

# Green Pulse

A Publication from **Green in Future Pte Ltd.**, Singapore

Volume 1 Issue 3 • JUNE 2017 • [www.greeninfuture.com](http://www.greeninfuture.com)



## **Green Development Near Yangtze River - Chongqing Eling Residences**

4

## COVER STORY



Green  
Development  
Near Yangtze  
River

- Chongqing  
Eling Residences

8

## FEATURE



Renaturalizing  
Manta Ray

Yeouido Han River  
Park & Yeoui-Naru  
Floating Ferry  
Terminal, Seoul

13

## FACE TO FACE



Maria Boey

President of the  
Institute of Parks  
and Recreation,  
Singapore

16

## NEWS



Singapore  
Sustainability  
Academy

- a visionary initiative  
in support of global  
and national climate  
actions

12

## EVENTS

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# Green Development Near Yangtze River - Chongqing Eling Residences

Located at the peak of Eling Hill in Yuzhong district, Chongqing, China, Chongqing Eling Residences is the recipient of the top-tier Green Mark Platinum Award, a first for a residential project in China. Designed by world-renowned architect Moshe Safdie, the 126-unit ultra-luxury residence enjoys an exclusive location endowed with the breathtaking views of the Yangtze River.

The development leverages on the smart home energy management system, a state-of-the-art technology that helps residents to track and manage their power usage of various home devices on a single platform, enabling them to save energy in real time. Another key green innovation at Chongqing Eling Residences is the centralised energy recovery ventilation system which encompasses multiple functions such as: maintaining

a constant indoor temperature, humidity and oxygen level; allowing fresh air intake at pre-programmed time intervals; and reducing the building's energy consumption via its heat exchange feature.

In addition, Chongqing Eling Residences features a wide array of energy- and water-efficient features which allow the development to be 36% more energy efficient and 24% more water efficient than other code-compliant buildings in Chongqing city. The development is expected to achieve total energy savings of approximately 2.3 million kilowatt-hours (kWh) per year and total water savings of approximately 20,000 cubic metres (m<sup>3</sup>) per year. This translates into an estimated reduction of over 1,100 tonnes of carbon dioxide emission each year.



The development leverages on the smart home energy management system that helps residents to track and manage their power usage of various home devices on a single platform, enabling them to save energy in real time. It also features a centralised energy recovery ventilation system which encompasses multiple functions such as: maintaining a constant indoor temperature, humidity and oxygen level; allowing fresh air intake at pre-programmed time intervals; and reducing the building's energy consumption via its heat exchange feature.



KEY GREEN FEATURES	BENEFITS
<ul style="list-style-type: none"> <li>▪ High energy efficient air-conditioning and gas water heaters are installed in all residential units</li> <li>▪ Energy recovery ventilation system</li> <li>▪ Low emissivity and double-glazed glass</li> <li>▪ Carbon monoxide sensors installed in the basement carpark</li> <li>▪ Passive architectural design and extensive greenery provisions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reduce energy consumption — overall estimated energy savings of approximately 2.3 million kWh per year</li> <li>▪ Extract heat from the exhaust air of the building and transfer the heat to the air supply</li> <li>▪ Minimise solar heat gain</li> <li>▪ Regulate demand for mechanical ventilation</li> <li>▪ Mitigate urban heat island effect and solar heat gain</li> </ul>
<ul style="list-style-type: none"> <li>▪ Solar photovoltaic panels at common areas to harvest energy for outdoor landscape lighting</li> <li>▪ Usage of sun pipes to induce natural daylighting into the basement carparks</li> <li>▪ Solar water heaters are installed in clubhouse and kindergarten</li> </ul>	<ul style="list-style-type: none"> <li>▪ Estimated renewable energy harvested of 50,000 kWh per year</li> </ul>
<ul style="list-style-type: none"> <li>▪ Sanitary fixtures and fittings of high water-saving ratings at all residences</li> <li>▪ Rainwater harvesting system to collect rainwater for irrigation</li> <li>▪ Efficient auto-irrigation system is provided</li> <li>▪ Sub-meters to monitor major water usage such as irrigation and water features</li> </ul>	<ul style="list-style-type: none"> <li>▪ Estimated water savings of approximately 20,000 m<sup>3</sup> per year</li> </ul>
<ul style="list-style-type: none"> <li>▪ Applied sustainable construction methodology and environmental management practices — recycled materials were used extensively in the landscaped deck</li> <li>▪ Provision of recycling bins</li> </ul>	<ul style="list-style-type: none"> <li>▪ Promote environmental conservation</li> </ul>
<ul style="list-style-type: none"> <li>▪ Low volatile organic compounds paints for internal walls</li> <li>▪ Green-certified adhesive products</li> <li>▪ Central vacuum system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve indoor air quality</li> </ul>



