

Sustainable

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Architecture

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GUOCOLAND
SINGAPORE
PTE LTD

Leading *the way* with green building

In January 2008, we published the inaugural edition of Sustainable Architecture, which contained features on an industrial building, a condominium and construction waste recycling technologies.

With this issue, we've decided to focus more on the people and the companies who are passionate about sustainability. We've delved a little deeper to find out what drove them to embark on the green journey and what has kept them on that path.

Maria Atkinson, the Global Head of Sustainability for Lend Lease Corporation, sits on the BCA's International Panel of Experts on Sustainability of the Built Environment. In this issue, she gives us her views on going green and gives local

contractors and developers a little insight on how they could go green.

We also feature Lend Lease, which now has 735 employees trained in Green Building Rating Tools, of which 316 are Green Building Accredited Professionals. Six Lend Lease Office Tenancies have achieved Green Building Council Certified Ratings globally and 13 tenancies and assets under management are targeting Green Certification. In addition, 100 percent of Bovis Lend Lease Australia's commercial office projects are registered to receive Green Building Certification.

City Developments Limited (CDL), which was conferred with the BCA Green Mark Champion Award this year, shares its

strong commitment towards environmental sustainability. Eddie Wong, the General Manager of Projects at CDL, elaborates on CDL's efforts in implementing green initiatives for its projects.

This issue also features Goodwood Residence, a private residential development by GuocoLand Singapore Pte Ltd. Goodwood Residence incorporates green features such as smart water management and user friendly dual pneumatic collection chutes in the design of the building. As a result, it bagged a Green Mark Platinum Award from BCA in 2007.

Phua Hui Chun
Building and Construction Authority

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We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

Building and Construction Authority 

Going green with Lend Lease

Lend Lease's way of doing business is defined

Lend Lease

by environmental, social and economic sustainability. The implications of this are wide-ranging, in terms of policies and initiatives.

At a strategic level, Lend Lease has been working to align its social, environmental and financial goals by identifying Sustainability Aspirations. These provide the Lend Lease Business Units with objectives and targets as well as a framework that enables them to be achieved. Each line of business has a Sustainability Business Plan and a Sustainability Executive. Lend Lease has made good progress in embedding sustainability across its businesses globally to ensure it can undertake global environment, social and governance monitoring and performance reporting.

The first step towards being sustainable has been to understand the company's impacts. Lend Lease has implemented systems and processes to deliver on the commitment to better understand and address the impact of its operations globally.

Measuring our performance

Lend Lease has undertaken a carbon footprint of its global activities and an Eco Footprint is now underway. An online web-based Management Reporting Tool has also been developed to provide Lend Lease with a centralised database that holds all metrics reporting data. This enables data analysis to identify key indicators for ongoing sustainability-performance monitoring and the reporting of intelligence for strategic business planning.

Reporting our performance

Transparency is another key component of sustainability and Lend Lease is involved in publicly reporting its performance using recognized sustainability frameworks and engaging with stakeholders. This takes a number of forms such as reporting under the internationally recognized Global Reporting Initiative (GRI) framework. Lend Lease has also led the push for the development of global indicators for the Real Estate and

Construction sector under the GRI.

Lend Lease also reports to leading global sustainability indices such as the Dow Jones Sustainability World Index and the Carbon Disclosure Project. According to the 2007 review of companies listed on the Dow Jones Sustainability World Index (DJSI World), Lend Lease achieved the 'best score' in its industry group for its environmental policy/management system, corporate governance, codes of conduct/compliance, climate change policy, human capital development, standards set for suppliers and its social integration.

First included on the DJSI World in 2001, Lend Lease is one of just 21 real estate and construction companies globally to be included on the 2007/2008 index. It is the only company in its sector classification to operate on a global scale. In 2007, Lend Lease became the first global property investment signatory to UN's Principles for Responsible Investment.

Reducing our impact

Lend Lease recognizes that, taking into account a building's life span, buildings are responsible for 25 to 40 percent of the world's energy use, 30 to 40 percent of the world's solid waste generation, 30 to 40 percent of the world's global greenhouse gas emissions, one-third of the consumption of the world's resources and eight to 12 percent of water usage.

In order to minimize these significant impacts, Lend Lease is committed to consistently delivering best practice environmentally sustainable solutions. It also aspires to be energy, water and waste zero net in what it designs, constructs and develops for the communities it builds and influences, for what it manages and for what it owns.

At a practical level, this means that the business assesses environmental considerations in all investment decisions and interrogates opportunities to minimise any negative environmental impact. It has implemented an integrated environment, health and safety compliance management system. There is also a corporate requirement that any new office lease for Lend Lease

operations will achieve a recognized green building rating. Lend Lease supports the establishment of green building rating tools in the countries in which it operates.

Lend Lease now has 735 employees trained in Green Building rating tools. Out of that number, 316 are Green Building accredited professionals. Six Lend Lease office tenancies have achieved Green Building Council certified ratings globally and 13 tenancies and assets under management are targeting Green Certification. In addition, 100 percent of Bovis Lend Lease Australia's commercial office projects are registered to receive Green Building certification.

Lend Lease is also actively engaged with Green Building Councils in its key geographies and it is a founding member of Green Building Councils in the United States, United Kingdom, United Arab Emirates, Malaysia and Australia.

