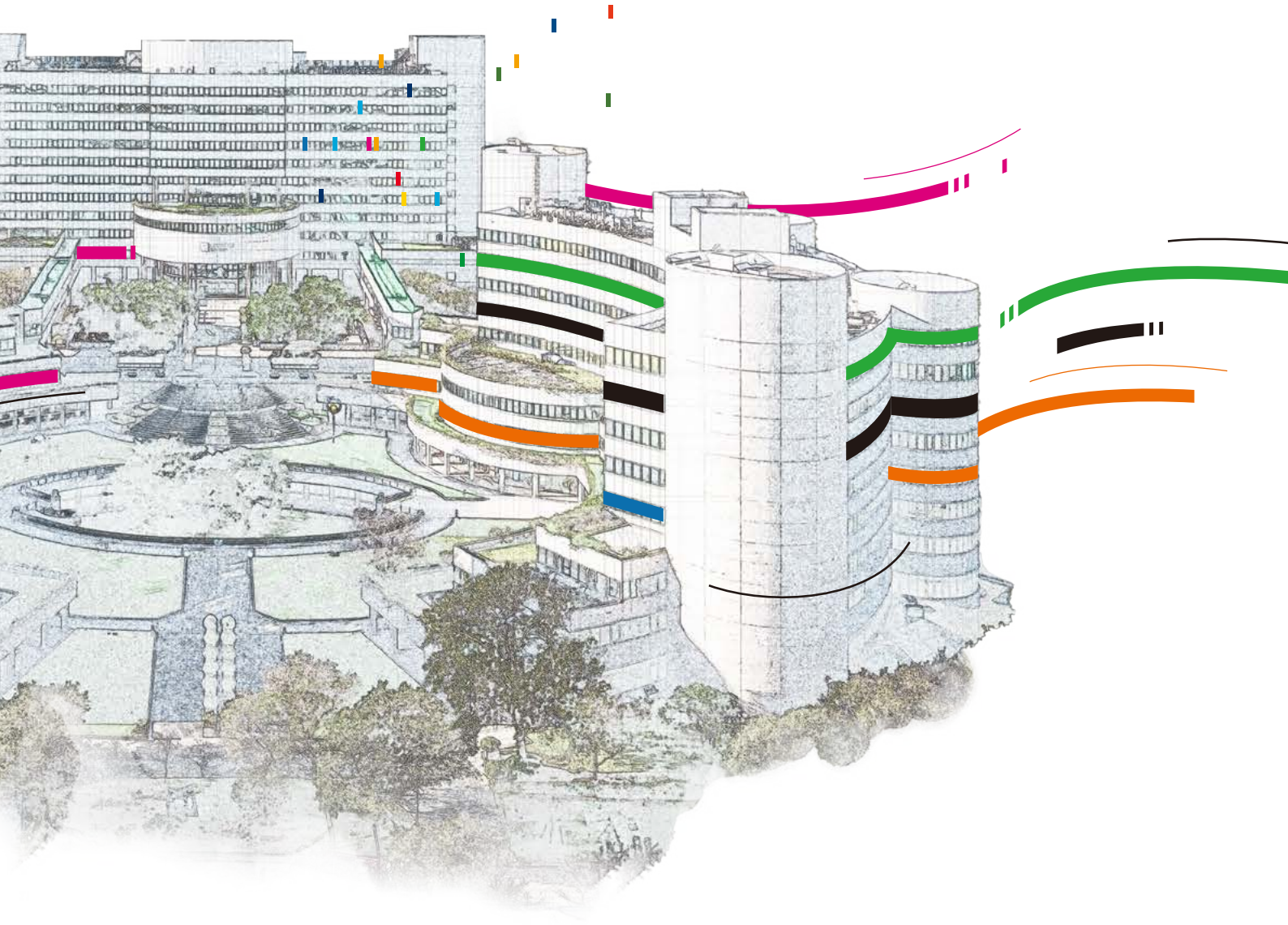
ITRI
Industrial Technology
Research Institute

2022 SUSTAINABILITY REPORT



INNOVATING **A BETTER FUTURE**

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About The Report

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The Industrial Technology Research Institute (hereinafter referred to as "ITRI") is an internationally renowned applied technology-oriented research institution that has long devoted itself to the R&D of industrial technology. Over the years, it has successfully propelled the development of related industries, created economic value, and enhanced social welfare, laying a solid foundation for sustainable development in Taiwan. Given the pressing global trends in sustainable development and the international community's heightened demands for E(environmental), S(social), and G(governance) information disclosure, ITRI voluntarily complies with the Global Reporting Initiative (GRI Standards 2021) and other sustainability reporting-related standards, publicly discloses details about the institute's investments and achievements in sustainable operational development, and aligns these efforts with the United Nations' Sustainable Development Goals (SDGs) for the benefits of its stakeholders and the public. This Report was reviewed by the ITRI Sustainability Steering Committee and issued after the approval of the president and chairman.

Reporting Period and Publishing Cycle

This is the inaugural Sustainability Report autonomously compiled by ITRI, published on the institute's official website in 2023. The information and related statements disclosed primarily cover the fiscal year 2022 (from January 1, 2022 to December 31, 2022), highlighting ITRI's specific initiatives and key accomplishments in sustainable development. In the interest of comprehensiveness for relevant projects and activities, some of their information preceding January 1, 2022 or extends to 2023 are included in this Report. ITRI intends to issue sustainability reports regularly moving forward.

Scope of the Report

The main focus of this Report is on ITRI's branches in Taiwan, encompassing the ITRI Headquarters (in Hsinchu) and the six service locations (e.g., Hsinchu Kuang-Fu Campus, Central Region Campus, Southern Region Campus, Taipei Branch, Southern Taiwan Innovation & Research Park, and Shalun Green Energy Technology Demonstration Site), with some content extends to cover ITRI's overseas offices. All financial figures in this Report, consistent with those in ITRI's financial statements, are denominated in New Taiwan Dollars. In comparison with the year 2021, there have been no significant changes in ITRI's scale, structure, ownership, and supply chain in 2022. If there are variations in the coverage scope among different chapters, relevant notations will be provided within the respective paragraphs.

Reporting Principles & Standard

Issuing Entity	Guideline followed
The Global Reporting Initiative (GRI)	GRI Standards 2021
United Nations (UN)	Sustainable Development Goals (SDGs)
	The United Nations Global Compact
International Organization for Standardization (ISO)	ISO 26000
International Integrated Reporting Council (IIRC)	Integrated Reporting (IR)

Note: The Report is compiled in accordance with the eight principles of the GRI Sustainability Reporting Standards: accuracy, balance, clarity, comparability, completeness, sustainability context, timeliness, and verifiability.

Audit & Assurance

Category	Guideline followed	Certification agency
Finance	Regulations Governing Auditing and Attestation of Financial Statements by Certified Public Accountant and Auditing Standards	Baker Tilly Clock & Co
Employee	ISO 45001: 2018 Occupational Health and Safety Management Systems	BSI Taiwan
Products and services	ISO 9001: 2015 Quality Management Systems	BSI Taiwan
Information security	ISO 27001: 2013 Information Security Management Systems	SGS Taiwan
	ISO 20000-1: 2018 Information Technology Service Management Systems	SGS Taiwan
Environment	ISO 14064-1: 2018 Organizational-level GHG inventory Standards	China Productivity Center (CPC)
	ISO 14001: 2015 Environmental Management Systems	BSI Taiwan

Notes: 1. The scope of the ISO 14064-1:2018 Organizational-level GHG Inventory in 2022 consisted of that of the ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, and Guang Ming Village. Said inventory underwent external verification of China Productivity Center (CPC), an impartial third-party organization, in July 2023, meeting the "reasonable assurance" level (for categories 1 and 2) as approved by the competent authority.
2. The scope of the ISO 14001: 2015 Environmental Management Systems Verification encompasses the planning, audit, and implementation of ITRI's Environmental Management Systems. In June 2023, ITRI underwent external certification audit by BSI Taiwan.

Contact Information

ITRI | Office of ITRI Sustainability

Tel.: +886-3-582-0100

Email: SDGs@itri.org.tw

Customer service hotline: 0800-458-899

Official website: www.itri.org.tw

Official website

If you have any comments or suggestions regarding this Report, please feel free to contact us.

Letter from ITRI Chairman & President GRI 2-22

Technological Innovations & Organizational Sustainability

As we reflect on the past year, the persistent impact of the ongoing COVID-19 pandemic and the relentless advance of global warming have left an indelible mark on our world. The repercussions, characterized by soaring summer temperatures, droughts, and water shortages, vividly illustrate the formidable forces of nature responding to extreme climatic conditions. The Global Risks Report 2023 by the World Economic Forum (WEF) highlights the four long-term global risks of our time: the failure to mitigate climate change, the failure of climate-change adaptation, natural disasters and extreme weather events, and biodiversity loss and ecosystem collapse. In the face of these crises, it is clear that no country, industry, or individual stands alone.

Historically, the economy and the environment seemed locked in a zero-sum game. Today, as we strive for the dual goals of mitigating climate change and achieving net-zero emissions, Taiwan's industries are undergoing green and digital transformations. The aim is to usher in a sustainable era where economic prosperity coexists harmoniously with environmental preservation.

At ITRI, our commitment is to drive industrial development, create economic value, and enhance social well-being through technology R&D. Aligned with the United Nations' Sustainable Development Goals (SDGs), ITRI established the ITRI Sustainability Steering Committee, the ITRI Sustainability Committee, and the Office of ITRI Sustainability in 2022. These entities are positioned to oversee the sustainability management of the Institute, integrating resources and efforts across departments. This ensures the realization of ITRI's vision and goals as outlined in the Sustainable Development Strategy & Roadmap. With a focus on six key dimensions—technological R&D, industrial promotion, social welfare, talent cultivation, friendly workplace, and net-zero environment—ITRI consciously incorporates SDGs into its organizational culture and R&D operations, aspiring to better the world in a world-class standard.

Leveraging our robust innovation capacity, ITRI serves not only as the government's think tank but also as a pillar supporting Taiwan's industries. We navigate global geopolitical changes and economic trends, identify opportunities for industrial upgrading amidst risks, and accelerate the integration of 5G, AI, and other technologies. Furthermore, we innovate market-centric solutions and spearhead the exploration of new market frontiers. Shoulder to shoulder with industries, we endeavor to chart new blue oceans and steer society towards a better future.

In an era defined by rapid change, agility is paramount. With change being the only constant, we uphold our core philosophies of "innovative thinking, open communication, and agile management." To address global challenges encompassing environmental protection, social progress, and economic growth, we have formulated the 2035 Technology Strategy & Roadmap. This roadmap centers on key application domains, including Smart Living, Quality Health, Sustainable Environment, and Resilient Society, leveraging Intelligentization Enabling Technology. Simultaneously, we actively drive the transition towards net-zero emissions, enhancing industrial competitiveness through cross-domain solutions. By co-creating value with our industries, we contribute to the sustainable development of industries, societies, and the world.

> Supporting the United Nations' Sustainable Development Goals (SDGs), ITRI conscientiously embeds these goals into its organizational culture and R&D operations, working towards a better world.

ITRI Sustainability Committee: Letter from the General Director GRI 2-22

Work Together to Achieve Co-benefits

As ITRI approaches its 50th anniversary, it is a critical moment for us to reflect on the past and embark on a sustainable transformation. Confronting future challenges, we strive to put our best efforts into practice, aligning with the United Nations' SDGs and operational performance. We actively communicate with our stakeholders from various sectors, industry-school-research organizations, and external expert consultants. Our focus on the six major sustainable development dimensions enables us to leverage our influence on environmental, social, and economy aspects, achieving sustainable operations and development.

For the "Technological R&D and Industrial Promotion" dimension, ITRI has accumulated over 30,000 patents, securing its position among the world's top 100 innovative institutions. Also, ITRI has won R&D 100 Awards for 15 consecutive years. Faced with the challenges of global sustainable development, ITRI serves as a bridge between industries, academia, and research institutions, constructing diverse application fields with industry services exceeding 17,000 annually. Additionally, ITRI offers key technologies and services for industries in net-zero-related applications, including domains such as "energy supply," "demand utilization," "low-carbon manufacturing," "environmental sustainability," and "net-zero services." These encompass over hundreds of critical technologies and services, driving industries to implement low-carbon transformation and offering a solid technological foundation and a continuous source of innovative impetus for Taiwan's industries.

Talent is not only the driving force for industrial innovation, but also a crucial key for ITRI to achieve sustainable development. ITRI is committed to "integrity governance" and actively integrates its organizational culture DNA into talent development and various management levels. Internally, ITRI cultivates professionals with cross-domain, innovative, and international skills. Externally, it consistently links with industries, academia, and research institutions, establishing the "Power School" and "Net-zero School" to collaboratively cultivate more talented, "green-collar" employees It aims to be a pioneer force in Taiwan's journey towards net-zero emissions, creating a high-quality, happy, and friendly working environment for elite professionals across various fields. ITRI's outstanding achievements have been repeatedly recognized by various domestic and international organizations as a "Best Employer".

Concerning the dimension of "Sustainable, Net-zero Environment", ITRI has been promoting the "Green Campus" Project since 2011, centered on creating a green, low-carbon campus. Utilizing independently developed smart energy-saving technology and highly efficient facility systems, as well as leveraging its Living Lab's (an experimental site) experience in experimental fields, the institute has gradually laid the foundation for a sustainable, net-zero demonstration campus. As of the year of publication of the Report, ITRI has obtained seven Green Building Labeling System of EEWH (Ecology, Energy Saving, Waste Reduction & Health) certifications and installed solar photovoltaic systems using proprietary technology, generating a total of approximately 3.24 million kWh of electricity, saving 4.23 million kWh of electricity, reducing carbon emissions by 2,150 metric tons, and conserving 139,000 tons of water. Moreover, water recycling constitutes 12% of the institute's total water usage, and the average green cover ratio of the campus has reached an impressive 276.25%. Furthermore, it continues to reinforce its digital transformation and epidemic response capabilities. In 2022, ITRI has surpassed NT$100 million in green procurement in 2022, showing its commitment to practicing green operations through the collective collaboration with its industry partners and colleagues.

ITRI promotes social welfare through three main aspects: technology application and services, technology education promotion, and corporate volunteering, extending its charity reach to various regions across Taiwan. To date, there have been a cumulative total of 94 technology-related applications for social welfare, training for 2,200 ITRI employee volunteers, and a total of 20,000 person-days of public services. Despite the impact of the pandemic on physical activities in 2022, to continue local services, ITRI collaborated with internal and external communities and colleagues to organize 53 charity events. Additionally, ITRI has long promoted the health-related social welfare technology applications, collaborating with NGOs to serve local seniors and people in remote areas. Also, it conducts field verifications in areas such as technology in remote regions, emergency assistance, recycling, and smart healthcare. ITRI develops relevant products and services, using technology for social welfare to benefit the society.

Sustainability is a long-term journey. ITRI leads domestic research organizations, focusing on R&D, and takes reference from the guidelines provided by the GRI Standard to compile the first "Sustainability Report". This Report discloses ITRI's investments and achievements in sustainable operations and development, aiming to address the needs of stakeholders and serve as a reference for the public. Looking ahead, we will enrich our commitment to a sustainable culture and practices, continuing to devote more efforts to the stable development of industries and society.

General Director

Sustainable Development-related Chronology of Events

1973

The Industrial Technology Research Institute Establishment Act has been officially passed into legislation, where the Industrial Technology Research Institute was established following the merger of the Ministry of Economic Affairs' Joint Mining Research Institute, Joint Industrial Research Institute, and Metal Industry Research Institute.

1988

Established the "Industrial Health and Safety Project Planning Office" to assist in promoting the establishment of industrial health and safety-related technology and systems.

1996

Established the "Open Lab/Startup Company Incubation Center", the first-ever startup company incubation center in Taiwan.

2001

Established the Employee Activity Center (the predecessor of the "YoHo Club" opened in 2009) to offer employees a high-quality space for health, leisure, and recreation.

2004

Established the "Remuneration Committee" to review and approve the remuneration and bonuses of ITRI's full-time chairmen and president.

2006

Promoted the "ITRI Employee Health Plan" and established the "Employee Smart Healthcare System", pioneering the digital tracking of employee health check-ups and risk assessment management mechanism in Taiwan.

2007

Established the "Audit Committee" to ensure the independent operation of internal audits and the assessment of internal control functions within the institute.

2008

Won the "R&D 100 Awards" for the first time. To date, ITRI has achieved a consecutive total of 50 technology awards.

2010

Established the "Carbon Footprint Restaurant", the first-ever restaurant in Taiwan to provide carbon emission information for its food.

2011

Established the "Public Welfare Committee" to implement social care through the technology application.

Initiated the "Green Campus" project and utilized ITRI campuses as forward-looking demonstration area for the applications of green technology.

2013

Integrated the "Industrial Safety and Health Association" and "Quality Promotion Committee" to establish the "(Safety, Health, Quality, Environment, Energy) Integrated Management System Committee".

2014

Received the highest honor in the first "Presidential Innovation Award" from the Ministry of Economic Affairs.

Received the inaugural "Work-Life Balance Award" from the Ministry of Labor.

2015

Won the "Derwent Top 100 Global Innovator" for the first time. To date, ITRI has won the award seven times.

2017

Won the "Edison Awards" for the first time. To date, ITRI has won the award 12 times and for seven consecutive years.

2019

Launched the "2030 Technology Strategy & Roadmap", outlining new strategies and blueprint that transition from technological innovations to value innovations.

Became the first juridical person under the Ministry of Economic Affairs to pass the audit stipulated in the "Cyber Security Management Act".

2020

Formulated the ITRI "the Code of Conduct for Integrity Operation" and established the "Integrity Management Committee", promoting and strengthening organizational integrity governance.

2021

Established the "Net Zero and Sustainability Strategy Office" as an integrated management platform for industries to promote zero carbon emissions.

2022

Established the "ITRI Sustainability Steering Committee" and "Office of ITRI Sustainability", integrating and promoting sustainability initiatives, aligning with the United Nations' SDGs.

2050 Net Zero Carbon Emissions Special Column

ITRI has formulated the "2050 Sustainable, Net-Zero Strategic Goals," leveraging its accumulated experience in R&D and applications related to renewable energy, energy conservation, and carbon reduction. Internally, it establishes ITRI as a Green Technology Living Lab, focusing on "low-carbon living, buildings, transportation, and campuses". Externally, it collaborates with the government and enterprises to participate in international environmental agreements It is also involved in various initiatives in fields such as renewable energy, CO_2 Capture, Utilization, Storage (CCUS), and water water resource recycling. These efforts aim to contribute to the establishment of a green industrial chain and align with the national net-zero carbon emission targets for 2050.

Performance Highlights

The average green cover ratio of the campus reaches 276%

7 green buildings were constructed.

ITRI Headquarters' buildings achieve a Top 2% rating according to the U.S. Energy Star rating standards.

48 key technologies and service types related to net-zero sustainability.

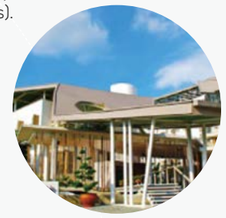
Important Events

Low-carbon living

- In 2000, ITRI initiated the "Green Office" environmental campaign.
- From 2008 onwards, ITRI gradually improved/reduced its workplace energy consumption by replacing its old motors with new ones, using solar water heating systems in dormitories, engaging in rooftop plantations to reduce thermal conduction, improving lighting in offices and laboratories, and implementing energy-saving measures in the staff cafeteria.
- In 2013, ITRI was certified as a green-mark from the Ministry of Environment.

Low-carbon buildings

- In 2010, ITRI obtained its first-ever Diamond-Level Green Building Label. To date, there are 7 green building label certifications and 2 intelligent building label certifications, which are owed to 7 buildings ITRI constructed.
- In 2013, ITRI pioneered the establishment of a district energy center, resulting in a 43% reduction in energy consumption for a 13-year-old building (i.e., Building 10 of ITRI Headquarters' buildings). In 2015, it received the diamond-level Green Building Labeling System of EEWH for its existing buildings.



Net-Zero Transformation

Industrial Net-Zero Initiative

Low-carbon transportation

- Since 2008, ITRI aimed at promoting low-carbon transportation, and has raised 5 energy-conserving measures, including the establishment of a "ridesharing platform", setting up U-bikes for official use within the campus, installing energy-saving waiting shelters, and the comprehensive utilization of official electric vehicles. Additionally, the institute also provides electric shuttle bus services.

Low-carbon campuses

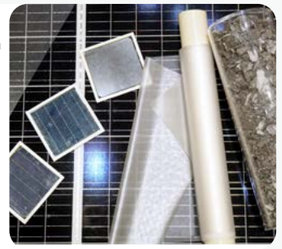
- In 2011, ITRI initiated the "Green Campus" project, promoting a green and low-carbon campus. The project involved the implementation of smart technology in old buildings and the establishment of an intelligent power monitoring platform for architectural systems. The campus serves as an forward-looking demonstration area for the application of green technology.
- In 2012, ITRI established an ecological pond within the campus of its headquarters to regulate the temperature of its surrounding environment. Concurrently, ITRI constructed an underground rainwater harvesting pool, collecting rainwater for plant irrigation.
- In 2021, the Shalun Green Energy Technology Demonstration Site applied microclimate conditions in its design, creating a green ecological park with reduced carbon and low-carbon operation.

International Initiatives

- Since the 1990s, ITRI has been participating in the UNFCCC and Montreal Protocol COP as an NGO observer on behalf of Taiwan, taking tangible actions to showcase Taiwan's commitment to global environmental issues and determination to actively participate in international environmental protection conventions.

Renewable Energy

- Since the 1980s, ITRI has been involved in the development of renewable energy technology, focusing on the research and development of wind, solar, geothermal, and biomass power generation technologies.
- In 2022, there was a successful development of the "easy-dismantled solar module," addressing the environmental problems stemming from decommissioned solar panels. In recent years, ITRI has continued to conduct technological innovation in the production, storage, and application of renewable energy and hydrogen energy.



CCUS

- Since 2011, ITRI have initiated in the research and development of carbon capture technology, to address the problem of high costs associated with carbon dioxide capture. Additionally, there has been a focus on developing carbon fixation technology.
- In 2022, ITRI promoted "co-production of steel and petrochemicals," which involves utilizing the captured carbon dioxide from steel mills in the production of chemicals in the petrochemical industry, creating economic profits.

Water Recycling

- Since 1985, ITRI has been involved in industrial wastewater treatment. In recent years, the focus has expanded from wastewater treatment to wastewater recycling and reuse, which has further been applied in practical terms to industrial wastewater treatment systems and water purification in disaster area.
- In 2021, ITRI successfully researched and developed the world's first technology capable of generating clean water from the air, addressing water resource problems.

COVID-19 Special Column

As COVID-19 spread globally, ITRI leveraged its accumulated technological R&D capabilities and engaged in horizontal, comprehensive, and cross-disciplinary integration to address both the needs of the government and the public. Also, ITRI promptly established the "Pandemic Prevention Response Team", employing strategies such as technological pandemic prevention, agile responses, and digital management to construct a all-encompassing technological pandemic prevention network, actively safeguarding the health and safety of the entire population and ITRI's employees. Concomitantly, the pandemic served as an opportunity for us ITRI to scrutinize and strengthen its organization-wide digital transformation and risk management policies, turning crises into opportunities, reinforcing its organizational resilience, and improving its rapid response capabilities.

Performance Highlights

Joined the National Mask Production Team, produced 92 mask machines to support the mask production capacity of Taiwan.

Constructed nearly 200 Positive Pressure COVID-19 Testing Booths across Taiwan.

Researched and developed Taiwan's first-ever medical-grade ventilator prototype, effectively reducing the mortality rates among people infected with COVID-19.

Researched and developed the "iPMx Nucleic Acid Detection System for 1-Hour Rapid Tests", which can rapidly detect the nucleic acids of coronavirus diseases, allowing frontline healthcare workers to swiftly conduct COVID-19 nucleic acid testing while on the go.

Protecting the Health of the Public against the Pandemic by Utilizing Technology

Designed the Positive Pressure COVID-19 Testing Booth for hospitals across Taiwan to build safe testing environments

ITRI developed the "Positive Pressure COVID-19 Testing Booth" to provide frontline healthcare workers with safe testing environments. During two months of the escalating pandemic, nearly 200 testing booths were deployed nationwide, utilizing technology for an immediate and effective pandemic prevention in the medical field.

Combined AI-based entrance control with rapid testing to facilitate screening for frontline staff

ITRI developed the "body temperature irregularity detection technology," an AI-based technology that can screen body temperatures in locations with a large influx of people, especially in outdoor settings; Additionally, the "iPMx Nucleic Acid Detection System for 1-Hour Rapid Tests" can rapidly detect the nucleic acids of coronavirus diseases, contributing to coronavirus detection and improving the efficiency and accuracy of screening efforts.

Had responsive teams quickly expand their mask production capacity, providing comprehensive protection

In 2020, ITRI responded to the government's call to join the National Mask Production Team. In 40 days, ITRI efficiently produced 92 machines, resolving the shortage of equipment in the country at that stage and stabilizing the production capacity of medical masks. Such efforts not only made Taiwan's mask production the world's second-largest, but also raised its daily mask production to 16 million, actively safeguarding the health of the people.