## Upcoming GREEN Events:

### World Sustainable Built Environment Conference 2017

05-07 June 2017

Hong Kong

- [www.wsbe17hongkong.hk/wsbe17-hong-kong](http://www.wsbe17hongkong.hk/wsbe17-hong-kong)

### Landscape Institute Conference 2017

22-23 June 2017

Manchester Metropolitan University

- [www.landscapeinstitute.org](http://www.landscapeinstitute.org)

### The 10th Making Cities Liveable Conference,

10- 11 July 2017,

Hotel Grand Chancellor, Brisbane

- <https://healthycities.com.au/>

### Green building & construction:

Pathway towards inclusive growth and the creation of decent and green jobs,

10-14 July , 2017,

Turin, Italy ,

- [www.itcilo.org/en](http://www.itcilo.org/en)

### The ECOCITY World Summit,

12-14 July,

Melbourne, Australia,

- [www.ecocity2017.com](http://www.ecocity2017.com)

### Archidex 2017

19-22 July ,

KLCC , Malaysia

- [www.archidex.com.my](http://www.archidex.com.my)

### ISAP2017

International Forum for Sustainable Asia and the Pacific,

25-26 July 2017,

- [www.iges.or.jp/isap/2017/en/](http://www.iges.or.jp/isap/2017/en/)

### Global Compact Network Singapore Summit,

29-30 August ,2017,

Suntec Convention Centre, Singapore,

- <http://gcnssummit.com/>

### ICSD 2017 :

5th International Conference on Sustainable Development,

6-7 Sept, 2017

Rome , Italy ,

- [www.ecsdev.org](http://www.ecsdev.org)

## BEX ASIA

### Bex Asia 2017

12-14 September 2017

Marina Bay Sands , Singapore

- [www.bex-asia.com/](http://www.bex-asia.com/)

### Mostra Convegno Expocomfort (MCE Asia)

12-14 September 2017,

Marina Baysands,Singapore

- [www.mcxpocomfort-asia.com](http://www.mcxpocomfort-asia.com)

### 2017 Taiwan International Air Purification and Sanitation Show

18-20 Oct 2017

Taipei Nangang Exhibition Center, Hall 1

### IFLA World Congress 2017

15 - 16 October 2017

Montreal, Canada

- <http://iflaonline.org/event/world-design-summit-montreal/#more-13776>

### ISOCARP-OAPA/53rd ISOCARP Congress

24-27 October 2017

Portland, Oregon, USA

- <http://iflaonline.org/events/>

### IFLA Asia Pacific Regional Congress,

02-05 November 2017

Bangkok, Thailand

- [www.2017iflaapr.com](http://www.2017iflaapr.com)

### Urban Scape Asia 2017

09 - 11 November 2017

Singapore EXPO Convention and Exhibition Centre

- [www.greenurbanscapeasia.com](http://www.greenurbanscapeasia.com)

## RENATURALIZING MANTA RAY

# YEUIDO HAN RIVER PARK & YEUI-NARU FLOATING FERRY TERMINAL, SEOUL

*An Example of biophilic and  
résilient architecture*



### SCENERY AND DESIGN PLAN: A PERMEABLE LANDSCAPING LINKING 4 CORES

The main objective of the “Manta Ray” project is to enhance the site’s natural irrigation by transforming the park into an ecological forest of willow trees. The creation of a marsh-like filtering strip of plants strengthens the natural protection of the banks against river floods.

This permeable landscaping enhances the Han River’s original scenery, thus restoring the park as one of the most praised tourist attractions in Seoul, as well as the new symbol of the symbiosis between urban dwellers and the natural environment.

The ambition of the project is to turn Yeuido Park into a genuine cultural hub, where nature progressively asserts its rights over the concrete city again to better protect it. The urban plan articulates around four biomimetic-looking projects whose architecture is densely vegetalized. These four cores are linked to the public transit system by fruit and vegetable gardens, and by a cable-stayed pedestrian bridge.







