs that will comply with building codes but at the same time achieve the necessary efficiency and performance. "We have been very satisfied that the building has been able to hit the efficiency targets and is generating more energy than it consumes, so it's actually a positive energy building."

Beca has moved on to conduct in-house R&D and now has its own centre of excellence for building design, he adds.

The ZEB also serves as a living lab for Research, Development & Demonstration (RD&D) of green building technologies.

Associate Professor Stephen Wittkopf from NUS, who was the Director of the cluster Solar and Energy Efficient Buildings

of the Solar Energy Research Institute of Singapore (SERIS), says that the ZEB attracts much attention from visitors for the innovations it showcases. "Every time, I bring overseas colleagues they are impressed by the wide range of photovoltaic (PV) technologies and types of integration (roof, facade, window, shading, railing etc)."

The Centre for Sustainable Building and Construction (CSBC) and the Solar Energy Research Institute of Singapore (SERIS) have been studying the ZEB's PV system closely. The study includes the performance of various daylighting and dynamic glazing systems.

In 2011, CSBC tested the Passive Displacement Ventilation (PDV) system in ZEB. This innovative air distribution system which operates without fans clinched the Asean Energy Award and has attracted visitors such as the Nanyang Technological University who subsequently decided to install it in their new Learning Hub.

In 2013, CSBC also tested a LED lighting system that featured an extensive sensor grid and the integration of power and control through low-voltage data cables. The lighting system led to significant savings and satisfactory visual comfort. The supplier has since benefited from the showcasing platform at ZEB and managed to secure a few projects.

Other ongoing and upcoming RD&D projects include:

- Cool paint
- Integration of lighting and blind
- Indoor environment sensing

BCA Zero Energy Building

The ZEB is 50 percent more energy efficient than a conventional office building of similar space usage and operating hours. Its energy efficient features include:



Low emissivity glass and shading devices

to reduce solar heat gain through windows



Use of natural daylight, motion sensors and energy efficient lighting

to reduce energy consumption for lighting



Advanced chiller and ventilation systems

including single coil twin fans and passive displacement ventilation, to reduce energy consumption for air conditioning



Photovoltaic systems

that power all appliances and lighting within the building



Advanced Building Management System

to control, monitor and manage all equipment installed in the building, so as to optimise energy use



First batch of graduates from the Master of Science in Sustainable Building Design

Developing a green workforce

To support the industry in the green building movement, the BCA Academy, an education and research arm of BCA, has set a target of training 20,000 green specialists at the professional, manager, engineer and technician level by 2020.

The BCA Academy offers a wide range of training programmes from diplomas and specialist certifications, to degree programmes for undergraduates, graduates and executives, to build capabilities in the design, operation and maintenance of green buildings. A series of Green Mark Certification Courses also train professionals in the skills needed to develop new or existing buildings to meet Green Mark standards.

Ms Jaye Tan of DP Architects, who received the BCA-SGBC Green Building Individual Award (Commendation) in May 2013 for her contributions to green buildings in Singapore, says that she became interested in green building design after going through the BCA Green Mark Certification Course, and went on to learn more about it through other BCA courses.

"I felt that what we were doing is good for not only the client but for the environment, so I continued pursuing this line. There is so much more to learn about how to design sustainably, both for professionals in the industry and for the public."

Ms. Rita Soh, Director of RDC Architects Pte. Ltd and President of the Board of Architects of Singapore was among the

first batch of graduates from the Master of Science in Sustainable Building Design offered by BCA Academy and the University of Nottingham.

"The multi-disciplinary participation in this Master programme offered unique opportunities for collaborative efforts and peer learning, especially through the many group projects undertaken throughout the course. This learning environment reinforces the integrative and interactive approach to design and development, and is very much a reflection of actual situations in our building industry," she says.

Such sustainability-related courses are important in helping industry professionals recognise and understand the multi-dimensional issues on green buildings.

"I remember congratulating the Singaporean government in 2009 for establishing the BCA Academy and housing within it, a Zero Energy Building (ZEB) to showcase innovation and clean technologies. The offering of a diverse range of qualifications and ongoing life-long learning courses and seminars was – and is – smart," says Ms Maria Atkinson from the International Panel of Experts.