- To prepare for the high demand for ventilators in the post-pandemic era, ITRI developed a home-based "medical-grade ventilator," assisting confirmed patients with COVID-19 reach a full recovery.
- ITRI assisted in the establishment of a GMP nucleic acid manufacturing plant, providing adjuvants to support the localization of vaccines.
- ITRI researched and developed zero-contact, zero-wearing technology such as remote monitoring and digital authentication, covering various aspects of health protection, including prevention, diagnoses, treatment, and monitoring management, ensuring the well-being of the people.

Safeguarding the Health and Safety of Employee via Agile Responses

Following the COVID-19 pandemic in 2020, ITRI immediately established the "Pandemic Prevention Response Team" (disbanded on May 20, 2023), adopting the principle of "rolling reviews and localized measures" to engage in comprehensive pandemic prevention and effective management. Additionally, embracing the concept of "concentric circles", ITRI assessed and determined the intensity of pandemic prevention, swiftly established reporting systems and pandemic prevention networks to effectively safeguard the health and safety of its employees.

Strengthening Organizational Resilience via Digital Management

To implement digital transformation, ITRI has been promoting remote operations even prior to the pandemic. The outbreak expedited the process of such digital transformation, compelling ITRI to continuously optimize work processes through emerging ICT technology. Today, remote work has become a new normal.

In response to the pandemic, ITRI underwent management transformation, shifting its focus from managing "procedures" to managing "results". The pandemic also heightened ITRI's emphasis on risk management. In the future, ITRI plans to incorporate risk management and organizational resilience in its sustainable development-related material topics, ensuring the institute's continuous operation and strengthening its overall competitiveness.

ESG Performance

Won 47 awards (including organizational awards and 26 personal awards) for the year

Continued to pass the **ISO 27001** and **ISO 20000-1** Information Security and Information Technology Service Standards verification with zero deficiencies

Underwent inspections by the government regulatory authorities in compliance with the **Cyber Security Management Act**

Received an "**outstanding**" rating in the "Assessment of the Research Institution Management System" conducted by the Ministry of Economic Affairs

Participated in more than 521 domestic public associations

Had 154 international partners

Possessed a local procurement ratio (type: labor services) of 96%

Integrity Governence

R&D and Technology Application

Reached revenue of NT$8.456 **billion** from the industry

Employed 6,000 technological R&D elites

Granted 821 patents (cumulative total: **31,544**)

Transferred technology to 585 companies this year (cumulative total: **6,304** companies in the past 10 years)

Provided technology services to 17,464 companies (cumulative total: **170,000** companies in the past 10 years)

Established 4 new startup ventures (Cumulative total: **157** companies and business groups)

Nurtured and incubated 215 companies in total

Cultivated 1,000 professionals in industrial carbon management

Organized/ participated in 53 social welfare-related activities

Had 10 (cumulative total: **94**) social welfare-related technology application and health R&D-related achievements

Volunteer involvement: 1,326 people (providing **20,000+** person-days of services)

The percentage of female employees is 38.18%, and the proportion of female executives is 29.5%

Had a total of 46 partnering institutions/societies

Conducted a comprehensive organizational employee opinion survey and organizational safety culture survey **across the institute**

New hire turnover rate of 10.45% and disabling injury frequency rate of 0.38, respectively

Passed the **ISO 45001** Occupational Health and Safety Management System verification covering the entire campus

Social Contribution

Environmental Protection

Completed and opened Building 2 of Kuang Fu Campus, the 7th green building of ITRI (Note)

Invested more than NT$ 90 **million** in the construction of low-carbon facilities

Had an average green cover ratio of 276.25% across all campuses

The annual reduction in general waste reached 8.32%

Saved 4.23 million kWh of electricity (reduced **2,093.9** metric tons of CO_2e)

Generated 2.05 **million** kWh of renewable energy, an increase of **71.72%** compared to the previous year

Passed the **ISO 14001** Environmental Management Systems verification

Passed the **ISO 14064-1** Greenhouse Gas verification and established ITRI's baseline year information

Note: The 7th green building of ITRI (i.e., Hsinchu Kuang-Fu Campus Building 2) was planned and constructed according to green building standards. The campus was officially inaugurated in 2022 and obtained the Green Building Labeling System of EEWH certification in March 2023. Such result was included in the scope of the disclosed information.

Awards and Recognitions

Top 100 Global Innovator

ITRI was named a Top 100 Global Innovator for 6 times since 2014

R&D 100 Awards

ITRI won 3 R&D 100 Awards in 2022 and was recognized for 15 consecutive years

2022 R&D 100 WINNER

- High Resolution Full-Color Micro LED Display for AR Glasses
- Point-of-care AI-DR
- GreenTape™ 9KC LTCC and Ag Metallization for mmWave 5G Wireless Devices

Edison Awards

EDISON AWARDS SILVER 2022 WINNER

BioMS-Ti

EDISON AWARDS BRONZE 2022 WINNER

Portable Edge AI-DR

Energy Globe Award

Innovative Low Carbon Ceiling Fan

institutions such as Universum and LinkedIn

Received the "Best Employer" awards

ASOCIO ICT Awards

"iPetWeaR" Smart Pet Collar

SCF Small Cell Awards

5G O-RAN energy-saving private networks

CES Innovation Awards

All-in-One Thermal Sensing System

iPetWeaR

RGB-D AI Robot

CES INNOVATION AWARDS 2022 HONOREE

NYX Marcom Awards

Content Marketing Strategy

Annual Report (Gold Winner)	Marketing Program (Silver Winner)
	
2021 ITRI Annual Report-Beyond Growth: Towards a Net Zero Tomorrow	ITRI @ CES 2022 Hybrid Event Marketing

About ITRI GRI 2-1, 2-6

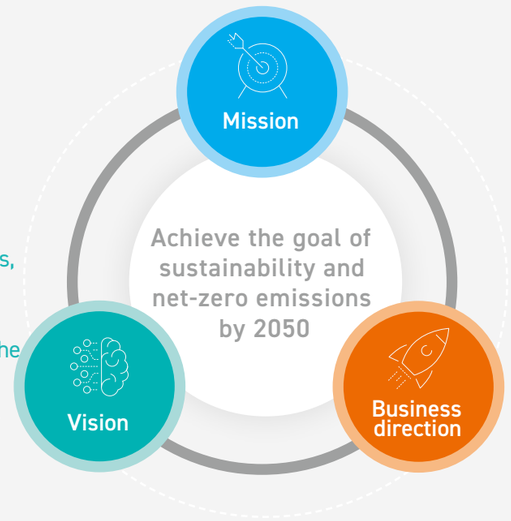
Established in 1973, ITRI serves as a bridge between industries, academia, research institutions, and the government. ITRI not only leverages its expertise to assist competent authorities in economic and industrial development strategy planning but also consistently develops interdisciplinary solutions based on market demands. Through technological R&D and innovations, ITRI drives Taiwan's overall industry development, creates economic value, and helps industries transform and upgrade, enhancing social welfare. As an internationally recognized applied research institution, ITRI boasts a team of 6,000 R&D experts. Concerning its R&D strategies, ITRI transitions from technological innovation to value innovation, finding new solutions for existing problems and uncovering new business opportunities for various industries. ITRI actively drives digital transformation and creates a technology work environment to enhance organizational efficiency and effectiveness.

Also, ITRI serves as a cradle for talent cultivation and industrial innovation. Through systematic strategic planning and actions, ITRI has successfully nurtured numerous emerging industries and elite talents, making significant contributions to Taiwan's overall economic and industrial development. To date, ITRI has played a leading role in pioneering innovative frontiers, accumulating over 30,000 patents, and was the first institution in Taiwan to invest in the R&D of integrated circuits, contributing to the growth of listed and over-the-counter companies such as TSMC, UMC, Taiwan Mask Corporation, EPISTAR, Mirle Automation Corp., and Taiwan Biomaterial Company, sparking waves of industrial development.

As ITRI approaches its 50th anniversary, it will continue to promote organizational cultural transformations, deepen the corporate management spirit, and leverage its interdisciplinary technological R&D strengths and expertise to facilitate scientific and research integration. These endeavors aim to meet social demands as well as elevate Taiwan's overall industrial competitiveness. ITRI is committed to pursuing sustainable organizational development, aligning with the United Nations' SDGs, and strengthening social resilience, creating a sustainable, low-carbon, and new living for industries and the society.

ITRI Positioning

- Use technological R&D to drive industrial development, creating economic value and enhancing social welfare



- Pioneering on the frontier of innovation
- Connect industries, academia, and research institutions with the world
- Serve as a world-class think tank
- Engage in market-oriented R&D
- Serve as an effective bridge
- Assist industries in transformation and upgrading

Global Layout

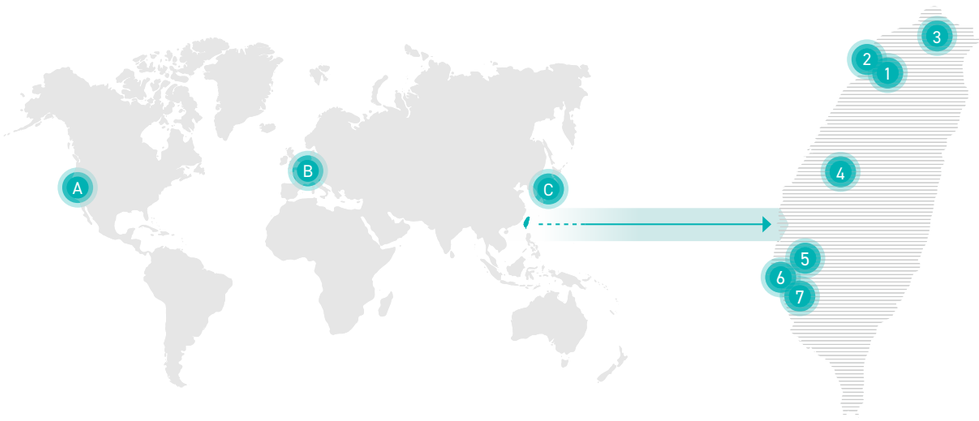
ITRI, based in Taiwan, has established seven service locations across northern, central, and southern Taiwan and a total of three offices in the United States, Germany, and Japan respectively. Through these locations, ITRI aims to connect with the global innovation and technology ecosystem, aligning with international standards. This network strengthens technological collaborative platforms with key countries and regions worldwide, fostering multilateral cooperation and further expanding international partnerships.

International service locations

A North American Office
2880 Zanker Rd., Suite 103, San Jose, CA 95134, USA
Tel : +1-408-428-9988
Fax : +1-408-428-9388
Email: info@itri.com

B European Office
Hohenzollerndamm 187, 7. OG., 10713 Berlin, Germany
Tel : +49-30-8609-360
Email: contact_germany@itri.org.tw

C Japanese Office
TTD Bldg., 3F, 1-2-18 Mita, Minato-ku, Tokyo, 108-0073 Japan
Tel : +81-3-5419-3836
Fax : +81-3-3455-5079
Email: itritokyo@itri.org.tw



Domestic service locations

1 ITRI Headquarters
No. 195, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County
Tel : +886-3-5820100
Fax : +886-3-5820045

2 Kuang-Fu Campus
No. 321, Sec. 2, Guangfu Rd., East Dist., Hsinchu City
Tel : +886-3-5820100
Fax : +886-3-5820045

3 Taipei Branch
No. 106, Sec. 2, Heping E. Rd., Da'an Dist.
Tel : +886-2-27377300
Fax : +886-2-27377387

4 Central Region Campus
No. 2, Wenxian Rd., Nantou City, Nantou County
Tel : +886-49-2345200
Fax : +886-49-2345298

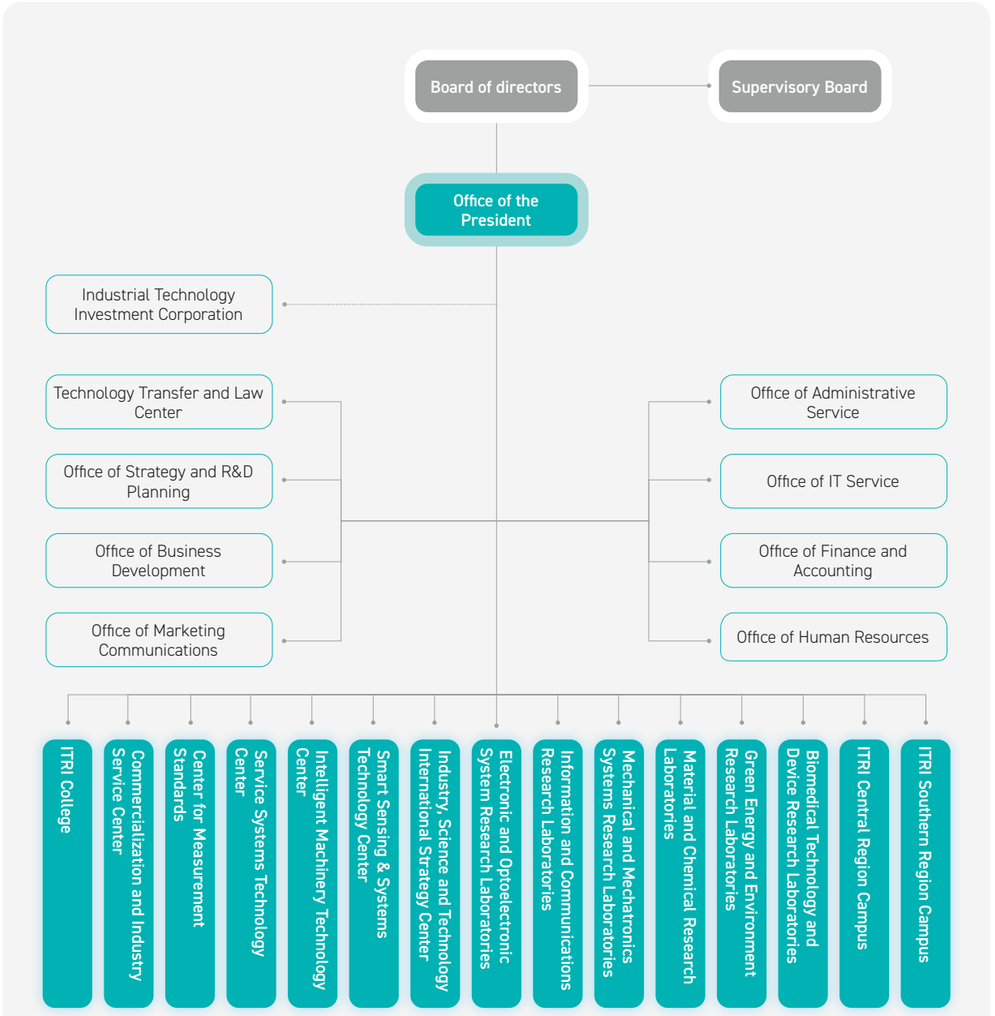
5 Southern Region Campus
No. 8, Gongyan Rd., Liujia Dist., Tainan CIty
Tel : +886-6-6939000
Fax : +886-6-6939111

6 Southern Taiwan Innovation & Research Park
No. 31, Gongye 2nd Rd., Annan Dist., Tainan City
Tel : +886-6-3847500
Fax : +886-6-3847184

7 Shalun Green Energy Technology Demonstration Site
No. 360, Gaofa 2nd Rd., Guiren Dist., Tainan City
Tel : +886-6-3636777
Fax : +886-6-3032026

Organization

ITRI is committed to the R&D and innovation of industrial technology, and has established robust governance, management, and functional laboratories and centers in compliance with the government's technology policies, and in response to industry demands as well as considering ITRI's R&D domains and application focuses. The highest governance bodies are the Board of Directors and the Supervisory Board, with the president and the executives from the Office of the President overseeing various laboratories and centers responsible for R&D, operation, business, and services. Each laboratory and center, in addition to striving to achieve operational targets while complying with performance indicators, also adapts to various government projects and management objectives to conduct agile management on cross-laboratory and cross-disciplinary collaboration, strengthening organizational connections and teamwork. These approaches adopted by ITRI, help align industries, academia, and research institutions with international standards through their enhanced and sound technological capabilities.



Sustainability Vision and Strategy GRI 2-22

In 2015, the United Nations proposed the "2030 Agenda for Sustainable Development", outlining 17 SDGs and 169 associated targets, guiding the world to work collectively to achieve SDGs. In response, the National Council for Sustainable Development under the Executive Yuan formulated Taiwan Sustainable Development Goals in 2016, introducing 18 core goals and 143 specific indicators to echo and align with global sustainable development actions and international standards.

To assist both Taiwan's industries and ITRI's own sustainable operation, ITRI has formulated the ITRI Sustainability Strategy & Roadmap based on the aforementioned indicators. Additionally, the Roadmap adheres to the principles of "innovative thinking," "agile management," and "open communication," ITRI proposed six major focal points, which were "technological R&D," "industrial promotion," "social welfare," "talent cultivation," "friendly workplace," and "sustainable, net-zero environment". These focal points cover the three dimensions of environment, society, and governance. For each of the six initiatives, short-term, mid-term, and long-term sustainable performance quantifiable goals have been established, allowing it to conduct periodic review on the progress towards ITRI's SDGs, contributing significantly to Taiwan's path towards sustainable development.

Note: The spirit of the ITRI Sustainability Strategy & Roadmap is to pursue a balanced development across various indicators without neglecting secondary issues. The organization aims to equally emphasize plans for environmental and governance development while giving equal importance to talent cultivation, human rights management, and addressing vulnerable groups in society.

SDGs Management

Technological R&D

Plan and promote the implementation of mid- and long-term technological strategies and roadmaps

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Completion status of the technological strategies and roadmap at the current stage	Updated the 2030 Technology Strategy & Roadmap (version 6.0)	Complete the planning of the 2035 Technology Strategy & Roadmap (version 1.0)	Complete the goals set for 2025 in the 2035 Technology Strategy & Roadmap	Complete the goals set for 2030 in the 2035 Technology Strategy & Roadmap	• Technological innovations and R&D • Technology application and promotion

Industrial Promotion

Assist clients in early development of net-zero emissions, elevating industrial competitiveness, and creating opportunities for carbon reduction

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Interim goals for industry net-zero emissions target	Established a net-zero carbon emissions service team for industries, promoted net-zero emissions and carbon reduction in the northern, central, and southern regions, as well as cultivated relevant knowledge and skills.	Complete the white paper on industrial carbon reduction planning by domestic public associations, to guide the direction of industrial carbon reduction	Guide policy resources into the direction of achieving net-zero emissions based on industry needs	Assist domestic businesses engage in net-zero transformation to achieve the national goal of net-zero emissions by 2030	• Technology application and promotion • Technological innovations and R&D • Sustainable, net-zero transformation
Number of businesses coached in achieving net-zero emissions	Established a net-zero emissions team responsible for promoting cross-domain net-zero collaboration with key clients, assisting them in evaluating carbon inventories, and signing contracts for the implementation of net-zero emissions and energy-saving technologies.	400	3,000	10,000	
Number of key client cases created	Established a net-zero emissions BD team, focusing on identifying hotspots, exploring technological collaborations, and planning for the future, working towards initiating cross-domain collaborations for achieving net-zero emissions with key clients.	1 case	3 cases	Assist 70 key clients in achieving sustainable, net-zero emissions and corporate transformation	
Examples of SMEs coached	Completed the establishment of a sustainable carbon management platform for SMEs, and coached SMEs to gradually implement net-zero carbon emissions	Create three SME exemplary cases	Promote exclusive online services for SMEs to drive SMEs' green output value or green investment, establishing exemplary results in various domains, with a total of 10 cases accumulated	Promote the diffusion of exemplary achievements among SMEs across various industries, realizing net-zero transformation	

Sustainable, net-zero Environments

Promote ITRI to become a campus demonstrating net-zero sustainability

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Renewable energy capacity, as indicated in contracts	8.97%	13%	16%	20%	• Technology application and promotion • Technological innovations and R&D • Sustainable, net-zero transformation
Electricity-saving rate (using the year 2021 as the baseline)	Saved 4.26% of the electricity	Perform electricity-saving reviews and management through spatial usage Save 7% of the electricity	Develop a basic model for electricity consumption and continue to monitor and control electricity consumption Save 10% of the electricity	Enhance the use of renewable energy and improve the efficiency of system operation Save 30% of the electricity	
Water-saving rate (using the year 2021 as the baseline)	• Established a cross-campus and cross-laboratory water resource team and initiated an agile contingency plan • Launched the smart water network in the campus, implementing intelligent control of water resources, disaster prevention and backup, and inventory control	Promote digital management to enhance water supply efficiency and water utilization benefits Save 4% of water	Replace water supply pipelines Save 5% of water	Implement the collection, recycling, and reuse of wastewater Save 10% of water	
Organizational carbon management (using the year 2022 as the baseline)	Established the ITRI GHG inventory promotional team and initiated GHG inventory planning	Complete the GHG inventory of the ITRI Headquarters, Kuang-Fu Campus, and ITRI Southern Region Campus, and pass the ISO 14064-1 GHG Emissions verification	Continue to complete the GHG inventory of the three ITRI campuses, pass the ISO 14064-1 GHG Emissions verification, and perform carbon reduction performance assessment	• Pass the ISO 14064-2 GHG Emissions Reduction or Removal Enhancement verification • Complete the GHG inventory and achieve a 50% carbon reduction	
Number of external environment verifications promoted	Initiated the ISO 14001 Environmental Management Systems verification	Ensure that some of the campuses pass the ISO 14001 Environmental Management Systems verification	Ensure that all campuses pass the ISO 14001 Environmental Management Systems verification	Ensure that all campuses pass the ISO 14001 Environmental Management Systems verification	

Friendly Workplace

Create an inclusive and sustainable workplace for the common good

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Rate of new startups incubated (including those involved with net-zero emissions)	Incubated 4 startup businesses (2 of which were involved with sustainable, net-zero emissions)	Facilitate the launching of 7 startup businesses (at least 2 of which are involved with sustainable, net-zero emissions)	Facilitate the launching of 14 startup businesses (at least 5 of which are involved with sustainable, net-zero emissions)	Facilitate the launching of 30 startup businesses (at least 10 of which are involved with sustainable, net-zero emissions)	• Organizational culture and integrity governance
Employee disability rate	0.38	< 0.38	< 0.34	< 0.3	• Occupational health and safety
Number of participants in health promotion activities (e.g., physical and mental care and sports services)	103k	115k	120k	125k	• Human Capital Management • Occupational health and safety
Number of people completing integrity management education and training	8k	10k	Advocate common risk situations (at least 15 events)	Build sound integrity management environments	• Organizational culture and integrity governance

Talent Cultivation

Implement lifelong learning for talent cultivation and industrial value

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Average training hours per employee	43 hours	45 hours	50 hours	80 hours	• Human Capital Management
Learning resource visit rate (reach)	231,962 visitors	245k visitors	255k visitors	300k visitors	
Number of internal lecturers trained	60	100	120	150	
Number (cumulative) of employees with international experiences	2	5	8	10	
Number of industry talent trained	12,069	12,000	30,000	80,000	
Number (cumulative) of youth employment talent trained	543	600	1,800	4,000	

Social Welfare

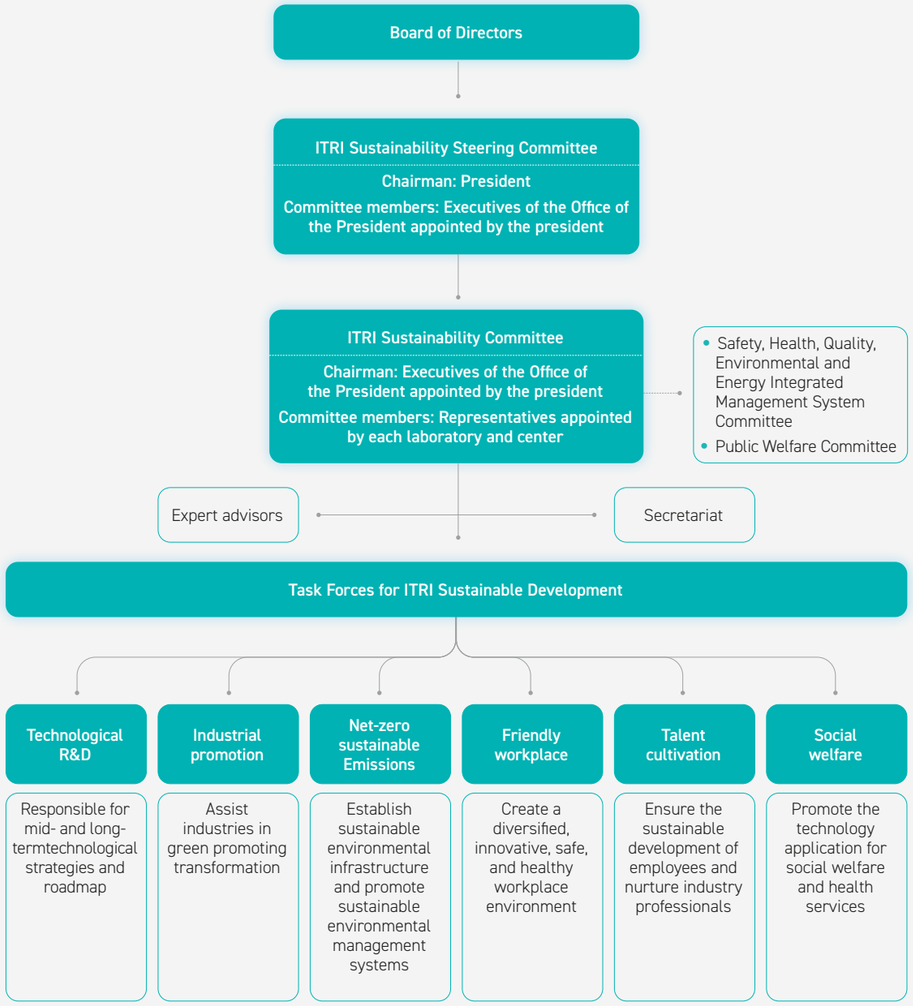
Engage in sustainable technological innovation, creating social welfare in a circular manner to generate value