### YEQUI-NARU FLOATING FERRY TERMINAL: PLAN LAYOUT AND FACILITIES SPACE DESIGN

Bio-inspired from the hyperbolic geometry of a Manta ray, the ferry terminal is suspended above the marina and gardens. The idea is to free the view towards the Han River and Yeuido Park by bringing all programmatic uses above the water.

The architectural project is divided into three levels:

1. Panoramic floating dikes along the lower docks: Steel dikes float on the river. Linked together with flexible seals, they surround and protect the marina from water currents. The marina is dedicated to small private and public boats such as water taxis, yachts and small sailing boats, but also to government ships. These floating piers integrate the technical equipment inside double floors, supplying boats with energy (water and electricity) and biofuels. In parallel with the maritime route and 60 meters (c.197 feet) away from the bank, a long straight dock can accommodate the simultaneous docking of five large cruise boats of up to 700 tons each. In the heart of the marina, a floating theatre can be used to organize outdoor

shows, while amphibious gardens line up the piers. The docking and fixed position of this circular floating platform are secured by a network of chains, anchoring it to the bottom of the river with 26 concrete slabs. The recycled concrete slabs are laid out to avert any structural component interference with the safety zone surrounding the metro line 5 tunnel right under the river bed. The chain-mooring system can be reinforced with a "dolphin-type mooring system" if the waves are too strong when ferries dock.

2. Programmatic uses inside the upper building: From the radial and concentric floating piers, tree-like structures made of CLT (Cross Laminated Timber) harvested from eco-responsible Korean forests rise towards the sky. Woven in a honeycomb pattern, those trees branch out at the top, creating the structure of a giant Manta ray over the marina. Inside their trunk, spiral staircases, glass elevators and helical ramps provide access to service and recreational equipments located on the upper level, and to the rooftop. Reception and leisure areas, food courts, and exhibition and educational spaces are laid out in the programmatic functional rings, freely punctuating the large double-curved open space area. This hyperbolic paraboloid rolls out like a soft-slope landscape, inviting passengers and visitors to wander and stroll while offering stunning views of the river.

3. Observation deck towards Ban Island and rooftop orchard: To learn about the river history in a unique, attractive location; to pick fruits in a blooming orchard before taking off on a cruise; even better, to marvel at the skyline towards the "N Seoul Tower" and the Mount Bukhan hills from a balcony floating over water: these are the emotions this rooftop promises to Seoul residents. Its main access is via the cable-stayed pedestrian bridge that links the metro station to the park. Its principal identity comes from the skyward wind trees and solar shields that guarantee its complete energy autonomy.





## EXCELLENCE IN ECO-FRIENDLY DESIGN, SAFETY AND TECHNICAL PLANNING

The “Manta Ray” project strives to be a prime example of energy saving, reduction in carbon dioxide emissions and circular economy. In order to optimize the cycle and resources, the ferry terminal embraces the three R’s of waste management: Reduction in waste; Reuse of resources; and Recycling of materials. The honeycomb-like CLT structure is thus entirely generated from local eco-responsible forest trees, where harvested trees are systematically replaced according to nature’s regeneration cycles. The materials used for interior spaces and furniture also come from bio-sourced, recyclable and/or recycled origin.

In order to produce 100% of its energy needs, the floating terminal also includes the following renewable energies:

1. Solar: The rooftop includes 4,4550 square meters (c. 49,000 square feet) of laminated glass facade, with encased photovoltaic polycrystalline cells. The roof edge is lined with 3,500 square meters (c. 37,300 square feet) of opaque photothermal panels.

**Yeoui-Naru:** The first core includes the construction of a floating ferry terminal on the Han River that can adapt to rising waters of up to 5 meters (c. 16.4 feet) according to seasonal floods. As a landmark for the entire project, the terminal manages the residents’ river transit and includes cultural spaces showcasing the history and development projects related to the river, which runs through the city of Seoul.

**Yeouijeong:** The second core includes the landscaping of the river bank, bringing back large terraces, pedestrian paths, bicycle lanes, and an amphitheatre along the river that take advantage of the site’s natural slope. The marsh-like bank can accommodate traveling bars such as barges or tiny houses.

