

The cover image is a composite of two photographs. The top portion shows a modern, elevated concrete structure, possibly a walkway or ramp, with a glass railing and a metal fence. The bottom portion shows a lush green landscape with several young trees supported by wooden stakes, situated in front of a building with a green roof.

# GreenPulse

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**Ecosystem for  
Vibrant &  
Sustainable  
Civil Structure**

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Soil Chain™ is an ecological engineering system, which designed for constructing vibrant and sustainable civil structure.

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# Ecosystem for Vibrant & Sustainable Civil Structure

**Ecological Engineering System**

**Design + Innovation**

**Non-Biodegradable & Recyclable Material**



Soil Chain™ is an ecological engineering system, which designed for constructing vibrant and sustainable civil structure. The ecosystem is capable of constructing various kinds of permanent structures, earth embankment and areas where land and water meets, without using any conventional hard material, or substance that could create chemical reactions.

It is designed to produce substantial reduction of air, noise and heat pollution, while eliminating usage of water and energy during construction. Both the ideology and methodology are meticulously designed to improve the environment; maintain bio-diversity and protect wildlife habitats; reduce carbon footprint; and prevent wastage of natural resources.

The Soil Chain™ system is probably the first and only innovation consisting of four directional ecological engineering. Innovation adopts principles from global practices of Mechanical Stabilize Earth (MSE), with a







combination of geo-technical, bio and environmental engineering. The revolutionary Soil Chain™ system can evolve from a soft scape building material into a hard scape standard eco-system.

It is a truly an environmental friendly engineering method for constructing permanent civil structures with strength, and yet being able to return the structure eventually back to earth.



