

Singapore Green Plan **2030**



Sustainability Opportunities for Companies in Singapore



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Singaporean-German Chamber
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DISCOVERY

Message

by Mr Desmond Tan Minister of State for Sustainability and the Environment

Since independence, Singapore has embraced sustainability as a fundamental principle of our development. This will be even more pertinent in an increasingly carbon- and resource-constrained world. Despite our land and resource limitations, we have pursued innovative policy and technological solutions to achieve sustainable development. For example, Singapore has successfully closed our water loop through the recycling of used water using advanced membrane technologies to produce NEWater, an ultra-clean, high-grade reclaimed water.

Earlier this year, the Government launched the Singapore Green Plan 2030 as a whole-of-nation sustainability roadmap. Led by five ministries working in concert, the Green Plan sets out concrete sectoral plans and ambitious targets over the next 10 years which will transform how we live, play, work, commute, and more. This will strengthen our efforts to implement the United Nations' 2030 Agenda for Sustainable Development and the Paris Agreement, and positions us to achieve net-zero emissions as soon as viable.

The Green Plan has five pillars: (1) City in Nature, where we will create a green, liveable, and sustainable home for Singaporeans, and build up our carbon sinks by extending nature throughout our island; (2) Energy Reset, where we will use cleaner energy and increase our energy efficiency to lower our carbon footprint; (3) Sustainable Living, where we will make keeping our environment clean and saving resources and energy a way of life in Singapore; (4) Green Economy, where we seek green growth to create new jobs, transform our industries and harness sustainability as a competitive advantage; and (5) Resilient Future, where we build up Singapore's climate resilience and enhance our food security.

The implementation of the Green Plan will require partnerships across all sectors and in particular, international collaboration, as no one country or company has all the solutions. In this regard, I am pleased that the Singaporean-German Chamber of Industry and Commerce (SGC) has released this insightful publication on the Green Plan and sustainability opportunities in Singapore for German companies. Singapore and Germany have long enjoyed extensive cooperation in trade and common interests in sustainable development.



For example, German companies have been actively contributing to Singapore's environment and water sectors over the years, and more recently, the Plastics Recycling Association Singapore (PRAS) was established through the SGC's support. As this book shows, there are many more opportunities for companies to provide solutions in these areas and others such as energy efficiency, mobility, and urban agriculture.

German companies are well placed to contribute to sustainable solutions in these sectors through innovative and advanced technology. There is much potential for collaboration to further green the economy in Singapore, which can also serve as a gateway to access sustainable business opportunities in the South-East Asia region.

I congratulate SGC on this publication and hope it will inspire readers to consider the opportunities in sustainability. I look forward to German businesses introducing new and innovative solutions and collaborating with Singaporean firms to realise the objectives of our Green Plan. Let us work together to achieve a sustainable future for all.

A handwritten signature in dark ink, appearing to read 'Desmond Tan'.

Desmond Tan
*Minister of State for Sustainability
and the Environment*

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Many thanks to the Sustainability Committee and the Plastic Recycling Association Singapore (PRAS) who contributed suggestions and content and gave their support for the “Green Plan 2030 – Sustainability Opportunities for Companies in Singapore”.

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Message

by H E Dr Norbert Riedel
Ambassador of the Federal
Republic of Germany to the
Republic of Singapore

Climate change and environmental protection are high on the agenda both in Germany and Singapore. The Singapore Green Plan 2030 underscores the determination of the Singaporean government to tackle these challenges, and similarly Germany has also devoted much attention to these questions over the last decade. Achieving sustainability has become a major global issue which calls for enormous efforts at all levels. Ambitious multilateral action in fora like the upcoming COP 26 is essential, but it needs to be prepared and complemented by bilateral coordination and cooperation. This point is stressed strongly in the Indo-Pacific policy guidelines that my government adopted in September last year.

Obviously, when we talk about transforming the economy from a carbon-based model to a sustainable, low-carbon and circular one, then coordination only between governments cannot be enough. As underlined by the German Minister for the Environment, Ms Svenja Schulze, in her statement at the recent Germany Singapore Business Forum Connect, the private sector must be a major partner in this endeavor, both to achieve the overall goal of keeping climate change within tolerable limits, but also to ensure its own long term viability. Therefore an event like the German-Singaporean Recycling Forum – and a publication like the one you are just holding in your hand – is most timely and relevant to foster exchange and cooperation between German and Singaporean firms for sustainable business practices and solutions.

Having to fight an epidemic at the same time does not make the task of economic transformation easier. However, I think the experience of the past 18 months can also make us optimistic, as we have seen that we can successfully adapt to challenging circumstances, and that we can successfully find solutions to tough problems, as shown by the sensationally quick development of Covid vaccines. Having to rebuild the economy after the lockdown and having to transform the economy to carbon neutrality and circularity offers the chance to build back better.



In the Indo-Pacific policy guidelines research and innovation are explicitly identified as major catalysts for the necessary adaptations. Traditionally German companies are known to be very innovative. Engineering and innovation skills have shaped German businesses' reputation. These skills are also a hallmark of the Singaporean economy. So here we can really combine our strengths to move forward together. The topic of recycling plastic waste illustrates this very well, with the Plastics Recycling Association Singapore, an initiative spearheaded by the Singaporean-German Chamber of Industry and Commerce, as a case in point for what can be achieved through bilateral cooperation. The German Embassy and the German government stand ready, together with our Singaporean counterparts, to support cooperation between companies and research institutions from our two countries that will help us to achieve the green transition.

H E Dr Norbert Riedel
*Ambassador of the Federal Republic of
Germany to the Republic of Singapore*



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Some 52,000 employees create value through innovation daily for the three business areas; human pharmaceuticals, animal health and biopharmaceuticals. This year, our companies in Indonesia, Malaysia, Philippines, Singapore, South Korea, Thailand and Vietnam have been awarded the prestigious recognition of Top Employer for 2021. Across South East Asia and South Korea, we are proud to have a dynamic and agile workforce with more than 2,300 employees and over 20 different nationalities represented.



Message

**by Mr Jens Rübbert,
President, and
Dr Tim Philippi,
Executive Director, Singaporean-German
Chamber of Industry and Commerce (SGC)**

In 2020, the Gruen book outlined the plastic recycling landscape in Singapore and marked our first step in the broader plan towards improving the plastic recycling and waste management process. The publication was also one stepping stone which later led to the launch of the Plastics Recycling Association of Singapore (PRAS).

Not stopping at this initiative, the Singaporean-German Chamber of Industry and Commerce (SGC), has also embarked on several efforts to promote environmental causes in the past year, including hosting business delegations in the areas of Energy Efficiency and participating in the Germany Singapore Business Forum (GSBF) Connect 2021 focussing particularly on the topic of plastic waste.

This publication includes the opportunities available to German businesses who bring cutting-edge technologies in the areas of *Recycling, Energy Efficiency, Water and Wastewater Management, Smart and E-Mobility*. Every chapter highlights the work and efforts of a German company in each sector. Additionally, information on the chamber's official business delegations and trade missions on Energy Efficiency, Innovation, Industry 4.0 and Electronics, have also been included.

It is a known fact that German companies, especially the German 'Mittelstand' companies are highly specialised in their own niche areas with state-of-the-art solutions. Together with Singaporean companies, we are confident their collaborative approaches will successfully engage the whole nation in living more sustainable lives. We would like to thank the SGC Sustainability Committee for being such an active committee. Members of this committee possess the talent and expertise to offer novel solutions to current business challenges and the chamber is honoured to have them as our advocates.

Last but not the least, we would also like to thank the SGC Board for their support and the staff of the chamber for their relentless hard work in pursuit of excellence in every project the chamber brings to the fore.