**Yeoui Terrace:** The third core includes the development of the park’s upper ground along Yeoui-Dong road and its famous lining of cherry blossom trees. Shops dedicated to “Han River, Seoul” products, fish or shellfish restaurants and organic farmers’ markets are connected directly to the subway line 5.

**Ari Cultural Center:** The fourth core includes a cultural complex dedicated to temporary or permanent exhibitions, as well as a science center centre and creative workshops for children.



**2. Wind:** Rooftop wind trees make up a 52-VAWT (vertical axis wind turbine) farm.

**3. Biomass:** Organic and biodegradable waste from Yeouido Park supply a biomethanation plant, providing energy for the equipments.

**4. Water:** Oscillating-foils hydrokinetic turbines (HAO) are integrated and synchronized along the hull of the large floating barrier encircling the marina. Biomimetically-inspired from the tail of a whale or dolphin, they move back and forth by tilting their profile, turning the river's kinetic energy into electrical energy.

These renewable energy sources work in collaboration, enabling the four cores of the project to share the energy their produce in real time via a smart grid.

Seoul is finding new ways to invest in this kind of soft infrastructure, helping to foster social cohesion with a greater sense of community among diverse socio-economic groups. With an eye toward increasing equitable access for everyone to these new facilities, this floating vessel is an example of biophilic and resilient architecture, demonstrating that it is possible to build with nature rather than against it, by respecting the life of the river and allowing the local fauna and flora to flourish. The "Manta Ray" project promotes

the permeability and renaturalization of river banks in cities with rivers running through them. The banks become new playgrounds for social innovation, and for urban "consumers-actors" seeking to promote urban farming, agroforestry and permaculture. The goal is to make them less vulnerable to climate change, and to the subsequent dramatic flood and urban heat island events witnessed over the past decades.

**Photo credit :** © Vincent Callebaut Architectures

**PROJECT CREDIT**

- Type : International Competition
- Host & Order Institution: Seoul Metropolitan Government
- Location: Yeouido Han River Park between the Mapo Bridge and the Wonhyo Bridge
- Status : Masterplan & Concept
- G.F.A. Spatial Planning : 25 600 m<sup>2</sup> = 9100 m<sup>2</sup> Ferry Terminal & Pier Deck + 8500 m<sup>2</sup> Yeoui Terrace + 8000 m<sup>2</sup> Cultural Complex





# Maria

is an Architect, Landscape Architect, Town Planner and Urban Designer. She has planned Tampines Town and Paris Ris Town. Tampines won the World Habitat Award in 1992 for Housing and Development Board, Singapore. She and her Architects designed most of the housing development in Neighbourhoods 1, 2, 3, 4, 5, 8 and 9 forming a network of Green Connectors within the town.

She is formally Hon. Sec. for the Singapore Institute of Planners and held other Executive posts for a decade. She is President of the Institute of Parks and Recreation, Singapore and Second Vice-President of Singapore Institute of Landscape Architects presently. She is a Rotarian and Soroptimist who donates generously to Lions Homes for the Elders, Lions Befrienders, Singapore Planned Parenthood Association and Henderson Senior Citizens Home and other charities. She is a Distinguished Toastmaster who helps people in communication.

## Tell us Briefly about your career as a Landscape Architect?



I really enjoyed my career as a landscape architect because it is such a wonderful thing to create landscaped spaces for the people to use. You can see plants grow in a short moment and encourages bio-diversity in attracting birds and butterflies to the selected plants.

I have 26 years experience in planning, designing and implementing from concept to completion in public housing of Singapore HDB (Housing Development Board). I lead a team of architects in planning of housing precincts which is a breakthrough in the housing design as we provide a central space for social interaction of the residents with green linkages to surrounding neighbourhoods. As an Architect, I have designed thousands of flats, a few neighbourhood centres, a mosque and some neighbourhood parks.

As head of HDB Landscape Studio, I set standards for landscape. We researched into different types of plants we should plant. For example, if you want fragrant plants there are lots of fragrant plants you can choose from. There is also the edible garden that we would like to plant especially fruit trees.

Many new design concepts were introduced which I am part of like the recreating waterbodies in Sungei Api-Api and Bukit Panjang Neighbourhood Park, which is a storm water retention pond.

I left HDB in 2003 to join Surbana International Consultants Pte. Ltd. where I continued as a landscape architect. We worked in team in landscape design and implementations.