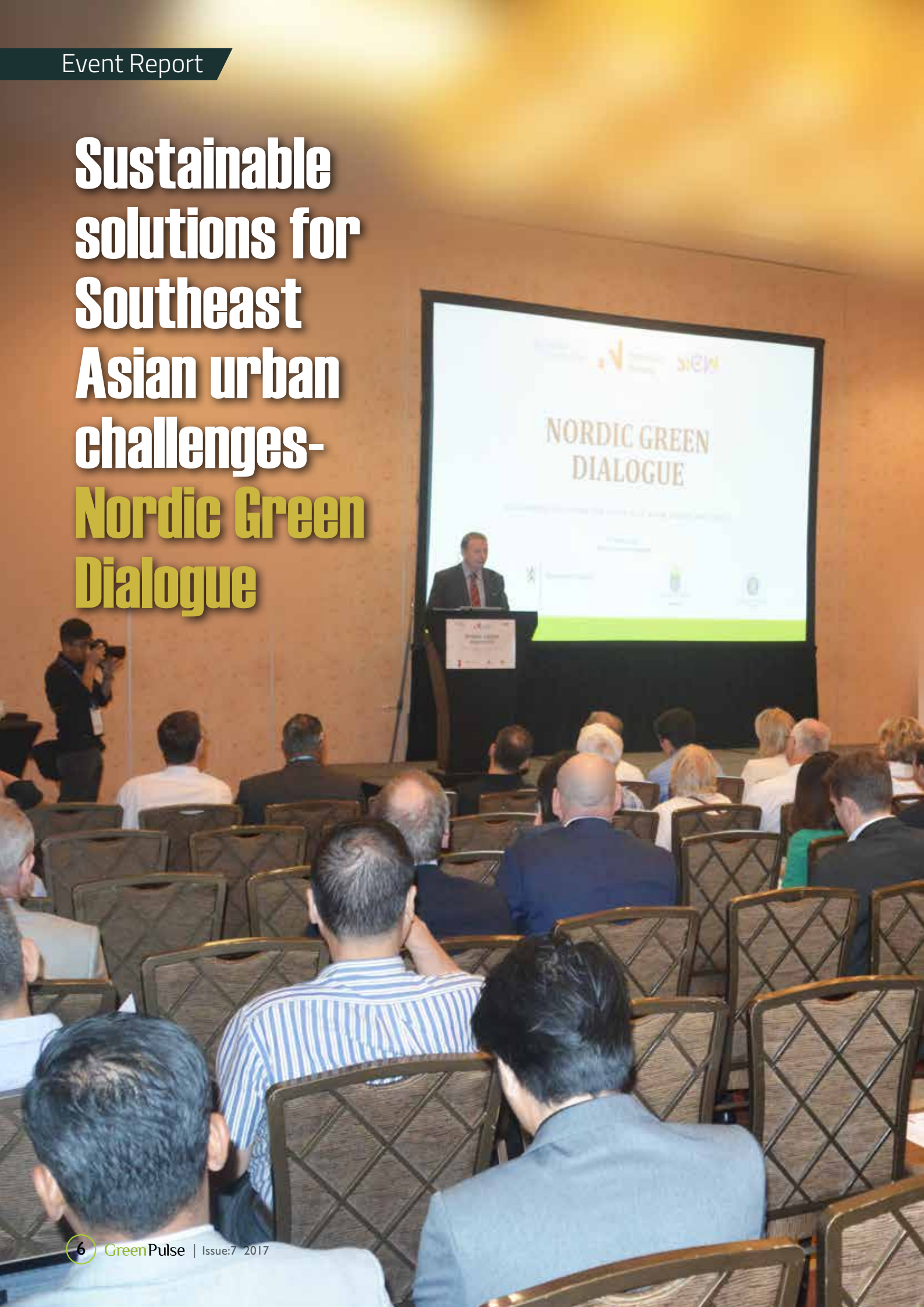
#### Project location - Pasir Ris

- **Area A** : Structure height 6.9m by 60m length with slope angle of 70 degree profile.
- **Area B** : Structure height 7.5m by 70m length with vertical angle of 90 degree and various profiles.
- **Area C** : Structure height of 2.8m by 100m length with vertical 90 degree angle.
- **Total structure area** : 1120sqm
- **Structure height**: Varies from 1.5m till 7.5m
- **Year of construction** : 2016





# Sustainable solutions for Southeast Asian urban challenges- Nordic Green Dialogue





The Nordic Green Dialogue aimed to contribute to solve urban challenges in Southeast Asia through an exchange of ideas and concepts, technologies and policies by companies, research communities and government. Held during the Singapore International Energy Week 2017, the event was organised by the embassies of Norway, Sweden, Finland and Denmark in Singapore and was endorsed and supported by Energy Market Authority, Sustainable Energy Association of Singapore, and Nanyang Technological University. The event was around Nordic and Singaporean/Asian stakeholders in the urban sustainability area attended the event, making it a meaningful and successful activity for building networks and exchanging ideas and concepts.

The Nordic region has developed and deployed smart and green city solutions and policies for decades. Experienced in cross-border grid collaboration, the Nordic countries also work together to improve energy security and provide excellent electricity market design and regulatory frameworks.

The Nordic region constitutes the world's 12th largest and the EU's 5th largest economy – an economy that has experienced a prolonged and dramatic decoupling of emissions and economic growth. However Nordic cooperation was not always a given thing. Nonetheless, the collaboration between countries has proven to be so successful, a crucial learning point for Southeast Asia.

The interconnected clean energy supply system between Norway, Sweden and Denmark allows for the export and import of excess energy from each other. Clean energy plays a substantial part of the energy mix already, but because natural resources fluctuate, there is heavy reliance on neighbours.

Southeast Asia is one of the fastest growing regions of the world, and cities across the region are in need of smart and sustainable solutions within areas such as energy efficiency, water, clean energy, transportation, waste management, and governance. The reliance on neighbours can greatly reduce the socio-economic inequalities within the region.







"I hope that the Nordic experience in clean energy collaboration can inspire the Southeast Asian region. There could be much to gain by applying a regional approach to achieving sustainable energy security in Southeast Asia."- The Danish Ambassador, H.E Dorte Bech Vizard.

Outward-looking policies, alliances and partnerships are crucial to reaching climate friendly goals and aspirations for a better planet. Earth is a shared resource and it will take a collective effort to protect it.

In Southeast Asia, Singapore leads the way with very forward-looking policies. Singapore was among the first 55 Parties to ratify the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC). Singapore has pledged to reduce its emissions intensity by 36% from 2005 levels by 2030, and to stabilise emissions with the aim of peaking around





2030. A host of strategies have also been deployed primarily centered on improving energy efficiency to reach this target, including soon a carbon tax.

In all, the Dialogue was a great highlight into the benefits of regional collaboration to address challenges and mitigate some of the pressing issues countries face with system level solutions – technical, financial and social.