Jens Rübbert
President, SGC

Dr Tim Philippi
Executive Director, SGC

Contents

01

Message by Mr Desmond Tan
Minister of State for
Sustainability and the
Environment

16

Editorial
Sustainable “Like a Bosch”

30

Recycling

05

Message by H E Dr Norbert Riedel
Ambassador of the Federal
Republic of Germany to the
Republic of Singapore

18

Water and Wastewater

32

Editorial
Transforming the recycling and
waste management industry by
ALBA

07

Message by Mr Jens Rübbert,
President, and
Dr Tim Philippi,
Executive Director, Singaporean-
German Chamber of Industry
and Commerce (SGC)

22

Editorial
Water & Fluid Solutions Focuses
on Water Reuse

34

Other Sectors

09

Singapore Green Plan 2030

24

Smart Mobility / E-Mobility

38

SGC Activities Supporting
Companies in Singapore

12

Energy Efficiency

28

Editorial
Transforming the everyday to
create a better tomorrow

43

Contacts

Singapore Green Plan 2030



In March 2020, Singapore submitted its enhanced Nationally Determined Contribution (NDC) and Long-Term Low-Emissions Development Strategy (LEDS) to the United Nations Framework Convention on Climate Change (UNFCCC), making it among the first 20 countries to do so.

Under its enhanced NDC and LEDS, Singapore targets to peak emissions at 65 million tonnes of carbon dioxide equivalent (MtCO₂e) around 2030 and aspires to halve its emissions from its peak to 33 MtCO₂e by 2050, with a view to achieving net-zero emissions as soon as viable in the second half of the century .

The Singapore Green Plan outlines the nation's ambitious and concrete targets for the next decade.

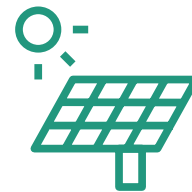
THE GREEN PLAN COMPRISES FIVE PILLARS



CITY IN NATURE



SUSTAINABLE LIVING



ENERGY RESET



GREEN ECONOMY



RESILIENT FUTURE.

It is a whole-of-nation plan, with the Government working closely with businesses, communities, and households to drive action towards sustainable development. Some of the targets include:

- **80%** of new buildings (by Gross Floor Area) to be Super Low Energy buildings from 2030;

- **80%** improvement in energy efficiency compared to the 2005 baseline for best-in-class green buildings by 2030;

- **Green 80%** of buildings by Gross Floor Area by 2030;

- Reduce waste sent to landfill per capita per day by **20%** by 2026, and **30%** by 2030;

- Increase solar energy deployed to **1.5 giga-watt** peak by 2025, and **2 giga-watt** peak by 2030;

- All new car and taxi registrations to be of cleaner-energy models from 2030;
- Develop Singapore as a leading centre for green finance centre in Asia and globally;

- Build capability and capacity to produce **30%** of Singapore's nutritional needs locally by 2030;

- Plant **1 million** more trees across Singapore by 2030

Some of the recent policies and regulations that underline the seriousness of Singapore's sustainability efforts are the nation's carbon tax. It is one of the highest average rates globally, as it covers 80% of total emissions, charging 5 SGD per ton on emissions from companies emitting at least 25,000 tons per year.

Another significant piece of regulation is the Resource Sustainability Act which was passed in 2019 and gave legislative effect to regulatory measures targeting Singapore's three main priority waste streams (e-waste, food waste, packaging waste incl. plastics).



1 Overview SG Green Plan 2030, Courtesy of the Ministry of Sustainability and the Environment (MSE)

Energy Efficiency



Challenges

The demand for energy in Singapore is expected to rise in the coming years due to the increasing prosperity of the population and the high-population density, with 7.810 inhabitants per km², Singapore counts as one of the most densely populated countries in the world.

Furthermore, the Government plans ahead to ensure there is capacity for growth in the future. This will inevitably lead to an increased demand for buildings and hence a rising energy demand.

As Singapore is scarce in natural resources, the most important energy carrier, natural gas, has to be imported via pipelines from Malaysia and Indonesia. In order to reduce the foreign dependence while ensuring to cater to the increasing energy demands, the Government focuses on energy efficiency and renewable energy sources. With this strategy, economic as well as environmental targets shall be fulfilled.

Singapore is member of the Association of Southeast Asian Nations (ASEAN) and hence enjoys access to a regional market with over 600 million inhabitants. As a result of its central and unrivalled geographical position, Singapore offers an excellent platform for business activities into the region and as hub to reach out to the surrounding Southeast Asian markets. The energy demand of the Asia Pacific Region is projected to increase by 2.1% annually until 2035 according to the Asian Development Bank (ADB), in comparison the demand in the rest of the world is set to increase by 1.5% annually.¹ The energy efficiency sector in Southeast Asia accounts for a market volume of ca. 40 billion USD (est. 54 billion SGD).² From 2019 till 2040, energy efficiency in the

region is projected to increase by 60% while renewable energies is projected to increase by 70%.³ In general, governments around the Asia-Pacific region are conscious of the importance and necessity of measures in the area of efficiency. The implemented measures in the region vary and relatively between countries, it we can see how a reduction of energy subventions result in a higher energy price, hence driving up the demand for energy efficient solutions. Energy efficiency presents growth opportunities for Singapore and Asia-Pacific.⁴

Targets

In 2016, Singapore ratified the Paris Agreement, a legally binding international treaty on climate change, which was adopted at the 21st UN-Climate Change Conference (COP-21) in Paris in 2015. To reach this aim, energy efficiency was identified as one of the key factors.⁵

Singapore aims to secure future energy supplies and to strengthen the competitiveness of energy-reliant companies. The energy sector can create more jobs and foster new technologies. Furthermore, the air quality and quality of life shall be raised through lowering the CO₂-emissions.

The efficiency in the energy production was improved by the opening of the market to competition. In addition, Singapore switched from less efficient and CO₂-intensive oil combustion plants to more efficient and cleaner gas combustion systems which are generating less CO₂.

In order to reach its ambitious energy efficiency targets, the Singapore government introduced energy efficiency programs, new initiatives and legislative measures, such as the Green Mark Scheme and standards that promote energy efficiency.

The targets were further concretized and strengthened through the Green Plan 2030. The magnified use of electric vehicles while vehicles with Internal Combustion Engines (ICE) will be discontinued, will further hike the energy demand. Moreover, targets for greener infrastructure and buildings further emphasize the importance the government places on energy efficiency solutions.

1. Asian Development Bank. (2015). Using Clean Energy to Power Asia.

2. Marusiak J. (2011). Tapping into Southeast Asia's energy efficiency market.

3. International Energy Agency (2020). Southeast Asia Energy Outlook 2019.

4. Hickson K. (2013). Dynamics of the Industrial Energy Efficiency Market: A Strategic Perspective.

5. Singapore Climate Change Secretariat, Singapore and International Efforts.

Opportunities for German Companies

The SGC publishes an annual market analysis on energy efficiency (biannual for buildings, biannual for the industry). Based on this research, there are several high-potential opportunity fields for German companies.

In Buildings: opportunities for German energy efficiency solutions

The super low energy building technology roadmap identified the following areas for bringing down the energy consumption in buildings:

PASSIVE STRATEGIES	ACTIVE STRATEGIES
• Sunlight Shading & Daylighting • Natural Ventilation • Dynamic Facade	• Air Conditioning • Mechanical Ventilation • Lighting Technologies
SMART ENERGY MANAGEMENT	RENEWABLE ENERGY
• Building Automation • Smart Building • Plug Load Management	• Site Optimization • Solar PV • Buildings-to-Grid Integration

Some examples to achieve the new standards for super low energy and zero energy:

- LED-lights
- Light dimming systems
- Cooling outdoor paint
- Energy efficiency ceiling ventilators
- Natural ventilation (also for side rooms, such as corridors, toilets, staircases)
- Hybrid-ventilation systems in offices
- Renewable energy through photovoltaic
- High-performance lifts
- Sheltered sidewalks, connection pathways, parking areas and self-supporting roof extensions

In Industries: opportunities for German energy efficiency solutions

Focus industries for energy efficient solutions are listed in the following:

- The **electronic industry** is the biggest manufacturing industry sector in Singapore. In 2020, the electronics companies contributed about 39% to the overall manufacturing sector (which accounts for 21.5% of the country's GDP).⁶ The semiconductor industry has one of the highest energy intensities, with most energy being used for cooling appliances and other machines of the production process.

