Agency for Science, Technology and Research

SINGAPORE

SUSTAINABILITY REPORT | FY2024

APRIL 2024 - MARCH 2025

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ABOUT A*STAR

OUR MISSION

We advance science and develop innovative technology to further economic growth and improve lives.

The Agency for Science, Technology and Research (A*STAR) drives mission-oriented research that advances scientific discovery and propels technological innovation. We play a key role in nurturing and developing talent and leaders for our Research Institutes, the wider research community, and industry.

Our research creates economic growth and jobs for Singapore. As a Science and Technology Organisation, we bridge the gap between academia and industry in terms of research and development (R&D). In these endeavours, we seek to integrate the relevant capabilities of our research institutes and collaborate with the wider research community as well as other public sector agencies towards meaningful and impactful outcomes. Together with the other public sector agencies, we develop industry sectors by:

- Integrating our capabilities to create impact with multi-national corporations and globally competitive companies;
- Partnering with local enterprises for productivity and gearing them up for growth;
- Nurturing R&D-driven start-ups by cultivating innovation and shaping them towards success.

Our research, in addition, also contributes to societal benefits such as improving outcomes in healthcare, urban living, and sustainability. These serve to enhance lives in Singapore and beyond.

OUR VISION

A global leader in science, technology and open innovation.

A*STAR is a catalyst, enabler, and convenor of significant research initiatives among the research community in Singapore and beyond. Through open innovation, we collaborate with our partners in both the public and private sectors, bringing science and technology to benefit the economy and society.

ABOUT THIS REPORT

REPORTING SCOPE

This Sustainability Report (SR) marks the second year of A*STAR's journey to share how we are embedding sustainability into our work. Covering the financial year (FY) from 1 April 2024 to 31 March 2025, it brings together the sustainability efforts of all our research entities, corporate functions, and subsidiaries in Singapore. Our organisation chart can be found here.

Our sustainability story takes place across our 11 locations across Singapore. We own premises at Jurong Island and Science Park 2 (SP 2), while the remaining nine premises are spaces we share through tenancy. Together, these sites represent the scale of our operations and the many touchpoints where sustainability is taking shape.

9 Leased Premises:

1. A*StartCentral – A*STAR Co-innovation Space
2. Biopolis 1 (BP 1): Centros, Proteos, Chromos, Helios, Genome, Nanos, Matrix
3. Biopolis 2 (BP 2): Immunos, Neuros
4. A*STAR Advanced Remanufacturing and Technology Centre (A*STAR ARTC) and A*STAR SIMTech at Cleantech Park
5. Fusionopolis 1 (FP 1): Connexis
6. Fusionopolis 2 (FP 2): Innovis, Kinesis, Synthesis
7. National University of Singapore (NUS) Brenner Centre
8. Lee Kong Chian School of Medicine HQ
9. Interlocal Centre

REPORTING FRAMEWORK

To tell our sustainability story with clarity and credibility, we have anchored our disclosures with reference to the Global Reporting Initiative (GRI) Standards. The GRI Content Index is provided on pages 30–31.

We have also woven the requirements of GreenGov.SG into our practices, aligning with Singapore's national sustainability agenda. Looking ahead, we are preparing for the future by progressively adopting the International Sustainability Standards Board (ISSB) guidelines. This shift will ensure our reporting continues to keep pace with industry best practices.

Our narrative also touches on the United Nations Sustainable Development Goals (UN SDGs).[1] By linking our initiatives to these global goals, we show how our work contributes to issues that matter not just to Singapore, but to the world.

DATA RESTATEMENT AND EXTERNAL ASSURANCE

As we continue strengthening our data governance, some past data has been restated to reflect improved collection processes and methodologies, with explanations provided in the footnotes. In this second year of reporting, the A*STAR Office of Sustainability (AOS) continues to coordinate and standardise sustainability data across A*STAR. While the information has been internally reviewed, it has not undergone external assurance. We may consider external verification in future reports to enhance transparency and credibility.

FEEDBACK

Sustainability is an ongoing journey, and this report is one part of the dialogue we wish to have with our stakeholders. Your views are important in shaping our path forward. We invite you to share any feedback or questions on this report with our Chief Sustainability Officer, Professor Yeoh Lean Weng, at **yeoh_lean_weng@a-star.edu.sg**, or with the A*STAR Office of Sustainability (AOS) at **a-star_os@a-star.edu.sg**.

1 The United Nations Sustainable Development Goals (UN SDGs) are a set of 17 global goals adopted by all UN Member States in 2015 as part of the 2030 agenda for Sustainable Development. They represent a universal call to action to address global challenges – balancing social, economic, and environmental sustainability

CHAIRMAN AND CEO FOREWORD

Singapore's transition to a low-carbon and resilient future will require bold science, strategic partnerships, and appropriate action. This FY2024 Sustainability Report reflects A*STAR's commitment to delivering impact through innovation – aligned with the public sector's Net Zero 2045 ambition, the Singapore Green Plan 2030 (SGP30) and the UN SDGs.

Advancing Sustainability Research

A*STAR is committed to shaping a sustainable future through science and innovation. In partnership with industry and global stakeholders, we contribute to solutions with transformative potential – from digital platforms that empower decarbonisation planning to breakthrough technologies in clean hydrogen, sustainable aviation fuel (SAF), and circular materials. These efforts support Singapore's journey to net zero while also advancing our position as a global leader in climate resilience and green growth.

Driving Decarbonisation and Expanding Our Carbon Brain Print

As artificial intelligence (AI) reshapes our world, its advancement must be balanced with environmental sustainability. In support of Singapore's Net Zero 2050 goals, we are driving innovation in advanced cooling solutions for AI-powered data centres that can significantly reduce energy use and emissions. For example, MOYA Analytics, an A*STAR spinoff, provides data-driven platforms that identify cost-effective strategies with the potential to reduce over 1 $GtCO_2e$ of global emissions annually.

Science-Led Innovation for Public Health Resilience

In the domain of public health resilience, A*STAR's partnerships with universities and healthcare clusters have helped shape national guidelines and strengthen resilience. For example, insights from the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study led to national recommendations of annual postpartum screening for women with a history of Gestational Diabetes Mellitus (GDM), improving maternal health outcomes and potentially saving an estimated S$19.4 million annually.

Operational Excellence and Environmental Stewardship

We are embedding sustainability into our infrastructure and operations to reduce A*STAR's environmental footprint. The Air-Conditioning, Mechanical and Ventilation (ACMV) retrofit at Biopolis achieved 47% energy savings compared to previous systems.

In FY2024, we achieved a 3.3% year-on-year reduction in carbon emissions and exceeded our annual targets, progressing at 67% and 114% of our FY2030 goals for energy utilisation and water efficiency respectively, while attaining 89% of our FY2030 waste disposal index target.

A*STAR will also embed sustainability in the design and operations of new and existing infrastructure renewal projects. This will be particularly important for our two major infrastructural projects in biomedical research and semiconductor wafer fabrication.

Investing in People and Culture

Our people drive our sustainability journey. We continue to be recognised as one of Singapore's most attractive employers and will redouble our focus on talent development while continuing support of initiatives that foster inclusion such as the International Women in STEM & Medicine Symposium. A*STAR has maintained a strong safety record with no workplace fatalities or major incidents. Staff commitment to social responsibility is also reflected in the more than S$146,000 raised for the Community Chest.

Looking Ahead

A*STAR will continue to innovate, collaborate, and lead by example – driving impactful research, operational excellence, and a culture of sustainability. We will deepen collaborations with public agencies, academia, and industry to deliver scientific breakthroughs that enable climate and public health resilience, contributing to the sustainable development for Singapore and beyond.

Professor Tan Chorh Chuan
Chairman

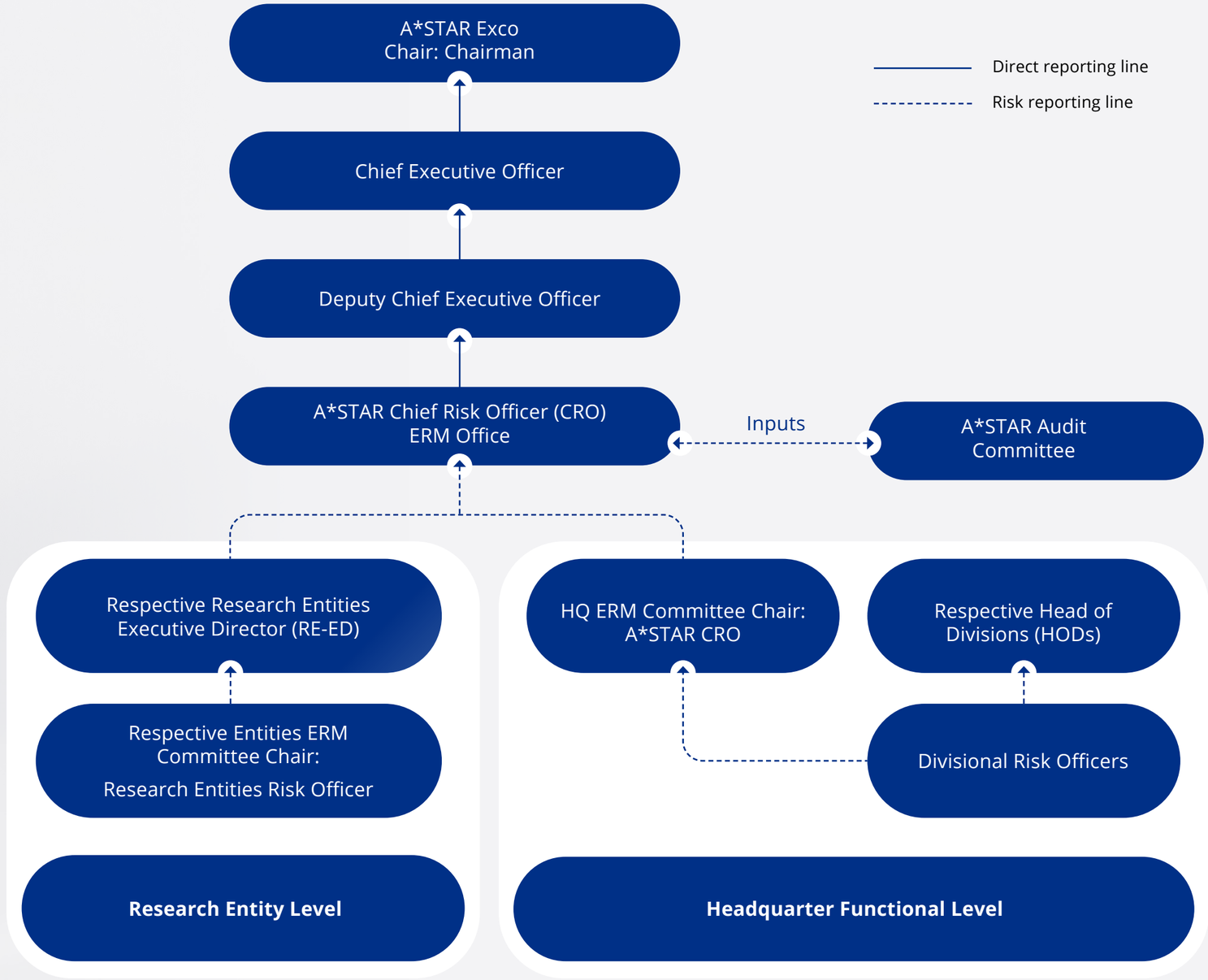
Mr Beh Kian Teik
Chief Executive Officer

CORPORATE GOVERNANCE

Enterprise Risk Management (ERM)

A*STAR recognises the importance of ERM in achieving our mission and objectives. Guided by international standards, our ERM framework systematically identifies, assesses, and manages key risks to our operations and strategy.