Good business

Lend Lease has received numerous accolades for its work in sustainability and green building in particular, but the incentive for being sustainable goes much deeper than the pursuit of accolades and recognition.

As Lend Lease has already found, taking account of social and environmental issues can lead to extensive innovation that unlocks savings from inefficient practices and processes. At its best, sustainability initiatives can open the way to business growth and new market opportunities.

Lend Lease is committed to successfully handling big jobs such as the greenest Olympic village for London in the year 2012 and is doing very well. Lend Lease also has a new Business Unit, Lend Lease Ventures, that is tasked with identifying, reviewing and investing in emerging sustainable technologies, innovations and initiatives that can be applied to its existing businesses and core capabilities where suitable. Equally, if not more important are the benefits gained in the attraction and retention of employees.

Above all, Lend Lease Executive Management believes that if it were not strategically addressing sustainability, challenging each line of business to deal with their area of environmental and social impacts and initiating solutions to make positive contributions, then it wouldn't be in business.

MAWSON LAKES



The town centre

Mawson Lakes is acclaimed as the most dynamic and successful master-planned mixed-use development in Australia today. The multi-award-winning project has set new standards for master-planned communities through the delivery of a range of environmental and social initiatives.

Located 12 km north of Adelaide, Australia, this project is the result of an extraordinary joint-venture partnership between the developer, Delfin Lend Lease, and the South Australian government's Land Management Corporation. The City of Salisbury and the University of South Australia also lent their support.

Delfin Lend Lease commenced work on the 620-ha site in 1997 to create a AU\$ 1.5 billion project that, by 2011, will be home to a community of 1,000 residents, 7,500 students and 7,000 workers.

Environmental planning and sustainability initiatives have been a primary focus from the onset of the project. These include:

- The development and implementation of a world-leading recycled water management system that is connected to all properties and open spaces within the development to reduce the use of potable water by 50 percent of the Adelaide average.
- Energy efficiency measures which optimize passive design and management practices for all residential, commercial, retail, education and community buildings. The project is also based on the principles of creating a neighbourhood that is highly permeable and delivers green, leafy streets. The project also aims to create over 26 km of continuous hiking and bicycle trails.
- Development and implementation of a range of demonstration sites about environmentally sustainable practices and technologies, including low water use landscaping, the application of solar and photovoltaic lighting systems and residential solar packages.
- Minimum water and energy efficiency design targets for all residential development that mandate and encourage external shading, solar hot water systems, natural ventilation and the smart selection of household appliances.



Mawson Lakes Community Centre Village



Dry Creek Linear Park

30 THE BOND



The Atrium

Lend Lease Corporation's global headquarters in Sydney, Australia, is a leading example of social and environmental sustainability within commercial objectives.

30 The Bond was the first commercial office building in Australia to achieve "Australian Excellence" as recognized by a 5 Star Green Star - Office As Built Certified Rating from the Green Building Council of Australia. L. Hunter Lovins of the prestigious Rocky Mountains Institute has described 30 The Bond as "the greenest building I have been in in the world".

The building features a range of environmental initiatives which have resulted in it being measured as producing 48 percent less greenhouse gas emissions than the typical Sydney office building. These include the use of passive chilled beam cooling, natural ventilation, energy efficient lighting and fully operable shading on the west-facing façade. These features ensure comfort for the building's occupants as do the interior's natural and recycled finishes. These include bamboo, wool, sisal, goat hair, linen, cotton and leather, all of which do not emanate toxins.

Other environmental features of 30 The Bond include:

- Daylight responsive lighting control
- Comprehensive electrical sun metering and monitoring program
- After-hours-lighting zone switching which is part of the building's sophisticated building management system
- Increased fresh air provided at 100 percent above the Australian Standard requirement
- Water-efficient fixtures and fittings
- Over 80 percent of the construction waste was recycled and therefore, diverted from the landfill
- Convenient access to Sydney's CBD bus, train and ferry networks. The Bond also provides access to secure bicycle parking, showers, changing room and locker facilities to promote employee health and wellbeing



30 The Bond's signage

313@Somerset



Created through Lend Lease's integrated property skills involving its three business streams of Bovis Lend Lease, Lend Lease Retail and Lend Lease Investment Management, 313@Somerset is a project that aims to develop the most sustainable shopping centre in the Asian region.

Due for completion at the end of 2009, 313@Somerset's environmentally sustainable practices and technologies have already been recognised. In March 2008, the Building and Construction Authority of Singapore (BCA) awarded the project with the Platinum Green Mark Award.

313@Somerset aims to not only reduce operating expenses by mitigating exposure to future rises in energy costs, but to also introduce community

engagement programmes that take the characteristics of the local cultural, historical and natural environment into account. This project also aims to reduce the carbon footprint, reduce water usage and establish estate recycling as part of the development.

With 313@Somerset being benchmarked against the Singapore Building Code Compliance, the energy efficiency initiatives put in place are expected to achieve a total of 30 percent in energy reduction and 26 percent of savings in water consumption.



Maria Atkinson was appointed Global Head of Sustainability in February 2006 and leads Lend Lease's work towards realizing its aspiration to be a sustainable organization.

Prior to her appointment, Ms Atkinson was a co-founder of the Green Building Council of Australia and its founding CEO. Ms Atkinson is an Environmental Scientist and is internationally recognised as a passionate advocate for green building. She has received several awards for her contribution to sustainable development, including a 2006 USGBC Leadership Award. She is also the author of numerous articles on the subject.