Moreover, the city-state invests in high-quality and innovative products, as well as research and development. Bioelectronics, 'green' electronics, synthetic and safety products are growth areas. The semiconductor industry shows a particular high growth rate. Another dynamic field is data storage.

6. Ministry of Trade and Industry, Economic Survey of Singapore 2020, https://www.mti.gov.sg/-/media/MTI/Resources/Economic-Survey-of-Singapore/2020/Economic-Survey-of-Singapore-2020/FullReport_AES2020.pdf.

- Singapore is also known as home to Southeast Asia's leading **chemical cluster**, it accounted for 14% of the country's manufacturing sector in 2020. The main products are petroleum products, petrochemicals, as well as specialty chemicals.⁷ In 2019, the small nation ranked as the 8th largest exporter of chemicals and is among the top 10 global chemicals and energy industries.⁸

The industry consumes the most energy in Singapore's manufacturing landscape. The largest buyers are from the petrochemical industry which uses high levels of energy for heating and vaporization. Focus areas for energy efficient solutions are heating and cooling processes, propulsion systems, lighting and other production systems.

- Singapore declared the **pharmaceutical and biotechnology industry** a key sector to the country's economy. The areas heating, air ventilation and air conditioning make up 65% of the industry's total energy consumption, another 25% are attributed to plug loads and lighting consumes another 10%. Hence, these are the three key areas for energy efficiency solutions.
- Other potential sectors for energy efficient solutions are the water and waste-water industry (Pumps, Water Treatment, and Electrochemical Water Desalination consume the most energy) as well as Medtech, F&B and marine & offshore.

TECHNOLOGY/APPLICATION	INDUSTRY
Improved catalysers	Chemical industry and refining industry
Integration of chemical plants and refineries	Chemical industry and refining industry
Highly efficient heat recovery systems	Chemical industry and refining industry
Control systems for the use of technologies	Chemical industry
Monitoring systems to control products and processes	Electronic industry
Technologies for water recovery and extraction	Electronic industry
Highly efficient nitrogen plants	All sectors
Advanced process heaters	All sectors
Intelligent manufacturing and automation solutions (smart manufacturing)	All sectors

7. Ministry of Trade and Industry, Economic Survey of Singapore 2020, https://www.mti.gov.sg/-/media/MTI/Resources/Economic-Survey-of-Singapore/2020/Economic-Survey-of-Singapore-2020/FullReport_AES2020.pdf.

8. Economic Development Board, Ennergy and Chemicals, <https://www.edb.gov.sg/en/our-industries/energy-and-chemicals.html>.



Sustainable “Like a Bosch”

By BOSCH

While climate action costs money, doing nothing will cost even more – the reason why Bosch continues to push forward with comprehensive sustainability efforts.

Living through a global health crisis this past year, we’ve had the chance to reflect on the broader meaning of “Invented for life.” If anything, focusing on the global existential threat from the pandemic has strengthened our resolve to play our part in tackling the even greater existential threat facing us all: climate change. In many ways, both challenges require colossal effort and collaboration to change the course.

Sustainability anchored in product portfolio

Our products themselves are a major focus of Bosch sustainability efforts. A good example of this is our

dishwashers. Equipped with Zeolith technology, it can offer energy savings of up to 20 percent. Besides commercial products, Bosch also considers energy efficiency to be the decisive criterion in the development of machines and systems. Bosch Rexroth’s CytoBox, for example which is a connected hydraulic power unit with variable-speed pump drives, can reduce energy consumption by up to 80% compared to the power units with non-variable drives.

Be it for home, or in manufacturing, Bosch offers product and solutions that are engineered and manufactured

to contribute to a more sustainable lifestyle. And one of ways we achieve this is by leveraging on megatrends such as connectivity.

Reducing energy consumption by means of efficiency and intelligence

Buildings account for over 20 percent of Singapore's emissions. Bosch incorporates AI, Internet of Things, and sensor-driven solutions to make buildings more secure, efficient, and comfortable in its intelligent building technologies portfolio. For example, Bosch surveillance solutions with video analytics help building operators better understand the dynamics of crowd movement in a building, and in turn provides insights on how to utilize and channel energy resources within a building. On the other hand, Bosch solutions use sensors that enable daylight harvesting to manage daytime indoor lighting, reducing power consumption where possible. Bosch integrated energy and thermal comfort management is an AIoT solution, which can help harmonize building use and equipment utilization, for example, by orchestrating heating, air conditioning, and ventilation systems based on the number of building occupants and their preferences.

While taking measures to achieve climate neutral manufacturing at all locations, Bosch is leveraging on its innovations to make our offices greener. This is best exemplified in our Southeast Asian headquarters in Singapore. Equipped with solar panels and smart air conditioning, the building is eco-friendly with energy consumption 30 percent lower than comparable industrial buildings. Smart air conditioning at Bosch canteen alone is recorded to reduce carbon dioxide emissions by more than eight tons annually, the equivalent to two cars driven. At a global level, Bosch aims to promote innovative measures to improve energy efficiency with investments of a billion euros by 2030. At the same time, Bosch's consumption of green electricity from new plants will be raised up to 40 percent of its total energy consumption.

Facing increasing demand of energy while stricter target of carbon emission reduction, we need to make significant investments in clean energy technologies. Only in this way can we make climate actions feasible, cost-effective and sustainable.



Bosch office equipped with energy and thermal comfort management solution



Bosch software solution Intelligent Insights brings data from scene to screen by using the built-in video analytics of Bosch cameras

Water and Wastewater



Challenges

Singapore's water demand is currently about 1,628 million litres of water per day (430 million gallons). Of that, households consume 45%, while 55% is used by the non-domestic sector. Notwithstanding the efforts to reduce water consumption, it is estimated that the total water demand could almost double by 2060 in tandem with economic and population growth, with majority of the increased demand coming from the non-domestic sector.⁹

Singapore as a small island-state faces several constraints in natural resources, such as land scarcity and lack of any natural water resources apart from rainfall.¹⁰ Currently, Singapore imports water from Johor under the 1962 Water Agreement, which allows Singapore to draw up to 946 million litres per day (250 million gallons) from the Johor River until 2061. In return Singapore is obliged to provide Johor with treated water of up to 2% of the water that is imported.¹¹

The two taps that Singapore focuses on are desalinated water and NEWater as these make Singapore independent from foreign water sources (which will be equally affected by climate change) and from local catchment that is heavily depending on varying rain falls.

Over the years, Singapore has developed a robust and diversified water supply from four sources known as the Four National Taps:



Water from Local Catchment



Imported Water



Highly purified reclaimed water (also known as NEWater)



Desalinated water

Targets

NEWater and desalinated water are climate-resilient sources of water, as they are not dependent on rainfall, and strengthen Singapore's water security, especially in the face of climate change. Today NEWater makes up to 40% of Singapore's current water demand, while desalinated water accounts for up to 30%.

The city-state's targets are to increase the proportion of the expected water demand in stages. In 2030 NEWater shall account for up to 50% and desalinated water up to 30%.

In 2060, when the water demand is expected to have doubled, both focus water sources shall make up to 85% of the demand. NEWater shall by then contribute 55% and desalinated water up to 30% to the national water needs.¹²

9. Public Utilities Board, <https://www.pub.gov.sg/watersupply/singaporewaterstory>.

10. E-Resources Singapore, https://eresources.nlb.gov.sg/infopedia/articles/SIP_2020-02-20_192848.html.

11. Ministry of Foreign Affairs, <https://www.mfa.gov.sg/SINGAPORES-FOREIGN-POLICY/Key-Issues/Water-Agreements>.

12. Public Utilities Board, <https://www.pub.gov.sg/watersupply/singaporewaterstory>.

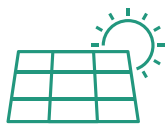
As water demand continues to increase due to population and economic growth, Singapore continues to plan ahead, to build up its infrastructure ahead of time, and to invest and develop new technologies to secure an adequate and affordable water supply.