The ERM governance is overseen by A*STAR's Chairman and Board, with active involvement from senior management. The ERM Office guides risk governance across all levels, facilitates alignment across divisions and entities, and consolidates key risks – including sustainability related risks – for annual reporting.



SUSTAINABILITY GOVERNANCE STRUCTURE

At A*STAR, sustainability is built into the way we work, anchored by a governance structure that brings together leaders across the organisation. This structure is chaired by our Board and supported by the AOS, which was established in March 2023 to coordinate and oversee our sustainability efforts.

1 Board and Senior Management

The Board:

- Provides strategic direction in the development and execution of A*STAR's sustainability policies and strategies.
- Reviews our sustainability initiatives and milestones.

Senior Management:

- Weaves sustainable practices into operations and approves the annual Sustainability Report.
- Drives efforts through the Core Leadership Members (CLM), a cross-functional leadership committee chaired by the CEO, playing a critical role in ensuring that sustainability is integrated across A*STAR.

2 Sustainability Working Committee (SWC)

The SWC, chaired by the Deputy Chief Executive (Corporate), is the engine of our sustainability agenda.

The SWC:

- Comprises of key divisional leaders from A*STAR's infrastructural and R&D operations management divisions.
- Monitors organisational performance against strategic sustainability targets.
- Guides the development of policies and initiatives by engaging our divisions and research entities.

3 Sustainability Working Group (SWG)

The SWG translates framework into action:

- Chaired by A*STAR's Chief Sustainability Officer (CSO), the SWG comprises Eco-Reps from key research and corporate entities.
- Eco-Reps, who report to the Executive Directors (EDs) of research entities and HODs in corporate divisions, serve as environmental champions within their entities.

Their key roles and responsibilities include:

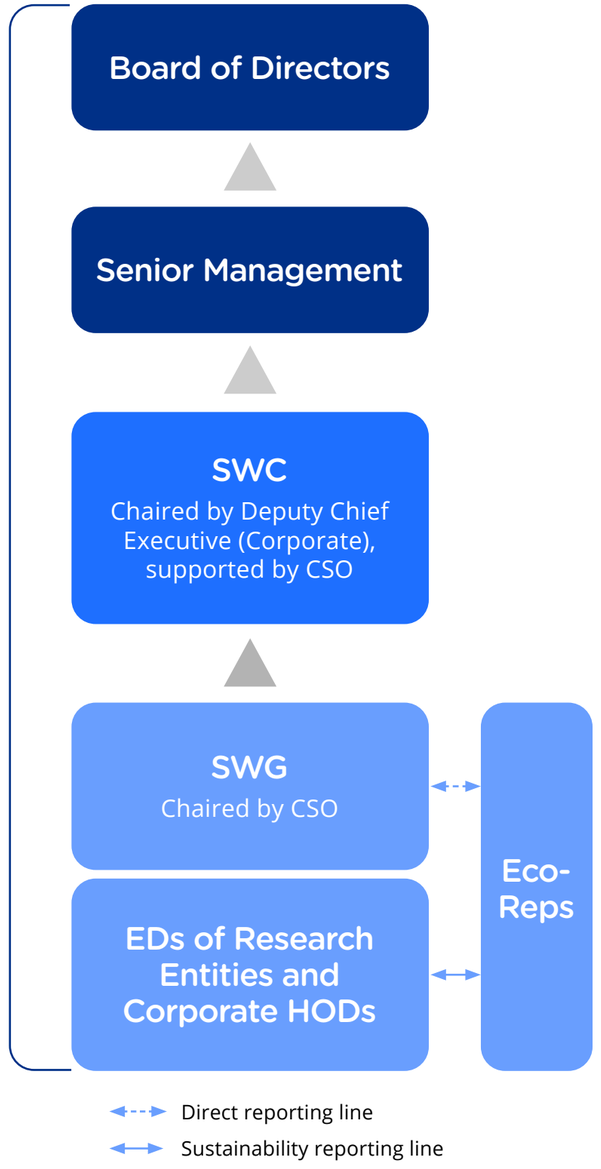
- Developing and implementing mitigation plans;
- Sharing effective practices across laboratories and offices;
- Providing valuable feedback from the ground to inform sustainability initiatives.

4 A*STAR Office of Sustainability (AOS)

Led by the CSO, the AOS coordinates sustainability efforts across the organisation through the following key functions:

- Develops strategic roadmaps, drives cross-functional projects, and ensures compliance with environmental targets and the Government's Finance Circular Minutes (FCM).
- Supports the sustainability governance structure, facilitates engagement through Eco-Reps, and delivers training programmes across A*STAR.
- Prepares for audits and ensures transparent progress tracking.
- Monitors the Carbon Brain Print to assess the intellectual impact of A*STAR's R&D on emissions mitigation.
- Evaluates emerging commercial sustainability technologies and conducts small-scale pilots to validate their impact.
- Synthesises data-driven recommendations for resource optimisation and environmental footprint reduction.
- Incorporates sustainability considerations and flexibility into major infrastructure renewal plans.
- Reinforces A*STAR's commitment to sustainable innovation and operational resilience, turning sustainability from principle into practice.

AOS
Provides secretariat support to the Sustainability Governance Structure



STAKEHOLDER ENGAGEMENT

Public Sector Entities

A*STAR works closely with public agencies through dialogue sessions, joint sessions, and collaborative meetings. These sessions help align agencies to frameworks like GreenGov.SG requirements and emerging sustainability standards like the ISSB for Sustainability Reporting. These regular engagements – including conferences, focus groups, and collaborative training courses – help shape national standards, strengthen sustainability capabilities, and promote knowledge sharing across public sectors.

Local and Overseas IHLs and Industry Collaborators

A*STAR aims to strengthen R&D sustainability capabilities through joint labs, consortia, and collaborative platforms with both academia and industry. Engagements include industry projects, workshops, seminars, and conferences held regularly to achieve our local and global sustainability goals.

Local Community

A*STAR engages our community through sustainability initiatives such as Sustainability Month and Earth Hour. Regular donation drives, community service events, and outreach visits also provide us a platform to give back and widen our sustainability impact.

Staff

A*STAR engages our staff regularly through events, training, and dialogues to promote sustainability, staff wellbeing, and ensuring workplace safety. Knowledge-sharing sessions and seminars keep staff informed about procurement processes, R&D, risk management, and personal data protection. Induction courses and internal communications align teams with A*STAR's vision and mission, fostering a unified team.

A*STAR's work is shaped by the people and partners we engage with – from staff and public sector agencies to local communities, Institutes of Higher Learning (IHLs), industry, and suppliers. Through regular dialogue and shared initiatives, we build trust, strengthen collaboration, and better understand stakeholder needs and expectations. This in turn, helps us deliver meaningful impact for both A*STAR and beyond.

Suppliers, Vendors, and Contractors

We collaborate closely with suppliers to uphold compliance with purchasing policies and requirements, while ensuring timely order fulfilment and adherence to contractual obligations.

Sustainability considerations are also integrated into our procurement processes where feasible.

A*STAR SUSTAINABILITY FRAMEWORK

A*STAR's sustainability framework takes a holistic approach, integrating environmental stewardship, social responsibility, sound governance, and research excellence. Guided by the materiality assessment[2], it prioritises areas critical to stakeholders and organisational success.

We harness R&D to develop innovative solutions aligned with Singapore's sustainability needs and priorities.

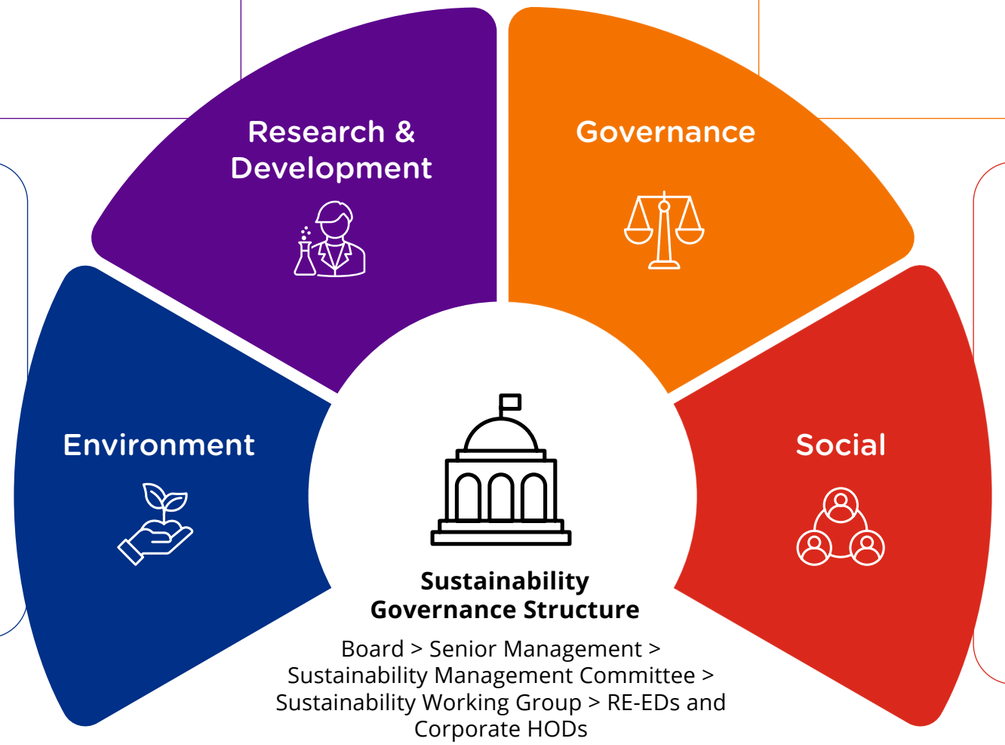
- Research & Development

VISION

A global leader catalysing sustainability transformation through science, technology, and open innovation

We uphold robust corporate governance and sustainable sourcing throughout our value chain.