## Keeping our Stomachs Full in a Warming World

*By Professor Jeff Obbard, PhD*

**F**ood production is fundamentally linked to predictable seasonal weather patterns, which in turn, are the expression of stable climatic systems around the world. These systems are now shifting - thanks to the unrelenting emission of greenhouse gases and the gradual warming of our atmosphere. Fossil fuel combustion coupled to major disturbances of the world's natural carbon sinks (forests, wetland and peatlands) is now threatening global food security - just when there are more mouths to feed on the planet than ever before.

In its latest report the Intergovernmental Panel on Climate Change (IPCC) concluded that global warming is now "unequivocal" and that the role of humanity is "clear". One of the key goals of the United Nations Framework Convention on Climate Change (UNFCCC) way back in 1992 was "to ensure that food production is not threatened", and to achieve "a time-frame sufficient to allow ecosystems to adapt naturally to climate change". In hindsight, this has proven wishful thinking as the global agricultural system is increasingly exposed to warmer temperatures, rising sea levels, shifting rainfall patterns, desertification and wildfires.

According to the IPCC, global food production accounts for about 10% of global carbon emissions. As I write, the United Nations World Meteorological Or-

ganization (WMO) has reported that global atmospheric carbon dioxide levels for 2016 reached 403.3 ppm, now 45% higher than pre-industrial levels and rising at an accelerating rate. Based on best IPCC projections, wheat, rice and maize production in tropical and temperate regions will be negatively impacted by global warming at local temperature increases of 2°C or more. Impacts will vary between crops and regions, but a 'business as usual' predicted global temperature increase of 4°C, combined with increasing food demand, will pose major risks to regional food security.

Sustained crop production depends on predictable temperatures and rainfall patterns throughout the growing season - both of which are now distorted by global warming. A warmer climate increases the risk of drought and crop failure via heat stress and soil moisture loss. Paradoxically, a more energetic atmosphere means that rainfalls more intensely, increasing the risk of floods and soil erosion. A warmer atmosphere also encourages the proliferation of insect pests that quickly threaten vulnerable crops. Warmer oceans increase the risk of violent storms, hurricanes and cyclones that can devastate crops, either directly from wind damage or indirectly via storm surges, inundation and the flooding of coastal farmlands. The loss of fertile agricultural soil is also exacerbated by poor farming practices and the over-intensification of agriculture.

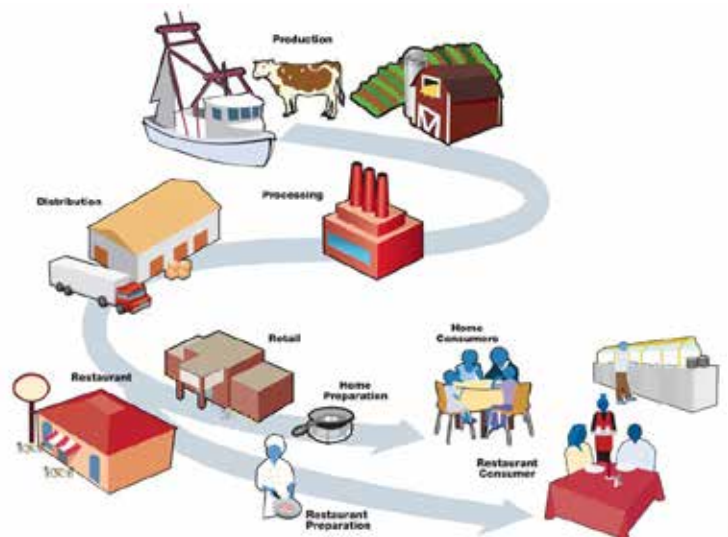


However, a warming planet is not all bad news for global food production. Plants tend to grow faster at slightly warmer temperatures, meaning that land which is now 'off-limits' to farming in colder northern regions and higher altitudes becomes available for growing crops. However, this benefit is predicted to be short-lived as the world inexorably warms and temperatures exceed the tolerance threshold of staple food crops such as wheat, maize and rice. Plants, just like us, are sensitive to rising temperatures. There is a delicate balance between vegetation's ability to soak up carbon dioxide from the air, and releasing it back again. If things get too warm, a crop, a forest or even a wetland switches from being a sink of carbon dioxide to becoming a source. Land clearing of carbon-rich forests and peatlands in Southeast Asia for agriculture can also lead to massive amounts of carbon being emitted to the atmosphere, further exacerbating global warming.