Managing water demand is another important aspect in ensuring a sustainable supply of water for Singapore. Singapore targets to reduce domestic water consumption to 130 litres per capita per day by 2030. To this end, Singapore has implemented various measures to encourage water conservation, such as mandating minimum water efficiency standards for water fittings, as well as introducing the Smart Water

Meter Programme. Singapore has also introduced various mandatory and facilitative measures to manage non-domestic demand, such as mandating the submission of Water Efficiency Management Plans by large water users and establishment of the Water Efficiency Fund to facilitate implementation of water efficiency projects by businesses.

Opportunities for German Companies

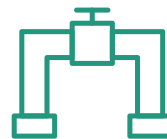
The SGC conducted a research paper as well as a comprehensive market study on the topic of water and wastewater management. Based on this research there are several high-potential opportunity fields for German companies:



Energy efficient solutions:
especially technologies for sea-water desalination and water reclamation as these processes require high amounts of energy.



Water treatment systems for quality assurance:
for regulating fluctuating water quality, especially when feeding in surface water.



Stowing and pipe solutions:
due to the land constraint Singapore faces the challenge how and where to catch and stow water especially during the rainy season for times of low precipitation.



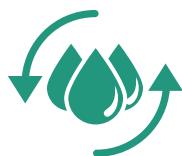
Technologies to reduce chemical usage and used water sludge:
currently high amount of chemicals are used in water treatment processes; innovative solutions that require less chemicals and/or produce less used water sludge during water purification processes are sought after.



Monitoring and control sensors:
reliable sensors for monitoring water quality at water reclamation and treatment plants to help ensure that the water produced meets the stringent requirements set by Singapore's national water agency as well as by WHO.



Water-saving applications for the industry:
as the non-domestic water demand is projected to increase to 70% of overall water consumption by 2060, Singapore is looking for solutions and technologies that require less water or substitute water in water-intensive processes, such as in the energy generation, semiconductor, and petrochemical industry.



Intelligent solutions for drainage systems:
solutions that provide early warnings to aid accurate flood prediction and reduce flood risks.



Control systems:
sensors, robots, etc. that increase the productivity, availability, and operational safety within the water circuit.

According to the studies and analysis conducted by the SGC, opportunities for German companies are especially prevalent in the areas of digitalization of the water industry, as Germany is a well-known pioneer for Industry 4.0 and has contributed to coining the phrase 'Water 4.0'. Germany is leading in the field of automation and digital solutions which results in a significant overlap between Germany's know-how and Singapore's requirements. Additionally, Germany is pioneering in the fields of sustainability and energy efficiency and hence shows great potential for this range of requirement.

Furthermore, water technologies are not just highly relevant to Singapore, but also to the surrounding ASEAN countries, as most of their water supply consists of ground water and rain catchment.

As a result, the ASEAN countries are heavily depending on climatic environmental conditions. Due to climate change effects, many countries are facing serious issues with their national water supplies and will require to find alternative sources. Hence, German solutions and technologies can be tested and adjusted according to the local requirements in Singapore, as the island-state is a vibrant R&D hub for water technologies, and then subsequently exported into the region. German companies have the opportunity to participate in the numerous R&D projects and to access the ASEAN markets from the central, prestigious city-state that has a blueprint function for many countries in the region.





Water & Fluid Solutions Focuses on Water Reuse

By MANN+HUMMEL

“Globally, 80% of wastewater flows back into the ecosystem without being treated or reused,” according to UN Water.

At MANN+HUMMEL Water & Fluid Solutions (WFS), our vision is to solve the world’s water and fluid challenges so that together we can create a safer, healthier, and more sustainable planet. Sustainable living is vital to Singapore’s Green Plan, including working toward a circular economy with water and wastewater reuse.

For MANN+HUMMEL WFS, the health, safety, and sustainability of our planet is more than simple words on a page. It’s what we do. We are focused on providing products and solutions to help address these challenges, and one of those ways is through water reuse. In locations where water is scarce, companies and governments consider reclamation options to convert wastewater into beneficial resources for purposes such as irrigation, industrial process, or groundwater replenishment.

Water reuse in these applications rather than using freshwater supplies can help save water. It also acts as an alternative source to meet the world’s water needs. Sustainable water and wastewater management is an important measure to reduce scarcity and ease the pressure on surface and groundwater sources.

Potable water from wastewater is already possible with current technology; however, this is a challenging topic for companies and governments for several reasons – one of which is public acceptance. Singapore’s NEWater systems are an example of indirect potable use for treated wastewater where the treated water is mixed with rainwater before being treated once again in a drinking water system.

MANN+HUMMEL WFS is committed to promoting water reuse solutions as part of the overall vision of the company. Reusing wastewater is one of the tenets of a circular economy, and innovations in water reuse using membranes boost the concept of a circular economy where we reuse and recycle more than use and dispose.

Tighter discharge regulations, urbanization, and increased water recycling efforts have made membrane bioreactors (MBR) the leading innovation in wastewater treatment compared to conventional activated sludge. BIO-CEL® MBR is successfully helping customers treat and reuse wastewater across the globe while using a smaller footprint and reducing energy demand.

In regions where water is scarce, BIO-CEL® MBR developed by MANN+HUMMEL WFS provides treated water to use for irrigation and other agricultural purposes. Installations in Turkey and Israel, for instance, report high-quality effluent, lower energy demand, decreased risk of downtime, and simpler maintenance with BIO-CEL® MBR modules.

There are also industrial applications of BIO-CEL® MBR modules with compelling results for water reuse. In a tuna cannery, roughly 35% of the tertiary treated water is reused in applications at the plant, including cooling towers, washing docks/boats, toilet facilities, cleaning the wastewater treatment plant (WWTP), and preparing chemicals for the WWTP. Learn more on the website at www.microdyn-nadir.com.

Sustainability is at the core of our vision at MANN+HUMMEL WFS, and it is the core of Singapore's Green Plan. It is important that we all work together globally to combat climate change, promote a circular economy, and support green initiatives. Join us in our vision to solve the world's water and fluid treatment challenges so that together we can create a safe, sustainable, and healthy planet.



Smart Mobility / E-Mobility



Challenges

As a densely populated and land-scarce island, Singapore's challenges with urban mobility stretches beyond land constraints. Efficient use of resources and sustainable alternatives for the future remain a key aspect of mobility and transportation.

Today, the transport accounts for 13% of Singapore's energy consumption¹³ and road transportation alone contributes to about 15% of CO₂ emissions in Singapore. Concurrently, vehicle electrification has been one of the slowest initiatives to achieve decarbonisation.¹⁴

Transportation policies such as the Certificate of Entitlement (COE) scheme and high taxes have only been able to tackle road congestion while stabilising the number of cars on the road and private ownership of vehicles. Conversely, favourable strategies and holistic planning by the government also places a great emphasis on public transportation as the choice of transport. Therefore, overall car-ownership and car-sharing concepts in Singapore must be considered from a different angle.¹⁵

Like ICE vehicles, high costs of vehicle ownership remain as one of the biggest hurdles for private vehicle owners to switch towards electric and alternative car types, in addition to the lack of public infrastructure, renewable energies and charging points to support the wide use of non-ICE vehicles.¹⁶

While road congestion and efficient use of resources are just some of the greatest challenges to transportation in Singapore, the overall increase in population, increasingly ageing population and a potential shortage in bus drivers also pose some challenges to sustainable mobility concepts in Singapore.

