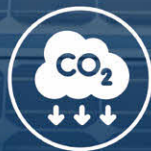


MICE VENUE SUSTAINABILITY PLAYBOOK



MICE Sustainability In Singapore

Introduction

In line with Singapore's dedication to sustainability in the MICE industry, we have set a foundation for monitoring carbon emissions and waste, to ensure measurable outcomes from the efforts of our venues. This playbook is thus designed to offer practical recommendations for MICE venues to enhance their energy efficiency, waste management, and water conservation efforts in advancing their sustainability ambitions.

This playbook features

A **decarbonisation framework** to establish a baseline for carbon and waste emissions in the MICE industry, ensuring consistent measurement and monitoring.



Best practices from purpose-built MICE venues and international counterparts, with actionable recommendations to enhance energy efficiency, waste management, and water conservation.



Consolidation of **Whole-of-Government (WOG) support schemes** to drive decarbonisation across Singapore's MICE venues.



Singapore, a city-state with limited natural resources, has always recognised the importance of sustainability for its future. As a responsible global destination, Singapore is committed to the **Singapore Green Plan 2030**, and strives to be a City in Nature, where large experiences come with small footprints.

Our ambition is to be the World's Best MICE City. In 2024, Singapore was ranked 2nd position in the International Congress and Convention Association (ICCA) Global rankings while maintaining the top spot in the Asia-Pacific region, underscoring our position as a top meetings destination.

To keep up our momentum, embracing sustainable practices will be a top priority to nurture a more environmentally sustainable MICE industry. Despite Singapore's certification to the Global Sustainable Tourism Council (GSTC) Destination Criteria and its ranking as the 7th global and 1st in Asia Pacific most sustainable tourism destinations,¹ there remains potential to enhance our sustainability performance through improved measurement and tracking of sustainability metrics.

¹ Global Destination Sustainability – Index 2024

3 Targets



Develop **sustainability standards** by 2023 and aim to be internationally recognised by 2024



Obtain **sustainability certification**² for purpose-built MICE venues³ & 80% of SACEOS members⁴ by 2025



Start **tracking waste and carbon emissions** by 2023, reduce waste and achieve net zero emissions by 2050

² Internationally or nationally recognised sustainability certification, or both.

³ Changi Exhibition Centre, Raffles City Convention Centre, Resorts World Convention Centre, Sands Expo & Convention Centre, Singapore EXPO, Suntec Singapore Convention & Exhibition Centre.

⁴ Target applicable to Event Organisers, Venues, Stand Builder Contractors, and F&B Caterers. All MICE players can get certified through education and collaboration initiatives provided by SACEOS.

The MICE Sustainability Committee, a collaboration between SACEOS and STB, unveiled the MICE Sustainability Roadmap in December 2022. This roadmap aligns with the **Singapore Green Plan 2030** and the UN Sustainable Development Goals, outlining clear targets and strategies to elevate sustainability standards in Singapore's MICE industry. It aims to position Singapore as a leading sustainable MICE destination in the Asia-Pacific region, focusing on standards, certification, and decarbonisation.

As part of the targets outlined in the roadmap, the STB is dedicated to comprehending and mitigating carbon and waste emissions in the MICE industry. To achieve this, Singapore took the pioneering step of establishing a national MICE Industry Carbon and Waste Baseline exercise in 2023, making it one of the first countries in the world to do so, to analyse the MICE industry's environmental impact.

Through this comprehensive study, an aggregated baseline of sustainability data points has been established, focusing on **Energy, Water, and Waste**. These metrics can be consistently measured and are in line with the global Net Zero Carbon Events Methodology.⁵

The findings have revealed that:



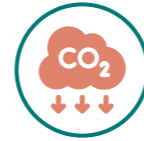
The average MICE venue-related carbon emissions per attendee stand at **14.13kgCO₂**



A significant proportion, **94%** of MICE venue-related emissions, is attributed to **Energy**

The aggregated data will enable STB and the industry to regularly monitor carbon emission data, and the insights gained will play a crucial role in driving strategies for waste reduction and decarbonisation, leading to positive environmental outcomes.

⁵ <https://www.netzerocarbonevents.org/resources/>



Measure Your Impact

In our effort to reduce carbon emissions, it is crucial to first understand the current state by measuring the amount of carbon emissions being produced. This understanding will pave the way for developing an aggregated baseline across identified venues, against which future emissions can be compared.



Monitoring Environmental Performance: Calculating Carbon Emission Intensity

The calculation of carbon emission intensity plays a pivotal role in enabling organisations to effectively monitor their environmental performance over time. This approach takes into account the expansion of business operations, such as an increased number of events and gross floor area, allowing for meaningful comparisons to be made over time.