"Training provided by the BCA Academy to equip a workforce with knowledge of best practices in green buildings can be exported as much as the services offered by Singaporean small businesses in the building industry can," she adds.

Telling Singapore and the world

BCA raises awareness of green buildings and sustainability both in Singapore and abroad through a range of outreach and engagement programmes and events. The largest of these events is the International Green Building Conference that is held during the Singapore Green Building Week (SGBW). The Singapore Green Building Council (SGBC) also co-organises various events such as the Asia Pacific Regional Network Forum, BCA-SIA-SGBC International Tropical Architecture Design Competition and Build Eco Xpo (BEX) Asia during the SGBW.

“While we encourage buildings and companies to actively choose energy efficient products and services in their business operations to gain both the environmental and financial

benefits, we will also extend our public education efforts in many more ways,” says SGBC President Mr Ng Eng Kiong. “We will embark on more events for the community (especially the young) and include community outreach elements in our annual BEX Asia Exhibition to engage consumers.”

Internationally, BCA actively participates in green building developments overseas such as the Sino-Singapore Tianjin Eco-City. The BCA Academy also conducts executive training programmes on sustainability-related topics for government officials and professionals from around the world. Between 2008 and 2013, about 800 foreign delegates participated in the BCA Academy’s green building training programmes.



Opening of International Green Building Conference 2013

International collaboration:

The Sino-Singapore Tianjin Eco-City

BCA plays a wide variety of roles in green building projects overseas, ranging from consultancy to training to standard-setting. In the case of the Tianjin Eco-city, BCA made the following contributions to the development among others:

- Jointly developed the Green Building Evaluation Standards (GBES) for the Eco-city, together with the Eco-city Administrative Committee (ECAC). The GBES is based on BCA’s Green Mark certification programme and the Green Star System adopted by the PRC Ministry of Housing and Urban-Rural Development.
- Conducted customised training programmes for Tianjin and ECAC government officials and industry professionals, so as to enhance awareness of green building concepts and develop industry capabilities in green building technologies in the Eco-city.

- Acts as a technical advisor for the Low Carbon Living Lab in the Eco-Business Park. The lab is the first project applying for dual Platinum Awards under both the Green Mark and the GBES.



Low Carbon Living Lab

Groundbreaking legislation for existing buildings

Singapore was among the first countries in the world to implement mandatory minimum environmental sustainability standards for existing buildings. Under the amendments to the Building Control Act, building owners who retrofit their buildings must meet the following energy efficiency requirements:

- Achieve the minimum Green Mark Certified rating for existing buildings when replacing or upgrading their chiller system(s);
- Submit three-yearly periodic energy efficiency audits of building cooling systems and comply with cooling plant efficiency standards; and
- Submit annual energy consumption data and other building related information.

“The greatest shift in the industry came about when the legislation for the Green Mark was implemented,” DP Architects’ Ms Jaye Tan says of how the amendments to the Building Control Act changed industry perceptions and behaviour. “When the government took the initiative and made it compulsory to meet Green Mark standards, there was a real impact on those who have to abide by the building guidelines.”

TR Hamzah & Yeang’s Dr Ken Yeang says such a move to make standards mandatory for architects and developers was unusual. “I have to commend the Singapore government for pursuing this, it’s a good example of what governments should be doing,” he adds. “BCA is not only setting the standards, it is also doing three things: firstly, continuing to develop it, secondly, doing research in it, and thirdly, promoting it. A lot of developers in Malaysia have chosen to use the Green Mark over others, so the impact has gone beyond national boundaries.”

While the legislation was key in setting the minimum sustainability requirements, there are also others like developers City Developments Limited and CapitaLand who have taken the initiative to go beyond the legislated requirements. Funding support through the Green Mark Incentive Schemes have been useful in helping building owners go the extra mile in improving the energy efficiency of their buildings.



Punggol Waterway, a BCA Green Mark Platinum project

GREENING THE VALUE CHAIN: BUILDING EXPERTISE AND ENGAGING STAKEHOLDERS

For the green building agenda to truly advance, all stakeholders along the value chain must buy into it. BCA therefore partners and collaborates with players within and beyond the construction industry, encouraging them to build on BCA schemes and programmes or create their own sustainability initiatives which will in turn influence the rest of the value chain.