- Anti-Corruption
- Sustainable Procurement



We work towards reducing our environmental impact and implementing energy-efficient and resource optimisation solutions in our operations.

- Greenhouse Gas (GHG) Emissions
- Energy Management
- Water Management
- Waste Management

Sustainability Governance Structure

Board > Senior Management > Sustainability Management Committee > Sustainability Working Group > RE-EDs and Corporate HODs

We strive to cultivate an inclusive and safe environment that promotes staff wellbeing and professional growth while making meaningful contributions to the community.

- Diversity and Inclusion
- Employment/ Talent Management
- Training and Education
- Workplace Safety & Health and Staff Wellbeing
- Community Involvement

2 For the FY2024 sustainability report, our material topics remain consistent with those identified in FY2023. Since there was no significant change in our operations during FY2024, these topics remain relevant and continue to guide how we set strategies, implement initiatives, and measure progress. We will review them every three years or whenever there are any significant changes in the operations.

FY2024 SUSTAINABILITY HIGHLIGHTS

Environment

67%
achieved towards FY2030 Energy Utilisation Index (EUI) target, based on FY2018–2020 baseline.

89%
achieved towards FY2030 Waste Disposal Index (WDI) target, based on FY2022 baseline.

114%
achieved towards FY2030 Water Efficiency Index (WEI) target, based on FY2018–2020 baseline.

3.3%
reduction in overall emissions from FY2023.

Governance

Zero-tolerance
stance on corruption.

Sustainability Criteria
and GreenGov.SG requirements weaved into our procurement process.

Up to 10%
of evaluation points allocated to environmental sustainability in relevant tenders and requisitions.

Research & Development

>1 $GtCO_2e$
annual reduction potential identified by A*STAR spin-off MOYA Analytics through the Global Mitigation Potential Atlas (GPMA), highlighting cost-neutral pathways that could cut net-zero transition costs by up to 20%.

500 $ktCO_2e$
potential[3] annual reduction enabled by KoolLogix's advanced cooling solutions for AI-driven data centres.

20%
reduction in resource use achieved through real-time consumption insights from the Resource Efficiency Mapping and Analysis Platform (REMAP).

50 $ktCO_2e$
annual emissions transformed into green construction materials through mineralisation.

Annual Postpartum Screening
recommended in Singapore for women with a history of GDM, to improve maternal health outcomes.

Faster and More Accurate:
A*STAR spin-off Carecam launched 3DGait, an AI-powered digital assessment tool that has demonstrated effectiveness in local hospitals to support frailty screening and stroke rehabilitation.

Social

140+
staff engaged through the SUPER Parents programme.

140+
Universum's Most Attractive Employer, among Engineering and Natural Sciences students from NTU, NUS, SUTD, SIT since 2021.

674
Reporting Officers (ROs) trained to engage staff in areas of Career Development and Management.

$146,187
raised through fundraising for Community Chest; (Charity Silver Award, 4th consecutive year).

>4,200
staff attended more than 18 Infuse After 5 events, designed to foster cohesion, celebrate cultural identities, and strengthen a sense of belonging.

>1,000
staff participated in the Mental Health and Wellness Week, which featured 28 activities.

3 If implemented across all 70 data centres with a total capacity of 1,000 MW, the solution has the potential to reduce up to 500 $ktCO_2e$.

01

Environmental Stewardship

A*STAR'S COMMITMENT TO SUSTAINABLE OPERATIONS

Our Environmental Journey:

Our mission at A*STAR is to drive economic impact through technological innovations, while aligning with Singapore's national sustainability goals – particularly the GreenGov.SG targets – and achieve Net Zero by 2045 for the public sector.

This commitment is in alignment with the SGP30[4] and supports multiple UN SDGs:

FY2024 Environment Performances, in relation to A*STAR's FY2030 targets[5]:

4 The SGP30, launched in February 2021, is a national initiative aligned with UN SDGs and the Paris Agreement to advance Singapore's national agenda on sustainable development and achieve net-zero emissions by 2050.

5 A*STAR's FY2030 targets are aligned with Singapore's public sector 2030 targets under the GreenGov.SG initiative, which include a 10% reduction in energy and water use from FY2018–2020 average levels, and a 30% reduction in waste disposal from FY2022 levels. These targets support the broader national goals of the SGP30.

EMISSIONS

Why it Matters

A*STAR remains firmly committed to aligning its sustainability goals with the GreenGov.SG target and contributing towards the public sector's goal of achieving net-zero emissions by 2045. This includes reducing GHG emissions, our carbon footprint, resource consumption and laboratory waste, all while demonstrating leadership in responsible R&D.

Emissions Targets and Achievements

Emissions peak expected around 2030, driven by the expansion of non-standard[6] facilities and operations such as:

- National Supercomputing Centre
- National Semiconductor Translational Innovation Centre (NSTIC) R&D Fab

Emissions Overview

Carbon Emissions ($ktCO_2e$)

	Scope 1[7]	Scope 2	Total
FY2021	0.01	64.6	64.6
FY2022	0.01	66.2	66.2
FY2023	4.80	66.6	71.4
FY2024	4.95	64.1	69.1

↓ **3.3%** overall reduction from FY2023[8]

Our Approach

A*STAR adopts a holistic decarbonisation strategy to support Singapore's Net Zero 2045 goal. This includes adopting innovative technologies and sustainable practices across operations.

Efforts to Reduce A*STAR Scope 1 Emissions

Although Scope 1 only constitutes 7% of our organisation's total emissions, we have nevertheless implemented initiatives to reduce them.

Plasma Scrubber Pilot by A*STAR Laboratory, Cleanroom and Admin Management (A*STAR LCAM)

- In FY2024, A*STAR piloted an electric-powered plasma scrubber system to replace the existing methane combustion scrubbers used in semiconductor manufacturing.
- This enables continuous operation and eliminates the need for frequent methane cylinder replacements, thereby reducing Scope 1 emissions and mitigating the risk of methane leakage – a GHG with approximately 30 times the global warming potential of CO_2.

Battery-Operated Forklifts at the Institute of Sustainability for Chemicals, Energy and Environment (ISCE²)

- A*STAR ISCE² transitioned to lithium battery-operated forklifts in FY2024, reducing reliance on fossil fuels and contributing to a reduction in Scope 1 emissions.

Efforts to Reduce A*STAR Scope 2 Emissions[9]

93% of our emissions come from Scope 2, primarily due to electricity consumption and cooling in cleanrooms, laboratories, and data centres.

Despite increased energy use at our non-standard facilities, we achieved an overall reduction through our energy-efficiency strategies, including:

- Retrofitting ACMV systems
- Upgrading equipment
- Reducing and optimising equipment usage

More details can be found on the next page under "Energy".

Future Plans

A*STAR will continue to work towards our goal of peaking emissions around 2030. As our non-standard facilities and operations expand, we will maintain our focus on improving energy efficiency across both standard operations and non-standard facilities.

6 A*STAR would like to restate the term 'non-standard facilities and operations' used in the SR FY2023. For SR FY2024, this term refers specifically to Invivos, the National Supercomputing Centre (NSCC), and expanded semiconductor activities at NSTIC, as resource usage in these areas is less dependent on occupancy and visitor numbers. This exclusion has been formally approved by the Ministry of Sustainability and the Environment (MSE) for GreenGov.SG reporting.

7 Scope 1 emissions refer to direct carbon emissions from sources that are owned or controlled by A*STAR, including lab gas usage, refrigerant leakage, combustion of fossil fuels in vehicles, and stationary fuel consumption.
Note: - In FY2023, A*STAR expanded the Scope 1 boundary to include lab gas usage, refrigerant leakage, and stationary fuel consumption, which were not accounted for in previous financial years.
- The FY2023 Scope 1 carbon emissions reported in the SR FY2023 should be restated as 4.80 (instead of 4.65) following a Scope 1 review.

8 Despite increase in our overall GHG from our non-standard facilities and baseline FY2021, we have achieved a reduction of 3.3% from FY2023. We are continuing our efforts to reduce our GHG while peaking it in 2030.

9 Scope 2 emissions refer to indirect carbon emissions resulting from the generation of electricity and purchased cooling consumed by A*STAR. A*STAR would like to restate Scope 2 emissions reported in the SR FY2023 due to restatement of the term 'non-standard facilities and operations' .

ENERGY

Why it Matters

Energy efficiency plays a pivotal role in A*STAR's decarbonisation strategy, as 93% of its total emissions originate from Scope 2 sources.

To address this, A*STAR is incorporating sustainability into the design and operations of major infrastructure across both new and existing facilities.

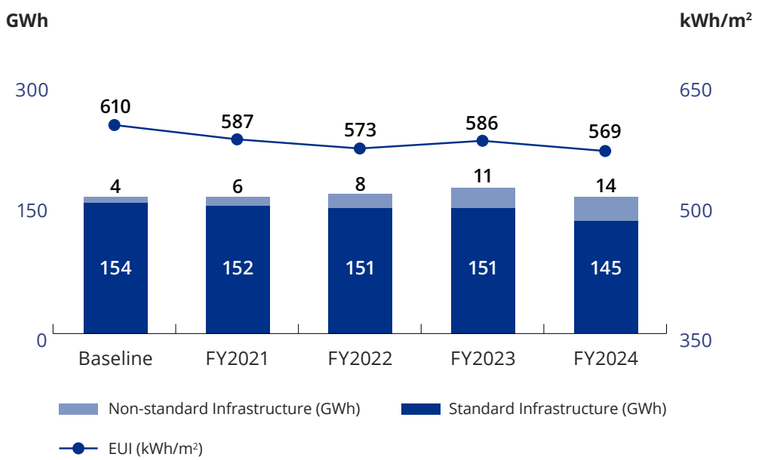
Total Energy Consumption

A*STAR's total electricity consumption[10] covers both standard[11] and non-standard facilities and operations.

For **GreenGov.SG reporting, only standard facilities and operations** are included in the calculation of energy consumption for EUI[12].

Electricity Targets and Progress

Energy Consumed (GWh) and EUI (kWh/m²)



↓ **6 GWh/year** energy reduction (4%) from FY2023

Our Approach

A*STAR is committed to reducing energy consumption by integrating targeted energy-saving measures and sustainable practices into both major infrastructure renewal efforts and operational efficiency at Research Entities (REs).

3.0 GWh/year[13]**:** Achieving 47% Energy Efficiency Savings – Biopolis ACMV Retrofit Success

- A*STAR completed a major retrofit at Biopolis between September 2023 and March 2025, replacing approximately 500 ACMV units with energy-efficient models. This initiative led to a 47% improvement in energy efficiency, with enhanced system performance and reliability.