In September 2007, former US President Bill Clinton invited Ms Atkinson to join a high-profile panel to discuss ways to accelerate green buildings, as part of the Annual General Meeting of the Clinton Global Initiative in New York.

From 1997 to 2002 Ms Atkinson managed Bovis Lend Lease's Environment and Sustainable Development team. Ms Atkinson was the project Environment Manager for the Sydney 2000 Olympic Village and the Homebush Bay Hotel developments. These are projects that have received international recognition for setting new benchmarks in environmental best practice for the construction and development industries.

Ms Atkinson is a member of the Australian Building Codes Board, the City of Sydney Advisory Committee and the New South Wales State Government Climate Change Council.

1. How and when did you find your calling for green building initiatives?

Essentially it was the 2000 Sydney Olympic Games. As an Environmental Scientist by training, I'd been working for an environmental and engineering consultancy and I found that I was much more interested in planning and buildings and their complex environmental and social objectives. In 1997, I took a job as an Environmental Manager at Civil and Civic, now called Bovis Lend Lease. My first two projects were the Olympic Village and the Homebush Bay Hotel developments.

The sustainability goals for these projects, which had been set by the government and Greenpeace, were visionary, but many in the building industry didn't know how to meet them, including me! However, as a generalist I wasn't bound by any one solution; my role was in inviting solutions from others, working out what to do and why, and then communicating that.

The Olympic Village and the Homebush Bay Hotel developments have since received international recognition for setting new benchmarks in environmental best practice for the construction and development industries.

2. If you could have things your way, what are the three items you strongly believe in and would push for?

Perhaps number one is something that is a matter of urgency. Clearly, we all have a role to play in addressing climate change, the real estate and the construction sector included. We are a significant part of the greenhouse gas emission problem. Up to 40 percent of global greenhouse gas emissions and up to 80 percent of emissions in our cities come from buildings. However, we also

have the potential to be a significant part of the solution, with energy efficiency improvements in buildings almost universally recognised as the cheapest, quickest abatement solution.

In order to enable the industry to do its bit, I'm a strong advocate for the recognition of energy efficiency in the non-residential sector in incentive schemes that operate on the same basis as Emissions Trading Schemes.

To this end, Lend Lease has worked in partnership with Lincoln Scott and its Advanced Environmental service to develop a proposal for an Efficient Building Scheme, which could be stapled to existing and/or proposed Emissions Trading Schemes as a complementary sector specific trading scheme. Such a scheme would drive through the split incentives in the sector by enabling developers and owners to make competitive financial returns on their capital-intensive investments in clever design and technology solutions such as façade upgrades, operable shading structures, alternative smart heating/cooling solutions and on-site energy generation.

The proposed scheme uniquely addresses the failures of other complementary schemes by ensuring no problems of additionality, double counting or perverse incentives. We believe such a scheme would be uniquely placed to stimulate emissions cuts of at least 60 percent, and even 100 percent, in new and, perhaps more importantly, existing buildings.

It would also enable the industry to focus and to innovate, which leads me to another ideal, if I could have things my way! While we've enjoyed exponential growth in green building in the past decade, we haven't fundamentally changed the way we design and operate the built form. We keep coming up with innovations

that tweak but doesn't re-engineer the entire process. As long as we continue to resist this, I fear we will never achieve what is required of us.

I think we must be brave enough to throw everything we've done thus far up in the air and almost start again. It's hard to predict exactly what we'll come up with, but I suspect that we need to design for zero waste and for disassembly. We need designs that maximize passive heating, cooling and comfort features as well as attributes of the local geography, and that building services will be re-engineered to accommodate distributed or onsite energy, water and waste solutions. More fundamentally, we need to re-engineer the supply chain by addressing the choice of materials from sustainable timber to non-toxic plastics and products. It's all a massive challenge as there are so many inefficiencies, but it will generate profits; Interface and Walmart have proven this.

3. Tell us about your involvement in the Clinton Global Initiative (CGI) in New York to hasten green building development and to 'green' existing buildings.

Last year I was honoured to receive an invitation from former US President, Bill Clinton, to discuss ways to accelerate the push to green buildings as part of a distinguished panel at the influential 3rd Annual General Meeting of the Clinton Global Initiative in New York.

The influential three-day meeting brought together around 10,000 leaders from business, NGOs, foundations, academia and government to identify concrete actions to help solve problems across four areas of focus, including energy & climate change.

Along with US architects William McDonough and Carlton Brown; Global Director of Capital Projects for Citi Realty Services, Stephen Lane; and leading Indian architect, Karan Grover; our brief was to "explore opportunities for fighting climate change through buildings, which are responsible for more heat-trapping gases than vehicles".

4. How would you suggest existing buildings in a tropical climate like Singapore, which consume one third of our energy, be made more energy efficient?

Efficient or passive design is the starting point. We can make buildings 30 percent more efficient from passive design, for example, through correct orientation and shading of the facade.

If we go beyond that and look at alternative cooling systems, smart lighting and metering, we can drive 60 percent efficiency gains.

If we're serious, we can get beyond 60 percent efficiency if we provide the power for the building through a distributed solution using fuel cells and renewable energy that, in Singapore, could leverage the plentiful sunlight.

5. Tell us more about Bovis Lend Lease's journey that led to it being recognised as the third greenest US-based contractor by Engineering News Record in 2007.