Global Comparability and Data Availability

The carbon emission intensity metrics listed below are widely used across MICE venues globally, providing a valuable framework for comparability between Singapore's baseline and international venue emissions. Furthermore, these metrics are supported by readily available data, facilitating comprehensive analysis across all venues.

1. Emissions per attendee
2. Emissions per unit area

Reference Guidelines:
 NZCE recommendations for Carbon Emissions Intensity quantification for MICE facilities
 US Environmental Protection Agency: GHG Emissions from Events and Conferences
 UK Department for Digital, Culture, Media & Sport: Environmental Impacts of Sporting/Cultural Events

$$\text{Emissions per sqft area} = \frac{\text{Total Emissions from Electricity (kgCO2e)}}{\text{Venue Area (sqft)}}$$

The Net Zero Carbon Events (NZCE) methodology and guidelines recommend the use of emissions per sq ft of venue area, a widely and globally recognised metric for assessing building-related emissions in MICE facilities. By adopting this metric, MICE venues can gain valuable insights into their carbon emission intensity and track progress over time using a comparable standard.

This metric specifically accounts for the total emissions stemming from electricity consumption, offering a targeted approach to measuring the venue's direct emissions. While other categories such as fuel, waste, and water are important considerations for overall sustainability, they are not factored into the facility's direct emissions under this specific metric.

$$\text{Emissions per attendee} = \frac{\text{Total Emissions (kgCO2e)}}{\text{Total No. of Attendees for the Year}}$$

Collecting and comparing emissions data on emissions per attendee is crucial as it allows MICE venues to assess the environmental impact of each attendee, enabling targeted strategies to reduce emissions.



Emissions per attendee



Data for a Sustainable Future

To kickstart this journey, STB conducted its inaugural study by gathering data from individual purpose-built MICE venues⁶. This involved the collection of standardised data points on Energy, Water, and Waste information for the assessment year of 2023.



Assessing Carbon Emissions

The carbon emissions assessment was conducted based on internationally recognised guidelines and methodologies, including the Net Zero Carbon Events (NZCE) guidelines and the greenhouse gas (GHG) Protocol for Scope 1 and 2 Emission Calculations. This comprehensive approach ensured that a holistic view of emissions across different aspects of venue operations was captured.

The data collection process focused on key areas such as Energy, Water, and Waste consumption.

Emissions Source	Activity Data Collected <i>Refers to the data associated with an activity that generates GHG emissions</i>	Emissions Factor Used <i>Used to quantify the GHG emissions per unit of activity</i>
Venue Energy Consumption	<ul style="list-style-type: none"> Fuel Consumption (i.e. diesel consumption) Purchased electricity, heating, or cooling Refrigerants 	Singapore's Grid Emission Factor (Energy Market Authority, 2022) Link
Venue Waste Collected	<ul style="list-style-type: none"> Emissions from the collection, transportation, and disposal of all types of waste Emissions from the treatment of wastewater 	USEPA GHG Emission Factors Hub Link
Venue Water Consumption	<ul style="list-style-type: none"> Water consumption from the MICE venue 	Life cycle assessment of water supply in Singapore — A water-scarce urban city with multiple water sources. Link
Events Data	<ul style="list-style-type: none"> Number of events Number of attendees Event space (i.e. Gross Floor Area) 	From venue's data collection

GHG Emissions = Activity Data x Emissions Factor

In determining the emission factors for our assessment, STB prioritised sources based on established standards and guidelines, guided by recommendations from the NZCE guidelines, ensuring alignment with optimal practices for sustainable event management.

This was aligned with global guidelines for decarbonisation to prioritise emission sources based on influence, relative size and proportion of emissions, and significance of action. The six venues were identified based on the ability to gather credible sustainability data, particularly from MICE events with high environmental impact. This targeted focus allows STB to effect change in areas of the MICE industry with the greatest environmental impact, to establish a solid foundation for decarbonisation efforts.

⁶ Data from six purpose-built venues: Changi Exhibition Centre, Raffles City Convention Centre, Resorts World Convention Centre, Sands Expo & Convention Centre, Singapore EXPO, Suntec Singapore Convention & Exhibition Centre.



Get Certified!

MICE venues are encouraged to pursue MICE and Green Building Certifications available in Singapore. This initiative aims to streamline sustainability data management systems and align venue operations with standards that optimise resource use and promote sustainability excellence.