The need to strike the right ecological balance in our food production system is something that modern agriculture recognizes, and is now striving for. Increasing harvests whilst conserving precious resources requires modern science and technology, as well as conventional agrarian wisdom. For example, it is now possible to genetically engineer crops such as maize, wheat and rice to be more tolerant to heat stress and drought. This, combined with farming practices that reduce soil erosion and boost fertility, means food production can be sustained moving forward – at least for a while.

Cutting carbon emissions from the global food supply chain stretches well beyond the farm. Harvesting, storage and transportation of food generates massive emissions of carbon, as does food wastage and disposal. The luxury of having strawberries on the supermarket shelf out of season comes with a big carbon footprint when it means flying them halfway around the world. Fortunately, there is a spectrum of possibilities for reducing the carbon footprint of what we eat - from encouraging the local production (and consumption) of food, to reducing food wastage by simply consuming less, or using waste food to generate energy and soil compost.

Growing wealth and rise of the middle classes in rapidly growing economies such as China and Brazil has become synonymous with growing levels of red meat consumption, a much more energy and resource-intensive type of food compared to cereal crops. Science is coming to the rescue here too - think of farting cows



and their emissions of the potent greenhouse gas methane! Engineered dietary supplements can significantly reduce methane emissions from livestock, so making the food chain a little more sustainable and climate friendly. Although dietary preferences are deeply linked to religion, culture and personal values, simply by moderating our consumption of meat we can significantly reduce our carbon footprint, and also boost our health and well-being.

Already, the threat of climate change to our food security is clear, at only a 1°C increase in average global surface temperatures. As global warming approaches (and likely exceeds) 2°C, then the risk of crossing thresholds and non-linear tipping points in the Earth's climate system increases. A new study published by the Lancet medical journal notes that reliable access to sufficient, affordable, and nutritious food can be negatively affected by climate change in many ways. This ranges from the direct impact of drought, flood, and heat on harvest yields, through to the health and social impacts of climate change, resulting in unhealthy populations unable to farm or work enough to earn money to purchase food. Furthermore, food trade could be disrupted as a result of damage to infrastructure caused by climate shocks.

The IPCC has specifically identified food security as one of the key climate challenges facing Southeast Asia. As population and living standards continue to grow in our part of the world, the nexus between water, food, and energy security becomes ever more critical. It is Asia's traditional knowledge of sustainable land cultivation, combined with modern scientific innovation and a more sustainable pattern of food consumption that offer our best hope to safeguard food security and human well-being into the 21st century.





## Committing to Create Green and Healthy Streets

The mayors of London, Paris, Los Angeles, Copenhagen, Barcelona, Quito, Vancouver, Mexico City, Milan, Seattle, Auckland & Cape Town committed to a series of ambitious targets to make their cities greener, healthier and more prosperous. By signing the C40 Fossil-Fuel-Free Streets Declaration, the pioneering city leaders pledged to procure only zero-emission buses from 2025 and ensure that a major area of their city is zero emission by 2030. The policies are designed to fight air pollution, improve the quality of life for all citizens, and help tackle the global threat of climate change.



Signatories to the Declaration “envision a future where walking, cycling, and shared transport are how the majority of citizens move around our cities.”

### The cities therefore commit to:

- Increase rates of walking, cycling and the use of public and shared transport
- Reduce the number of polluting vehicles on city streets
- Lead by example by procuring zero emission vehicles for city fleets
- Collaborate with suppliers, fleet operators and businesses to accelerate the shift to zero emissions vehicles and reduce vehicle miles in cities

Cities will report back every two years on the progress they are making towards the goals of the C40 Declaration.

“Air pollution caused by petrol and diesel vehicles is killing millions of people in cities around the world. The same emissions are also causing climate change,” said Anne Hidalgo, Mayor of Paris and C40 Chair. “In Paris we are taking bold action to prioritise the streets for pedestrians and cyclists. Working with citizens, businesses and mayors of these great cities we will create green and healthy streets for future generations to enjoy.”





emission public transport right at the heart of Londoners' day-to-day lives alongside energy efficient buildings, clean energy and increased recycling."

