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# SG GREEN



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*Inside:*

**CapitaGreen: A Tree of Life in the Central Business District**

**SGBP: The Building Blocks to a Greener Built Environment**

**Interface: Get Growing with Sustainability**





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# SG GREEN

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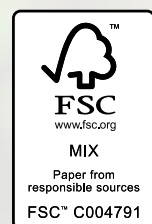
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Photo  
CapitaLand, CapitaLand Commercial Trust, Mitsubishi Estate Asia



# MESSAGE FROM THE EDITORIAL TEAM

Buildings account for a major part of our daily lives, forming the places where we live, work and play in. We spend most of our time inside buildings, so it is important for our buildings to be well designed, competently constructed as well as properly maintained to ensure the health and productivity of its occupants.

Buildings are also massive structures that can have substantial impact on their immediate environment. This is especially pertinent in this modern day and age, where climate change has become the norm rather than the exception. As the effects of the global change in temperature continue to make their presence felt, buildings have to evolve to become more adaptive, efficient and environmentally-friendly in order to mitigate these effects.

As important as a Green building's design is, the fundamental building blocks that make up the building are equally significant. Individually, these materials may seem trivial and inconsequential to a building's final look and performance, but they actually play important roles in creating a Green building. As a holistic supply chain from design to completion, the final structure can become an amalgamation of Green building design principles, brought together by the 'unsung heroes' that are the Green building products and materials.

This is the objective of SG Green, to spread awareness and knowledge of the many Green building products in the market, as well as to encourage their adoption and widespread use to create Greener, healthier buildings.

In our inaugural issue, we shed a little more light on the Singapore Green Building Product (SGBP) labelling scheme, the first and only dedicated labelling scheme for Green building products. A robust and relevant scheme developed for the industry by the industry, the SGBP has certified more than 700 environmentally-friendly building products, with many more in the pipeline.

The magazine will also share practical applications of Green building products and materials, whether in new buildings, existing buildings or interiors. The importance of carbon

footprinting to businesses will also be explored, along with the sustainability journey of a corporation with a global emphasis on environmental preservation.

We hope that through this publication, greater appreciation for Green building products and services can be forged, as well as the promotion of the widespread use of such materials to create a Greener, healthier built environment for our generation and beyond.

Sincerely yours,  
SG Green Editorial Team

The logo for SG GREEN features the letters 'SG' in a bold, black, sans-serif font. A stylized green leaf with a white vein is positioned between the 'S' and the first 'G'. To the right of the leaf is another 'G', followed by the word 'GREEN' in a bold, black, sans-serif font.





# THE BUILDING BLOCKS TO A GREENER BUILT ENVIRONMENT

The Green building movement has advanced exponentially over the years, steadily increasing in adoption rate and buy-in from all levels of the building and construction industry. As the world starts to recognise the connection between buildings, the environment and human health, the demand for Greener, healthier buildings will only grow. This is a positive and heartening trend, particularly since buildings are where we spend the greater part of our days in. Yet, we often overlook how buildings and the materials installed therein, their operations as well as maintenance play a direct role in affecting our immediate environment and our well-being.

## WHY GREEN BUILDINGS?

Put simply, Green buildings are marvels of engineering and construction, encompassing and connecting a wide range of

seemingly different and dissimilar features and properties into structures that usually possess an environmental footprint well below their conventional counterparts. So, a Green building's vertical greenery works best with interior environments that are regulated with efficient chiller systems, monitored by smart trackers that accurately measure ambient temperature and make minute adjustments accordingly. It is easy to incorporate a few Green building features and call it a day. However, true Green buildings go beyond the façade, so to speak. They start from the raw materials that bring the architect's blueprints to life. Building materials create our built environments: from the floors we walk on to the walls that give us privacy, every part of a building is made from one or more materials and functional systems. It is this proliferation that makes the technical applications of Green building products relevant.

A recent study conducted by the World Green Building Council dives into this at length, illustrating the direct impact of buildings on occupant health, well-being and their productivity. The study posits that better indoor air quality in a building can lead to productivity improvements of 8 to 11 percent. Further, the study found that thermal comfort has a significant impact on workplace satisfaction and some degree of control over individual thermal comfort can increase staff productivity. From these findings, it is clear that there is a direct link between the quality of the buildings and the health of its occupants.

## TOWARDS GREENER BUILDINGS

So how do building designers and builders know which materials possess the best environmental performance?

Enter the Singapore Green Building Product (SGBP) labelling scheme. Established as one of the primary mandates of the Singapore Green Building Council (SGBC) in 2010, the SGBP assesses and labels building products and materials based on their total environmental performance. It is not just the carbon

emissions of the final product; the manufacturing processes and disposal methods are also taken into consideration to ensure a holistic, inclusive assessment of the building product across its entire life cycle. Since its launch, the SGBP is envisioned as an authoritative scheme that serves as industry-standard benchmarks, helping to bring lesser known Green building products to the market and subsequent adoption by industry players. Across the more than 40 product categories that cover electrical, roofing and façade, mechanical, finishes, interiors systems and fixtures, as well as civil and structural; each product is put through a meticulous assessment process that spans five key areas: energy and water use; resource efficiency; health-related impact; and pollution control. Although the categories may seem broad, the SGBP remains laser-focused on building products and materials, with technical committees established specifically for each and every category.

1 SGBP label categories







### FROM THE INDUSTRY, FOR THE INDUSTRY

These technical committees form the backbone of the labelling scheme and a unique framework has been developed to draw upon the collective wisdom of the industry. These working groups comprise industry professionals from both public agencies and private organisations within the building and construction sector. Professionals from test laboratories, representatives from government statutory boards or agencies, scientists, architects, engineers and other product specialists regularly convene to draft certification criteria for each of the product categories, refining the documentation regularly so as to keep up with changes and trends in the built environment. It is this emphasis on current, relevant and updated industry experience that makes the SGBP distinctive and authoritative.

The beauty of this system is that the industry members know the industry best, and they can identify what is lacking in the short term and what can work in the long term. Instead of engaging a third-party organisation to run the certification scheme, the SGBP technical committees are made up of qualified individuals who have years of relevant experience, with considerable knowledge of their respective fields of expertise.

As an industry-oriented effort, the mandate of the SGBP is not on profit, but rather on bolstering the sustainability of the entire industry as a whole. Therefore, these technical committees are able to roll out certification criteria that are relevant and useful for companies, allowing them better access and greater ease of mind when they embark on certification. Committee members meet the SGBC member companies regularly for discussions on their products to be certified, factoring in their concerns and priorities about the product's assessment, once again ensuring that the criteria are applicable to specific products that fall within that category.

### RELEVANT AND APPLICABLE

Furthermore, SGBP product categories are also closely aligned with the Singapore Construction Electronic Measurement Standard (CEMS) and the OmniClass Construction Classification System (OCCS), allowing for easier integration into specifications for building projects and into building information modelling (BIM) and other forms of building object libraries. To maintain relevancy and credibility, the criteria is also benchmarked against better known local and international sustainability standards, including the Singapore Standards (SS) and International Standards Organisation (ISO) as well as





## ABOUT SINGAPORE GREEN BUILDING PRODUCT LABELLING SCHEME



renewed if the company has demonstrated efforts to further improve the product's performance.

SGBP certified products specified for use in projects and buildings receive additional points under the Singapore Building and Construction Authority's (BCA) Green Mark Scheme with higher ratings. This ensures that SGBP certified products remain one of the top choices for developers, consultants, contractors, architects and experts as the demand for Green buildings continues to grow.

### BUILDING BLOCKS FOR BETTER BUILDINGS

While a building's good design is important, the impact that building materials can have on occupant health and productivity cannot be discounted. As the nation moves towards a sustainable future, our buildings can become even Greener, healthier and more productive for occupants. Therefore, ensuring the environmental performance of these building blocks will have a profound impact on the quality of life for future generations and beyond.

For more information on the SGBP labelling scheme, please visit [www.sgbc.sg](http://www.sgbc.sg).

any other standards body that is associated with the particular product. Since 2014, thorough technical evaluation of products is carried out by renowned certification body TÜV SÜD PSB Pte Ltd, a service provider for a suite of product testing, inspection and certification services. With SGBC developing the assessment criteria and TÜV SÜD PSB Pte Ltd handling the technical assessment, this synergistic partnership gives the SGBP labelling scheme more credibility and transparency. At the end of the rigorous certification period, certified products are awarded with one of four levels of sustainability achievement namely: good (SGBP√); very good (SGBP√√); excellent (SGBP√√√); and leader (SGBP√√√√). Each SGBP labelling scheme certificate is valid for two years and will be



Photo  
RSP Architects Planners & Engineers (Pte) Ltd.



## 5 Key Assessment Criteria:

- Energy efficiency
- Water efficiency
- Resource efficiency
- Health & environmental protection
- Other green features



## SGBP Product Classifications:

- Mechanical
- Electrical
- Civil & Structural
- Walls & Finishes
- Floors, Ceilings & Fixtures
- Façade & Roofing



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+65 6732-5518







## Build Greener Buildings

### Singapore Green Building Product Labelling Scheme

The Singapore Green Building Product (SGBP) labelling scheme is jointly administered by the Singapore Green Building Council (SGBC) and TÜV SÜD PSB Pte Ltd. It is the first and only dedicated labelling scheme for green building products in Singapore.

