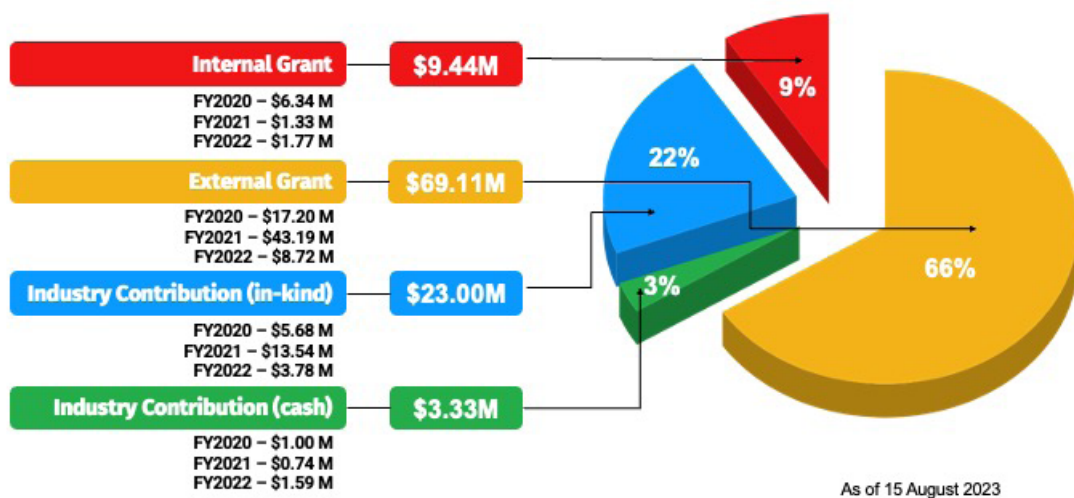


Applied Research

Growing applied research is key to strengthening SIT's applied learning. Focusing on translational research and innovation, we aspire for research outcomes that demonstrate application pathways which will drive industry transformation and train talent for industry.

Since ramping up research in 2020, SIT inked close to 150 applied research-related agreements with industry partners to work on research and innovation projects. SIT's external grants and industry contributions have grown by 4.0 and 3.9 times respectively, from FY2020 to FY2022.

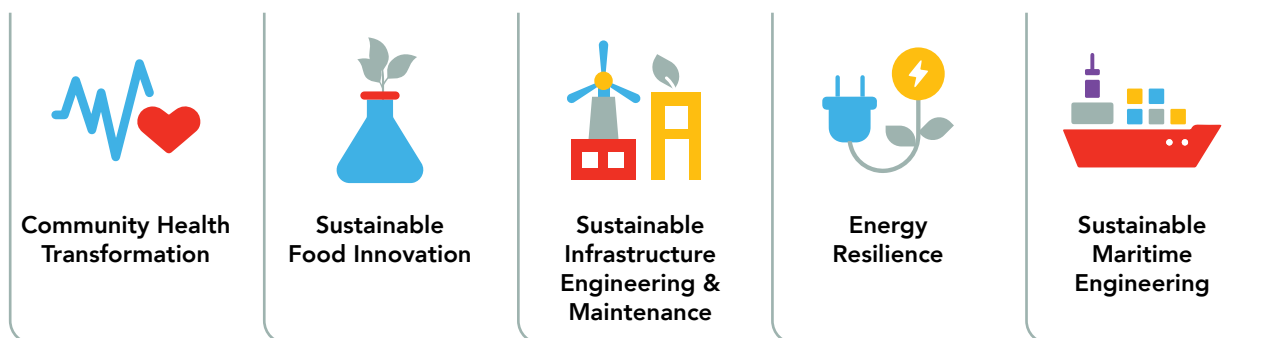
Accumulative Tabulation of Grants and Industry Contributions FY2020 – FY2022



TRANSLATIONAL RESEARCH AND INNOVATION FOCUS

SIT's research focuses on 5 domain areas, with Sustainable Maritime Engineering identified as a new domain focus in our translational research strategy in FY2022. As we prepare to relocate to our new campus in Punggol, which is situated in a digital and coastal district, we look forward to growing our thought leadership in these domains, working with industry partners and leveraging our Living Labs.