"The largest sources of air pollution are also the largest sources of carbon emissions - and in many cities, transportation is the biggest culprit," said UN Special Envoy for Cities and Climate Change and C40 Board President, Michael R. Bloomberg. "C40 Mayors understand thriving cities require clean air. By switching to cleaner vehicles, we can fight climate change and save many lives."

"I am absolutely committed to tackling the deadly effects of toxic air on Londoners and making London a zero carbon city," said Sadiq Khan, Mayor of London. "That's why I am incredibly proud that today in London we have introduced the pioneering T-Charge, the toughest emission standard of any city in the world, which will help drive down the number of dirty vehicles polluting our roads and our lungs. We are leading the fight to clean up our filthy air and protect our citizens from the devastating consequences of climate change. "This is just the first step - we are introducing further world-leading restrictions on polluting vehicles over the next few years, as well as cleaning up our bus fleet and keeping our pledge not to buy a single new double decker diesel bus. We are also building brand new cycle lanes right across the city and focusing on reducing pollution around schools. I want to make London one of the greenest cities in the world - that's why I'm putting walking, cycling and zero



"In Copenhagen we believe that citizens have a right to clean air. We therefore have the ambitious goal of becoming the world's first CO2 neutral capital by 2025 and continuously try to improve air quality," said Frank Jensen, Lord Mayor of Copenhagen. "This is achieved through a green transition of our transportation, energy production and energy consumption. With this commitment we hope to inspire other cities to act."

"Cities have to be the real protagonists in the fight against climate change, and to tackle this challenge it's imperative to have greater powers and a bigger budget," said Ada Colau, Mayor of Barcelona. "Barcelona is working to gain 165 hectares of green space in the next few years, to triple the number of kilometres covered by bike lanes, to boost public transport, to cut journeys in private vehicles by 21%, and to implement the superblock plan and create more space for pedestrians. In Paris, we once again express our commitment to the climate, set out with over 800 city entities, to cut emissions by 40% and increase urban greenery by 1m2 per inhabitant"

"Tacking climate change requires bold mobility policies in cities. The transport sector accounts 60% of CO2 emissions in Mexico City, and private vehicles represent 80% of the total fleet", said Miguel Ángel Mancera, Mayor of Mexico City. "In Mexico City we are taking concrete actions to foster sustainable mobility with BRT corridors, cyclist infrastructure and friendly streets for pedestrians".

"Responding to climate change's threat requires big thinking and bold action," said Tim Burgess, Mayor of Seattle. "By reaffirming our commitment to a zero-emission transportation system, Seattle is proud to join our friends around the world in demonstrating the power of cities to lead on climate."

"We need structural measures to fight air pollution



and its impact on the health of citizens – said Mayor of Milan Giuseppe Sala. More than ever before, as mayors of the world cities most committed to tackle environmental challenges, we must set ambitious targets. Milan invests in a better mobility, in particular by strengthening public transportation and by expanding car, bike and motorbike sharing opportunities. We want cities without polluting vehicles and with much cleaner air. We owe this to our citizens”.

“This is the time for cities to take bold action towards fossil fuel free future,” said Mauricio Rodas, Mayor of Quito. “Quito is ready to lead the way and committed to provide a better more resilient, low carbon and sustainable local development for all our citizens.”

“In Auckland, our largest single contributor to greenhouse gas emissions is from transport – around 40%, so signing this declaration signals how serious we are about tackling climate change,” said Phil Goff, Mayor of Auckland. “With more than one-third of New

Zealand’s population and the majority of its growth, Auckland has a key leadership role to play and we are committed to transforming the way our people move and delivering a clean, green city for all.”