#### Key features of the SGBP:

- A holistic and comprehensive approach to building product rating
- Relevant assessment criteria drafted by the industry, for the industry
- Robust technical assessment carried out by TÜV SÜD PSB Pte Ltd
- Certified products accrue additional points under the BCA Green Mark Scheme
- Adheres to ISO 14024 Type I Environmental Labelling Programme requirements
- Accredited under Singapore Accreditation Council (SAC) to ISO/IEC 17065 requirements



#### Benefits of certification:

- Improve competitive edge in the industry
- Proven sustainability performance
- Ready acceptance by the industry
- Enhance access to global markets
- Wider industry exposure and awareness
- Rating level differentiates your products in the market



#### Simple Certification Process





## SGBP 4-tick Showcase



### ACMV Pte Ltd

59Q Tuas South Avenue 1  
Singapore 637416  
Tel +65 6863 3231  
Fax +65 6863 9665  
Category: Auto Tube Cleaning System

### Akzo Nobel Paints (Singapore) Pte Ltd

AkzoNobel House 3  
Changi Business Park Vista #05-01  
Singapore 486051  
Tel +65 6635 5489  
Fax +65 6265 4775  
www.dulux.com.sg  
Category: Paints & Coatings

### Carrier Singapore (Pte) Limited

28 Teban Gardens Crescent  
Singapore 608926  
Tel +65 6410 0246  
Fax +65 6567 6818  
www.carrier.com.sg  
Category: Chillers

### HVS Engineering Pte Ltd

1 Bukit Batok Crescent  
#09-45 WCEGA Plaza  
Singapore 658064  
Tel +65 6310 8918  
Fax +65 3150 5498  
www.hvs.sg  
Category: Auto Tube Cleaning System

### Hydroball Technics (SEA) Pte Ltd

1 Kaki Bukit Avenue 3  
#02-17 KB-1  
Singapore 416087  
Tel +65 6338 8033  
Fax +65 6260 3008  
www.hbt.com.sg  
Category: Auto Tube Cleaning System

### Nippon Paint (S) Co. Pte. Ltd

1, First Lok Yang Road, Jurong  
Singapore 629728  
Tel +65 6265 5355  
Fax +65 6264 1603  
www.nipponpaint.com.sg  
Category: Paints & Coatings

## SGBP 3-tick Showcase



### ABB Pte Ltd

2 Ayer Rajah Crescent  
Singapore 139935  
Tel +65 6776 5711  
Fax +65 6778 0222  
www.abb.com.sg  
Category: Switchboard

### AGC Asia Pacific Pte Ltd

460 Alexandra Road,  
PSA Building #32-01  
Singapore 119963  
Tel +65 6273 5656  
Fax +65 6271 3817  
www.agc-flatglass.sg  
Category: Glazing

### Armstrong (S) Pte Ltd

81 Ubi Avenue 4, #02-12, Ubi One  
Singapore 408830  
Tel +65 6604 6839  
Fax +65 6604 6835  
www.armstrong.com  
Category: Panel Board

### CBS Paints Pte. Ltd.

Blk 5063 Ang Mo Kio Ind Park 2  
#01-1381 Singapore 569566  
Tel +65 6482 5455/5655  
Fax +65 6481 1210/6853 2613  
www.cbspaints.com.sg  
Category: Paints & Coatings

### Danfoss Industries Pte Ltd

25 International Business Park  
#03-57/58 German Centre  
Singapore 609916  
Tel +65 6885 9788  
Fax +65 6885 9799  
www.danfoss.com  
Category: Variable Speed Drive

### Dätwyler Cabling Solutions AG

30 Toh Guan Road, #01-01A  
Singapore 608840  
Tel +65 6863 1166  
Fax +65 6897 8885  
www.cabling.datwyler.com  
Category: Cable

## SGBP 3-tick Showcase

### Engro Corporation Limited

29 International Business Park  
#08-05/06 Acer Building Tower B  
Singapore 609923  
Tel +65 6561 7978  
Fax +65 6561 9770  
www.engro-global.com  
Category: Blended Cement

### Grundfos (S) Pte Ltd

25 Jalan Tukang  
Singapore 619264  
Tel +65 6681 9688  
www.grundfos.sg  
Category: Pumps

### Interface Singapore Pte Ltd

80 Marine Parade Road  
#22-03/05 Parkway Parade  
Singapore 449269  
Tel +65 6478 1519  
Fax +65 6478 1528  
www.interfaceglobal.com  
Category: Carpet

### JS Creates Pte Ltd

10 Admiralty Street  
#03-06 North Link Building  
Singapore 757695  
Tel +65 6752 7977  
Fax +65 6752 7077  
www.jscreates.com.sg  
Category: Cooling Tower

### Kansai Paint (S) Pte Ltd

74, Joo Koon Circle  
Singapore 629093  
Tel +65 6261 8621  
Fax +65 6265 0301  
www.kansaipaint.com.sg  
Category: Paints & Coatings

### Leoni Studer AG

29 Gul Lane  
Singapore 629423  
Tel +65 6863 4966  
Fax +65 6863 4955  
www.leoni.com.sg  
Category: Cable

### Milliken Asia Pte Ltd

438B Alexandra Road  
Alexandra TechnoPark Blk B  
#08-05 Lobby 2  
Singapore 119968  
Tel +65 6593 1329  
Fax +65 6377 3444  
www.millikencarpets.com  
Category: Carpet

### Nexans Singapore Pte Ltd

111 Somerset Road  
#09-06 TripleOne Somerset  
Singapore 238164  
Tel +65 6317 0101  
Fax +65 6317 0103  
www.nexans.com  
Category: Cable

### Nichias Singapore Private Limited

25 International Business Park  
German Centre  
Singapore 609916  
Tel +65 6268 6568  
Fax +65 6265 7681  
www.nichias.com.sg  
Category: Insulation Product

### PAREXGROUP Pte Ltd

28 Tuas South Ave 8  
Singapore 637648  
Tel +65 6861 0632  
Fax +65 6862 3915  
www.parexgroup.com.sg  
Category: Paints & Coatings; Adhesives & Sealants

### POWER-PLUS (S) Pte Ltd

10 Admiralty Street  
#02-78 North Link Building  
Singapore 757695  
Tel +65 6752 0171  
Fax +65 6752 0879  
Category: Switchboard

### Rockwool Building Materials (Singapore) Pte Ltd

3 International Business Park  
#03-29 Nordic European Centre  
Singapore 609927  
Tel +65 6933 7110  
Fax +65 6933 7129  
www.rockwoolasia.com  
Category: Insulation Product

### Schneider Electric Singapore Pte Ltd

10 Ang Mo Kio Street 65  
#02-17/20 Techpoint  
Singapore 569659  
Tel +65 6484 7877  
Fax +65 6484 7800  
www.schneiderelectric.com  
Category: Switchboard; Variable Speed Drive

### Shaw Contract Group

No. 1, Kim Seng Promenade  
#15-12, Great World City West Tower  
Singapore 237994  
Tel +65 6733 1811  
Fax +65 6836 6075  
www.shawcontractgroup.com  
Category: Carpet

### SMJ Furnishings (S) Pte Ltd

31 Jurong Port Road  
#02-20 Jurong Logistics Hub  
Singapore 619115  
Tel +65 6261 1212  
Fax +65 6261 6512  
www.smjf.com.sg  
Category: Carpet

### SuZhou Tuntex Fiber & Carpet Co.,Ltd

204 National Highway  
No. 28 Chengxi South Road Taicang, Jiangsu,  
215400 China  
Tel 512 5353 0142  
Fax 512 5353 4029  
www.tuntex-carpet.com  
Category: Carpet

### Tai Sin Electric Limited

24 Gul Crescent, Jurong Town  
Singapore 629531  
Tel +65 6672 9292  
Fax +65 6861 4084  
www.taisin.com.sg  
Category: Cable

### Top-Mix Concrete Pte Ltd

29 International Business Park  
Singapore 609923  
Tel +65 6890 8863  
Fax +65 6561 9770  
Category: Ready Mix Concrete

### Trane Distribution Pte Ltd

27 Benoi Sector  
Singapore 629859  
Tel +65 6468 8622  
Fax +65 6468 1828  
www.trane.com  
Category: Chillers

### Truwater Singapore Pte Ltd

1 Soon Lee Street  
#06-33 Pioneer Centre  
Singapore 627605  
Tel +65 6686 4868  
Fax +65 6686 4887  
www.truwater.com.sg  
Category: Cooling Tower

### Vacon Pte Ltd

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# CAPITAGREEN: A TREE OF LIFE IN THE CENTRAL BUSINESS DISTRICT

Located in the heart of the Central Business District, CapitaGreen—one of the newest office buildings to be completed—stands out with its striking green façade. As a modern office tower comprising 40 storeys of premium Grade A space, CapitaGreen breaks away from conventional office building design, incorporating multiple sustainable features in its construction and operation.

## A TREE OF LIFE

Designed by Pritzker laureate Toyo Ito like a plant growing towards the sky, CapitaGreen is crowned by a sky forest of tropical trees on its rooftop. A cool void, which runs through the building, channels fresh air from its roof top through its air-conditioning system to cool the office floors. At the same time, the building's generous floor-to-ceiling height allows natural lighting to permeate the space, creating a sense of spaciousness without the use of energy-consuming artificial lighting.

The design of CapitaGreen challenges the norms of what a typical office building looks like and strives to balance environmental consciousness with functionality. In addition to developing a dramatic façade, the development teams have also placed much emphasis on the interiors and building features to ensure they are befitting of a premium Grade A office building. The outstanding design is complemented by good connectivity to an established transport system and ancillary amenities.

For its environmentally-sustainable and inclusive design, CapitaGreen has been awarded the Green Mark Platinum Award in 2012 and Universal Design GoldPLUS in 2013 by the Building and Construction Authority.

1 Sky terrace





NEW BUILDING: CAPITAGREEN



**BRINGING NATURE CLOSER**

CapitaGreen is envisaged as more than a normal workplace; lush landscaping elements are placed at strategic points, bringing nature closer to the occupants. The building façade is clad with perimeter planters filled with shrubs and ground covers. Such greenery provides shade and visual comfort to its occupants while they are working.

A podium roof garden, three sky terraces and the sky forest on the rooftop offer occupants respite in the company of lush greenery.

The CBD is densely packed with many office towers of varying sizes and heights, fulfilling different business functions and standing tall in the 266-hectare wide district. Within such an enclosed built environment with buildings placed in close proximity to each other, CapitaGreen has a unique feature to bring fresh air into the building.

The summit of CapitaGreen features a distinctive red and white petal-like structure, which is part of a 'cool void' that

harvests the cooler and fresher air from the top of the building and around the sky forest, and circulates it via air-handling units to every office level. The feature is a novel way to offer fresh air to the office environment in a natural and sustainable manner.

**AESTHETIC INTEGRATION WITH FUNCTIONAL NEEDS**

The focus on aesthetic design combined with practical and functional considerations can be seen in the provision of the double skin façade for the entire building, with wide reinforced concrete ledges along the perimeter of the building façade. This serves as a maintenance corridor, as sunshading measures, as well as to add depth to the façade in order to create an interesting aesthetic effect with the interplay of various materials: the glass panels, lush greenery and fair-faced concrete.

- 2 CapitaGreen stands out with its striking green façade
- 3 The building is designed like a plant growing towards the sky





NEW BUILDING: CAPITAGREEN



**GREEN FEATURES**

The whole building incorporates plenty of green features and a plethora of sustainable materials, each contributing in their own way to the overall environmental performance of the building. Plasterboards, composite woods and various M&E products certified by the Singapore Green Building Product (SGBP) labelling scheme are incorporated throughout the structure.

With a 55-percent green ratio, CapitaGreen's gardens, sky terraces and planters placed on office levels offer the occupants a source of contact with natural landscaping in the dense built-up environment. Aimed at minimising solar heat gain, the building houses a large expanse of greenery as well as sky terraces on Levels 5, 14 and 26, while its innovative façade employs energy-efficient double skin high-performance glass and extensive vertical greenery. To irrigate the building's impressive array of plants, the building deploys innovative water-saving techniques such as rainwater harvesting to water the plants in a sustainable manner, also aided by VersiCell landscape drainage systems (SGBP✓) supplied by Elmich Pte Ltd. This extensive greenery also gives CapitaGreen its distinctive look. The use of Onewood composite wood (SGBP✓)—offered by Pacific Forest Products Pte Ltd—as

timber deck material for the outdoor refreshment area on the 40th storey is also a breath of fresh air from the voluminous steel, glass and concrete.