Certification in MICE Sustainability	
Singapore MICE Sustainability Certification	The MICE Sustainability Certificate (MSC) equips and certifies businesses for adopting sustainable practices in events and raises sustainability standards across Singapore's MICE industry. Administered by SACEOS, the Singapore MSC consists of three tiers that align with the company's level of readiness for adoption.
GSTC MICE Criteria	These criteria aim to serve as the global sustainability standards for the industry and were created to provide a common understanding of sustainable tourism in the MICE industry throughout the world. The criteria are organised around four main themes: effective sustainability planning, maximising social and economic benefits for the local community, enhancing cultural heritage, and reducing negative impacts on the environment. Developed by the Global Sustainable Tourism Council with the support of STB and SACEOS, these standards are applicable to the MICE industry globally.
ISO 20121:2024 Event Sustainability Management Systems	The standard guides organisations to seamlessly integrate sustainability into every facet of their event planning and execution. With a keen focus on social, economic, and environmental impacts, this standard is pivotal for events that aspire to leave a lasting positive legacy. It applies to events of all types and sizes, encouraging organisations to manage social, economic, and environmental impacts responsibly.
EIC Sustainable Event Standards	This collection of eight specific standards assesses events and industry suppliers on a wide range of sustainability criteria in support of environmental and social responsibility. The standards cover events, event organisers, accommodation, food and beverage, venue, exhibition services, audio visual and production, destination, and integrated property. The environmental criteria assessed include water management, materials and circularity, and supply chain management.

In addition to certifications for companies and events, there are infrastructure-specific certifications. These certifications are designed to evaluate a building's environmental impact and performance, providing a comprehensive framework for assessing the overall environmental performance of buildings to promote sustainable design and best practices in construction and operations. They focus on areas such as energy and water efficiency, carbon footprint, embodied carbon of buildings, environmental management systems, waste management, and the health and well-being of occupants.

Additional Certifications for Infrastructure	
Green Mark Certification	Developed by Singapore's Building and Construction Authority (BCA), the Green Mark Certification scheme is a green building rating system designed to evaluate a building's environmental impact and performance.
Singapore Certified Green Building (SCGB) Scheme	Developed by Singapore Green Building Council, SCGB is a certification scheme to recognise green building products and facilitate sustainable procurement.
LEED Certification	Developed by the US Green Building Council.

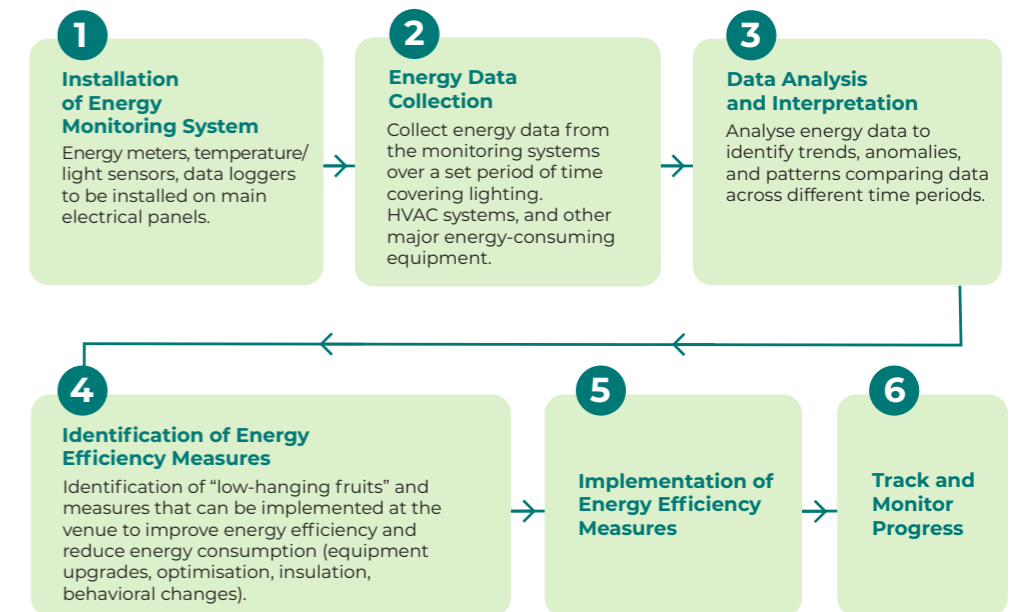


Recommendations on Venue Energy Consumption



Conduct a Comprehensive Energy Audit

Conducting a detailed **energy audit** is crucial for identifying energy efficiency issues and uncovering energy-saving opportunities within MICE venues. By analysing energy consumption patterns, venues can pinpoint areas where energy wastage occurs, such as inefficient equipment, heat, ventilation and air conditioning (HVAC) systems, or inadequate insulation. This valuable information can guide decision-making when upgrading equipment or implementing energy-saving technologies.