Key performance indicator (KPI)	Achievements in 2022	Short-term (2023) goals	Mid-term (2025) goals	Long-term (2030) goals	Corresponding material topics
Number of local social welfare institutions or NGO groups that ITRI worked with	Collaborated with a cumulative total of 54 local social welfare institutions or NGO groups, strengthening the impact of social welfare initiatives	Grow by 1%	Grow by 3%	Grow by 10%	• Technology application and promotion • Technological innovations and R&D • Sustainable, net-zero transformation
Number of annual events hosted or participated in ESG (social welfare/ environmental) (using the year 2022 as the base year)	53 events for the year	Increase in the number of events by 0.5%	Increase in the number of events by 1.5%	Increase in the number of events by 3.5%	

Sustainability Management Structure

GRI 2-9, 2-12, 2-13, 2-16

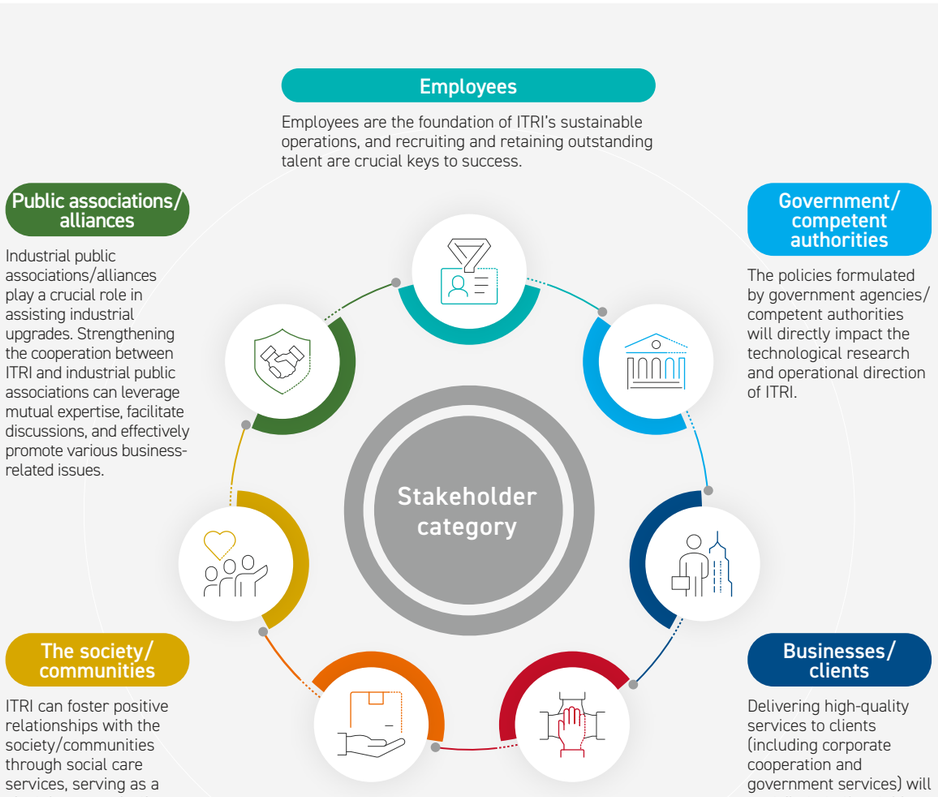
In 2022, ITRI established the ITRI Sustainability Steering Committee, chaired by the president, with meetings held every six months. The committee, together with the executives appointed by the President's office, formulate decisions to implement ITRI's sustainable development vision, strategies, and operational guidelines. It supervises the progress and improvement directions of various sustainable development projects. To facilitate the promotion and implementation of ITRI's sustainability initiatives, the ITRI Sustainability Committee was established. Executives appointed by the President's office serve as the chairman of the committee, holding regular progress meetings each quarter. The committee's primary responsibilities are to identify sustainable development issues, set objectives, supervise cross-team communication and resource integration, promote action plans and improvement initiatives, and track the execution results of sustainable operations. Six task forces for ITRI Sustainable Development were established, along with expert advisors and a secretariat for sustainable industries. Additionally, the Office of ITRI Sustainability was created to ensure the continuous promotion and operation of ITRI's sustainable organizational development and operations.



Stakeholder Engagement GRI 2-25, 2-29

Identifying Stakeholders

ITRI values and listens to the voices of various stakeholders. Through discussions and reviews made by ITRI Sustainability Committee members, the Office of ITRI Sustainability, and various working groups, as well as through diverse communication channels and internal/external surveys, ITRI collects feedback on its operational activities that may impact internal or external groups or individuals. In accordance with the five major principles stipulated in the AA1000 Stakeholder Engagement Standard (SES) (i.e., responsibility, influence, tension, diverse perspectives, and dependency), ITRI identified its seven primary stakeholders, which are ITRI's employees, businesses/clients, industry-academia-research partners, suppliers, the government/competent authorities, the society/communities, and public associations/alliances.



Stakeholder Engagement

ITRI attaches great importance to and listens to the voices of various stakeholders. Through regular and ad-hoc communication channels, ITRI seeks to understand the actual and potential impacts of its operational activities on relevant groups. Such information serves as a basis for planning relevant preventive and mitigating actions in the future. Moving forwards, ITRI plans to conduct face-to-face interviews to regularly collect and organize feedbacks from stakeholders and, if necessary, conduct identification surveys to ensure the comprehensive engagement with stakeholders and the establishment of diverse two-way communication channels, aligning with ITRI's commitment to industrial sustainability values.

environmental social governance

Category	Important issues	Communication channel and frequency		Communication results in 2022
Employees	Technology application and promotion Business partner relationship Organizational culture and integrity governance Diversity and inclusion Human Capital Management	President's ITRI report	Twice a year	Presented/held/conducted 2 ITRI report, 5 labor-management meetings, 2 employee representative meetings, and 1 employee opinion survey Held 474 training sessions to educate the topics of human rights protection as well as diversity and inclusion. The training sessions totaled nearly 30,000 hours; and a total of 12,448 employees have completed the training Held 492 employee health promotion events, with a total of 119,809 participants Established two valid employee grievance cases, one of which pertained to employee performance, and the other related to sexual harassment in the workplace. The matters had been handled in accordance with relevant management regulations to safeguard the rights and interests of the employees involved Held 4 Information Promotion Committee meetings (once per quarter), 2 Cyber Security Management Act Promotional Team meetings (once every 6 months), and 4 Information Security Working Team meetings (once per quarter) Hosted 15 information security general education digital courses and 1 information security professional training course for information staff. The completion rate of the institution-wide staff in the general education courses was 100%, and the new employee training course also achieved a 100% completion rate.
		ITRI official website and employee learning platform	Permanent	
		Employee representative meetings	Twice a year	
		Labor-management communication meetings	Once a quarter	
		Employee opinion surveys	Once every 2-3 years	
		Forums	Periodically	
		President's mailbox	Permanent	
		Office of Human Resources hotline	Permanent	
		Staff-IT customer service hotline/ counter services	Permanent	
Government agencies / competent authorities	Technological innovations and R&D Business partner relationship Sustainable, net-zero transformation Green energy	Strategic planning staff	Periodically	Received an "outstanding" rating in the "Assessment of the Research Institution Management System" from the Ministry of Economic Affairs Served as strategic planning staff for the competent authority, achieving five outcomes during the year: presented technological R&D projects such as the petrochemical industry low-carbon transformation project, proposed future hydrogen energy application technological strategies and roadmap in Taiwan, incorporated in the 2022 White Paper, assisted in the development of domestically and independently researched and developed sports science integrated solutions, as well as initiated an innovative bio-manufacturing technology development project Established five cross-domain strategy offices comprising the "Office of Power Grid Management and Modernization Strategy", "Office of AI Application Strategy", "Office of Southern Industrial Innovation Strategy", "Office of Sustainable, Net-zero Emissions Strategy" and "Office of Intelligent and Green Vehicle Promotion Strategy", to consolidate ITRI's technological research capabilities Engaged in international partnership with over 154 organizations (covering industry/government/academia/ research domains) spanning 26 countries and 4 continents Assisted in raising the information security awareness of judicial persons and enhancing the information exchange among judicial persons. and conducted five audit operations for judicial persons under the jurisdiction of the Technical Department; Executed information outsourcing audits for a total of 30 vendors
		Advisory committee meetings	Periodically	
		Official documents and letters	Periodically	
		Personal visits or telephone interviews	Periodically	
		Press conferences, forums, or seminars	Periodically	
		Various management examinations or assessments	Once a year	

Category	Important issues	Communication channel and frequency		Communication results in 2022
Businesses / clients	Technology application and promotion Green energy	0800 customer service hotline	Permanent	The customer service hotline handles approximately 8,000 cases each year. Served 74 key clients and promoted 304 technical collaboration projects Provided a total of 573 industrial talent training sessions, serving 3,614 enterprises and training 12,715 industry professionals Transferred technology to 585 businesses, provided industry services to 17,464 businesses, and established 4 new startup companies and business groups Conducted satisfaction surveys with contract clients, analyzing feedback from 936 clients and providing management suggestions Established a SME carbon estimation platform for the Ministry of Economic Affairs, which had been used for over 20,000 times; collected the information of carbon emissions from 800 companies, 180 of which were assessed; provided integrated technology services; and coached 60 companies to improve their green technology, contributing to a reduction of approximately 5,000 metric tons of CO_2e and promoting green investments exceeding NT$100 million Efforts in intangible asset financing since 2018 which, combined with the credit guarantee fund financing, have enabled ITRI to expand its scope to 26 domestic financial institutions capable of undertaking related business
		Industry service locations and contact windows	Permanent	
		Service platforms	Permanent	
		Key client services	Permanent	
		Industrial talent training	Permanent	
		Customer satisfaction surveys	Once a year	
		Press conferences, exhibitions, and information sessions	Periodically	
		Face-to-face or phone interviews	Periodically	
Industry-academia-research partners	Business partner relationships Technological innovations and R&D Technology application and promotion	Joint Research Center	Collaborate with specific schools	Connecting with 21 schools to establish the "Learning and Research Bridging Program in the Field of Large Machinery" to strengthen technological R&D and talent cultivation Engaged in international partnerships with more than 154 organizations spanning 26 countries and 4 continents and strengthened connections through ITRI's overseas branches such as those in North America, Europe, and Japan. In recent years, ITRI has also expanded to establish a contact window in Bangkok, Thailand in response to the collaboration model Collaborated with 3 government bodies as well as 16 universities and colleges, ITRI implemented over 9 national industrial talent projects
		Joint employment system	Permanent	
		Official documents, letters, and phone calls	Periodically	
		Press conferences, forums, or seminars	Periodically	
		Theme-based cooperation projects	Periodically	
		Project meetings	Periodically	
		Visits to ITRI or mutual visits	Periodically	

Category	Important issues	Communication channel and frequency		Communication results in 2022
Suppliers	Technology application and promotion Technological innovations and R&D Supplier management Energy management Green energy Water resource management Waste management	Official website and comment mailbox	Permanent	Possessed a local procurement ratio of 96% Reached a green procurement amount totaling NT$108 million 100% completion of supplier audits All ITRI suppliers fully complied with the Supplier Code of Conduct The i-Shopping platform added the "green product" purchasing area, with 518 products available as of the end of 2022
		Supplier assessment and management mechanisms	Permanent	
		Supplier management systems	Permanent	
		Face-to-face or phone interviews	Periodically	
The society / communities	Sustainable, net-zero transformation Social welfare services	0800 customer service hotline	Permanent	Publishes a total of 43 issues of Chinese and English publications every year Issued a total of 133 relevant press releases Operated an online social media platform, with the Facebook fan base reaching 170,000 Hosted the ITRI NET ZERO DAY forum and special exhibition, with the participation of over 30 corporate leaders and experts, exhibiting more than 40 carbon reduction technologies, and attracting more than 2,000 visitors Collaborated with 46 non-profit organizations/institutions to hold 53 social welfare activities Worked jointly with various schools to organize over 10 talent-recruitment events. Involvement in academic and research cooperation projects reached 1,438 faculty and students p.086
		Official website and social networking site	Permanent	
		Industrial talent training	Permanent	
		Employee recruitment activities	Regularly	
		Press releases/ exclusive interviews/ columns/ microfilms	Periodically	
		Journal issuance	Regularly	
		Press conferences/ media gatherings	Periodically	
		Forums and exhibitions	Periodically	
		Visits to ITRI	Periodically	
Public associations / alliances	Business partner relationships Technology application and promotion (governance)	Websites/staff designated/ phone numbers designated	Permanent	Participated in over 521 domestic public associations including the public associations, societies, alliances, and research societies of various industries. Among them, 102 organizations have key positions held by senior executives, managers, and colleagues from ITRI Founded the Net-zero School and Talent Alliance, conducting 44 classes of professional talent training, achieving over 100,000 views in social education
		Committee or member activities	Permanent	
		Forums and exhibitions	Periodically	
		Publications	Periodically	
		Information sessions, lectures, workshops, etc.	Periodically	

Materiality Analysis and Management

Materiality Analysis GRI 2-12, 2-13, 3-1

ITRI referred to the GRI 2021 Material Topic Identification Process and Reporting Principles. Based on its operational situations, ITRI developed the following material analysis process, with it serving as a reference for prioritizing sustainable development issues and resource allocation. The establishment and execution results of goals related to material topics were regularly reported to the ITRI Sustainability Steering Committee by the Office of ITRI Sustainability. Upon authorization by the Board of Directors, the President reviewed and improved the relevant directions and practices to enhance the effectiveness of ITRI's sustainable development.

Collect and compile topics of sustainable development

ITRI gathered and referred to global sustainable development trends (e.g., the United Nations' SDGs and the WEF's Global Risks Report), national sustainable development-related policies (e.g., net-zero pathways, renewable energy development, and hydrogen energy development), and benchmark technological research organizations' sustainable development material topics. Based on the operational status of ITRI, 17 sustainable development topics are identified.

Investigate stakeholders' level of concern to the topics

According to the relationship between various stakeholders and ITRI's operational models, the influential key entities were identified. Next, ITRI performed stratified sampling and distributed "Questionnaire Assessing the Attention to Material Topics" to evaluate external stakeholders' level of concern regarding the 17 sustainable topics. A total of 85 valid questionnaires were collected, encompassing the responses from the society/communities, employees, suppliers, businesses/clients, industry-academia-research business partners, government agencies/competent authorities, and public associations/alliances.

Analyze operational impacts

Internal laboratories and centers responsible for sustainable development issues distributed the "Material Topic Analysis Questionnaires" to assess the scale/scope of the impact of sustainable development topics as well as their likelihood of occurrence. Specifically, negative impacts were additionally assessed for irreversibility. Also, ITRI considered the opinions of external sustainability experts and advisory teams to further identify the substantial and potential impacts that various operational activities of ITRI might have on economic, environmental, social and human aspects.

Confirm material topics

ITRI integrated the results of internal impact significance assessments, feedback from external stakeholders, and professional opinions from external advisors to plot matrix of material topic. In the matrix, the X-axis represented the organization's impact level on the issue, where the magnitude of the impact (in numerical values) was used to determine whether the impact was positive or negative. The Y-axis represented stakeholders' assessment of the probability of the topics occurring. This matrix was used to confirm ITRI's material topics for 2022.

Respond and disclose

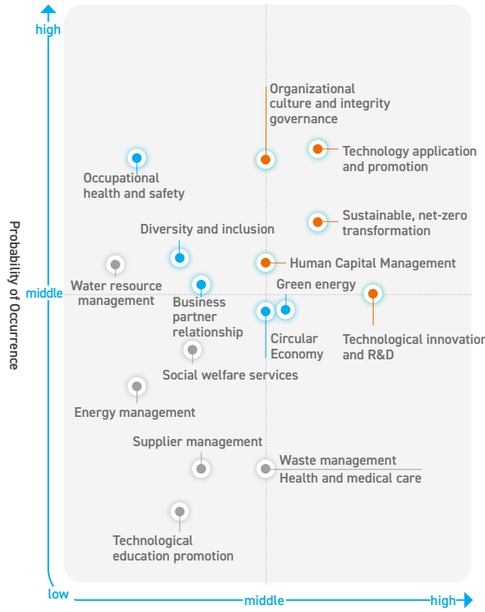
For six material topics, ITRI analyzed both actual positive/negative impacts and their effects on the value chain. Strategies and management policies were then formulated to address these impacts, and the findings and actions taken were publicly disclosed to the public through the sustainability report.

Materiality Analysis Matrix GRI 3-2

According to ITRI's materiality analysis, the matrix and identification results for the material topics of the year 2022 are detailed in the figures below:

Material topics | Secondary Topic | Concern Topic

Positive impact matrix



negative impact matrix

Material topic categories

Governance	Environmental	Social
Positive impact		
Technology application and promotion	**Sustainable, net-zero transformation**	**Human capital management**
Technological innovations and R&D	Green energy	Diversity and inclusion
Organizational culture and integrity governance	Circular economy	Occupational health and safety
Business partner relationship	Waste management	Health and medical care
Supplier management	Water resource management	Social welfare services
	Energy management	Technological education promotion

Governance	Environmental	Social
Negative impact		
Organizational culture and integrity governance	**Sustainable, net-zero transformation**	Occupational health and safety
Supplier management	Energy management	Diversity and inclusion
	Water resource management	
	Waste management	

Note: Text in **bold font** are material topics

Material Topic Management GRI 3-3

Material topic	Significance of Impact	Relevant policies or commitment	Impact on the value chain	Corresponding chapters and pages
Technology application and promotion GRI 2: General Disclosures 2021	Positive impact **Technology services or transfer, promoting industrial innovations** **[Economic dimension]** ITRI provides its technological innovations and R&D to its business partners through collaboration or technology transfer, enhancing their productivity, competitiveness, and financial performance and contributing to the local, national, and global economic systems.	• *2035 Technological Strategies and Roadmap* • *ITRI Sustainability Strategy & Roadmap: Industry Promotion* • *ITRI Sustainability Strategy & Roadmap: Social Welfare* • *ITRI Business Policies: Mission, Vision, and Strategies*	○ Suppliers ✓ ITRI employees ✓ Business partners ✓ Businesses/ clients ✓ Government agencies ✓ The society ✓ Public Associations/ alliances	• CH1 Integrity Governance (Industry Services) p.052 • CH 2 Technological R&D p.058 • CH5 Social Impact (Industry Promotion: Sustainable, Net-zero Transformation) p.130
Technological innovations and R&D GRI 2: General Disclosures 2021	Positive impact **Technological R&D, promoting industrial innovations** **[Economic dimension]** ITRI provides its technological innovations and R&D to its business partners through collaboration or technology transfer, enhancing their productivity, competitiveness, and financial performance and contributing to the local, national, and global economic systems. **[Social/human dimension]** The businesses enjoy favorable financial and operational performance, satisfying the interests of shareholders, employees, and the society.	• *2035 Technological Strategies and Roadmap* • *ITRI Sustainability Strategy & Roadmap* - technological R&D • *ITRI Business Policies: Mission, Vision, and Strategies*	○ Suppliers ✓ ITRI employees ✓ Business partners ✓ Businesses/ clients ✓ Government agencies ✓ The society ✓ Public Associations/ alliances	• CH1 Integrity Governance (Industry Services) p.052 • CH2 Technological R&D p.058
Sustainable, net-zero transformation GRI 2: General Disclosures 2021	Positive impact **The scaling of net-zero/low-carbon technological R&D assists ITRI's business partners in successfully transitioning** **[Economic dimension]** ITRI strengthens the R&D strategic layout and management of its business partners in climate and sustainable development issues through technology transfer and guidance, facilitating the development of net-zero/low-carbon- industries/technology. **[Environmental dimension]** ITRI assists its business partners in conducting net-zero/low-carbon-related technological R&D and industry innovations, thereby reducing the negative environmental impacts caused by human production activities. Negative impact **Unsuccessful net-zero/low-carbon technological R&D results, preventing ITRI's business partners from successfully transitioning** **[Environmental dimension]** The net-zero/low-carbon technological R&D entrusted by ITRI to its business partners fail to achieve the targets. Thus, it may impede efforts to mitigate existing environmental impacts, resulting in ongoing environmental pollution.	• *ITRI Sustainability Strategy & Roadmap:* Sustainable, Net-zero Environments • *ITRI Environmental Policies*	✓ Suppliers ✓ ITRI employees ✓ Business partners ✓ Businesses/ clients ○ Government agencies ○ The society ○ Public Associations/ alliances	• CH4 Sustainable, Net-zero Environments p.106 • CH5 Social Impact (Industry Promotion: Sustainable, Net-zero Transformation) p.130
Organizational culture and integrity governance GRI 2: General Disclosures 2021	Positive impact **Sound governance, safeguarding the rights and interests of stakeholders** **[Social/human dimension]** ITRI establishes a robust organizational governance mechanism, ensuing proper management practices to safeguard the rights and interests of its employees, clients, and other stakeholders. Negative impact **The absence of an integrity governance mechanism within the organization can compromise the rights and interests of its stakeholders** **[Social/human dimension]** Due to inconsistent organizational culture or unsound governance and grievance mechanisms, resulting in ITRI violating the law and increasing its operational risks, affecting the rights of its employees and other stakeholders.	• *ITRI Business Policies: Mission, Vision, and Strategies* • *ITRI Work Rules* • *ITRI Code of Conduct for Integrity Operation* • *ITRI Internal Audit System* • *ITRI Internal Control System*	○ Suppliers ✓ ITRI employees ✓ Business partners ✓ Businesses/ clients ○ Government agencies ○ The society ○ Public Associations/ alliances	• CH1 Integrity Governance (Organizational Culture and Integrity Governance) p.036
Human Capital Management GRI 401 Employment GRI 404 Training and Education GRI 405 Diversity and Equal Opportunity	Positive impact **Talent cultivation contributes to the enhancement of industrial and corporate competitiveness** **[Economic dimension]** ITRI provides its employees with professional knowledge and skill training courses and learning resources, cultivating professional talents required by industries, thereby enhancing industrial competitiveness. **[Social/human dimension]** Through appropriate educational training measures and job counselling, ITRI not only enhances the work skills and professional knowledge of its employees but also contributes to their future career planning and development.	• *ITRI Sustainability Strategy & Roadmap-* talent cultivation • *ITRI Staff Recruitment Regulations* • *ITRI Human Capital Development Regulations* • *ITRI Salary Management Regulations* • *ITRI Employee Welfare Promotion Regulations* • *ITRI Performance and Annual Appraisal Regulations*	✓ Suppliers ✓ ITRI employees ✓ Business partners ✓ Businesses/ clients ○ Government agencies ✓ The society ○ Public Associations/ alliances	• CH3 Human Capital (Talent Cultivation: Development and Retention) p.080

CHAPTER

1 INTEGRITY GOVERNANCE

- Uphold the core philosophies of innovation, integrity, and sharing
- Foster the culture integrity management and be committed to the practice of safe and sustainable R&D in the environment
- Conduct comprehensive and thorough risk prevention to promote continuous improvements

Highlights

Information security

- Continuously passing the **ISO27001** and **ISO20000-1** Information Security and Information Technology Service Standards verification with zero defects

Operational performance

- Received an "**outstanding**" rating in "The Assessment of the Research Institution Management System" from the Ministry of Economic Affairs'
- The annual corporate revenue reaches NT$ 8.456 **billion**

Domestic participation

- Participated in over 521 domestic public associations as ITRI

International cooperation

- Collaborated with 154 global partners

Local procurement

- Possessed a local procurement ratio for labor services of 96%

1-1 Organizational Culture and Integrity Governance GRI 2-22

ITRI upholds "innovation, integrity, and sharing" as its core values and strongly emphasizes fostering an ethical organizational culture. To strengthen the ethical culture within the organization, ITRI has established guidelines such as the Code of Conduct for Integrity Operation, the Regulations Governing the Establishment of the Integrity Management Committee, and Integrity Management and Operating Guidelines. These guidelines aim to ensure that ITRI staff adhere to integrity management practices in their work, effectively connecting the industrial and research domains and aiding industries in their transformation and upgrades. In doing so, ITRI continues to make significant contributions to Taiwan's economic development.