Eco-friendly plasterboards, such as the Standard Core Board supplied by Boral Plasterboard (Malaysia) Sdn Bhd and the Gyproc FireLine fire-rated gypsum plasterboard supplied by Saint-Gobain Malaysia, are used as architectural ceiling finishes. Both products have "Very Good" (SGBP✓) ratings for their proven environmental performances. For thermal and acoustic insulation within the building, MAKIBEE Fire Rated Rock Wool Blankets (SGBP✓✓) from Nichias Singapore Private Limited are utilised.

Within the inner workings of CapitaGreen, main switchboards (SGBP✓) provided by SMB Electric Pte Ltd and MNS Switchboards (SGBP✓✓) from ABB Pte Ltd serve as part of the building's electricity supply system. A Johnson Controls (S) Pte Ltd YK Series centrifugal chiller helps to proficiently provide a steady supply of chilled water to the building, with Hydroball autotube cleaning systems from Hydroball Technics (SEA)

4 The building façade is clad with perimeter planters filled with shrubs  
 5 The summit of CapitaGreen features a distinctive red and white petal-like structure that draws cool air in





NEW BUILDING: CAPITAGREEN



Pte Ltd and H&L autotube cleaning systems from ACMV Pte Ltd—both SGBP√√√√ “Leader” products—used to maintain the efficiency of the building’s chiller systems. In addition, the TA-FUS10N-C control and balancing valve, STAP and DA 516 differential pressure controllers (SGBP√) from TA Hydraulics Pte Ltd installed into CapitaGreen’s chilled water system help to improve energy efficiency and cost savings, as well as to improve the return temperature of the chilled water to the chiller in the hydronic system.

Tenants within CapitaGreen have also utilised Green building materials in their own office fit-outs. For example, Jones Day has installed plainAir demountable partitions (SGBP√) supplied by Clestra within their premises. These prefabricated products require no glue or chemicals to install, and add a more natural feel to an otherwise artificial and rigid office environment.

With its iconic design, CapitaGreen looks set to be a beacon for Green building design and a new landmark in the CBD. It will redefine the Singapore cityscape and the perception of urban greenery, and bring about enhanced value for its stakeholders.

**Concept Designer**

Toyo Ito & Associates Architects

**Project Architect**

RSP Architects Planners & Engineers (Pte) Ltd

**Civil & Structural Engineers**

Sasaki and Partners (Concept)

RSP Architects Planners & Engineers (Pte) Ltd

**Mechanical & Electrical Engineer**

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**Quantity Surveyor**

Langdon & Seah (Singapore) Pte Ltd

**Façade Consultant**

ARUP Singapore Pte Ltd

**ESD Consultant**

ARUP Singapore Pte Ltd

**Landscape Architect**

Sitetectonix Private Limited

**Lighting Consultant**

Lighting Planners Associates (S) Pte Ltd

**Interior Designer**

Mitsubishi Jisho Sekkei Inc

**Main Contractor**

Takenaka Corporation

**Images/Photos**

CapitaLand; CapitaLand Commercial Trust; Mitsubishi Estate Asia

6 CapitaGreen building in the evening

7 The double skin façade integrates aesthetic design with functional needs





8 CapitaGreen is located in the heart of the Central Business District





# GET GROWING WITH SUSTAINABILITY

*"I have the mental image of a mountain to climb—a mountain that is taller than Everest, and infinitely more difficult to scale. The name of the mountain is Mount Sustainability. We are only on the lowest slopes of this mountain, but we know the way to the top." – Ray C. Anderson*

When the late founder of Interface, Ray Anderson, addressed the company task force in 1994, they expected him to talk about compliance, review legal requirements, and discuss what the company needed to do to manage risk. Instead, he stunned them by setting out his vision to make Interface "the first name in industrial ecology." As this thinking matured, the vision grew into Mission Zero—the company's promise to eliminate any negative impact it may have on the environment by the year 2020. In 1994, many people within and outside the company thought his idea was crazy, if not impossible. Yet 20 years down the road, the company is a recognised and well-respected pioneer and leader in the sustainability field.

Sustainability is more than an environmental philosophy. It is a platform to drive growth, build value and stay ahead of the

competition. Embracing sustainability opens up energising possibilities for an organisation. You can gain fresh insights into streamlining processes for greater efficiency, retooling products so they are most cost effective and refining employee strategies that build on what is best for your operations, culture and mission. In short, sustainability makes great organisations even greater.

## **FIVE THINGS WE HAVE LEARNT ABOUT THE POWER OF MISSION ZERO**

### *1. Set an outrageously ambitious goal to inspire real change*

The magnitude of Interface's sustainability vision is its unique strength. When it was announced in 1994, the vision was so radical that people embraced it and indulged the idea because the date for achieving the goal was 25 years away. The Interface vision to have zero negative impact is extremely

1 Urban Retreat tiles





## SGBC SUSTAINABILITY PROFILE: INTERFACE

demanding, and some people say it was naive to think that it could be achieved. However, due to its challenging nature, it has inspired fundamental changes in the way people work at Interface; no matter your role, you can always do better and push a little further towards the goal. Employees are continually striving to come up with innovative processes that contribute to achieving the long-term vision, as opposed to small incremental improvements to meet less demanding targets.

At Interface, we use this phrase “there has to be a better way”. It applies to everything from new manufacturing processes and new products to new ways of engaging customers. Rather than setting a limited target that can be achieved only by refining existing technologies or making current processes more efficient, Mission Zero demands real innovation. If we cannot achieve our goal using the technology we have available to us, we are continually challenged to think of new ways of doing things. This challenge has given us groundbreaking innovations such as:

- TacTiles, our adhesive-free way of installing carpets that produce virtually zero volatile organic compounds (VOCs) and reduce environmental impacts by 90 percent
- Entropy, our non-directional flooring collection that produces less than 1 percent of installation waste due to its ability to mix and match random designs
- Microsfera, our latest breakthrough in product innovation, has the smallest carbon footprint of any carpet tile in history at just 3 kilogrammes of carbon per square metre
- ReEntry, our carpet recycling programme, which has successfully diverted more than 118 million kilogrammes of carpet from landfills globally

### 2. Address the ‘elephant’ in the room

Interface’s sustainability strategy gained credibility because it addresses our material issues, including major and complicated challenges. Mission Zero is split into seven key areas (or fronts), each addressing a key sustainability

- 2 Net Effect tiles
- 3 Carpet tiles for ReEntry





challenge (see sidebar). Rather than avoiding problem areas, our strategy focuses on finding solutions to some of our biggest sustainability challenges, such as:

- Nylon yarn, our main raw material is derived from oil, which increases our carbon footprint and thus we said we would “cut the umbilical cord to oil”
- Our customers were sending old carpet to landfills, a process that Interface had little control of; we said we would “close the loop, engage stakeholders and redesign commerce”

As an organisation, Interface seeks to adopt a natural model of a closed-loop system and continues to look for better and brighter ways to leverage existing resources rather than mine Mother Nature’s limited supply.

One of the most exciting and innovative efforts underway at Interface right now is Net-Works, a cross-sector initiative in partnership with the Zoological Society of London and our yarn supplier, Aquafil. The programme has established a community-based supply chain for collecting discarded fishing nets in rural coastal areas in the Philippines, recycling them into carpet yarns while lifting the incomes of poor fishing communities. These discarded nets, which are made from the same material that is used to make carpet yarn, do not disintegrate easily. When not properly disposed, the nets can trap and kill marine life. Net-Works addresses this growing environmental problem, while also supporting Interface’s ambitious Mission Zero goal—100-percent recycled nylon.



Thus far, Net-Works has saved close to 66,860 kilogrammes of discarded fishing nets from becoming pollutants in the ocean, and helped villagers in the Philippines to earn supplemental income that equates to 230,667 additional meals. The success of our pilot programme, across 14 collection sites in Danajon Bank and Bantayan in central Philippines, is now being replicated in the Lake Ossa region in Cameroon, Africa. This type of collaboration with our suppliers can deliver various multipliers of value that are consistent with our materials management strategy, supply chain development, community engagement, social sustainability and product innovation.

**3. Let the business case speak for itself, right from the start**

For Interface’s strategy to succeed, we made sure our people could clearly see that sustainability would benefit the business. At Interface, we began to see the results of our commitment very quickly. As we worked towards Mission Zero, costs were going down, not up. This dispelled a myth that a choice has to be made between the environment and the economy. It also helped to convince employees who were initially wary if sustainability could deliver value for the business. Making the business case speak for itself right from the start is essential. It gives the sustainability strategy credibility among potential cynics.

A wide range of initiatives across the company is helping to reduce waste and energy use, while cutting costs. For example, our global quality utilising employee suggestions and teamwork (QUEST) programme, which encourages employees to identify and reduce waste across the business, has enabled us to save over \$405 million globally since 1995. If QUEST focuses on incremental improvement (using, for example, Six Sigma, waste management programmes and focusing on lean manufacturing), our EcoSense programme targets step change and transformative disruptions. EcoSense allows different factories to benchmark, establish goals, as well as track and report the progress. Since its inception, the programme has



continuously evolved with new opportunities and new metrics as we have come to understand what it truly takes to become a sustainable company, and as we have become better at measuring our progress, although the business case is not just about cutting costs.

When we began our journey in the mid-1990s, sustainability was a relatively unknown concept. Since then, the market has changed. Sustainability and climate change are now hot topics with many companies or organisations keen to show that they are reducing their environmental impacts. Our customers increasingly want to buy more sustainable products with high recycled content and a low carbon footprint. They want their buildings to meet sustainability standards like LEED or BREEAM, and they ask us to help. For some of our key customers, sustainability is the number one criterion.

**4. Make Mission Zero personal, one mind at a time**

At Interface, we target our communications and highlight different aspects of the Mission Zero challenge to ensure sustainability messages resonate with each of our employees in their particular role. We encourage dialogue with employees on sustainability issues instead of depending on one-way communication, and encourage them to make suggestions. This helps motivate our people to be creative and come up with solutions to the challenges, and they are rewarded for their efforts.

Additionally, employees are given opportunities to reduce their personal environmental impact through voluntary programmes such as Cool CO2mmute, which allows them to neutralise their emissions generated from daily commuting and personal travel through the sponsoring of tree plantings. Interface matches any pledge our employees make on their primary vehicle so the contribution is doubled. More than 64,000 trees have been planted since the programme began in 2002.