STRATEGIC TRANSLATIONAL RESEARCH PROGRAMMES AND ENABLERS



TECH ENABLERS

Artificial Intelligence, Cybersecurity, Augmented/Virtual Reality, 5G/6G & Future Communications, Robotics and Autonomous Systems

APPLIED RESEARCH PROJECTS: KEY HIGHLIGHTS

In FY2022, some of our applied research outputs have been adopted by and delivered impact to industry partners.

STRENGTHENING SINGAPORE'S R&D EFFORTS IN SUSTAINABLE MARITIME ENGINEERING

DEVELOPING SUSTAINABLE AND SMART TECHNOLOGIES FOR SHIPS AND SYSTEMS

Over the last 3 years, SIT secured \$1.5 million in applied research grants in maritime engineering. Projects included (i) digital twinning of electrical harbourcraft for design enhancements with Seatech and the Technology Centre for Offshore and Marine, Singapore, as well as (ii) data-driven AI models for estimating ships' carbon emissions with Wärtsilä and the National University of Singapore. Previous collaborations with PSA Marine and Penguin International supported maritime sustainability, notably with Greenhouse Gases (GHG) emissions mapping.



Faculty members from SIT's Naval Architecture and Marine Engineering programme onboard Penguin Tenaga, Singapore's first hybrid-powered vessel.

DRIVING SUSTAINABLE FOOD INNOVATION

ADVANCING FOOD INNOVATION

SUSTYFOODS
FORMERLY SUSTAINANCE



High protein, low calorie snack with light, crispy texture

AGROCORP
Nourishing a changing world



Plant-based vegan cheese

WellSpent
Tasty. Gutsy. Earthly.



Orange peel marmalade using upcycled orange peel

FISH SOUP PARADISE
潮州鱼汤



Shelf stable premium fish broth concentrate

Green Capsule



Shelf stable stew for infants

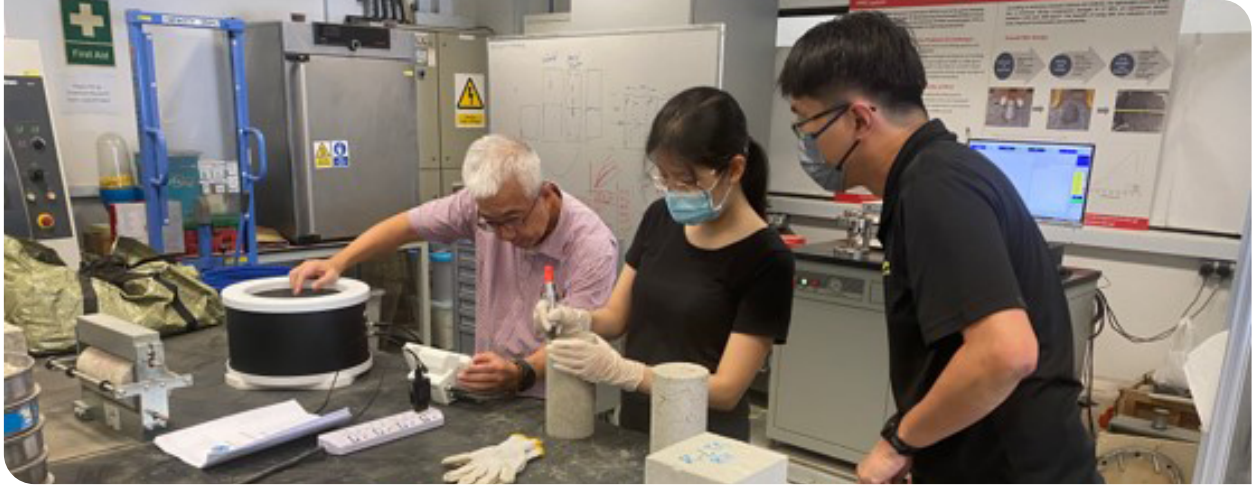
Commercialised products from FoodPlant. (Photos are sourced from the respective companies)

