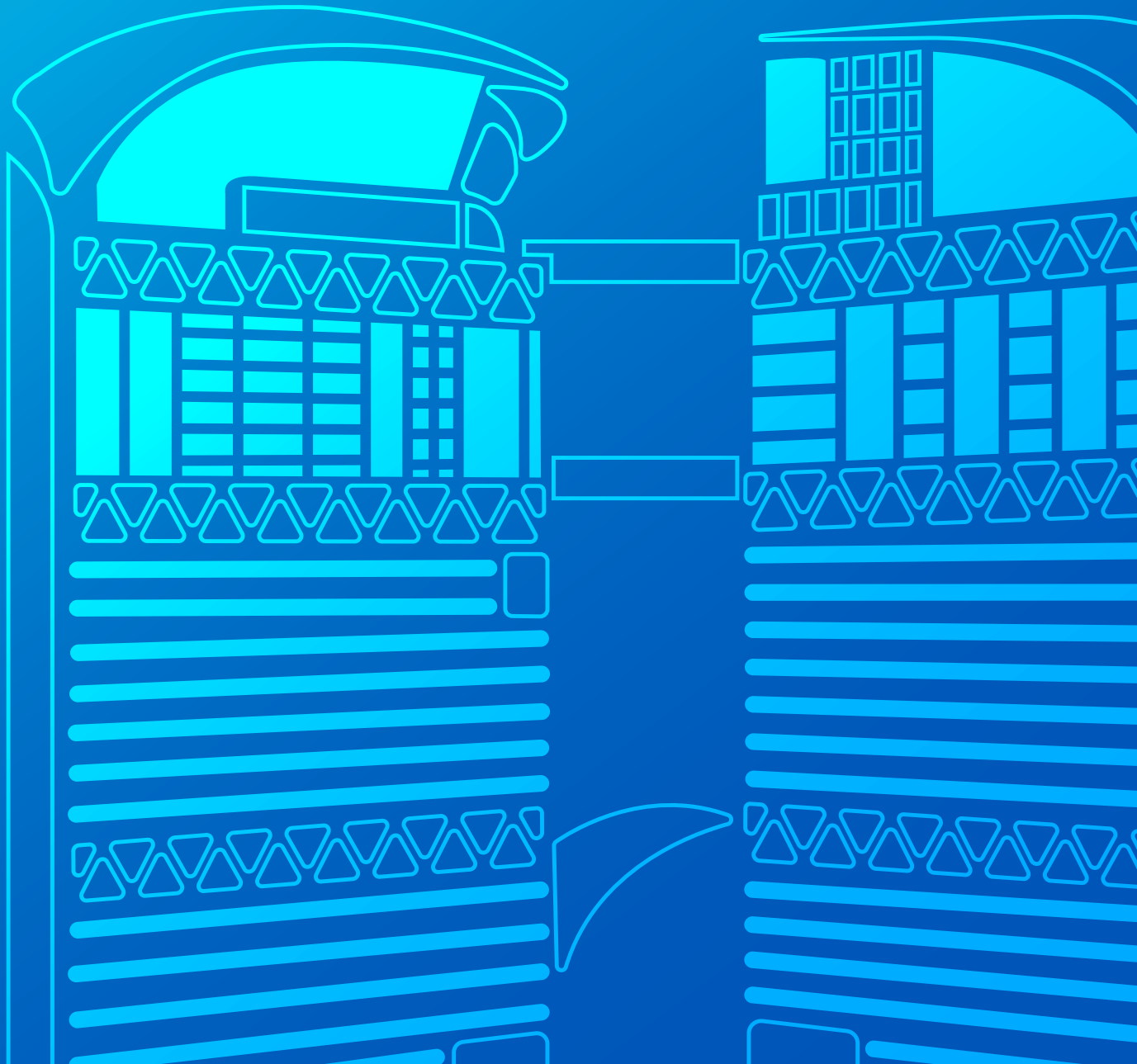




BUILDING INDUSTRIES

SUSTAINABILITY REPORT

JTC FY2022



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CEO's Message

GRI 2-22



Tan Boon Khai, Chief Executive Officer, JTC

Last year, JTC published our first Sustainability Report to demonstrate our commitment to sustainability. We aim to integrate sustainability into all aspects of our work, from master planning to operations. Progress does not happen overnight, but I am pleased to report that JTC continues to prioritise sustainability in our planning, development, construction, and operations. This report presents JTC's sustainability commitment, management approach, and performance summary for FY2022. We reaffirm the importance of sustainability to JTC, our vision and mission, and our alignment with the Singapore government's sustainability goals, such as the targets laid out in the GreenGov.SG initiative.

As I write this message, the world is gathering in Dubai for COP28 to take concrete actions to tackle sustainability issues at a critical time when we are witnessing an inflection point in climate change. Extreme weather conditions are becoming more frequent, and conflicts as well as challenging economic conditions are putting pressure on many previously pledged sustainability commitments. Despite these challenges, we cannot give up on our mission to create a greener future. While Singapore may be a small player in the global ecosystem of sustainability initiatives, every effort counts. At JTC, we will continue to do our part to reshape the sustainability strategy in Singapore's industrial real estate sector, and drive sustainable innovation.

In this report, we invite you to discover the various initiatives that JTC has undertaken, such as the establishment of a refreshed Sustainability Committee that adopts a more holistic Environmental, Social and Governance approach, moving beyond just focusing on environmental concerns. We are also exploring ways to "recycle" Singapore's industrial real estate sector, with a particular focus on adaptive reuse. This approach emphasises the environmental benefits of estate and building rejuvenation, while addressing the challenges of quantifying and assessing these benefits.

As JTC strives towards achieving Net Zero, we appreciate the commitment of all our partners and stakeholders who are with us on this journey. We are encouraged by the collective efforts we see, and look forward to furthering sustainability-centric collaborations with everyone.

We hope you enjoy JTC's FY2022 Sustainability Report.

A handwritten signature in black ink, reading "Tan Boon Khai". The signature is stylized and fluid, with a large initial 'T' and 'B'.

Mr Tan Boon Khai
Chief Executive Officer
JTC



Jurong Island Pond

About This Report

GRI 2-2, 2-3, 2-4, 2-5

This annual Sustainability Report for Financial Year (FY) 2022 covers our sustainability commitments, material topics, management approaches, and performance summary for the period of 1 April 2022 to 31 March 2023. Through this report, JTC Corporation (JTC) aims to communicate our sustainability practices in a transparent and accountable manner while seeking feedback from our partners, stakeholders, and the community at large.

Standard Implemented

The report has been prepared in accordance with the Global Reporting Initiative (GRI) Standards 2021, which is one of the most widely used sustainability reporting frameworks both globally and locally.

Reporting Scope

This report covers the performance of all JTC's operations in Singapore excluding our subsidiaries'.

Feedback Mechanism

We welcome enquiries and feedback for improvement. For queries about the contents of this report, please contact us via [this link](#).

Assurance

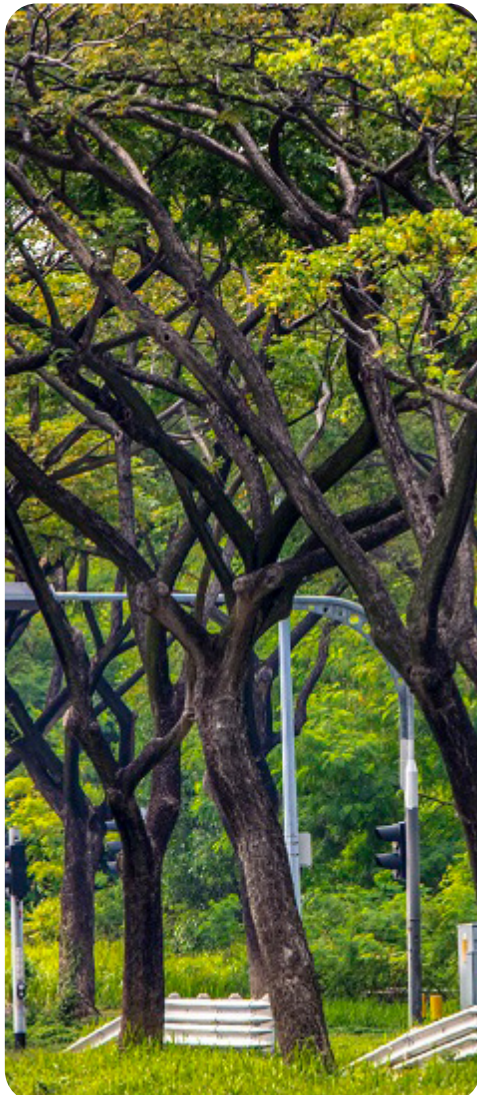
This report has undergone rigorous internal review. While the information was reviewed by an external sustainability consultant to ensure compliance with the GRI Standards, we have not sought external assurance for the reporting period.

Our Key Achievements for FY2022

Allocated **135.6 megawatt-peak (MWp)** of solar projects as of the end of FY2022



Planted **34,000 trees** on Jurong Island, bringing the total population to 44,000, up from 10,000 in 2019



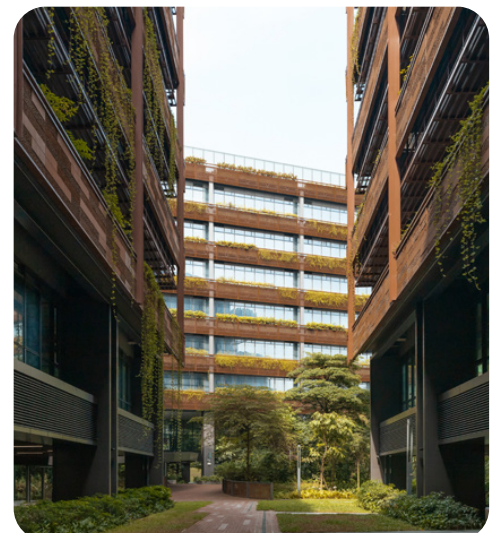
Approximately **56%** of JTC's building spaces are certified Green Mark (GM) or above as of the end of FY2022



Certified **Eco-Office Elite** in FY2022



Made Ministry of Sustainability and the Environment's (MSE) **Green Nation Pledge (Champion)**



Developing Our Sustainability Roadmap

The success of any endeavour relies on a well-thought-out plan. JTC has crafted a sustainability roadmap that clearly defines key roles and strategies as well as aligns our objectives with international standards. The roadmap is continuously refined to keep pace with changing needs.



Organisation Overview

GRI 2-1, 2-6

JTC is a Singapore government agency under the Ministry of Trade and Industry (MTI) that is responsible for planning, developing, and managing industrial infrastructure and facilities in Singapore. Since our inception in 1968, JTC has journeyed with the nation through numerous industrial transformations, pivoting to meet evolving needs and propelling its economic growth by developing business estates hallmarked by modernity, vibrancy and hospitality.

Our business chain comprises various upstream and downstream entities such as government agencies, non-governmental organisations (NGOs), contractors, suppliers, tenants, lessees, and other service providers. By forming meaningful collaborations with these entities, we can better support the planning, development, and management of Singapore’s industrial infrastructures and facilities. Innovation is at the forefront of our mind, as it has the potential to multiply our industries’ competitiveness. As such, we undertake strategic initiatives to accelerate the growth of emerging industries, facilitate technology adoption, and nurture collaborative ecosystems.

At the heart of our operations lies a commitment to sustainability. Guided by our sustainability vision and mission, and harnessing our role as a master planner and developer, we aim to inculcate a green culture in Singapore’s industrial sector.



Figure 1: JTC’s Sustainability Vision and Missions

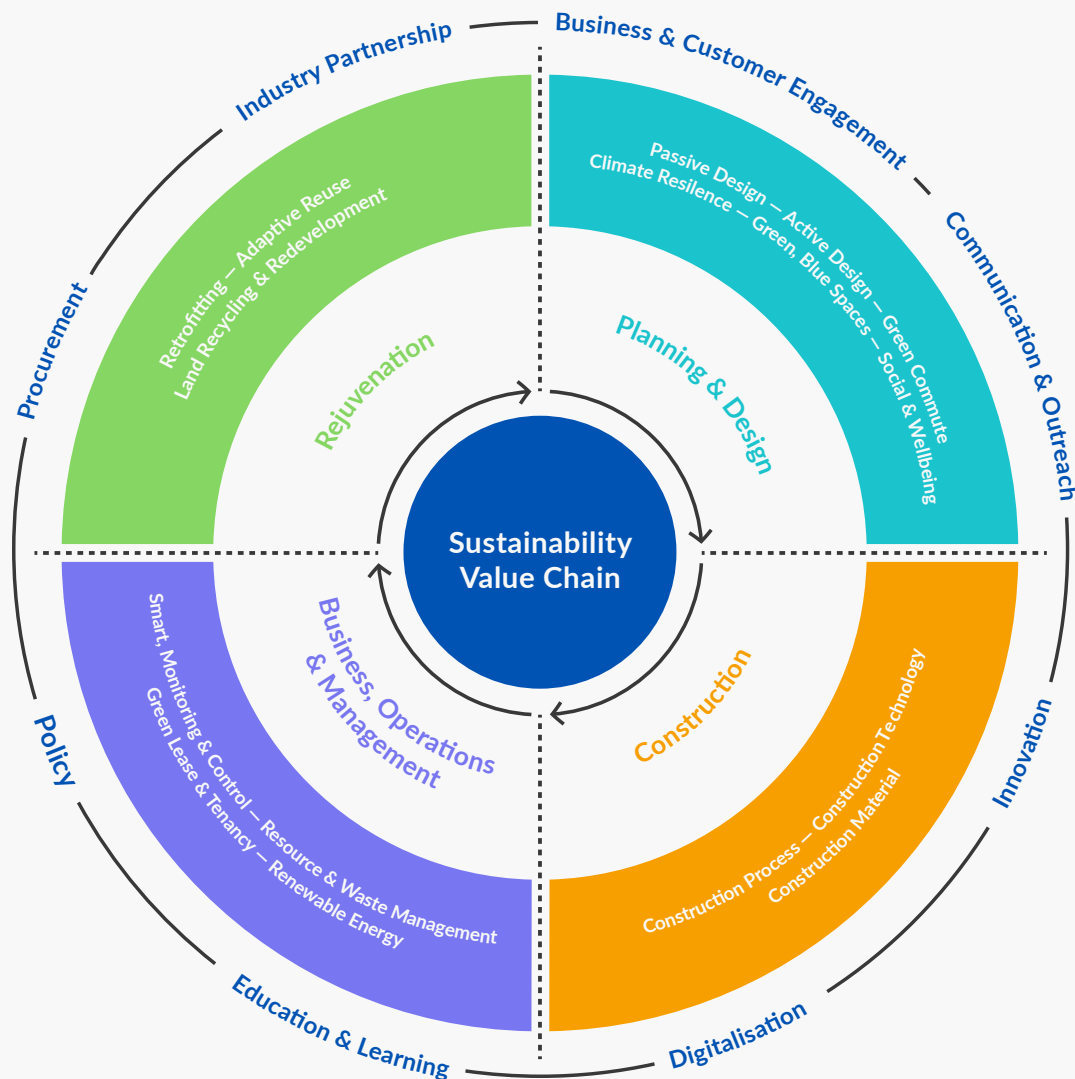


Figure 2: JTC's Wheel of Sustainability

Sustainability Governance Structure and Framework

GRI 2-9, 2-10, 2-11, 2-12, 2-13, 2-15, 2-17, 3-2

In 2019, JTC established the Environmental Sustainability Committee (ESC) that sets corporate sustainability directions, oversees the implementation of green initiatives, and ensures that our operations are aligned with sustainability targets.

In 2021, we have rebranded the ESC as Sustainability Committee (SC) to cover the key areas of Environmental, Social and Governance (ESG). Four key focus areas identified were: planning and design, sustainable construction, operation optimisation, and rejuvenation. The four critical areas of our sustainability framework are supported by eight horizontal enablers to ensure our sustainability goals are achieved. These enablers include business and customer engagement, community and outreach, industry partnership, procurement, policy, education and learning, digitalisation, and innovation.