**5. Use sustainability as a source of inspiration and innovation**

Since 1994, Interface has been collaborating with Janine Benyus, a biologist, innovation consultant and author, to explore how we could bring the principles of biomimicry to our business. Emulating nature’s designs and processes has been a great source of inspiration and offered us many sustainable solutions in our journey to realise Mission Zero.

We also began to look at biophilia—the way that we are all naturally drawn to and benefit from the natural environment. The benefits of being in a biophilic environment are measurable and positively affect the occupant’s well-being and productivity. Leading companies like Google are incorporating echoes of nature into their spaces, enabling their employees to leverage stimulating environments to either infuse calmness or inspire creativity.

At Interface, we are using biophilic designs for our modular carpet tiles to help interior designers create environments that benefit the occupants in aesthetic and physical ways. By installing these carpet tiles, the office environment gets an acoustic enhancement through noise reduction as well as improvement to underfoot comfort. Studies have also shown an improvement in indoor air quality through the use of these tiles. Some of our most popular collections such as Urban Retreat, Net Effect and Human Nature, draw their inspiration from nature and in addition to their biophilic benefits, they allow designers to create path-like directions in the floor, driving traffic in a desired direction, creating organic breakout spaces, or just letting the floor roll across a corridor.

**Images/Photos Interface**

- 4 When not properly disposed, nets can trap and kill marine life
- 5 Net-Works has lifted the incomes of poor fishing communities
- 6 Carpet tiles for ReEntry

**Our Top Tips**

- Set ambitious targets that inspire people.
- Have the courage to face up to tough challenges; don’t just tell the positive stories.
- Link the sustainability strategy to the business case.
- Acknowledge the need to fundamentally redesign core products and processes for a truly sustainable transformation.
- Create a culture of “there is a better way”.
- Lead from the top with visible and sustained commitment from senior executives.
- Inform, engage and motivate employees to put the strategy into action.
- Use the ambitious sustainability strategy to achieve competitive advantage through innovation.





# INTERFACE & MISSION ZERO

7

Interface is a worldwide leader in the manufacture of modular commercial flooring, producing the industry’s largest and most diverse range of carpet tiles.

Interface founder and chairman Ray Anderson pioneered corporate sustainability in 1994 by recognising that the way the industry works is fundamentally unsustainable and that it had to change. It needed to stop having a destructive effect on the natural and social environments, and, instead, work to restore it.

Ray’s epiphany revolutionised Interface’s business strategy from that day forward. It later transformed into Mission Zero, which we likened to climbing a mountain higher than Everest. With this in mind, we have set out our path to scale Mount Sustainability on seven ambitious fronts.

The Seven Fronts: our goals and progress

1. Eliminating waste – Eliminating all forms of waste in every area of business. Since 1996, there has been a 91-percent reduction in waste sent to landfills.
2. Benign emissions – Eliminating toxic substances from products, vehicles and emissions. We have cut our actual greenhouse gas emissions by 73 percent since 1996.
3. Renewable energy – Reducing our energy demands while substituting non-renewable sources with renewable ones like solar, wind and landfill gas. Forty-five percent of our global energy comes from renewable sources.
4. Closing the loop – Redesigning processes and products so that all resources used can be recovered and reused, closing the technical or natural loop. Fifty percent of our total raw materials are recycled or are bio-based materials.

5. Resource-efficient transportation – Transporting people and products efficiently to reduce waste and emissions. To facilitate resource-efficient transportation across APAC, Interface has manufacturing plants in Thailand, China and Australia.
6. Sensitising stakeholders – Creating a community within and around Interface that understands the functioning of natural systems and the impact our actions can have on them.
7. Redesign commerce – Redesigning commerce to focus on the delivery of value instead of material.

7 Human Nature tiles

| Interface Singapore Pte Ltd   |                             |                                     |
|---|-----------------------------|-------------------------------------|
| Carpet manufacturer with SGBP√√√ rated products certified under the Carpets category of the Singapore Green Building Product (SGBP) labelling scheme. |                             |                                     |
| Building Project  | SGBP Certified Product Used | Approximate Square Feet Implemented |
| Ng Teng Fong General Hospital   | Glasbac (SGBP√√√)           | Over 100,000 sq ft                  |
| MND @ JEM   | Glasbac (SGBP√√√)           | Over 200,000 sq ft                  |
| GEMS World Academy Singapore  | Glasbac (SGBP√√√)           | Over 60,000 sq ft                   |
| BHP Billiton @ CapitaGreen  | Glasbac (SGBP√√√)           | Over 30,000 sq ft                   |
| DBS Learning Academy @ DBS Asia Hub   | Glasbac (SGBP√√√)           | Over 40,000 sq ft                   |



# WALKING THE TALK

In February 2014, the Singapore Green Building Council (SGBC) relocated from its former location at Robert Bosch (SEA) building to their current premises at King's Centre—a Green Mark Platinum (Existing Buildings) certified property developed by City Developments Limited. In line with its key role to advocate Green building design, practices and technologies and to drive environmental sustainability in Singapore's building and construction industry, SGBC endeavours to walk the talk within its own office premises.

At the macro-level, the building has a whole suite of sustainability features—motion-sensored lighting for the basement car park, a robust recycling programme and an energy consumption monitoring system among others—while at the micro-level, the SGBC office is equipped with its own set of Green features that enhance the comfort and well-being of its occupants.

## LAYOUT & DESIGN

### *Waiting area*

At just over 100 square metres, the office space is relatively small. Visitors are greeted at the entrance by a curved glass and timber screen wall, which ushers them into the waiting area. Here, eco-friendly Lacobel low-iron, white back-painted glazing and MNGE Mirox mirrors—both SGBPV products from AGC Asia Pacific Pte Ltd—clad the walls. The reflectivity of the glass and mirror walls adds visual depth to create the perception of a larger space, and helps permeate daylighting. Located behind the three full-height glass panels are much needed storage cabinets. In one of them, an LED TV (Energy Star certified) provides a running video of the Green design features and products employed in the office.

### *Conference room*

Back-painted wall glazing once again features in the conference room, surrounding and embracing the space—this time in SGBC's trademark green colour. A movable wall partition system divides the conference room into two when needed, while foldable conference tables on wheels provide usage flexibility—affording more use with less space and resources. Additionally, all the chairs here are reused from the former SGBC office.

Both the waiting area and the conference room form the front-of-house zone of the office, as delineated by the light grey

carpeting and plasterboard ceiling with downlights; while dark grey carpeting and mineral fibre ceiling tiles with fluorescent tube lights define the back-of-house work area.

### *Work area*

The work area has an open layout with low modular system partitions. The executive room sits away from the windows to better allow for daylight penetration into the main work space. Visually, the room is part of the larger work area, but is enclosed within clear glazing for acoustical privacy. Potted greens line the windows, and sunshades help mitigate solar glare to improve occupants' visual comfort.

1 Office entrance







## INTERIORS: SGBC OFFICE



### Lighting

Lutron GL Limited designed the lighting management solutions system based on an overall lighting power budget of less than 7.9 W/m<sup>2</sup>. As motion sensors (SGBP-V product) are installed throughout the office, lights will automatically switch off when an area is vacated, and turn on when movement is detected within the vicinity. User-controlled ceiling lighting and table lamp task lighting provide occupants with the ability to adjust the illuminance of their immediate environment to suit needs. Daylight photocell sensors by the window regulate the amount of artificial lighting needed, by dimming electric luminaires when daylight harvesting is possible, to achieve electrical energy savings.

Within the conference room, dimmable energy-saving Zenia Senia LED integrated downlights with light diffusers (SGBP-VV product), from Megaman (Singapore) Electrical and Lighting Pte Ltd, provide soft diffused illumination over the conference table. Colour Rendering Index (CRI) of more than 80 ensures accurate interpretation of colours. VEET LED MR16 reflector lamps serve as wall accent lighting. They look and light up similar to halogen lamps, making them excellent low-energy alternatives. The power rating of these lamps is 6 watts, versus halogen's 35 watts—resulting in energy savings of more than 80 percent. They also have high colour rendering of up to 92 CRI.

The lighting system within the work area has been upgraded from the existing T8 to T5 fluorescent tube lights. The power rating of each T5 lamp is 13 watts, which translate to about 25 to 30 percent savings in terms of electric power consumption,

## ENERGY, EQUIPMENT & LIGHTING

### Energy

King's Centre's power provider, Tuas Power Supply Pte Ltd (TPS), has an online electricity automated meter reading (AMR) portal that provides the building tenants with easy access to their electricity consumption data. This allows for better control on electricity usage, improving building energy efficiency.

### Equipment

The computers, monitors, photocopier and printers within the office are Energy Star certified, with energy-saving settings turned on where available. The pantry has a Mitsubishi Electric refrigerator with a 3-tick energy labelling scheme (ELS) rating.

2 Ample potted plants that cover more than 2 percent of the office floor area, including these at the entry area, help to create a lush and fresh work environment

3 Work System Furniture here is reused from SGBC's previous office. This i5 Modular Office System Furniture from Innoplant Technology Pte Ltd uses 100 percent post-consumer recycled fibre

4 Office layout plan







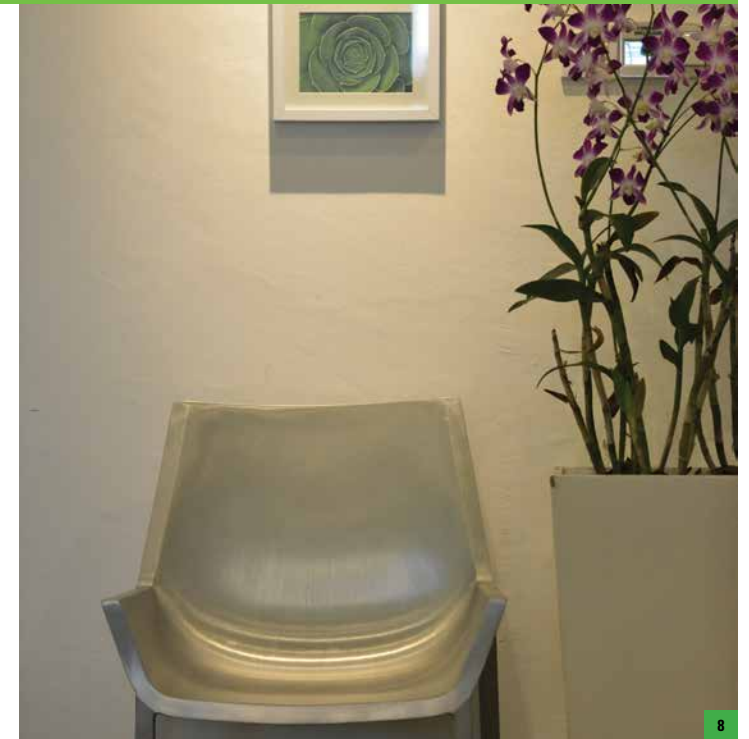
## INTERIORS: SGBC OFFICE

as compared to the 18-watt T8 lamp. The Phillips T5 lamps installed in the SGBC office are high efficiency eco-fluorescent tube lights with higher lamp efficacy as compared to ordinary T5s, thus allowing additional electrical energy savings of up to 10 percent.