Implement IoT-enabled HVAC Systems

Internet-of-Things (IoT)-enabled HVAC systems offer the capability to automatically adjust HVAC settings based on occupancy, weather conditions, and other factors to optimise energy usage and maintain a comfortable indoor environment.

These systems can effectively reduce energy consumption through two strategies:

Controlled (Occupancy-based) Strategy

The venue can establish an occupancy-based strategy where the system automatically adjusts indoor temperature levels based on occupancy. Occupancy data is gathered through sensors mounted on the ceiling, detecting the presence of people and adjusting temperatures accordingly.

Scheduled Strategy

The venue can establish a schedule within the system to automatically adjust indoor temperature levels based on preferences. For example, the venue may set the air conditioning system to operate at 25°C during the day, and higher during the evening - as high as occupants feel comfortable. Every 1°C increase can save about 3% of electricity cost on the air-conditioning system.



Install IoT-enabled Lighting Systems/Light Sensors

IoT-enabled smart lighting systems and light sensors can be utilised as effective energy-saving measures through the following strategies:

Automatic Lighting Control

The venue can establish an automatic lighting control system to detect the presence or absence of people in a room or area. When no activity is detected for a specified period, the sensors can automatically turn off or dim the lights. This prevents unnecessary energy consumption when spaces are unoccupied, such as in exhibition halls and meeting rooms.

Daylight Harvesting

Light sensors can be integrated with natural light sources, such as windows or skylights, to optimise lighting levels. The artificial lighting can be adjusted based on the available natural light. When sufficient daylight is detected, the sensors can automatically dim or switch off the artificial lights to maintain the desired illumination level. This approach avoids over-lighting spaces and reduces energy usage during daylight hours.

Zoning and Personalised Control

The venue can utilise light sensors to create zones within the exhibition halls. By dividing a space into zones, lights in unused or low-traffic zones can be automatically turned off or dimmed.



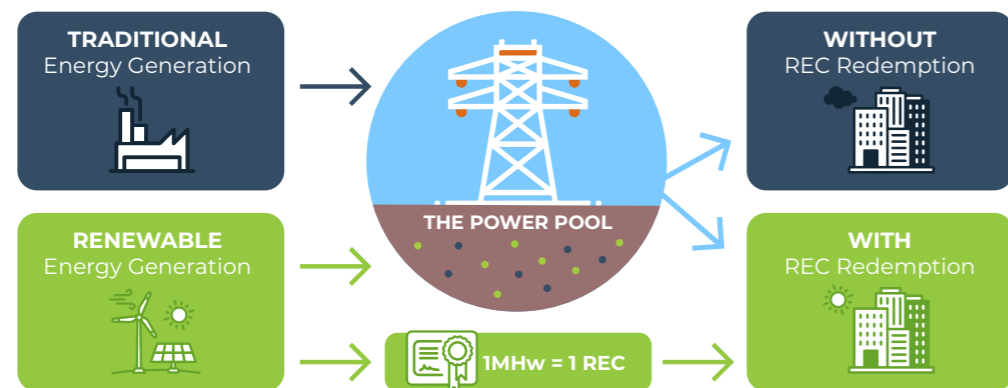
Energy-Efficient Lighting

Light Emitting Diode (LED) Lighting: LEDs are significantly more energy-efficient than traditional incandescent or fluorescent bulbs, leading to reduced electricity consumption and lower GHG emissions. Additionally, LED lighting products typically have a much longer lifespan than other types of lighting. A high-quality LED bulb can last three to five times longer than a compact fluorescent light (CFL) and 30 times longer than an incandescent bulb. LEDs emit light in a specific direction, reducing the need for reflectors and diffusers that can trap light, making LED lighting more efficient.



Renewable Energy Certificates (RECs)

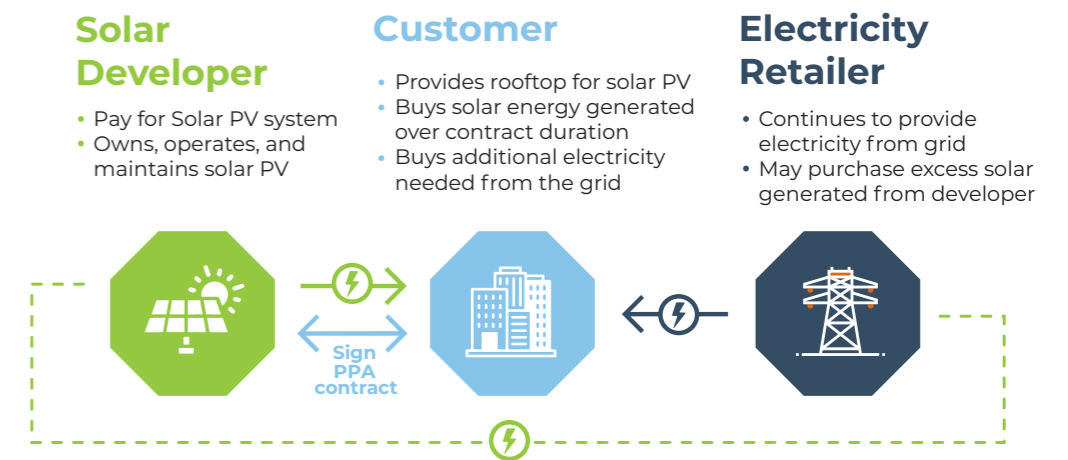
A **renewable energy certificate (REC)** is a market-based instrument that represents the property rights of 1 megawatt-hour (MWh) of electricity generated and delivered to the electricity grid from a renewable energy resource. MICE venues may procure RECs to increase their proportion of energy acquired from renewable energy sources, thus reducing their overall carbon emissions.