I was involved in the Institute of Parks and Recreation (IPRS) for many years and now I am the President since 2008. This has helped me to

contribute to the community in terms of landscape. For example, I promoted community garden in our public housing. Community Gardens is a nationwide gardening movement known as Community in Bloom initiative by NParks, to provides a platform for people to bond with the wider community while drawing them closer to nature in our cityscape!

**? What is the most rewarding aspect of your job as a landscape architect?**



As a landscape architect the biggest reward is to see people enjoy themselves in the HDB Parks and Gardens that I designed individually or in a team.

The latest project that I helped to implement was Eco-Park at Rumah Tinggi. This linear park is part of the KTM railway providing cargo access to Brickworks. Here, we use water retention tanks and swales for this ABC (Active, Beautiful and the Clean water) project, encouraged by Public Utility Board.

In Kallang Trivista Housing near the Kallang MRT station, we implemented what is best for the environment with fruit trees, edible plants and flowering plants for butterflies and birds. Here we use the ABC concept of planting with rain gardens and swales which means that the rainwater will be collected underground, through the drain and plants on top of the drain. It is very beautiful scheme by integrating the drains, canals and reservoirs with the surrounding environment in a holistic way

**? Tell us briefly about one of your favourite project and why ?**



Not many know about a dinosaur park in Woodlands. A decade back, this park was a very popular attraction located in Woodlands street 81. I was inspired by the Stonehenge in Wiltshire, England and bought a small model with Stonehenge footprint to create the park entrance. This park is called Fu Shan (Fortune Mountain) Garden. We used mostly natural stones to form the waterfall. Leaves from the existing trees were sculptured into green petals fallen into the waterfall as part of nature.

At that time we didn't have many proprietary playgrounds so by designing a set of dinosaurs I have to use my creativity how would the children use it. Mainly because there are different types of dinosaurs, we have a number of slides, sunken into

the sand pits. As there were much publicity about this park, many parents brought their children from all parts of Singapore to play in this park.

**? What were the challenges arise and how did you manage that ?**



The challenges arise basically when we have areas that we have to plant without enough sunshine as we need sunshine for six hours for a plant to grow effectively. And there will be areas with too much water so we have to think first about what types of plants we can plant.

These days, there are roof gardens which are of intensive and extensive use. The extensive roof garden has no public access but planted with simple species which are durable and has little maintenance. The intensive roof gardens are furnished with shelters, 3 generations play and exercises equipment. Due to its limited space, planting are limited to small trees and away from the housing units.

**? What advice do you have for young landscape architects and designers?**



I think for any designer whether it is graphic design, architecture or landscape, a person must have a passion and love what they do. It becomes more an enjoyment when you combine work and the passion for what you are doing. The ability to create great things for the people is what we should focus on to do. Care for the people and the environment. With lots of trees, animals like squirrels, Butterflies and birds will just appear. Birds can benefit from trees yielding berries. So let's ensure we keep architecture and landscape related together for a better environment and ecology.

**? What are the do's and don'ts of Architectural Designing ?**



Do everything that is right and don't do anything that is wrong because in the process of landscaping we are actually learning as well. So there are things that we have to do right is like planting the right plant to the right environment. For example you don't plant a water plant on the dry ground. You have to plant it in water. You must not work alone, work as a team. Work with the licensed contractors and the suppliers, that way new products keep coming out. So it's good to know the industry as well. We must learn and improve ourselves further to make the world a better place.



**? Say something you would like to share on sustainability and landscape design?**



Sustainability is a very wide field. It extends from plants to building. As a president of IPRS, I promote edible planting and insist on growing your own plant. We have a book authored with Vegetarian Society, Singapore called *At Home from Pot to Pot* to encourage families to plant their own vegetable and eat them. This book is especially to encourage children to eat more fruits, herbs and vegetable in their own home.

**? What are the points to be noted while designing parks for recreation ?**



There are many types of parks in Singapore. For public housing, it was neighbourhood parks and now known as "common green" due to its smaller housing precincts. For the children, it is the proprietary playground and for the (NS) National Service, we have the exercise station and for the Elderly we have the exercise equipment. There is a jogging track which doubled up for brisk walking. We have shelters and seats for all. We should design according to the park's size and what facilities the budget have proposed. Big parks like Singapore Botanic Garden which is an UNESCO site requires more conservation and protection.