### BUILDING PRODUCTS

#### *Sustainable materials*

The SGBC office uses an extensive range of eco-friendly building products, many of which are Singapore Green Building Products (SGBP) certified. An example is Nippon Paint's Odourless Premium All-in-1 paint, an SGBP✓✓✓✓ 'leader' rated product that is applied on the walls and ceilings. It does not contain ammonia, mercury, lead (0.2 percent) or heavy metals in general; and has a volatile organic compound (VOC) level of almost zero. Without emitting much odour during and after painting, it provides a healthier environment not only for the occupants, but also for the painters. For network wiring, eco-friendly LANmark-6 cables (an SGBP✓✓✓ product) from Nexans Singapore Pte Ltd are used. Covering the floor are carpet tiles from Interface Singapore Pte Ltd, with GlasBac backing system (an SGBP✓✓✓ product). This backing system contains about 40 percent post-industrial recycled content and does not use adhesive for its installation. TacTiles connectors, glue-free adhesive squares, adhere the carpet tiles to one another and create a 'floating' floor. As VOCs are virtually non-existent, the materials do not emit odours.



#### *Green Practices*

Apart from building products, the office supports the use of environmentally-friendly office materials and stationery, cleaning products, dishwashing and floor-washing detergents, as well as printing paper and toilet paper. The use of personal mugs and porcelain glasses instead of disposable ones is also encouraged.

Recycling is also a fundamental office practice—waste paper and other materials are reused when possible. Individual employees also reduce the need for printed matter by preparing soft copies of notes or materials.

For all of its environmentally responsible efforts, the SGBC office has been awarded the BCA Green Mark Platinum (Office Interiors) certification.

#### **ID Concept Designer**

Architects 61 Pte Ltd

#### **ESD Consultant**

Building System and Diagnostics Pte Ltd

#### **ID Contractor**

Skillplan Designer & Builder Pte Ltd

#### **Images/Photos**

Singapore Green Building Council



**5** High-pressure laminates Shiro Bamboo and Luftigo Walnut finish the timber-cum-glass screen wall and conference table respectively. These SGBP certified products from Maica Corporation Sdn Bhd are made using raw materials from sustainably managed forests and plantations. Contrasting against the rich and warm textures of the timber laminates, are the Lacobel back-painted glazing from AGC Asia Pacific Pte Ltd, with up to 30 percent recycled glass content

**6** Work area with ceiling and task lighting

**7** Satchmo and Big Band carpet tiles from Interface Singapore Pte Ltd

**8** The Sezz Collection chair by Christopher Pillet, from Space Furniture Pte Ltd, creates a fusion between comfort and strength, while retaining the original Emeco process of using 80 percent recycled aluminium

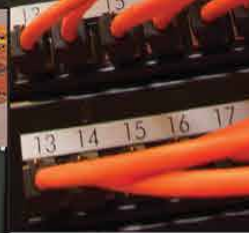






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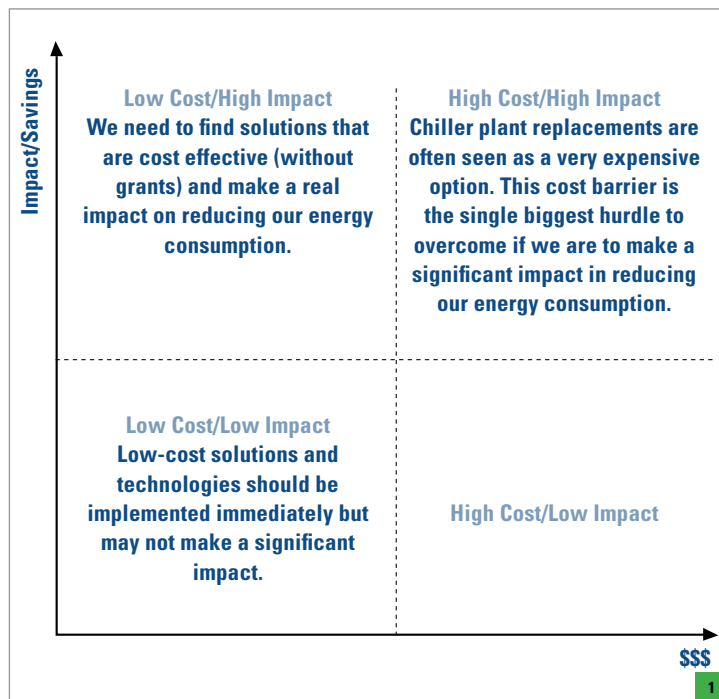


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# OUTSOURCING SUSTAINABILITY

Existing buildings pose the greatest challenge as we move towards the target of 80 percent Green Mark certified buildings by 2030. These structures make up the majority of Singapore's building stock and new buildings will only add 1 percentage point to the total number of buildings each year. Exacerbating the situation, measures to improve energy efficiency are often seen as too expensive with prohibitive payback periods of five to 10 years. For example, although a new chiller plant system can promise an improvement in efficiency of 50 to 60 percent, the typical payback period of seven years is enough to turn off many building owners.



Local energy service company Kaer, a certified environmental sustainability design (ESD) service provider under the Singapore Green Building Service (SGBS) labelling scheme, has been working with local building owners to identify gaps and implement innovative business models that allow for energy-efficient improvements without invoking the threat of prohibitive cost. To date Kaer has pioneered three such models. The common feature of all these models is that building owners can outsource their energy efficiency and sustainability targets to Kaer whilst they remain focused on their core business.

## 1. AIR-CONDITIONING AND MECHANICAL VENTILATION (ACMV) SYSTEM OPTIMISATION WITH SHARED SAVINGS

In 2013, Kaer partnered with property developer Lendlease to further optimise the energy efficiency of the ACMV system at the already Green Mark Platinum (New Buildings) certified shopping mall 313@somerset.

In this project, Kaer invested in three major initiatives:

- A. Installation of the K-RealTime energy monitoring system with inbuilt optimisation intelligence.
- B. An extensive chiller plant and air-side optimisation programme with on-site management by Kaer engineers.
- C. Green Mark Platinum re-certification under Existing Buildings.

In the contract, Kaer was given full accountability for the efficiency of the system. Although many models with similar objectives had been trialled in the past, this model fully outsourced the operations of a building's air-conditioning system to an external service provider, and offered attractive incentives for energy efficiency performance targets. As a way to deliver the promised system efficiencies, Kaer monitored and operated the chiller plant through their

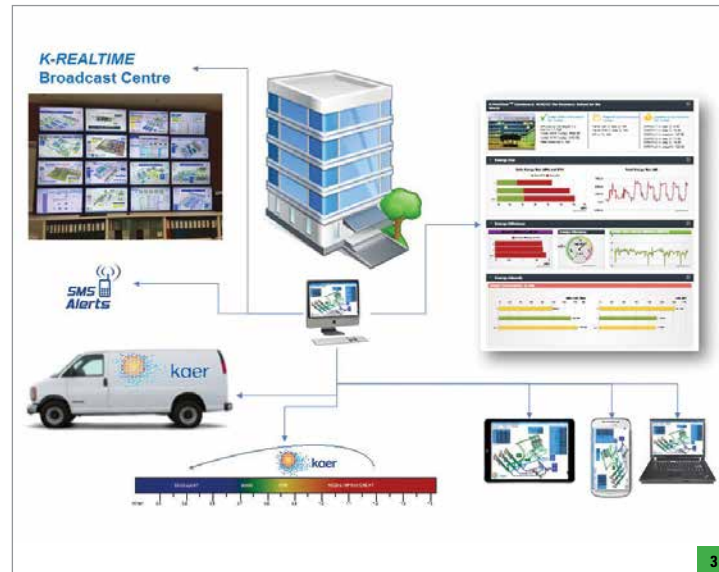
1 Identifying the main hurdle to overcome as we move towards more energy-efficient buildings  
 2 K-RealTime Broadcast Centre (KBC) monitoring over 40 sites in the Asia-Pacific region





## EXISTING BUILDING: KAER'S INNOVATIONS

K-RealTime Broadcast Centre. This provides 24-hour visibility on plant operations, using an SMS alert platform to keep the engineers and service team aware of optimisation requirements and generates energy dashboards that are reviewed on a daily basis to continually drive improvements to the plant's efficiency. This partnership resulted in a 20-percent improvement in the chiller plant efficiency. Due to the success of this arrangement at 313@somerset, Kaer and Lendlease have expanded their collaboration to include Setia City Mall in Shah Alam.



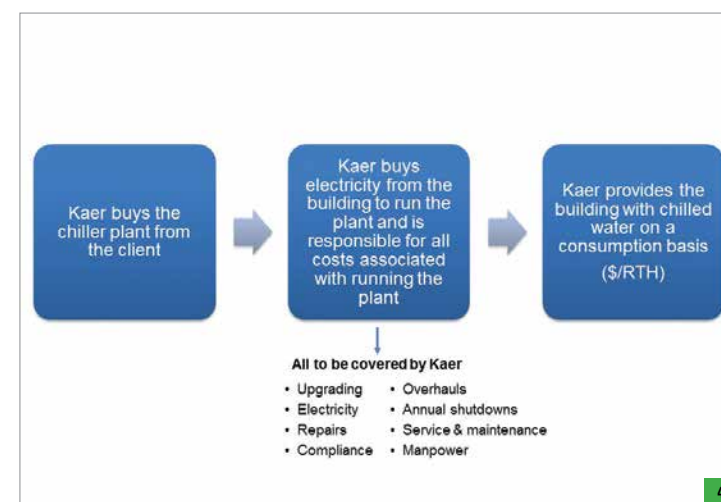
## 2. GUARANTEED ENERGY SAVINGS PROGRAM (GESP) CONTRACTING

In this model, Kaer typically designs, builds and operates chiller plants for one to five years, at a guaranteed level of efficiency. Although there are slight variations, the main features are common across all GESP contracts. The client will stipulate a required efficiency guarantee such as 0.65kW/RT and service providers will bid for the project on a design-and-build basis. Service providers are responsible for designing the system, building the new plant and are given a service and maintenance contract for a one- to five-year period. During this period, the service provider furnishes annual operating system efficiency (OSE) reports stating the efficiency of the plant. If the efficiency level is higher than what was promised (e.g., 0.70kW/RT against the promised 0.65kW/RT), the service provider is responsible for reimbursing the client with any loss in savings. This allows the client to outsource their energy efficiency goals to the service provider who is operationally and financially responsible for hitting the desired efficiency targets.