Bovis Lend Lease's journey is one that should inspire all contractors that it can be done.

In 2005, less than five people across Bovis Lend Lease (US) were LEED-accredited. Today, as a result of a commitment to and enthusiasm for sustainability across the business, along with a growing number of projects that are demanding sustainability, that number has grown to more than 200 LEED-accredited professionals.

This remarkable transformation is the background to Bovis Lend Lease (US) being ranked third in a list of the Top 50 Green Contractors. The list, based on contractors' 2006 revenue from projects registered with or certified by third-party ratings groups under objective environmental or sustainable development standards, also considered factors such as the number of certifications/accreditations for LEED™, Green Advantage and Green Globe.

In the Singapore market, Bovis Lend Lease Asia Pacific is on a similar journey, with operations that include a recognised design group comprising green building modelling experts, architects and engineers.

6. As contractors in Singapore embrace the concept of sustainability, what are some good practices or tips to being 'green'?

Contractors who want to embrace the concept of sustainability need to know that their biggest negative climate change impacts are through the products and materials they use; primarily steel, concrete, timber and glass. In addition, avoiding waste going to landfills is a smart strategy because avoiding waste saves money and resources. So, the best tip to being green is to get your products and materials sorted.

Conversely, the biggest positive impact contractors can make is through procurement. So the tip here is to keep yourself informed about all the available green practices and technologies. Don't be afraid to apply them. There are a growing number of case studies to show just how well green building practices, alternative technologies, products and materials, and construction techniques can and have worked.

7. Are there any common misperceptions that contractors tend to have about green buildings?

Contractors can be disillusioned about building green by the misperception that it won't count for much, and that it's the building's efficient operation that really matters.

Of course, management efficiency is very important, but the good news for contractors is that something like 75 percent of a building's efficiency comes from its design and choice of plant and equipment. This is more than whether the tenant remembers to turn their lights and computers off or whether the building manager is running the air-conditioning system at maximum efficiency. The lights that the contractor specifies in the first place and type of cooling system installed are more important.

Contractors also commonly overlook the fact that they can, and should, leverage considerable power through their supply chain.

8. Do you think making energy consumption data (e.g. energy use intensity/energy efficiency index) publicly available would be effective in letting building owners/managers to know where their buildings stand in relation to other similar building type?

While carbon reporting will not of itself do anything to reduce carbon emissions, ensuring that credible and meaningful information is available to potential purchasers and renters/lessees on the relative energy performance of buildings is one of a number of effective means of stimulating improvement in the energy efficiency of commercial (non-residential) buildings, and thereby, of reducing greenhouse gas emissions.

It would also enable assessment of an building's impact and its potential for improvement, as well as providing an opportunity to demonstrate that the management is at or better than the asset's potential.

9. Could you share some substantive international findings on the business case for building and managing 'green' buildings? (Bearing in mind that the business case for green buildings started with looking at the green cost premium. The business case studies now revolve around asset value, rental yield, operational costs and quantifying of intangible benefits such as better occupant health.)

Lend Lease has the benefit of its businesses spanning the entire property industry, including property investment and development, construction and asset management. Its long history of property funds management experience is well supported by the internal development pipeline and Lend Lease can also co-invest in funds or invest directly in high quality properties. Therefore, by understanding the entire property cycle, our first response to 'the business case for green buildings' is risk management. There are a range of issues that can threaten the future value of buildings such as operational costs and customer demand for green attributes.

At the end of the day, green buildings are about providing healthier built environments for their occupants, so arguably, the most compelling business case for building and managing green buildings revolves around the increased health, wellbeing and productivity of occupants which they can deliver.

The results of a pre- and post-refurbishment workplace productivity study of a 30-year-old, 28-level multi-tenanted building in Melbourne's CBD is one such business case.

The owners, the Kador Group, wanted to undertake a green refurbishment of the building, to transform it from a typical 1970s A Grade building that had lots of marble, dark timber lifts, black beam panelling, and little focus on energy consumption, to a modern icon which takes advantage of more natural light and views and is 'air-conditioned' using an active chilled beam system. The installation of active chilled beams immediately reduced energy consumption by about 15 percent. Additional initiatives have further reduced greenhouse gas emissions from the base building. Bovis Lend Lease project managed the refurbishment.

'Green' features of the staged refurbishment plans include chilled

beam air-conditioning, solar panels that supply 25 percent of domestic hot water and energy efficient T5 light fittings.

The refurbishment plans for 500 Collins Street, Melbourne were the first refurbishment plans of a CBD commercial building to achieve a 5 Star Green Star Certified Rating from the Green Building Council of Australia.

The pre- and post-refurbishment workplace productivity study was conducted after a green fit out of a number of floors, which involved monitoring existing tenants who had moved into upgraded space. 500 Collins Street presented a unique opportunity for an Indoor Environment Quality study because tenants in the building were simply moving to sustainable refurbished space in their existing building.

This study found that a shift by two companies to sustainable office accommodation has led to improvements in a broad range of business productivity indicators. Indeed, one executive of the company observed that the "productivity has gone through the roof."

The results included:

- Average sick days per employee per month reduced by 39 percent
- Sick leave costs reduced by 44 percent
- A nine percent improvement in the average typing speed of secretaries and a significant improvement in overall accuracy
- A seven percent increase in lawyers' billing ratios, despite a 12 percent decline in the average monthly hours worked by the lawyers.