0.5 GWh/year[13]**:** A*STAR LCAM – Fan Filter Unit (FFU) and Lighting Optimisation

- FFU airflow in cleanrooms was reduced from 850 CMH to 750 CMH, saving 262 MWh/year (109 tCO_2e) while maintaining ISO cleanroom standards.
- A partial switch-off strategy in the cleanrooms resulted in additional savings of 253 MWh/year (106 tCO_2e).

250 MWh/year[13]**:** A*STAR Institute for Human Development and Potential (A*STAR IHDP) – Airflow and Freezer Optimisation

- A pilot initiative reduced the air change rate from 10 to 8 ACH on one lab level, saving 190 MWh/year (79 tCO_2e).
- A freezer energy-reduction initiative where sample disposal, storage consolidation, and temperature adjustments of backup ultra-low temperature (ULT) units saved 53 MWh/year (22 tCO_2e).

Future Plans

Our FY2030 target of 549 kWh/m²/year calls for an additional 3.3% reduction from FY2024 levels. We aim to grow our research capabilities responsibly while minimising environmental impact through the following strategies:

Sustainability Embedded in Infrastructure Modernisation

- As part of our major infrastructure renewal plans, A*STAR is investing S$500 million each into two flagship projects:
  - Expanding the biomedical research infrastructure beyond Biopolis into the greater One-North area.
  - Establishing semiconductor research wafer fabrication infrastructure at nanoSpace.
- These resource-intensive facilities, including cleanrooms, laboratories and animal facilities, will incorporate sustainability features in its design and operations.
  - To address the substantial energy needs of NSTIC's semiconductor R&D operations and the need to mitigate environmental impacts, A*STAR is proactively evaluating best-in-class energy and water efficient technologies.
  - Our new biomedical research infrastructure will be Green Mark Platinum certified.
- Looking ahead, A*STAR will ensure that sustainability is embedded in both the design and operations of all new and existing infrastructure renewal efforts.

Technology Pilots and Innovation

- A*STAR will explore a series of pilot initiatives to trial innovative but not yet widely adopted technologies across labs, offices, data centres, wafer fabs and other facilities, including:
  - High-efficiency motors and fans for ACMV.
  - Predictive control systems for environmental sensors and automated optimisation.
  - Internet of Things (IoT)-enabled smart plugs to monitor and reduce idle lab equipment.
  - Digital infrastructure monitoring for real-time data and control.
  - Demand-controlled ventilation for laboratories and offices.

10 A*STAR would like to restate the total electricity reported in the SR FY2023 to account for purchased cooling through district cooling systems and landlord-operated chiller systems. Our electricity consumption data includes all standard and non-standard facilities and operations, and includes both purchased electricity from the grid and cooling supplied via these external systems.

11 A*STAR's standard facilities and operations include 11 premises (listed on page 4), excluding the non-standard facilities and operations mentioned on page 13. A*STAR's calculation of electricity consumption for EUI is only for standard infrastructure which has been approved by MSE for GreenGov.SG reporting.

12 The formula used to calculate the EUI is as follows: Agency EUI in Year N = (Total amount of electricity consumed for all Agency premises in Year N) / (Total GFA for all Agency premises in Year N). For the calculation of EUI performance across FY2021 to FY2024, we have updated the Gross Floor Area (GFA) figures previously reported in the FY2023 Sustainability Report. The revised figures are 259,728 m² for FY2021, 262,870 m² for FY2022, 257,324 m² for FY2023, and 254,470 m² for FY2024.

13 These estimated energy savings figures are either provided by appointed consultant, calculated based on system specifications, or derived from measurements taken during pilot trials. For comparison, the typical annual electricity consumption of a 4-bedroom HDB unit is 4.2 MWh/year.

WATER

Why it Matters

Water scarcity is a major concern in Singapore. As an organisation conducting resource-intensive research, water conservation is essential to both operational efficiency and environmental responsibility. Effective water management supports national sustainability goals and UN SDGs, and enhances the resilience and scientific excellence of research facilities.

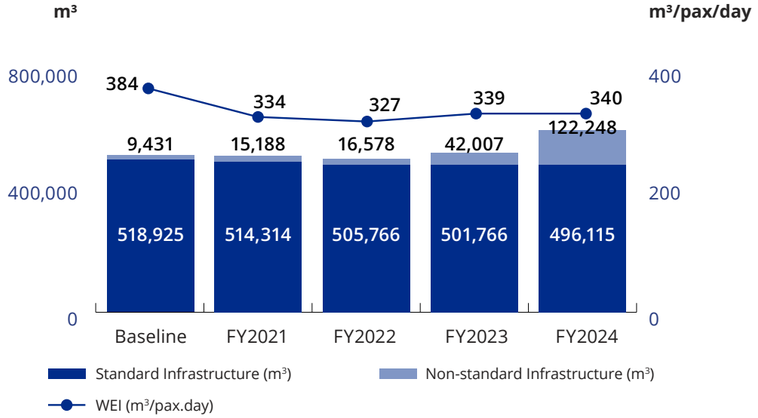
Total Water Consumption

A*STAR's total water consumption covers standard and non-standard facilities and operations, including both potable water and NEWater[14], from FY2021 to FY2024. There was a 6.7% increase in total water consumption, driven by expanded semiconductor activities at our non-standard facilities and operations.

For GreenGov.SG reporting, only standard facilities and operations are included in the calculation of water consumption for WEI[15].

Water Targets and Progress

Water Consumed (m³) and WEI (m³/pax/day)



↓ **~5,500 m³/year** water usage reduction (1.1%) from FY2023

Our Approach

As NEWater usage constitutes about 82% of the organisation's water consumption, our efforts are focused on reducing reliance on NEWater and improving overall water efficiency. We are adopting data-driven water conservation strategies, including regular water audits to identify efficiency opportunities and enhance operational practices.

Vivarium Water Usage Optimisation

- A*STAR conducted a water audit at our animal facility and identified the autoclave process as a major water consumer. To reduce usage, the following initiatives were adopted:
  - Operational days were cut by 20%.
  - Condensate and reverse osmosis (RO) reject water is being reused in boilers and tunnel washers were modified for water recycling.
  - Water meters were also installed to enable ongoing monitoring and efficiency improvements.

Future Plans

A*STAR remains committed to water conservation and will progressively replace ageing equipment with more water-efficient alternatives. Our efforts are focused on reducing NEWater reliance through advanced water recycling systems at facilities like Synthesis, technologies pilots, and process redesigns at our semiconductor facilities. Enhanced water audits and data-driven approaches will support these efforts.

74,460 m³/year[16]: Ultrapure Water (UPW) Reclaim System

- We plan to further expand the UPW Reclaim System across applicable facilities. Preliminary results estimate a potential saving of approximately 74,460 m³ (S$185,000)[17] of NEWater annually.

732 m³/year[16]: Glassware Washer and Steriliser Upgrades

- A*STAR will be upgrading four outdated glassware washers and four sterilisers with water-efficient models that reuse rinse water for subsequent cycles. This upgrade is projected to save approximately 732 m³ of water annually, supporting resource conservation and operational sustainability.

14 The NEWater is consumed at two locations, namely SP 2 and FP 2. NEWater is supplied to cooling towers and labs, and essential processes like UPW and PCW, which are critical for semiconductor operations.

15 A*STAR's WEI target is in line with the GreenGov.SG target. The formula used to calculate WEI is as follows:
Agency WEI in Year N = [Total amount of water consumed for all Agency premises in Year N× 1000] / [Average number of operational days in Year N for the Agency] × (Total number of staff per day for the Agency + (0.25 × Total number of visitors per day for all Agency premises)]
- The average number of operational days has been revised to 250, instead of the 260 days used in the SR FY23. Accordingly, we would like to restate the WEI figures reported in the SR FY23 for this report.
- The number of staff per day for FY2021, FY2022, FY2023 and FY2024 are taken to be 6,029, 6,119, 5,863 and 5,771 respectively.
- Total number of visitors per day for all our premises is taken to be 253. Where actual data for visitor numbers are not available, we have used estimates to improve the completeness of the dataset to facilitate meaningful analysis.
- The work-from-home arrangement since FY2023 was 2 days a week.

16 These estimated water savings figures are either provided by appointed consultant, calculated based on system specifications, or derived from measurements taken during pilot trials.

17 Calculated based on PUB's tariff as of 1 Apr 2025, at $2.50/m³ NEWater.

WASTE

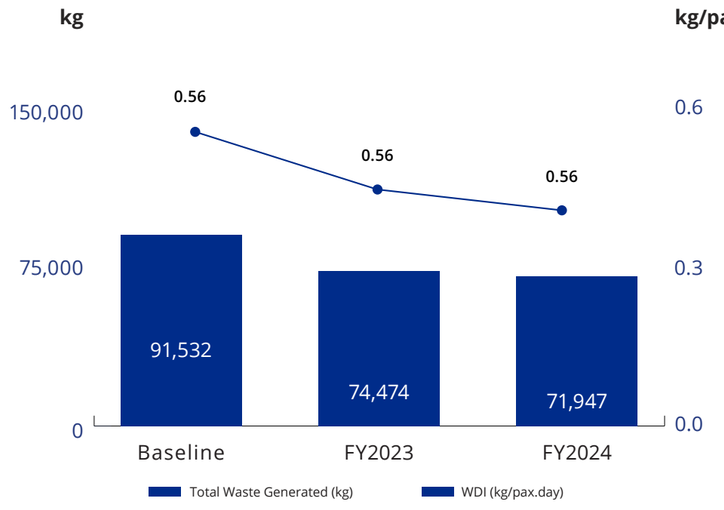
Why it Matters

Singapore's only landfill, Semakau, is nearing capacity. A*STAR's diverse facilities encompass offices and laboratories across locations such as Jurong Island and SP2, generating both general and hazardous waste. Proper waste handling is therefore essential to minimise environmental impact, safeguard health and safety, and align with national sustainability objectives.

Waste Targets and Progress

Currently, we have access[18] to waste data for the facilities located at Jurong Island and SP2, which are occupied by our staff from A*STAR ISCE² and A*STAR Institute of Microelectronics (A*STAR IME), respectively.

Waste Disposed (kg) and WDI[19] (kg/pax/day)



↓ **2,527kg (3.4%)** waste disposed from FY2023

Our Approach

Our waste management strategies include both waste minimisation and resource-sharing practices. In our offices, initiatives such as the use of recycling bins, digital documentation, and the repurposing of old furniture, help reduce waste, promote circularity and foster sustainability awareness. In our laboratories, we emphasise proper segregation and disposal of hazardous waste, working with licensed service providers for safe collection and incineration.