“

Sustainability goes beyond the effort of any single player in the value chain. For instance, while buildings may be designed to energy efficient standards, building occupants' energy consumption habits will also affect the energy performance of buildings. Hence, we see great value in engaging all players in the supply chain and encouraging sustainable behaviour amongst end users.

– Dr John Keung, CEO of BCA

COLLABORATION: THE KEY TO GREEN BUILDING LEADERSHIP

The success of the Green Mark certification programme and the Green Building Masterplan is achieved through the collaborative work of many institutions, ranging from government agencies, non-profit organisations, to corporate industry players and educational institutions. Individual corporations have worked with BCA to develop and refine the Green Mark criteria, while non-profit organisations help to raise awareness of the green building sector both locally and internationally.

Educational institutions, too, have recognised their influence in setting an example for the student body. The National University of Singapore (NUS), which became the first tertiary institution to be awarded Green Mark Champion in 2012, actively educates its students and staff about sustainability as a complement to its green operating practices. “As a leading educational institution, it is crucial for NUS to play an active leadership role in environmental sustainability and stewardship,” says Professor Tan Chorh Chuan, President of NUS.

Government agencies also play a key role: the Housing and Development Board for the greening of public residential developments, the Land Transport Authority and the Public Utilities Board for the development of Green Mark for road infrastructure, and the Urban Redevelopment Authority and National Parks Board for the integration of green spaces into other aspects of urban development.

Ms Maria Atkinson, an internationally recognised expert in green building and sustainability who sits on the BCA-convened International Panel of Experts who reviews Singapore's progress on greening buildings, notes: “In this era of globalisation, co-operation needs to be achieved by policymakers. The Singapore public servant is open to and seeks out diverse knowledge and viewpoints, forms partnerships and removes barriers to outcomes. Working collaboratively across agencies and departments is the norm. This has proven to be a very efficient and effective model, and is the envy of most of the world”



PUBLIC HOUSING ECO-PRECINCT: TREELODGE@PUNGGOL

In 2011, BCA introduced the Green Mark for Existing Residential Buildings, a scheme developed in collaboration with the Housing and Development Board (HDB). The HDB is the largest developer and the main provider of residential buildings in Singapore, and has been closely aligned with the green building drive for years.

In line with the Green Building Masterplan, HDB has been implementing eco-friendly solutions in new public housing estates. Since 2007, all new public housing developments have been Green Mark certified. A number of major HDB projects have also achieved the Green Mark Platinum rating.

The first public housing eco-precinct, Treelodge@Punggol, was completed in 2010 and won the Green Mark Platinum award. It served as a test-bed for eco-features from the precinct such as LED lighting with motion sensors, an elevator energy regenerative system where excess energy generated by elevators is converted to reusable electricity, and a centralised chute for recyclable wastes. These have been implemented in subsequent new public housing developments in Punggol.

THE SINGAPORE GREEN BUILDING COUNCIL: EDUCATING INDUSTRY AND PUBLIC

The work of non-profit organisations such as the Singapore Green Building Council (SGBC) forms an important counterpart to the government's initiatives. Mr Tai Lee Siang, the immediate past president of SGBC, says that while the government has taken an active role in advancing green buildings in Singapore, there is much that non-profits can do. "SGBC plays an instrumental role in educating the industry and public on the importance of green buildings," he says.

SGBC was launched in 2009 with seed money from BCA to advocate green building design, practices and technologies. Since then, it has launched a number of initiatives to raise awareness, understanding and acceptance of green buildings.

The most successful, according to Mr Tai, are the Singapore Green Building Product (SGBP) Certification Scheme and the Green Schools Initiative (GSI). The SGBP was implemented in 2010 to raise the standard and recognition of green building products, ranging from concrete and structural materials, to furnishings and finishes, and the GSI was established in January 2013 as an outreach platform to help schools green their environment. Both initiatives have been well received.

Moving forward, says Mr Tai, SGBC will continue to focus on green building products and public awareness. "We will continue to collaborate with BCA and all other green organisations to widen the use of green building products," he says. "In addition, SGBC will like to work with various end-user groups to increase their knowledge of green buildings."

Beca Asia emeritus chairman Lee Chuan Seng, who was the first SGBC president, says that despite BCA's initial funding, the council needed a sustainable financial model. So it started to develop ways to raise funds and also put a succession framework in place.