Besides having happier and more productive employees, the refurbishment saved about AU\$15,000 a year in energy bills and cut greenhouse gas emissions by more than 1,700 tonnes a year.^{1[1]}

Taken in their totality, these results provide a convincing case that the shift delivered business gains that far exceed the cost of upgrading the Indoor Environment Quality of the offices.

Greening buildings makes sense. They are not only responsive to environmental pressures but they also deliver superior benefits to the occupants and we know the demand for green building skills and capability is increasing.

10. Finally, what are your thoughts on being invited to be one of the members of our distinguished International Panel of Experts (IPE) on Sustainability of the Built Environment?

I am very honoured to have been invited to be one of the members of the International Panel of Experts on Sustainability of the Built Environment. I am pleased to have the opportunity to contribute what I can and I also look forward to learning from others.

Finally, I'm looking forward to being able to use my global speaking opportunities to share the phenomenal leadership of the Singapore Government.

^{1[1]} Green Building Productivity (Sustainability Victoria): <http://www.sustainability.vic.gov.au/www/html/2575-green-building-productivity.asp>

CDL's BCA Green Mark Platinum Award Projects



In January 2005, the BCA Green Mark scheme was introduced to assess the environmental impact and performance of buildings. It is also meant to promote the development of more environmentally friendly buildings and a more sustainably built environment in Singapore. As the highest tier under the scheme, the BCA Green Mark Platinum award is awarded to exemplary green projects that demonstrate 30 percent of water and energy savings, environmentally sustainable building practices and innovative green features.

In 2007, CDL was accorded two BCA Green Mark Platinum Awards for the Oceanfront @ Sentosa Cove (residential) and City Square Mall (commercial), making CDL the first private developer to be awarded this honour. In 2008, CDL was conferred the Green Mark Platinum Award by the BCA for its luxury residential developments, Cliveden at Grange and The Solitaire, as well as for its high-tech complex, 9 Tampines Grande. CDL's five consecutive wins of the BCA Green Mark Platinum award accentuates its commitment towards environmentally sustainable development.

"CDL embarked on the green journey over a decade ago with the belief that we could make a positive contribution towards the environment. Back then, we took bold steps in uncharted territory to proactively incorporate innovative designs and state-of-the-art technology to make our projects more environmentally sustainable. As we continue to endeavour to create new benchmarks of green excellence, it is indeed gratifying that our sustained, voluntary green efforts have been recognized with 17 BCA Green Mark awards accorded since its inception," said Mr Kwek Leng Joo, CDL's Managing Director.

Cliveden at Grange

Bringing luxury to new heights, Cliveden at Grange comprises 110 units of luxury apartments housed in four towers that are each 24 storeys in height. Set amidst regally manicured gardens and lush landscaping, CDL spent approximately 3.5 percent of the construction cost on the design and development of green features.

Energy efficiency features:

- Installation of heat pumps for hot water heating in the clubhouse area
- Wireless lighting with on/off and dimming switches for all apartment units
- Installation of photo-catalyst coating water film system at the clubhouse area to cool down the internal and external atmosphere of the building

Water efficiency features:

- Rainwater harvesting system for the irrigation of the landscape
- Waterless urinals at the clubhouse restrooms

Some of the designs for environmental quality and protection installed are as follows:

- Installation of a mechanical ventilation system which incorporates carbon monoxide sensors in the car park. The sensors activate the ventilation system when the amount of carbon monoxide hits a pre-set level. A dynamo fan is used to generate electricity for the jet fan system. This system reduces maintenance and ensures safety

Artist's impression of Cliveden at Grange.



The Oceanfront @ Sentosa Cove

Comprising of 264 units of luxury apartments housed in five towers between 12 to 15 storeys in height, The Oceanfront @ Sentosa Cove is the epitome of waterfront living. Approximately 3.8 percent of the construction cost was invested in the designing of green features.

Energy efficiency features:

- Some of the green features include the installation of energy-efficient air-conditioning with the "4 Ticks NEA Energy Label"
- Motion sensors for lighting in common areas such as the private lift lobby and the clubhouse
- Low-emissivity glass for the minimization of heat from the sun
- Sun path analysis to determine the effectiveness of the interior layouts
- CCTV circuit is powered by a solar power system with photovoltaic cells

These measures are expected to reduce air-conditioning energy costs by SG\$290,000 yearly.

Water efficiency features:

- The innovative "Pontos Grey Water Recycling System" recycles water from the apartments' showers, bathtubs and washbasins for the flushing of the clubhouse toilets and the irrigation of the landscape
- Water sub-meters that monitor water consumption and detect leaks

Some of the designs for environmental quality and protection installed are as follows:

- High-frequency ballasts for car parks and common areas to prevent flickering that is associated with fluorescent lighting
- Installation of a ductless mechanical ventilation system which incorporates carbon monoxide sensors in the car park

Artist's impression of The Oceanfront @ Sentosa Cove.



City Square Mall

Designed for both energy and water efficiency, City Square Mall is the prototype of an eco-friendly and community-friendly mall. CDL invested approximately five percent of the total construction cost into the development of the mall's numerous green innovations. Many of Singapore's "firsts" are featured in the mall's design. Some of these innovative designs are featured in the lists below.