Installation of Rooftop Solar System

Rooftop solar systems can significantly reduce carbon emissions by harnessing renewable solar energy to power MICE venue operations, thereby reducing reliance on fossil fuels and traditional electricity sources. MICE venues may consider installing solar panels on rooftops, carports in parking lots, or on any unused land surrounding the venue.

MICE venues may also explore entering into **Power Purchase Agreements (PPAs)**, as part of an initiative by the Singapore government in partnership with energy distributors island-wide. A Solar Power Purchase Agreement (SPPA) is a financial arrangement where a developer arranges for the design, permitting, financing, and installation of a solar energy system on a customer's property at little to no cost. After the installation, the developer then sells the energy back to the customer at a fixed rate. This way, customers benefit from a reduced electric bill and a smaller carbon footprint, with minimal upfront investment.

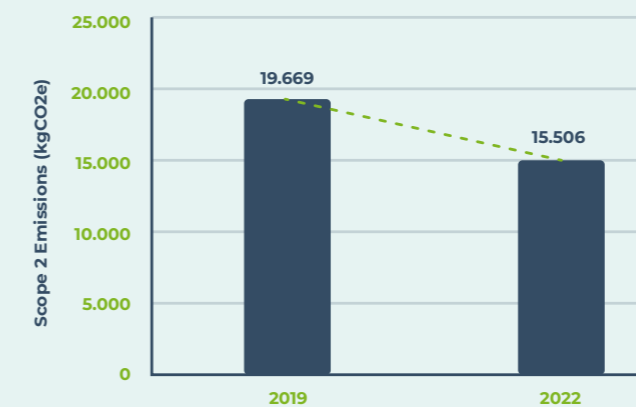


Case Study

Milan's Allianz-MiCo Congress Centre's Emission Reduction Efforts

Fiera Milano achieved a significant reduction in emissions from the base year 2019. Starting in 2022, they converted 100% of the electricity used for their Allianz-MiCo Congress Centre (1 out of 4 of Milan's total venue spaces) to renewable sources, utilising a combination of Solar PV installations and REC.

This initiative resulted in a **21% reduction** in Fiera Milano's total Scope 2 emissions (emissions arising from electricity consumption).



Scope 2 Emissions (Electricity)	
2019	19,669
2022	15,506
% Reduction	-21%

Source: [Fiera Milano Sustainability Report 2023](#)

Venues in Singapore can follow Allianz-MiCo Congress Centre's example by procuring Renewable Energy to reduce emissions. However, further optimisation of energy efficiency and waste generation will be necessary to achieve significant reductions of emissions.



Recommendations on Waste Produced at Venue



Conduct a Comprehensive Waste Baseline Audit

A **waste audit** is a systematic review of all waste generated by a facility. Conducting a waste audit will enhance the waste management systems of the facility by:

Identifying Key Waste Streams

Identify the categories and amount of waste generated by the venue. The waste audit can pinpoint the highest categories of waste and low-hanging fruits where intervention should be prioritised to achieve significant improvement in waste management.

Identifying Sources of Contamination within recycling streams and implementing behavioural changes.

Optimising Resource Allocation

The baseline audit will identify areas where investments in infrastructure, equipment, or personnel are needed to improve waste management practices. For example, investments in additional recycling bins or clear signage for proper waste sorting.



Food Waste Management

Composting

Implement composting programs for organic waste generated during events, such as food scraps and biodegradable materials, to reduce the volume of waste sent to landfills while producing nutrient-rich compost for landscaping or donation.

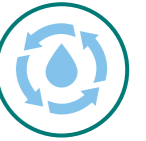
Procurement of Food Waste Digesters

Food waste digesters are capable of processing and diverting up to 1 tonne of food waste per day per digester. Food waste management technologies may be supported under the [National Environment Agency \(NEA\) 3R Grant](#).