"Very quickly, this will build up a cohort of past presidents and office holders. It will help the SGBC to grow and build up the local green building capability," he adds. Mr Lee was also previously on the World Green Building Council (World GBC) Board – a post that Mr Tai Lee Siang, the second SGBC president, took over recently. SGBC has been working with the World GBC on areas such as harmonising green building standards and other initiatives.

Current SGBC president, Mr Ng Eng Kiong, says of SGBC's mission: "We would like to complement the government's measures and incentives to drive the building and construction industry towards greater environmental sustainability, and also to galvanise the industry and community to collaborate with us to reduce the nation's carbon footprint."



Launch of Singapore Green Building Council in 2009

INFLUENCING THE SUPPLY CHAIN

BCA's Green Mark Incentive Schemes play a part in encouraging industry players and professionals along the supply chain to work towards sustainable buildings. BCA's seminars and events also enable industry professionals to learn from other organisations' approaches in driving environmental sustainability, their best practices and project experiences.

"The developer has a vital role in greening the value chain," says CapitalLand's Mr Francis Wong. "By setting green directions and targets right at the beginning of a project, we can influence the consultants to design green – including the use of green technology by building specialists and specifying the use of green materials from selected suppliers, the builders to build green, the operators to operate green and the end-users to adopt a green way of life. We can also engage the wider community to go green by spearheading various activities held in and beyond our properties."

Such engagements and incentives have contributed to a pool of eco-conscious building professionals who in turn exercise great influence over the rest of the industry and even over end users.

In the early 2000s, for example, City Developments Limited (CDL) established its own Environmental, Health and Safety (EHS) assessment system to improve the EHS performance of its builders, and later made EHS compliance a tender prerequisite.

"At that time, we realised that in order to make our business strategy truly sustainable, we had to internalise the sustainability philosophy and operationalise it on a day to day basis on the ground," says CDL's Ms Esther An. "We also needed to influence our buyers, tenants and stakeholders. And to do that, we needed the co-operation of everyone along our supply chain: contractors, consultants, suppliers and so on. Hence, we came up with various initiatives to engage our stakeholders and in a way drove change in the industry."

Mr Rod Leaver, the CEO of Lend Lease's Asia operations, says that his company keeps a close eye on the environmental, social, ethical and financial impact of its business activities. "We believe that our involvement in the entire property value chain (from development to investment management, construction and property services) can influence a truly sustainable outcome."

Lend Lease was the first developer here to implement Green Lease, a collaborative effort between the landlords and tenants of a building to establish appropriate agreements on minimising the adverse environmental impact of the buildings they own and use during a lease period.



313@Somerset is one of the projects adopting the Green Lease in Singapore.



SUSTAINABLE CONSTRUCTION ñ THE METHODS OF THE FUTURE

Greening buildings start from the use of sustainable products for construction. BCA has been guiding the industry towards sustainable construction methods since 2007, when the Sustainable Construction Masterplan was launched to encourage the optimal use of building materials.

BCA has also worked with the industry to develop performance-based specifications to facilitate the use of recycled materials as well as carry out pilot projects to demonstrate the feasibility of using such materials. The Tampines Concourse and the Samwoh Eco-green building projects are such examples.

Both these iconic projects were the first in Singapore to use sustainable construction materials in a big way. The Tampines Concourse Building used a combination of recycled materials for all its concrete elements while the Samwoh Eco-green Building was the first building in the region to use up to 100% of recycled concrete aggregates for the construction of its structural framework.

"We managed to address the various issues through extensive laboratory tests to evaluate the material properties such as permeability and creep of concrete," says Dr Ho Nyok Yong, Director of Samwoh Corporation. He also adds that, "These initiatives were made possible by the support from the MND Research Fund administered by BCA."

In addition, a \$15 million Sustainable Construction Capability Development Fund was set up in 2010, providing monetary support to industry players such as demolition contractors and waste recyclers to test bed sustainable construction practices and technologies.

Developers and designers alike agree that the use of sustainable products is the next big thing in green building design, but this also comes with its own set of challenges.

"Plant-based renewable materials can be engineered to meet the building code. They are fire-resistant, termite-resistant, generate less waste and are more energy-efficient to use," says Ms Jaye Tan of DP Architects. However, she points out that these materials are taking some time to catch on because traditional materials and methods are still very easy to use and come by.