**? Tell us about your current role as the president of IPRS and your future plans and goals?**



The Institute of Parks and Recreation Singapore (IPRS) is a professional body dedicated to the conservation and enhancement of the country's parks and other recreational facilities. We are inspired by the beauty of natural surroundings in contrast with the modern backdrop of the city.

As part of our core values, we spearhead several fundraising projects that have green initiatives. We work with people who have a similar vision as ours, one that involves a sustainable future through a lively environment.

We have organized cycling events and even workshops and we are organizing a conference in July. International Greenery, Recreation, Infrastructure Park Conference 2017 and World Urban Parks Asia-Pacific Congress 17-20 July 2017.

For the goals, we should have more members locally and internationally. We have plans to expand overseas and planning to have upcoming overseas conferences in future. Tentatively one in Japan next year.



# Singapore Sustainability Academy - a visionary initiative in support of global and national climate actions

In conjunction with World Environment Day, the Singapore Sustainability Academy (SSA) was officially opened by Mr Teo Chee Hean, Deputy Prime Minister (DPM) and Coordinating Minister for National Security, together with Mr Masagos Zulkifli, Minister for the Environment and Water Resources. Jointly created by City Developments Limited (CDL) and the Sustainable Energy Association of Singapore (SEAS), the Academy is the first major People, Public and Private (3P) ground-up initiative in support of global and national goals to tackle climate change.

This is also the first time a local private-sector property developer and non-profit organisation have teamed up to create a major training and networking facility on sustainability. The SSA aims to promote a low carbon economy, resource efficiency, and sustainable practices among businesses and the community, in particular, youths. It will focus on advocacy, building capacity and collaboration, education and training, information and resource sharing as well as user engagement.

The SSA is supported by six government agencies — Building and Construction Authority (BCA), Ministry of the Environment and Water Resources (MEWR), National Climate Change Secretariat (NCCS), National Environment Agency (NEA), National Parks Board (NParks), and Urban Redevelopment Authority (URA) and 15 founding industry partners. It will be governed by an advisory board, chaired by Professor Tommy Koh, and a programme committee that will provide strategic direction and implement programmes to its mission.



The SSA is the first in Singapore to have its construction materials, Cross Laminated Timber (CLT) and Glued Laminated Timber (Glulam), verified by the Nature's Barcode™ system as coming from responsible sources.



Mr Teo Chee Hean, Deputy Prime Minister (DPM) and Coordinating Minister for National Security officially opened the SSA and was accompanied by Mr Masagos Zulkifli, Minister for the Environment and Water Resources, Mr Sherman Kwek, CDL Deputy CEO (first from right), Mr Edwin Khew, SEAS Chairman (second from left), Mr Chia Ngiang Hong, CDL Group General Manager (first from left) and Ms Esther An, CDL Chief Sustainability Officer (first from right).

At the official opening, it was also announced that the SSA will be a platform for the Women4Green initiative by CDL, the first Singapore network for women in sustainability. Women4Green brings together women executives in green industries who contribute to climate action, sustainable business, and social change. It will harness the collective knowledge and expertise of these female leaders to empower other women to incite meaningful change in areas such as green building, technology, energy, financing, consultancy and non-governmental organizations.

To raise awareness of climate issues and build a larger community for change, the SSA will also partner Eco-Business, a leading media company on sustainable development, to set up a Sustainability Studio. The studio will produce films on sustainability for various digital platforms.

Mr Sherman Kwek, Deputy Chief Executive Officer of CDL, said, "CDL firmly believes that sustainability creates immense value for businesses, stakeholders, the community and the environment. Sustainability is strategically integrated into CDL's business and operations from developing green buildings and managing them in an energy-efficient and resource-efficient manner, to engaging and influencing stakeholders on sustainable development. The SSA and Women4Green initiatives will further advance CDL's stakeholder engagement to achieve a greater

impact in building a sustainable future.”