Source Reduction

Encourage event organisers and attendees to **minimise waste generation by reducing waste from the sources**, for example, by practising digital communication, providing reusable or compostable materials, and avoiding single-use products like plastic cups, in favour of reusable products like glasses and jugs of water.



Recommendations on Water Consumption

Understanding the Impact of Water Consumption

Although the impact of water as an emission source is relatively small compared to other sources, it is essential for MICE venues to address water consumption in their decarbonisation efforts, and as part of resource management.



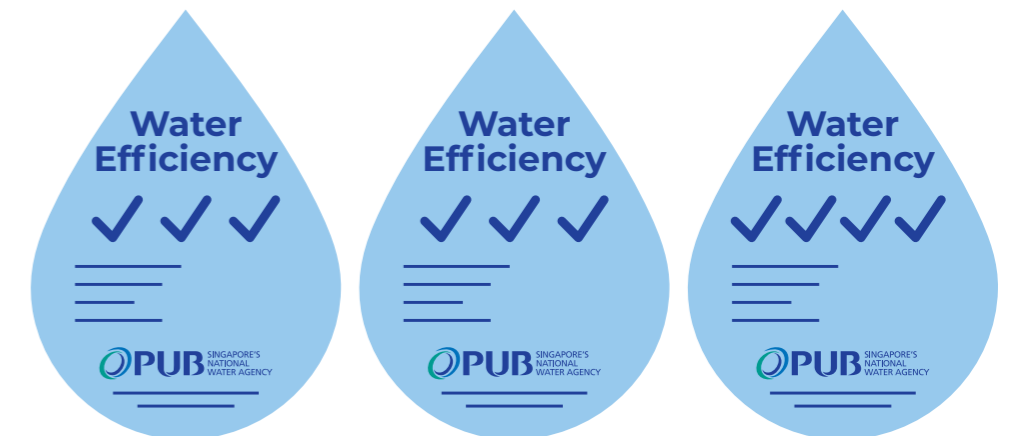
Water Efficient Building (Basic) Certification

MICE venues are encouraged to consider undergoing the [Water Efficient Building \(WEB\) \(Basic\) Certification Programme](#) under the Public Utilities Board (PUB). By adopting water-efficient measures, such as installing water-efficient fittings and following the recommended flow rates and flush volumes, venues can save up to 5 per cent of their monthly water consumption.



Usage of Water-Efficient Fixtures

Venues are encouraged to use **water-efficient fittings, appliances, and products** labelled under the Water Efficiency Labelling Scheme (WELS) introduced by the PUB. This scheme aims to raise awareness about water-efficient products and encourage water conservation. Products under this scheme are rated between zero to four ticks, symbolising their water consumption efficiency.



Greywater Recycling and Reuse

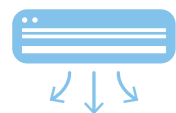
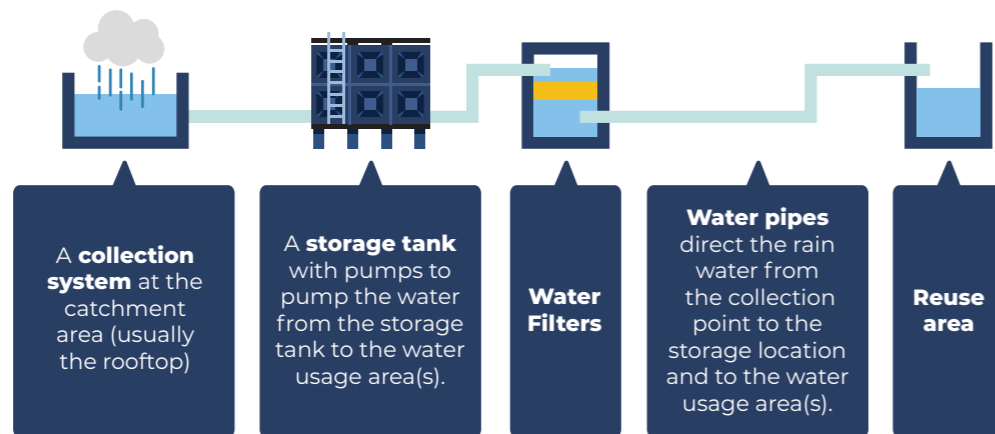
Greywater is **untreated used water** that has not been contaminated with toilet waste. It can be treated and disinfected for reuse in toilet flushing, general washing, irrigation, and cooling tower makeup. The [Technical Guide for Greywater Recycling System](#) provides requirements for the design, installation, testing, operation, and maintenance of greywater recycling systems.