Chaired by the CEO and led by division directors, the SC comprises a diverse group of JTC leaders and officers with expertise in sustainability, architecture, engineering, facility management, policy, business, etc. The sustainability performance is also reported to the Board, which oversees and provides advisory to overall sustainability strategies.

Both SC and the Board play a vital role in our sustainability governance structure by identifying opportunities for improvement, setting sustainability targets, and monitoring progress towards our sustainability goals. In addition, when considering JTC's overarching business strategy,

direction, and operations, the Board committees place an emphasis on environmental and societal sustainability to ensure minimised impact on the environment and its people and stakeholders. Updates on the Board's decisions and direction are also tabled at the quarterly Board meetings so that the Board can manage JTC's impact on the economy, environment, and people. Knowledge sharing by other government agencies and overseas trips, including topics related to sustainability, would also be organised to advance the collective knowledge, skills, and experience of the Board. To ensure that the Board and our committees discharge their duties effectively, JTC selects and nominates our Board members in accordance with the standards expected of a Fifth Schedule Statutory Board. Furthermore, Board members are required to declare their interests that may conflict a subject and recuse themselves from discussion of the subject matter.

For more information on JTC's board members, governance structure, and financial performance in FY2022, please refer to our website [here](#) and Annual Report [here](#).



Figure 3: The structure of JTC's Sustainability Committee

Stakeholder Engagement and Material Topics

GRI 2-14, 2-29, 3-1, 3-2

Stakeholder engagement is the prelude to organisational success. And the trifecta for effective engagement is establishing robust rapport with interested parties, understanding their needs and expectations, and working together to achieve shared objectives. In view of this, JTC has identified key stakeholders based on their impact on our business and operations, and compiled a list of their ESG topics as well as concerns, so that we can address them timely and effectively.

Key Stakeholder Group	ESG Topics and Concerns Raised by Stakeholder Group	Forms of Engagement	Frequency
Employees	<ul style="list-style-type: none"> › Corporate direction › Upskilling and training › Working environment › Remuneration and employee benefits 	<ul style="list-style-type: none"> › Regular employee dialogue sessions with reporting officers › Regular appraisals for staff to identify training opportunities for career development › Regular reviews of remuneration, benefits and staff welfare policies › Environmental, health, and workplace-safety awareness activities › Trainings and leadership development programmes catered to the specific needs of different employee groups › Team building and recreational activities 	Bi-annual or as required
Customers	<ul style="list-style-type: none"> › Green building and resource efficiency › Quality and cost of facility/space › Customer satisfaction › Health and safety concerns 	<ul style="list-style-type: none"> › Regular discussions and feedback channels 	As required
Service Providers (e.g. contractors, consultants, suppliers, etc.)	<ul style="list-style-type: none"> › Legal compliance › Responsible sourcing › Green procurement practices › Health and safety concerns 	<ul style="list-style-type: none"> › Regular procurement guideline reviews › Regular discussions and feedback channels 	Monthly/quarterly meetings, or as required

Key Stakeholder Group	ESG Topics and Concerns Raised by Stakeholder Group	Forms of Engagement	Frequency
Industry Partners Academic and Research Institutes	<ul style="list-style-type: none"> › Sustainability innovations and collaborations › Sharing of industry best practices › Climate change and sustainability strategies 	<ul style="list-style-type: none"> › Senior management representation within industrial associations and national programmes 	Regular meetings, discussion forums, and periodic reviews of collaboration frameworks, as necessary
Government Agencies	<ul style="list-style-type: none"> › Climate change and greenhouse gas emissions › Resource management › Corporate governance › Cybersecurity 	<ul style="list-style-type: none"> › Active participation in external conferences, dialogues, and events across different industries › JTC Innovation Challenge 	Regular meetings, discussion forums, and periodic reviews of collaboration frameworks, as necessary
NGOs	<ul style="list-style-type: none"> › Greenery and biodiversity › Community engagement 		
Media	<ul style="list-style-type: none"> › Business impact on environment and society › Community engagement › Efficient use of public funds › Corporate directions 	<ul style="list-style-type: none"> › Organising and participating in conferences, meetings, and site visits › Media releases and interviews › Feedback channels › Staff involvement in community volunteering events › Community development initiatives 	Regular press releases as per communication plan
..... General Public and Community			Public engagement sessions as required

Based on these key topics and concerns, and following the GRI's reporting principles of stakeholder inclusiveness, materiality, and completeness, we identified a set of material topics that warrants our attention. Together with sustainability reporting consultants and experts, we conducted a yearly materiality review to determine the most important topics for JTC, and identified the United Nations' Sustainable Development Goals (SDGs) that are aligned with our material topics. As a result, we have streamlined our list of material topics to sharpen our focus, and removed those that are no longer applicable (e.g. infectious diseases). This report, as well as the material topics, has been reviewed by our senior management and acknowledged by selected Board members. We are prioritising these topics, engaging our stakeholders, progressively setting targets, and tracking the performances of these topics to ensure our own sustainable development is on the right track.

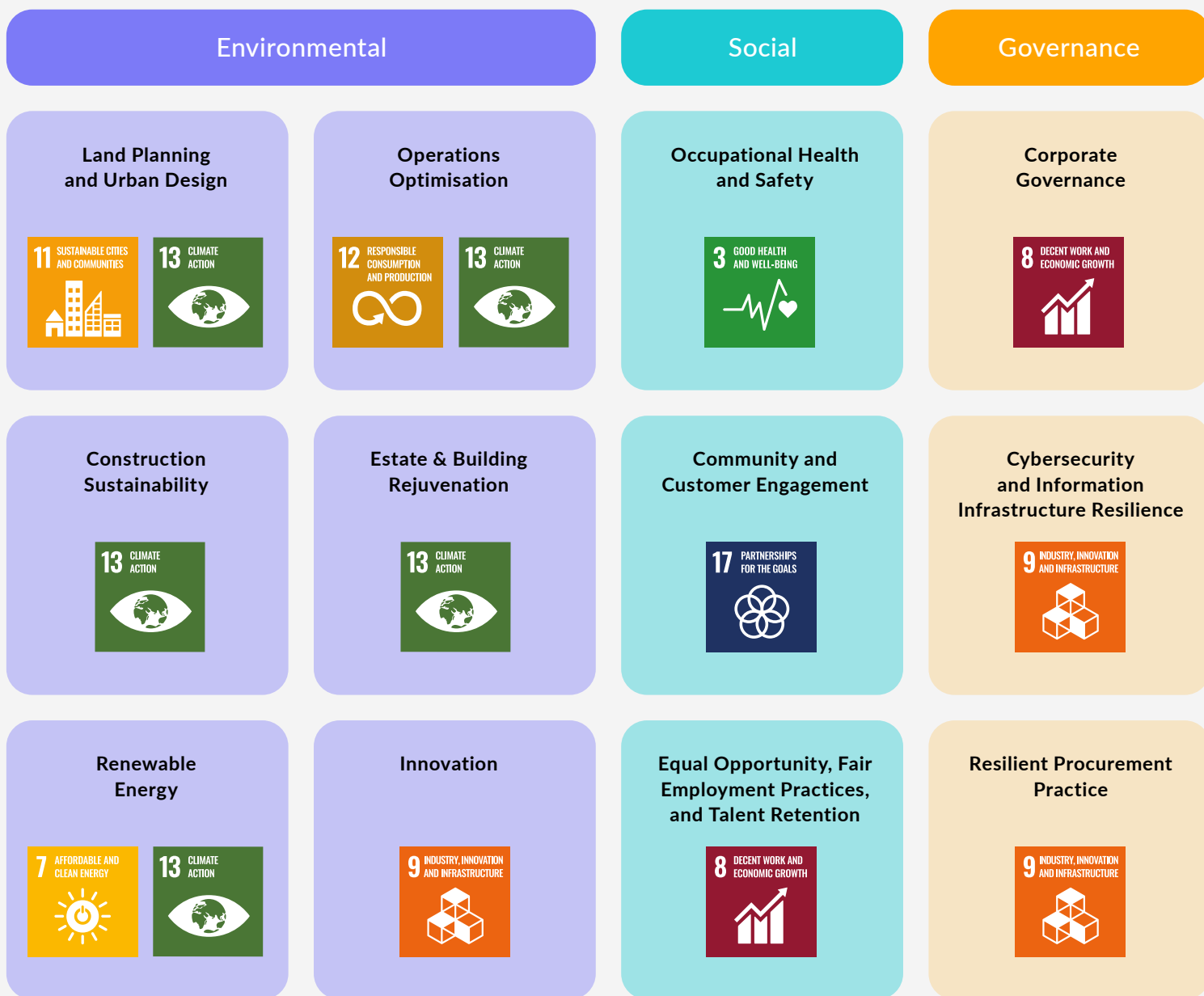


Figure 4: Material topics JTC will focus on

Our Bid to Nurture a Greener Future

When it comes to achieving our sustainability goals, we know that we cannot do it alone. In tandem with industry experts and government agencies, we have embarked on a plethora of endeavours, from complex research projects to the introduction of industry tools. The successful outcomes as well as buy-in from construction companies we have seen inspire us to do more in the years to come.




Sustainability by Land Planning and Urban Design

GRI 3-3

A Sustainability Mindset Right from the Get-go


Singapore Green Plan 2030's "City in Nature" pillar envisions a future where residents can enjoy a liveable, sustainable and climate-resilient Singapore. This pillar serves as an inspiration for us, and we too seek to infuse our business estates with sustainability-centric features that can promote the well-beings of both individuals and the environment.

Utilising comprehensive design strategies, JTC aims to vitalise our industrial estates and buildings, so that businesses can flourish, innovation can thrive, and collaboration can prosper. We proactively identify and capitalise on opportunities to adopt sustainability principles across the entire life cycles of our development projects. We focus our efforts in three key areas: estate design, infrastructure design, and building design.




Estate Design

- › Strategically shape the layout and functionality of our estates to optimise resource efficiency
- › Minimise environmental impact
- › Create dynamic spaces conducive to productivity and well-being



Infrastructure Design

- › Provide sustainable systems and services, such as energy-efficient utilities and smart transportation networks



Building Design

- › Prioritise use of sustainable construction materials, energy-efficient systems, and innovative architectural practices that promote environmental stewardship
- › Foster comfortable and inspiring spaces for occupants

Estate Design in Action: How We Develop Smart and Sustainable Districts

When launched, Jurong Innovation District (JID) and Punggol Digital District (PDD), touted as Singapore's next-generation industrial estates and business parks, will invite one to step into the future of smart living and working.

Vibrant and teeming with greenery, these new estates are places where one can work, live, relax and play. Besides exemplifying JTC's drive for digitalisation and environmental sustainability, they are also designed to support the national climate target of net-zero emissions by 2050.

Three key sustainability strategies are employed in the master planning of the two districts, as follows:

Improving Thermal Comfort and Encouraging Natural Ventilation

- › Wind and outdoor thermal comfort simulations are conducted to optimise the orientation and massing of developments

Ensuring Integration of Nature and Biodiversity Within the Estate

- › A minimum green cover target of 30% is set during the master planning of the estate
- › PDD aims to achieve a higher green cover of 40%

Incorporating of Green and Blue Spaces

- › More than 15 hectares of park spaces in JID
- › A 1-hectare retention pond at Jurong Eco-Garden
- › A 1-hectare detention pond at Bulim Park for sustainable urban drainage
- › Approximately 10,000 trees to be planted in JID

Collectively, these strategies will mitigate the anticipated Urban Heat Island (UHI) effects. Both estates are also served by District Cooling Systems, which centrally produce and distribute chilled water to provide air-conditioning to buildings. Benefits include improving energy efficiency as well as freeing up valuable roof spaces for potential solar deployment.



Heritage Trail at PDD: The old Punggol Road will be transformed into a 1.3km pathway that is a haven for nature enthusiasts.

Setting Our Sights on Green Mark

Across our projects, JTC has always strived to keep abreast of the standards stipulated in Building and Construction Authority's (BCA) Green Mark (GM) certification scheme, which evaluates a building's environmental impact and performance. For PDD and JID, we are pushing ourselves to attain high GM ratings for all building developments, including direct allocations and land launches. By aligning ourselves with national standards, we can then take a consistent approach towards achieving active and passive design outcomes, for instance, energy savings, thermal performance of building envelopes, and airtightness.

Furthermore, both estates will feature GM Super Low Energy (SLE) developments: Surbana Jurong Campus in JID, and Tower 4 in PDD.

Prioritising the Use of Low-carbon Materials

Our green sensibility follows through to the construction stage. We consciously opt for greener materials such as low-carbon concrete with ground granulated blast furnace slag (GGBS) mix, and electric arc furnace (EAF) steel. Additionally, embodied carbon studies are conducted to progressively benchmark the emissions for different industrial building typologies against BCA's baselines¹. The relative carbon footprints of concrete, steel and other building materials will be studied, in turn enabling us to formulate and refine our strategies to minimise emissions. This will allow PDD and JID, as well as other JTC estates and buildings, to achieve reductions in superstructure embodied carbon.

¹ Published under the BCA Green Mark Guide [here](#).

Making Buildings Smarter with AI and Machine Learning

When the districts are operational, facilities management of the buildings will be operationalised via artificial intelligence and machine learning (AIML), digital twin as well as command, control, and communication (C3) systems under JTC's Open Digital Platform (ODP). The ODP allows for dynamic responses that can optimise real-time behaviours of air-conditioning and mechanical ventilation (ACMV), lighting and lift systems. Furthermore, with streams of real-time data as well as diagnostics resources now at our fingertips, we will be able to implement a predictive maintenance programme that anticipates and prevents equipment faults as well as reduces energy wastage.



The structural beauty of the architectures within JID's Bulim Square is enlivened by trees and trellises.

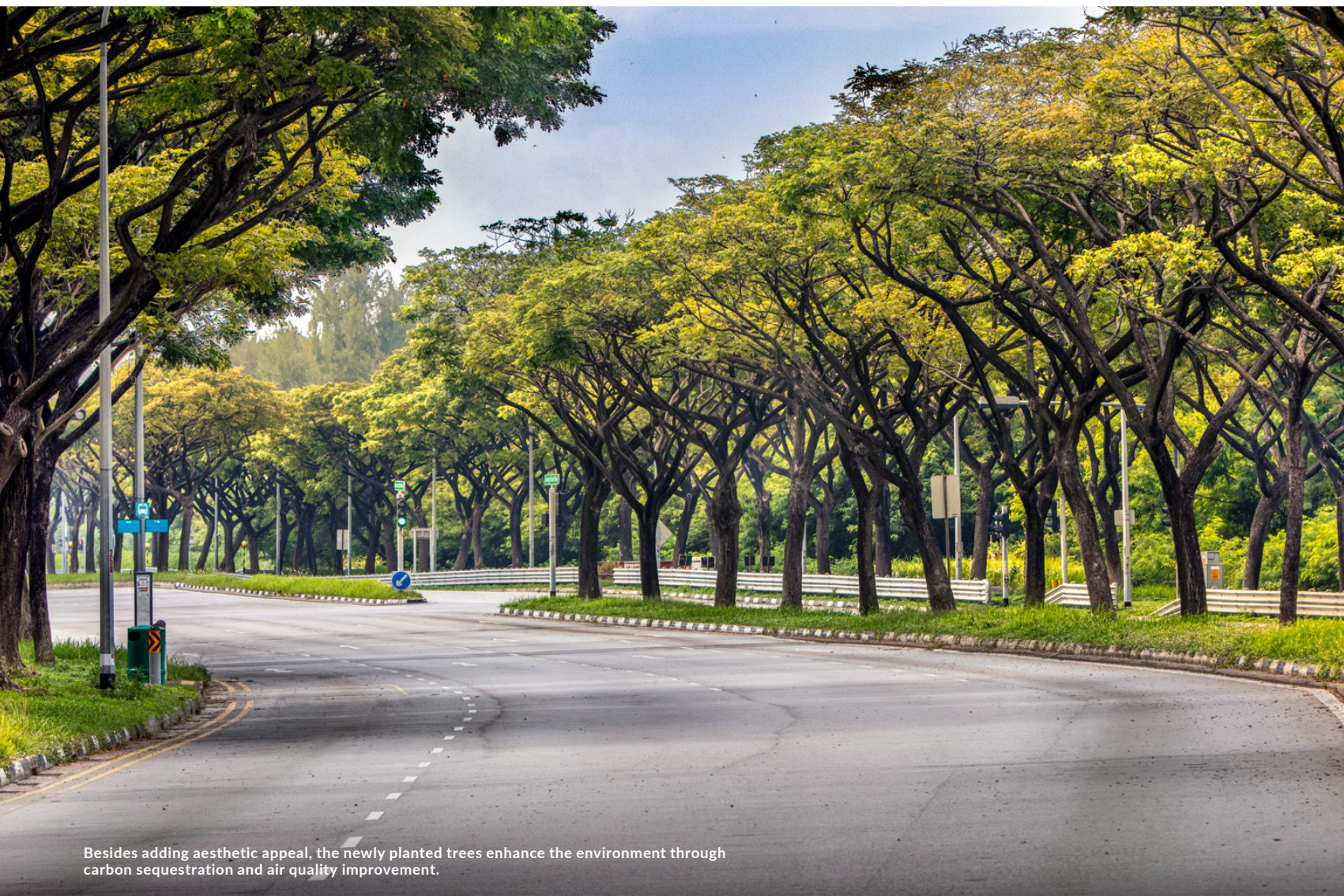
Beautifying Jurong Island with Thousands of Trees

It is not just our new estates that are getting a sustainability push – our existing estates are undergoing transformations as well. Jurong Island, for example, has undergone major greening works. The “Greening Jurong Island Masterplan” project, first announced by JTC and National Parks Board (NParks) in 2019 as part of the latter’s One Million Trees movement, has gained much traction.