Targets

The future of mobility in Singapore can be thought out in a two-pronged approach. Electric vehicles and autonomous/ self-driving vehicles will shape the future of transportation in Singapore:¹⁷

- New registrations of diesel cars and taxis to cease from 2025,
- 8 EV-Ready Towns with chargers at all HDB carparks by 2025,
- All new car and taxi registrations to be of cleaner-energy models from 2030,
- 60,000 charging points nationwide, including 40,000 in public carparks and 20,000 in private premises by 2030;

For both public health and climate change reasons, Singapore intends to phase out ICE vehicles within two decades and with all new car and taxi registrations to be of cleaner-energy models from 2030.¹⁸ Singapore's first task force on electric vehicles was launched as early as 2009, where 8 ministries came together to assess nationwide costs, benefits and feasibility of EV adoption in Singapore.¹⁹ Currently, there are limited charging points available in both private and public spaces. The lack of widely available charging infrastructure has not spurred much enthusiasm for the switch towards hybrid and electric vehicles. Therefore, Singapore aims to increase the number of charging points for all vehicle in private and parking spaces, from a current total of about 1,600 to 40,000 in public parking spaces and 20,000 in private spaces, by 2030. With the support and provision of readily available infrastructure, this could encourage the adoption and transition towards non-ICE vehicle usage and ownership in Singapore.

Incentives will be provided by the government to induce a switch towards EVs and Hybrid vehicles. For instance, the Government will introduce the EV Early Adoption Incentive (EEAI). Individuals who buy fully electric cars and taxis will receive a rebate on the Addition Registration Fee.²⁰ The LTA states that the EEAI will lower the upfront cost of an electric car EV by an average of 11% and narrow the upfront cost gap between electric and ICE cars,²¹ hence expanding the potential for vehicle buyers to make a switch. Furthermore, there will be a reduction in road taxes for ownership of non-ICE vehicles. The additional registration fee floor for electric cars will also be lowered to zero from a current level of \$5,000.²²

13. Ministry of Transport, <https://www.mot.gov.sg/about-mot/land-transport>

14. EV Association of Singapore, EV Guide 2021, p.5 <https://www.evas.org.sg/#ev-guide-2021>

15. Land Transport Authority (LTA), National Climate Change Secretariat (NCCS), E-MOBILITY Technology Roadmap, p.4 <https://www.nccs.gov.sg/docs/default-source/default-document-library/e-mobility-technology-roadmap.pdf>

16. LTA, NCCS, E-MOBILITY Technology Roadmap, p.4; Lim Min Zhang (2021, Feb 25) Challenges flagged over wider electric vehicle adoption, Straits Times: <https://www.straitstimes.com/singapore/politics/challenges-flagged-over-wider-electric-vehicle-adoption>

17. SG Green Plan 2030, <https://www.greenplan.gov.sg/key-focus-areas/our-targets/>

18. Mindy Tan (2021, Mar 04) No new diesel cars, taxis in Singapore; road taxes for EVs updated: Ong Ye Kung, Business Times: <https://www.businesstimes.com.sg/government-economy/singapore-budget-2021/no-new-diesel-cars-taxis-in-singapore-road-taxes-for-evs>

19. Wong Pei Ting, (2021, 27 Feb) A timeline of S'pore's electric vehicle journey so far, Today: <https://www.todayonline.com/singapore/spores-electric-vehicle-journey-so-far>

20. Matthew Mohan, (2020, Feb 18), Budget 2020: Additional incentives to encourage use of more environmentally friendly vehicles, Channel News Asia: <https://www.channelnewsasia.com/news/singapore/budget-2020-additional-incentives-to-encourage-use-of-more-12446342>

21. Matthew Mohan, (2020, Feb 18), Budget 2020: Additional incentives to encourage use of more environmentally friendly vehicles, Channel News Asia: <https://www.channelnewsasia.com/news/singapore/budget-2020-additional-incentives-to-encourage-use-of-more-12446342>

22. Mindy Tan (2021, Mar 04) No new diesel cars, taxis in Singapore; road taxes for EVs updated: Ong Ye Kung, Business Times: <https://www.businesstimes.com.sg/government-economy/singapore-budget-2021/no-new-diesel-cars-taxis-in-singapore-road-taxes-for-evs>

Autonomous technologies can also tackle Singapore's challenges with road congestion, greater mobility for the disabled and ageing population, reduce reliance on private ownership and optimisation of use of land space.²³ In line with goals in becoming a smart nation, Singapore has already rolled out autonomous vehicle test beds across various spots in Singapore, such as in the Singapore Science Park and Jurong Island. The Land Transport Authority (LTA) has also signed agreements with various companies and institutions to develop solutions for autonomous truck fleets to transport containers from one port terminal to another. There is also an inquiry into the development of self-driving utility vehicles for waste collection and road sweeping.²⁴

Such self-driving technology is one of the new technologies that has the potential to complement the rollout of Electric Vehicles. To complement the

sustainable and green fuel alternative, autonomous technologies can support car-sharing concepts. Driverless technologies can take people to their destinations on-demand, without owning a car. This also promotes greater mobility for the elderly and disabled.

Opportunities for German Companies

With a holistic and long-term approach being formulated by the government and multiple stakeholders, there are several areas where there is potential for German companies to value add their technologies:

Given that Germany is a world leader in automotive technologies, energy efficient structures and green technologies, this is another area in which Germany and Singapore can come together and complement each other's strengths.



Increasing presence of EVs in Singapore:

To increase awareness and encourage the adoption of EV's and other non-ICE vehicles in Singapore, automotive companies can embark on B2B and B2C campaigns, forming alliances and strategic partnerships in the industry with local authorities to further promote a faster transition towards EVs



Provision of charging infrastructure:

Retrofitting of EV/Hybrid Vehicle Charging systems in existing buildings, installation of new and charging systems in new buildings, working with fleet operators to supply fast charging infrastructure to support public transportation and on-demand car-sharing plans, communication systems between the vehicle, charging column, and network



Smart and energy efficient grid systems:

urban planning, smart grid energy systems to flatten the daily load curve, optimising the distribution of energy during peak and off-peak periods to prevent overloading the system and power plants, secondary energy storage solutions²⁵



Smart technologies for self-driving vehicles:

Sensors, navigation systems, GPS tracking technologies, on-demand apps for car-sharing plans, communication systems between the riders, users, operators and network

23. Smart Nation, <https://www.smartnation.gov.sg/what-is-smart-nation/initiatives/Transport/autonomous-vehicles>

24. Ibid.

25. Maurizio Di Paolo Emilio, (2019, 09 May) Smart Grid for Electric Vehicles, EE Times: <https://www.eetimes.com/smart-grid-for-electric-vehicles/#>



Transforming the everyday to create a better tomorrow

By Siemens

At Siemens, we define sustainable development as the means to achieve profitable and long-term growth. We align ourselves with the goals of the United Nation's 2030 Agenda for Sustainable Development and strive to balance people, environment and profit.

Transforming the everyday to create a better tomorrow

Sustainability is an integral part of Siemens' business – it's in our DNA.

For 173 years, Siemens has been providing technologies to improve the lives of people all over the world. Our innovative solutions help to tackle challenges in the areas of environmental protection, decarbonization, health and safety. They have one clear goal: make the world a more livable, sustainable and inclusive place.

This goal aligns perfectly with the Singapore Green Plan (SGP) 2030's ambition of achieving net zero emissions as soon as viable.

In fact, as a long-term resident and partner of Singapore, Siemens has been working with Singapore along its visionary transformation journey, contributing to its sustainable development – from buildings and industries to food and transport.

Energizing eMobility

In the area of transport, Siemens is supporting Singapore's drive to adopt more electric vehicles (EVs). One of SGP 2030's target for its Energy Reset pillar is to expand the network of EV charging points to 60,000 by 2030.

The location of these charging points are crucial to encourage more EV adoption. With 81% of Singapore residents living in “HDBs” or public housing, it is absolutely necessary to ensure sufficient public charging points, accessible by EV-owners who do not have private chargers. In addition, with such a high proportion of EV-owners sharing public charging points, fast charging is another necessity.