## Upcoming GREEN Events:

### The World Future Energy Summit

15-18 January 2018

ADNEC, Abu Dhabi,

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

### World Green Infrastructure Congress '18

26-28 February 2018

Bangalore, India

- [www.iginasia.org/wgic.php](http://www.iginasia.org/wgic.php)

### The 2018 National Sustainability in Business Conference.

8 - 9 March 2018

Grand Chancellor, Brisbane

- <https://conference.sustainability.asn.au>

### Solar Power Asia

19-22 March 2018

Singapore

- [www.solar-powerconference.com](http://www.solar-powerconference.com)

### Windpower Asia

19-22 March 2018

Singapore

- [www.wind-powerconference.com](http://www.wind-powerconference.com)

### Middle East Smart Landscape Summit '18

7 - 8 May 2018

Sofitel Dubai The Palm Resort & Spa, Dubai, United Arab Emirates

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

### World Cities Summit

8-12 July 2018

Marina Bay Sands, Singapore

- [www.worldcityessummit.com.sg](http://www.worldcityessummit.com.sg)

### Bex Asia 2018

5-7 September 2018

Marina Bay Sands, Singapore

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

### Singapore International Energy Week

29 October - 2 November 2018

Marina Bay Sands, Singapore

- [www.siew.sg/#](http://www.siew.sg/#)

### Intersolar India 2017

5-7 December 2017

Mumbai, India

- [www.intersolar.in](http://www.intersolar.in)



Singapore Institute  
of Building Limited

## RICS-SIBL MEMBERS' NIGHT

Date: **Friday, 19 January 2018,**

Time: 7 pm to 10 pm

Venue: Union Square @ Havelock II, 2 Havelock Road,  
#02-04/05/06/07, Singapore 059763

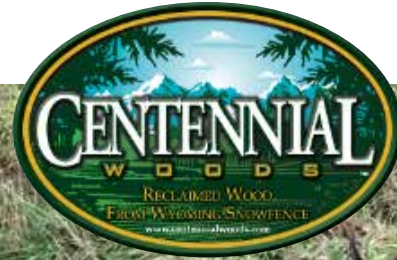
Singapore Institute of Building Limited (SIBL) brings together the communities of SIBL and Royal Institute of Chartered Surveyors (RICS), to promote greater interaction, and foster strategic alliances and partnerships.

*For more details, please contact:*

*SIBL's Secretariat, Ms Josephine Kwan*

at [josephine@sibl.com.sg](mailto:josephine@sibl.com.sg) or call us at 62232612





# CARBON NEGATIVE RECLAIMED WOOD

Centennial Woods™ is one of the largest providers of reclaimed wood in the world through maintaining and reclaiming the aged wood off of the hundreds of miles of snow fences lining the Wyoming highways. Snow fences endure the harsh elements to make travel safer during Wyoming's brutally long winters. Wyoming's intense weather conditions are ideal for producing stunning and sustainable weathered wood.

Before Centennial Woods™ began harvesting Wyoming snow fences, the older boards from the fences were either burned or thrown in a landfill when replaced. What makes the recycled boards carbon negative is the skipping of the kiln drying process. Kiln drying is an important and energy intensive part of reclaiming wood. Wood has a certain amount of moisture content just by existing in the environment. So a 100 year old piece of wood will still have moisture albeit much less than that of a freshly cut piece of wood. The kiln drying process removes this remaining moisture whilst eradicating any insects living in the wood. The Wyoming climate is so intense that it naturally dries the wood and it does not have to go through this process, making reclaimed wood a carbon negative product.

Highly sought after by green builders, Centennial

Woods' products are free of chemicals, incorporate vibrant, natural colouring and are naturally weather resistant. They can be used in their natural weathered grey state or surfaced to reveal fresh cut wood in combination with the beautiful patina. The company has become the premier provider of reclaimed wood to green builders all over the world.

By developing an international market for this sustainable and carbon negative resource, Centennial Woods™ has repurposed more than 18 million feet of reclaimed wood (as of 2016), avoiding more than 18,000 tons of CO<sup>2</sup> emissions as of 2017. Centennial Woods' reclaimed wood is made of sustainably harvested Ponderosa Pine, Lodge Pole Pine, Douglas fir, and Spruce from the Rocky Mountain region. The wood is certified by Bureau Veritas on behalf of FSC® as FSC® 100% Recycled. The product also qualifies for MR (Materials and Resources) in the MR3, MR4, and MR5 under LEED credits.

The reclaimed Wyoming fence wood can be found in projects in Laramie, Seattle, New York, Dubai, and Singapore. The Singapore Green Building Council (SGBC) did a carbon impact study of the product and found that even accounting for shipping across the Pacific Ocean, this weathered wood is still carbon negative.