Together with NParks, companies on Jurong Island and members of the Association of Process Industry (ASPRI), JTC completed the planting of 34,000 trees. This brings the total number of trees on the island to 44,000. The trees and flora on Jurong Island were specially selected to support biodiversity, providing habitats and enhancing ecological connectivity for butterflies and birds.

“As a leading energy and chemicals (E&C) hub, Jurong Island is at the epicentre of Singapore’s efforts to achieve its climate goals. We are pleased to work with companies on Jurong Island to capture opportunities to transform Jurong Island into a more sustainable E&C park, in line with the Singapore Green Plan 2030.”

Ms Cindy Koh
Director, Energy & Chemicals Cluster
JTC



Besides adding aesthetic appeal, the newly planted trees enhance the environment through carbon sequestration and air quality improvement.



The trees are planted in a multi-tiered manner to mimic the look of a forest. Additionally, this helps to reduce the UHI effect. Photo courtesy of NParks.



Over **80** new species of trees, chosen for their hardiness, drought tolerance, and ability to add shade, colour, and vibrancy



More than **70** companies contributed over **\$760,000** to the tree-planting initiative



The number of trees on the island has quadrupled to **44,000** in April 2023 from **10,000** in 2019

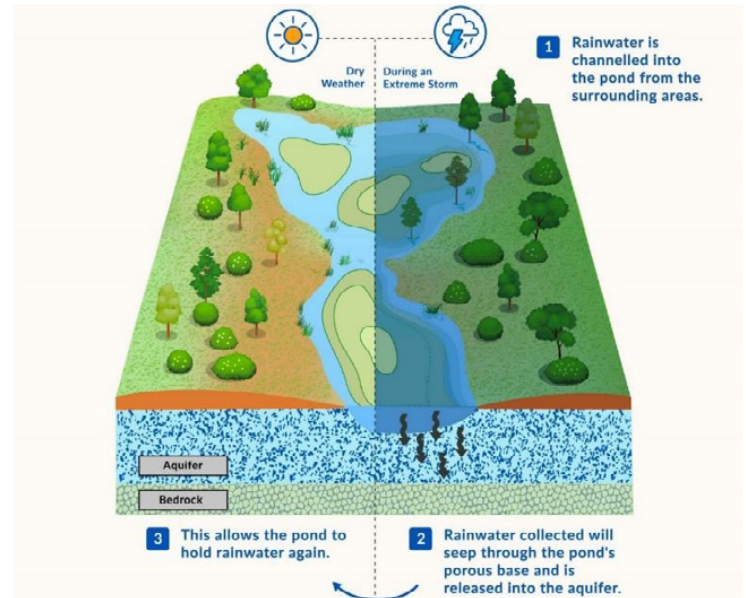
Jurong Island Pond: A Nature-Based Solution That Strengthens Flood Resilience

Jurong Island is home to critical infrastructures that underpin our energy security and economy. Within the island, there are several low-lying areas. To pre-empt future flooding risks brought on by climate change, from rising sea levels to intense and frequent storms, JTC conducted a trial to develop a nature-based solution that can effectively mitigate the risk of flooding on the island.

The result is a bio-retention pond that spans about 8.7 hectares (equivalent to 17 football fields), and is able to hold a design volume of up to 125,000m³ of rainwater. It makes use of existing sandy ground conditions to capture and dissipate rainfall runoff naturally into groundwater table.

To validate the pond’s flood mitigation performance and its long-term reliability as a climate adaptation measure, JTC is continuously monitoring the pond water level, groundwater level and impact of biodiversity on ground permeability.

Apart from flood mitigation, the biodiversity was also greatly enhanced in the vicinity of the pond, proving the possibility to co-locate biodiversity in harsh environments within Jurong Island. The planted trees at the pond can also create a carbon sink effect to absorb carbon emissions from the surrounding companies. This could potentially lower the island’s carbon footprint by 22.5 tonnes of carbon per year, contributing towards JTC’s long-term net zero emission goal.



The flood mitigation process cycle of Jurong Island Pond.



Since the initial planting of 1,500 trees and 25,000 shrubs around the pond, other types of flora have spontaneously started to grow as well.

Embracing the Alternative in Our Infrastructure Design

JTC’s infrastructure planning and design approach encompasses careful material selection, environmental design principles, and a comprehensive assessment of technical and socio-economic factors. These sustainability criteria are embedded in our Infrastructure Design Requirement (IDR), which guides a wide range of infrastructure projects.

From Waste to Treasure

In addition, JTC undertakes research projects with likeminded sustainability champions to explore the feasibility of using alternative fine aggregate materials in our concrete mixes. This is important, because Earth’s resources, such as natural sand, are precious and finite. Also, Singapore currently has to import these resources from neighbouring countries. Should the option of using alternative fine aggregates become viable, the collective construction industry can diversify its supply chain, and enhance its resiliency against unforeseen events such as price hikes or even export bans.

On this front, we have made significant headway. Comprising engineers and experts from JTC, NEA and Temasek Polytechnic (TP), a research team sought to turn recycled plastic waste – such as disposed bubble teacups, grocery bags and water bottles – into a fine aggregate alternative that can replace sand in concrete. After rounds of experimentation, they successfully developed a plastic-concrete formulation, replacing 20% of its sand volume with recycled plastic waste.



Each particle of the plastic waste (polypropylene) aggregate measures 2mm to 4mm, and is now a ready-to-use ingredient for the concrete mix.

Transforming Everyday Plastic Waste into Pellets



Figure 5: The process of turning plastic waste into an alternative fine aggregate

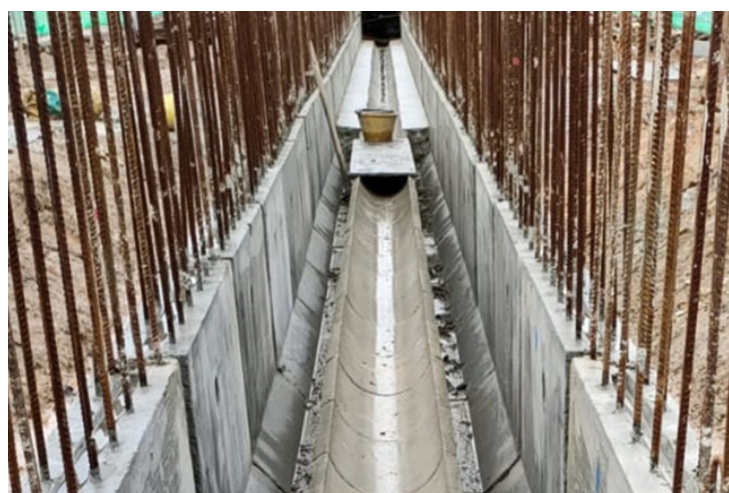


The process of mixing the plastic-concrete mix, and then forming, curing and testing the performances of the samples.

Based on the results of the laboratory tests, the team found that the physical and mechanical properties of the plastic-concrete mix are comparable with those of conventional concrete.

Once cured, this plastic-concrete formulation can be used to create non-structural elements such as road kerbs and drain channels. A pilot trial to install prototypes of road kerbs and drain channels in an actual construction site was conducted at an infrastructure project near Tuas Link MRT station, where JTC constructed a road, along with a roadside drain, sewer line, and footpath. The performances of the prototypes have been encouraging thus far.

JTC has also commissioned other collaborative projects to explore how we can give materials such as Municipal Solid Waste (MSW) slag a second life. The MSW slag has been used as an alternative fine aggregate in a concrete design mix, and the results have been optimistic.



Prototypes of the drain channels have been installed at a JTC construction project near Tuas Link MRT station.

Building Design: Reducing Resource Consumption

Sustainable building design plays a crucial role in reducing resource consumption while simultaneously enabling us to create higher-quality spaces for our customers. At JTC, our green building design approach focuses on minimising energy usage while also incorporating essential elements such as water conservation, material usage, and facility maintainability. These principles are encapsulated in our Building Design Requirement (BDR), which serves as a guiding framework for our projects.

To ensure that our developments meet stringent sustainability standards, we actively pursue green building certifications, such as Green Mark, for both new and existing buildings. We are pleased to update that as of the end of FY2022, 61.8% of JTC's total Gross Floor Area (GFA) are certified Green Mark or above.



For their efforts to turn recycled plastic waste into a sand substitute, the project team received an award from Minister-in-charge of the Public Service and Minister for Education Chan Chun Sing at the Public Service Science, Technology & Engineering (STE) Conference 2022. Photo courtesy of the Prime Minister's Office.

Construction Sustainability: From Design to Delivery

GRI 3-3, 301-1, 301-2

Lowering the Environmental Impact of Our Projects

At JTC, we recognise that sustainable construction practices can reduce greenhouse gas (GHG) emissions, improve air quality and reduce the risk of our workers contracting respiratory-related illnesses. Furthermore, we can reap cost savings through reduced energy, water consumption and increased efficiency.

As such, we aim to inspire the collective built environment sector to adopt greener and more sustainable construction practices. We have identified three key aspects that form the foundation of our sustainable construction approach. They are as shown in Figure 6.

We have also imposed strict requirements pertaining to the choice of building materials under our BDR, as shown below.



Figure 6: Three key aspects of JTC's sustainable construction approach

Green Building Material Policies

- Minimum Singapore Green Building Council-(SGBC) certified **4 Ticks** (for cast-in-situ) & **2 Ticks** (precast) for non-structural element
- Minimum **20%** (by mass) Recycled Concrete Aggregates (RCA) up to C40/50 replacement for superstructure element
- Minimum **10%** (by mass) Washed Copper Slag (WCS) replacement for superstructure element
- Minimum **30%** RCA used in sub-base and base course for internal non-suspended road (building) and road in infra projects

Green Building Material Usage for FY2022

Total Volume of Concrete: ~1,116,000m³	Total Volume of SGBC-certified Green Concrete used: ~691,000m³ (61.9%)
Total Tonnage of Steel Usage: ~209,000	Total Tonnage of Recycled Steel: ~101,000 (48.3%)
Total Tonnage of Aggregate: ~110,000	Total Tonnage of RCA: ~10,000 (9.1%)

Figure 7: JTC's strict requirements pertaining to the choice of building materials under our BDR. The material usage data is approximate and based on available information submitted by contractors

A Unified Industry Tool for Calculating Embodied Carbon

One industrywide problem that JTC is keenly invested in tackling is the lack of accounting for embodied carbon (EC). While there are extensive methods to account for operational carbon, accounting for EC remains a challenge due to the absence of a localised material carbon database.

On a global average, EC constitutes 30% of a building's GHG emissions², but in Singapore, that number can reach as high as 40% due to constant urban renewal. Unlike operational carbon, which can be lowered through implementing energy efficiency measures, embodied carbon is upfront and cannot be reduced over the course of a building's lifecycle. Hence, all our efforts to design an energy-efficient building would be negated if the significant impact of EC (out of total carbon) is not kept in check right off the bat.

To bridge this gap, JTC commissioned the National University of Singapore's (NUS) Energy Study Institute (ESI) to develop a unified Building Embodied Carbon Calculator (BECC) for local use. This was also done in collaboration with SGBC and BCA.

With this unified tool, industry players can make informed decisions on material and product selections to reduce the carbon footprints of the projects. It is the de facto embodied calculator to be used in conjunction with the Sustainable Construction section of the Code for Environmental Sustainability of Buildings (Edition 4.0), and the Green Mark 2021 Whole Life Carbon assessment.

The tool, which takes the form of a comprehensive spreadsheet, was officially launched in May 2022. It is already being used for the developmental cycles of JTC's own projects, including PDD and JID as well as other public sector projects.

Click the link [here](#) for more information about the embodied carbon calculator.

²Source [here](#).

What Is Embodied Carbon?

Embodied carbon consists of all the GHG emissions associated with the construction process, including extracting, transporting, manufacturing, and installing materials on site as well as operational and end-of-life emissions.

How the Building Embodied Carbon Calculator Works

- › Accounts for upfront carbon of materials (from raw material extraction to supply)
- › Practical completion (construction and installation)
- › Takes into consideration established building databases for 35 major building materials such as concrete, steel, glass, timber, aluminium, bricks, etc.
- › Adapted for local context using a developed classifier structure
- › Transportation distances for materials can also be entered

Embodied Carbon Benchmarking for Sound Decision Making


Currently, we are establishing the embodied carbon benchmark of JTC’s stock of standard industrial typologies with the Energy Research Institute @ Nanyang Technological University (ERI@N).


Once the quantified embodied carbon benchmark study is completed, JTC will be able to measure and track the amount of embodied carbon abated for our developments at every stage of the construction process. This will enable JTC to make informed decisions on the use of more sustainable materials, construction methodologies and even source for suppliers of lower-carbon materials who are located near Singapore (likewise for the Whole-Of-Government [WoG] and the built environment sector).


For reference, for five completed building typologies with a combined GFA of 360,000m², the estimated embodied carbon abated was 293,157tCO₂e as measured against BCA’s respective reference values for embodied carbon.

Digitising Our Project Management for Improved Productivity

Excellent project management is key to the success of any construction project. To that end, JTC has set up a common data environment for built environment (BE) project delivery called OPTIMUS (One Platform To Integrate Many User Systems). OPTIMUS digitalises various BE project processes, and centralises project activities and data within a common platform.

- 

100,000 files and documents
- 

More than 2,000 registered users
- 

100 onboarded projects

JTC is currently developing OPTIMUS v2.0 – the newer iteration further integrates with various in-house as well as external Software as a Service (SaaS) platforms to provide seamless information flow for project delivery. It will contain intuitive dashboards to provide project performance insights and data at different levels such as team, project, and portfolio of projects. OPTIMUS v2.0 also leverages Integrated Digital Delivery (IDD) and Building Information Modelling (BIM) to connect various upstream and downstream stakeholders, and harmonise different work processes, thereby reducing abortive work and wastage.



OPTIMUS v2.0
Introducing the next gen OPTIMUS v2.0 (O2), JTC's Connected Data Environment for construction project delivery.