Kaer was recently awarded GESP contracts with the Parliament House, Singapore Aviation Academy, Becton Dickinson, Alexandra Point and Commonwealth Food Services, and has been consistent in achieving the efficiency levels stated in the different contracts.

## 3. KAER WATER

Kaer Water can be considered one of the most significant innovations in the air-conditioning industry of the last 20 years. As an arrangement that outsources chilled water production to a trusted supplier, Kaer takes ownership of a building's chiller plant and is responsible for delivering a reliable, constant supply of chilled water as required. With Kaer Water, the building owner is spared capital investment for upgrading their chiller plant, and this allows them to focus on their core business, knowing that a certified professional organisation is ensuring the performance and efficiency of their plant. This model ensures plants are monitored 24 hours a day, delivering system efficiencies of 0.55kW/RT and below.



Kaer Water has been implemented across all the building sectors including educational facilities (e.g., INSEAD Business School), commercial buildings (e.g., Orchard Towers) and mission critical industrial buildings housing data centres (e.g., 7000 AMK, the old Seagate building).

3 Kaer's K-RealTime Infrastructure that delivers continuous plant monitoring and optimisation  
4 The Kaer Water model

## CASE STUDY: KAER WATER

### ORCHARD TOWERS

The Orchard Towers office block was served by a 19-year-old chiller plant.

- Three water-cooled chillers
- Increasing occurrence of reliability issues
- Escalating repair costs
- End-of-life for the chiller plant that was in need of complete replacement



5

Kaer bought the existing chiller plant and took over all responsibility for the operations and upgrading of the plant, delivering an uninterrupted supply of chilled water to the building. They designed, built, paid for and installed a brand new chiller plant. With zero capital investment, Orchard Towers now has a brand new chiller plant operating at Green Mark Platinum efficiency levels.



### INSEAD BUSINESS SCHOOL

The INSEAD campus consists of two buildings served by a 17-year-old chiller plant.

- Three air-cooled chillers
- Efficiency of 1.8kW/RT
- Increasing occurrence of reliability issues
- Escalating repair costs
- No possibility of Green Mark certification

5 The old chiller plant at Orchard Towers  
6 Kaer Water at Orchard Towers



## EXISTING BUILDING: KAER'S INNOVATIONS

Under this arrangement, Kaer bought INSEAD's existing chiller plant and took over all responsibility for the operations and upgrading of the plant. With zero capital investment, INSEAD now has a brand new chiller plant operating at 0.55kW/RT (annual average). Their electricity consumption halved overnight and they received the prestigious Green Mark Platinum award for their campus.



## CONCLUSION

By addressing the key barrier to upgrading chiller plants through the various models described above, it is now possible to have reliable and efficient ACMV systems that can operate with target efficiencies of 0.55kW/RT and below. This allows building owners to focus on their core business and invest their capital in other areas that can make their buildings more energy efficient or their businesses more profitable.

## Images/Photos

### Kaer

- 7 The old chiller plant at INSEAD
- 8 Kaer Water at INSEAD

### Kaer Pte Ltd

Service provider certified under the Environmental Sustainability Design category of the Singapore Green Building Service (SGBS) labelling scheme.



# SLTDC

SINGAPORE LIGHTING TECHNOLOGY AND DESIGN CENTER



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To accelerate the adoption of energy-efficient lighting technologies and best practice design in Singapore's built environment

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Demonstration,  
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# MAKING BUSINESS SENSE OF CARBON FOOTPRINT

By Dr Song Bin, Senior Scientist, Singapore Institute of Manufacturing Technology (SIMTech)

With increasing awareness of and concern over climate change all over the world, governments, organisations and product manufacturers have made efforts to reduce their carbon footprint (CFP), which has become a frequently used indicator for environmental performance. Actions such as regulations, Green procurement guidelines, supplier criteria, etc., are cascading through the supply chain down to general businesses. It has therefore become increasingly important for businesses to understand what CFP is, the factors affecting its quantification, and how they can benefit from CFP initiatives.

## WHAT IS CFP?

CFP can be defined as the sum of greenhouse gas (GHG) emissions and removals caused directly and indirectly by an individual, organisation, event or product. For the building and construction industry, a product can be defined as material used by the materials manufacturers, a building component (e.g. windows) for the component makers, or it can refer to the entire building for the developer or owner. CFP includes the six Kyoto Protocol GHG emissions namely, carbon dioxide

(CO<sub>2</sub>); methane (CH<sub>4</sub>); nitrous oxide (N<sub>2</sub>O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulfur hexafluoride (SF<sub>6</sub>). The increase of GHG in the atmosphere results in rising temperature on the earth's surface and this in turn contributes to climate change. The intensity and effect of each GHG on global warming is different: for instance, the global warming potential impact of methane on climate change is 28 times that of carbon dioxide<sup>1</sup>. Thus, to aid in CFP quantification, the intensity of each GHG is converted into its carbon dioxide equivalent (CO<sub>2</sub>e)—a standard unit measure for carbon footprint—to obtain a unified indicator.

CFP can be divided into two categories: organisation CFP and product CFP. The organisation CFP (ISO 14064) is the total GHG emissions and removals caused by an organisation while product CFP (ISO/TS 14067) is more complex. It is the sum of GHG emissions and removals resulting from all stages of a product's life cycle: starting from the extraction of raw materials, manufacturing of the product, use of the product to its end-of-life. If the CFP quantification does not cover the entire product life cycle, it is called partial CFP.

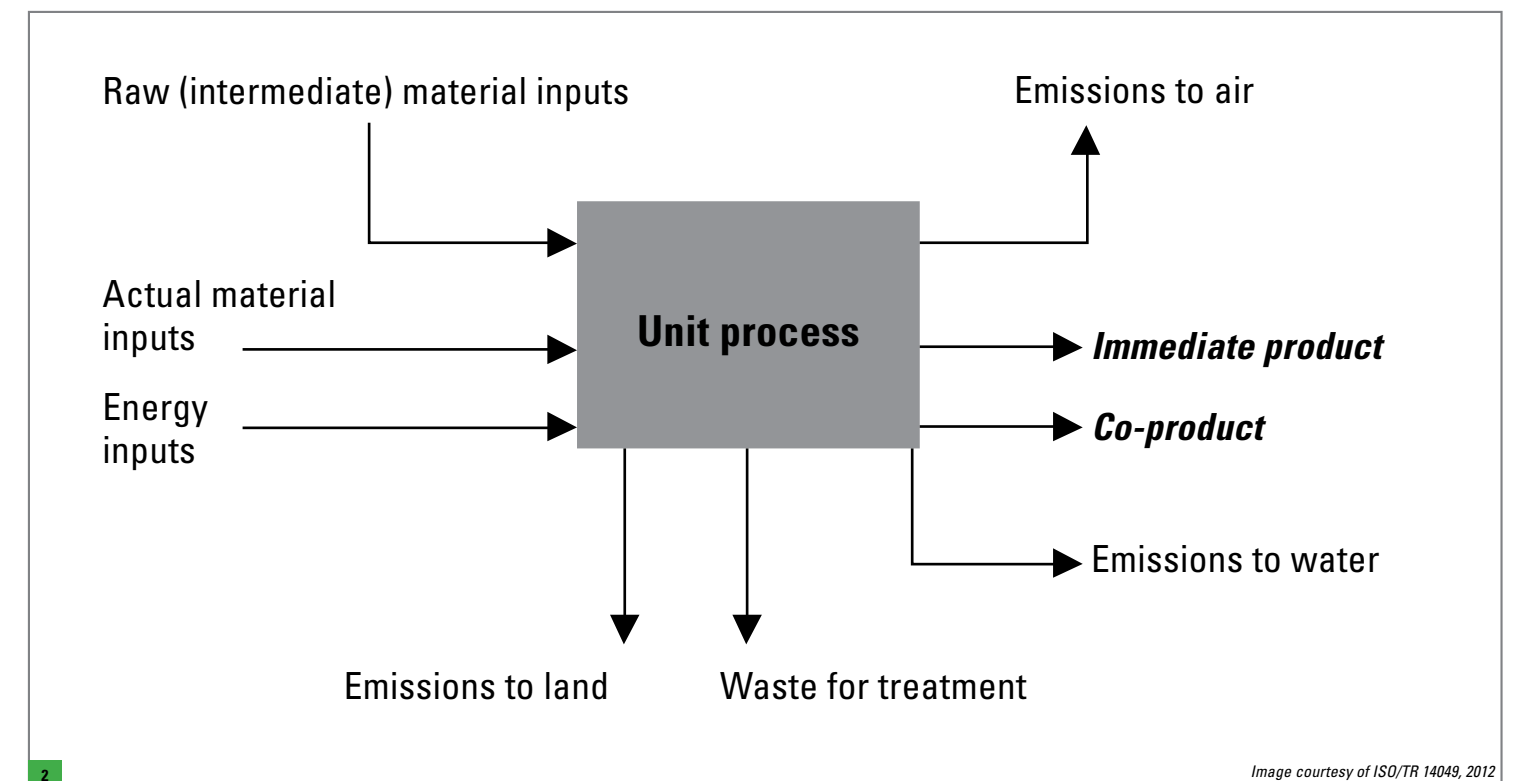
## HOW IS CFP QUANTIFIED?