FoodPlant, a shared food production facility jointly set up by Enterprise Singapore, JTC Corporation and SIT, was officially launched in April 2022 to support innovation in the food manufacturing industry. The facility is licensed by the Singapore Food Agency and equipped with state-of-the-art food processing technologies, featuring 12 specialised rooms for small-batch food production.

As of March 2023, close to 30 companies comprising both MNCs and SMEs have benefitted from this facility, producing more than 100 prototypes, of which 7 have been commercialised. FoodPlant helped a local company, Fish Soup Paradise, to develop new shelf-stable soup pouches, which could be stored at ambient temperatures and ready to be heated up for consumption. To date, Fish Soup Paradise has sold more than 10,000 packs of soup and is building its own food facility to scale production. Another beneficiary of FoodPlant is Sustyfoods, a direct-to-consumer brand selling healthy, calorie-controlled food products online, which used to outsource their production. By partnering with FoodPlant, they were able to lower their costs of production by about 30% and catalyse their own food manufacturing business. Other companies which have developed commercial products through FoodPlant's support are Agrocorp International, WellSpent and Green Capsule.

FoodPlant has conducted 4 customised training courses in collaboration with Workforce Singapore for 6 companies, as well as another 3 customised training courses to help Singapore food companies adopt advanced food processing technologies.

ENHANCING SUSTAINABLE INFRASTRUCTURE ENGINEERING AND MAINTENANCE

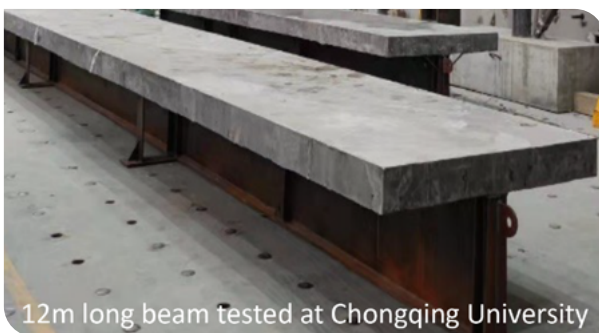


CITE staff and students conducting lab test for the Fibre Concrete project.

STRENGTHENING SINGAPORE'S TUNNELLING AND INFRASTRUCTURE DEVELOPMENT CAPABILITIES

The **Centre for Infrastructure and Tunnel Engineering (CITE)** was established in collaboration with the Land Transport Authority (LTA). The centre focuses on projects to enhance productivity and safety throughout the lifecycle of infrastructure and tunnels, including design, construction, operation and maintenance. CITE also plays a vital role in upskilling civil engineers in these domains.

CITE worked with LTA on a project that focuses on concrete reinforcement with steel fibres to make tunnels safer, save man hours and minimise corrosion from water seepage. These fibres greatly increase the durability of concrete and prevent cracking, which is particularly crucial for transport tunnels such as MRT lines, where the availability of limited operational downtime restricts repair opportunities. CITE provided material tests, design reviews, as well as scaled model tests.



Development of high-performance pre-engineered steel concrete composite beams by CTIL. (Photo: Prof. Yang Bo, Chongqing University, China)

IMPROVING PRODUCTIVITY IN THE CONSTRUCTION SECTOR

The **Construction Technology Innovation Laboratory (CTIL)** serves as a platform for the development of innovative construction technologies to enhance the productivity of the Singapore construction sector. In FY2022, CTIL successfully obtained \$1.47 million for 3 research projects working with 4 industry partners. CTIL also developed 2 patents during this period.