In contrast, less research has been done on renewables. "There is always a risk factor with new materials," she adds. "People are wary about trying something that is not widely proven. To make this an industry norm, we need suppliers who are willing to produce renewable materials and designers willing to work with them."

INFLUENCING END USERS

Government agencies and industry players alike play a significant role in influencing end users to adopt green behaviour. BCA, for example, has conducted more than ten green building roving exhibitions from 2009, taking the green building movement a step further to reach out to the general public. The exhibitions are aimed at helping the public understand what a green building is and learn about green features in homes and offices. It also empowers consumers to make intelligent, informed decisions on green buildings and drive the message that everyone plays a part in our green building movement. BCA also created a green building portal, Facebook page and youth engagement programmes, as part of its efforts to promote green buildings.

In addition, developers have also organised their own green influence initiatives, such as CapitalLand's 'Building a Greener Future' community engagement drive and the Ascendas Green Movement.

To further encourage an active pursuit of sustainability among building users and occupants, BCA introduced user-centric Green Mark schemes since 2009, which recognise environmentally-friendly and sustainable practices.



ENGAGING STUDENTS: GREENOVATE CHALLENGE AND BUILD IT GREEN CLUB

A Greenovate Challenge, an inter-school green building competition, was first organised in 2013 to engage youths in greening their schools and nurture them to become green building advocates.

The competition gave students a chance to work with Energy Service Companies (ESCOs), who provided free energy audits for participating schools. Through this industry tie-up, students were able to learn more about energy efficient methods, create action plans to reduce energy and water consumption, as well as save resources.

Marsiling Secondary School, the winner of the inaugural Greenovate Challenge had adopted solar leasing whereby photovoltaic panels were rented to harness the sun's energy. The energy harvested was then used to offset part of the electricity needs of the school. The school also engaged in other energy efficient initiatives such as switching to LED lighting and employing the 3R (Reduce, Re-use, Recycle) and water conservation concepts.

Marsiling Secondary's principal, Miss Foong Lai Leong, says: "In Marsiling Secondary School, we believe that simple habits, formed when young, have the power to influence our students for the rest of their lives. We are thus committed to raising their eco-consciousness at every opportunity. This will help instill in all of our students a caring attitude towards the environment. The commitment which begins with small changes from within ourselves, will, we believe, lead to bigger changes being fronted by the students as they step up to take greater responsibility for the environment."

The BCA also formed the Build it Green (BiG) club in August 2011. The club aims to nurture green advocates and promote greater awareness and understanding of green buildings among youths. Some of the activities include tours to various green buildings around Singapore and being student ambassadors at BCA's green building roving exhibitions.



OCCUPANT-CENTRIC GREEN MARK CERTIFICATION PROGRAMMES

Since 2010, BCA has introduced a suite of new occupant-centric certification programmes to promote Green Mark in office interiors, restaurants, supermarkets, retail outlets and data centres.

BCA Green Mark for Office Interiors

The certification programme promotes the use of environmentally-friendly features and sustainable practices by office tenants. Sustainable practices like setting the office temperature not lower than 24°C and monitoring and maintaining of good indoor air quality are essential aspects of the scheme.

BCA Green Mark for Restaurants

The certification programme was introduced to promote corporate responsibility as well as to recognise environmentally-friendly and sustainable practices in restaurants. The use of energy-efficient kitchen equipments and environmentally-friendly materials for food containers and carry-out bags are encouraged.

BCA Green Mark for Supermarkets

The certification programme promotes environmentally-friendly as well as sustainable practices and features in supermarket operations. For instance, operators are encouraged to reduce, reuse and recycle items such as cardboards, and implement a priority 'green' checkout lane for consumers with their own recycle bags.

BCA-IDA Green Mark for Data Centres

This a joint collaboration between BCA and the Infocomm Development Authority of Singapore (IDA) to benchmark the energy efficiency of data centres in Singapore. It assesses data centres on their energy efficiency, water efficiency, sustainable construction and management, indoor environmental quality and other green features.

BCA Green Mark for Retail

The certification programme recognises the efforts of individual retail tenants for their sustainability efforts, such as the installation of energy-efficient lighting during the fit-out renovation stage.