Rainwater Harvesting

MICE venues can maximise the use of rainwater by installing **rooftop water collection systems**. The collected rainwater can be used for various purposes such as toilet flushing, general washing, irrigation, and cooling tower makeup, contributing to water conservation efforts.

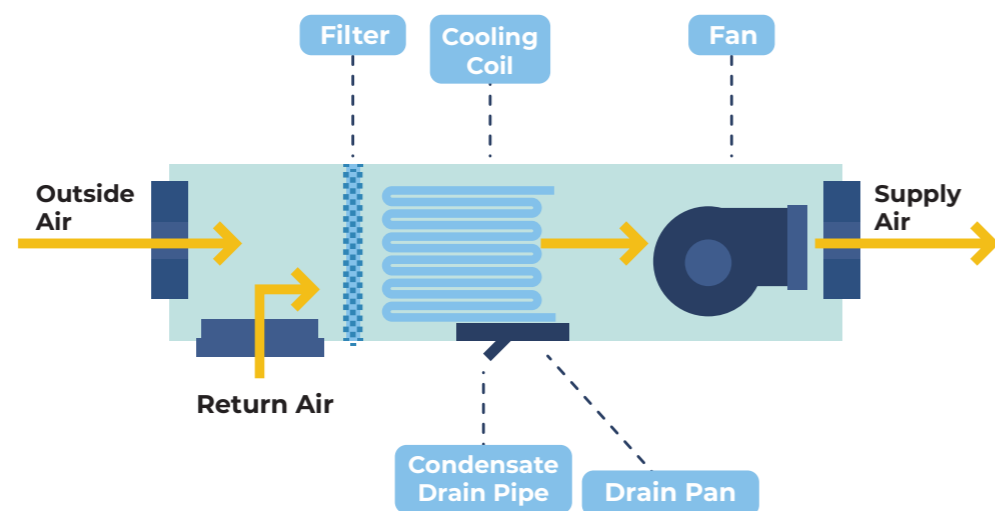
Essentials of a rainwater harvesting system



Air Conditioning Condensate Reuse

The condensate collected from air conditioning systems can be reused for **non-potable areas** such as cooling tower makeup, irrigation, water features, process cooling water, and even for toilet flushing. Reusing condensate water is recommended as it is generally cold with low dissolved mineral content, making it suitable for various non-potable purposes.

In a commercial building, the standard air conditioning system includes **air-handling units (AHUs)** that distribute air to indoor spaces as part of an HVAC system to maintain comfort. The air passes through a cooling coil in the AHU, reducing its temperature and removing humidity from both outside and return air as condensate. This condensate is typically collected in internal cooling coil drain pans and then discharged by gravity to outside drain pipes. It can be collected and reused at different locations within the building.



Support for Your Business

Tourism Sustainability Programme

To strengthen the tourism sector's foundation in sustainability, the Tourism Sustainability Programme (TSP) was developed to support tourism businesses' sustainability journeys at all stages of development, equipping you to build your workforce capabilities and develop innovative solutions.