BENEFITS YOU CAN EXPECT

- 

Streamlined Workflows
Improve work productivity! We have removed overlapping process steps. Supercharge your project delivery work with O2's streamlined digital workflows.
- 

Ease of Use
Elevate your user experience – no more waiting in long queues for assistance. Completing your project work is a breeze on mobile and desktop with O2's intuitive and user-friendly design.
- 

Clear Processes
Minimise compliance efforts – with no uncertainty on what to do next. With O2, tasks are now more transparent, so you can focus on what's necessary. See your latest project status and track your progress systematically.
- 

One Connected Platform
Transform your work - say goodbye to manual searches and data verification from multiple sources. With O2, access your project data all in one place.

OPTIMUS 

We encourage our project stakeholders to use OPTIMUS v2.0 and reap the benefits of going digital.



In what was a first for Singapore, two virtual TOP inspections successfully took place at JTC Logistics Hub @ Gul in April 2021 and JTC semiconSpace in Tampines Wafer Fab Park in September 2022.

Making Singapore’s First Virtual TOP Process a Reality

As proponents of technology, JTC believes innovative solutions can help us rethink the way we approach traditional and time-consuming workflows. Reality capture technology, for example, has reached a point where accurate and reliable 3D data (i.e. point cloud data³) can be produced. We saw an opportunity to harness this technology to design a virtual Temporary Occupation Permit (TOP) process, one that eliminates the need for physical inspection.


The new workflow allows a BCA inspector and the project team to access a project site virtually via the 360-degree photo platform. Measurements and close-up photos can be prepared ahead of time and uploaded to the 360-degree photo platform. Personnel can switch between inspection locations to check the measurements attached for regulatory compliance, and cross-reference them with the point cloud data, if necessary.

This process considerably cuts down the amount of time a physical TOP inspection would have otherwise taken. Furthermore, the evaluations of the BCA inspector are digitally recorded and tracked, along with details of the specific locations, thereby increasing accountability. A report will also be automatically generated for ease of reference and documentation. Comparisons before and after the follow-ups can also be traced through the platform.

The pilot has provided both JTC and BCA with valuable insights into developing an effective virtual TOP inspection. These case studies will serve as useful references for the industry to adopt virtual inspections in future.



Time and manpower savings of up to 30%



Less travelling to reduce carbon emission

³ Point cloud data is a collection of data points in a three-dimensional coordinate system. These points represent the external surface of objects or environments, and they are usually generated through technologies like laser scanning and LiDAR (Light Detection and Ranging). Each point in the point cloud is defined by its spatial coordinates (X, Y, and Z) and sometimes includes additional information like colour or intensity.

Operations Optimisation: Maximising Performance and Utilising Green Energy

GRI 3-3, 302-1, 303-1, 303-2, 303-3, 305-1, 305-2, 306-1, 306-2, 306-3, 306-4, 306-5

A Multipronged Approach to Green Our Operations

The industrial sector is the largest energy consumer in Singapore. This presents significant potential and many energy-saving opportunities for us to capitalise on. Recognising the importance of sustainable building operations, JTC proactively manages and minimises energy and water consumption, as well as waste generation within our buildings and estates. Furthermore, we also encourage our partners to adopt energy- and water-efficient equipment while highlighting the benefits of waste reduction practices in their operations.


GreenGov.SG: The Public Sector Leads the Way

Formerly known as the Public Sector Taking the Lead in Environmental Sustainability (PSTLES) initiative, the GreenGov.SG is a nationwide movement dedicated to advancing Singapore's sustainable development agenda. It calls upon the public sector to strive towards the goals of carbon abatement and resource efficiency, as well as assume the role of a positive enabler of green efforts. Under its Excel pillar, GreenGov.SG has set new and more ambitious targets for the public sector to attain. As a public agency, JTC is supportive of GreenGov.SG. Our FY2022 performance for environmental indicators is as follows:


To improve operational efficiency, we have identified a range of operations optimisation measures that will help us to reduce our energy and water consumption. By implementing these measures, we hope to achieve our targets while also improving the overall performances of our operations.



- › Our GHG emissions: Scope 1[^] approximately 6tCO₂e, Scope 2[#] approximately 50,500tCO₂e



- › Electricity Consumption: Approximately 121,000MWh*
- › Water Consumption: Approximately 925,600m³*



- › Green Space: Certified GM or above for approximately 56% of JTC's building spaces
- › Solar Capacity: Allocated total of 135.6MWp of solar projects

Our Operations Optimisation Measures

- › Installation of District Cooling Systems for suitable estates such as PDD
- › Efficient operations of chiller plants over and above BCA's Green Mark requirement
- › Optimisation of daylight design with perimeter zones controlled by sensors
- › LED lighting systems with smart sensors in common areas
- › Rainwater harvesting
- › Water fittings rated 3 ticks under the Water Efficiency Labelling and Standards (WELS)
- › Pneumatic waste management and food waste management systems

[^]This includes diesel consumption (approximately 1,000 litres / 0.04 TJ) from generator sets and petrol consumption (approximately 800 litres / 0.03 TJ) from JTC vehicles on leasing mode, and other fuel consumption from JTC's operations

^{*}Conversion factor used to convert fuel consumption into standardised unit of TJ: GHG Protocol Cross Sector Stationary Combustion Emission Factors

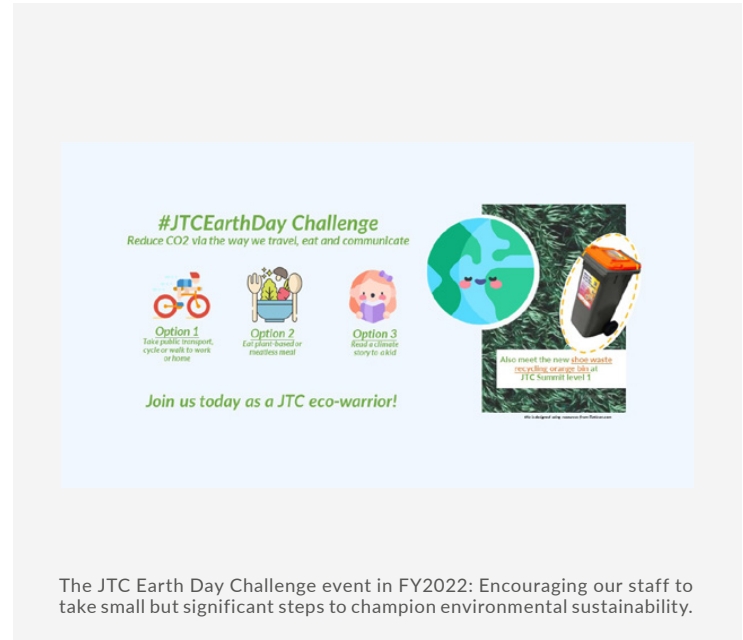
[#]Based on EMA's year 2022 grid emission factor of 0.4168 kg CO₂/kWh. [Here](#)

^{*}Based on energy and water consumption data extracted from GovTech Trusted Centre for sensor data platform

Eco-Office Certification: Sustainable Hardware Meets Passionate Heartware

Administered by Singapore Environment Council (SEC), the Eco-Office certification inspires organisations to embrace a low-carbon lifestyle, adopt a mindset of “one less” as well as adhere to responsible consumption practices. Since 2020, JTC has been certified an Eco-Office Champion, in recognition of our efforts to instil an eco-consciousness in our staff and implement effective environmentally friendly practices such as the reduction of paper, water, electricity usage.

However, we did not rest on our laurels. JTC has since implemented an enhanced green lease policy that outlines sustainability requirements for tenants and lessees. We also rolled out various improvement measures such as introducing additional waste recycling facilities, and organising events like the JTC Earth Day Challenge to raise sustainability awareness. Also, in FY2022, JTC underwent the Eco-Office recertification exercise, and achieved the highest tier of Eco-Office Elite.



The JTC Earth Day Challenge event in FY2022: Encouraging our staff to take small but significant steps to champion environmental sustainability.






JTC received the Eco-Office Elite award in FY2022.

Ushering in a New Era of Intelligent Building Automation and Analytics with Model Predictive Control

Technology, while a great multiplier of potential, is not without its limitations. Solutions become outdated and may not be able to address evolving needs. Take for example the building automation and control (BAC) systems that are used for the operational control and monitoring of modern buildings. Conventional BAC systems lack the level of intelligence needed to coordinate the control of complex building systems to achieve multiple targets such as energy efficiency and occupant well-being. Their limitations have often led to low-energy efficiency and unsatisfactory human comfort.

To overcome the limitations and bottlenecks, JTC proposed a Model Predictive Control (MPC) solution that employs a building model to perform optimal, predictive and coordinated control of various building service systems including ACMV, lighting, blinds and electrochromic windows, etc. The technology has been rolled out at the third level of Jurong Town Hall, which is occupied by Civil Service College (CSC). The site consists of learning zones, offices, makerspaces as well as open areas. The MPC system now provides coordinated control of different building services – including setting of room temperature, automated dimming as well as shading – all tailored to the unique needs of the different spaces.

Limitations of Conventional BAC Systems

-  Core control algorithm that performs in a reactive manner such as on/off control or proportional-integral-derivative (PID) control
-  Unable to achieve desired control targets in ACMV systems, as they rely on past measurement information
-  Incapable of coordinating multiple systems



The MPC was trialled at Jurong Town Hall.

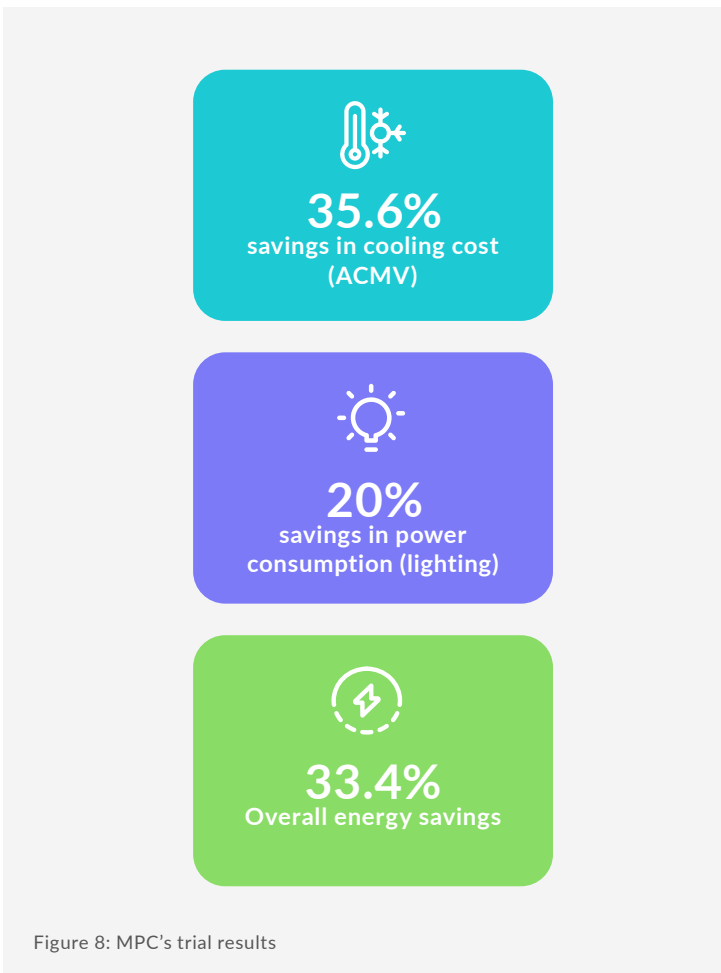


Figure 8: MPC's trial results

Green Nation Pledge: Being a Part of a Collective Push

The Green Nation Pledge, which was initiated as part of the “Forward Singapore” exercise, is led by the Ministry of Sustainability and the Environment (MSE). It aims to rally stakeholders from every segment of society to tackle climate change, balance trade-offs and explore priorities to realise the nation’s vision of a green, liveable, and climate-resilient Singapore. Under this exercise, the MSE calls for individuals, educational institutions, and organisations to make pledges corresponding to one of three tiers: “Contributor”, “Advocate”, or “Champion”.

JTC is proud to have made the Green Nation Pledge in February 2023, and be a “Champion” for environmental sustainability. This is a testament to our commitment to making a positive impact to our industrial estates and business parks.

JTC Pledges to Be a MSE Green Nation Pledge Champion

Examples of the pledged actions are:



Set air-con temperature to 25°C



Use energy-efficient appliances



Switch off appliances when not in use



No bottled water for meetings/events



Cease/reduce production and usage of single-use disposables



Publish a sustainability report



Start a sustainability initiative that helps other organisations/companies to move forward in their sustainability journeys

Reducing Waste Generation and Promoting Resource Circularity

According to National Environment Agency (NEA), Singapore generated some 7.39 million tonnes of solid waste in 2022, with non-domestic sectors (industries and commercial premises) accounting for 5.53 million tonnes, up from 2021’s number of 5.12 million tonnes. Seeing the urgent need to tackle waste generation, JTC works with service providers to collect and recycle waste according to the local laws and regulations. We have also have ramped up our efforts to minimise waste from our daily operations, and maximise circularity of resources across all JTC compounds. Furthermore, we have increased the quantity of recycled waste throughout all parts of our daily operations. Reducing and recycling waste will help to ensure that we can conserve our natural resources, mitigate environmental pollution, promote sustainable consumption, and prolong the lifespan of Pulau Semakau.

While we have become mindful of the way we dispose our everyday rubbish, many may not know that the improper discarding of our used electronics poses a huge environmental threat. This is because the items contain heavy metals and substances that may leach into our soils. To inculcate responsible electronic-waste (e-waste) disposal and recycling habits in our tenants, we have partnered solution providers to provide e-waste bins at some of our estates. Two types of e-waste recycling bins are now deployed at one-north. They can be found at Block 67 (near both lift lobbies) and Block 77 (opposite the letterbox) at LaunchPad, as well as Pixel.



The 3-in-1 e-waste bin allows tenants to recycle digital equipment, batteries, and bulbs while the 1,100-litre e-waste bin is used for the collection of fluorescent tubes.

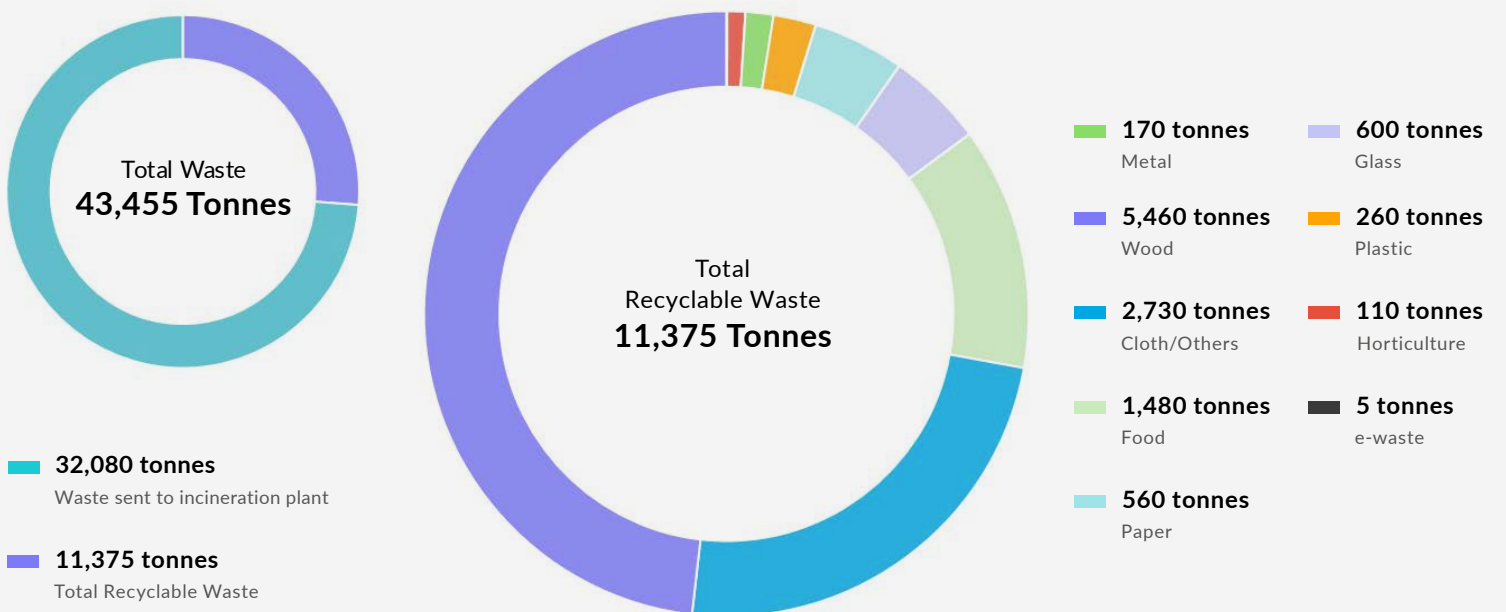


Figure 9: JTC’s waste recycling performance in FY2022
The waste data is approximate and based on available information submitted by contractors

Powering a Green Future by Embracing Renewable Energy

GRI 3-3

“Sunny Singapore” – that is one of the endearing nicknames our nation goes by. It is no surprise then that solar energy is one of our most reliable renewable energy sources. Under the Energy Reset pillar of Singapore Green Plan 2030, there is a goal to achieve at least two gigawatt-peak (GWp) of installed solar capacity by 2030, equivalent to meeting the yearly electricity needs of some 350,000 households.