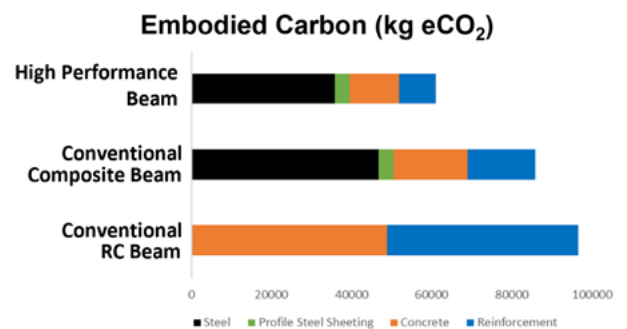


Chart comparing embodied carbon emissions volume from high-performance beam to other conventional beams.

An example of an ongoing project is the development of high-performance pre-engineered steel concrete composite beams that offer several advantages over traditional concrete flooring systems, including cost-effectiveness, reduced weight and lower embodied carbon emissions. The industry partner is currently conducting trials to assess the technology's feasibility and effectiveness.

ENHANCING ENERGY RESILIENCE

HELPING COMPANIES TACKLE ENERGY CHALLENGES

The **Energy Efficiency Technology Centre (EETC)**, a collaboration between SIT and the National Environment Agency (NEA), supported more than 25 SMEs to conduct energy sustainability assessments to identify opportunities that can reduce energy-related costs, pollution and greenhouse gas emissions. These initiatives under Phase 1 will help the SMEs catalyse substantial energy savings of up to 12 million kWh (equivalent to about \$1.6 million in electricity bill savings) and annual carbon abatement of up to 4.5 million kgCO₂e upon implementation of these energy conservation strategies.

EETC will train a pipeline of SIT engineering undergraduates and upskill existing energy efficiency practitioners in the field. As of FY2022, 70 students have completed their attachment in EETC and worked under the supervision of Singapore Certified Energy Manager (SCEM)-qualified energy specialists. These training initiatives will grow the pipeline of talent in the industry.

With a recent second tranche of funding from NEA for Phase 2, EETC will broaden its impact by establishing a specialised training facility to conduct a hands-on training module for the SCEM course to support more SMEs

in developing and upskilling these capabilities in their employees. EETC will also leverage the SIT Punggol Campus as a testbed to unlock new opportunities to catalyse applied research projects.



Training of talent pipeline for the industry.

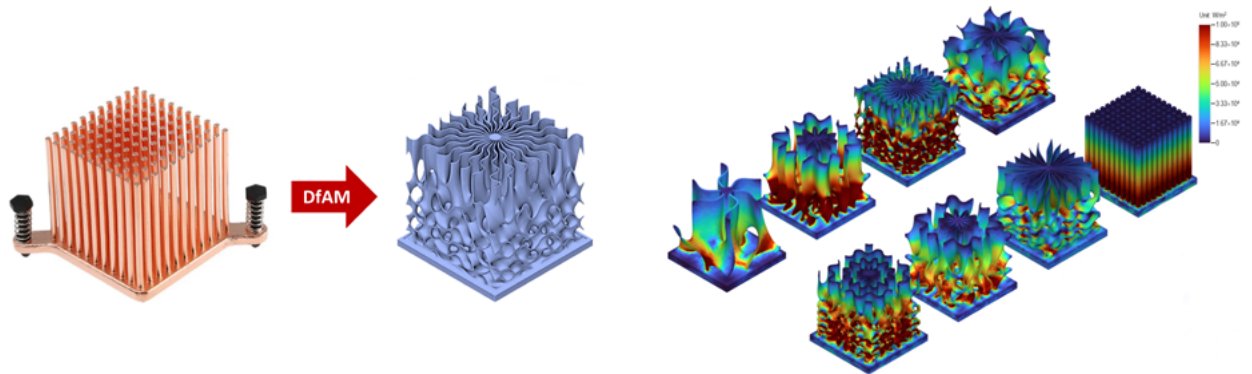
DRIVING INDUSTRY INNOVATION THROUGH INNOHUB

InnoHub comprises 4 interconnected innovation centres, namely **Design Factory@SIT (DF@SIT)**, **National Additive Manufacturing Innovation Cluster (NAMIC Hub@SIT)**, **Rapid Product Innovation and Development (RaPID) Centre**, and **SIT-Poly Innovation Centre of Excellence (SPICE)**. These centres work synergistically to drive innovation and contribute to the development of innovative solutions for industry.