1-1-1 Governance Framework GRI 2-9~2-12, 2-16, 2-17, 405-1

ITRI's Board of Directors serves as its highest governance body responsible for making crucial decisions and overseeing significant internal matters in accordance with relevant laws, regulations, and the authority granted by competent authorities. To guarantee sound supervisory functions and strengthen management capabilities, a Supervisory Board was established under the Industrial Technology Research Institute Establishment Act and donation charter, responsible for auditing ITRI's annual financial statements and supervising important organizational affairs. Additionally, three functional committees (Remuneration Committee, Integrity Management Committee, and Audit Committee) were established under the Board of Directors to ensure the effectiveness and quality of organizational governance, taking into account the organizational operation and legal policy direction.

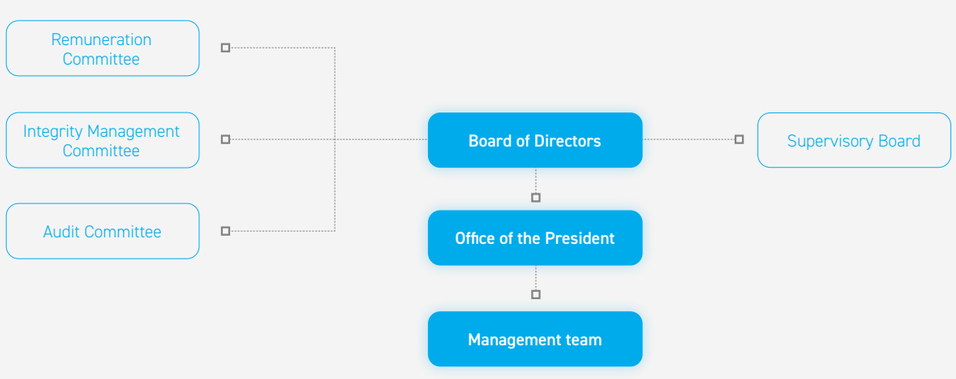
Furthermore, with a view to strengthening sound governance, the President of the Executive Yuan of the Taiwan government appoints a President and two Vice Presidents who are responsible for formulating various laws, regulations, and guidelines in accordance with relevant laws and regulations, making important decisions, and leading the management team.

ITRI's annual operational performance, budget planning, and financial reports are regularly presented to its Board of Directors. Additionally, the President provides internal stakeholders with public explanations regarding ITRI's organizational positioning, management strategies, and R&D strategies, articulating the institute's overall goals and future prospects in a clear and concise manner.

To ensure that organizational performance objectives are achieved, the President communicates the planned annual strategic directions to employees at all levels, linking the overall institute's goals with the performance goal setting of laboratories & centers. This approach fosters a sense of unity and collaboration, ensuring every individual in the organization is working towards the same objectives.

The comprehensive business performance is annually reported in the published yearbook, disclosing essential information such as organizational structure and personnel, intellectual property and services, industry trends, international awards, industry promotion, and international collaboration with partners. This information is announced annually on ITRI's official website, making it easily accessible for various stakeholders.

Organizational Governance Framework



Board of Directors GRI 2-15, 2-19, 2-20

A sound, diverse, professional, and efficient Board of Directors forms the foundation of organization's integrity governance. The ITRI's Board of Directors reviews ITRI's organizational structure, work policies, and important decisions. Members of the board are appointed by the President of the Executive Yuan, with a term of three years as the basis. After the initial term, reappointment is possible for one additional term, with the number of reappointed members not exceeding half of the total number of board members.

In 2022, the Board of Directors comprises a total of 11 members. Considering ITRI's long-term business strategies and the diversity of backgrounds, the board members are industry experts and scholars from various fields including information and communication electronics, business management, intellectual property, mechanical engineering, and aerospace technology. The members include directors of government agency, experts, scholars, and representatives from private businesses. Also, there is one female director appointed, and future efforts will be made to gradually increase women's participation in its decision-making process, complying with the principles of gender equality. The Board of Directors holds regular meetings quarterly, with the possibility of convening special meetings at times of significant matters or emergencies. In 2022, a total of 5 meetings were held, with an average attendance rate of 99% for the directors. Additionally, the Supervisory Board comprised three supervisors this year, including one managing supervisor, and all of whom were appointed by the President of the Executive Yuan with a term of three years, renewable upon completion.

An average attendance rate of 99% for the directors.

Members of the Board

Managing directors and chairman	Chih-Kung Lee
Managing directors	Mei-Hua Wang, Tsung-Tsong Wu, Chao-Tung Weng, and Ying-Yao Cheng
Directors	Yaw-Shyang Chen, Wen-Lon Cheng, Kai-Hung Hu, Chi-Mau Sheih, Chao-Yi Chen, and Zhang-Hua Fong
Managing supervisors	Hung-Kun Tsai
Supervisors	Ching-Jung Liao and Fuh-Sheng Shieu

Functional Committees of the Board GRI 2-18, 2-20

Remuneration Committee

Reporting frequency	Twice a year
Number of chairmen	1
Number of committee members	5

Functions

- In accordance with the Foundations Act and other relevant regulations, taking into consideration the contributions and performance of the Chairman and the President to review their remuneration

Audit Committee

Reporting frequency	Twice a year
Number of chairmen	1
Number of committee members	5

Functions

- Review annual audit plans and audit reports, follow-up on improvements, and oversee the revision of internal audit system to ensure that ITRI's internal controls and audit systems perform independent inspections and assessment functions

Integrity Management Committee

Reporting frequency	Once a year
Number of chairmen	1
Number of committee members	5

Functions

- Establish the Code of Conduct for Integrity Operation, promote and advocate for integrity management policies, conduct educational training, as well as plan and implement whistleblowing systems
- Establish disciplinary and grievance systems governing violations of the Code of Conduct for Integrity Operation, ensuring that operations in all areas comply with the highest standards

Integrity Management

GRI 2-15, 2-23~2-27, 205

ITRI is committed to promoting sustainable development among Taiwanese industries, implementing sustainable operations by embodying the core values of "innovation, integrity, and sharing" and placing a high emphasis on the establishment and promotion of an "integrity management culture". To foster sound management, ITRI has formulated regulations such as the Code of Conduct for Integrity Operation, Integrity Management and Operation Guidelines, and Conflict of Interest Avoidance Regulations. Also, in accordance with the Regulations Governing the Establishment of the Integrity Management Committee, ITRI established the Integrity Management Committee under the Board of Directors. The committee is responsible for formulating Code of Conduct for Integrity Operation, promoting and advocating integrity management policies, conducting educational training, planning and implementing whistleblowing systems, creating disciplinary and grievance systems governing violations of the Code of Conduct for Integrity Operation, and assisting the Board of Directors and management in evaluating the effectiveness of the Code of Conduct for Integrity Operation. This ensures complete operational adherence in all areas to the highest standards, collectively establishing a core culture and values based on the principles of integrity management, safeguarding the rights and interests of all employees and ensuring the practical implementation of integrity management in the workplace.

Implementation Situations of the Integrity Management Committee

Functions

- A dedicated "Integrity Management Committee" has been established under the Board of Directors pursuant to the Regulations Governing the Establishment of the Integrity Management Committee, assisting the board and the management in evaluating the effectiveness of the Code of Conduct for Integrity Operation as well as supervising and implementing related systems
- ITRI explicitly stipulates that the Integrity Management Committee should report on the compliance with integrity management to the Board of Directors at least once a year. The internal Audit Committee also incorporates the compliance with integrity management into its audit scope, and regularly report to the Board of Directors on any deficiencies or improvements

- Reported on the compliance with integrity management to the Board of Directors once a year

Management system

- Formulated regulations encompassing the Code of Conduct for Integrity Operation, Regulations Governing the Establishment of the Integrity Management Committee, Integrity Management and Operation Guidelines, and Conflict of Interest Avoidance Regulations

- Reported on the execution status of integrity management and compliance with conflict of interest avoidance legal regulations during the annual Board of Directors and Supervisors meetings regularly.

Education and training

- Established digital training courses related to integrity management, including topics such as ethics-related rules, common ethics risks, intellectual property regulations, procurement management systems, and whistleblowing channels. Upon completing the courses, all staff were required to undergo online assessments
- The "Integrity Management Committee" consolidated essential integrity concepts and specific precautions into the Employee Code of Conduct

- Provided educational training to all ITRI employees to cultivate and establish integrity concepts and ethical culture, achieving a 100% completion rate for signing the "Employee Code of Conduct".

Grievance Mechanisms

GRI 2-16

Mechanisms

ITRI has established diverse grievance channels. Any stakeholders who discovers any illegal activities or violations, they may report to the Integrity Management Committee via its customer service hotline (0800-45-8899) or e-mail (integrity@itri.org.tw). Employees may report to the Committee via the aforementioned e-mail, HR managers of their respective laboratories & centers, illegal infringement reporting e-mail (HREAP@itri.org.tw), or by dialing extension #18800. The identities of the whistleblowers and content of the grievances will be kept confidential in accordance with ITRI regulations.

Regulations

ITRI has a well-established grievance systems and relevant management measures. In cases where employees' rights and interests are subject to unfair treatment or illegal infringement, they may file complaints in accordance with the Employee Complaint Handling Regulations, Sexual Harassment Prevention and Handling Regulations, and Prevention Plan for Unlawful Infringement during the Execution of Duties. For other stakeholders, please refer to the Stakeholder Engagement section p.027~029 of this report.

Annual performance

In the fiscal year 2022, ITRI received a total of 2 grievance cases, both of which came from its employees. Relevant details pertaining to these cases have been disclosed in the CH3 Human Capital section p.84-85. Regarding grievances from various sectors, they are all handled, responded to, and followed up for improvements in a confidential manner.

Regulatory Compliance

GRI 2-23, 2-24, 2-27, 205

ITRI has established a rigorous internal supervision system and actively promotes an organizational culture of regulatory compliance to ensure the reasonable utilization of its resources as well as the transparency and integrity of its operations. ITRI employees are required to strictly comply with the legal requirements, and no illegal activities are tolerated. Concurrently, in compliance with the Industrial Technology Research Institute Establishment Act, Foundations Act, and Regulations Governing the Management and Supervision of Foundations by the Ministry of Economic Affairs, ITRI mandates that its directors, supervisors, and employees strictly adheres to laws and regulations in the performance of their duties to ensure ITRI's legal and regulatory compliance. These laws and regulations encompass not only general regulations but also special requirements governing ITRI as a juridical person, ensuring that the organization can effectively fulfill its social welfare missions as well as create a culture of high-quality integrity management and legal compliance.

To assist the Board of Directors and management in auditing and evaluating the effectiveness of its internal control systems, ITRI has established the "Internal Control and Audit Systems", and under the direct jurisdiction of the Board of Directors, an "Audit Committee" and the "Audit Office" have been set up, equipped with an appropriate number of qualified internal audit personnel. The internal audit team operates with independence and impartial attitude to carry out audit tasks, providing timely suggestions for improvement and audits, ensuring the continuous and effective implementation of ITRI's internal control systems and serving as the basis for reviewing and revising said systems.

Legal compliance systems

Formulated ITRI's "Internal Control and Audit Systems" in accordance with the Industrial Technology Research Institute Establishment Act, Foundations Act, Regulations Governing the Management and Supervision of Foundations by the Ministry of Economic Affairs, and other relevant laws and regulations

- Set up educational training courses in compliance with relevant laws and regulations!
- All staff performed various operations in accordance with relevant laws and regulations, with no illegal activities found in the annual review
- A total of one legal compliance report was presented to the Board of Directors in 2022

Legal compliance risk assessments

Every year, ITRI conducts a "Risk Assessments of Activities or Projects Involving High-risk Countries or Regions (Money Laundering or Terrorist Financing)", assessing ITRI's activities, services, donations, regional risks, service/delivery channels, etc.

- Based on various indicators, the organization is classified as having low risk in the year 2022

Internal audits

Established the Audit Committee and Audit Office under the direct jurisdiction of the Board of Directors to ensure the independent inspection function of internal auditing in ITRI, and to serve as crucial basis for reviewing and revising management systems

- Conducted 4 internal audits and examined finance, business, R&D, information, and other management operations throughout the year. A total of 26 items were handled in compliance with relevant regulations

Internal control

Based on the effectiveness criteria of internal control systems, annual internal control and self-assessments were conducted to examine the adherence of various laboratories & centers within ITRI to legal requirements, including the effectiveness and efficiency of operations, reliability of financial reports, and the effectiveness of internal controls and legal compliance related to relevant regulations

- Annual assessment results indicated that ITRI's internal control systems and legal compliance were both practically and effectively executed
- ITRI had no major legal violations in 2022

ITRI implemented a comprehensive legal compliance system by engaging in legal consultations, establishing communication channels, enhancing legal promotion through educational training, and taking appropriate preventive and corrective measures. This is done to prevent any form of misconduct.

Risk Management GRI 2-13

As an innovative research and development institution, ITRI adopts a strategy of conducting multifaceted assessments and responding positively to various risks encountered in its operations. Upholding the principles of integrity management and sustainable development responsibilities, the process is overseen by senior executives of the Office of the President and implemented by three major committees composed of supervisors from various levels of each laboratory and center. Through a layered and diversified approach, ITRI implements risk management strategies and conducts deliberations on risk issues. This involves systematic processes such as risk identification and assessment, risk control, risk mitigation and responses, and subsequent risk monitoring, ensuring the comprehensive implementation of organizational risk management.

In addition to collaborating with the responsible departments in planning and jointly executing risk management plans, each department also conducts corresponding risk supervision and control measures according to its technological and industrial characteristics. Within this comprehensive risk management organizational structure, task forces can be formed as needed to respond to urgent situations and emergencies. For instance, in response to the outbreak of the COVID-19 pandemic in 2020, ITRI immediately established the "Pandemic Prevention Response Team", initiating a series of contingency plans and comprehensive risk control measures through its existing manpower.

ITRI risk management procedure

	Management organizations	Management dimensions
Business policies	Integrity Management Committee Technology Transfer and Law Center	• Integrity management • Internal control
Integrated management policies	Integrated Management System Committee Quality and Risk Management Office	• Products and services • Supply chain management • Environmental protection • Occupational health and safety • Energy management
Information security policies	Information and Security Promotion Committee Office of IT Service	• Information security • Personal information management • Digitalization

Risk management procedure

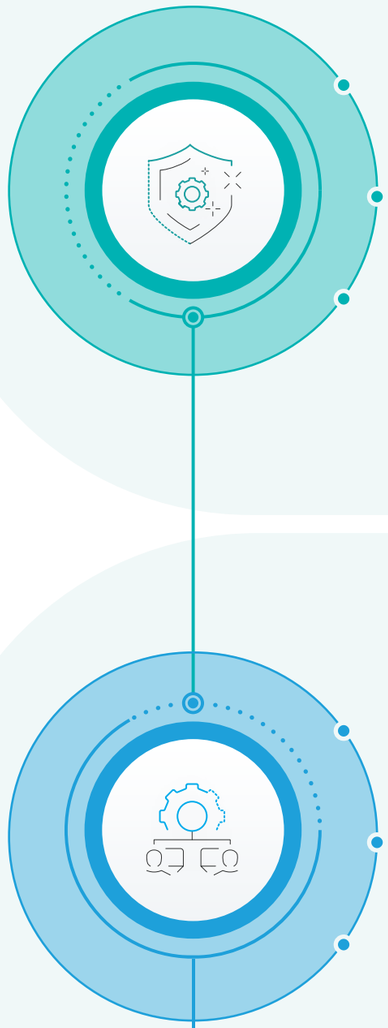
- **Risk identification and assessments**: Identify impacts and hazards, and systematic analyses and assessments are conducted to determine risk levels
- **Risk control**: Establish and implement risk control measures and objectives
- **Risk handling and responses**: Implement and verify the effectiveness of risk control measures; plan and conduct contingency drill
- **Risk monitoring**: Continuously monitor risk changes, conduct regular risk management performance evaluations, and promote continuous improvements

Information Security GRI 2-23

As an internationally renowned R&D institution and a pioneer in the industry, ITRI places great emphasis on scientific research-related output, industry collaboration, and information security and confidential information management of organizational operation. In 1999, the "Information and Security Promotion Committee" was established, chaired by a senior executive from the Office of the President serving as the Chief of Information Security, with deputy heads of various laboratories & centers serving as the committee members, and the Office of IT Service coordinating related affairs. Through quarterly meetings, the committee reviews and decides on important informatization planning and information security policies. Also, the committee collaborates with various laboratories & centers to strengthen the overall information security defense and management mechanisms, enhance the quality and resilience of its information services, and safeguard ITRI's R&D achievements and critical outputs.

In 2018, the Taiwanese government enacted the "Cyber Security Management Act". To comply with the requirements for a "Specific Class B non-governmental organization," ITRI, under the supervision of the Information and Security Promotion Committee and Chief of Information Security, established the "Cyber Security Management Act Promotional Team". The task force aims to implement the various strategic, managerial, and technical requirements of the Act. It continuously constructs information security protection and monitoring measures, adopts international information security standards, enhances the application of information security technologies, and raise the awareness of information security among ITRI staff. This ensures that ITRI's employees can conduct R&D activities in a secure environment, protecting Taiwan's crucial R&D data, and realizing the goal of sustainable operations.

To protect ITRI's R&D achievements and important outputs, reduce ITRI's operational risks, and comply with regulatory requirements, ITRI outlines the following four development strategies:



Information security governance

Objectives

- Align with ITRI's organizational management strategies
- Establish information security organizations
- Formulate policies and management measures

Actions

- Established a dedicated information security committee (i.e., the Informatization and Security Promotion Committee) and appointed the Chief of Information Security, both under the direct supervision of the senior executive of the Office of the President.
- Formulated 4 regulations and rules related to information security management

Results

Reviewed important tasks regarding information and information security during regular meetings at various levels, obtaining support and resources from senior management

- Held 4 (i.e., quarterly) meetings of the Information Promotion Committee, 2 (semi-annually) meetings of the Cyber Security Management Act Promotional Team, and 4 (quarterly) meetings of the Information Security Working Team
- Reviewed 4 qualitative information security objectives and 7 quantitative information security objectives, all of which were in compliance

Information security promotion

Objectives

- Promote information security policies and objectives
- Incorporate international standards and pass verifications
- Comply with laws and regulations

Actions

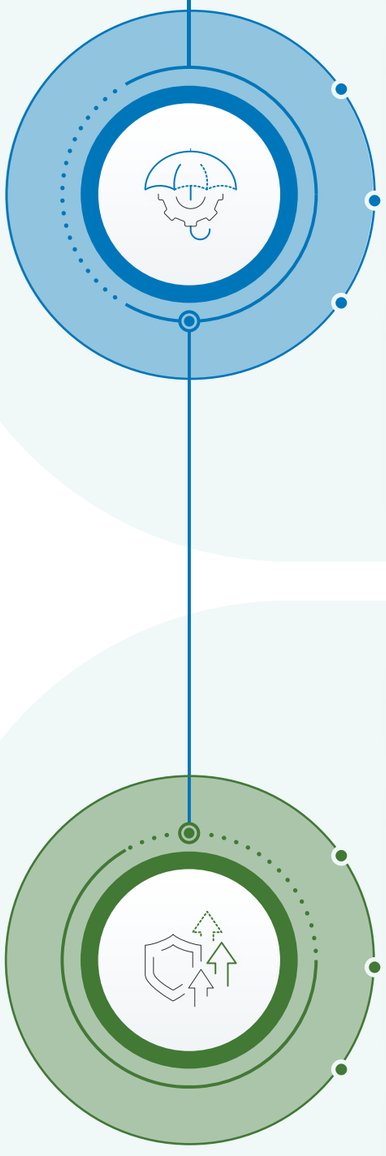
- Established the "Cyber Security Management Act Promotional Team" to formulate and promote ITRI's information security policies, achieving quantitative and qualitative information security objectives
- Obtained certifications for three major management systems: namely, the ISO27001 (information security management system), ISO20000-1 (information service management system), and ISO9001 (quality management system)

Results

Every year, the Cyber Security Management Act Promotional Team is responsible for promoting information security, implementing information security governance policies, and achieving significant work outcomes

- Continued to pass ISO27001 and ISO20000-1 certifications with zero defects
- Passed the regulatory audit by the competent authority responsible for the enforcement of the Cyber Security Management Act
- Outsourced audits of information system for a total of 30 vendors

Continuously passing the **ISO 27001** and **ISO 20000-1** Information Security and Information Technology Service Standards verification with zero defects.



Information security risk management

Objectives

- Continuously monitor internal and external information security risk issues
- Provide a secure R&D and working information environment

Actions

- Planned and implemented information security risk assessments: Performed comprehensive organization-wide assessments annually to evaluate the risks and opportunities of the Information Security Management System (ISMS), and conducted risk assessments for confidentiality, integrity, and availability of ISMS
- Planned and evaluated information security technological tools: Established an Information Security Monitoring and Operation Center for real-time monitoring and incident response; ensuring the development of secure information systems through security testing and third-party component management

Results

Performed risk assessments through risk management approaches, and employed technical tools to detect, prevent, and block potential risks

- Completed organization-wide risk assessments, inventoried information assets, and implemented risk improvement plans
- Completed a total of 9 business continuity drills in 2022 based on a three-year business continuity operation drill schedule
- Completed mainframe and website vulnerability scanning, penetration tests, and vulnerability patching annually

Information security strengthening

Objectives

- Raise awareness of information security for all staff
- Enhance the professional competence of information security

Actions

- Planned and regularly offered courses to staff based on different roles and responsibilities
  - All supervisors and employees: general educational training regarding information security
  - New employees: information security training for newcomers
  - Information staff and designated cybersecurity personnel: professional information security courses/cyber security capability training
- Conducted social engineering attack drills, adjusted implementation measures, and strengthened personnel training based on drill results as needed

Results

Promoted overall awareness of information security, provided newcomer with information security awareness trainings, and conducted social engineering drills for foreign staff and relevant colleagues

- Provided 15 digital courses of information security general education and 1 professional information security training session
- Achieved 100% completion rates for information security general education training as well as information security training courses for newcomers
- Conducted two unscheduled social engineering attack drills

Sustainable Governance Performance Assessments GRI 2-18, 201-1

ITRI has been deeply rooted in Taiwan and led industry innovations for nearly half a century. To continuously strengthen organizational sustainable governance and effectively manage operational performance, ITRI reports its annual work execution results and overall business performance to all directors and supervisors at the Board of Directors' meeting at the beginning of each year. To promote ITRI's sustainable and healthy operations, and to strengthen its adjustable remuneration mechanisms for recruiting and retaining outstanding talents, a revision to the overall business performance assessment mechanism was approved by the Board of Directors in 2022, and will be implemented starting from 2023 onwards.

Through the overall business performance assessment mechanism, ITRI proposes its overall operational and financial objectives to its Board of Directors for review, serving as a reference for ITRI's continuous operational improvements in the future. The operational performance indicators of the assessment mechanism include two dimensions, which are "Overall Business Performance" and "Financial Performance." These dimensions are further broken down to assess the results of ITRI's operational focuses (i.e., major benefits, operational performance, and organizational development) and financial performance (indicating corporate revenue growth situations, and the ratio of corporate revenue to total revenue). ITRI conducts an annual and regular assessment of its overall business performance every year to ensure the ongoing enhancement of organizational sustainable governance.

Business Performance

Governance focus	Indicator	Measurement criterion	Key performance result
Major benefits	• Technological R&D and innovations • Industry value added and services • Social welfare	According to the execution performance, the Board of Directors assesses qualitative and quantitative performance, assigning ratings based on the following criteria: 1. Innovative inventions or technological breakthroughs demonstrating high originality and international impact 2. Initiating startup businesses, facilitating crucial investments, significant industrial upgrades and transformations, and the promotion of emerging industries and services 3. Integrating scientific research to guide and promote major policy issues and contribute to sustainable environmental development	Key achievements in 2022 primarily involve pioneering the green industry development and facilitating high-value industries that engage in sustainable development innovations, as specified below: • International awards and recognition: ITRI's innovations have been recognized with various international awards including Derwent Top 100 Global Innovators, R&D 100 Awards, Edison Awards, and the American Consumer Electronics Show (CES) awards. • Industry application and promotion: Taking utilizing health technology as an example, ITRI integrated precision health and successful aging demands to develop health products (e.g., natural, food-grade formulas that slow aging), prevention (e.g., a chronic kidney disease detection platform and AI medical assistants)to treatment (e.g., an ophthalmological drug startup base), collaborating with industries to implement practical industry applications and promotion of the initiatives. • Promotion of net zero carbon emission policy: – 1. Assist the National Development Council, Executive Yuan in developing the "Net-Zero Pathway Task Force", and take the lead in establishing the "Net Zero and Sustainability Strategy Office" to promote interdisciplinary technology across the aspects of supply, utilization, manufacturing, and environment. – 2. Establish the 2050 Sustainable, Net-zero Emissions Information Platform to provide businesses with one-stop platform services including net-zero information, carbon inventory and carbon footprint estimation platforms, industry obstacle analyses, solutions and verifications, and patent and intellectual property layout, actively assisting businesses in carbon reduction. – 3. On the technological development front, ITRI established experimental factories through carbon capture and reuse technology, industry-academia collaboration, and integrated, cross-industry carbon reductions and reuse. In collaboration with the China Steel, ITRI launched Taiwan's first Co-production of Steel and Petrochemicals Demo Pilot Plant, aiming to achieve a carbon reduction benefit of 4,900 tons/year.
Operational performance	• R&D revenue • R&D results deposited	The Board of Directors gives ratings according to the achievement of objectives	ITRI strengthens the 2030 technological strategic layout, supports 2050 net-zero carbon emissions, and integrates scientific research, generating a total R&D revenue for the year of NT$1.188 billion, NT$499.8 million of which were deposited into the treasury. ITRI pursues organizational sustainable development through balanced technological R&D and results as well as by implementing a balanced and healthy financial structure.
Organizational development	• Organizational development strategies • Talent recruitment and training • Organizational vitality	The Board of Directors gives ratings according to the efforts made in operational management, such as organizational development strategies adopted, talent recruitment and retention, organizational activities orchestrated, and the level of achievement in organizational sustainable development	• Flexible talent remuneration: Actively enhance the value of work and design non-cash incentives. • Establish a communication culture: Conduct comprehensive employee opinion surveys to shape a sustainable development culture. • Promote digital transformation: Driving new organizational efficiency and a technological working environment through three aspects: providing a secure and stable information security environment, automating various business processes, and establishing remote and diverse platforms.