In June this year, Siemens launched SICHARGE D, a new public fast charging and high-powered compact EV charger (IEC standard) in Singapore. It provides one of the highest peak efficiencies on the market, has scalable charging power and dynamic power sharing. It is suited for highway and urban charging stations, city parking as well as shopping malls – a perfect fit for Singapore’s cityscape.

The creativity and ability to install EV chargers on existing infrastructure is another critical point, in view of space constraint and the fact that at current moment for the near future, infrastructure for Internal Combustion Engine (ICE) vehicles will still be the norm. Old and new need to be able to co-exist, until a stage when ICE vehicles are phased out completely.

Siemens has worked on innovative ways to install EV chargers on existing city infrastructure. Last year, Siemens teamed up with Westminster City Council and echarging provider ubitricity to create UK’s first fully converted EV lamp-post “Electric Avenue”. It enables residents to charge their EVs at 24 lamp-posts at various locations along the street.

Electrifying public transport



Like many countries, the shift to cleaner-energy vehicles in Singapore does not stop at private EVs. The Land Transport Authority has committed to having a 100% cleaner energy bus fleet by 2040. Moving forward, it will only purchase cleaner energy buses.

Siemens is a trusted partner for eBus depot solutions in many parts of Europe and in New Zealand. In Germany, for example, Siemens is equipping one of the largest eBus depots in the country with a medium-voltage connection and charging infrastructure. The depot in Nuremberg will support simultaneous charging of up to 20 buses overnight or during other breaks in operations.

Most eBus depots are built in existing locations. Therefore, for depot charging, it is critical to integrate the charging processes into the current infrastructure and workflows in the best possible way – this is where Siemens’ experience and portfolio expertise lies.

For Zurich Transport Authority’s eBus depot in Hardau, Siemens installed 45 charging stations in the retrofitted garage. The charging cable feeds from a corresponding cable suspension system in the ceiling so as not to disturb ongoing operations when installing the necessary equipment.

eMobility for a more sustainable future

eMobility is going mainstream around the world, for sure, and the upswing is happening faster now than in the last 10 years. It is an exciting transformation journey that Siemens is ready to contribute to, to help create a sustainable future for all!

A background image featuring several clear plastic bottles, some with blue caps, lying on a light blue, crinkled surface. The bottles are covered in water droplets, suggesting they are wet. The overall color palette is various shades of blue.

Recycling

Challenges

Growth in Singapore's population and economy has contributed to an increase in the amount of solid waste disposal. For 2020, a total of 5.88 million tonnes of waste was generated, with only 52% of waste being recycled.

Since the late 1970s, the NEA (National Environment Agency) adopted waste-to-energy (WTE) incineration which reduces waste volume by 90% and reduces landfill space. Today, Singapore has four WTE plants, namely Tuas, Senoko, Tuas South and Keppel Seghers Tuas Waste-To-Energy Plant (KSTP) and one landfill, the Semakau Landfill for non-incinerable waste and incineration ash that is a high-tech offshore landfill. The Semakau landfill is projected to run out of space by 2035 at current waste disposal rates.

As a low-lying island-state, Singapore is particularly vulnerable to rising sea levels. Climate change will also increase strain on resources with rising global consumption, and more waste, due to population growth and rapid urbanization.

Targets

To overcome these challenges, Singapore is keen on building three new resiliences: climate resilience to address existential threat of climate change, resource resilience to ensure a safe and secure supply of critical resources and economic resilience to ensure the future Singaporean economy remains competitive by overcoming carbon and resource constraints.

The aims of Singapore's Zero Waste Masterplan and Singapore Green Plan are:

- Extension of Semakau Landfill's lifespan beyond 2035
- Reduction of amount of waste sent to landfill per capita per day by 20% by 2026, and by 30% by 2030
- Achievement of a 70% overall recycling rate (81% non-domestic, 30% domestic recycling rate)

Opportunities for German Companies

Although climate change and growing resource constraints are the key drivers, Singapore is determined to turn these challenges into opportunities. A few examples as follows:

- Chemical recycling that turns plastic into the original chemical building blocks, so that it can re-enter the production process.
- Treated incineration bottom ash can be used as conventional aggregates (e. g. sand) in construction applications.
- E-waste recycling recovers valuable materials from waste.

German companies can contribute with the in-depth knowledge and understanding in waste collection infrastructure (e. g. yellow bag system, reverse vending machines, etc.), waste separation technologies, as well as their expertise especially in mechanical recycling of plastic waste as well as e-waste recycling. In regard to plastic recycling, Singapore requires solutions to reduce carbon emissions and reduce the waste ending up in the land fill in the immediate future.

Short-term mechanical recycling is considered the preferred option as a bridging technology until chemical recycling is more advanced and scalable. Chemical recycling can help to close the plastic waste loop in Singapore as it is able to treat contaminated plastic waste which cannot be mechanically recycled, into higher value products such as pyrolysis oil. Singapore is currently studying the feasibility of chemical recycling to treat plastic waste in Singapore. German companies can furthermore contribute with certification and standardization knowledge in the area of recycling.



Transforming the recycling and waste management industry by ALBA

By ALBA

The ALBA Group, one of the leading recycling and environmental services companies as well as raw material providers worldwide, operates with its two brands – ALBA and Interseroh – within Germany, Europe and Asia.

In 2020, its divisions generated an annual turnover of 1.9 billion Euros and employed a staff of approx. 8,700 employees. In 2019 alone, ALBA Group saved 4.2 million tonnes of greenhouse gases compared to primary production and at the same time 32.3 million tonnes of primary raw materials through its recycling activities.

ALBA first ventured into Singapore in 2020 together with local waste management company Wah & Hua Pte Ltd, becoming the public waste collector for the Jurong sector from April 1st 2020 until March 31st 2027. Subsequently, ALBA secured the license from the National Environment Agency (NEA) to become the sole Producer Responsibility Scheme (PRS) Operator for E-Waste for the entire Singapore, from July 1st 2021 to June 30th 2026. As part of its role, ALBA spearheads the implementation of a nationwide collection system for E-Waste. With its innovative suite of services, ALBA has introduced a plethora of sustainability, digitalisation and productivity initiatives for their projects in Singapore.

Dr. Axel Schweitzer, one of the co-CEO of ALBA Group has a vision of a “World Without Waste”. In Singapore, ALBA brings this vision to reality by aligning it to Singapore’s Green Plan – a whole-of-nation movement to advance Singapore’s national agenda on sustainable

development. The Green Plan has five pillars, amongst which ALBA’s focus lie on two: Green Government and Circular Economy.

By working closely with the NEA, ALBA aims to enable citizens and businesses to adopt more sustainable practices such as the reduction of waste generation and increasing recycling rates. This helps to enhance resource efficiency and enable the nation to increase the lifespan of the Semakau landfill. With the set-up of the E-Waste collection system and the collaboration with local recyclers, ALBA is working towards reducing waste generation as much as possible, thus paving the road ahead for a Zero Waste Nation powered by a circular economy, with a high rate of recycling

Additionally, the Energy Reset pillar under Green Plan is also aligned with ALBA’s vision on clean-energy vehicles. The company’s existing diesel vehicles are designed to be as green as possible through the installation of solar mats and dust filters for particulate matter filtration plan. The solar mats will convert solar energy into electricity for the vehicle, thus reducing fuel consumption and carbon emissions. ALBA has also invested and will continue to invest substantially in jobs creation in the Environmental Services sector for Singaporeans.

As with any industry adopting sustainable solutions, challenges do exist. Sustainable solutions can come at a higher price compared to the existing conventional solutions, and often it is difficult to find that balance, especially when waste management is traditionally an industry dictated by its low-cost pricing. This is when the direction set by the government comes to our aid. The Green Plan is a driver for many industries to have their own sustainability roadmaps, thereby encouraging more industries to become open and accepting of greener solutions. This results in a pricing that encompasses the benefits for the society and the environment.