As of 31 March 2023, InnoHub and its innovation centres have secured nearly \$6 million in external funding to set up the innovation infrastructure and to support their manpower resources. More than 600 students and Professional Officers actively participated in various innovation projects and activities, successfully developing 25 innovation projects in collaboration with industry.



Team members from Innohub and the 4 innovation centres.



(Left) Design for Additive Manufacturing (DfAM) enhanced passive heat sink and the different generated design computational results, a project by NAMIC Hub@SIT.

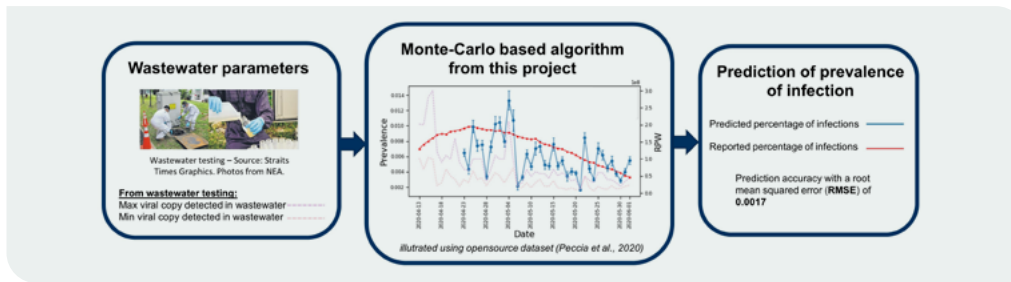
CONTRIBUTING TO COMMUNITY HEALTH TRANSFORMATION

POLLEN-BASED HYDROGEL FILM TO PREVENT POST-SURGERY COMPLICATIONS

A/Prof Cheow Wean Sin from the Food, Chemical and Biotechnology Cluster teamed up with local startup Sporogenics, to develop a fully biodegradable and biocompatible pollen-based hydrogel film to prevent post-surgery complications. The hydrogel film acts as a membrane barrier against peritoneal adhesion and releases a treatment drug at the adhesion site. The prototypes are undergoing clinical trials, and Sporogenics hopes to introduce hydrogel film to the global market by 2026.



A/Prof Cheow Wean Sin developed a hydrogel film that can prevent post-surgery complications.



COVID-19 wastewater-based epidemiology with predictive algorithm.

COVID-19 WASTEWATER-BASED EPIDEMIOLOGY

Asst Prof Elisa Ang from the Engineering Cluster collaborated with the Home Team Science and Technology Agency (HTX) to develop a robust predictive algorithm that can estimate the prevalence of symptomatic and

asymptomatic COVID-19 infection based on measurable data obtained through wastewater monitoring. The developed algorithm can take the measured RNA copies in wastewater and estimate the prevalence of COVID-19 infection. The algorithm can also be utilised for disease monitoring or other applications that require wastewater-based surveillance such as drug detection.



Led and facilitated by A/Prof Kwah Li Khim from SIT and A/Prof Shamala Thilarajah from SGH, a workshop was held with stroke survivors and caregivers from Singapore National Stroke Association to refine the physical activity programme. (Photo: diFilm Pixel works/James Chung)

MOTIVATE: A MULTI-MODAL TRAINING PROGRAMME TO PROMOTE PHYSICAL ACTIVITY AFTER STROKE

The MOTIVATE project, funded by SIT's Ignition Grant and in collaboration with the Singapore National Stroke Association, developed a multimodal training programme to promote physical activity (PA) after stroke in Singapore.