Since 2017, JTC has been empowering our business community to generate renewable energy and contribute to Singapore’s solar capacity through our SolarRoof and SolarLand programmes. The two programmes open up available rooftops and temporary vacant industrial land for the purpose of solar panel installation.

With efforts well underway to make all feasible JTC buildings, vacant industrial land, and privately leased industrial properties available for solar panel installation, as well as deploy floating photovoltaic (PV) systems near Jurong Island, JTC could potentially contribute 1,250MWp of solar energy by 2030. This constitutes about 60% of Singapore’s 2030 target for total solar deployment.

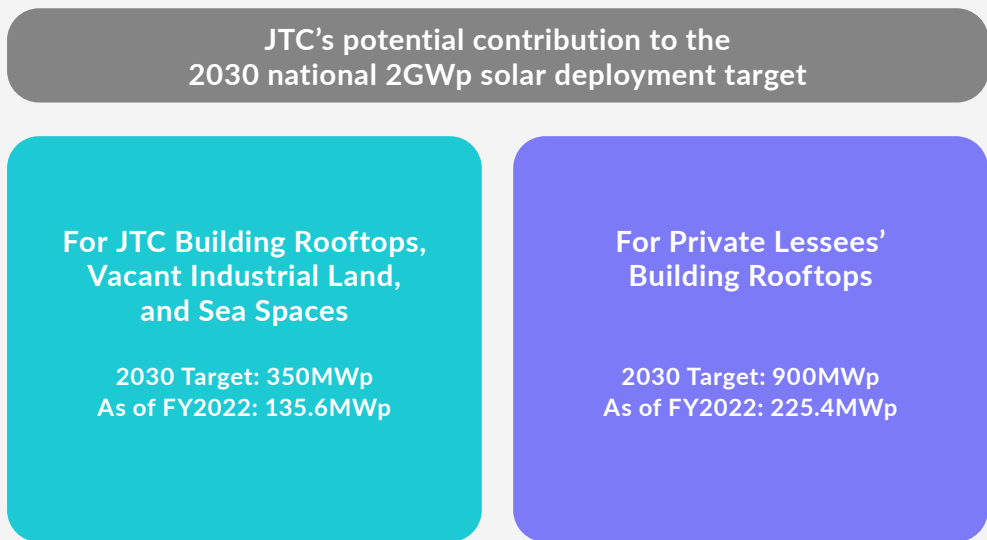


Figure 10: JTC's 2030 solar deployment targets



Under our agrivoltaics initiative, we explored the feasibility of cultivating plants such as pandan, Thai watercress and Brazilian spinach at the solar sites.

Our Projects Are Yielding Bright Outcomes

JTC awarded the SolarLand Phase 2 project at Changi Business Park to Terrenus Energy, which involved the deployment of solar technology on 11.6 hectares of JTC interim vacant land.

Testbeds have been set up at the ground-mounted solar farm to examine how solar PVs can take on dual purposes. These include one of the first installations of hydropanel technology, which harnesses solar power to convert water vapour into high-quality drinking water.

Agrivoltaics – which is the cultivation of agriculture on solar sites – is also one of SolarLand Phase 2’s key innovations. It utilises pockets of land underneath the solar panels to study the growth of several plants under shady conditions, and determines the potential implementations of solar urban farming initiatives in Singapore. It hopes to push the frontier of sustainable development, creating a possibility where solar panels and vegetation can coexist and thrive, thereby contributing towards energy and food security for the city-state.

Notwithstanding the agile solar deployment efforts, we observed that our tenants of land-based facilities have faced difficulties in installing solar panels on their own, considering their short tenures as opposed to the required long-term commitment of a typical 15- to 20-year contract. In order to



If successful, the hydropanel at Changi Business Park (CBP) could pave the way for more innovative uses to take root at our solar sites.

overcome this challenge and unlock the utilisation of roof space on currently tenanted land-based facilities, JTC has begun deploying solar panels on the rooftops of our tenanted land-based facilities since end 2022. As part of this initiative, JTC also provides incentives to the tenants in the form of a one-off rental rebate.

On 30 June 2022, JTC awarded the third phase of SolarRoof programme to two solar vendors: Terrenus Energy and Sembcorp Solar. Both vendors are required to supply, install and maintain the solar panels to be mounted on the rooftops of various JTC properties including land-based facilities, flatted factories, terrace workshops, and linkways.

Under this programme, JTC is also exploring an innovative scheme that sees the installation of an integrated system of solar PV panels and greeneries on the same rooftop spaces. This scheme will be piloted on the rooftops of three JTC buildings, namely AMK Tech II, Kranji Green, and Bedok Food City. Should this scheme prove to be successful, it can be scaled up in future to further enhance the capabilities of the renewable energy industry as well as minimise the issue of competing urban rooftop uses.

When the solar PV system is fully installed and energised, SolarRoof Phase 3 is slated to add at least another 11MWp of solar capacity to JTC's overall solar deployment.



JTC's SolarRoof Programme: Maximising vacant building rooftops for the purpose of generating solar power.



Spick and span: Robots are deployed to clean and maintain the surfaces of the solar PV panels, which in turn will ensure maximum project performance and energy output.

“We are ramping up solar capacity in our industrial estates as part of our efforts to operate more sustainably. With this new initiative, Jurong Island will be one of Singapore’s largest solar-generating estates. This supports our vision to transform Jurong Island as a sustainable E&C park as part of the Singapore Green Plan 2030.”

Mr Tan Chee Kiat
Chief Sustainability Officer
JTC

Expanding Solar Power Generation on Jurong Island

To further boost solar power generation in our industrial estates, JTC has launched a tender in December 2022 to solarise 60 hectares of interim vacant land and the rooftops of five JTC buildings on Jurong Island. This tender supports the Singapore Green Plan 2030’s ambition to transform Jurong Island into a sustainable E&C park.

8 FOLD increase in Jurong Island’s current capacity of 12.3MWp of solar power generated from rooftop installations

The tender is structured into three packages, as follows:

1 Land Licensing for 40 hectares of interim land with the option to deploy Virtual Power Plant (VPP) platform

2 Land Licensing for 20 hectares of interim land and Roof Top Licensing for Oasis @ Sakra and Pulau Damar Laut Checkpoint as well as option to solarise JTC properties at Jurong Rock Caverns, Ex- Chemical Process Technology Centre (CPTC), Jurong Island Checkpoint and dead sea spaces in Jurong Rock Caverns

3 Option to solarise on open drains and canals

To encourage solar adoption on the island, JTC has aggregated the solar demand of 12 Jurong Island companies interested in embarking on solarisation. The companies can tap JTC’s solar contracts to solarise their roofs and open car park spaces, and where feasible, with zero upfront capital outlay. They can do so by either leasing solar panels in return for the discounted electricity, or leasing roof or open car park spaces to solar vendors and generate revenue. Thanks to economies of scale from aggregating the island’s solar demand, Jurong Island companies will be able to enjoy more competitive rates.

Estate and Building Rejuvenation: Unveiling a New Look

GRI 3-3

In years to come, Singapore’s urban landscape will look very different. Attractive and positive work environments will no longer be concentrated in just the city centre. This is all part of the deliberate planning under Singapore’s decentralisation strategy, which aims to create job centres closer to homes, and outside of the central area. In line with this strategy, JTC is giving our mature industrial estates a makeover. In so doing, we ensure that all our industrial estates, not just our new ones, can continue to attract top talents as well as businesses of the future.

Such a rejuvenation exercise allows mature industrial estates to continue supporting existing businesses and their transformations, as well as address new challenges brought on by a fast-changing world. Urban rejuvenation is also timely as mature industrial estates are up for a much-needed upgrade. This upgrade will allow for the improvement of connectivity, injection of vibrancy through lifestyle facilities and activities, reintroduction of greenery and biodiversity into the urban fabric, as well as the creation of multi-generational and more inclusive features.



Figure 11: Desired outcomes of JTC’s rejuvenation and redevelopment plans for mature industrial estates

Sungei Kadut Eco-District: An Epicentre of Clean, Green Tech and High-value Jobs

Boasting over 60 years of history, Sungei Kadut Industrial Estate is one of Singapore’s first industrial estates, a home where the nation’s pioneers in the timber, furniture, construction and waste management industries got their humble starts. Over the decades, it has anchored the growth of Singapore’s manufacturing sector. In 2015, JTC identified the 500-hectare estate for land recovery and redevelopment, recognising its potential to catalyse economic restructuring.

JTC’s masterplan will breathe new life into Sungei Kadut, rebranding it as Sungei Kadut Eco-District (SKED), a pilot ecologically friendly industrial district in Singapore. The masterplan aims to rejuvenate this brownfield estate into an inclusive and vibrant mixed-use district that exemplifies the nation’s continuing pivot towards Industry 4.0 (I4.0) adoption, enhanced food security, and strengthened climate resilience.

SKED supports Singapore’s decentralisation strategy by providing a new and exciting employment centre, and showcasing new planning paradigms for manufacturing in the north region. The estate will also seed and spearhead the creation of a circular economy, and shape a more collaborative ecosystem that unites the varied lifestyle, agritech, environmental technology, and construction companies housed there.

The masterplan for SKED showcases a new urban planning paradigm that integrates industrial and non-industrial activities to serve both industrialists and surrounding communities. It includes the following key strategies:



Figure 12: Key planning strategies for SKED



A facelift: Sungei Kadut Eco-District will incorporate exciting green and lifestyle features while preserving heritage elements.



A rejuvenated Yishun Industrial Estate, as proposed by Arup Singapore.

Reimagining Singapore’s Industrial Landscape: Blue-sky Ideas for Rejuvenating Mature Estates

Besides SKED, the Yishun and Kallang-Kolam Ayer Industrial Estates were also identified as prime estates ideal for rejuvenation. Going about it differently, JTC launched a Request for Proposals (RFP) to solicit concept masterplans and design proposals from local and foreign design teams with expertise in master planning, urban design, and architecture.

The RFP consisted of a two-stage selection tender process. During Stage 1, seven teams were shortlisted across the two estates to enter Stage 2. A total of 26 submissions were received, and the shortlisted teams were selected based on their experience and proposed key value propositions for the two projects.

The RFP exercise concluded with a public exhibition held at the URA Centre as part of Archifest Singapore 2023. The exhibition showcased the proposals from all shortlisted and winning teams for both estates, with the aim of gathering suggestions and feedback from the public. For JTC, one critical criterion for any actual implementation plan is the ability of the estate to support the evolving needs of Singapore’s manufacturing sector. The feedback and suggestions will be reviewed and taken into consideration as planning agencies shape the redevelopment masterplans for the two as well as other mature industrial estates to be identified for redevelopment in future.



Broadway Malyan’s proposed concept of the new Kallang-Kolam Ayer Industrial Estate.

Innovation and Industry Partnership as Enablers

GRI 3-3

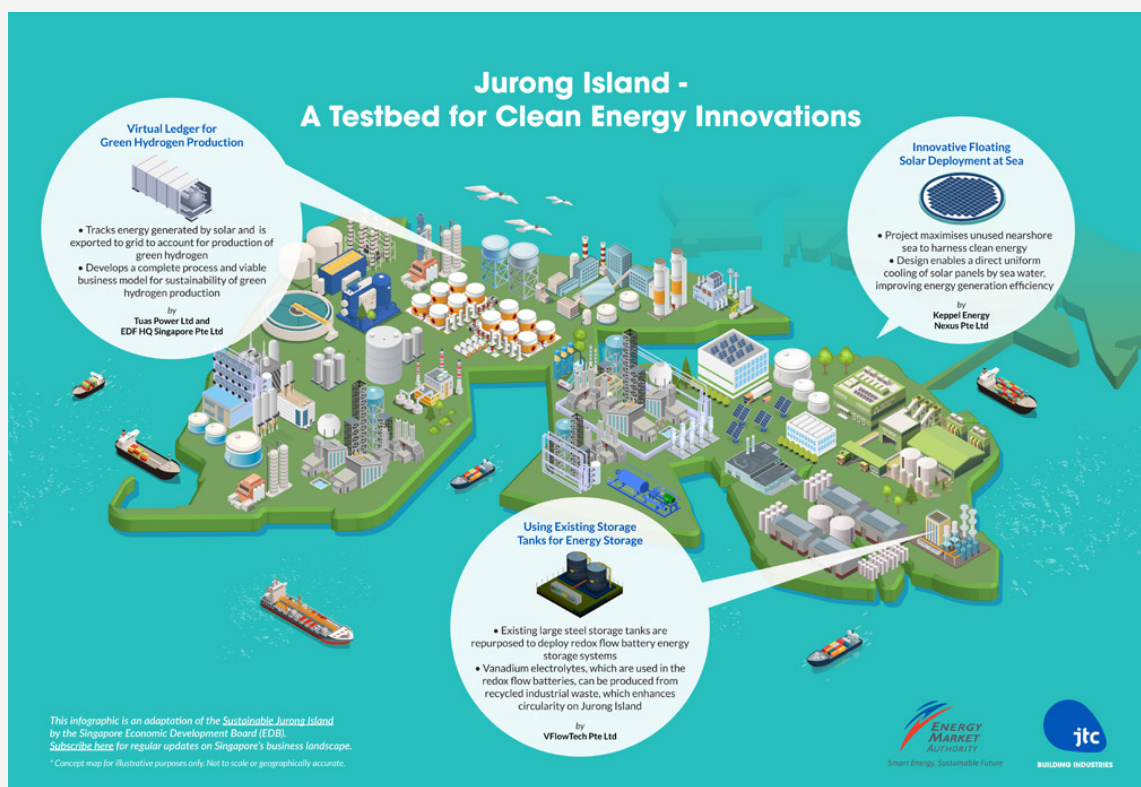
Cultivating a Symbiotic Relationship with Our Partners

Over the years, JTC has transcended our traditional role as an industry developer, and taken on the role of a collaborator. Buoyed by a diverse team with multifaceted expertise, JTC is able to lead as well as expand a wide range of sustainability initiatives. We actively uncover novel opportunities with our business partners and stakeholders, working together to co-create value for the industry. As our alliances blossom, we can continue to drive innovation, share expertise, and collectively address sustainability challenges in a synergistic manner.

Creative Minds Bring New Clean Energy Innovations to Jurong Island

Jointly launched by JTC and Energy Market Authority (EMA), the Jurong Island Renewable Energy Request for Proposal (JI RFP) brings together industry, academia and government agencies for the purpose of test-bedding and developing clean energy innovations for rollout on the island. This marks a positive step that benefits the various parties, as JI companies have gained access to promising solutions to address their challenges while local small and medium enterprises (SMEs) as well as startups can build their track records and strike up networking opportunities with giants within the renewable energy industry.