Another challenge would be finding enough manpower to deal with wastes due to the nature of the industry. With new smart technologies and productivity solutions, ALBA aims to attract more Singaporeans to join. Despite the challenges, ALBA foresees that this industry will continue to expand and transform. By tapping on its industry expertise and technologies, ALBA intends to be at the forefront of this change towards more sustainability, thus becoming a leader in the Singapore's sustainability space.

In its time operating in Singapore, ALBA has observed some key differences in the industry between Singapore and Germany. The focus for Germany has been on increasing recycling rates and introducing extended producer responsibility schemes for different types of recyclables. They started with sorting in late 1960s. By pricing landfilling and incineration solutions highly, they have guided people to consider it as the last resort and drive maximum recovery of secondary raw materials. With the new push from the European Union (EU) against incineration, and with lack of funding support for new incinerators, the focus is ever so prominent for industries to come up with new technologies for mechanical and chemical recycling solutions.

Whereas at Singapore, the focus has been to have Clean, Green and Blue Singapore, where there are unprecedented expectations on the level of cleanliness and service levels. Incineration still plays a key role as part of the waste management solutions available. With the push from the Singapore Government to reduce the waste sent to Semakau landfill, the nation is beginning to invest resources on enhancing material recovery, which would pave more opportunities for local recycling industries to flourish.

Although the approaches are different for both countries due to differences in contexts, both countries excel in their specific focus and have shown foresight in this industry.

As a bridge, ALBA intends to bring more of its know-how from Europe and Asia to Singapore, especially in solid waste recycling. ALBA specializes in recycling and treatment technologies for a variety of waste streams. As laid out in the Resource Sustainability Act, the Ministry of Sustainability and the Environment is keen on finding solutions for food waste and plastics recycling. ALBA is keen to explore these opportunities and offer recycling solutions based on our expertise from abroad.

It is important to note that building the industry's capabilities requires involvement from all parties, not just one company or the government alone. The whole

process starts with an active dialogue, between all stakeholders in the waste management supply chain - what ALBA calls the Golden Triangle which includes the government, the people and the waste management industry. With the upcoming PRS schemes, The Golden Triangle is expanded to also include key stakeholders like Producers in the loop.

From the dialogue, loopholes can be analysed, along with the different use cases and the design challenges which would require innovation. Solutions need not always be found within the waste management industry and can be often found outside where they face similar issues. The key here is to link and adopt technologies to enable the systems to become more adept, resilient and an improvement over the existing systems.

Besides technologies, communications and recycling habits are key to a robust waste management industry. For example, being in a waste management company in Germany is a job with high prestige, be it a waste-truck driver or top-level management. Branding and the way you communicate about waste plays an important role and it is important to change perspectives on how people view waste. By setting the narrative right, together with a robust infrastructure, we can attract talents, create new solutions and amplify the industry's appeal.

Furthermore, a notable difference between the German recycling system to that of Singapore's is source segregation. Once you guarantee a clean source of segregated recyclables, there are more takers for the material, which automatically builds up local recycling capabilities. In Singapore where we have the commingled bin system, more efforts are required to educate the people to lower the contamination of recyclables and to make them aware of what should and should not end up in the blue bin.

In the coming years, we see the government's efforts to introduce more take-back systems like they did with E-Waste for beverage containers as well. Once those are fully established, more of the positive value recyclables will be taken care of.



A large commercial greenhouse with a high, arched glass roof supported by a metal frame. Inside, rows of green lettuce plants are growing in white trays, which are placed on a raised metal structure. The plants are arranged in neat rows, and the greenhouse is filled with natural light. Several yellow tags are hanging from the ceiling structure. The text "Other Sectors" is overlaid in white on the upper right portion of the image.

Other Sectors

Carbon Emissions Reduction

Prior to the UN Climate Change Conference in Copenhagen in 2009, Singapore pledged to reduce greenhouse gas emissions by 16% below business-as-usual (BAU) levels in 2020.

Under the Paris Agreement adopted in December 2015, Singapore made a further commitment to reduce Emissions Intensity by 36% from 2005 levels by 2030, and to stabilise greenhouse gas emissions with the aim of peaking around 2030.

In March 2020, Singapore submitted its enhanced Nationally Determined Contribution (NDC) and Long-Term Low-Emissions Development Strategy (LEDS), where it targets to peak emissions at 65 million tonnes of carbon dioxide equivalent (MtCO₂e) around 2030 and aspires to halve its emissions from its peak to 33 MtCO₂e by 2050, with a view to achieving net-zero emissions as soon as viable in the second half of the century.²⁶

This is an ambitious goal given Singapore's limited access to alternative energy sources and will require a joint effort by all stakeholders, from the Government, to businesses, households, and individuals. Initiatives such as plastics recycling and sustainable vehicle alternatives will contribute towards this goal.



26. National Climate Change Secretariat (NCCS) <https://www.nccs.gov.sg/singapores-climate-action/singapore-and-international-efforts/>; Matthew Mohan (2020, Feb 28) Singapore targets to halve peak emissions by 2050, achieve net zero emissions 'as soon as viable' in second half of century, Channel News Asia: <https://www.channelnewsasia.com/news/singapore-targets-to-halve-peak-emissions-by-2050-achieve-net-12480032>

Solar Energy

Solar energy is the most promising form of renewable energy for Singapore, as Singapore has a high average annual solar irradiation and exposure of about 1,580 kWh/m². However, the limited land space poses a challenge to large scale deployment of solar panels.

Additionally, the presence of high cloud cover across Singapore and urban shading could create intermittencies in solar energies generated.²⁷ Singapore aims to deploy at least 2 gigawatt-peak of solar energy by 2030. This is equivalent to powering about 350,000 households for a year.²⁸

There are several test-bedding projects currently in place and recently, one of the world's largest floating solar farm was launched in Singapore, equivalent to the size of about 45 football fields.²⁹ This could be one of the ways in which Singapore can overcome land-space constraints.

Public transportation fleets are also adopting cleaner and more sustainable fuel alternatives. A 6-month trial of buses partially powered by solar panels is being conducted to evaluate bus performance and effectiveness in using solar energy to reduce GHG emissions and fuel consumption.³⁰



27. National Climate Change Secretariat (NCCS), <https://www.nccs.gov.sg/singapores-climate-action/singapore-approach-to-alternative-energy/>

28. Ibid.

29. Uma Devi (2021, Jul 14) Sembcorp, PUB open one of world's largest floating solar farms on Tengeh Reservoir, Business Times: <https://www.businesstimes.com.sg/energy-commodities/sembcorp-pub-open-one-of-worlds-largest-floating-solar-farms-on-tengeh-reservoir>

30. Zhaki Abdullah (2021, Mar 30) Go-Ahead to conduct six-month trial of buses with solar panels, Channel News Asia: <https://www.channelnewsasia.com/news/singapore/go-ahead-to-conduct-six-month-trial-of-buses-with-solar-panels-14523682>

Urban Agriculture



Singapore also has a goal to build local capabilities and capacity to produce 30% of its nutritional needs by 2030 (“30 by 30”). Currently, Singapore’s food supply is vulnerable, as Singapore imports more than 90% of its food.³¹

About 1% of Singapore’s land is used for food farming.³² Land and space constraints make it challenging to allocate more land for food production. Singapore can leverage new technologies and urban farming methods to optimise and intensify food production. Eggs, vegetables, and seafood are identified to have best potential for high-tech urban farming practices in Singapore.³³ Growing food, such as vegetables, in urban spaces, for example building rooftops, has also become increasingly possible.

To spur innovation in this area, the Singapore Food Agency (SFA) has awarded various grants to co-fund farms in adopting technology that is productive, innovative and sustainable. The goal is to also balance high productivity with sustainability and commercial viability of the farms. In a push to produce more food in Singapore, SFA will also closely support existing conventional farmers to upgrade their processes.