A/Prof Kwah Li Khim from the Health and Social Science Cluster led this initiative, which has since secured a SingHealth research grant to test the programme's effectiveness through a randomised controlled trial. This project could potentially lead to the development of an affordable and scalable programme that will offer stroke patients the same PA opportunities as the able-bodied population in Singapore.



An SIT physiotherapy student assisting a residential participant in Ang Mo Kio-Thye Hua Kwan Hospital to put on the accelerometer/activity tracker.

UNDERSTANDING BEHAVIOURAL MAP TO ASSESS QUALITY OF PHYSICAL ACTIVITY IN STROKE SURVIVORS

A behavioural map to assess the quality of physical activity in residential stroke survivors across different institutional settings in Singapore was developed by a Health and Social Science faculty, Asst Prof Choo Pei Ling and her team. The behavioural map was validated across 4 community hospitals and nursing homes to capture a myriad of rehabilitation settings. 11 SIT physiotherapy students were trained in a real-life healthcare setting and employed by hospitals and polyclinics upon graduation.

ADVANCING INFOCOMM TECHNOLOGY ADOPTION



South West District Mayor Low Yen Ling (right), with SIT faculty and students at the launch of the Heartland Gems @ South West Augmented Reality (AR) Trail on 2 July 2022. (Photo: South West Community Development Council)

DEVELOPING FIRST-OF-ITS-KIND CURATED AUGMENTED REALITY TRAIL IN THE HEARTLAND

Supported by SIT's Ignition Grant, Prof Lim Boon Huat from the Business, Communication and Design Cluster collaborated with the South West Community Development Council, Corporate Alliance for Good Ltd, LDR Technology Pte Ltd and SG Digital Office to launch the **Heartland**

Gems @ South West Augmented Reality Trail on 2 July 2022. This initiative aims to encourage residents to appreciate the rich history, culture and heritage of the heartlands and learn new digital skills in support of the Digital for Life movement. SIT students were involved in the development of the user experience concept and digital content for the trail, as well as the design of a heritage logo embedded with a QR code.

ENHANCING ROAD SAFETY THROUGH A REAL-TIME RISK ASSESSMENT SYSTEM

This 4-party collaborative project is supported by the National Research Foundation, Singapore, and the LTA under its Urban Mobility Grand Challenge Programme, and led by Senior Lecturer Dan Chia (Infocomm Technology) in partnership with MooVita, Strides Frontiers and the University of Glasgow, Singapore. The team developed a real-time risk assessment methodology and created a novel **Spatial Temporal Risk Estimation Ensemble Technique (STREET)** algorithm using deep learning embedded with a model-based risk tagging approach. The outcome product is a **Mobile Camera Acquisition System (MoCAS)** that performs STREET risk tagging of the environment. Building on this outcome, the team moved on to develop a novel **Real-time Risk Assessment Cooperative Mode (ReRAC)** system to alert drivers in advance of potentially hazardous events at specific times and locations. The technology enables advance notice through Smart Infrastructure, including 5G communication and edge computing for drivers to avoid risk. This Smart Infrastructure equipped with the ReRAC will be deployed at 6 locations within Ngee Ann Polytechnic.



Real-time Risk Assessment Cooperative Mode (ReRAC).



Mobile Camera Acquisition System (MoCAS).

TRAINING MANPOWER FOR INDUSTRY THROUGH APPLIED RESEARCH

In addition to securing grants, our academic staff are also actively encouraged to leverage SIT's Industrial Doctorate and Industrial Masters (ID/IM) programmes to grow their research capability through practice-oriented research with industry partners. SIT's ID/IM programmes have garnered the participation of 21 companies.

An example of a successful partnership is NVIDIA, which currently has 7 employees enrolled in our ID/IM programmes.

CURRENT ENROLMENT (AS OF FY2022)