Energy efficiency features:

- Lighting zoning and alternate lighting circuits for common areas
- Motion detectors and lighting sensors for toilets, staircases and car parks
- Intensive green roof to lower ambient temperature and heat gain into the building

Energy usage will be reduced by 39 percent as compared to designs utilizing standard industry codes.

Water efficiency features:

- Rainwater harvesting for watering of plants
- Recycling of condensate water from PAHU for cooling tower make up
- "Eco-restrooms" with waterless urinals fitted under PUB's Water Efficiency Labelling Scheme

These are just some of the measures in the mall that will help reduce operational costs with estimated cost savings of SG\$48,000 per annum.

Some of the designs for environmental quality and protection installed are as follows:

- Cooling load variations that correspond to thermal comfort
- An air-purging system that is integrated with a smoke extraction system for the improvement of indoor air quality
- Installation of sensors to monitor levels of indoor carbon dioxide

Artist's impression of City Square Mall.



Mr Eddie Wong is the General Manager of Projects at City Developments Limited (CDL). Since he joined the company in 1981, he has been instrumental in leading his division towards realising CDL's corporate vision of developing properties with environmental sustainability in mind.

Mr Wong is a Fellow of the Society of Project Managers. He is also a Steering Committee Member of the Energy Sustainability Unit, which is a partner of the Economic Development Board. As a member of the construction industry's IT Standards Committee, which develops standards for the construction industry, and as an Industry Ambassador appointed by the Building and Construction Authority, Mr Wong is actively involved in fostering connections with industry peers and the community to improve the built environment.

In recognition of his deep passion and commitment towards sustainable development, he was recently awarded the EcoFriend Award by the National Environment Agency.



1. Can you describe the beginning and the motivation behind CDL's strong commitment towards environmental sustainability?

Our commitment towards building sustainable developments stems from our Corporate Social Responsibility (CSR) principles and our corporate green philosophy. CDL's pioneering efforts towards this direction was chartered by our Managing Director, Mr Kwek Leng Joo. Even before terms like "CSR" and "environmental sustainability" became buzzwords, he recognized the need for the company to adopt a holistic approach towards property development; the need to balance profit and economic gains and consider the impact that our operations have on the environment. With this charter in place, CDL went boldly ahead to develop and manage our properties with environmental sustainability in mind.

2. What are some of the more prominent sustainable initiatives implemented by CDL over the years?

To ensure that our business associates share the same environmental commitment, we established the CDL 5-Star EHS System and CDL EHS Excellence Award. It is also compulsory for our consultants to conduct EHS risk analyses for their designs and on the impact of construction and occupation downstream.

To encourage eco-habits, we initiated the Project Eco-Office programme in partnership with the Singapore Environment Council to promote green office practices amongst our tenants and other corporations. We also introduced the "Let's Live Green" Open House to encourage CDL homebuyers to practice eco-friendly habits in their homes.

One of the most successful green features that CDL has introduced into our developments is the twin-chute pneumatic waste disposal system. The system comprises two hoppers on each floor, where residents may dispose of two groups of waste. One is for general waste and the other is for recyclables, which include paper, plastic bottles and metal cans. As the system makes use of air suction to transport waste to the designated collection centre, all waste is contained and is not exposed to the surroundings during the entire refuse disposal and removal process. This results in a clean, odourless and vector-free environment. Parc Emily, jointly developed by CDL and TID Pte. Ltd., is the first development in Singapore with this system.

There is also the "1°C Up" Campaign for tenants, which encourages CDL's tenants to make an active green contribution by agreeing to raise the air-conditioning temperature in their offices by 1°C, without compromising on comfort levels.

3. Would you say that going "green" has further increased the escalating construction costs faced by the industry? Also, how has going "green" paid off for CDL?

We typically invest between two to five percent of the construction cost of a development on green design and features. While there may be initial capital investment, we view it as sound investment. The returns of this investment are reflected in the reduced

use of natural resources (both during the construction process and the life cycle of the building), cost savings during the building's operation phase (from reduced water and energy usage) and even the possible increased capital value of the development.

A good example would be a BCA Green Mark Platinum development such as the 700,000 sq ft City Square Mall. It is Singapore's first eco-mall that is designed to be the prototype of an eco-friendly and community-friendly mall. City Square Mall is projected to reduce its energy usage by approximately 39 percent as compared to designs using standard industry codes. This will offset the five percent of the construction cost invested in the green features within five years.

4. How does CDL engage its consultants and contractors in adopting green measures or initiatives that complement CDL's green efforts?

Since 2001, we have audited the EHS performance of our contractors quarterly through our in-house developed CDL 5-Star Assessment System, where we engage an external, independent auditor to rate each ongoing project with a score of one to five stars.

Leveraging on this platform, results of the audits along with good practices and lessons learned are shared with the top management of our contractors and consultants at our in-house quarterly seminars. Through this peer learning and information sharing exercise, our contractors and consultants are encouraged to achieve even better EHS results in the next review.

As an added incentive, we also introduced our CDL EHS Excellence Award in 2005 to recognize exemplary contractors. All these efforts have helped influence our contractors and consultants to set up their own EHS Management Systems. More than half of our consultants have obtained ISO 14001 and OHSAS 18001 certifications.

As part of our green procurement policy, our consultants and contractors are required to achieve a project-specific minimum standard for Green Mark certification that necessitates the adoption and implementation of sustainable designs and innovative products and the CDL 5-star EHS Excellence Award.