JTC and EMA have awarded three projects to local technology providers. If successful, these projects will bring about a complete process and business model to produce green hydrogen locally, store energy more efficiently, and generate more power compared with traditional "air-cooled" PV systems. These projects will also allow stakeholders to better understand the various aspects of green hydrogen production, from the economics involved to safety considerations, commercial viability to the latest technologies available. The awarded projects are currently in the development phase, and their testbeds are expected to be deployed in the first half of 2024.



The scopes of the three projects awarded under the JI RFP.

Green Compass™: Helping Companies Navigate Their Sustainability Transformations

While many local businesses are warming up to the idea of environmental sustainability transformation, they are often hindered by uncertainty and challenges when taking the first steps. In view of this, the Agency for Science, Technology and Research (A*STAR), JTC and TÜV SÜD in tandem developed the Green Compass™. This assessment and road mapping tool helps companies to manage their carbon emissions, energy, water, and waste impact, as well as chart roadmaps for environmental sustainability. Through the Learn-Assess-Prioritise-Plan model of Green Compass™, companies will acquire knowledge on sustainability trends and methodologies, and assess their current environmental sustainability levels.

Lending support are Enterprise Singapore (EnterpriseSG), Singapore Manufacturing Federation (SMF), Singapore Precision Engineering and Technology Association (SPETA) and Singapore Polytechnic (SP), which will promote the tool to their networks of contacts.



On 19 October 2022, the seven parties supporting the Green Compass™ initiative came together to sign a memorandum of understanding (MOU) at the Industrial Transformation Asia-Pacific (ITAP) 2022.

Empowering Our People and Upholding Accountability

Every project JTC undertakes requires the multi-faceted expertise of different stakeholders, from architects to project managers and migrant workers. That is why JTC strives to model a workplace where our people can work safely and pursue a rewarding career. As a statutory board, we also have in place stringent policies that our employees and partners must adhere to. Here is a look at our corporate social responsibility as well as governance measures.



Community and Customer Engagement

GRI 3-3

Building Communities We Want to Live in

At JTC, we uphold a strong commitment to making a positive impact on society through our Corporate Social Responsibility (CSR) initiatives. Our CSR committee has established the CSR framework, as shown below.

Guided by the four principles, we have established meaningful partnerships and collaboratively organised CSR events with charities such as MINDS Fernvale Garden, AWWA Senior Community Home, and Waterways Watch Society.

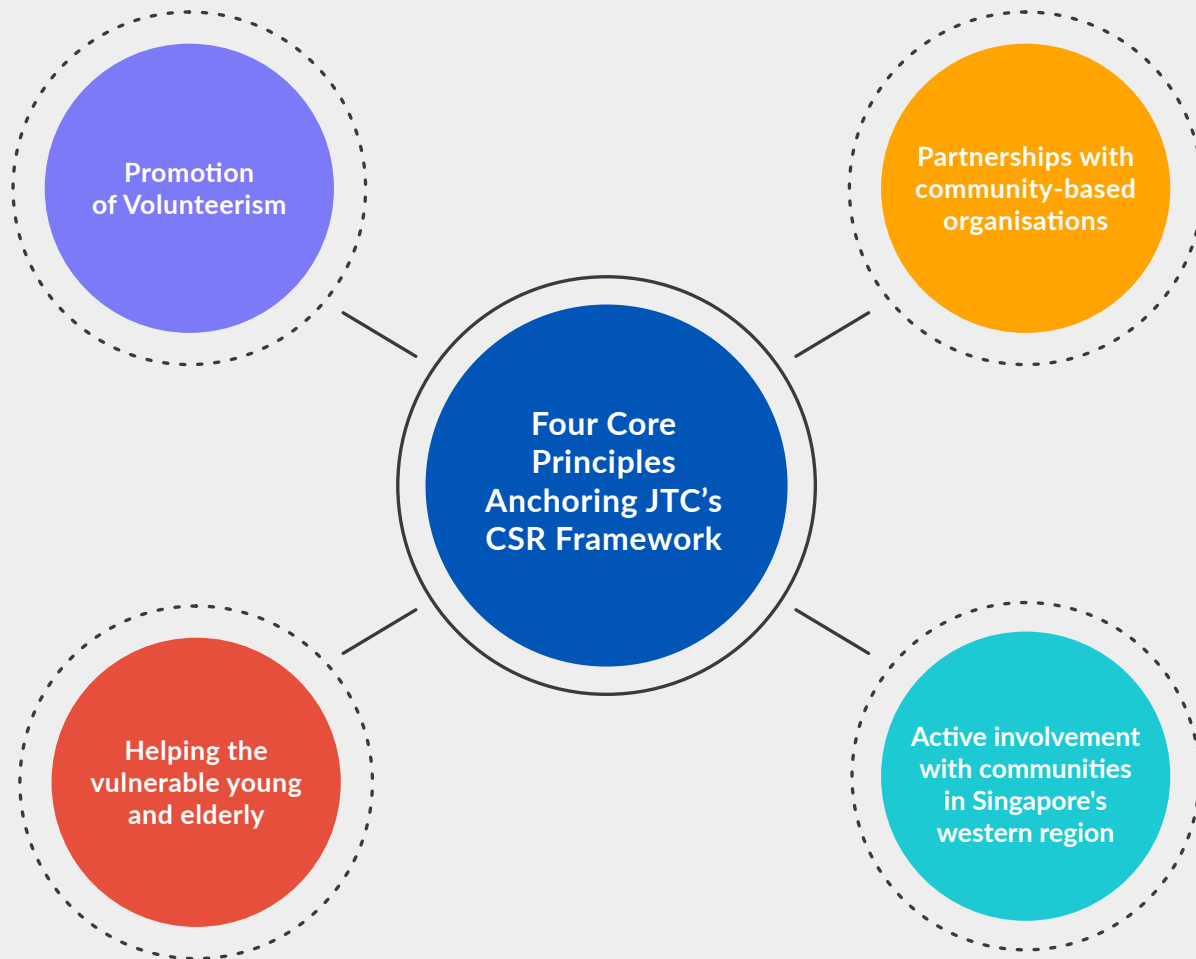


Figure 13: JTC's CSR framework



JTC volunteers were beaming during the CNY shopping trip and lunch initiative.

Providing Companionship to Seniors

Vulnerable seniors can feel particularly isolated during the festive period. To let them know they are not forgotten, JTC partnered AWWA Ltd to organise the annual Chinese New Year (CNY) shopping trip and lunch for vulnerably elderly living in the west of Singapore. This year, 46 JTC staff signed up to accompany 55 seniors for the shopping trip. We also collected more than \$4,119 from the CNY donation drive, which were distributed to the seniors in red packets and used to sponsor their buffet meals.

Fulfilling Wishes and Feeling Fulfilled

In December 2022, JTC partnered Southwest Community Development Council's Hong Kah North Division to organise the third instalment of the Grant-a-Wish Christmas party for underprivileged children in the Hong Kah North Zone. In total, 95 staff signed up to adopt a wish, one for each of 95 beneficiaries. Buoyed by the help of 55 staff members, JTC organised an event replete with fun games and activities, such as carnival booths, popcorn and candyfloss stations and ball pits to ensure that the children and their parents had a memorable time.



JTC volunteers coming together to make wishes come true.

Occupational Health, Safety, and Well-being

GRI 3-3, 403-1, 403-2, 403-3, 403-4, 403-5, 403-6, 403-7, 403-8, 403-9

Our Occupational Health & Safety Efforts: Putting Workers’ Welfare First

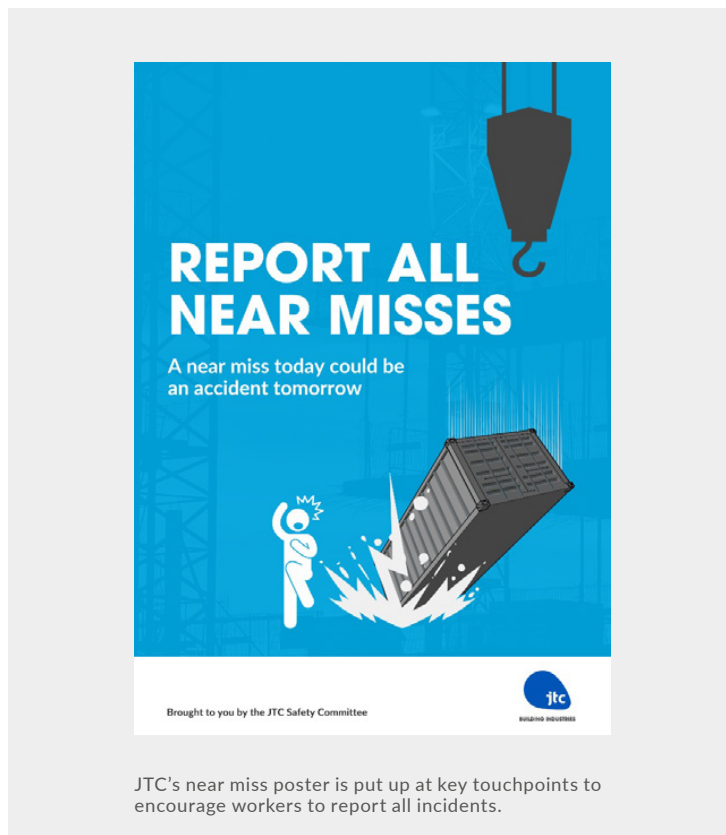
Established in 2006, JTC’s Workplace Safety and Health (WSH) Committee plays a crucial role in overseeing our Occupational Health and Safety (OHS) management system and policies for all employees and contractors. To uphold and enhance safety standards, our Workplace Safety Department (WSD) diligently monitors and updates the OHS management system across JTC worksites.

Recognising the valuable contributions of migrant workers, we collaborate with contractors and NGOs, including the Migrant Workers’ Centre (MWC), to explore ways we can prioritise their physical and mental well-being. Our rigorous vendor and contractor evaluation process includes assessing their safety records, and ensuring safety management systems are rolled out at their respective worksites. For all construction projects, we emphasise prompt reporting of near misses, incidents, and accidents, with a follow-up of thorough investigation and implementation of mitigation measures as outlined in the safety specifications.

Additionally, we conduct regular safety audits, and require contractors to submit workplace accident details for comprehensive monitoring and improvement. Enforcing safety measures can lead to increased productivity, reduced absenteeism, improved employee morale and reduced work-related injuries.

JTC takes OHS very seriously, and we have implemented a range of measures to promote a safe and healthy work environment. In addition to providing training and resources to employees, we have also conducted a series of events aimed at improving workplace OHS.

As part of JTC’s overall framework to improve the safety performances at our project sites, and to encourage safety ownership amongst all stakeholders, we conducted a project-wide engagement session with all stakeholders on the importance of near-miss reporting. A near miss is an unforeseen event that did not result in any injury, illness or damage, but had the potential to do so, such as slips, trips and narrow escapes. By making near-miss reporting a requisite, JTC aims to improve the overall workplace safety, instil a safety mindset in all workers, and encourage them to share their safety observations.



JTC’s near miss poster is put up at key touchpoints to encourage workers to report all incidents.

Work-related injuries reported by contractors in FY2022*

Number of work-related injuries (including first-aid cases)	39
Number of major injuries [#]	4
Number of fatal incidents	0

^{*}This information is obtained from our contractors and is dependent on their reporting accuracy
[#]Major Injuries refer to Non-Fatal but Severe Injuries, for example, amputation; blindness; deafness; paralysis; crushing, fractures and dislocations; head, back, chest and abdomen, neck, hip, and pelvis; exposure to electric currents; asphyxia or drowning; burns requiring more than 20 days of medical leave; concussion requiring more than 20 days of medical leave; mosquito-borne diseases requiring more than 20 days of medical leave; and virus outbreaks requiring more than 20 days of medical leave.



The JTC Annual Safety Seminar is one way we reach out to stakeholders and inspire them to embrace a Zero Harm mindset. The 2022 edition was themed "Target Zero: Towards Culture of Care".

Shaping a Zero Harm Culture in Singapore's Built Environment Sector

Together with our contractors, JTC aims to achieve the goal of Zero Harm at our worksites. To do so, we leverage technologies such as drones, 360° cameras and mobile CCTVs to enable and step up vigilance through virtual inspections and assessments. CCTVs, for one, enable companies to monitor their worksites in real time, and remotely from their offices. The captured footages can also be used as safety education materials. JTC started exploring the use of Virtual Surveillance System (VSS) to monitor our construction worksites in 2018. Tapping into lessons learnt from rolling out COVID-19 measures, we also established the Remote Operation Centre (ROC) in The JTC Summit circa March 2023 to enable off-site monitoring.

In addition, WSD partners various agencies and associations to improve WSH standards continually. We collaborate with the safety committee of Singapore Contractors Association Limited (SCAL) on the development of JTC's safety specifications for construction. We seek consultations with them to review the practicality and reasonableness of these specifications. Furthermore, we work with SCAL at our construction safety school, where our workers undergo experiential training sessions and assessments prior to their commencement of work.

To achieve exemplary safety and health outcomes in our construction projects, we actively participate in the Ministry of Manpower (MOM)'s Developers and Designers Early Engagement (D2E2) programme. This programme encourages stakeholders of our construction projects to embrace a robust safety culture and prioritise safety and health at every stage.

Additionally, WSD plays a strategic role as a member of the WSH Council Working Group committee, actively contributing to the development of WSH standards in building and construction areas. We are a member of the Singapore Standards Safety Review Committee, contributing collectively to the development and improvement of safety standards in these domains.



Conducted in November 2022, JTC Active Day 2022 served as a reminder to our valued staff to take charge of their own health journeys.

Boosting the Well-being of Our Staff

The oneJTC committee is a newly established committee that aims to promote the well-being of our staff. The committee recognises staff well-being as an ingredient of organisational success, and aims to create a supportive and inclusive work environment that fosters employee engagement, satisfaction, and productivity. The oneJTC committee works towards identifying and addressing the needs of JTC's staff, providing them with the necessary resources and support to enhance their physical, mental, and emotional well-being. One event the committee organised is the JTC Active Day.

From gravity-defying rock climbing to an electrifying game of futsal, there were plenty of challenges for our staff to take on. The event is JTC's way of motivating our fellow colleagues to stimulate their minds and keep their bodies healthy through movement, as well as build camaraderie among staff. Through oneJTC committee, we hope to create a positive and fulfilling work culture that attracts and retains top talent, ultimately contributing to JTC's overall success.

Organising a Fun Day Out for Our Migrant Workers

Together with China State Construction Engineering Corporation (CSCEC) and students from SP, JTC organised the Bulim Dormitory Workers' Appreciation Day 2022 on 23 October 2022 to recognise the hard work of our workers. More than 70 volunteers championed and facilitated the event, which welcomed approximately 600 workers. The event consisted of various carnival booths, dodgeball matches, ice cream carts, and prizes. It was a great success and put big smiles on many of the participants' faces. JTC will continue to organise more activities and events to show our appreciation for our migrant workers' contributions.



Excitement reached fever pitch during one of the many friendly matches.

Equal Opportunity, Fair Employment Practices, and Talent Retention

GRI 2-7, 2-8, 2-25, 2-30, 3-3, 401-1, 401-2, 401-3, 404-1, 404-2, 404-3, 405-1

Attracting and Retaining Talents Through Equal Opportunity and Fair Employment Practices

JTC believes employees are our most valuable assets. As a signatory of the Employers' Pledge of Fair Employment Practices established by Tripartite Alliance for Fair and Progressive Employment Practices (TAFEP), we are dedicated to providing equal opportunities, adopting fair employment practices to retain our talents, and ensuring human rights are respected. A diverse and inclusive workforce can lead to increased productivity, better employee morale, increased innovation and creativity. Our employment practices align with government regulations, including the Employment Act, Workplace Safety and Health Act, and the Retirement and Re-employment Act. Our employees are represented by the Amalgamated Union of Public Employees (AUPE), with whom we maintain a collaborative relationship based on trust and open communication.