31. Clarisa Diaz, (2021, Apr 07) 3 ways Singapore’s urban farms are improving food security, World Economic Forum: <https://www.weforum.org/agenda/2021/04/singapore-urban-farms-food-security-2030/>

32. Ibid.

33. Ibid., Daniel Moss, (2021, Apr 30) Can 1% of Singapore’s Land Feed Its Population?, Bloomberg: <https://www.bloomberg.com/opinion/articles/2021-04-29/singapore-s-investment-in-urban-farming-isn-t-just-trendy>

SGC Activities Supporting Companies in Singapore



Delegations

The SGC carries out official business delegations and trade missions on behalf of German Federal Ministries and on behalf of the various Federal States. These trade

missions are organised based on various themes, such as Innovation, Industry 4.0, Energy Efficiency, Electronics and different formats that cover workshops, site visits, group meetings and conferences. In addition, the team is experienced in physical, virtual and hybrid formats.



Hybrid forum and panel discussion as part of the BMWi Innovation Tour 2021



Left: evening reception as part of Thuringia delegation 2019

Right: symposium as part of BMWi market entry program for a business delegation the maritime and offshore industry in 2019



Top: virtual event for the BMWi energy efficiency export initiative in 2020

Bottom: virtual ASEAN-Hessen investor conference on e-mobility in 2021

Individual Services

Our team is able to support the market entry and market expansion requirements of companies into Singapore through various initiatives.

The SGC has experienced consultants who can provide individualised and customized services for your business needs:

- (Virtual) business matchings to connect you to potential clients, distributors or partners;
- Customized market studies based on your requirements;
- Market entry accelerator: a part-time representative office who serves as local point of contact for clients, attends trade fairs/events, takes care of post and phone calls, and much more;
- Curated events with various formats: workshops, trainings, conferences and forums, in virtual, physical or hybrid;
- Mailing services to promote your products/services or events.

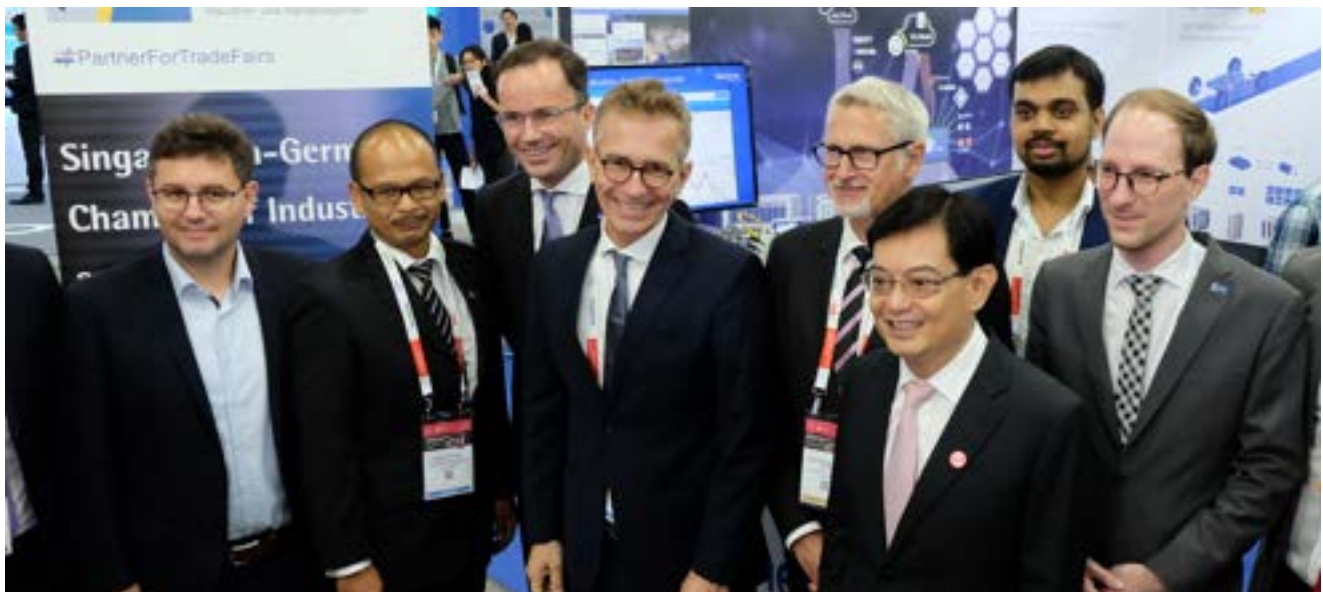
Are you looking for a service that we have not listed? Contact us today!

Trade Fairs

FAIRS&MORE is the German Chamber Network's international trade fair division. It provides a complete range of services for participation of visits for leading trade fairs in Europe and the Asia-Pacific region. A dedicated team offers expert advice and reliable customer care to the complete satisfaction of clients. With ingenuity in ideas and on-going innovation FAIRS&MORE creates an indelible impact for their clients' presence in any trade fair. The services offered include but are not limited to exhibition stand/national

pavilion design and construction, business matchings, exhibition stand/national pavilion management, travel and accommodation, freight/exhibition logistics, product launches, press releases and press conferences.

The SGC's trade fair division has supported companies and government agencies to participate several sustainability related trade fairs, such as Built Environment Xpo 'BEX ASIA' (Asia's largest trade exhibition showcasing green building technologies and solutions), Asia Fruit Logistica 'AFL' (specialised annual trade show and conference event for the Asian and international fruit and vegetable business), InnoTrans (world's largest trade fair focused on the rail transport industry), and Industrial Transformation Asia Pacific 'ITAP' (Asia-Pacific's leading Industry 4.0 event).



Bottom: SGC booth at ITAP welcoming Deputy Prime Minister Heng Swee Keat in 2019

Top: SGC pavilion at IFA 2019

Chamber Committees

The SGC currently has 11 committees that constitute the backbone of the chamber. These committees are specialized groups that aim to cater to the different fields of businesses that the chamber is involved in: Automotive, Banking, Chemical industries, Digitalisation & Innovation, Financial Management, Healthcare & Life Sciences, Human Resources, Inclusion, Mittelstand, Regional Markets and Sustainability.

Those involved comprise of representatives from various backgrounds and corporate sector companies who operate in Singapore. The committees meet on a regular basis to discuss new developments and work on projects of interests. Here they are given a platform to identify areas of interest, voice problems, discuss new topics and share experiences.

In particular, the Sustainability Committee (SC) was founded in 2020 and released the Grün Publication that was handed over to Minister Grace Fu the same year. The SC regularly involves NEA and MSE in its meetings. Some recent and current activities include a presentation at the trade fair AICHEMA, a breakout session on plastic waste at the Germany-Singapore Business Forum (GSBF Connect) by ESG as well as the Sustainability Forum on Plastic Recycling. Furthermore, the SC is closely working with and supporting the Plastics Recycling Association Singapore (PRAS).

Plastic Recycling Association Singapore (PRAS)

The Plastic Recycling Association Singapore (PRAS) was founded following the release of the Grün Book publication, which also received overwhelming support from the public as well as the corporate sector for the proposed international collaboration project of a bottle-to-bottle PET recycling plant.

Hence PRAS was founded beginning of 2021 as an organization that brings together organisations, societies, institutions, and government agencies to discuss ways to support plastic waste recycling as identified in Singapore's Zero Waste Masterplan. PRAS aims to assist with establishing communication channels between Singapore, Europe (especially Germany) and elsewhere to share knowledge on regulations, processes, expertise, best practises, future directions and other aspects of plastics recycling.

PRAS is establishing a Plastics Recycling Centre of Excellence (PRCOE) in Singapore with operational expertise, technical know-how about plastic recycling as well as to create benefits and opportunities for local SMEs. With the support of participating German technology suppliers PRCOE will be able to acquire the necessary types of equipment and gain insights into their knowledge of the field. With that, PRAS and the PRCOE hopes to assist in designing and building a plastic recycling industry in Singapore and in the Southeast Asia region by assisting in technical transfer, skills training, and services, and in growing a new plastic manufacturing industry.



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