9% Year-on-Year Reduction: Hazardous Waste Management

- A*STAR's diverse R&D activities generate both hazardous waste and general lab waste, managed through comprehensive guidelines on segregation, labelling, and disposal procedures. Each hazardous waste type requires specific handling and disposal methods to mitigate environmental and health risks. Licensed Toxic Industrial Waste (TIW) service providers oversee the collection and incineration, with full documentation to ensure compliance.
- In FY2024, hazardous waste[20] was reduced by 9% year-on-year to 964 m³, driven by initiatives in our biomedical laboratories that promoted the use of reusable sterilised plastics and glassware wherever feasible, alongside the safe disinfection of liquid biohazardous waste. However, single-use plasticware still remains necessary for contamination control in certain research contexts.

25.0% Cost-Savings: Turning Waste into Value

- Since 2019, A*STAR IME has implemented a waste recovery initiative that reclaims gold from used parts, alkaline chemicals, and filters used in wafer fabrication.
- In addition, used silicon wafers were re-polished and reused, resulting in approximately 25% in cost savings compared to purchasing new wafers.
- These efforts reflect IME's commitment to resource efficiency and environmental sustainability.

Future Plans

Moving forward, we aim to further reduce waste through enhanced circularity practices, increased upcycling efforts, and refined our waste segregation processes. Plans are underway to scale up initiatives such as chemical and e-waste recycling, expand resource-sharing among research teams, and implement new waste minimisation programmes.

Additional innovative solutions being explored include converting waste into valuable inputs and increasing staff engagement in sustainability practices. Our goal is to work towards a zero-waste future by continuously improving waste management processes, fostering a culture of resource efficiency.

Collected 10.6 t of E-Waste: A*STAR ISCE² Driving Impact through Waste Minimisation and Resource Sharing

- In FY2024, A*STAR ISCE² collected 7,196 kg of recyclables and 10,609 kg of e-waste. This is a 26% recycling rate increase compared to FY2023.
- A*STAR ISCE² has strengthened its sustainability efforts through a range of waste reduction initiatives, including an e-waste drive for ICT devices, glass and battery recycling, and the sorting of renovation waste for recycling and reuse. These efforts will continue in the coming years.

23.5% Purchases Avoided: Sustainable Procurement through Resource-Sharing

- To ensure optimised resource usage and support sustainable procurement, teams were encouraged to check existing stocks of equipment, chemicals, and gases before making new purchases.
- Since FY2023, S$536,000 worth of idle equipment has been reallocated and repurposed, and 23.5% of chemical purchases have been avoided through inter-team sharing.

18 For premises owned by landlords such as JTC, they are in-charged of submitting the consolidated waste data of the premises directly to the MSE.

19 Based on GreenGov.SG's recommendation, the baseline year for the WDI is for FY2022. We would like to restate in our Sustainability Report FY2023 that as there were no historical data for FY2022, we extrapolated the data from January to June 2023. A*STAR's WDI target is in line with GreenGov.SG target. The formula used to calculate WDI is as follows:
Agency WDI in Year N = [Total amount of general waste disposed of at Jurong Island and SP 2 in Year N] / [Average number of operational days in Year N for Jurong Island and SP 2 × (Total number of staff per day for Jurong Island and SP 2 + (0.25 × Total number of visitors per day for Jurong Island and SP 2))]
- The average number of operational days has been revised to 250, instead of the 260 days used in the SR FY23. Accordingly, we would like to restate the WEI figures reported in the SR FY23 for this report.
- The total daily staff count is estimated at 649 for FY2022 and FY2023, and 690 for FY2024.

20 The amount of hazardous waste is estimated based on the total volume of waste collected, assuming a 80% container capacity.

SUSTAINABILITY EVENTS AND ACTIVITIES

From Awareness to Action

Highlights from A*STAR's Inaugural Sustainability Month

A*STAR's inaugural Sustainability Month, held from 16 September to 10 October 2024, marked a major milestone in embedding sustainability across the agency. Supported by cross functional teams, the initiative aimed to raise staff awareness through activities spanning environmental, social, and research domains.

- Environmental activities included a site visit to the Urban Redevelopment Authority (URA) to learn about Singapore's urban sustainable development, as well as sharing sessions on A*STAR's sustainability-related research projects. Hands-on workshops such as upcycling plastic and making sustainable crafts were also conducted.
- In addition, outreach booths featured eco-friendly products, offered education on food waste, and provided upcycled treats. Staff could bring in their own containers in exchange for incentives, reinforcing everyday sustainable habits.
- Staff were also given the opportunity to learn more about A*STAR's innovative sustainability solutions in plastics, food, and energy through the monthly Sustainability Science Brew talk – a regular A*STAR event that fosters cross-institute exchange.

Sustainability Challenge to Encourage Ground-Up Initiatives

In FY2024, A*STAR launched an internal sustainability challenge to encourage ground-up initiatives that reduce resource consumption, promote sustainability awareness, and strengthen learning across the organisation. Highlights from these initiatives have been featured in the earlier environmental section.

- Among the participating entities, the Resource Support Centre (RSC) was recognised as the overall Sustainability Champion, ranking among the top five in all four categories – energy, water, outreach activities, and learning. Its key initiatives include the BMRC-wide freezer consolidation project, which identified optimal freezer models to support future scale-up in our biomedical research infrastructure renewal project, and the planting of 55 trees at Kent Ridge Park under NParks' OneMillionTrees movement.
- To further engage staff, RSC also developed monthly eDMs to reinforce sustainability messaging across the organisation. Through this holistic and proactive approach, RSC demonstrates how diverse initiatives can collectively drive environmental impact and strengthen A*STAR's culture of sustainability.

Strengthening Our Sustainability Culture through Learning

A*STAR saw active participation across the different management levels, including our Eco-Reps, in workshops that were catered toward an organisational culture that supports sustainable corporate practices.

- To further strengthen our culture of sustainability, employees were encouraged to take LinkedIn Learning courses such as the Daily Habits to Live Sustainably course and the Sustainability Foundations: Core Concepts course. These modules provided practical insights into eco-conscious living and foundational knowledge of sustainability, empowering staff to make informed decisions both at work and in their daily lives. They also support our collective efforts to embed sustainable practices across the agency and contribute meaningfully to SGP30.

Leading with Impact: A*STAR's CSO Advances Sustainability Dialogue

In FY2024, A*STAR's CSO, Prof Yeoh Lean Weng, actively represented the agency on key international and local platforms to showcase A*STAR's decarbonisation capabilities and foster global collaboration.

- Through engagements with youth, industry leaders, government officials, and international organisations, he highlighted Singapore's national sustainability strategies, demystified technologies such as Carbon Capture, Utilisation and Storage (CCUS), and introduced A*STAR's Low-Carbon Technology Translational Testbed (LCT^3).
- In addition, A*STAR explored partnerships with global sustainability leaders such as Danfoss and Grundfos. Notable engagements included the Singapore Youth for Climate Action (SYCA), IEC Market Strategy Board (IEC MSB), NCS Impact, Process Innovation Asia Pacific (PIA), Hydrogen Summit Asia, and Ammonia & Carbon Capture Asia (ACCA).

02

Turning Science into Sustainability Impact

RESEARCH GOVERNANCE

A*STAR's research governance aligns with the national Research, Innovation and Enterprise (RIE) master plan, ensuring a robust research strategy through annual workplans and expert reviews for global competitiveness. A*STAR upholds robust research governance and compliance by implementing policies that guide and support the entire research lifecycle.

A*STAR drives impactful R&D by contributing to national sustainability targets and global UN SDGs. We develop technologies and solutions through translational R&D to support Singapore's transition to a low-carbon, resource-efficient, and climate-resilient future, while also enhancing long-term health outcomes for resilient and healthier communities. By having strategic partnerships across government, industry, academia, and global networks, we aim to amplify innovation and knowledge-sharing and generate environmental and societal impact for a more sustainable and inclusive society. Collectively, these research projects advance the UN SDGs, including:

TRANSLATING RESEARCH INTO IMPACT

A*STAR Carbon Brain Print: Low-Carbon Solutions

A*STAR is catalysing Singapore's transition to a low-carbon, circular economy through deep-tech innovation and strategic partnerships to deliver scalable solutions that address global sustainability challenges. These research efforts not only enhance resource efficiency and climate resilience but also contribute to A*STAR's carbon brain print – an indicator of the intellectual impact of research and innovation on decarbonisation.

- By enabling others to reduce emissions through the adoption and application of our innovations, our carbon brain print reflects how A*STAR's research drives indirect decarbonisation across industries and ecosystems.

S/N	Key R&D Projects	Abatement Potential
1	Empowering Corporates and Nations to Meet Emission Reduction Targets	**>1 $GtCO_2e/yr$**
2	Methane Cracking to Decarbonise Singapore's Power and Industrial Sectors	**8 $MtCO_2e/yr$**
3	Developing Advanced Cooling Solutions to Cut Energy Use and Emissions in AI-Driven Data Centres	**500 $ktCO_2e/yr$**
4	Transforming Waste and CO^2 into GreenConstruction Materials to Drive Circularity and Net Zero Goals	**50 $ktCO_2e/yr$**
5	Turning Captured Carbon into Clean Aviation Fuel for Greener Skies	**25 $ktCO_2e/yr$**
6	Driving Real-Time Resource Insights to Achieve Operational Sustainability	**12 $ktCO_2e/yr$**

Public Health Resilience

We are driving innovation that improves lives and strengthens safety – from universal screening for gestational diabetes, protecting mothers and children, to rapid tests that safeguard public health. AI-powered tools like 3DGait and real-time maritime monitoring are transforming care and safety, delivering measurable impact and reinforcing our commitment to a healthier, safer, and more sustainable future.

S/N	Key R&D Projects	Key Highlights
1	Annual Postpartum Screening for Gestational Diabetes to Improve Maternal Health Outcomes	GUSTO findings recommended annual postpartum screening of women with a history of GDM
2	Leveraging Rapid Field Testing to Safeguard Public Health	This solution resulted in efficient on-site surveillance of HPAI and LPAI and faster decision-making.
3	Deploying AI Motion Analytics for Timely Detection and Personalised Rehabilitation	This technology supported frailty screening and stroke rehabilitation.
4	Leveraging AI for Real-Time Detection of Near-Miss Incidents to Strengthen Maritime Safety	This solution enabled port operators to monitor risks in real time and guide safer ship movements.

DRIVING NET ZERO: A*STAR'S STRATEGIC ROLE IN SINGAPORE'S GREEN TRANSFORMATION

Empowering Corporates and Nations to Meet Emission Reduction Targets

Challenge

Decarbonisation planning is highly complex, often requiring extensive data and expertise. Without streamlined tools, progress toward net-zero 2050 goals become slow, costly, and fragmented.

Response

- MOYA Analytics Pte Ltd, an A*STAR spin-off, develops digital platforms to support policymakers and corporates.
- National level: MOYA co-leads the Global Mitigation Potential Atlas (GMPA), a web tool that identifies cost-effective emissions reduction opportunities and fosters global collaboration. More than 30 countries have adopted the platform to guide their decarbonisation strategies.
- Corporate level: MOYA is piloting MOYA Cascade, a software platform for supply chain carbon accounting and decarbonisation planning, validated with A*STAR's Life-Cycle Analysis platform.