## First-of-its-kind Sustainable Building in Singapore Featuring Innovations and Responsibly-Sourced

### Construction Materials

In line with its mission to promote sustainability among the industry and community, the SSA is the first in Singapore to have its construction materials, Cross Laminated Timber (CLT) and Glued Laminated Timber (Glulam) verified by the Nature’s Barcode™ system as coming from responsible sources. This entails scientific tests like DNA analysis to minimise the risk that the wood comes from illegal logging. CLT is a sustainable material harvested from sustainably-managed forests and fabricated by binding layers of timber perpendicular to each other with structural adhesive whereas Glulam’s layers of timber are cut in the same grain and then joined together. They are light yet structurally robust making them a lightweight alternative to steel or concrete.

Both CLT and Glulam are game-changing technologies that support the concept of Design for Manufacturing and Assembly to significantly boost productivity. For the SSA, the use of CLT and Glulam increased productivity by more than 30% and saved around 130 man days. Pre-fabricating the timber components off-site improves efficacy in assembly. This also keeps on-site pollution to a minimum, resulting in a cleaner and safer worksite.

The zero-energy building features solar technology with about 3,200 square feet of photovoltaic panels extensively covering the 4,300 square-foot SSA which comprises classrooms, a veranda, an office, and an exhibition gallery. It also features a real-time tracker of energy generation and consumption. The made-

in Singapore solar panels are expected to generate an annual energy yield of over 60,000 kilowatt hours (kWh). This is more than the SSA’s estimated annual energy consumption of about 50,000 kWh. There will also be an automation control and energy monitoring system that adapts lighting and air-conditioning to situations, providing maximum energy savings while maintaining full comfort.

### Towards Zero-Waste: Upcycling SSA’s Residual Building Materials

At the official opening of SSA, DPM Teo also met the winners of the 6th CDL Singapore Sculpture Awards, introduced by CDL since 2002 to nurture artistic talent amongst youths and local artists, foster greater appreciation for this art form and enrich Singapore’s cultural landscape through the commissioning of winning works for public display.

Centred on the theme of ‘Towards Zero-Waste!’, the submissions, which drew inspiration from the concept of a circular economy and Singapore’s vision of becoming a zero-waste nation by 2030, utilised the SSA’s residual building materials, including CLT, Glulam and timber decking. Through this theme, CDL hopes to shift mindsets and change behavior from a linear ‘take-make-dispose’ model to a more circular one, in which resources are circulated back into the economy and used for a prolonged period.

Selected from more than 300 entries, the winning work of the open category is the creation by MsToh Ah Lan, a full-time artist. The winner of the student category is Ms Joanne Lim Sok Hua, a Secondary 4 student from the Singapore Chinese Girls’ School. The winning sculpture from the open category will be displayed outside the SSA to remind and inspire all to conserve resources for a sustainable future.



DPM Teo, Minister Masagos, Mr Kwek (ninth from right) and Mr Khew (ninth from left), together with the key representatives from the six supporting government agencies and 15 founding industry partners.

# Solutions for a Circular Economy in Singapore

Ricoh Asia Pacific's (Ricoh) 11th edition of the annual Eco Action Day campaign featured an inaugural industry roundtable discussion, which casted a spotlight on ideas to shift Singapore towards more responsible patterns of production and consumption, and achieve a circular economy. The event was co-hosted by Ricoh and Eco-Business.

Guest-of-Honour Dr Amy Khor, Senior Minister of State, Ministry of the Environment and Water Resources & Ministry of Health, and senior business, government and academic leaders discussed ways on how Singapore can be more sustainable and resource efficient by applying circular economy principles.

Mr Kazuhisa Goto, Managing Director, Ricoh Asia Pacific, said: "To tap on the potential of the circular economy, businesses need to acknowledge that traditional methods must give way to newer and more dynamic operations and models. This will involve increased collaboration vertically and horizontally across industries. This roundtable discussion is a great starting point for businesses seeking to embark on the green journey."

"For Ricoh, we constantly strive to achieve environmental conservation and profits simultaneously by developing eco-friendly technologies and fine-tuning our manufacturing and procurement processes.

It is a journey that does not have immediate outcomes but will be worthwhile in the long run. We hope more companies can join us in this journey for the greater good of the environment. All these will complement the government's sustainability plans as per the Budget 2017, Paris Agreement and Sustainable Singapore Blueprint," he added.

**The following points were raised during the roundtable discussion:**

Business opportunities in a circular economy

- Business leaders need to change mindset

and relook their business models to design circularity into their production cycle right from the start.