Corporate revenue (NT$8.456 billion) accounts for 35% of ITRI's total revenue, showcasing an average growth of 108% compared to the past three years.

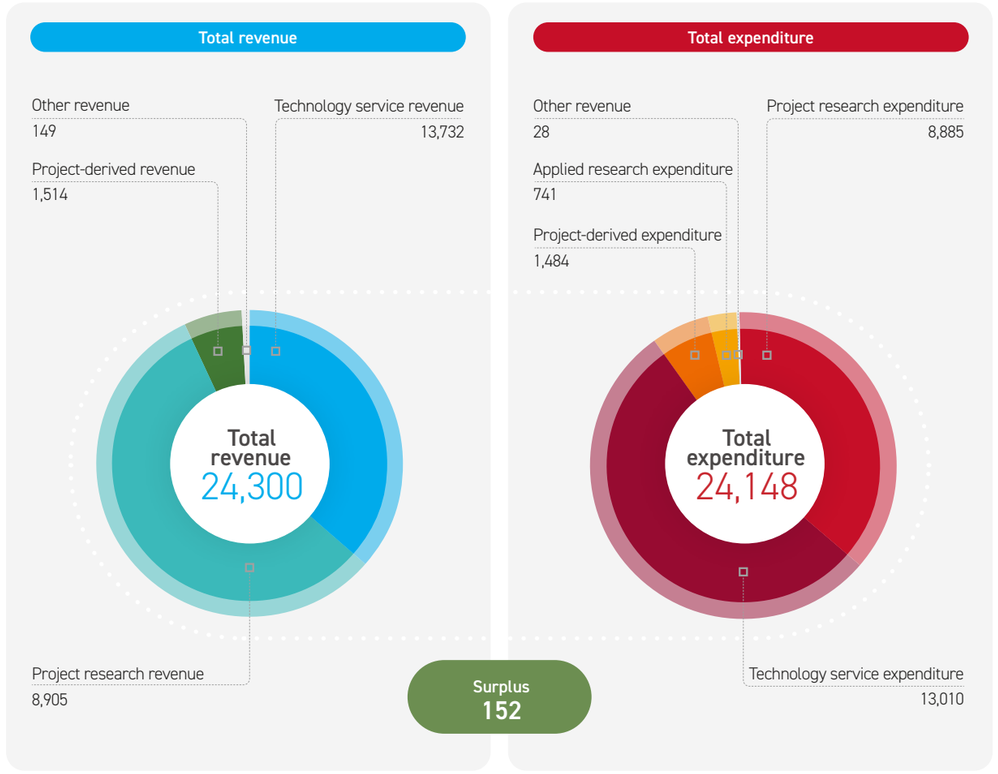
Financial Performance

GRI 201-1, 201-4

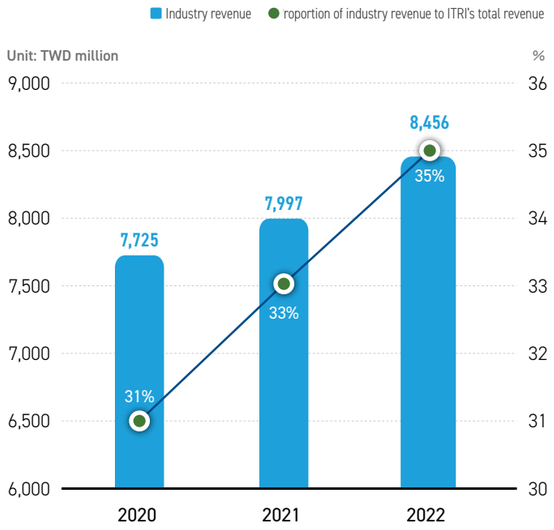
As an engine of industrial innovations, ITRI responds to market demands by dedicating itself to industrializing R&D results for industries. By maintaining a healthy and balanced financial structure, ITRI aims to achieve long-term sustainability in its operations. In 2022, the overall financial performance showed positive growth compared to the previous year, with its industry revenue (NT$8.456 billion) accounting for 35% of total revenue, exhibiting an average growth of 108% compared to the past three years. Such a growth is attributed to the expansion of new business in areas including new self-driving logistic technology, circular economy, green energy environments, and rail systems. Over the past two years, ITRI has enjoyed a revenue surplus, driving industrial co-benefits with its healthy, positive financial structure and industry impact.

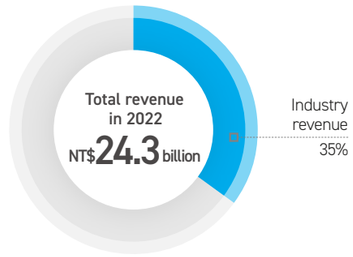
2022 Financial performance

Unit: NT$1 million



Growth in industry revenue





An annual corporate revenue of

$8.456 billion

1-1-2 ITRI Culture

Organizational Culture and DNA

"Innovation" is ITRI's enduring core value. To enhance the organization's resilience in adapting to environmental changes, ITRI integrates three cultural elements: "Innovative Thinking", "Open Communication", and "Agile Management" altogether within its "DNA", and designs an employee-centric learning experience, subtly instilling such cultural DNA into the hearts of each colleague. This approach guides the organization toward a more open, agile, and innovative future.

Innovative Thinking

Encourage staff to think outside the box, daring to try new approaches and breakthroughs, guided by market demands, and promoting a blue ocean strategy. Staff are urged to think differently and create value, promoting industrial upgrades and transformation.

Open Communication

IRTI is dedicated to creating an environment for open communication, fostering a strong sense of shared emotions, and cultivating a collaborative experiences based on communication and trust. Through open communication, ITRI encourages its staff to share innovative ideas and experiences, promoting mutual learning and growth, and inspiring more innovation.

Agile Management

ITRI encourages its teams to adopt agile and adaptable attitude, encouraging its staff to align with markets and enhance their efficiency through a mindset of agile work and client-oriented actions. Through agile management, ITRI can respond more quickly to market demands and provide clients with superior services.

1-2 Sustainable Value Chain GRI 2-6

1-2-1 ITRI Value Chain

Having devoted itself to developing Taiwan for 50 years, ITRI continues to center around Taiwanese industries, connecting them to the global innovative technology network, aligning with international standards, and constructing technological R&D and interdisciplinary collaboration platforms. Through diverse business partners, advanced technological R&D application, and international industry-academia exchanges, ITRI assists industries in developing innovative technology, cultivating key talented personnel, and driving Taiwan's overall industrial transformation and upgrading.

Competent authorities/suppliers and research institutions

- Government agencies / competent authorities
- Suppliers
- Domestic and international research institutions
- Strategic business partners
- Media
- Academic units

ITRI

- Domestic service locations
- International service locations
- Industrial Technology nvestment Corporation (ITIC)

Corporate clients/partners

- Corporate clients
- Individual customers
- Industry associations/societies
- Other juridical persons
- Non-profit organizations

Highlight Industrial Technology Investment Corporation (ITIC)

To fully implement the R&D results of domestic application technology, ITRI has established the Industrial Technology investment Corporation (ITIC). The corporation has successfully created a global partner network that integrates resources such as technology, capital, talents, and management knowledge and skills, diffusing technological capabilities across various industries and providing startups with resources needed, support, and guidance, thereby facilitating Taiwan's industrial upgrades and its alignment with international communities. Since its establishment, ITIC has obtained remarkable results, playing a crucial role in various innovative sectors, such as automotive engine technology, semiconductor industry, and the rapidly growing digital and AI industries, complementing and supporting ITRI's overall operations.

1-2-2 International Participation

ITRI plays an important role as a bridge for the exchange of Taiwan's industrial technology with international institutions. By connecting global innovative technology networks with its cutting-edge and forward-looking industrial technology R&D capabilities, ITRI strategically integrates and plans the use of cross-domain and avant-garde technology. In addition to establishing overseas offices in North America (Silicon Valley, USA), Japan (Tokyo), and Europe (Berlin, Germany), ITRI has extended its reach to found a new base in Bangkok, Thailand, in recognition of the demand arising from collaborative models in the region. After decades of international collaboration, the international partners of ITRI has expanded to cover diverse sectors of industry, government, academia, and research institutions, involving more than 154 organizations and spanning across 26 countries in four continents. The establishment of overseas offices has significantly strengthen our connections globally. Moreover, in recent years, ITRI has linked with international strategic partners and harnessed resources through bilateral/multilateral cooperation and long-term partnerships. ITRI continuously expands its international footprint through establishing regional platforms for collaboration, strengthening its technological R&D capabilities, and disseminating research results. In line with the international innovative trends, ITRI also provides guidance to domestic enterprises to invest in the development of forward-looking and emerging industrial technologies, and encourages cross-disciplinary integration to enhance the development of Taiwan's industrial ecosystem. In addition, ITRI has also established technological cooperation platforms in key global regions.

The table below outlines the international collaboration and activities coordinated and participated in by ITRI in 2022. Through active collaboration with various international government agencies, corporations, academia, research institutions, public associations, and sustainable advocacy organizations, ITRI shares and exchanges new technologies in semiconductors, hydrogen energy, and intelligent machinery; jointly promoting innovative technology and sustainable industrial development. Moreover, it initiated collaborative projects and formalized memoranda of understanding with various international academic and research institutions, strengthening our research capabilities through academic exchanges. During the year, ITRI's global partnerships spanned across numerous countries, including the United States, Germany, Finland, Japan, Australia, Vietnam, and Israel. These collaborations provided substantial momentum to Taiwan's industrial development, and guided Taiwan enterprises to get access to international markets and industries.

The international partners of ITRI reached

154

organizations.

International Cooperation

Technology Cooperation with international science and technology research institutions

Technology Cooperation Partners

- University of Southern California, (USC), United States
- French Alternative Energies and Atomic Energy Commission (Commissariat à l'énergie atomique et aux énergies alternatives (CEA)) of France
- German Research Center for Artificial Intelligence (DFKI)
- Power America

Alliance

- European Association of Research & Technology Organisations (EARTO), the largest R&D association in Europe

Reaching out to international partners to initiate collaborative projects

Japan

- Tokuyama Corporation
- Panasonic
- Asahi Kaisei Pharma

United Kingdom

- Oxford Instruments

Cooperative undertakings

- Initiated the "Taiwan-EU EUREKA Transnational Collaborative R&D Program", establishing a collaborative platform for industrial innovation with British government
- Collaborated with British Office Taipei to introduce the "Taiwan-UK Innovation Industry Researcher Relocation Program", serving as a vital bridge to facilitate scientific and innovative talent exchange between Taiwan and the UK
- Signed a memorandum of cooperation with Invest India to promote mutual exchange and collaboration between the startup ecosystems of both sides, establishing a platform for startup exchange between India and Taiwan
- Signed agreements with Stanford University and the University of California, Berkeley to introduce Silicon Valley experiences, assisting Taiwanese startups in expanding internationally
- Launched the Taiwan-EU international cooperation project "Horizon 2020-5G CONNI," facilitating the verification of 5G private network intelligent manufacturing solutions

Industrial exchanges

- Conducted semiconductor talent cultivation along with industry and supply chain cooperation exchange meetings with the Taipei Office (of the Japan-Taiwan Exchange Association) and Kyushu Bureau of Economy, Trade and Industry
- Explored onshore power generation technology and field verification collaboration opportunities with Eco Wave Power, an Israeli company
- Led 40 startup teams to participate in the BIO International Convention in North America and MEDICA in Germany
- Led Taiwan industrial research units to Australia for technical exchanges with Australian companies in the fields of green hydrogen, clean energy, and green energy infrastructure

Low-carbon transformation

- Organized the inaugural Taiwan-Fiji Renewable Energy Forum online conference
- Held the inaugural Taiwan-Spain Navarra Cooperation Forum to facilitate opportunities for collaboration in the fields of renewable energy technology and commerce between Taiwan and Spain
- Co-organized the Taiwan-Australia Hydrogen Technology and Industry Exchange Forum with the Australian Office
- Co-hosted the "GO Europe!! Low-Carbon Transformation Forum" with TÜV SÜD Germany, Advantech Taiwan, and Wärtsilä Finland

Climate change

- Co-organized the "2022 Climate Change Adaptation Action Forum" with the International Climate Development Institute
- Participated in the 27th United Nations Climate Change Conference (UNFCCC COP27), co-organizing peripheral meetings and the Net Zero Forum with the Kingdom of Eswatini, one of Taiwan's diplomatic allies

Supply chain management

- Co-organized the "Taiwan-Japan EV Seminar and Matchmaking Meeting" and "Japanese Semiconductor Supply Chain Business Opportunity, Law, and Regulation Seminar" with the Mitsubishi UFJ Financial Group (MUFG)
- Co-hosted the "International Sustainable Steel Seminar" with TÜV SÜD Germany
- Held the 3rd "EU Investment Forum", initiating investment cooperation in the green supply chain between Taiwan and the EU

Technological innovations

- Organized the "2022 International Workshop on Trustworthy AI"
- Conducted an online seminar with Vietnam Precision Industrial JSC (VPIC) to exchange insights on topics such as smart factories, electric vehicles, and lightweight composite material technology
- Co-hosted the Seminar on "Technological Application of Low-Temperature, Co-Fired Ceramic Techniques in 5G Millimeter Waves" with the DuPont Microcircuit Materials (MCM), Rohde & Schwarz Taiwan (R&S), and Taiwan Ceramic Society

ITRI is involved in

521

domestic public associations, holding key positions in more than 102 organizations.

1-2-3 Business Partners GRI 2-28

In 2022, impacted by the COVID-19 pandemic and the overall global political and economic situations, supply chain and sustainable development strategies have undergone rapid changes. Similarly, Taiwanese industries have also faced various opportunities and challenges in transformation. As a crucial bridge assisting in the industrial transformation and upgrading, ITRI continuously participates in various industry associations, technology R&D societies, and alliances related to public policy and non-profit organizations. Through methods such as policy advocacy, academic research, and consultancy, ITRI consistently focuses on significant issues like technological innovation, integrity governance, and environmental sustainability. It contributes its robust capabilities in technological innovation application and R&D to the overall industry, thereby facilitating industrial exchanges and technological development in Taiwan.

As of the end of 2022, the number of public domestic associations that ITRI participates in has reached an impressive 521, encompassing various industry associations, academic societies, alliances, and research groups. ITRI's senior executives, managers, and staff also hold key positions in 102 of these associations. Going forward, ITRI will continue to collaborate with industrial, governmental, academic, and research institutions to develop innovative technologies, engage in national policy discussions, and refine industrial strategies. By integrating key technologies from domestic industries and research organizations, ITRI effectively enhances the overall competitiveness of Taiwanese industries and ensures their sustainable development.

Organizations engaged in 2022

Industry Communication

Name of the public association	Position held/nature of membership	ITRI representative
Cloud Computing & IoT Association in Taiwan	Director general, director, supervisor, and committee members	Chairman Chih-Kung Lee Executive Operating Officer Shiaw-Shian Yu Senior Vice President Stephen Su and others
The Allied Association for Science Park Industries	Advisor of the Board of Directors	President Edwin Liu
Institute for Biotechnology and Medicine Industry	Supervisor	President Edwin Liu
Taiwan Optoelectronic Semiconductor Industry Association (TOSIA)	Secretary general	General Director Shih-Chieh Chang
Taiwan Electrical and Electronic Manufacturers' Association	Advisor, director, and committee convener	Chairman Chih-Kung Lee Senior Technology Expert Chih-I Wu General Director Pang-An Ting
Chinese Association for Industrial Technology Advancement	Director	General Director James Wang
Taiwan Chemical Industry Association	Director	General Director Tzong-Ming Lee
Taiwan Semiconductor Industry Association	Director	General Director Shih-Chieh Chang
Taiwan Display Materials & Devices Association	Director, supervisor, etc.	General Director Shih-Chieh Chang General Director Tzong-Ming Lee General Director Tzeng-Yow Lin and others
Taiwan Display Union Association	Member representative	General Director Tzong-Ming Lee
Semiconductor Equipment and Materials International	Vice chairman of the committee	General Director Tzeng-Yow Lin
Taiwan Association of Machinery Industry	Vice president of the Professional Inspection and Measurement Committee	General Director Tzeng-Yow Lin

Note: The table above only lists important industrial public associations which are more representative, and in which senior executives of ITRI participate in key roles. ITRI has been involved in nearly 35 relevant organizations in 2022.

Technological innovations

Name of the public association	Position held/nature of membership	ITRI representative
Taiwan Power and Energy Engineering Association	Director general	President Edwin Liu
The International Commission on Illumination-Taiwan, CIE-Taiwan	President	Executive vice president Pei-Zen Chang
Monte Jade Science & Technology Association of Taiwan	Supervisor	Executive vice president Pei-Zen Chang
Taiwan Automation Intelligence and Robotics Association	Advisor and chairman of the standards committee	Executive vice president Jwu-Sheng Hu
Taiwan Society for Precision Engineering	Director	Executive vice president Jwu-Sheng Hu
Mobility Taiwan Automotive Research Consortium	Advisor	Executive vice president Jwu-Sheng Hu
Postsecondary Electronic Standards Council	President	General Director Shih-Chieh Chang
Taiwan IC Industry & Academia Research Alliance	Director general	General Director Shih-Chieh Chang
AI on Chip Taiwan Alliance	Vice president	General Director Shih-Chieh Chang
Taipei Computer Association	Director	General Director Jen-Chieh Cheng
Information Service Industry Association of R.O.C.	Executive director	General Director Jen-Chieh Cheng
Chinese Society for Management of Technology	Secretary general and deputy secretary general	General Directors Lewis Chen and Johnny Fu
Taiwan Dechnology Institute	Director general	General Director Stanley H. Huang
Chinese Industrial Design Association	Deputy director general	General Director Stanley H. Huang
Materials Research Society-Taiwan International Conference	Deputy director general	General Director Tzong-Ming Lee
Taiwan Institute of Chemical Engineers, TwIChE	Executive director	General Director Tzong-Ming Lee
Society of Theoretical and Applied Mechanics of the Republic of China	Managing supervisor and supervisor	General Director Da-Jeng Yao and Chairman Chih-Kung Lee
International Conference on Automation Technology	Director	General Director Da-Jeng Yao
Society of Automotive Engineers Taipei Section (SAE Taipei Section)	Executive director and supervisor	General Directors Da-Jeng Yao and James Wang
Nanotechnology and Micro System Association	Director	General Director Da-Jeng Yao
Taiwan Biotechnology Society	Director	General Director Da-Jeng Yao
Academia-Industry Consortium for Southern Taiwan Science Park	Director	General Director Fang-Hei Tsau
Society of Manufacturing Engineers (SME) of R.O.C.	Director general	Deputy General Director Chao-Chang Chen

Note: The table above only lists important technological R&D associations which are more representative, and in which senior executives of ITRI participate in key roles. ITRI has been involved in over 52 relevant organizations in 2022.

Organizational governance

Name of the public association	Position held/nature of membership	ITRI representative
Digital Governance Association	Director	Legal Counsel Peng-Yu Wang
Chinese Life Technological Law Society	Executive director	General Director Wei-Lin Wang
Hsinchu Science Park Management Association	Executive director	General Director Da-Jeng Yao
Hsinchu Chinese Human Resource Management Association, HCHRMA	Executive director	General Director Amy Wu
Chinese Society for Management of Technology	Secretary general	General Director Lewis Chen
Association of Technology Manager in Taiwan	Director general	General Director Wei-Lin Wang

Note: ITRI participated in 6 organizational governance (legal compliance, management, and intellectual property) organizations in 2022.

Environmental Sustainability

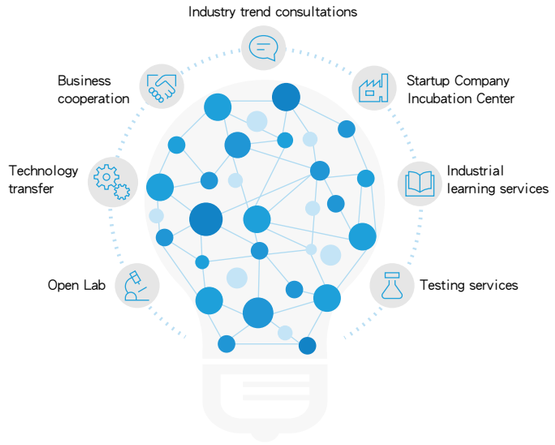
Name of the public association	Position held/nature of membership	ITRI representative
SEMI Taiwan	Vice chairman	Executive vice president Jwu-Sheng Hu
Common Wealth Magazine Sustainability, CWS	Member	Deputy Operating Officer Ta-An Ho
Taiwan Association of Machinery Industry: Sustainable, Net-zero Emissions Promotion Committee	Committee member	General Director Da-Jeng Yao
Taiwan Chemical Industry Association: Sustainable Development Committee	Convener	General Director Tzong-Ming Lee
Sustainable & Circular Economy Development Association	Deputy director general	General Director Tzong-Ming Lee
Association of Taiwan Bio-based and Sustainable Material Industry, TBSM	Executive director	General Director Tzong-Ming Lee
Taiwan Chemical Engineering Association: Sustainable Development Committee	Chairman	General Director Tzong-Ming Lee
Taiwan Green Building Council	Director and supervisor	Manager-level supervisor of the Green Energy & Environment Research Laboratories
Chinese Environmental Analytical Society	Director	Deputy team leader Ching-Min Tu

Note: ITRI participated in 9 environmental sustainability (net-zero emissions, circular economy, sustainability, and environmental management) organizations in 2022.

1-2-4 Industry Services

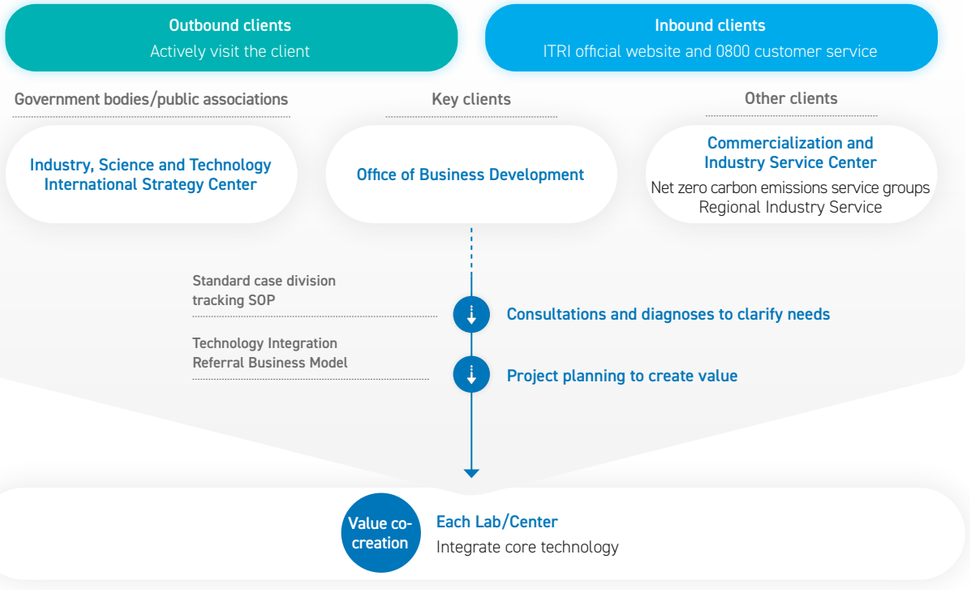
GRI 203-2

ITRI is committed to enriching technological foresight and interdisciplinary technological integration. Through diverse technical guidance, patent advantages, and the foundation created by the Open Lab and Startup Company Incubation Center, ITRI offers comprehensive R&D collaboration and business consulting services to various industries. The services include the commissioned development of new technologies and products, small-scale pilot production, process improvement, calibration and measurement, as well as technology transfer and intellectual property enhancement. Additionally, ITRI actively promotes and nurtures startups, accelerating industrial technology development and nurturing emerging high-tech industries. Through the Open Lab and the Startup Company Incubation Center, ITRI offers essential support and resources to entrepreneurs, aiding them in achieving their entrepreneurial aspirations.