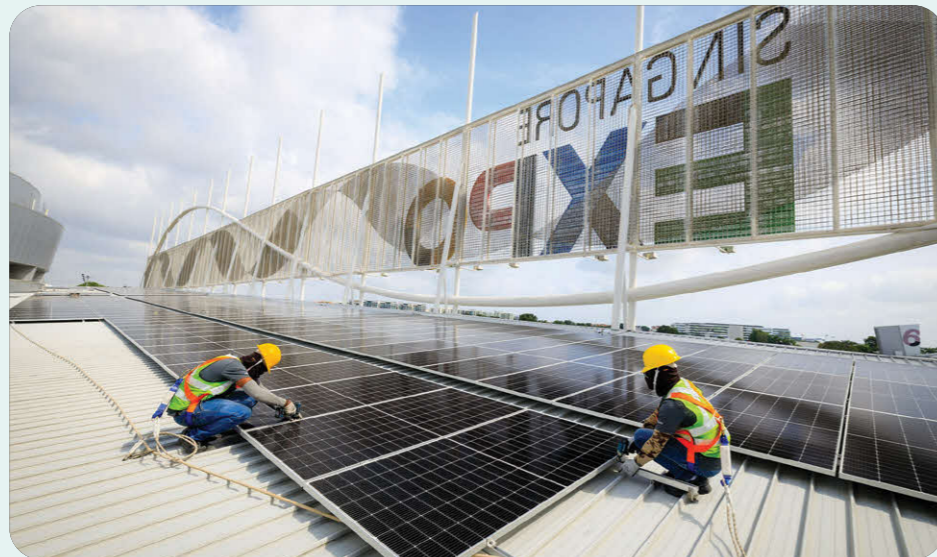
Category	Resource
<p>Energy Conservation</p>	<p>Green Mark Incentive Scheme for Existing Buildings 2.0 (GMIS-EB 2.0) Building & Construction Authority (BCA)</p> <p>Supports building owners to improve the energy efficiency of their buildings. Building owners can receive funding support based on the Green Mark certification rating and carbon emissions reduction achieved through retrofitting. For example, retrofits to cooling systems and redesigning spaces to incorporate natural ventilation or hybrid cooling may qualify.</p> <p>Click here to find out more</p>
<p>Waste Management</p>	<p>3R Fund National Environment Agency (NEA)</p> <p>Supports any organisation in Singapore with projects that aim to increase quantity of solid waste recycled or reduce quantity of solid waste generated. For example, projects to redesign packaging or products and install new waste recycling infrastructure may qualify.</p> <p>Click here to find out more</p>
<p>Water Conservation</p>	<p>Water Efficiency Fund (WEF) Public Utilities Board (PUB)</p> <p>The funding categories cater to a wide spectrum of needs, from companies seeking to conduct water efficiency assessments and identify improvement opportunities, to those exploring the feasibility of recycling projects, and even those ready to implement recycling initiatives or adopt water efficient equipment.</p> <p>Click here to find out more</p>
<p>Green and Sustainable Financing</p>	<p>Green and Sustainability-linked Loan Grant Scheme (SLGS) Monetary Authority of Singapore (MAS)</p> <p>The scheme supports businesses of all sizes to obtain green and sustainable financing by defraying the expenses of engaging independent sustainability advisory and assessment service providers which are required to validate the green and sustainability credentials of the loan. This could include activities such as setting sustainability performance targets (SPTs) for sustainability-linked loans, external review to demonstrate alignment of the loan with internationally recognised green/sustainability-linked loan principles, and external review to verify attainment of SPTs etc.</p> <p>Click here to find out more</p>

For more schemes to support decarbonisation efforts, refer to the [Tourism Sustainability Programme](#).

Case Studies



Harnessing the Power of Green Energy



Singapore EXPO is dedicated to meeting its energy needs while minimising its impact on the environment. In 2023, the venue implemented Singapore's largest **single-site solar rooftop installation**, covering an estimated area equivalent to 6.5 football fields. This impressive installation comprises 16,508 solar panels that harness the sun's energy to power the venue's operations.

The solar panels not only provide energy for the venue's operations but also support 20 electric vehicle (EV) chargers, making Singapore EXPO the largest EV Charging Hub in Eastern Singapore. Partnering with Shell, the venue ensures that these chargers are powered by the solar energy generated by the rooftop panels, effectively harnessing the sun's energy to power visitors' cars.

This green energy initiative is projected to generate enough clean, renewable energy to power 4,000 3-room apartments for an entire year. By embracing green energy, Singapore EXPO significantly reduces CO2 emissions, equivalent to the environmental impact of 500 round trips between Singapore and New York.



Water Conservation

Resorts World Sentosa (RWS) demonstrates a commitment to **sustainable water management**, with 49% of its water consumption being drawn from alternative sources such as rainwater, reclaimed water, seawater, and NEWater. Rainwater is harvested in RWS' lagoons and swimming pools for irrigation, while seawater is processed for the S.E.A. Aquarium's life support system for marine animals.

Additionally, NEWater is utilised for the district cooling plant in RWS and the chiller plant for Genting Hotel Jurong. The implementation of a water reclamation system for the district cooling plant has enabled RWS to recycle and reuse the cooling tower blowdown, resulting in a nearly 5% reduction in NEWater usage. RWS has also achieved WEB certification by PUB, with the majority of its water fixtures being water-efficient. Furthermore, a co-funded water audit conducted by PUB has identified additional water conservation opportunities, including the installation of meters for better tracking and the implementation of more water-efficient fixtures.



Sustainable Waste Management

Marina Bay Sands has implemented a **comprehensive waste collection and recycling programme**, with dedicated multi-stream recycling bins strategically placed around Sands Expo & Convention Centre to encourage waste segregation. The resort actively seeks opportunities to eliminate unnecessary packaging and materials, and has provided over a hundred elegant water filters at the convention centre to reduce bottle consumption and waste footprint at events.

In terms of food waste management:



Marina Bay Sands has installed **five aerobic digesters** on site to transform food waste into residual material.



The resort also collaborates with contemporary artisans to create new products from **imaginative circular materials**, showcasing its commitment to sustainable waste management.



Additionally, Marina Bay Sands has established a close partnership with the Food Bank Singapore to **donate unserved, safe food** to vulnerable communities, with over 30,000kg of food donated to their network of over 370 charities since 2016.