Essentially, CFP counts the GHG emissions from the burning of fossil fuels. The invention of steam and combustion engines has led to an era of heavy industrialisation, where coal, crude oil and natural gas are dug from the earth to provide as fuel to drive machines to produce modern materials and products to support our contemporary way of living. In the process, carbon

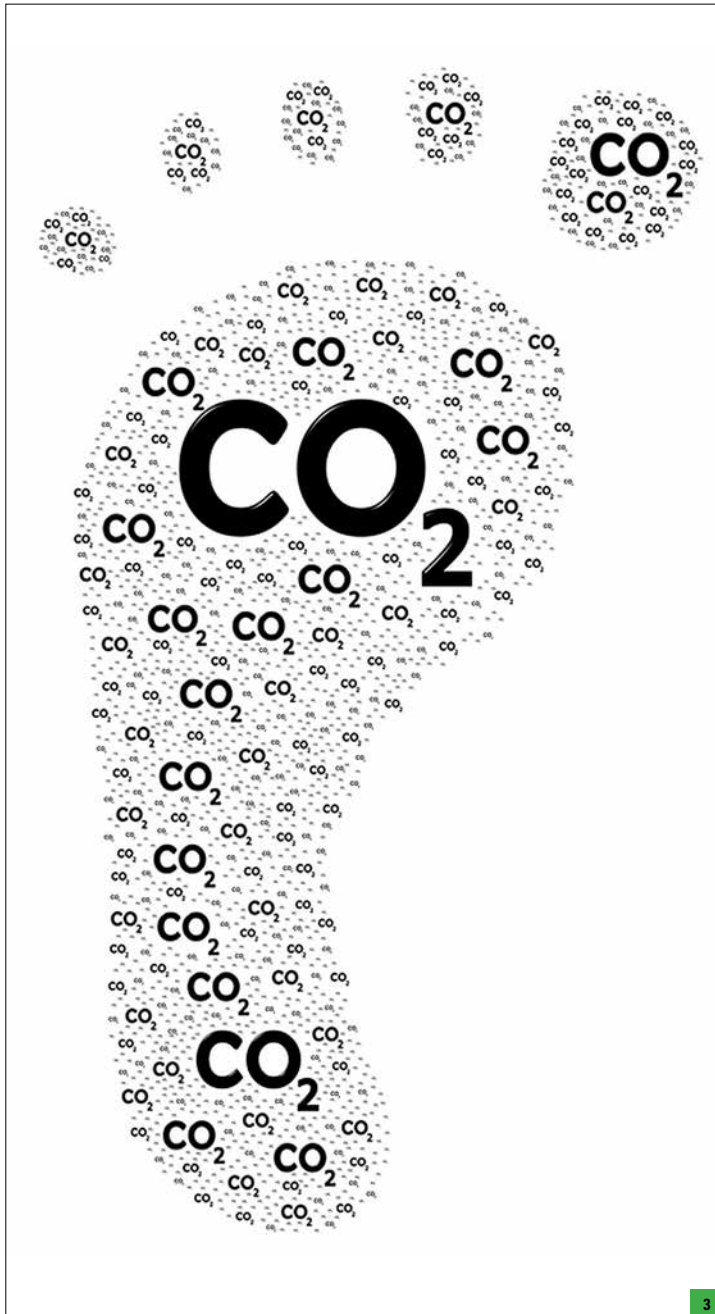
dioxide and other GHG stored within fossil fuels are released into the atmosphere, contributing to climate change.

As a quantitative indicator of the impact on climate change, product CFP calculates the GHG emissions and removals throughout the product's life cycle. Each material has its embodied GHG emissions resulting from the consumption of energy when the material was produced, and each energy source has its emission factors based on the type (electricity, diesel, gasoline, biomass, etc.) and the way it is obtained. For example, electricity generated by burning coal has a bigger emission factor than that produced from natural gas as the burning of coal results in a higher amount of GHG emissions. Another example would be plants. Plants absorb carbon dioxide during growth. When they decompose or are burned, the gas is released. If the plants are grown and harvested in a sustainable way, the carbon dioxide would circulate naturally in the atmosphere, reducing impact on the environment. Hence, when plant-based materials or biomass is used as a material in products, embodied carbon dioxide is counted as carbon dioxide stored during the intended use until it is released at the end of the products' life cycle. When it is used as energy, e.g., burnt to generate heat, the embodied carbon dioxide may be excluded when accounting for CFP.

<sup>1</sup> The era of heavy industrialisation and production of modern materials and products to support our contemporary way of living have contributed to climate change  
<sup>2</sup> The specific input and output of processes at each stage of the product's life cycle are modelled in the assessment of its carbon footprint







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assessment can be seen as a first step in the right direction towards Greener business practices. Although it requires time and cost, with adequate knowledge of CFP, businesses can gain a competitive advantage in a variety of ways.

CFP assessment is an ideal tool for measuring and managing environmental impact within and across businesses as well as for the communication of environmental performance to stakeholders. For example, if a company believes that its products have superior environmental performance, CFP can be a way to substantiate these claims. When a company achieves savings in electricity, it can be measured in kilowatt-hours (kWh) and associated cost reduction but when converted into GHG emissions, the savings can measure the reduction of its environmental impact. In fact, CFP is increasingly used as a major indicator for sustainability performance by organisations in their corporate social responsibility (CSR) reports.

During CFP assessment, the GHG emissions embodied in materials and released from the used energy are tabulated. The specific input and output of processes at each stage of the product's life cycle are modelled in the assessment of its CFP. The input and output elements, together with their associated contributions to GHGs, are captured and revealed. Such an understanding provides a new perspective for the visualisation and quantitative analysis on the use of materials, energy and waste streams, and can also unearth opportunities for improvements. When viewed from a total product development approach, improvements in product design and manufacturing processes can lead to innovations that could drastically or radically reduce environmental impacts, resulting in cost savings and technical features beyond the conventional approaches.

Specific benefits from CFP can be explored as part of an organisation's operations and product or service offerings. This can be incorporated into a company's continuous improvement and innovation efforts. From this perspective, building up internal knowledge and expertise is a useful first step to discerning the critical aspects and junctures for intervention and opportunities to make a positive impact.

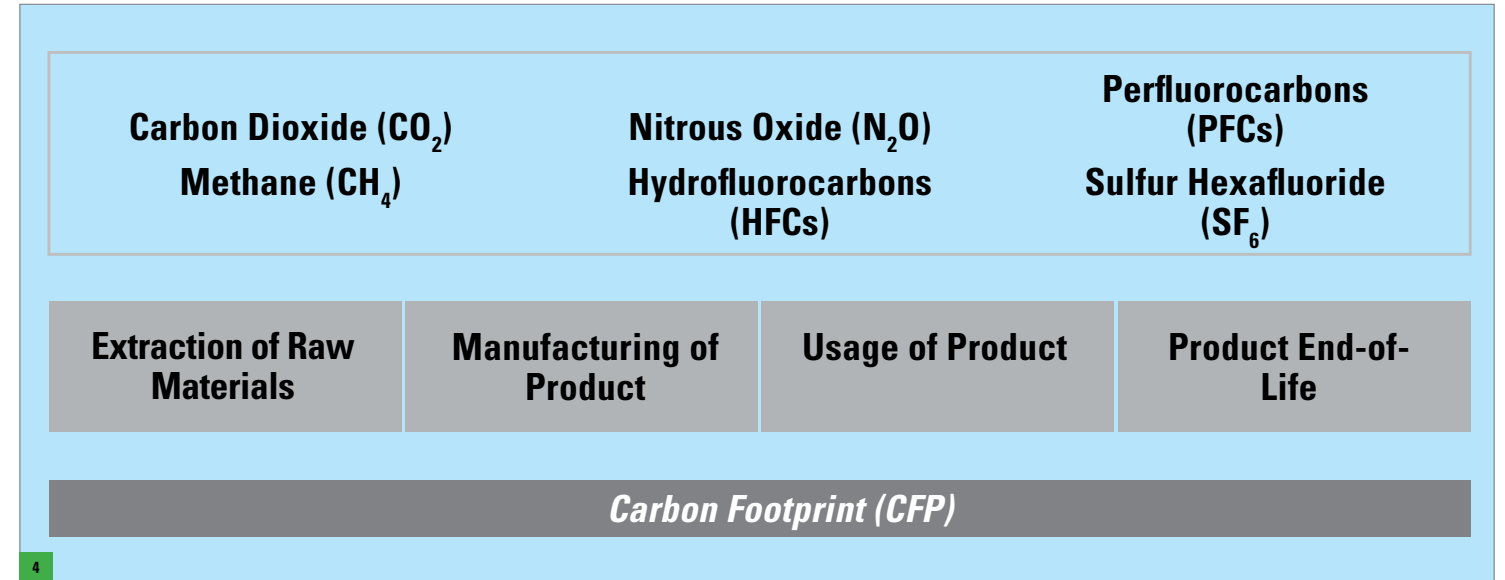
1 Based on IPCC fifth assessment report (AR5)

- 3 Carbon footprint
- 4 Technical definition of carbon footprint
- 5 CFP assessment is an ideal tool for measuring and managing environmental impact within and across businesses as well as for the communication of environmental performance to stakeholders

Solar, wind and tidal energy are normally considered as renewable energy sources that cause little GHG emissions. Hydropower and nuclear power are also very low in GHG emissions as compared to energy released from fossil fuels. Of the energy from fossil fuels, natural gas emits about half the GHG compared to coal, with oil falling somewhere in between the two fuels.

### HOW CAN CFP BENEFIT A BUSINESS?

Singapore is a renewable energy disadvantaged country due to its geographical conditions. However, 90 percent of its electricity is generated by natural gas, resulting in relatively lower CFP for locally made products and services. CFP



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# Integrated Carbon Footprint Assessment Reporting Essentials (i-CARE) for BUILDING PROJECTS / PRODUCTS

## WHY YOU NEED TO ATTEND

Singapore's 3<sup>rd</sup> Green Building Masterplan has identified the need to measure the environmental impact of buildings through its carbon footprint. The BCA Green Mark Scheme will thus introduce the reporting of embodied carbon as a criteria for new buildings.

SGBC's Singapore Green Building Product (SGBP) labelling scheme will be supporting the changes to the BCA Green Mark scheme by including the carbon emissions of building products as a key criterion for assessing the environmental performance of products.

## COURSE OVERVIEW

Jointly organised by SGBC and BCA's Centre for Sustainable Buildings and Construction (CSBC), the course is specially designed for the Building Industry. It provides an in-depth understanding of the carbon footprint of buildings and the products and materials therein. The course will impart the skills to enable participants to assess the environmental impact of their buildings and products.

Delivered through both classroom and hands-on practice, participants will learn robust and reliable methodologies in compliance with international standards to effectively communicate environmental performance of building projects and products.

## THE BENEFITS

- **Become** skilled in Carbon Footprint (CFP) Assessment
- **Quantify** CFP of building projects and products
- **Save** costs through more efficient use of energy and materials
- **Identify** environmental hotspots affecting company's bottom-line
- **Enhance** business competitiveness
- **Prepare** for compliance with ISO standards

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## THE CARBON EXPERTS



**DR. SONG BIN** is a Senior Scientist at SIMTech. He leads a team of researchers on Sustainability and Lifecycle Management. He is also an expert in the ISO TC207/SC7 on ISO/TS 14067 development and related standards. His current research focus is on carbon, energy and resource efficiency management in manufacturing operations. In recent years, he has initiated and led many projects on life cycle assessments for multi-national as well as small and medium sized companies. He holds a B.Eng. in mechanical engineering from Northeast University, China, and a PhD in mechanical engineering from Queen Mary College, University of London.



**MR. NG RUIHENG** is a Senior Research Engineer at SIMTech and one of the pioneers in providing carbon footprint consultancy services for organizations. Recognized in his field, he has been invited as a speaker for a number of sustainability-related events and has published widely in the area of sustainability. Mr. Ng has received a number of awards such as the MTI and A\*STAR Borderless Award in 2011 and the SIMTech Merit Prize in 2008 for his contributions in sustainability-related research and initiatives. He has an MBA (Distinction) from University of Birmingham and a B.Eng. (Hons) in computer engineering from NTU.