To extend the reach of ITRI's services to more potential clients and create a win-win situation for government policies, industry services, and ITRI's technological promotion, active efforts have been made in the area of corporate marketing. In terms of online marketing, the official website serves as the primary collaborative gateway, providing timely updates on industry information and actively maintaining the platform. For its stakeholders, a toll-free customer service hotline (0800) has been established, providing customized services based on customer needs. Regarding corporate collaboration, in addition to strengthening its industry connections by participating in various conferences and forums, ITRI also works with Industrial Safety Technology Institute, performing demand analyses for various industries, understanding the obstacles encountered by these industries, and formulating solutions. This approach aims to provide clients with optimal R&D collaboration and business consulting services, assisting clients in achieving innovation and success while comprehensively satisfying the demands of its clients across various industries.

ITRI net-zero carbon emissions service flowchart



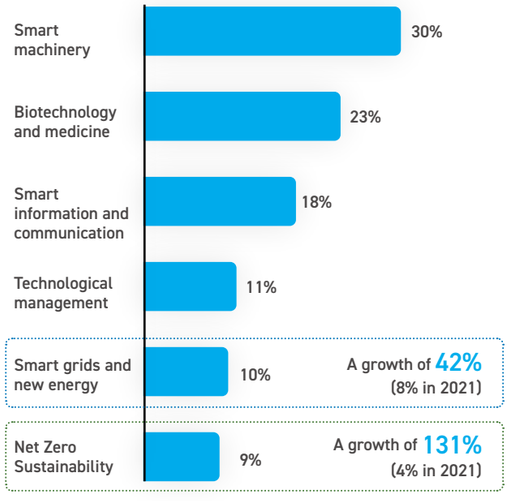
Industry service highlights

Integrated technology services

In response to the flourishing development of international carbon issues, and to assist Taiwanese industries in enhancing their green competitiveness, ITRI has established the SME Carbon Estimation Platform (under the Ministry of Economic Affairs). The platform leverages integrated technology services and diverse channels (e.g., policy promotion lectures, educational training courses, and comprehensive diagnostic tools) to enhance industries' green intelligence. The platform also facilitates the matchmaking of in-house green energy knowledge and technology to provide in-depth guidance and support for businesses.

In 2022, the platform was used by over 20,000 users, gathering carbon emissions data from 800 enterprises and conducting carbon emissions assessments for 180 enterprises. Furthermore, the platform offered integrated technology services, helping 60 businesses enhance their green technologies, which resulted in a reduction of approximately 5,000 metric tons of CO_2e, and promoted over NT$100 million in green investments.

Percentage of open training courses for various fields



Industrial talent training

ITRI remains dedicated to addressing industrial demands and aligning with national policy development, thereby enhancing market-oriented talent training. By leveraging its expertise and the exceptional talent pool, ITRI plays a pivotal role in nurturing elite professionals for various industries, consequently boosting both industry and national competitiveness.

The courses introduced in 2022 predominantly comprised technical and scientific management subjects, centered around six major domains. Throughout the year, ITRI conducted a total of 573 industrial talent training sessions, benefiting 3,614 companies and educating 12,715 industrial professionals.

Interdisciplinary R&D: Strategic Integration

As global industry trends become increasingly complex, interdisciplinary R&D strategies are frequently required to systematically address challenges faced. In response to international net-zero trends and to comply with Taiwan's Pathway to Net-Zero Emission in 2050, ITRI has focused on the aspects of corporate clients and interdisciplinary cooperation, collaborating with businesses to conduct joint R&D and interdisciplinary innovation projects, and successfully establishing the "Office of Grid Management and Modernization Strategy," "Office of AI Application Strategy," "Office of Southern Taiwan Industrial Innovation Strategy," "Office of Net Zero and Sustainability Strategy," and "Office of Intelligent and Green Vehicle Promotion Strategy." These offices serve as platforms to integrate and leverage ITRI's scientific research capabilities maximizing ITRI's resource efficiency.

The Promotional Situations of the Interdisciplinary Offices

Office of Grid Management and Modernization Strategy — July 2018

Domain	Power grid management and modernization technology
Objectives	• To actively promote power grid management technologies and solutions, maintaining the stability and reliability of the domestic power system, integrating ITRI's expertise and resources, gathering experts from academic and industrial domains to serve as a bridge between the government and industries
Development strategies	• Implement the order of power loading and make proper use of private resources • Strengthen the risk management of power grid and build a resilient, flexible system • Improve grid interconnection technology, identifying challenges in interconnection, and propose solutions and suggestions
Scope of operations	• **Act as a power grid think tank:** Establish a Power Grid Advisory Committee, offering suggestions and viewpoints on power development in order to serve as an annual basis for promoting issues. The suggestions and viewpoints are submitted to government agencies to serve as references for formulating policies • **Promote the consensus on sustainability:** Utilize means such as media, seminars, and lectures to build a consensus on issues and concepts related to power among the general public • **Foster talent cultivation:** Establish the "Power School and Talent Development Alliance", awarding "Power Grid Talent Development Scholarships" annually to cultivate interdisciplinary talents for the power industry

Office of AI Application Strategy — October 2018

Domain	AI innovation technology and application
Objectives	• To integrate AI development of various laboratories within ITRI, promoting interdisciplinary research and international cooperation both within and outside ITRI, and strengthen ITRI's leading position of the AI technology
Development strategies	• Promote AI technology services to become a cross-ministerial think tank for AI, influencing the directions of government policies • Establish data application platforms, accumulating AI data through an experimental model of AI technology, and advocate for the establishment of a "Trustworthy AI Application Ecosystem in Taiwan" • Connect domestic and international resources together, leading cross-domain collaboration opportunities within and outside ITRI, and stimulating AI innovation technology business opportunities • Strengthen ITRI's professional brands, expanding the visibility and professional influence of the AI within
Scope of operations	• **Human-centered:** Utilize AI development to understand people, assist in human live and work, and enhance human value • **Interdisciplinary innovations:** Combine the AI-driven force of cross-disciplinary innovation, utilizing "industry advantages and AI innovations" to create synergic effects for Taiwanese industries • **Digital resilience:** Utilize AI to assist in establishing a robust Taiwanese industrial ecosystem, becoming a globally reliable key partner • **Sustainable, and net-zero:** Integrate AI with various technologies, assisting Taiwanese industries in achieving net-zero emissions and sustainable development as well as aligning with international standards

Office of Southern Taiwan Industrial Innovation Strategy — 2020

Domain	Compound semiconductors and green energy
Objectives	• To integrate the technological capabilities of various laboratories within ITRI, collaborating with local governments and industry needs, accelerating industrial upgrades and innovation
Development strategies	• Be fully informed about the industrial development strategies of local governments, collaborating as a think tank, and providing comprehensive solutions for a win-win-win situation • Based on the smart digital technology and the sustainable, net-zero technology, integrating opportunities for emerging technology research to elevate the competitiveness of industries in southern Taiwan
Scope of operations	• Continuously conduct industry-specific research to grasp industry dynamics, providing important trend observations and strategic suggestions for industries in southern Taiwan • Listen to local demands and provide recommendations as a think tank, organize activities at different locations, and enhance industry participation • Public associations develop special interest group (SIG), holding discussions to seek cooperation to promote industrial technological upgrades • Establish a local transformation assistance model to provide localized solutions

Office of Net Zero and Sustainability Strategy — 2021

Domain	Net-zero carbon emissions
Objectives	• To comply with the government's Taiwan net-zero emissions pathway and industrial technology roadmaps, acting as a bridge and a promoting platform between industry, government, academia, and research • To construct integrated technologies with a scientific and technical mindset, and guide Taiwan's industries towards sustainable and zero-carbon transformation • To bring experts in relevant fields together to promote industrial innovation research on interdisciplinary, integrated net-zero carbon emissions
Development strategies	• Integrate the capabilities of various laboratories to plan the development of emerging technology; and grasp the opportunities and business models in emerging industries such as renewable energy, circular economy, green transportation, and environmental protection
Scope of operations	• Research and analyze carbon reduction pathways and practices of major international countries and key enterprises • Participate in the Executive Yuan and various ministries' net-zero carbon emissions operations and assist in policy promotion • Promote the concept of net-zero carbon emissions inside and outside ITRI, and handle social communication matters • Develop Taiwan's Pathway to Net-Zero Emissions in 2050 and industrial technological development roadmaps

Office of Intelligent and Green Vehicle Promotion Strategy — 2022

Domain	Intelligent and green vehicles
Objectives	• To develop technological R&D of intelligent smart green vehicles, and establish a cross-domain strategic development and communication platform in Taiwan, to expand innovative services and application, assisting in driving rapid industrial development
Development strategies	• Facilitate the cross-domain integration or collaboration of key research technology within ITRI to respond to external competition and provide industry services • The research focuses include: unmanned flying vehicles, self-driving vehicles, rail transport, green vehicles, vehicle electronics, autonomous mobile robots (AMRs), and information and communication services
Scope of operations	• Provide technological innovations and validation, and perform technological demonstrations to lead and assist in the establishment of local application sites • Assist the government in formulating industrial policies, and provide long-term development strategies and recommendations • Promote the formation of industry alliances for collaborative development, and advocate for the establishment of industrial/product/ technological standards • Connect international businesses and R&D organizations to facilitate international cooperation and enhance international influence • Combine efforts with industries and academia to address the specific needs for technical talents in the industry, cultivating industrial talents

1-2-5 Supply Chain Management

GRI 2-6, 2-24, 204-1, 308-1, 408-1, 409-1, 414-1

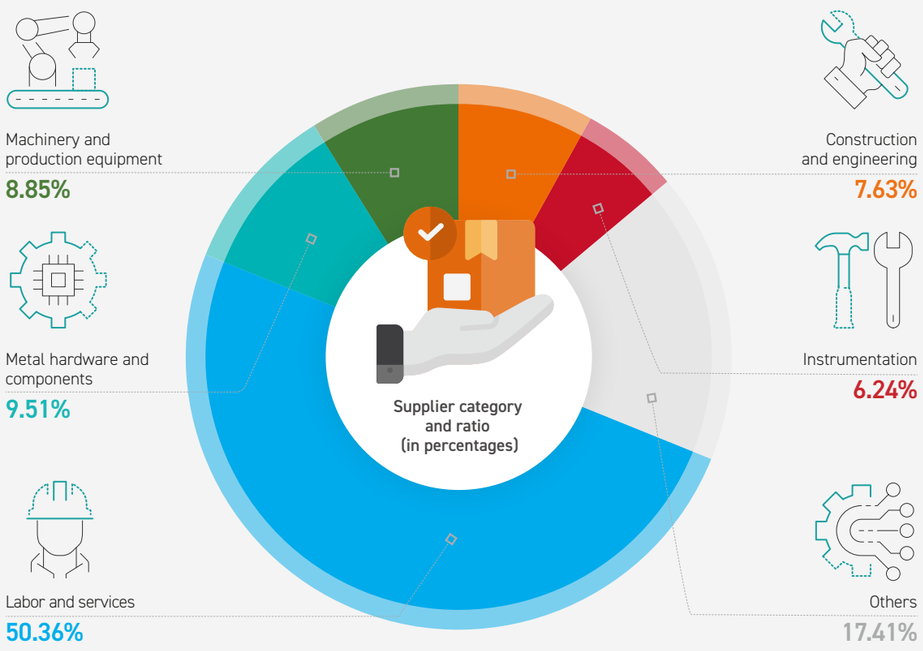
ITRI adheres to the principles of ethics, fairness, openness, justice, and legality, striving to leverage its influence on its suppliers to promote sustainability. It collaborates with its suppliers to establish green supply chains collectively. Through strengthening green procurement practices and selecting local suppliers, ITRI pursues sustainable operations and growth, aiming for mutually beneficial partnerships and achieving the overall sustainable development of the organization.

The main operating bases of ITRI are all located in Taiwan. As of 2022, the cumulative number of suppliers amounted to 62,000, with labor and services being its largest procurement category. The remaining procurement categories included metal hardware and components, machinery and production equipment, construction and engineering, instrumentation, and others, totaling 17 categories. In 2022, the number of suppliers that ITRI conducted direct transactions with was approximately 9,811, comprising 9,692 suppliers for general procurement and 119 suppliers for online transactions (engineering, computer, and relocation services). Since 2023, ITRI has demanded collaborative suppliers to sign the Corporate Social Responsibility Commitment Letter, enabling ITRI and its suppliers to jointly consider economic, environmental, and human (including human rights) aspects, enhancing sustainable competitiveness and striving for sustainable development in supply chains. In the future, ITRI will continue to collaborate with local suppliers to identify environmentally friendly products, driving industrial development, revitalizing the socio-economic environment, and increasing domestic employment opportunities.

Possessed a local procurement ratio for labor services of

96%.

Supplier category and ratio



Supply chain management endeavors

Supplier assessment

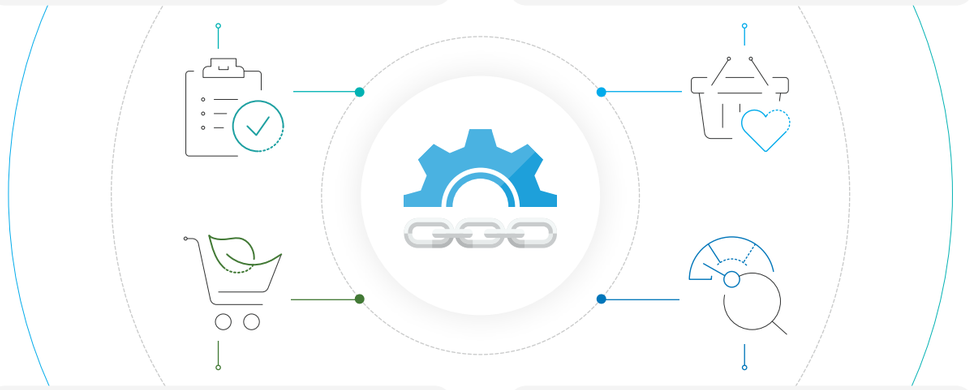
- Suppliers must be reviewed under the ITRI's Supplier Code of Conduct. In addition to considering basic conditions such as suppliers' technical expertise, experiences, and production capacity, assessments are made based on "laborers' rights, interests, and human rights," "health and safety," "community and environmental protection," and "ethical rules."
- New suppliers are required to sign the Corporate Social Responsibility Commitment Letter. Only those who pass the ITRI's SDG and basic supplier qualification standards can become ITRI's new suppliers.

- 100% compliance with the Supplier Code of Conduct.

Local/social welfare-related procurement

- Priority is given to the procurement of products and services produced by organizations for the welfare of people with disabilities or in sheltered workshops.
- Priority is given to the procurement of products offered by domestic suppliers or related products, meeting the objective of local procurement.
- 3C information products purchased are required to be domestic brands, and for the centralized procurement of laptops, 100% must be from domestic brands.

- Local procurement rate for local service categories accounts for 96%



Green procurement

- Priority is given to the procurement of products with Eco-Labels, achieving electricity and water conservation as well as reducing energy consumption, with a view to minimizing environmental impact.
- When purchasing energy services, products, and equipment involving significant energy use, energy performance is considered a key indicator in the procurement evaluation.
- When renewing or adding new machines for leased office equipment, it is mandatory to choose those with Eco-Labels and toner cartridges with Eco-Labels.
- All suppliers are required to use pulp of at least 90% to reduce waste.
- Implementation of a packaging material recycling mechanism for suppliers in collaboration with ITRI.

- Construction materials with Eco-Labels used reaches 60% among engineering projects.
- NT$108 million in the amount of green procurement.

Supplier assessment

- Conduct audits for general suppliers and evaluations for specific suppliers. (Note 1)
- Suppliers are evaluated annually for "on-time delivery rates", "customer satisfaction", "compliance with health, safety, and environmental regulations", and "defect rates" to assess ITRI's risks of collaboration with suppliers.
- In the future, assessments of environmental dimensions in supplier evaluations will be strengthened. ITRI will continue to provide ongoing coaching to its top 10 regularly engaged suppliers to enhance their sustainable development capabilities.
- Suppliers with poor contract performance, failed audits/assessments, or violation of the Government Procurement Act are subject to sanctions including suspension or observation periods.
- All measures are conducted in accordance with the supplier management procedures, assessing actual transaction situations. The assessment results as well as rewards/punishments are reviewed and implemented through official meetings

- 100% check on suppliers.

Note: Specific suppliers refer to those who have been evaluated and deemed qualified by ITRI's assessment teams for specific professional items or products, in response to the needs specified by certain laboratories and centers, projects, or clients.

CHAPTER

2 TECHNOLOGY R&D

Innovation is one of ITRI's core values. The Institute leverages its robust technology R&D and application experiences accumulated throughout the years to satisfy the demands of the industries, the general economy, and the sustainable growth of our society. We have observed four key drivers that are propelling future industrial developments:

- Digital technology and economic are transforming industry structures and the public's lifestyles.
- Changes in demographic structures are impacting society's productivity and elderly care.
- Impacts of 2050 net zero emissions on society and industry.
- Industrial and social resilience become crucial for future national and economic development.

ITRI strives to create new industry value amidst competition, transform life through forward-looking technological innovation, and provide solutions from a market-demand perspective. The goal is to enhance the well-being of society, and guide our industries towards a brighter future. Many of ITR's award-winning technologies have been transferred to domestic manufacturers and commodified over the past years. Through research and development, ITRI continues to strengthen social and industrial resilience and contribute to the sustainable development of the nation and the world.

Highlights

R&D Talents

- Employed 6,000 technological R&D elites

Patent Certifications

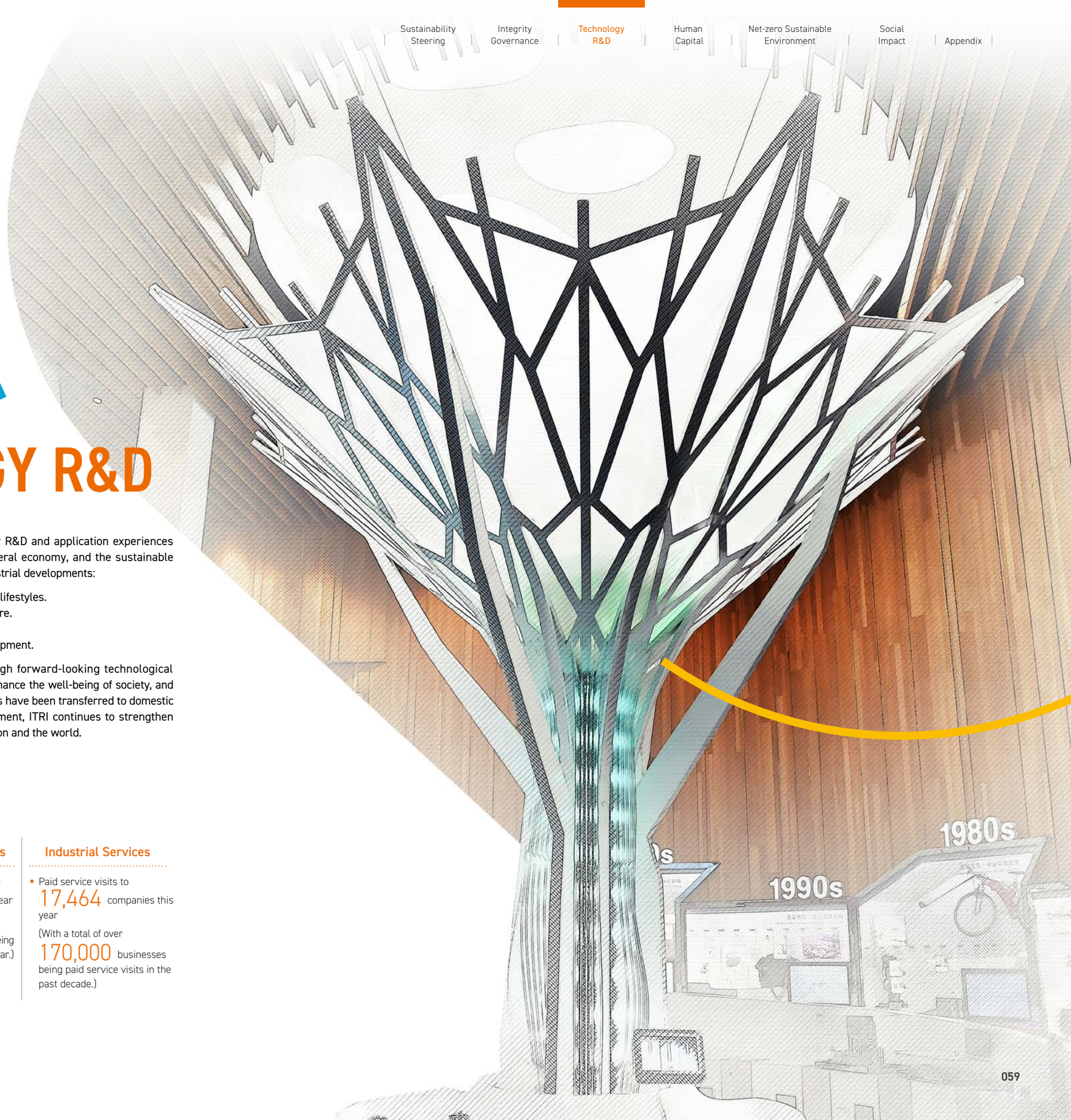
- Received 821 patents this year
  (With a total of 31,544 granted so far.)

Technology Transfers

- Transferred technology to 585 companies this year
  (With a total of over 6,304 businesses being transferred technology so far.)

Industrial Services

- Paid service visits to 17,464 companies this year
  (With a total of over 170,000 businesses being paid service visits in the past decade.)



ITRI 2035 Technology Strategy & Roadmap

GRI 203-2

Digital technology is changing industry structures and public lifestyles, while demographic changes impact productivity as well as the demand for elderly care in an aging society. Climate change presents new opportunities and challenges for achieving net zero carbon emissions by 2050, with industrial and social resilience emerging as key trends for future national and economic development. To address the rapidly changing global business environment and accelerate industrial progress, ITRI has outlined the "2035 Technology Strategy & Roadmap". This initiative focuses on R&D in 4 application domains: "Smart Living", "Quality Health", "Sustainable Environment", and "Resilient Society". To support the four application areas, the Intelligentization Enabling Technology platform was established for the development of relevant technologies such as "AI and cybersecurity", "semiconductor", "communications", and "smart sensing". Additionally, ITRI continues to develop cross-domain solutions driven by market demand, utilizing innovative technology to transform lifestyles and improve the health and well-being of the public and society, pursuing sustainable environmental development, strengthening social resilience while satisfying societal needs and enhancing Taiwan's industrial competitiveness. Through ITRI's systematic strategy planning and actions aligned with the UN's SDGs in 9 areas, ITRI aims to lead Taiwan's societies and industries toward a better future.

ITRI 2035 Technology Strategy & Roadmap

Smart Living
- Human-machine Interaction and Service
- Autonomous Mobile System
- Smart Consumption and Logistics Service

Quality Health
- Smart Medtech
- Healthcare

Sustainable Environment
- Circular Economy
- Low-carbon Manufacturing
- Green Energy System & Environment Technology

Resilient Society
- Infrastructure Resilience
- Resource & Energy Resilience
- Workforce Resilience

Intelligentization Enabling Technology
- AI and Cybersecurity
- Semiconductor
- Communications
- Smart Sensing

Note: The 2035 Technology Strategy & Roadmap was revised during the compilation of this report, and content related to the field of "resilient society" was added. The relevant achievements and performance will be disclosed in the next report.

ITRI's 2035 Technology Strategy & Roadmap aligns with the UN SDGs.

2-1 Smart Living

Creating a Happy Life With Smart Technology

Trends

- IoE and AI are omnipresent, and our lives will be filled with various types of smart devices and services.
- Digital transformation will be a crucial driver of global economic innovation, and smart technology will create new business models as well as faster, smarter, and more convenient lifestyles.

Role of ITRI

- Develop integrated innovative smart devices and services that combine hardware and software to satisfy the demands of daily lives and business operations.
- Acting as a key player to connect Taiwan with global technology development trends to create happy lifestyles with smart technology and generate new opportunities for business development.

Pain Points

- The limited intelligence, senses, and abilities of humans make us insufficient to cope with the future. The Phygital World (personal/home/workspace → mobile space → smart city, virtual world) requires new connection and collaboration technologies.
- The pandemic and other external factors have impacted and transformed consumption patterns and lifestyles, leading to structural changes in supply and demand as well as daily lifestyles. Relevant technologies need to adapt to these changes promptly.