To ensure employee engagement, members of the senior management team regularly conduct sessions to address issues and concerns. We also conduct employee satisfaction surveys every three years to gather feedback and improve organisational practices. We believe in fair remuneration, considering factors such as ability, performance, and experience. We provide equal opportunities for professional development through initiatives such as training, job rotations, attachments, professional accreditations, and study awards. JTC closely monitors professional training to ensure that our staff possess the relevant skillsets to excel in their roles and future transitions. To adapt to remote work arrangements, we have introduced digital content and enhanced blended learning experiences, enabling our employees to access training conveniently and continue their professional development.

Through these initiatives, we create an inclusive and supportive work environment that empowers our employees to thrive and contribute to the success of JTC.

Total no. of employees by employment contract, by gender	Male	Female
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Permanent employees	474	478
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Fixed term/temporary employees	108	76
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Total no. of employees by employment type, by gender	Male	Female
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Full-time employees	582	550
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Part-time employees	—	4
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Non-guaranteed hours employees	—	—
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Total no. of employees by employment contract, by region	Permanent	Temporary
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Singapore	952	184
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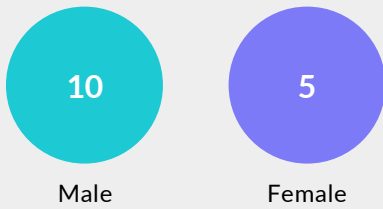
Others	—	—
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Total no. of employees by employee category and gender	Male	Female
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Professional Staff and above	499	411
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Executive Staff	83	143
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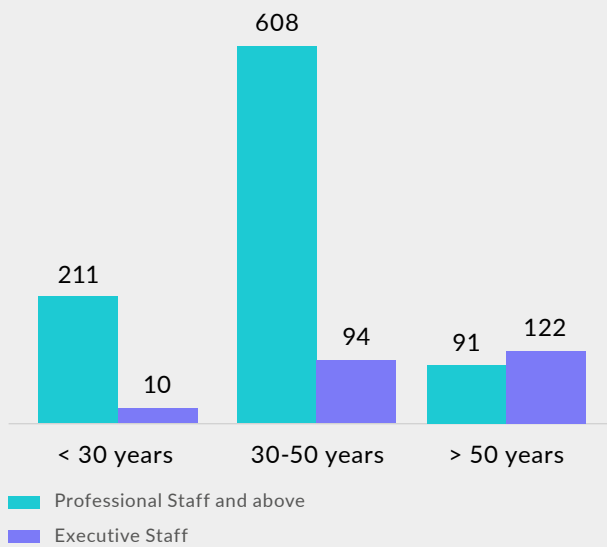
Total no. of Board members by gender



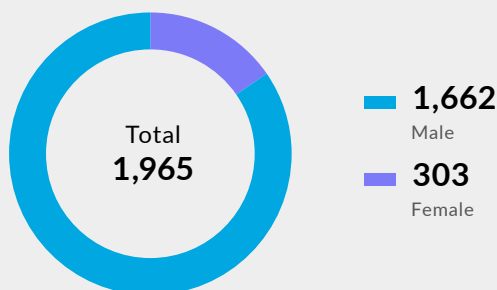
Total no. of Board members by age group



Total no. of employees by employee category and age group



Total no. of workers who are not employees (working in organisation’s controlled environment)



Total new hires

Permanent employees	167
Overall new hire rate	15%

New hires, by age group, during the reporting period

	<30 Years	30-50 years	>50 Years
Permanent employees	46	102	19
Rate of new hires (Denominator: total number of employees)	4%	9%	2%
Rate of new hires (Denominator: No. of employees in age group)	21%	15%	9%

New hires, by gender, during the reporting period

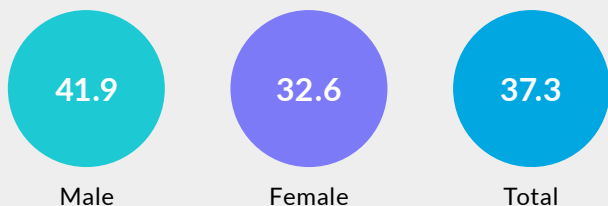
	Male	Female
Permanent employees	81	86
Rate of new hires (Denominator: total number of employees)	7%	8%
Rate of new hires (Denominator: No. of employees in gender category)	14%	16%

Total no. of employees who

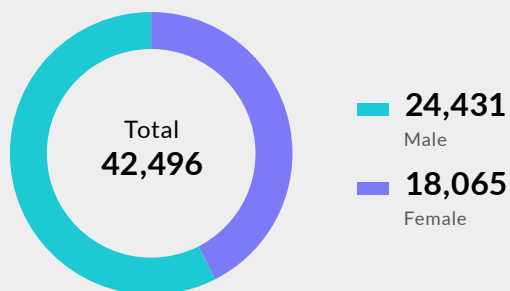
	Male	Female
Were entitled to paternity/maternity leave during reporting period (Married status only)	423	355
Took paternity/maternity leave	30	31
Returned to work after parental leave ended (during reporting period)	26	26
Were employed for 12 months after their return to work, after parental leave	26	26

Average hours of training per year per employee, by gender

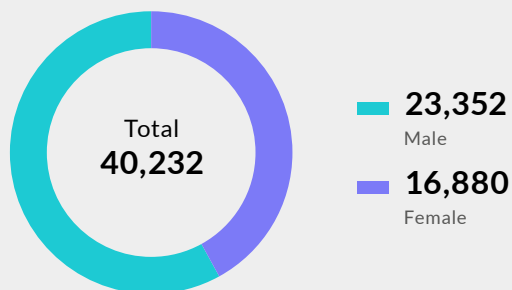
Average no. of training hours
(Denominator: no. of employees in gender category)



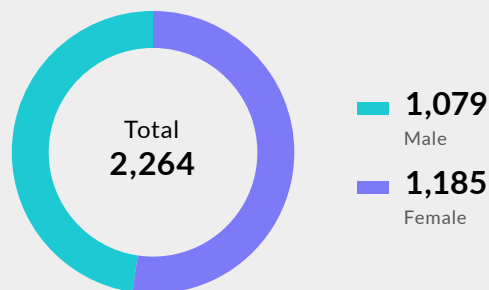
No. of training hours



No. of training hours for Managers and above



No. of training hours for Executive and above



Total Turnover

Total turnover 185

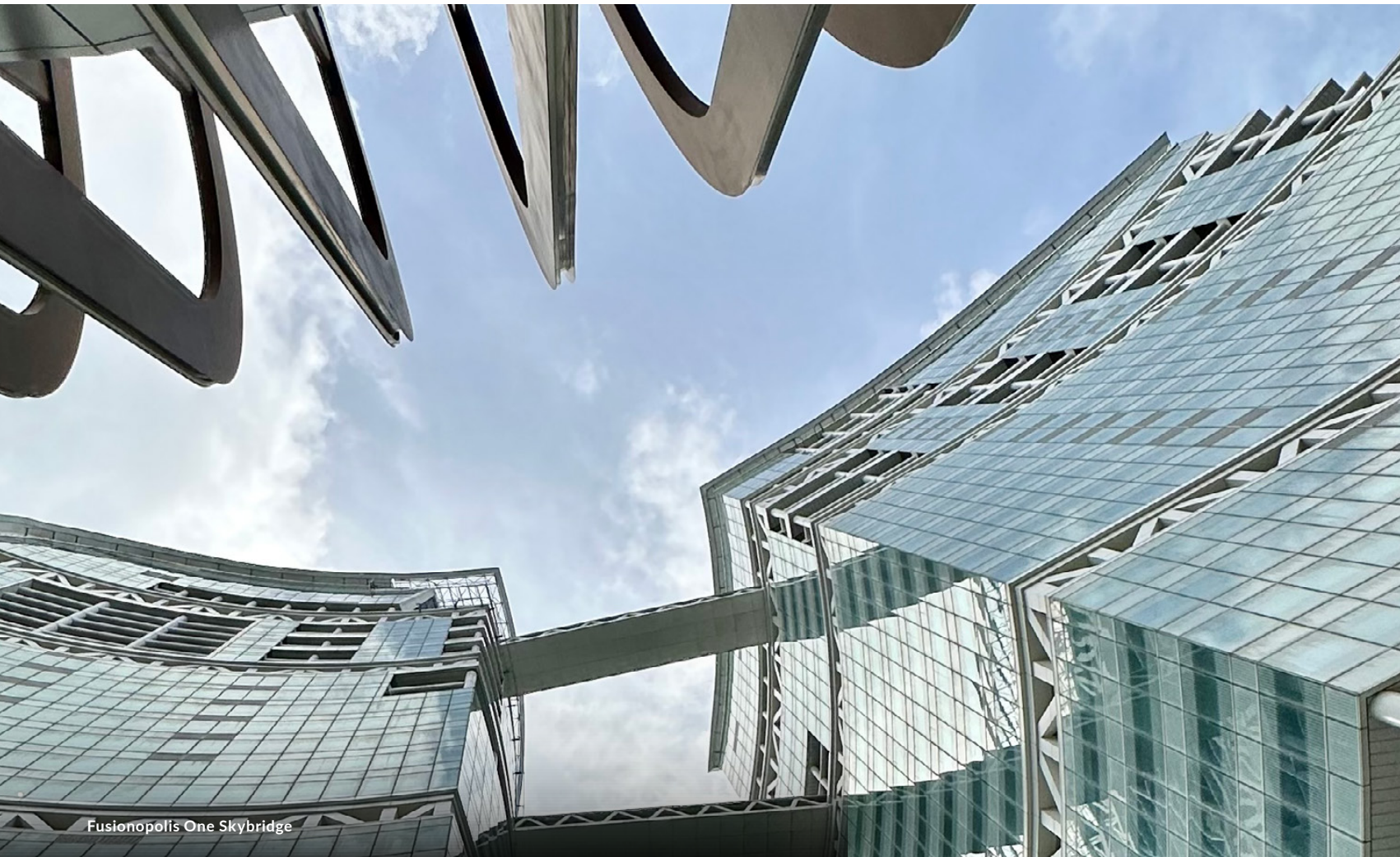
Overall turnover rate 16%
(Denominator: no. of employees by region)

Total turnover, by age group, during the reporting period

	<30 Years	30-50 years	>50 Years
No. of voluntary turnover	25	123	11
No. of non-voluntary turnover	5	7	14
No. of voluntary & non-voluntary turnover	30	130	25
Rate of voluntary & non-voluntary turnover (Denominator: total number of employees)	3%	11%	2%
Rate of voluntary & non-voluntary turnover (Denominator: no. of employees in age group)	14%	19%	12%

Turnover, by gender

	Male	Female
No. of voluntary turnover	77	82
No. of non-voluntary turnover	13	13
No. of voluntary & non-voluntary turnover	90	95
Rate of voluntary & non-voluntary turnover (Denominator: total number of employees)	8%	8%
Rate of voluntary & non-voluntary turnover (Denominator: no. of employees in gender category)	15%	17%



Corporate Governance

GRI 2-16, 2-26, 2-27, 3-3, 205-1, 205-2, 205-3

Holding Ourselves to the Highest Level of Professional Conduct

As JTC recognises the paramount importance of stakeholder trust, we have implemented robust procedures to effectively monitor and mitigate the risks associated with non-compliance to applicable laws and regulations.

Our commitment to upholding ethical standards is clearly articulated to all employees through our comprehensive Code of Conduct and Ethics. To ensure compliance, all staff are required to adhere to JTC's Financial Manual for procurement matters, undergo fraud-risk training, and provide an annual declaration regarding core values and conflicts of interest.

In addition, JTC has a whistleblowing policy in place which is communicated to all employees upon their employment. We take every report seriously and will review all cases received through the whistleblowing channels. Thorough investigations will be conducted for cases involving wrongdoings such as fraud, corruption and collusion, and where necessary, the cases could be reported to local law enforcement agencies.

JTC has a zero tolerance policy against fraud and corruption, and all substantiated whistleblowing reports will be circulated to Board Chairman, Audit and Risk Committee, and members from senior level management affected by the reports. We are pleased to report that JTC did not receive any whistleblower reports in FY2022 relating to corruption that were substantiated. In addition, there were no significant instances of non-compliance with laws and regulations during the reporting period.

For detailed information on JTC's financial performance in FY2022, please refer to our Annual Report available [here](#).

Cybersecurity and Information Infrastructure Resilience

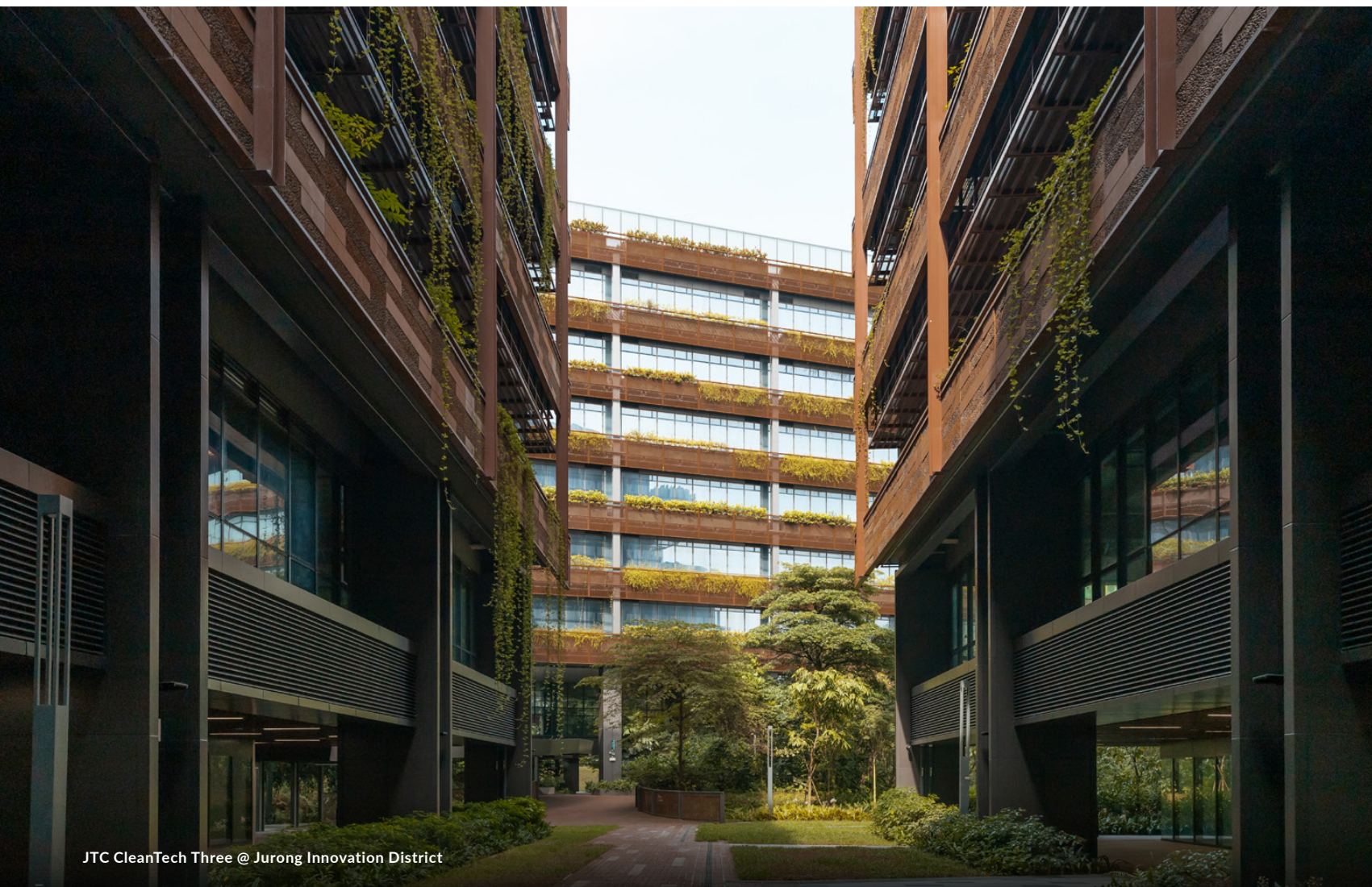
GRI 3-3, 418-1

Enhancing Our Cybersecurity and Information Infrastructure Resilience

The cyber threat landscape is constantly evolving. JTC understands the critical importance of maintaining robust cybersecurity measures to protect our operations and the sensitive information entrusted to us. We adhere to stringent cybersecurity compliance rules, continuously review and enhance our controls and processes to proactively address emerging security threats.