BCA has also launched the BCA Green Mark Portfolio Programme to meet tenants' needs for a streamlined approach to certify similar spaces across a portfolio of projects. The programme, through the use of prototype standards, allows tenants to simplify the Green Mark certification for multiple spaces of a similar type, achieving certification faster and at a lower cost compared to individual project certification.



BCA Green Mark for Restaurants



BCA Green Mark for Supermarkets



BCA-IDA Green Mark for Data Centres



BCA Green Mark for Retail

THE PATH AHEAD: SINGAPORE, A GLOBAL LEADER IN GREEN BUILDINGS, WITH EXPERTISE IN THE TROPICS AND SUB-TROPICS

In 2010, consulting firm Solidance had rated Singapore as the first in Asia for its green building policy. In early 2013, research by McGraw Hill Construction also found that out of 62 countries worldwide, Singapore is most heavily involved in the development of green buildings today. The Singapore firms which participated in the report, "World Green Building Trends", reported that two-thirds of their 2012 project work was related to green buildings.

SINGAPORE'S INTERNATIONAL STANDING IN THE GLOBAL GREEN BUILDING LANDSCAPE

Through a combination of innovative policies and industry engagement, BCA has gained global recognition for Singapore over the last decade and placed the city-state on the map of the global green building landscape, particularly for the tropical and sub-tropical regions.

Mr Brian Castelli, executive vice president of programmes and development for the Alliance to Save Energy, notes: "BCA has looked at the long term and understood that the energy efficiency and sustainability of buildings are critical to the future of Singapore and frankly, the future of the entire world. I see a great deal of leadership in how BCA has planned for the development of green buildings in the long term."

Mr Castelli, who is a member of the International Panel of Experts (IPE) on Sustainability of the Built Environment, adds that there is a need for such leadership in the region. "What works in the US or Europe won't work here because of climatic differences. But it's important that someone should lead the tropical and sub-tropical building sectors, whether ASEAN or APAC, and bring all the other countries along once it works," he says.

Indeed, BCA's drive to develop the local green building industry has in turn spawned new business opportunities for local firms.

Dr. Uma Maheswaran, vice president of Jurong Consultants' sustainable design unit and CEO for Jurong (India), says the firm started its sustainable design unit three years ago and has adopted a 'total sustainability solutions' approach to its master planning, infrastructure and building projects.

"We approach projects at a holistic and macro level and get it right from the start with passive design strategies properly optimised. Then we integrate active design solutions to make the project sustainable. The knowledge we accrued in Singapore in green buildings has certainly helped open the doors overseas."

In the past two years, Jurong Consultants has won a number of iconic projects, including in the high-profile Tianjin Eco-City in China, a bilateral government-to-government project between the Asian giant and Singapore. They are the advisors for Tianjin's Eco-City's zero energy building and also the low carbon living lab, both of which are targeting to become GBES (Tianjin Eco-City's Green Building Evaluation Standard) platinum projects. The firm is also targeting for the living lab to be the first Green Mark Platinum project in China.

Jurong Consultants is also currently working on an IT park project in Trivandrum, India, which has set out a goal to become the country's first Green Mark Platinum project.

“Not everyone knows about the Green Mark, but when they start learning about it, they realise it’s one of the few rating systems developed by a government authority which removes the biases out of the accreditation process. They quickly understand that this Singapore brand carries a lot of weight, so the receptiveness of the Green Mark overseas is quite high,” adds Dr Uma.

In 2013, Dr Uma received the inaugural BCA-SGBC Young Green Building Individual Award for his strong commitment and contribution in propelling a sustainable built environment in Singapore.

BCA and the Singapore Green Building Council (SGBC) had introduced the Young Green Building Individual Award and Commendation Award on top of the existing Green Building Individual Awards to recognise more green and young practitioners who act as role models for the younger generation, and are able to energise and inspire others to scale new heights in sustainable development.

INTERNATIONAL AWARDS AND ACCOLADES

In being the key driving force behind the local construction industry’s move towards higher sustainability standards, the BCA has picked up a number of milestone awards from international bodies on its journey.

The Aspen Institute Energy and Environment Award (Government): In 2010, BCA became the first government agency outside North America to be conferred this award, which recognises government leadership in designing and implementing policy and programmes to promote green buildings and sustainable construction that are innovative, comprehensive and replicable by other cities.