>1 $GtCO_2e$/year

of potential reduction has been identified through GPMA, which could lower net-zero transition costs by up to 20%.

Methane Cracking to Decarbonise Singapore's Power and Industrial Sectors

Challenge

Access to large-scale, affordable, and low-emission hydrogen is critical for Singapore's energy transition. However, hydrogen production remains a major bottleneck, limiting the viability of carbon utilisation technologies and slowing progress toward Singapore's net-zero 2050 goals.

Response

- To develop cleaner and more cost-effective hydrogen production, A*STAR partnered with ExxonMobil under the ExxonMobil-NTU-A*STAR Corporate Lab to develop methane cracking – a process that splits methane into hydrogen gas and solid carbon in the absence of oxygen, thus without direct CO_2 emission.
- This innovation eliminates direct CO_2 emissions from hydrogen generation, bypassing the need for carbon capture and storage (CCS). This offers a significant advantage for Singapore, which lacks CCS infrastructure and faces limitations in alternative energy sources.

8 $MtCO_2e$/year

of potential reduction, assuming 30% of Singapore's power generation is from green hydrogen, and bypassing the need for CCS.

Developing Advanced Cooling Solutions to Cut Energy Use and Emissions in AI-Driven Data Centres

Challenge

The rapid growth of AI is driving higher energy demand in data centres. In Singapore, data centres accounted for 7% of national electricity use in 2020, with cooling systems consuming 40% of that. Without innovative cooling solutions, energy costs and carbon emissions will continue to escalate.

Response

- To reduce energy consumption and emissions in AI- and GPU-driven data centres, A*STAR and KoolLogix launched a joint lab in December 2024.
- One of the lab's key innovations is the HRM50 Rear Door Heat Exchanger – a compact, pump-free, and compressor free system that can remove 50kW of heat per rack, delivering up to 50% of energy savings.

500 $ktCO_2e$/year

avoided if implemented across Singapore's 70 data centres with a total capacity of 1,000 MW.

DRIVING NET ZERO: A*STAR'S STRATEGIC ROLE IN SINGAPORE'S GREEN TRANSFORMATION

Transforming Waste and CO_2 into Green Construction Materials to Drive Circularity and Net Zero Goals

Challenge

Singapore faces dual pressures: reducing carbon emissions to meet net-zero 2050 goals and managing the increasing volume of waste generated from the Waste-to-Energy (WTE) plant and construction debris. Without innovative solutions, these challenges could derail national sustainability targets, strain landfill capacity and compromise long-term resilience.

Response

- A*STAR, together with NUS and NTU, developed technology that transforms CO_2 emissions and waste into mineralised sand.
- The process achieves 10% carbonation capacity by locking carbon into mineralised materials, prevents heavy metal leaching from Incinerator Bottom Ash (IBA), and potentially uses about 500 kt/year of IBA to produce low carbon alternative sand – reducing reliance on natural sand and supporting coastal protection.decarbonisation planning, validated with A*STAR's Life-Cycle Analysis platform.

50 $ktCO_2e$/year

potentially captured and stored, while 500 kt of alternative sand is produced.

Turning Captured Carbon into Clean Aviation Fuel for Greener Skies

Challenge

As Singapore's air travel and logistics hub expands, decarbonising aviation is vital for Singapore's net-zero 2050 goals. However, limited scalable SAF production slows progress despite its potential to cut emissions by up to 80%.

Response

- A*STAR and IHI Corporation launched Singapore's first bench-scale test rig on 15 January 2025 that directly converts captured CO_2 into liquid hydrocarbons.
- This innovation strengthens Singapore's SAF research and production capabilities, supports the aviation sector's net-zero 2050 goals, contributes to the Civil Aviation Authority of Singapore's (CAAS) targets of 1% SAF adoption by 2026 and 3–5% by 2030, and advances Changi Airport's Sustainable Air Hub Blueprint.

36 $ktCO_2e$/year

is processed by the system to produce SAF, demonstrating strong potential for future scale-up.

Driving Real-Time Resource Insights to Achieve Operational Sustainability

Challenge

Organisations face increasing pressure to optimise energy, water, and waste usage across operations. Traditional monitoring systems often lack real-time insights and integration, making it difficult to identify inefficiencies and translate sustainability goals into actionable improvements.

Response

- A*STAR developed the Resource Efficiency Monitoring and Analytics Platform (REMAP), a unified platform that provides real-time monitoring and analytics to help companies optimise energy, water and waste usage across operations.
- The platform monitors equipment level usage, identifies resource hotspots, and integrates resource analysis to translate sustainability targets into measurable actions, achieving an average 20% reduction in energy and water consumption across 30 projects.

12 $ktCO_2e$/year

avoided due to electricity savings achieved through the KPE/MCE tunnel ventilation project using REMAP's E2MAS.

DRIVING NET ZERO: A*STAR'S STRATEGIC ROLE IN SINGAPORE'S GREEN TRANSFORMATION

Annual Postpartum Screening for Gestational Diabetes to Improve Maternal Health Outcomes

Challenge

Gestational diabetes mellitus (GDM) can have serious health implications for both mother and child. Previously, early pregnancy screenings were only offered to women considered high risk, yet this approach missed roughly 50% of actual cases, leaving many undiagnosed.

Response

- The GUSTO birth cohort study (a collaborative effort by A*STAR, KK Women's and Children's Hospital (KKH), National University Health System (NUHS) and NUS) tracked 1,000+ mother-child pairs since 2009, providing critical data for new national guidelines, including universal screenings for GDM.

Universal screening

is recommended in Singapore for annual postpartum screening of women with a history of GDM, based on the GUSTO findings, with projected savings of S$19.4 million.

Leveraging Rapid Field Testing to Safeguard Public Health

Challenge

Conventional methods for detecting Highly Pathogenic Avian Influenza (HPAI) can take days, delaying intervention and increasing the risk of outbreaks in poultry and wild bird populations.

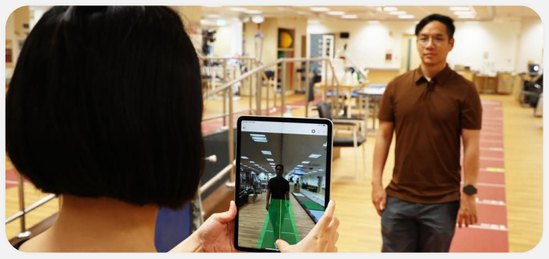
Response

- A*STAR DxD Hub, the Bioinformatics Institute (BII), and Japan's National Institute for Environmental Studies (NIES) have jointly developed Steadfast, a PCR test that can detect and distinguish between HPAI and Low-Pathogenicity Avian Influenza (LPAI) strains in less than three hours.

<3 hours detection time

enables efficient on-site surveillance and faster decision-making, safeguarding public health and sustaining agricultural livelihoods. This PCR test was officially adopted in Japan as the standard screening method for highly pathogenic viruses.

Deploying AI Motion Analytics for Timely Detection and Personalised Rehabilitation



Challenge

Traditional diagnosis and the monitoring of movement-related conditions like frailty and stroke rehabilitation can be subjective, time-consuming and dependent on large setups, limiting timely and accurate interventions.

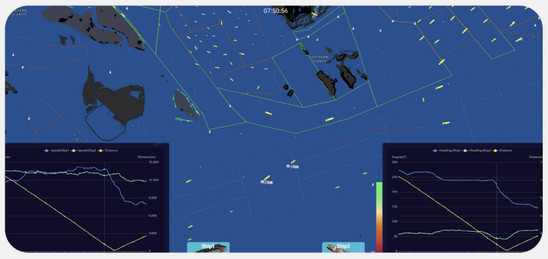
Response

- A*STAR spin-off Carecam developed 3DGait, an AI-powered digital assessment tool designed to provide early diagnosis and monitor movement-related conditions.

Faster and more accurate

detection, providing actionable insights to support frailty screening and stroke rehabilitation, proven effective in local hospitals and polyclinics.

Leveraging AI for Real-Time Detection of Near-Miss Incidents to Strengthen Maritime Safety



Challenge

Near-miss cases – situations involving close encounters between vessels that could have led to accident or injury – pose a serious safety risk in Singapore's busy port waters, where over 1,000 vessels are operating at any one time. These incidents often go unreported, limiting opportunities for proactive safety measures.

Response

- A*STAR partnered with PSA Marine to develop an AI-powered tool, which automatically detects near-miss ship collisions in real-time for proactive management of Singapore's busy port waters.

>90% detection

of near-miss cases that were previously unreported in Singapore's port waters were identified by the tool, enabling port operators to monitor risks in real time, guiding safer ship movements.

03

Transparency Today, Resilience Tomorrow

ANTI-CORRUPTION

Why it Matters

A*STAR adopts a strict zero-tolerance stance on corruption. Ethics, transparency and accountability are at the heart of everything we do. Integrity is non-negotiable at A*STAR and we strive to maintain trust with our stakeholders – the government, industry partners, research institutions, and the public – by upholding our staff to the highest standards of conduct.

Our Approach

Our approach to guiding our staff is to communicate clear policies and instil best practices. All policies and relevant information are available on A*STAR's internal staff portal to reinforce the message across A*STAR.

Code of Conduct

- Our Code of Conduct acts as a compass for all staff. Every staff member is expected to conduct themselves professionally with integrity and uphold A*STAR's reputation in their daily work.

Conflict of Interest

- Staff are required to declare their investments, external appointments, and non-indebtedness annually. This ensures that potential conflicts of interest are managed appropriately.
- All board members are required to submit an annual Disclosure of Interest form, with any changes outside the annual declaration period reported to the secretariat. These declarations are tabled at the first Board Meeting of each year, reinforcing our culture of accountability.

Whistleblowing Policy

- Our whistleblowing policy enables individuals to report wrongdoing in confidence and without fear of reprisal. This policy underscores our expectation that all staff uphold the highest standards of integrity and professionalism, while ensuring that lapses are addressed swiftly and fairly.

SUSTAINABLE PROCUREMENT

Why it Matters

We embed sustainability into every step of our procurement process, making sure our choices go beyond cost and efficiency to include ethics and environmental impact. We aim to create lasting value for our partners, stakeholders and the community, while driving a sustainable future for Singapore.

Our Approach

Policy Integration

- We've woven sustainability criteria and GreenGov.SG requirements into our procurement specifications wherever possible, ensuring environmental responsibility is embedded right from the start.

Conflict of Interest

- We encourage tenderers to bring forward eco-friendly alternatives and innovative green solutions. To drive this further, we now allocate up to 10% of the evaluation points to environmental sustainability in relevant tenders and requisitions.