# ebmpapst's S-Force Compact Fans

ebm-papst is the globally leading supplier of motors and fans. By providing optimum application and system solutions to manufacturers of Air Conditioning, Refrigeration, Ventilation, Heating, Household and Electronic Cooling Equipment, ebm-papst has developed into a global market leader within its specific market segment and has now been maintaining its outstanding position for many years.

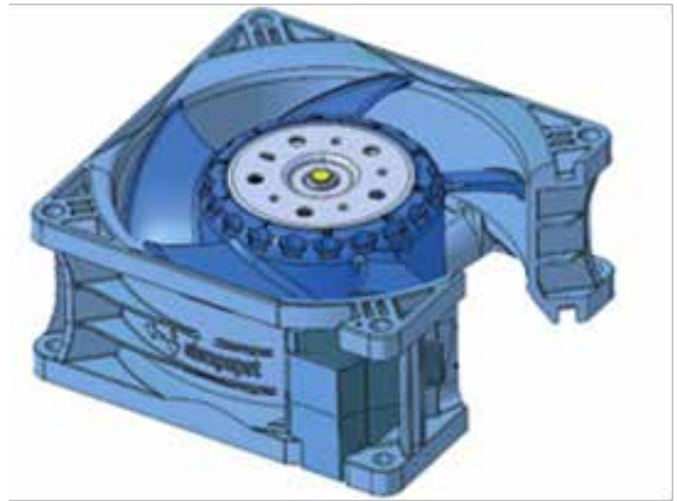
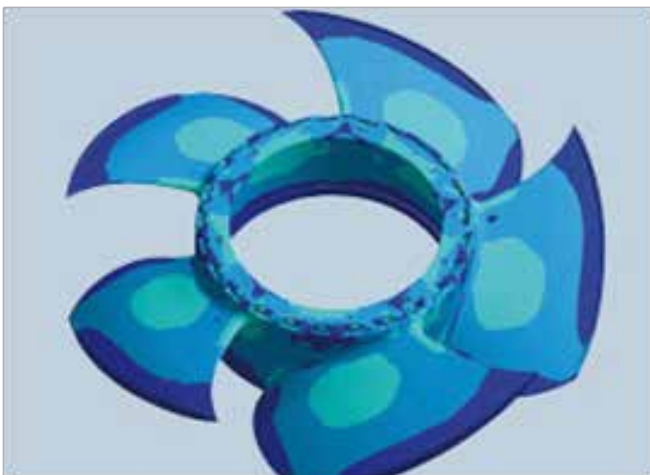
Starting at the concept phase, materials and processes are designed to achieve maximum environmental compatibility, energy balance and recyclability. Development is focused on improving motor technology, electronics and fluid mechanics, whilst working on reducing energy consumption.

The S-Force high-performance fans, for example, which overshadow its competitors in terms of power, air performance and efficiency due to the perfect interaction of motor technology, fluid mechanics and intelligent electronics.

The S-Force series is composed of five smaller series with sizes from 80 to 220 mm. Each is the world champion in its class in terms of air performance and pressure build-up - with first-class motor efficiency and a long service life. Wherever you need cooling performance fast that is equally quick and powerful, they are a solution for which there is virtually no alternative.

## Compact and uncompromising

The S-Force series reaches nominal speeds up to 14,000 rpm and operating values that had



previously been attained only by larger fans. Harnessing this much power in the smallest space requires outstanding strength values. To equip the housing, stator, bearing system and rotor for high performance, a one-of-a-kind housing design was developed, with mechanical precision down to the smallest detail.

Even before the first prototype was designed, state-of-the-art computer simulation programs ensured precise calculation of the critical parameters. In doing so, all individual mechanical parts of the S-Force series, the material strengths and the fixed-link connection between the motor and housing were redeveloped from the ground up and adapted to the more stringent conditions.

## Maximum aerodynamic efficiency

The wide range of aerodynamic details boasted by each fan is a highlight of their pioneering engineering. Special impellers, developed just for the S-Force series, have a revolutionary impeller design that provides unmatched pressure build-up in the saddle. The especially steep curves of this generation of fans have values that push the limits of the possible.

The optimized inside contours of the housing, the small gap clearance between the blade and venturi housing, and the use of winglets on the fan blades also ensure exemplary running smoothness. The aerodynamically optimum design, coupled with maximum mechanical precision, enables the S-Force fans to have constant low noise.