The World Green Building Council Government Leadership Award (Regional Leadership): In December 2011, BCA became the first recipient of the inaugural Regional Leadership Awards, one of the six World Green Building Council Government Leadership Awards. The award was bestowed in recognition of BCA’s Green Building Masterplan and Singapore’s leadership in the green building movement in the Asia Pacific.

The International Star (I-Star) of Energy Efficiency Award: In June 2013, Singapore became the first country outside America and Europe to receive the I-Star Award. Conferred by US-based energy efficiency coalition Alliance to Save Energy, the award recognised BCA for its commitment to green at least 80 percent of Singapore’s buildings by 2030.



LEADING THE REGION

The BCA Green Mark certification programme is gradually becoming a benchmark for the Southeast Asian region and beyond. By mid-2013, close to 200 projects in over 10 countries including China, Malaysia, Vietnam, Thailand and Indonesia had adopted the Green Mark and applied for certification. The certification programme also acts as a reference for other countries developing their own green building rating systems.

BCA also works closely with the United Nations Environment Programme (UNEP) to advance sustainability goals in the region’s built environment. From 2010 to 2012, BCA has served as an elected member of the UNEP’s Sustainable Building and Climate Initiative (UNEP-SBCI) Advisory Board; as well as its Sustainable Building Index Steering Committee since 2010.



On 14 September 2011, UNEP and BCA signed a Memorandum of Understanding to formalise the collaboration between UNEP and BCA with a more structured arrangement. The BCA Centre for Sustainable Buildings (BCA CSB) was then established in Singapore and designated as a Centre Collaborating with UNEP.

In this capacity, BCA has helped UNEP-SBCI with outreach projects such as the production of Southeast Asia country reports on green building development and initiatives in the region.

In 2011, a BCA Centre for Sustainable Buildings, a Centre Collaborating with UNEP, was established in Singapore. The first of its kind in Asia, the centre’s goal is to drive the adoption of green building policies and practices in Southeast Asia. Its work includes the development of green building tools, approaches and support for countries in the region. Ultimately, the collaboration between BCA and UNEP aims to broaden the reach and distribution of UNEP’s work on sustainable buildings and cities.

Dr. Arab Hoballah, Chief of UNEP’s Sustainable Consumption and Production Branch says: “Singapore is now an Asian regional bridge for promoting green building methods. It can serve as an example to other countries and cities.”

THE THIRD GREEN BUILDING MASTERPLAN

Singapore aims to continue its leadership in green buildings in the tropics and sub-tropics. To achieve this, BCA is embarking on the third Green Building Masterplan, with a vision of making Singapore “a global leader in green buildings, with special expertise in the tropics and sub-tropics – enabling sustainable development and quality living.”

While the key initiatives under the first two Green Building Masterplans establish the groundwork and ‘hardware’ for green buildings, the next step is to develop the ‘software’ – a conscious and active pursuit of sustainability and green consumption behaviour among building users and inhabitants, and a focus on the well-being of these people.

Close collaboration between the public, private and people sectors is thus required to accelerate efforts and develop initiatives and programmes under the upcoming third Green Building Masterplan through three key strategic goals:

- (i) Continued Leadership ;
- (ii) Proven Sustainability Performance ;
- (iii) Collaboration and Engagement with Stakeholders.

Specific focus areas under each strategic goal will be identified to guide plans for the proposed initiatives in the next five to ten years.

This will ensure that Singapore remains well poised to share its green building knowledge with the rest of the world.