- Businesses cannot work alone, they need to work with all stakeholders to find new, regenerative ways of manufacturing goods.
- Resources are recovered but many are not designed to be recyclable. There are business opportunities that can stimulate new innovations, especially in the area of redesign.
- Employee buy-in and education are necessary for companies to transition into circular business strategies. Legislating for a circular economy
- Judicious legislation is needed. Otherwise, it will impede development and growth.
- Legislation can help in setting and facilitating the right conditions and environment to motivate and nudge development for a circular economy and its practices among businesses and individuals.
- Mandatory waste reporting will be introduced in the coming years in Singapore, along with guidelines for sustainable packaging – a move that will help to raise standards in the industry and encourage circular practices.
- The government can also play a role in introducing circular economy concepts to education curriculum from an early age.

## Obstacles to the circular economy

- The circular economy concept needs to be simplified so people can understand and adopt it as a practice.
- Awareness and knowledge are key for the transition to a circular economy model.
- Consumer behaviour needs to change; and 'nudges' can be used such that consumers are motivated to return and/or recycle products.
- Businesses need to be engaged to help them realise the competitive advantage of adopting

circular economy principles.

### **New technologies for a circular economy**

- New technologies and innovation will result in more robust and durable products.
- Technological innovations will enable the economic case for adapting all waste streams into useful resources.
- All stakeholders need to embrace both innovation and systems-level thinking to design and implement circular economy practices.

According to the United Nations, the demand for products and services will spike as the world population continues to grow to 8.5 billion by 2030, and 9.7 billion in 2050. If the population reaches 9.7 billion, the equivalent of almost three planets could be required to provide the natural resources needed to sustain current lifestyles.

In February this year, Ricoh and Eco-Business launched the inaugural Eco Action Day Circular Economy Challenge. Participants were challenged to create innovative solutions to improve sustainable consumption and production patterns in the city-state.

### **Team MSW (First Prize)**

Team MSW, a group of four young professionals aged between 27 and 29 years old, clinched the overall win with its project on the upcycling of durian husks. Often considered as waste and byproduct by many Singaporeans, the team came up with a circular solution to reduce the use of virgin material.

The team proposed collecting durian husks from the point of sale and having them returned into the supply chain as raw materials to make takeaway containers for the durian fruit, hence reducing the use of non-biodegradable materials such as styrofoam boxes. Team MSW presented their idea to the distinguished guests at the roundtable. They also walked away with a sponsored trip to Japan, which includes a tour to Ricoh's newly built Eco Business Development Centre.

### **Team Hangary for Change (Merit Prize)**

Team Hangary for Change, a group of three youths aged between 18 and 19, clinched the merit prize with its proposal for a fitness company to adopt a leasing model and using cradle-to-cradle design

to increase modularity of fitness equipment. The proposed idea is for the fitness company to start a trial by leasing equipment to customers, aside from the conventional purchase of fitness equipment. The idea of providing Singaporeans with better access to fitness equipment on a tiered basis as a circular solution would reduce bulky waste items tremendously.

### **Project Coop-erative (Special Prize)**

Project Coop-erative, a team of four working adults aged between 25 and 27 years old, finished as special prize winner with their project on the use of egg shells to enhance flexibility of bioplastics.

They suggested the use of egg shells, something that is discarded without much thought, to enhance flexibility of bioplastic products due to its characteristics in its nano-particle form. Waste matter such as egg shells can be repurposed to generate additional income for businesses.

Eco Action Day is an annual nationwide campaign which encourages awareness and action for the environment. It is held in conjunction with World Environment Day, which is celebrated on 5 June every year. It is Singapore's largest and longest led environmental initiative.

Eco Action Day has come a long way since its inception. To date, 1,207 organisations, schools, buildings and individuals have pledged positive actions for the environment in Singapore.

The success of Eco Action Day in Singapore has led to the creation of a regional platform in Asia Pacific this year, where nine other sales companies have been roped in for Ricoh Global Eco Action. They are Australia, Hong Kong, India, Malaysia, New Zealand, Philippines, Taiwan, Thailand, and Vietnam.

In Singapore, Eco Action Day has gained the support of several public and private sector organisations for over a decade. This year's partners include the Ministry of the Environment and Water Resources, National Environment Agency, Singapore Environment Council, Energy Market Authority, Building and Construction Authority, Keppel Land, Keppel REIT, Global Compact Network Singapore, SMRT, EcoBusiness, among others.