Lifecycle Impact

- Our teams are guided to assess the full lifecycle costs and environmental impact of the goods and services we procure, ensuring long-term value and sustainability.

Green Purchase Tracking

- We've enhanced our procurement system to track green purchases, boosting transparency, and accountability, while reinforcing our commitment to a greener future.

Future Plans

We are dedicated to sustainable and responsible procurement, driving positive environmental impact while powering world-class research and innovation. Moving forward, we will focus on building strong partnerships, empowering our people, and strengthening local supply chains to create lasting change.

Supplier Code of Conduct

- We will set clear, transparent standards on sustainability, ethics, and compliance. This will guide our suppliers on what it means to partner with A*STAR responsibly, from environmental stewardship to ethical business practices, ensuring our supply chain reflects our values.

Staff Training and Awareness

- Our people are at the heart of change. Through comprehensive training programmes, we equip staff with the skills and knowledge to make informed, sustainable decisions in their daily work. By embedding sustainability competencies across all levels, we strengthen A*STAR's culture of responsibility.

04

Building a Culture of Care and Inclusion

DIVERSITY AND INCLUSION

Why it Matters

We are committed to encouraging diversity and inclusion in our organisation. We value different perspectives, ideas and abilities in the work we do. We aim to foster a workplace where every staff member is able to thrive and contribute fully to A*STAR's mission.

Quantitative Highlights

5,771 staff from more than **60 countries**

70 staff participated in the **"Which Cake R U"** quiz, reflecting on their work styles and exploring bias in the workplace

24 essays published to promote a more inclusive culture at A*STAR

140+ staff engaged through the **SUPER Parents programme**

70% completion rate for **LinkedIn Learning courses** on unconscious bias

Our Approach

- **Championing Awareness and Education:** Tackling unconscious bias and inclusive practices.
- **Establishing Support Systems:** Helping working parents balance career and caregiving.
- **Strengthening Pathways for Gender Equity:** Empowering women in STEM through mentorship and leadership opportunities.
- **Celebrating Diverse Voices:** Encouraging open dialogue and sharing of experiences.

Our Initiatives

- Diversity Working Group (DWG) co-organised the International Women in STEM & Medicine Symposium held in conjunction with International Women's Day 2025. A*STAR Chairman, alongside A*STAR speakers, hosted panel discussions on key enablers for women's career advancement, such as mentorship, resilience, and growth.
- Voices of Inclusion Panel featuring Diversity Champion nominees and essay winners, sparking open dialogue and personal sharing on Diversity & Inclusion themes.

EMPLOYMENT/TALENT MANAGEMENT

Why it Matters

Attracting and retaining talent are key to sustaining A*STAR's ability to drive cutting-edge research and innovation to enhance our organisation's impact and mission. With a strong Singapore core, and talent from 60+ countries, we cultivate a diverse and inclusive workplace to drive collaboration, innovation, and excellence as reflected in our recognition as one of Singapore's most attractive employers.

Quantitative Highlights

	Workforce:	New Hires:	Turnover:
	2,633 female (46%)	**347** female (47%)	**276** female (48%)
	3,138 male (54%)	**395** male (53%)	**304** male (52%)

Recognition:

Universum's Most Attractive Employers – **#1** among Engineering and Natural Sciences students from NTU, NUS, SUTD, SIT since 2021.

Gradsingapore 100 Leading Graduate Employers (2022–2024) – **Top Graduate Employer of Choice since 2022.**

Awards and Honours:

3 National Research Foundation Fellowships (NRFF)

Firefly Awards: 1 Exemplary Award, 1 Gold, 1 Silver, 1 Bronze,

1 Go the Extra Mile for Service (GEMS) Award

49 National Day Awards

692 Dedicated Service Awards, including **183** for 15+ years of service

6 GEMS Commendations

Our Approach

- Attracting and retaining diverse, global talent with a strong Singapore core.
- Recognising achievements to motivate and develop key talent.
- Benchmarking compensation to ensure fairness and competitiveness.
- Building employer brand through strong university partnerships and industry engagement.

Our Initiatives

- Recognition of staff's service and contributions to A*STAR and Singapore through MTI's Firefly Awards, National Day Awards, and A*STAR Dedicated Service Awards.
- Recognition of scientific excellence through NRF Fellowships, Investigatorships and more.

TRAINING AND EDUCATION

Why it Matters

As we operate in fields where scientific knowledge and technology evolve constantly, we believe in lifelong skills development and learning for our staff to ensure they stay at the forefront of innovation. By nurturing a diverse and inclusive learning culture, as well as providing equal opportunities for growth, we empower every individual to reach their fullest potential – driving both personal advancement and organisational success.

We also offer clear, structured pathways for career progression, enabling staff to build competencies across different career stages.

Quantitative Highlights

105 hours

Average number of learning hours per staff

► **Structured Programmes:**

▶ **Mandatory**
Induction Programme for all new hires

614 staff
trained under the A*STAR Induction Programme

308 staff
trained across four tiers under the Leadership Milestone Programmes

► **Centrally-Run Courses:**

803 staff
trained in research and project management

526 staff
trained in design thinking, executive presentation, and policy or minutes writing.

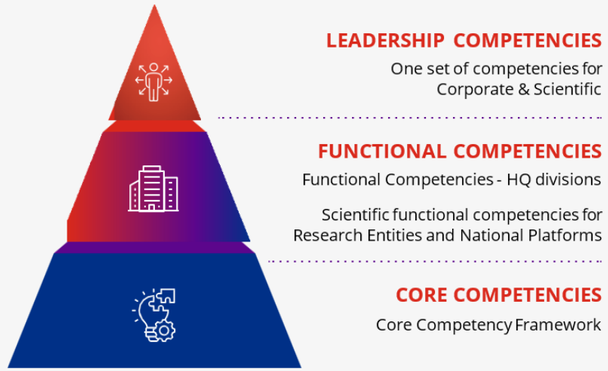
► **Leadership Workshops:**

674 ROs
trained in conducting career development and management conversations, as well as coaching and mentoring skills

Our Approach

We adopt a three-pronged learning approach – organisation-led, supervisor-led, and self-initiated. Aligned with the Public Service Division's Instruction Manual 2, our Development Framework encompasses three key competency areas – Leadership, Functional, and Core competencies.

Development Framework



Career Development and Advancement Framework

At A*STAR, we promote equal opportunities for growth through the Career Development and Advancement Framework (CDAF), offering clear, structured pathways for staff to advance their careers by building competencies across different career stages. We ensure fair, competency-based development by outlining clear developmental pathways, providing relevant learning roadmaps, and encouraging ongoing career development conversations.

Empowering all staff with equal access to growth opportunities

Building a **structured, competency-based learning ecosystem**

Encouraging **self-directed learning** through digital platforms like LinkedIn Learning

Developing leaders at all levels to create inclusive, high-performing teams

Our Initiatives

Launch of A*STAR Learning Management System in March 2024 to streamline learner engagement across the organisation and host competency-based content.

Competency-based reviews to support career progression, outlining **personal, functional and leadership competencies,** with mapped development interventions.

Support for formal structured education through sponsorship schemes, including Examination Leave.

Leadership development framework for new managers to senior leaders, and fit-for-purpose managerial skills training for all ROs.

Annual performance reviews aligned with CDAF for transparent growth and career planning.

CDAF Guides inform all staff on competency development pathways for performance and career opportunities.

Access provided to **LinkedIn Learning** for flexible, on-demand e-learning courses.

Centrally-Run courses for core competency development.

Comprehensive onboarding through a **mandatory induction programme** for new hires.

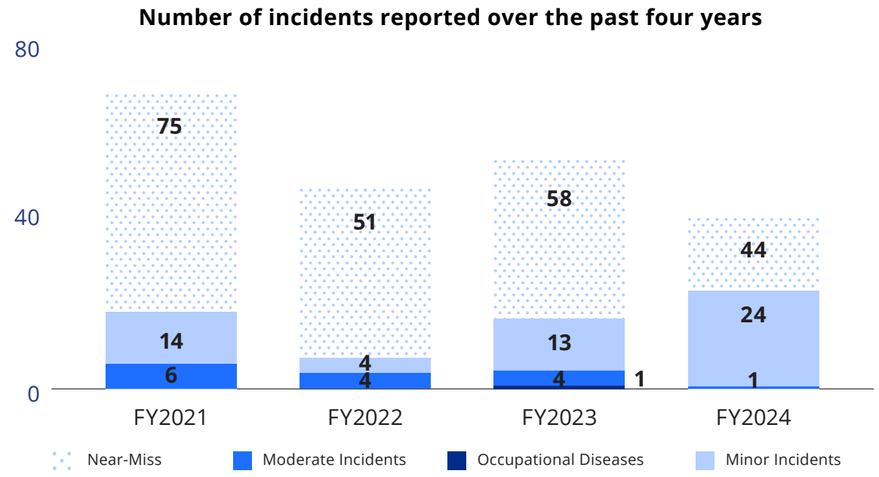
WORKPLACE SAFETY AND HEALTH

Why it Matters

We believe it is fundamental to provide our staff with a healthy, safe, and conducive work environment. A supportive workplace enables our staff to focus on innovation, knowing they are cared for both physically and mentally.

Workplace Safety and Health (WSH) is managed as a key organisational risk under our ERM framework. Incidents are reported and tracked monthly with our CLM members to ensure transparency and accountability. Research entity-level committees reinforce safe practices while risk assessments and health screenings foster a safety-conscious culture.

Quantitative Highlights



FY2024 outcomes

- **No fatalities**[21] or **major incidents**[22] or **occupational diseases**[23]
- 75% reduction in **moderate incidents**[24]
- 24% drop in **near-miss**[25] cases, showing effective risk mitigation
- Increase in **minor incidents**[26], reflecting a proactive reporting culture that encourages staff to report any accidents

Our Approach

Governance and Risk Management

- WSH remains a core organisational risk, with incident data reviewed monthly at leadership levels.
- WSH audits are conducted for all entities on a continual 2-year cycle by external auditors who will be assisted by internal auditors.
- Digital incident reporting system for faster tracking and analysis.

Building a Safety Culture

- Entity-level WSH committees promote ownership and accountability, supported by digital platforms like A*Connect for regular updates and engagement.
- Conducted risk assessments and implemented control measures for all work activities.
- Actively identified high-consequence WSH hazards through audits.
- Care Time activities were organised to enhance staff awareness on health and wellness issues.

Training

- Conducted regular WSH training and awareness programmes for staff, including safety inductions and external training for specific hazards.
- Equipped staff with the knowledge to respond effectively to potential hazards through programmes such as CPR + AED training, fire warden development and emergency drills.