Development Focus

- We aim to establish intelligent new lifestyles by focusing on three major sub-domains: "Human-Computer Interaction and Services", "Autonomous Mobile System", and "Smart Consumption and Logistic Services". Key development areas include cyber-physical interactions and services, smart imaging and sensing systems, wearable devices, sensing and prediction, decision-making and control, autonomous mobility platforms as well as the intelligentization of consumption and logistics services necessary to further develop and perform commercial activities.

Objectives

- Remote online entertainment/learning/sports/tourism have become common societal patterns. Spaces need to adapt to changing needs of activities such as remote work, entertainment, or online learning in real-time.
- Vehicle cabins will become a space for living, working, entertainment, shopping, and healthcare, etc., as the interior configuration can be modified according to needs and purposes. When integrated with self-driving capabilities, these vehicles can provide users with seamlessly optimized transportation services.
- Through the digitalization of factory production and inventory information, real-time capacity prediction can be achieved; Additionally, by digitalizing retail spaces, data on retail distribution and inventory can be monitored, improving operational efficiency and processes.

Smart Living | Highlight Projects

Human-machine Interaction and Service

Advanced Micro LED Display Technology

Collaborating with partners to drive the development of Taiwan's industries and seizing early business opportunities in the international market.

Autonomous Mobile System

Self-Driving Shuttle Bus Service

Responding to the urgent transportation connection needs, we provide shuttle services from the "International AI Smart Park" to the HSR station.

Smart Consumption and Logistics Services

AI-Based High-Density Shuttle Rack System

Lead the transformation of the domestic equipment industry and comprehensively enhance the overall competitiveness of the logistics and warehousing industry.

Advanced Micro LED Display Technology - Integrating Domestic Technology R&D Results

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Contributions

E (Environment)

90%

Reduces material usage and 90% of energy consumption.

S (Social)

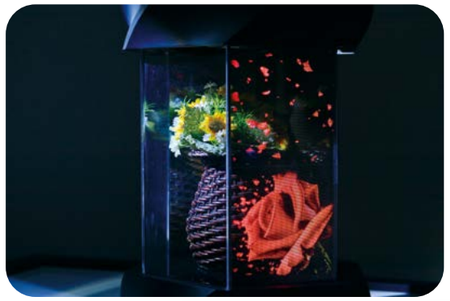
Gathers talents and generates job opportunities

G (Governance)

Assists in integrating supply chains and driving new markets/industrial transformations. The technology has been honored with the 2022 R&D 100 Awards.

Taiwan currently possesses many pertinent industries in place that are required to establish a comprehensive and highly-competitive Micro LED technologies. Domestic manufacturers also show strong willingness to enter the Micro LED industry, however, they have lacked relevant experience in the past. Furthermore, in the early phase of the industry construction, supply chains have been challenging for manufacturers to integrate independently, and most industry players have been confronted with the situation of a high entry barrier due to the multifaceted development of Micro LED.

ITRI continues to develop display modules or system technologies that align with future market demands and has invested hundreds of millions to establish Micro LED equipment for R&D as well. With the support of the Ministry of Economic Affairs, ITRI collaborated with Taiwan's backplane, IC, Micro LED, and eyewear system manufacturers to advance Micro LED display modules from proof-of-concept (POC) stages in the laboratory to trial production. The goal is to address the key issues in the incomplete supply chains of the emerging display industry and inspire the sector to explore new markets as well as transformation. Through this process, ITRI also intends to foster industrial collaboration, gaining a competitive edge in the market, and showcase Taiwan's technological strengths and comprehensive supply chain to the global market.



Technology Applications

- The Advanced Micro LED Chip Fabrication Laboratory and Micro LED Mass Transfer and Trial Production Laboratory.

Results

- Developed energy-saving Micro LED modules that meet market demands. The modules offer advantages such as high brightness, high resolution, and low energy consumption. Compared to traditional LCDs, they are thinner, reducing thickness by half and saving 90% of energy consumption. The technology makes a substantial contribution to sustainability and energy conservation and is expected to have the potential to outperform OLED, the high-end products. Besides providing one-stop quick certification service to contribute to the early deployment of next-generation display technology, ITRI also aims to integrate cross-domain industry chains to overcome the issue of incomplete supply chains in the emerging display industry.
- Collaborated with partners, ITRI has achieved recognition for its Advanced Micro LED Display Technology, earning the 2022 R&D 100 Awards.

Future Prospects

- Implement a more efficient production model and move towards diverse applications and extensions in various fields.
- Combine the additional value of current display devices with innovative applications of cross-domain non-display devices to enhance and create future industry value.

Autonomous Driving Vehicle and ADAS Technologies and Self-Driving Logistics System Test Runs – Galvanizing the Development of Taiwan's Autonomous Car Industry Chain and Transforming Taiwan into A Smart Living Society

According to a report by the World Economic Forum, it predicts that the global output value of fully autonomous driving is expected to reach USD 7 trillion by 2050. Taiwanese manufacturers have currently mastered the foundational technology for autonomous driving, but the most core technologies are still in the initial stage.

In addition to utilizing open field verification to expedite the commercialization of Self-Driving Logistics and leveraging relevant technologies to address existing issues related to labor and transportation safety, ITRI assists domestic and international government agencies and businesses in implementing pertinent technologies to reduce the costs of transit stations, long-distance transportation, and tallying personnel. The technologies can also address problems such as workforce shortages and late-night long working hours for drivers in the logistics sector, and significantly contributes to the commercialization of intelligent and public transportation developments.

In the future, ITRI will continue to encourage both domestic and international industries to participate in real-world operation cases and technological developments in the field of autonomous driving. ITRI aims to boost the development of domestic autonomous vehicle industry chains and assist Taiwan in transitioning towards Smart Living through R&D and actual implementations.

7 AFFORDABLE AND CLEAN ENERGY · 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE · 11 SUSTAINABLE CITIES AND COMMUNITIES

Contributions

E (Environment)

Reduces transfer volume and carbon emissions during the transportation process.

S (Social)

Addresses the shortage of manpower and long working hours for drivers in the logistics and transportation industry.

G (Governance)

Reduces the long-distance transportation costs and tallying personnel costs in the logistics industry.

Technology Applications

- To address existing labor shortage and transportation safety issues, ITRI enhanced sensor sensitivity and precision with technologies including modular software design, high-precision 3D dynamic maps, accurate positioning and mapping technology, and integrated data collected from sensors and LiDAR camera systems that leverage machine learning and deep learning.
- Self-driving buses equipped with ITRI's iRoadsafe, a vehicle-to-everything (V2X) technology, leverage roadside systems and integrate information from communication devices, sensors and traffic signs, and roadside infrastructure. This integration helps reduce the driver's blind spots and enhance overall operational safety.

Results

- Collaborated with domestic and international operators to test-drive tractor trailers on highways, utilizing smart road applications to make up for the gaps within the industry.
- Received the Edison Awards and ITS World Congress Industry Award.
- Collaborated with Hsinchu County Government and domestic industry partners to jointly launch the Hsinchu County HSR Self-Driving Shuttle Bus Service experimental project, providing self-driving electric bus shuttle services between Hsinchu HSR station and Zhubei City.

Future Prospects

- A technology collaboration with Australian toll-road operator, Transurban, led to the establishment of the Future Transport and Partnerships Department. Both parties initiated a technology transfer project with the goal of reaching 500 self-driving tractor trailers operating on the 7 major highways connecting the seaports and logistics centers in 3 major cities in eastern Australian cities within 5 years. The estimated total cargo capacity per day is expected to exceed 10,000 containers, accounting for approximately 33% of the national daily land transportation volume. Through this project, relevant manufacturers within Taiwanese supply chain will also be introduced into the Australian market.
- The Hsinchu County HSR Self-Driving Shuttle Bus Service has completed passenger service sandbox verification in October 2023.

AI-Based High-Density Shuttle Rack Service System – Leading Industrial Transformation in the Smart Warehousing Logistics Ecosystem

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE · 11 SUSTAINABLE CITIES AND COMMUNITIES

Contributions

E (Environment)

Increases warehouse space by more than 2 times, reducing land development

S (Social)

Reduces over half of labor costs in the logistics and warehousing industry, addressing the shortage of manpower in the logistics industry.

G (Governance)

Saves 30-40% of processing time in the logistics and warehousing industry, reducing out-of-warehouse time by 60%.

Warehousing logistics is the infrastructure of the service industry. However, the current warehousing logistics industry lacks scale and smart technology, resulting in time-consuming and labor-intensive operation with poor efficiency. Furthermore, the industry is facing significant pressure for transformation in recent years as the pandemic has stimulated the rise of e-commerce, coupled with the demands for high-mix low-volume (HMLV) manufacturing and quick deliveries. Addressing the diverse, fast and complex order fulfillment requirements of urban economies is essential.

ITRI has effectively addressed the challenges faced by Taiwan's logistics industry through innovative solutions. Through collaborations with leading logistics companies and international e-commerce businesses, ITRI developed an optimized, modular AI-Based High-Density Shuttle Rack Service System which is intelligent and standardized. The system innovates a novel "from restocking and delivery" procedure with higher quality, efficiency, and labor-saving. By fully connecting the supply chain with clients, this technology addresses the pain points of time, labor, and costs pressure in warehousing logistics. This implementation has been successfully replicated in over 100 businesses, effectively leading the overall transformation and upgrade of the industrial ecosystem.

Technology Applications

- Developed market-driven smart warehousing logistics solutions that incorporate the AI-Based High-Density Shuttle Rack System and apply technologies such as AIoT, automation, mobility, and cloud computing to create Taiwan's AI-Based High-Density Shuttle Rack Service System.

Results

- Established Asia's first "AI-Based High-Density Shuttle Rack System Center" which increases warehouse space and reduces out-of-warehouse time, thereby enhancing the overall competitiveness of the logistics warehousing industry.
- Leading operators in the industry to reduce costs, increase revenue, and innovate service chains chain for high-speed, high quality, flexible, and space-saving warehousing and transportation. This initiative significantly improves warehouse process efficiency while reducing the consumption of natural and social resources.
- The application of smart warehousing solutions has expanded from e-commerce to retail, postal services, aviation, and manufacturing fields. This has led to the transformation of domestic equipment industry into solution providers, thereby enhancing the overall competitiveness of the industry.
- Maximized resource efficiency through circular recycling designs to promote a high-quality, high-value, and net-zero green living services.

Future Prospects

- Provide e-commerce and logistics businesses with net-zero emission transition solutions, with a focus on creating a carbon reduction ecosystem (lower carbon emissions, reduce traffic congestion, and transportation costs) with the goals of zero waste and zero emissions.
- Incorporate driving/transportation behaviors along with carbon footprint monitoring, coupled with electrification of equipment and the use of recyclable vehicles/containers into circular co-share model designs and supervising technologies, to achieve the shared use of logistics and transportation.

2-2 Quality Health

Safeguarding Lives with Advanced Medical Technology

Trends

- Taiwan will enter an ultra-aged society in 2026, with increased burdens on National Health Insurance and long-term care. The shortage of labor will inevitably affect the economic development momentum.
- The COVID-19 pandemic, which ravaged the world since 2019, has brought forth a "new normal" lifestyle that includes requirements for safety, social distancing, proactive prevention, and personalized smart health care.
- Taiwan continues to accelerate the deployment of epidemic prevention and care networks by implementing telehealth measures and integrating ICT industry technology.

Role of ITRI

- Combine the strengths of Taiwan's ICT technology with the healthcare system advantages to boost the promotion of telemedicine and epidemic prevention and care networks.
- Create a new industry ecology for smart medical and smart healthcare through cross-domain collaborations, entering the international biomedical market value chain.
- Improve the health and well-being of the public, delay dementia and disability with technology, and increase the healthy life expectancy of the population.
- Enhance care efficiency, reduce national medical expenditure, and increase industry added valu

Pain Points

- Lack of a comprehensive ecosystem for personalized health promotion, diagnosis, treatment, and rehabilitation hinders the fulfillment of all-round wellness.
- The efficiency and performance of the medical and caregiving system are insufficient to meet the needs of an aging population and high-quality lives, leading to increased burden on healthcare and insurance.
- The business model of healthcare has not yet escaped its reliance on government subsidies.

Development Focus

- Heading towards the development of two major sub-domains of Smart Medtech and Healthcare, ITRI focuses on key technologies including smart medical electronics, regenerative medicine, pharmaceutical R&D, Mobile LOHAS, Caretakers Decision Support System, and smart long-term care systems.

Objectives

- Innovative services for precision health: care services such as lifestyle and health risk assessments, and prevention-oriented solutions such as health promotion and precise empowerment.
- Smart Medtech industry ecosystems: integrated diverse service solutions and value chains that involve digital diagnosis and treatment, telemedicine, and regenerative medicine that meet clinical scenario needs.
- Smart environments for precision care: facilitating the usefulness and social engagement of the elderly, meeting new demands for choice, optimization, and empowerment.

Quality Health | Highlight Projects

Smart Medtech

The Ophthalmic Technology Platform for Developing Drug and Drug Delivery System

Successfully developed two new drugs, providing patients with glaucoma and wet AMD with innovative and higher-quality treatment options.

Point-of-Care AI-DR

Efficiently assists non-ophthalmic physicians in the interpretation of diabetic fundus lesions to increase the rate of early detection among potential patients and reduce healthcare expenditures and social costs.

Healthcare

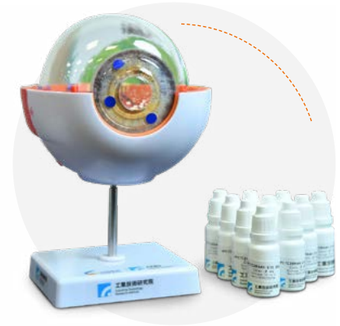
Positive Pressure COVID-19 Testing Booth

Leading healthcare professionals to achieve the remarkable feat of zero infections, effectively preventing a decrease in the quality of sample and the loss of medical manpower due to COVID-19 infections.

ITRI's Ophthalmic Technology Platform Novel Dual-target Agent for Glaucoma and Pioneering Dry Delivery System for Wet Age-related Macular Degeneration (wet AMD)

According to the International Agency for the Prevention of Blindness (IAPB), nearly half of blindness in developed countries is attributed to macular degeneration, while around 20% results from glaucoma. Factors such as aging population the excessive use of computers/ communications/ consumer electronics, and prolonged exposure and eye fatigue contribute to the increasing prevalence of eye diseases among modern individuals. Patients often encounter challenges such as inconvenient drug usage, drug resistance, or other side effects when managing symptoms and controlling the condition. Traditional injection treatments also evoke fear and resistance among patients.

In the area of new ophthalmic drug R&D, ITRI established Taiwan's first Ophthalmic Technology Platform for Developing Drug and Drug Delivery System. Through independent R&D of ophthalmic products, the institute supports domestic drug developers in contributing to unmet medical needs in the field of eye drugs, thereby enhancing the competitiveness of Taiwan's ophthalmic pharmaceuticals. The new drug for glaucoma leverages novel dual-target agents to further relax the trabecular meshwork (TM), promoting aqueous humor (AH) drainage, achieving reduced intraocular pressure without significant side effects (such as noticeable eye irritation). The wet AMD eye drops utilize the "Coordinated Supra-Molecule Complex (CSC) for Posterior Eye Delivery" to address the issue of traditional eye drops being unable to deliver medication to the retina. By substituting eye drops for ocular injections, ITRI significantly improves patient compliance and alleviate discomfort.



3 GOOD HEALTH AND WELL-BEING

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Contributions

S (Social)

providing patients with ophthalmic medications with lower side effects, more effectively preventing or delaying the occurrence of blindness.

G (Governance)

NTD 670 million

promoting domestic manufacturers to invest more than NTD 670 million in the sector, enhancing the competitiveness of domestic ophthalmic drugs.

Technology Applications

- ITRI has already developed new target drugs for glaucoma and new eye drops for wet AMD. Compared with those available in the market, these products are more convenient, effective, and safer.
- ITRI is continuously investing in new eye drops to treat dry eye syndrome, diabetic macular edema (DME), and dry age-related macular degeneration

Results

- Established the first Ophthalmic Technology Platform for Developing Drug and Drug Delivery System in Taiwan, designing and providing products that are more convenient, effective, and safer than those available in the market.
- Provide technical consulting and services to relevant technology contractors to expedite the implementation of product clinical trials.

Future Prospects

- Continuously providing comprehensive "Contract Research Development and Manufacturing Organization" (CRDMO) services to ophthalmic pharmaceutical industry.
- Continue to collaborate with domestic manufacturers to develop eye products in various fields, such as the development of functional or highly comfortable contact lenses.

Point-Of-Care AI-DR - First AI Medical Treatment in Taiwan to Pass Clinical Trial Exemption

In Taiwan, the high prevalence of diabetes among the population increases the likelihood of associated eye complications. Diabetic retinopathy is a leading cause of blindness in adults. However, over half of the townships and cities in Taiwan lack ophthalmologists, significantly increasing the difficulty for patients to seek medical treatment. The Point-of-Care AI-DR developed by ITRI utilizes AI to assist non-ophthalmic physicians (such as metabolism or family medicine doctors) who are less experienced in interpreting fundus images to increase the early detection rate of fundus lesions in patients. Through symptom labelling, it provides interpretability for disease severity classification, thus supporting the confidence of non-ophthalmic physicians in the AI interpretation results. Effectively assisting non-ophthalmic physicians in diabetic retinopathy diagnosis, it eliminates the inconvenience of referring to ophthalmology, increasing the rate of early detection among potential patients, and reducing health care and social expenditures.

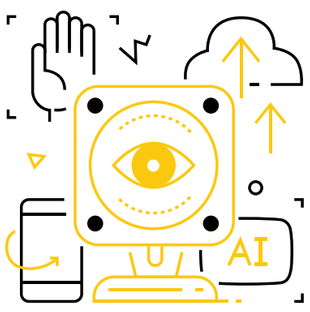
Contributions

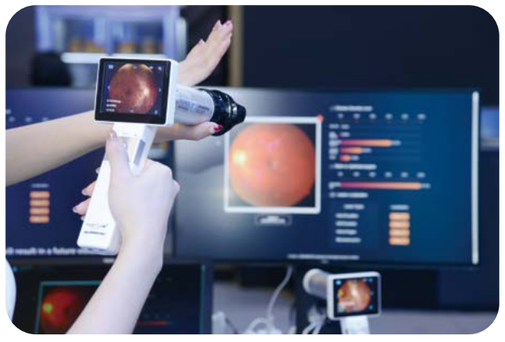
S (Social)

Preventive medical care (early detection among potential patients to reduce the strain on social medical resources).

G (Governance)

Assisted manufacturers in simplifying certification processes and established verification procedures for AI diagnostics without the need for clinical trials.





Technology Applications

- The Point-of-Care AI-DR technology helps diabetes-care physicians interpret fundus images more accurately and increase the early detection rate of fundus lesions in patients.

Results

- The product and technology have been transferred to manufacturers, and ITRI has assisted them in obtaining TFDA marketing authorization through approaches such as clinical trials or substantial equivalence comparisons.
- Assist domestic AI smart medtech companies in implementing medical device similar product determination processes through clinical trial exemption to expedite product review time and obtain marketing authorization as soon as possible.

Future Prospects

- Assist technology manufacturers in obtaining marketing authorization without clinical trials through the Substantial Equivalence comparison method.
- ITRI has been invited to collaborate with TFDA in establishing the AI medical device inspection and registration guidelines, and will continue to contribute to the AI medical device industry in the future.

Positive Pressure COVID-19 Testing Booths – Rapidly Expanding Across Taiwan to Protect Healthcare Personnel

During the COVID-19 pandemic in Taiwan, frontline healthcare workers faced the risk of direct infection due to the surge in demand for testing in different areas. Additionally, the hot and humid weather in Taiwan created a stifling environment inside the sampling tents, contributing to a decrease in the quality of sample collection and manpower losses for healthcare personnel.

To better protect our medical care workers, ITRI leveraged its extensive experience in clean room cleaning technology and quickly assembled 10 domestic manufacturers and over 50 relevant product supply chain manufacturers within one month after the outbreak of the pandemic. Through simplified and standardized settings, we quickly manufactured testing booths with positive pressure, constant temperature, energy-saving, and purification features and comfort. Furthermore, these booths offer the advantages of rapid production and easy installation. This greatly alleviated the pressure and impact on the frontline medical care personnel during the spread of the pandemic. With these new booths, sample collection could be easily completed while the healthcare personnel only needed to wear protective masks.

Contributions

E (Environment)

Provided more energy-efficient positive pressure COVID-19 testing booth.

S (Social)

Reduces the risk of frontline healthcare personnel contracting respiratory illnesses.

Technology Applications

- Rapidly integrating manufacturers and supply chain partners to simplify and standardize the technology required for the positive pressure COVID-19 testing booth.
- ITRI leveraged its rich experience in clean room cleaning technology to oversee the manufacturing process and quality of the testing booths, including frames and heat insulation partition construction, sample collection frame installation, sample collection glass and internal accessories assembling, leakage test, and quality control inspection. Each testing booth must undergo nearly 100 inspection procedures established by the team before exiting the factory to ensure the safety and quality of the product.

Results

- Within one and a half months of the outbreak, more than 180 booths were installed at various medical institutions, community screening stations, and science parks throughout Taiwan.
- The technology has been transferred to manufacturers and production capacity has been increased, enabling them to possess the capability for high-quality production and large-scale manufacturing of positive pressure COVID-19 testing booth.

Future Prospects

- The technology becomes the best guardian for frontline healthcare personnel when highly infectious influenza viruses or other respiratory diseases appear in the future.

2-3 Sustainable Environment

Building A Sustainable Future with Green Technologies

Trends

- Multiple governments have committed to achieving net-zero emissions and have progressed from policy declarations to legislation and actual implementation in industry policies.
- Large international manufacturers have set net-zero targets, forming alliances to lead and support smaller entities, fostering a collaborative effort throughout the supply chain to reduce carbon emissions.
- Consumers and businesses are placing a greater emphasis on sustainability, Leading to a gradual shift in lifestyles and business operation styles. Embracing low-carbon lifestyles has become a trend and a fashion statement.

Role of ITRI

- Support the domestic manufacturing industry in upgrading and transformation while promoting the development of the green industry utilizing recycled materials, intelligent manufacturing, and sustainable energy.
- Minimize energy and resource consumption as well as environmental impacts caused by emission. Establish an ecosystem in which a net-zero sustainable society and industry development can mutually prosper.
- Facilitate high-value industries that promote sustainable innovations and create a vibrant and enduring future with green energy technologies.

Pain Points

- Current technology can only achieve halfway towards the net-zero target. Technology innovations will be crucial to net-zero transformation.
- With limited land resources, there is a need for high-efficient, cross-domain, stable supplies of green energy and subsequent maintenance under large-scale green energy deployment.
- Complicated recycling systems and high recycling costs hinder the recycling and proper disposal of discarded electronics and green energy products.

Development Focus

- Develop 3 sub-domains including "circular economy", "low-carbon manufacturing", and "green energy & environment"; focusing on key areas such as recyclable new materials, the intelligentization of design in production processes, and supply chain management systems, as well as environmental technologies that align with ecological coexistence.
- Integrating low-carbon, energy-saving manufacturing processes with equipment and material innovations, along with product process designs and technologies that preemptively prevent pollution. Applications include low-carbon and zero-carbon energy supply, low-carbon and zero-waste productions, and technologies and systems for environmental protection.

Objectives

- Develop a circular economy and establish a system for the recycling and reuse of resources.
- Invest in low-carbon manufacturing, aiming for zero waste and low energy consumption in production.
- Increase green energy systems and strengthen environmental technology to protect the environment.

Sustainable Environment | Highlight Projects

Circular Economy

PV Module Recycling and Circularity Technology

Researched and developed PV Module Recycling and Circularity Technology, replacing the current practice for burying discarded photovoltaic modules in Taiwan, and offering a comprehensive circular economy solution for the PV industry.

Microbial Dye Production Platform

Provides the domestic textile industry with non-toxic, carbon-reducing, and sustainable materials to meet international requirements.

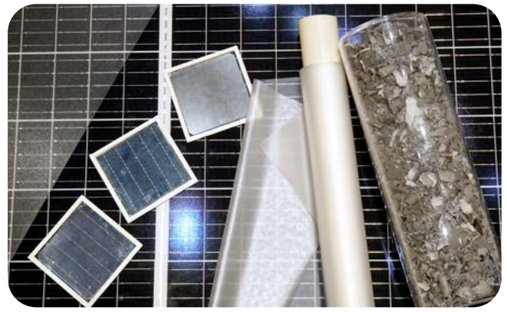
Low Carbon Manufacturing

Domestic Intelligent Cloud Platform for The Machinery Industry

Assist industry development through the setup of a platform, from which equipment and manufacturing industries can access various solutions for operations and management, product development, and production management.

Note: ITRI's technological R&D relevant to Sustainable Environment also encompasses the sub-domain of "Green Energy & Environmental Technology". For detailed achievements in the current year, please refer to p. 26-27 of the 2022 ITRI Annual Report .