We also encourage our architects and engineers to be ISO 14001 certified. Our procurement policy requires our architects and engineers to submit a written commitment that they undertake to comply with CDL's policy on EHS. One criterion for the prequalifications of contractors for projects developed by CDL is that they must be ISO 14001 and OHSAS 18001 certified.

5. Could you elaborate on how CDL has managed to maintain the cost efficiency despite the high standards it sets?

As part of CDL's three-pronged approach towards environmental sustainability, we believe in not just developing eco-friendly buildings, but also in managing our properties in a cost-efficient and energy-efficient way and in influencing stakeholders through community outreach initiatives.

Having invested in green buildings and grooming our core consultants and contractors for over a decade, we have been able to improve our overall EHS standards, especially in the areas of energy and water efficiency during construction. Our contractors have also been able to enjoy significant savings. This helps them to be more competitive when they tender for our projects. Besides, with our best practices deployed across all our developments, our green costs are increasingly offset by the economies of scale.

6. In your opinion, what would be the toughest challenge faced by a green advocate like CDL, and how have you managed to overcome it?

The challenge in going green at the outset, apart from having to invest in green technology, was the initial resistance we faced when we encouraged our stakeholders to adopt green building practices and innovative construction methods. By introducing programmes and incentives such as the CDL 5-Star EHS Assessment System as early as 2001 at all CDL worksites, we managed to influence our stakeholders to move towards a "safe and green" culture.

7. What do you think the authorities can do to further encourage the industry to go green?

The BCA Green Mark for Buildings Certification and Incentive Scheme has helped to shift attitudes towards green building methodology within the industry. Apart from providing incentives to the industry to go green, awareness campaigns amongst homeowners, office tenants and other end-users to promote the benefits of green buildings and eco-features will help to raise the demand for green buildings.

The greatest challenge is eco-education and mindset or behavioural change beyond infrastructure capabilities. This will help drive demand for green developments.



Goodwood Residence

An inviting lush green belt awaits residents of Goodwood Residence, which is the result of a seamless merger between the natural foliage of Goodwood Hill and the green features within Goodwood Residence, a luxurious condominium. Developed by GuocoLand Singapore Pte Ltd, the development sits on a 2.5 ha site that shares a 150 m boundary with Goodwood Hill, a tree conservation area that is dotted with historical black and white colonial bungalows.

Set against the abundant backdrop of Goodwood Hill, the 210-unit Goodwood Residence is therefore, a rarity amid the hustle and bustle of the Orchard Scotts vicinity. When the design process first began on the project, it was almost an instinctive reaction to visually draw in the greenery of the area into the new freehold development to create a green lung for residents. Indeed, the "green" experience starts as residents and visitors drive along a tree-lined boulevard as they arrive at the residence.

Merging green design with nature

Goodwood Residence's Green Mark Platinum Award has demonstrated that green features need not be costly when adopted early on in the design process. The original design scheme revolved around the concepts of Green Space, Environmental Shades and Filters, which cost only 1.8 percent more in construction cost when it comes to introducing new and innovative approaches in sustainable architecture. The estimated savings from these green measures are approximately SG\$600,000 a year on utility bills for the home and the common area. This is equivalent to a 20 percent reduction in monthly maintenance costs for the new homeowners.

Just like a building system, the green features will require maintenance. This

is an issue that has to be addressed at the design stage so that they will remain useful and relevant to the future Management Council when it takes over the maintenance of Goodwood Residence.

Green Space and Green Living

Tree conservation and natural greenery were the initial design inspirations behind Goodwood Residence. By drawing in the surrounding greenery into the spacious development, the architect was able to provide a luxurious 100 m distance between the two apartment blocks, enhancing the residents' privacy. Along with 58 preserved trees, approximately 500 other trees that are indigenous to Southeast Asia will complement the expanse of greenery in Goodwood Residence. The concept of Green Space is further reinforced in Vertical Greenery, where about 1,700 sq m of vertical landscaping blends the development seamlessly with the green foliage and reduces the building's solar heat gain.

Environmental Sunshades

Goodwood Residence incorporates extensive use of planters and balconies as low-maintenance environmental sunshades. Planters of one m wide adorn both frontages of the buildings while balconies, which occur in either 2.7 m or 4.5 m depths, provide tropical outdoor space and shade to the apartment below.

User-Controlled Environmental Filters

As a distinct architectural feature, Goodwood Residence incorporates vertical aluminium filters along both frontages of the buildings. Inspired by a weaving pattern of Asian origin, the aluminium filters provide privacy and shading control for the residents without compromising on ventilation.

Smart Water Management

All landscaping requires water for sustenance in order to remain looking at its best while working effectively as heat sinks. At Goodwood Residence, a self-sustaining irrigation system was developed to make this possible. The system also minimizes the use of potable water by harvesting rainwater, irrigation water run-off and underground water to irrigate the plants during the wet and dry seasons. This integration was possible because of the high water table and location at the foot of Goodwood Hill. Reed planting beds that act as filters provide a natural bio-filtration process along the water migration route in order to improve water quality before it is stored for the next cycle of irrigation.

User Friendly Dual Pneumatic Chutes

Separate refuse chutes for organic waste and recyclable waste are provided side by side at the common service lobby to make daily recycling efforts convenient for all residents. Recyclable waste and organic waste are compartmentalised separately using a pneumatic waste system that periodically stores these waste materials in separate containers. A recycling company will then collect the waste and take over the recycling process.