**MR. YEO ZHIQUAN** has vast experience in sustainability assessment and has been a key trainer in carbon footprint data processing and management. He is part of the pioneering team to spearhead carbon footprint consultancy services and has conducted carbon footprint assessments for a diverse range of industries. Mr. Yeo is recognized for his expertise in data management and uncertainty analysis with research interests in the fields of environmental footprinting and data analytics. He is a Research Engineer with SIMTech and holds a B.Eng. (Hons) in chemical engineering from NUS.

## COURSE DETAILS

### Course Date

- 4<sup>th</sup> Intake to take place in October/November 2015

### Course Fee

- The course fee is \$4,000 before WDA funding & GST
- Singaporeans and PRs are entitled 70% funding of course fee from WDA
- Enhanced SME funding support of 90% of the course fee available for companies with at least 30% local shareholding AND annual sales turnover of <\$100 million or with less than 200 staff strength

### CPD CREDITS:

SIA-BoA: 2 points

PEB : 27 PDUs

### For enquiries, please contact:

**Registration Enquiries** – 6732 5518 or [certification@sgbc.sg](mailto:certification@sgbc.sg)

**WDA & SME Funding** – 6793 8430 or [kwyip@simtech.a-star.edu.sg](mailto:kwyip@simtech.a-star.edu.sg)

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- ✓ Promotes environmental stewardship



## AN INDUSTRY LED INITIATIVE

Our mission is to propel the Singapore building and construction industry towards environmental sustainability.

# GOING

# GREEN

is not a matter of 'If',  
It's a matter of '**When**' – *for every business.*



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Don't ask what you can do for 'green'. Ask what going green can actually do for your business.

## SGBC MEMBERSHIP BENEFITS

- ◆ **Get to know the Green Business Professionals**  
Establish connections with green building leaders, advocates and practitioners in both local and international industries.
- ◆ **Stay Updated on the Latest Trends and Knowledge**  
Participate in numerous programs such as trade missions, seminars, conferences, and networking sessions.
- ◆ **Stay Updated on the Latest**  
Get access to the latest within green building and sustainability: new knowledge and technology, trends, engineering and more.
- ◆ **Make Your Voice Heard**  
Use your membership influence to set the direction for green building practices.
- ◆ **Gain Exposure in the Green Building Marketplace**  
On SGBC webpage, get your company listed together with a hyperlink in the member directory, as well as free monthly job listings.
- ◆ **Walk the Talk**  
Enjoy free use of the SGBC corporate logo for your business cards and corporate stationery.
- ◆ **Get Discounted Rates**  
Enjoy preferential rates to SGBC congress, events, seminars and for a range of certification services.

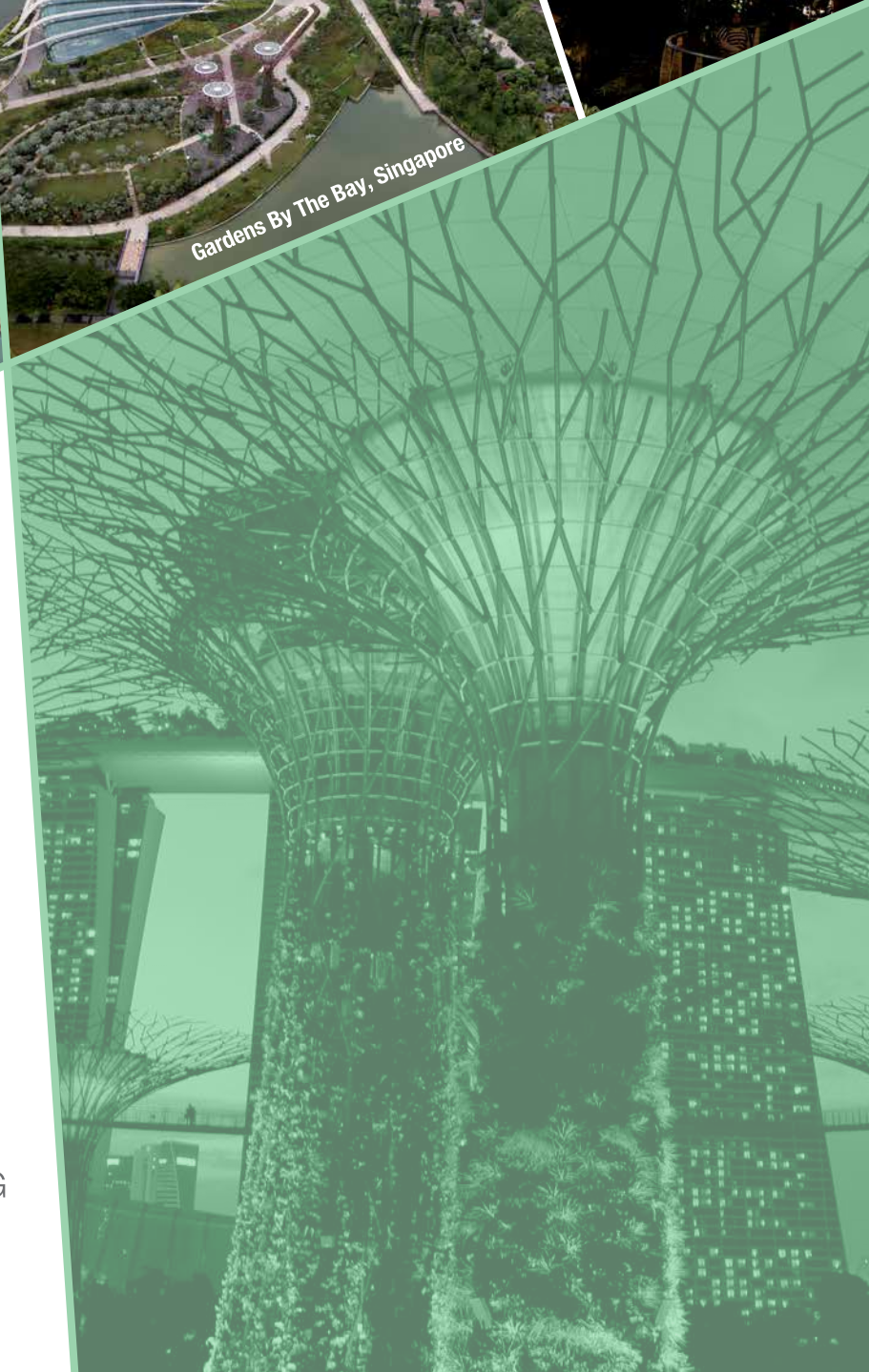




Marina Bay Sands Resort, Singapore



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# SUSTAINABILITY

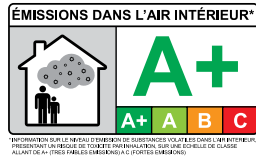
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# Innovative Solutions for Sustainability

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Leveraging on comprehensive strengths, our three business domains are

- Safe, Sound and Comfortable Living Spaces and Materials
- Higher Quality Display Devices and Communications
- Clean and Green Energy

In Singapore, architectural glass products from the AGC group are the first products in their industry to be certified by Singapore Green Building Product (SGBP) with an Excellent rating of 3 ticks. With performance recognised by various awards, AGC products are the preferred choice for environmentally sustainable solutions.



Sunergy Clear solar control glass with low-e coating



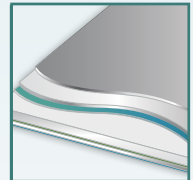
AntiBacterial Glass where strict hygiene is essential



Fibre Reinforced Plastics (FRP) to create light-weight and durable structures



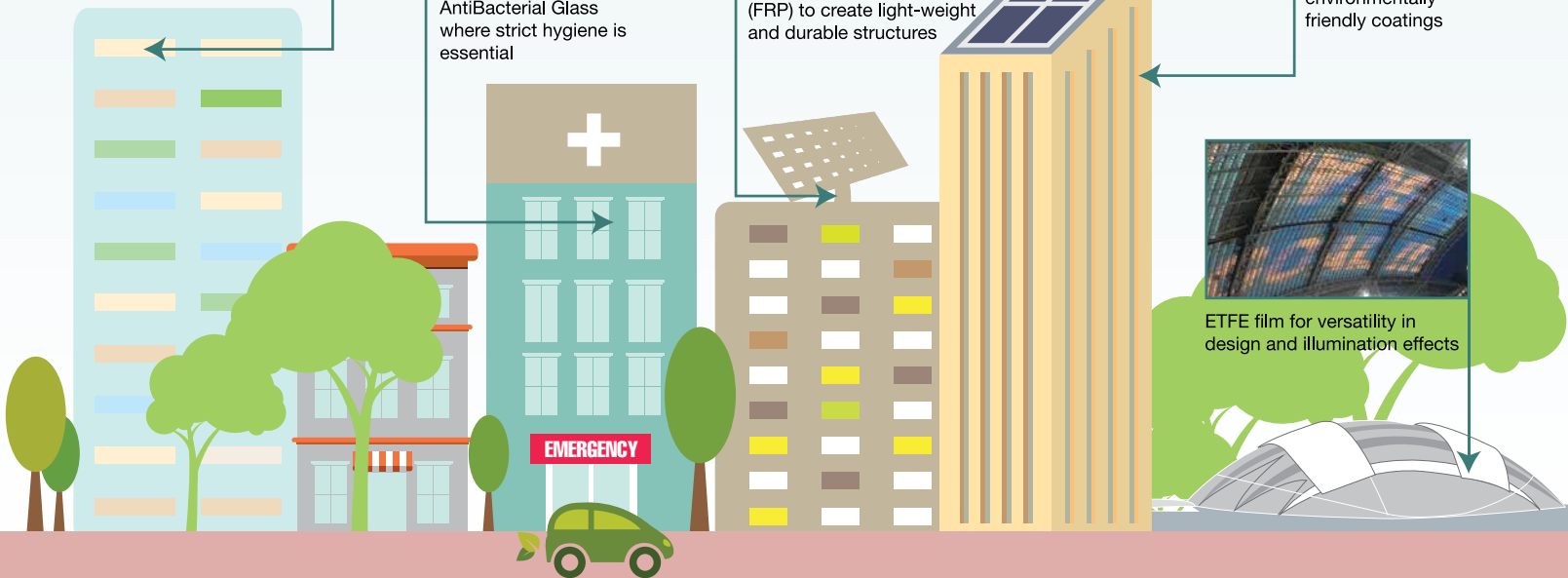
Glass Integrated PhotoVoltaics (GIPV) to harness solar energy



LUMIFLON® resins for durable yet environmentally-friendly coatings



ETFE film for versatility in design and illumination effects



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Rated Excellent for Product Models:

- Stopray Grey 25T
- Stopray Indigo 48T
- Stopray Lime 61T
- Stopray Titanium 37T
- Stopray Vision 50T
- Stopray Vision 60T
- INTERPANE ipasol Ultraselect 62/29



Rated Good for Product Models:

- Lacobel
- Matelac
- Matelux
- MNGE Mirox