Our Initiatives

Work-Related Hazards Identified in FY2024	Mitigative and Control Measures Implemented
Inhalation of toxic gases used in cleanrooms (e.g. ammonia, phosphine, hydrogen fluoride)	Gas cabinet systems, life support systems, emergency response procedures, and user training for staff handling toxic gases in cleanrooms
Misuse of manufacturing machines/equipment including high-power lasers and robotic arms	Machine guards, lockout or tagout procedures, user training, mandatory personal protective equipment when using machines
Exposure to arsenic, benzene, cadmium, manganese, and mercury	Handling of chemicals in fume hoods only, medical surveillance of staff, user training, and mandatory personal protective equipment when handling these chemicals

Organised **Care Time activities** for around **150** participants, including a TCM talk, and head and shoulder massages provided by the Singapore Association of the Visually Handicapped.

21 **Fatalities:** An incident that results in loss of life.

22 **Major Accidents:** An incident that resulted in serious injury to a person (i.e., high-consequence work-related injury) or caused serious damage to plant, equipment, or building.

23 **Occupational Diseases:** Any disease specified in the Second Schedule of the Workplace Safety and Health Act (WSHA) and any other disease directly attributable to an exposure to any chemical or biological agent arising out of and in the course of employment, e.g., musculoskeletal disorders of the upper limb.

24 **Moderate Incidents:** An incident that resulted in minor injury to a person with >3 days medical leave and/or moderate damage to plant, equipment, or building, where assistance from external agencies (e.g., SCDF) is not required.

25 **Near-Miss:** An incident that does not involve any injury to a person; an incident that resulted in minor injury to a person but does not require medical treatment or medical leave; and it is not classified as a dangerous occurrence

26 **Minor Incidents:** An incident that resulted in minor injury to person with >3 days medical leave; and/or moderate damage to plant, equipment or building, where assistance from external agencies (e.g. the SCDF) is not required.

STAFF WELLBEING

Why it Matters

In 2024, we launched our Wellbeing Framework as part of our belief in supporting our staff holistically across heath, relationships, growth, and assurance. This aligns our initiatives with organisational goals and promotes staff wellbeing with the aim of sustaining a motivated, resilient, and high-performing workforce.

Quantitative Highlights

100% **return-to-work rate from parental leave** among our **201 staff** (90 males; 111 females)

107 **Empowered Wellbeing Ambassadors** empowered through training in mental health and first aid, and by leading entity-specific projects that delivered impactful results, such as:

- **Mindset training** workshops
- A traveling exhibition on **grief and loss**
- Leadership management sessions to help ROs foster **psychological safety and build healthier team dynamics**

73% **Favourable Wellbeing score** in the biennial 2023 **Employee Engagement Survey**, three points above the **Public Service average**

Our Approach

The Wellbeing Framework 2024 provides a clear and consistent structure for supporting staff needs. It aligns with ISO 45003:2021 and drives initiatives under five pillars:

Positive Health:

- Activities and resources to maintain physical and mental vitality.

Personal Growth:

- Programmes supporting skills career advancement.

Warm Relations:

- Opportunities for connection through events, interest groups, and community building.

Assurance:

- Systems that ensure psychological safety, fairness and support during challenging situations.

Work-Life Harmony:

- Policies and leave schemes that help staff balance personal and professional priorities.

Our Initiatives

Comprehensive Leave Benefits and Flexible Work Arrangements:

- Marriage, maternity, paternity, childcare, infant care, family care, birthday leave and volunteer leave for community service or blood donation.
- Flexible arrangements include part-time work, staggered hours, and hybrid work.

Staff Engagement:

- **Safespace@Work programme** provides confidential support for staff experiencing harassment, stress, or bullying, supported by Employee Assistance and grievance-handling protocols.
- **Quarterly Pulse Surveys** track morale and identify teams needing additional support.
- **Mental Health and Wellness Week**, featuring 28 activities across physical, mental, financial and safety domains, engaging over 1,000 staff.

COMMUNITY INVOLVEMENT

Why it Matters

We aim to foster a strong spirit of volunteerism and make a positive impact on the lives of the less fortunate, while promoting science and technology within the community. Guided by our CSR Committee, our efforts focus on science, community, and environment – uplifting communities, inspiring future generations, and contributing towards a more caring and inclusive Singapore.

Quantitative Highlights

Volunteerism:

332 volunteer hours contributed by 57 staff

Fundraising:

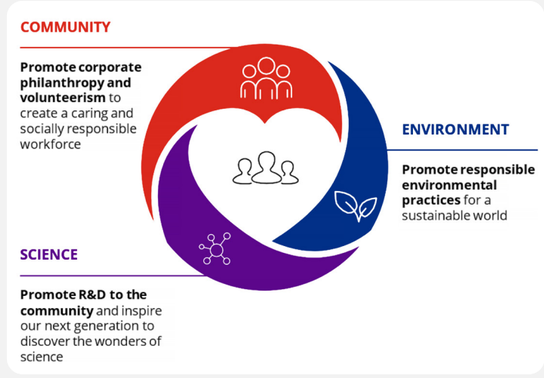
S$146,187 raised for Community Chest (Charity Silver Award, 4th consecutive year)

Close to S$5,000 raised for Pathlight School at National Day Observance Ceremony 2024

Our Initiatives

We combine research **excellence with social responsibility**, focusing on:

- **STEM outreach** to inspire future scientists
- **Community support** through volunteering and fundraising
- **Partnerships** to drive inclusion and impact



Our Initiatives

Staff-Led Community Programmes:

- **Inclusion:** Participated in Purple Parade 2024 at Suntec City to support inclusion and celebrate the abilities of persons with disabilities.
- **STEM Outreach:** Singapore Institute of Food and Biotechnology Innovation (SIFBI) partnered The Astronauts Collective to host Kuo Chuan Presbyterian Secondary School students for hands-on food science experiments, laboratory tours and career talks.

Fundraising was conducted for Community Chest and Pathlight School.

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GRI Standards	Disclosure Number	Disclosure Title	Page Reference
General Disclosures			
GRI 2 (2021): General Disclosures	2-1	Organisation Details	03
	2-2	Entities included in the organisation's sustainability reporting	04
	2-3	Reporting period, frequency, and contact point	04
	2-5	External assurance	04
	2-6	Activities, value chain and other business relationships	09
	2-7	Employees	26
	2-9	Governance structure and composition	05-07
	2-10	Nomination and selection of the highest governance body: The nomination and selection process for board members will adhere to MTI's and Public Service Division (PSD)'s guidelines for Statutory Boards and shall be approved by Cabinet. Key considerations for nominating and selecting board members include aligning with our strategic areas of focus, ensuring board diversity in line with MTI's guidelines, and maintaining independence among board members.	
	2-11	Chair of the highest governance body	
	2-10	Role of the highest governance body in overseeing the management of impacts	
	2-11	Delegation of responsibility for managing impacts	
	2-12	Role of the highest governance body in sustainability reporting	
	2-13	Delegation of responsibility for managing impacts	
	2-14	Role of the highest governance body in sustainability reporting	
	2-15	Conflicts of interest	24
	2-16	Communication of critical concerns	24
	2-20	Process to determine remuneration	26
	2-22	Statement on sustainability strategy	05, 09. 12-16, 19, 24, 26, 29
	2-23	Policy commitments	
	2-24	Embedding policy commitments	
	2-26	Mechanisms for seeking advice and raising concerns	24, 29
	2-29	Approach to stakeholder engagement	08

GRI Standards	Disclosure Number	Disclosure Title	Page Reference
Material Topics			
GRI 3 (2021): Material Topics	3-1	Process to determine material topics	09
	3-2	List of material topics Refer to SR FY2023 as material topics remains unchanged from FY2023 reporting period.	09
Integrating environmental sustainability into our core operations			
Material topic: Greenhouse Gas (GHG) Emissions			
GRI 3 (2021): Material Topics	3-3	Management of material topics	12-13
GRI 305 (2016): Emissions	305-1	Direct (Scope 1) GHG emissions	
	305-2	Energy indirect (Scope 2) GHG emissions	
	305-5	Reduction of GHG emissions	
Material topic: Energy Management			
GRI 3 (2021): Material Topics	3-3	Management of material topics	12, 14
GRI 302 (2016): Energy	302-1	Energy consumption within the organisation	
	302-3	Energy intensity	
	302-4	Reduction of energy consumption	
	302-5	Reduction in energy requirements of products and services	
Material topic: Water Management			
GRI 3 (2021): Material Topics	3-3	Management of material topics	12, 15
GRI 303 (2018): Water	303-1	Interactions with water as a shared resource	
	303-2	Management of water discharge-related impacts	
	303-5	Water consumption	
Material Topics: Waste Management			
GRI 3 (2021): Material Topics	3-3	Management of material topics	12, 16
GRI 306 (2020): Waste	306-1	Waste generation and significant waste-related impacts	
	306-2	Management of significant waste-related impacts	
	306-3	Waste generated	
	306-4	Waste diverted from disposal	

GRI CONTENT INDEX

GRI Standards	Disclosure Number	Disclosure Title	Page Reference
Advancing R&D capabilities to support Singapore's sustainability agenda			
Material topic: Research and Development (R&D)			
GRI 3 (2021): Material Topics	3-3	Management of material topics	19
GRI 203 (2016): Indirect Economic Impacts	203-2	Significant indirect economic impacts	19-22
Upholding trust and enabling a green economy			
Material topic: Anti-corruption			
GRI 3 (2021): Material Topics	3-3	Management of material topics	24
GRI 205 (2016): Anti-corruption	205-2	Communication and training about anti-corruption policies and procedures	
Material topic: Sustainable Procurement			
GRI 3 (2021): Material Topics	3-3	Management of material topics	24
GRI 204 (2016): Procurement Practices	204-1	Proportion of spending on local suppliers	
Caring for our people and community			
Material topic: Diversity and Inclusion			
GRI 3 (2021): Material Topics	3-3	Management of material topics	26
GRI 405 (2016): Diversity and Equal Opportunity	405-1	Diversity of governance bodies and employees Referencing A*STAR's Board, women makeup approximately 20% (as of Dec 2025).	26

GRI Standards	Disclosure Number	Disclosure Title	Page Reference
Material topic: Workplace Safety & Health and Staff Wellbeing			
GRI 3 (2021): Material Topics	3-3	Management of material topics	28-29
GRI 403 (2018): Occupational Health and Safety	403-1	Work-related injuries	
	403-2	Hazard identification, risk assessment, and incident investigation	
	403-3	Occupational health services	
	403-4	Worker participation, consultation, and communication on occupational health and safety	
	403-5	Worker training on occupational health and safety	
	403-6	Promotion of worker health	
	403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	
	403-9	Work-related injuries	
	403-10	Work-related ill health	
Material topic: Employment/Talent Management			
GRI 3 (2021): Material Topics	3-3	Management of material topics	26, 29
GRI 401 (2016): Employment	401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	
	401-3	Parental leave	

Agency for
Science, Technology
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SINGAPORE