Zero Building Waste Concept

Responding to the shortage of sand, the project team had a brainstorming session with Professor Wee Tiong Huan from the National University of Singapore where they developed the Zero Waste Concept. The concept works on the principle that most building components that are demolished could be recycled into another rebuilding cycle. This approach reduces the energy that is consumed in making new bricks and transporting sand. Demolition is done systematically; firstly by removing organic materials, followed by the removal of plastics, timber, metal and glass. Through a controlled demolition process, sand-like aggregates can be reclaimed from a building. Utilizing the techniques of making lightweight partition walls pioneered by Professor Wee, 100 percent of the internal walls of Goodwood Residence are built from reclaimed aggregates that originate from the existing building walls and structures.

1. How does the concept of environmental sustainability — in its broadest sense — fit into GuocoLand's policies and initiatives?

Our core business is real estate and globally, buildings are one of the biggest energy and resource consumers. We are aware that decisions made at the design stage of the building will have an environmental impact as long as the building exists. Therefore, we believe that as property developers, embracing the concept of environmental sustainability will go a long way to conserve the limited natural resources for our future generations.

When incorporating eco-friendly features in our developments, we are conscious of striking a good balance between the cost of such features, their practicality and at the same time, ensuring that they blend in well with the overall design.

Our mission is to ensure that good architecture, environmental sustainability and cost effectiveness can co-exist. In this regard, we are constantly exploring new technology and brainstorming innovative ideas with like-minded professionals such as architects and landscape specialists who share a passion for well-designed and eco-friendly developments.

Our challenge is to integrate useful green features that are easy to maintain so that our customers, who are the end users, can appreciate the outcome and enjoy the benefits.

2. What are the environmental sustainability initiatives that have been implemented over the years?

The environmental sustainability initiatives implemented by GuocoLand over the years can be seen in our developments; Goodwood Residence and The Quartz.

At Goodwood Residence, a luxurious condominium that is under construction in the prime Orchard-Scotts vicinity, we are undertaking one of our major environmental sustainability initiatives.

The key feature of Goodwood Residence is its vast landscaping and greenery. Landscaping requires extensive irrigation. Since more than 500 trees will be planted, not to mention the vertical planting and ground covers, we focused on incorporating environmentally friendly features which are aimed at conserving the consumption of water. We reverse-engineered the

method of storm water drainage used on highways and used it to harvest underground water for landscape irrigation. Together with rain water harvesting, these features complement the usage of potable water for landscape irrigation.

Another breakthrough is in the selective re-use of certain re-usable building materials from the existing condominium buildings, through which we were able to cut down on energy consumption in the redevelopment of the new buildings in Goodwood Residence.

These are significant pioneering concepts that will also benefit the industry as they can be applied broadly.

At The Quartz, an outstanding green feature is the use of recycled heat from the air-conditioning units in the apartments to heat water in the showers at the clubhouse.

The Quartz, which won the BCA Certified Green Mark Award in 2006, is a mere three-minute walk from the Buangkok MRT station in Sengkang New Town. With 625 apartment units, The Quartz is currently under construction.

3. Following Goodwood Residence, which won the BCA Green Mark Platinum award - Singapore's highest accolade for green building, will we see more "green" developments from GuocoLand?

In Singapore, we have a portfolio of residential sites where we plan to have "green" architecture by including innovative and yet practical eco-friendly features. As we develop these sites, we will build on our experience to improve on environmental sustainability.

Each site has its own unique set of characteristics and through intensive research and meaningful partnerships with consultants, we will work towards customised solutions with a view to maximise the site's attributes. Technology too is constantly changing and we plan to keep abreast of it to enhance our solutions.

4. Can you tell us a little bit about the upcoming "green" buildings?

Our emphasis will be on the practicality and sustainability of "green" features, taking into account the benefits and enjoyment which may be derived by our end users.

5. In your opinion, do you see "green" buildings fully going mainstream in the near future?

We believe that going mainstream for "green" buildings will be the way forward in future. With the era of cheap energy being over, coupled with a heightened awareness of environmental issues, going green has become a global issue that can only gain momentum. We see that developers which incorporate green architecture in "green" buildings will be able to differentiate their product and also play their part in environmental sustainability.



Mrs Trina Loh
is the Managing
Director of
GuocoLand
(Singapore) Pte Ltd.

6. At this point, do the economic and environmental benefits of "green" buildings present a strong business case for GuocoLand to go green?

Developed countries such as Western Europe are ahead of Singapore and Southeast Asia in terms of environmental consciousness. This is reflected in their choice of accommodation, with a preference for eco-friendly buildings. This trend will become more apparent with the younger generation in Singapore as students are already more exposed to green issues these days. "Green" buildings will increasingly be the norm in the future.

GuocoLand aims to have a headstart by offering well-designed, eco-friendly developments that will appeal to home buyers while playing a part in protecting our eco-systems.

7. Tell us about GuocoLand's sustainable design philosophy in achieving low energy and energy efficient tropical developments while maintaining a low "green" cost premium?

We strive to include eco-friendly features as an integral part of GuocoLand's design philosophy.

We plan to incorporate "green" features from the very beginning, working with consultants who share our ideals. Considering these early on during the design stage will help to shape a cost-effective and energy efficient development. The design philosophy has to be sufficiently flexible to accommodate each site.

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