STRATEGIC GOALS OF THE THIRD GREEN BUILDING MASTERPLAN

Continued Leadership

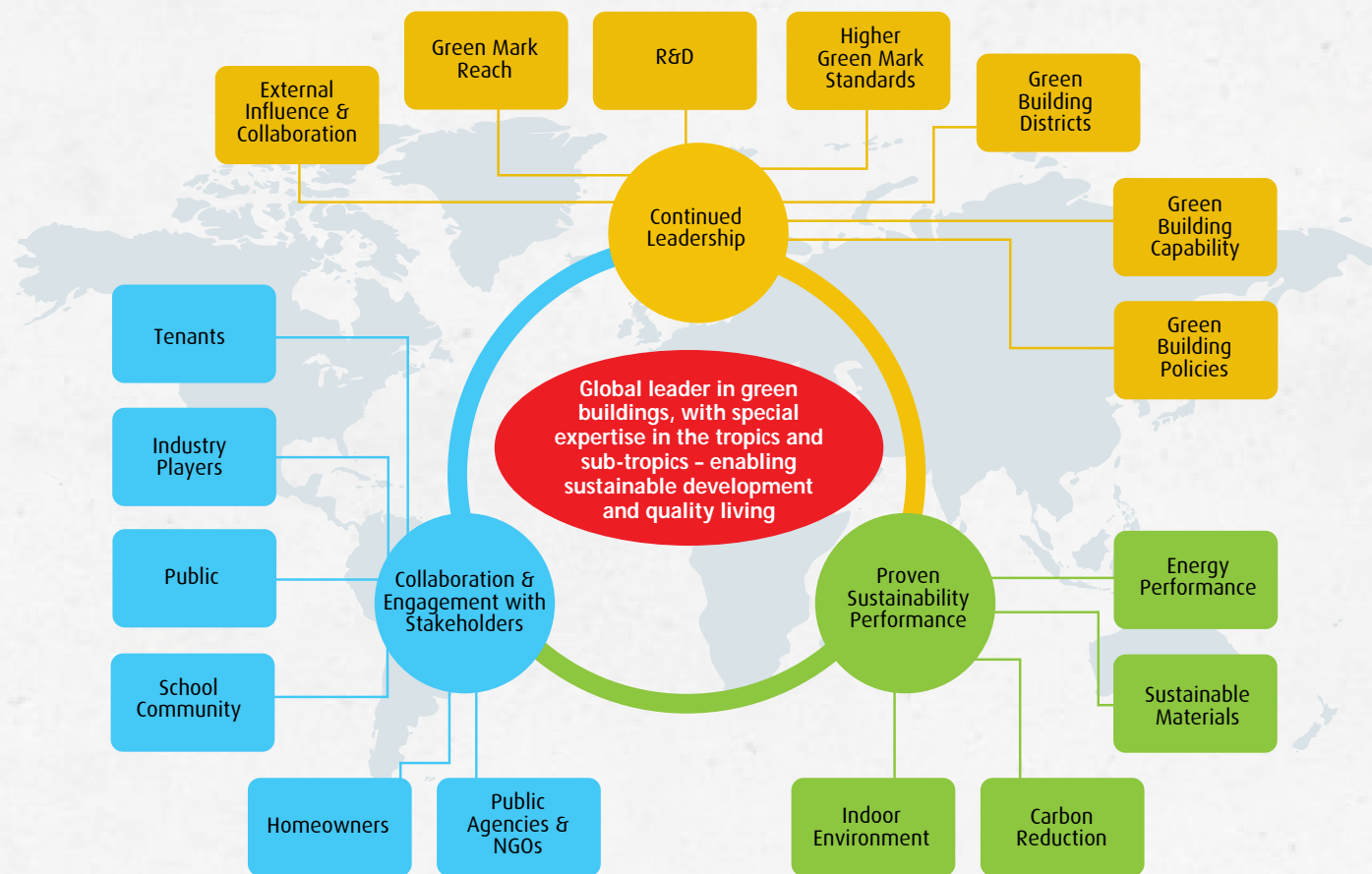
BCA aims to continue leading and supporting green building advancement in the region through sharing and training on sustainable buildings and technologies, as well as developing and establishing industry standards with innovative solutions to achieve zero/net-positive energy low rise buildings and low energy high rise buildings. This will be supported by grooming green specialists and experts for proper management of sustainable buildings.

Proven Sustainability Performance

The masterplan will address the need to monitor energy consumption, demonstrate building energy performance and make such relevant information more readily available. In addition, more attention will be paid to develop a roadmap that addresses carbon emissions reductions in a holistic manner, improving the quality of the built environment and occupant well-being, as well as incentivising the industry to accelerate the development of new green buildings and upgrade existing buildings' energy efficiency.

Collaboration and Engagement with Stakeholders

The Government will continue to take the lead in championing green building development. There will be greater emphasis on inter-agency collaboration through joint initiatives to raise awareness and encourage community involvement in sustainable development, as well as engaging key stakeholders and occupants on sustainable behaviour.





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