To ensure the highest level of data security, we have made significant investments in advanced cybersecurity technologies. Equally important is the role of our staff, who undergo regular cybersecurity awareness training to ensure strict adherence to protocols when handling sensitive data and reporting potential cybersecurity events. In the event of a cybersecurity intrusion or potential data breach, we have well-defined response procedures in place to swiftly contain and minimise any potential impact.

In FY2022, we did not receive any substantiated complaints regarding breaches of customer privacy or loss of customer data. This is a testament to our commitment to maintaining the confidentiality and integrity of the information entrusted to us. In FY2023, we will continue to enhance our cybersecurity technologies and processes to protect against cyber threats.



Resilient Procurement Practice

GRI 3-3, 205-2

Our Transparent and Ethical Procurement Practices

By establishing and maintaining resilient procurement practices, JTC aims to harness the benefits of having stable, cost-efficient and sustainable supply chains. We achieve this through the following prongs in Figure 14.

JTC adheres to stringent procurement guidelines set by the Ministry of Finance (MOF) and undergo regular audits conducted by our internal audit team as well as the Auditor-General’s Office (AGO). In this regard, our procurement practices are aligned with the government’s three key procurement principles, i.e. transparency, value for money, and fair competition. JTC has operationalised these procurement principles into frameworks, supporting policies and processes to guide our divisions in procurement and contract management matters. These processes are subject to internal performance reviews and audits to ensure the continued effectiveness of our procurement framework and policies.

In FY2022, we awarded over 200 contracts valued at about \$726 million

to support our construction and corporate functions. As part of vendor management, JTC actively assesses the performances of consultants and contractors through systems such as the BCA Consultants’ Performance Appraisal System (CPAS) and C41 for construction procurement, and Facilities Management (FM) performance appraisal framework for corporate procurement, specific to Integrated Facilities Management (IFM) and/or Managing Agent (MA) services. In addition, JTC expects our suppliers and vendors to comply with the JTC Partner Code of Conduct, and to conduct their businesses in accordance with the laws and regulations of Singapore as well as the countries that are in the supply chain for the provision of our goods and services. These laws and regulations cover the areas of anti-corruption, labour and employment, environmental protection, protection of data and intellectual property rights.

As a key master planner and developer of Singapore’s industrial landscape, JTC also aims to demonstrate leadership by spearheading the public sector’s decarbonising efforts, and proactively adopt more environmentally sustainable practices through our procurement

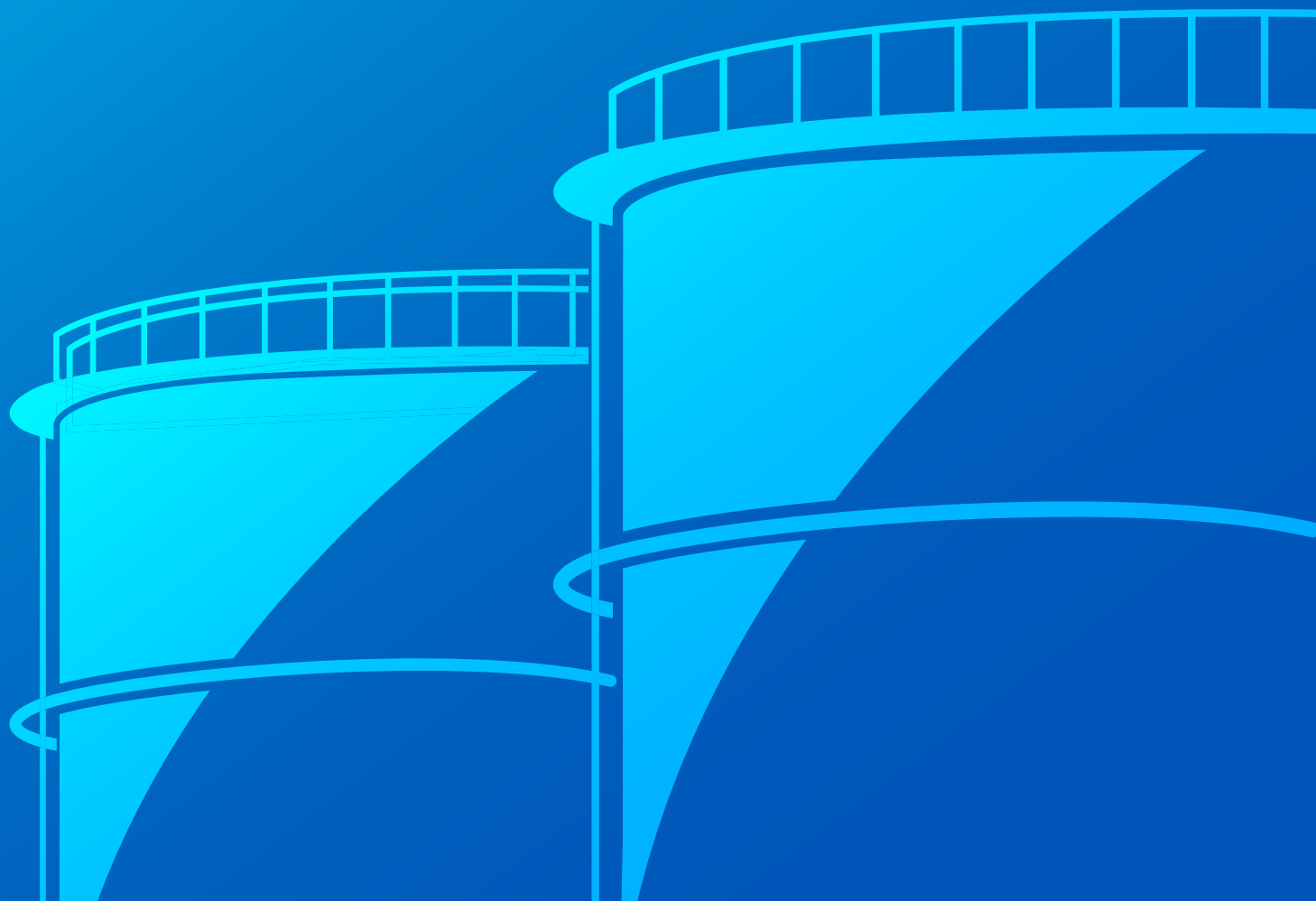
processes. JTC supports the WoG GreenGov.SG initiative for green public procurement through the incorporation of environmental sustainability considerations into our tender specifications and evaluation criteria, starting with large construction projects.

For example, JTC has incorporated requirements for the adoption of greener building materials (e.g. recycled aggregates, etc.) and reduce our reliance on fossil fuels for our facilities and projects. We have also reached out to our partners in the built environment industry such as consultants, contractors, and suppliers to encourage stakeholders in the construction value chain to decarbonise and adopt sustainable practices. To champion our sustainability agenda and accelerate the greening of our supply chains, JTC targets to establish a Sustainable Procurement Framework by FY2023. Through this, we hope to align both our internal and external stakeholders with JTC’s sustainability goals, ultimately contributing to a liveable and more sustainable nation.



Figure 14: JTC’s three-pronged approach to ensuring resilient procurement practices

GRI Content Index



GRI Content Index

Statement of use	GRI 1 used	Applicable GRI Sector Standard(s)
JTC Corporation has reported in accordance with the GRI Standards for the period of FY2022	GRI 1: Foundation 2021	N.A.

GRI Item Description	Location	Direct Answer/ Reasons for Omission
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General Disclosures

GRI 2: General Disclosures 2021	2-1	Organisational details	Page 5	
	2-2	Entities included in the organisation's sustainability reporting	Page 2	
	2-3	Reporting period, frequency and contact point	Page 2	
	2-4	Restatements of information	—	There have been no restatements of information from the previous reporting period.
	2-5	External assurance	Page 2	
	2-6	Activities, value chain and other business relationships	Page 5	
	2-7	Employees	Page 45	
	2-8	Workers who are not employees	Page 45	
	2-9	Governance structure and composition	Page 6-7	
	2-10	Nomination and selection of the highest governance body	Page 7	

GRI Item Description		Location	Direct Answer/ Reasons for Omission	
GRI 2: General Disclosures 2021	2-11	Chair of the highest governance body	Page 6	
	2-12	Role of the highest governance body in overseeing the management of impacts	Page 6-7	
	2-13	Delegation of responsibility for managing impacts	Page 6-7	
	2-14	Role of the highest governance body in sustainability reporting	Page 8-10	
	2-15	Conflicts of interest	Page 6-7	
	2-16	Communications of critical concerns	Page 48	
	2-17	Collective knowledge of the highest governance body	Page 6-7	
	2-18	Evaluation of the performance of the highest governance body	—	This includes sensitive information and will not be disclosed due to confidentiality constraints.
	2-19	Remuneration policies	—	This includes sensitive information and will not be disclosed due to confidentiality constraints.
	2-20	Process to determine remuneration	—	This includes sensitive information and will not be disclosed due to confidentiality constraints.
	2-21	Annual total compensation ratio	—	This includes sensitive information and will not be disclosed due to confidentiality constraints.
	2-22	Statement on sustainable development strategy	Page 1	
	2-23	Policy commitments	—	Disclosed throughout the sustainability report

GRI Item Description		Location	Direct Answer/ Reasons for Omission	
GRI 2: General Disclosures 2021	2-24	Embedding policy commitments	—	
	2-25	Processes to remediate negative impacts	Page 45	
	2-26	Mechanisms for seeking advice and raising concerns	Page 48	
	2-27	Compliance with laws and regulations	Page 48	
	2-28	Membership associations	—	JTC is a member of Singapore Green Building Council, which is an NGO that forges public-private partnerships to create innovative industry solutions across the entire building and construction value chain.
	2-29	Approach to stakeholder engagement	Page 8-10	
	2-30	Collective bargaining agreements	Page 45	
Material Topics				
GRI 3: Material Topics 2021	3-1	Process to determine material topics	Page 8-10	
	3-2	List of material topics	Page 10	
JTC's Material Topic: Land Planning and Urban Design				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 12	
JTC's Material Topic: Construction Sustainability				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 20	

GRI Item Description		Location	Direct Answer/ Reasons for Omission	
GRI 301: Materials 2016	301-1	Materials used by weight or volume	Page 20	JTC utilises recyclable materials (e.g. recycled steel and aggregates) instead of renewable materials in our construction process, due to the nature of our work.
	301-2	Recycled input materials used	Page 20	
JTC's Material Topic: Operations Optimisation				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 24	
GRI 302: Energy 2016	302-1	Energy consumption within the organization	Page 24	
GRI 303: Water and Effluents 2018	303-1	Interactions with water as a shared resource	Page 24	JTC withdraws water from PUB, a third party service provider.
	303-2	Management of water discharge-related impacts	Page 24	JTC is not directly involved in the industry processes requiring significant volumes of water, and all wastewater is discharged into the sewage systems as per local laws and regulations.
	303-3	Water withdrawal	Page 24	JTC withdraws water from PUB, a third party service provider.
GRI 305: Emissions 2016	305-1	Direct (Scope 1) GHG emissions	Page 24	
	305-2	Energy indirect (Scope 2) GHG emissions	Page 24	
GRI 306: Waste 2020	306-1	Waste generation and significant waste-related impacts	Page 28	
	306-2	Management of significant waste related impacts	Page 28	

GRI Item Description		Location	Direct Answer/ Reasons for Omission
GRI 306: Waste 2020	306-5 Waste directed to disposal	Page 28	306-4 (b), (c): Information unavailable: the data that breaks down the way hazardous and non-hazardous waste has been diverted from disposal is not available.
	306-3 Waste generated	Page 28	
	306-4 Waste diverted from disposal	Page 28	306-4 (b), (c): Information unavailable: the data that breaks down the way hazardous and non-hazardous waste has been diverted from disposal is not available.

JTC's Material Topic: Renewable Energy

GRI 3: Material Topics 2021	3-3	Management of material topics	Page 29
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JTC's Material Topic: Estate and Building Rejuvenation

GRI 3: Material Topics 2021	3-3	Management of material topics	Page 33
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JTC's Material Topic: Innovation

GRI 3: Material Topics 2021	3-3	Management of material topics	Page 37	3-3 (e): We are progressively setting targets and tracking performance for our material topics to ensure our sustainable development is on the right track.
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JTC's Material Topic: Community and Customer Engagement

GRI 3: Material Topics 2021	3-3	Management of material topics	Page 40-41	3-3 (e): We are progressively setting targets and tracking performance for our material topics to ensure our sustainable development is on the right track.
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GRI Item Description		Location	Direct Answer/ Reasons for Omission	
JTC's Material Topic: Occupational Health and Safety				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 42-43	
GRI 403: Occupational Health and Safety 2018	403-1	Occupational health and safety management system	Page 42-43	
	403-2	Hazard identification, risk assessment, and incident investigation	Page 42-43	
	403-3	Occupational health services	Page 42-43	
	403-4	Worker participation, consultation, and communication on occupational health and safety	Page 42-43	
	403-5	Worker training on occupational health and safety	Page 42-43	
	403-6	Promotion of worker health	Page 42-43	The insurance and coverage benefits cover non-occupational medical and healthcare services.
	403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	Page 42-43	
	403-8	Workers covered by an occupational health and safety management system	Page 42-43	
	403-9	Work-related injuries	Page 42-43	JTC uses average manpower instead of total number of hours worked for the computation of the WIR.

GRI Item Description		Location	Direct Answer/ Reasons for Omission	
JTC's Material Topic: Equal Opportunity, Fair Employment Practices and Talent Retention				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 45	3-3 (e): We are progressively setting targets and tracking performance for our material topics to ensure our sustainable development is on the right track.
GRI 401: Employment 2016	401-1	New employee hires and employee turnover	Page 45-47	
	401-2	Benefits provided to full-time employees that are not provided to temporary or parttime employees	Page 45-47	The organisation provides the same benefits to both full-time employees and part-time employees. However, the entitlement for part-time employees is pro-rated based on their work schedules. The benefits that are offered to both groups include life insurance, health care, disability and invalidity coverage, family care leave, and retirement provision.
	401-3	Parental leave	Page 45-47	
GRI 404: Training and Education 2016	404-1	Average hours of training per year per employee	Page 45-47	
	404-2	Programmes for upgrading employee skills and transition assistance programs	Page 45-47	
	404-3	Percentage of employees receiving regular performance and career development reviews	Page 45-47	JTC conducts regular performance review for all employees.
GRI 405: Diversity and Equal Opportunity 2016	405-1	Diversity of governance bodies and employees	Page 45-47	
GRI 406: Non-discrimination 2016	406-1	Incidents of discrimination and corrective actions taken	Page 45-47	There were no incidents of discrimination during the reporting period.

GRI Item Description			Location	Direct Answer/ Reasons for Omission
JTC's Material Topic: Corporate Governance				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 48	
GRI 205: Anti-Corruption 2016	205-1	Operations assessed for risks related to corruption	Page 48	
	205-2	Communication and training about anti-corruption policies and procedures	Page 48, 50	
	205-3	Confirmed incidents of corruption and actions taken	Page 48	
JTC's Material Topic: Cybersecurity and Information Infrastructure Resilience				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 49	3-3 (e): We are progressively setting targets and tracking performance for our material topics to ensure our sustainable development is on the right track.
GRI 418: Customer Privacy 2016	418-1	Substantiated complaints concerning breaches of customer privacy and losses of customer data	Page 49	
JTC's Material Topic: Resilient Procurement Practice				
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 50	