PV Module Recycling and Circularity Technology - Providing a Complete Circular Economy Solution for the PV Industry



In response to green energy and environmental policies, Taiwan has installed a significant number of solar PV modules. It is estimated that after 2035, more than 100,000 tons of waste modules will be generated annually. However, the current domestic technology can only dismantle the aluminum frames before burying the discarded modules, resulting in high processing costs and environmental burdens. Furthermore, Taiwan also lacks the raw materials for solar PV modules and heavily relies on imports.

To address the issue, ITRI has developed the "PV Module Recycling and Circularity Technology" and "Easy-Dismantled Solar Panel Modules". The new technologies implement the circular economy concept from the design stage and enable us to effectively separate, recycle, and reuse the metals and inorganic materials from the module. By integrating these technologies into existing processes, it can also increase the recycling value of the module four times and reduce the carbon footprints by over 50%. This new development offers a comprehensive circular economy solution for the solar energy industry.

7 AFFORDABLE AND CLEAN ENERGY | 11 SUSTAINABLE CITIES AND COMMUNITIES | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Contributions

E (Environment)

50%

increases the recycling rate of solar PV modules, reduces waste generation as well as decreases carbon footprint by over 50%.

G (Governance)

promotes the transformation of domestic solar PV module industry and reduces the demand for raw materials in solar PV modules.

Technology Applications

- The PV Module Recycling and Circularity Technology is developed to process intact discarded solar PV modules. ITRI developed thermal cracking technologies to assist in separating and recycling as well as wet purification technology which can effectively separate and recycle over 96% of the inorganic materials (metals and ceramics) from the module. We have also established a glass cleaning liquid regeneration system to recycle and reuse the washing liquid.
- Developed the "Easy-Dismantled Solar Module", utilizing temperature control to allow each layer of materials in the solar panel to detach automatically. This allows the complete recovery of valuable metals such as silicon chips, glass, and silver, and 92% of inorganic materials can be continuously recycled and reused.

Results

- ITRI provided relevant manufacturers with low-caron solutions to reduce the demand for raw materials and substitute the imported raw materials required by Taiwan's industries.
- Received the first "International Electrotechnical Commission (IEC)" international certificate for the "Easy-to-disassemble Solar PV Modules" from TÜV Rheinland, Germany in 2022.
- The second generation of easy-to-disassemble solar modules has been certified by TÜV SÜD and has also passed the Bureau of Standards, Metrology and Inspection of the Ministry of Economic Affairs for the VPC certification for solar module quality.

Future Prospects

- Enhance collaborations with waste management operators to process various of waste solar PV modules circulating in the market.
- After the establishment of the mass production processing line, silicon and glass pellets can be recycled and reused in various industries, such as materials, to further enhance carbon reduction benefits.

Microbial Dye Production Platform – Supporting Green Production in the Domestic Textile Industry

Contributions

E (Environment)

30%~50%

decreases carbon footprints by an average of 30-50% and reduces environmental pollution caused by the textile industry.

G (Governance)

promotes green transformation in the domestic textile industry.

The textile industry is Taiwan's fourth-largest foreign-exchange earning industry, but it is also one of the high-risk industries that cause environmental pollution. The synthesis processes often generate poisonous intermediate compound, leading to environmental pollution risks in dyeing and finishing process.

ITRI initiated the Textile Industry Biomass Dye Production Project in 2015 to achieve the goals such as non-toxic sustainability and zero carbon emissions in response to international policies and the requirements of green supply chains of various brands. Outstanding professionals from the textile, chemical, information, and biology domains were assembled to form a cross-domain biosynthesis technology research team. By incorporating AI technology, the team successfully utilized microorganisms to produce green biomass dyes., and facilitated technology transfer to manufacturers for mass production. This initiative provides a key strategic technology for the next generation, promoting non-toxic and carbon-reducing practices, leading the green upgrade of the textile industry in our country. Furthermore, Taiwan can also foster self-sufficiency in bio-synthetic chemicals and promote local applications.

Technology Applications

- Introduced AI technology for the optimization of the microorganisms' metabolic pathways. Furthermore, the enzyme activities have been modified and enhanced through big data stimulation and prediction techniques. This approach accelerates the R&D process, and improves the overall efficiency of microbial dye production.
- By employing the "biosynthetic approach" to produce dyes, the metabolic byproducts from microorganisms can replace the existing plant-based dye extraction process. This method results in dyed products with more vibrant hues.

Results

- Established the Microbial dye production platform technology to develop low-hazard, non-toxic, carbon-reducing, and sustainable microbial dye processes and products.
- The green biomass dyes produced (microbial indigo blue, black, and brown dyes) have completed field certification in collaboration with partner manufacturers, confirming their compliance with application requirements.
- Compared to chemical synthesis technology, the biosynthesis technology can reduce the carbon footprint by an average of 30-50%.
- Overcoming the pain points of "plant-based dye extraction technology" with advantages such as minimal land requirements, stable quality, and the potential for industrial-scale mass production.

Future Prospects

- ITRI will continue to invest in new product development, realizing self-sufficiency in biosynthetic chemical products and local applications, promoting the growth of the green production process dye industry in Taiwan.

Domestic Intelligent Cloud Platform for The Machinery Industry – Support Domestic Equipment Industry Transformation and Entry into the International Market

Remote working and digitization have become the new normal in business operations in the era of IoT and Industry 4.0, and the digital transformation of traditional machinery industry is urgent. In Taiwan, nearly 80% of operators of manufacturing and machinery equipment industry are SMEs, and most operations rely on the traditional experience passed down from experienced masters, resulting in a lack of technology development talents and insufficient system integration capabilities. The common challenges faced include the individual establishment of respective information and communication approaches in the development of equipment across various industries. While moving towards intelligent manufacturing and digital transformation, there are numerous obstacles to overcome.

To address this issue, ITRI collaborated with the Taiwan Association of Machinery Industry (TAMI) and various juridical persons to establish the "Domestic Intelligent Cloud Platform for the Machinery Industry". We created a management and task scheduling system module that features data visualization, information transparency, and predictable data capabilities to integrate upstream and downstream production management data to build a unified supply chain management system. A general AI toolbox for the industry was also established to reduce the barriers for enterprises to adopt AI technology, so that they can agilely adapt the system to cater to various production line scenarios for quick and practical applications. Furthermore, the platform has strengthened its information security protection mechanism, ensuring that businesses can utilize cloud services securely. This initiative aims to develop an intelligent manufacturing ecosystem, and through partnerships with international manufacturers, integrate international soft and hardware services to assist the domestic equipment industry in transforming into key players in the global supply chain.

Contributions

E (Environment)

promotes the digitization of industries, improves efficiency in production, and reduces energy consumption to reduce carbon emissions.

S (Social)

solves the shortage issue of smart robot talents in SMEs.

G (Governance)

encourages the domestic industry to incorporate intelligent tools to enhance the competitiveness of domestic industries on the international stage.

Technology Applications

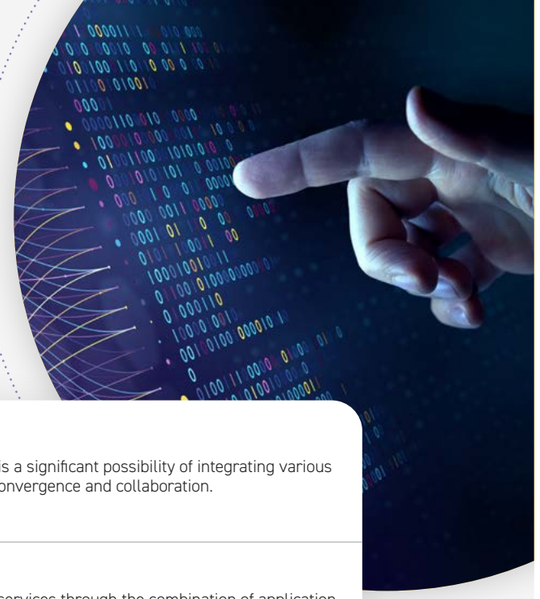
- Established a public version of the "Domestic Intelligent Cloud Platform for the Machinery Industry" in response to practical needs of the industry. Developed apps and software tools for the industries as well as enterprise resource management systems, production management systems, task scheduling system modules, and a Domestic Intelligent Cloud Platform for the Machinery Industry service ecosystem.

Results

- Since its launch, the "Domestic Intelligent Cloud Platform for the Machinery Industry" has attracted at least 1,500 vendors to sign up, with over 70 vendors adopting and using the platform.
- Assisted Taiwan's five major industries (metal cutting, electronic equipment, metal forming, plastics and rubber, and textile equipment) in introducing the "Customized Cloud Intelligent Module" to reduce energy consumption and enhance green economic competitiveness.
- Assisted domestic screen-printing equipment major manufacturers in introducing intelligent tools to break through the dominance of Japanese and South Korean businesses, and seizing new orders in the Southeast Asia region.
- Assisted major plastic and rubber machinery manufacturers in resolving equipment communication and integration problems, rapidly digitizing to enhance international competitiveness, and securing international orders exceeding NT$150 million.

Future Prospects

- Future plans include singing MOUs with domestic and international telecom operators to expand services to the New Southbound market through the integration of 5G and platforms.
- Building on the foundation of the Smart Machinery Cloud, the development of tools for cyber-physical integration is extended, aiming to achieve the application of the industrial metaverse. This initiative aligns with the future of intelligent manufacturing, transitioning towards a green economy with net-zero emissions.
- Replicate and expand the application of the smart machinery cloud and guide the industry towards the development of smart green manufacturing and sustainable operations.



2-4 Intelligentization Enabling Technology

Building Diverse Applications Upon a Solid Technological Foundation

Trends

- The world will eventually enter the post 5G/6G era and there is a significant possibility of integrating various networks to achieve global coverage through multi-network convergence and collaboration.

Role of ITRI

- Demonstrate the value of innovative systems and application services through the combination of application requirements, and through technological evolution, it stimulates the potential for more applications.

Pain Points

- In the trend of IoE, various application services need to address issues such as limited bandwidth, communication delays, network coverage, information privacy, and computational processing.

Development Focus

- ITRI focuses on the development of four sub-domains "AI and information security", "semiconductor chip technology", "communication technology", and "smart sensing technology" – in the four major application domains (Smart Living, Quality Health, Sustainable Environment, and Resilient Society). The development is premised on conditions conducive to industry growth.

Objectives

- Meeting the demands for real-time capability, reliability, privacy and customization.
- Safeguard data privacy and maintain data security in the face of increasingly diverse and complex information security threats.
- High performance AI and communication capabilities for the IoT.

Intelligentization Enabling Technology | Highlight Projects

Semiconductor Chip Technology

X-Ray Metrology for 2 nm Process

Assist domestic semiconductor manufacturers upgrading their capabilities to the level of highly specific wafer measuring to enhance product competitiveness.

Communication Technology

Develop Domestic 5G Micro Base Stations and Non-Terrestrial Network Technologies

Establish strategic partnerships with international manufacturers to facilitate the most significant global communication standards and enhance the international competitiveness of domestic base station equipment manufacturers.

Smart Sensing Technology

Optical Air Quality Sensor

Provide the public and businesses with real-time air pollution/air quality information for personal health protection or adjust industrial operations.

Note: ITRI's technological R&D of Intelligentization Enabling Technology also encompasses the sub-domain of "AI and Information Security Technology". For more details, please refer to the link of the official website.

X-Ray Metrology For 2 nm Process– Supporting Domestic Semiconductor Industry Developments

The semiconductor industry in Taiwan has evolved to processes below 2 nanometers, requiring the introduction of Gate All-Around (GAA) 3D complex structure technology which involves utilizing a single electrode to simultaneously control multiple transistors. However, GAA faces several challenges to overcome, including the reduction of chip size, the introduction of new materials, and demands for dimensional measuring precision. Current traditional measuring technologies struggle to meet industry requirements.

In 2021, ITRI collaborated with domestic semiconductor manufacturers to develop the first 2-nm process front-end measuring instrument. Together with the domestic semiconductor manufacturers, we successfully designed the high-end components within the machine and optimized the instrument performance through discussions with experts from Germany and Sweden. The technology, which has gained recognition and been applied in relevant factories, assisting in enhancing the manufacturing capabilities of domestic semiconductor equipment manufacturers in the front-end processes.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Contributions

E (Environment)

increases the domestic self-sufficiency rate of the semiconductor industry, reducing carbon emissions generated from material and equipment imports.

S (Social)

startups can attract semiconductor industry talents and create more job opportunities.

G (Governance)

enhances the capabilities of domestic semiconductor manufacturers in advanced processes.

Technology Applications

- Based on XRCD, the first 2 nm front-end measuring equipment has been developed.

Results

- ITRI successfully designed the high-end components in the machine with domestic semiconductor manufacturers, and the process testing has begun, gaining initial recognition from relevant manufacturers for the technology.
- Assisted in enhancing the front-end process manufacturing capabilities of domestic equipment manufacturers, enabling them to upgrade their capabilities to meet high specifications. This allows domestic manufacturers to compete with international giants and seize opportunities in the global market.
- Raised the domestic self-sufficiency rate of equipment, accounting for 5% of the substantial procurement opportunities in Taiwan's semiconductor equipment industry.

Future Prospects

- Leveraging the XRCD technology, a new startup named "NanoSeeX" which was officially established in Q3 of 2023. It is set to attract and connect domestic high-end semiconductor technology talents and technologies.
- As the market is projected to reach USD 130 million by 2025 (with a CAGR of 36.8%), it is expected to lead to an annual investment of nearly USD 10 million or more by domestic manufacturers in semiconductor measuring equipment.

Domestic 5G O-RAN Microcell and Non-Terrestrial Network Technology – Expanding the Product Blueprint of Domestic Base Station Equipment Manufacturers to Increase Global Competitiveness

The base station products of Taiwan's communication services are mainly small cells, which can only provide a limited service range, and it may be necessary to deploy over a dozen small cells to achieve full coverage for larger factories. Moreover, Taiwan's 4G/5G mobile communication network still faces challenges in providing adequate signal coverage in rural areas, oceans, aviation, and other scenarios.

Through the deployment of relevant ITRI technologies and the establishment of microcells in surrounding suburbs, we effectively upgrade the original communication range of small cells to the level of microcells, resulting in a fourfold increase in base station coverage and an expansion of signal coverage. This not only provides cost-effective and more comprehensive communication services but also addresses mobile communication issues in remote areas, oceans, and air spaces. Furthermore, local base station equipment manufacturers, leveraging the high coverage and large capacity features of microcell products, gain the opportunity to compete for markets in large private networks and public networks markets. This contributes to the mutual prosperity of Taiwan and the international markets, reinforcing our global competitiveness.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

Contributions

S (Social)

expand internet coverage and bridge the gap between city and rural areas.

G (Governance)

assist the communications industry in its transformation to enter the global supply chain.

Technology Applications

- "Distributed MIMO technology", "High Power RF Front-End Technology", "Microcell System Technology", and "Non-Terrestrial Network (NTN) Technology".

Results

- With the support of the technology development programs, the non-terrestrial network (NTN) project team has independently mastered the technologies of 5G base station communication protocols at various layers and successfully overcome the challenges related to coverage and capacity issues of microcells.
- Showcased the NTN base station and mobile phones capable of two-way video calls at the Mobile World Congress (MWC), in compliance with the 3GPP open standards.
- Established strategic alliances with several global manufacturers and fostered collaboration with 3GPP, the world's most significant communications standard-setting organization, to jointly research and develop "Non-Terrestrial Network Technologies".
- Encouraged domestic base station equipment manufacturers to enhance their global competitiveness and strengthen the ecosystem of NTN ecosystem based on open standards.

Future Prospects

- Plan the next phase for large bandwidth NTN communications collaborating with partners.
- Continue to develop and strengthen the performance efficiency and features of mid-sized/large base stations, assisting domestic open base station equipment manufacturers in expanding their product blueprints, and entering the global supply chain which is mainly led by telecommunication operators.

Note: 1. Distributed MIMO Technology leverages smart antennas and the physical properties of radio waves to efficiently concentrate signals in specific directions when transmitting or receiving at wireless base stations.
2. Non-Terrestrial Networks (NTN) refer to the installation of communications/transmission equipment in space or high-altitude carriers to deliver communication network signals. In this context, NTN specifically denotes Low Earth Orbit satellite communication technology.

Optical Air Quality Sensor – Small Low-cost Sensors to Help Improve Air Quality Inspection Accuracy

3 GOOD HEALTH AND WELL-BEING

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

Contributions

E (Environment)

helps enhance air quality management

S (Social)

promotes public health

G (Governance)

assists in the enforcement of the Air Pollution Control Act

Air pollution has contributed to an estimated 7 million premature deaths every year, it already yielded a significant concern for the public and the government. The Ministry of Environment has recently established an "Air Quality IoT Platform" to monitor air quality nationally with a higher resolution. However, in the past years, the core technology for air quality sensors was not yet domestically developed, leading to insufficient precision. Besides, the non-MIT made electronic components and non-MIT manufactured air sensors could raise concerns regarding information security.

ITRI develops a comprehensive air quality sensing technology from sensing components, modular design, to system operations. The solutions are appropriate for wide-range deployment due to the advantages of small size, low cost and durability. The ITRI-developed air quality sensors can be installed in downtown traffic areas, rural wide open areas and industrial areas. An additional wind field and meteorological information can be integrated to simulate the pollution hot spots, pollution time hot spots, and even identify the source of pollution. It is allowing for environmental law enforcement and inspection, with the public being able to be notified for protection and evacuation at the early stage of pollution. The technologies have already been successfully applied in the industrial areas, ship port areas, and heavy traffic areas for self-management applications.

Technology Applications

- Developed the "Optical Air Quality Sensor" to measure airborne PM2.5 particulate matter and ozone concentration with optical detection technology.

Results

- The sensing technology of optical air quality sensor has been transferred to domestic manufacturers and has won the "2022 Taiwan Excellence Award" and "National-Level Information Security Certification". As of 2022, it has been implemented in cities and counties (3,016 points) which is achieving a nationwide deployment rate of 30% and the data is uploaded concurrently onto "Air Quality IoT Platform" for monitoring air quality with a higher resolution.
- The Taichung City Environmental Protection Bureau has adopted the domestic-made air quality sensors to establish an air quality data center to support smart law enforcement. In the year, they had detected 37 cases of violations of Air Pollution Control Act, and was earning recognition with the "2022 Smart 50 Awards" and "Taiwan and Asia-Specific Sustainable Action Awards".
- The self-management application is deployed at the 7 major international commercial ports in Taiwan, which it is utilized to monitor and forecast air quality changes in port areas in real-time, enabling the scheduling of dock operations to reduce the impact of cargo handling on urban air quality.

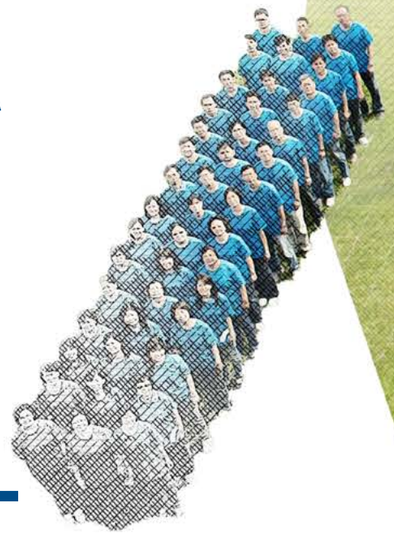
Future Prospects

- Work on the development of the "Miniaturized Optical-based Greenhouse Gas Sensor Module" which utilizes optical multi-band sensing technology to enhance the detection accuracy to a specific greenhouse gas emissions.
- Design diversion and pressure-reduction channels to reduce interference from environmental particles and moisture. This provides accurate and real-time measurement results to meet regulatory requirements for monitoring the emission or release of micro-amounts of methane and other greenhouse gases in the environment.

CHAPTER

3

HUMAN CAPITAL



As an organization approaching its 50th anniversary, ITRI upholds the spirit of "being people-oriented", offering its employees a high-quality work environment that encourages them to leverage their strengths, engage in lifelong learning, and achieve a balanced physical and mental development. In addition to actively recruiting and nurturing talents, ITRI is committed to creating a harmonious and friendly work atmosphere, utilizing a diverse and inclusive management culture along with flexible measures, to meet the values of its employees from different generations. Considering talent as the most valuable asset, ITRI focuses on both hard and soft skills, balancing career development with self-fulfillment. From the workplace to the home, ITRI strives to create a harmonious work-life balance, providing a highly humane environment where every employee is suitably positioned. In this environment, the physical, mental, and spiritual well-being of each staff member is appropriately cared for, contributing to Taiwan's sustainable talent development.

Highlights

Gender equality (Note 1)

- The proportion of female supervisors accounts for 29.5%
- The proportion of female employees accounts for 38.18%

Employee engagement

- Conducted large-scale meetings and organization-wide surveys, with a total of 11 times of engagements (Note 2)
- The participation rate in the organizational staff opinion survey (on ITRI) accounts for 71%

Talent attraction (Note 3)

- Recognized by domestic and international institutions as a **"Best Employer"**
- Had an annual new employee rate of 10.45%

Safe workplace

- Passed **ISO 45001** Occupational Health and Safety Management System Verification
- Received the **"Health Promotion Label"** issued by the Health Promotion Administration, Ministry of Health and Welfare

Notes: 1. Calculated based on the percentage of female employees and supervisors among permanent employees in 2022. The percentages of both female employees and supervisors at our institute have been increasing year by year.
2. In 2022, ITRI presented/held/conducted 2 ITRI president reports, 5 labor-management meetings, 2 employee representative meetings, and 2 employee opinion surveys.
3. In 2022, ITRI was recognized as a "Best Employer" by organizations such as Universum and LinkedIn.

3-1 Talent Cultivation: Development and Retention

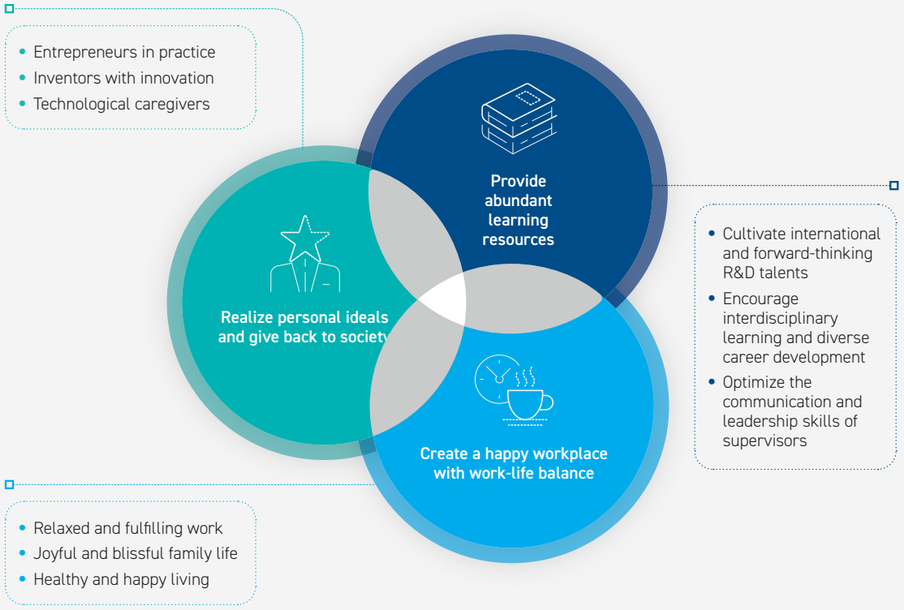
GRI 2-7

Talents serve as the driving force of industrial innovation and a key focus for ITRI as it moves towards the next 50 years. As a national think tank and industry linkage platform, ITRI is dedicated to pioneering research and development in innovative technologies while upholding the core value of "integrity management". It is committed to creating career opportunities for elites from various fields, establishing systematic cultivation and development programs as well as diverse recruitment channels. These endeavors enable talented individuals to pursue their ideal careers and professional achievements. ITRI aims to provide a happy and friendly workplace conducive to holistic personal and professional growth.

3-1-1 Vision and Policies

ITRI values its employees as crucial business partners, emphasizing the principles of "innovation, integrity, and sharing" to cultivate a collective awareness focused on "altruism" and "co-benefits". To attract and nurture more elite talents, ITRI actively expands its sources of talent, providing comprehensive training and development opportunities, encourages friendly and two-way communication between supervisors and employees. ITRI has also established the ISO 45001 Occupational Health and Safety Management System, organized various physical and mental health-promoting activities, and created a healthy and high-quality working environment for its colleagues. ITRI aims to continuously be a cradle for nurturing industry talents, allowing employees to work with dignity while enjoying a fulfilling life.

Three Major Talent Development Directions



3-1-2 Diversity and Inclusion

GRI 2-7、2-8、2-23、2-24、2-25、2-30、405-1~405-2、406-1、407-1、408-1、409-1、411-1

To create a diverse and innovative workplace, ITRI is committed to promoting priority initiatives such as diverse recruitment, collaborative learning and research, gender equality, and human rights protection. Such efforts enhance the diversity and developmental potential of its talent composition. Through continuous recruitment of capable women from various generations, domestic and international interns, and foreign employees; and the establishment of open communication and grievance channels, ITRI fosters equal and two-way communication between labor and management as well as the internal talent mobility, ensuring equal employment and development opportunities for all employees.

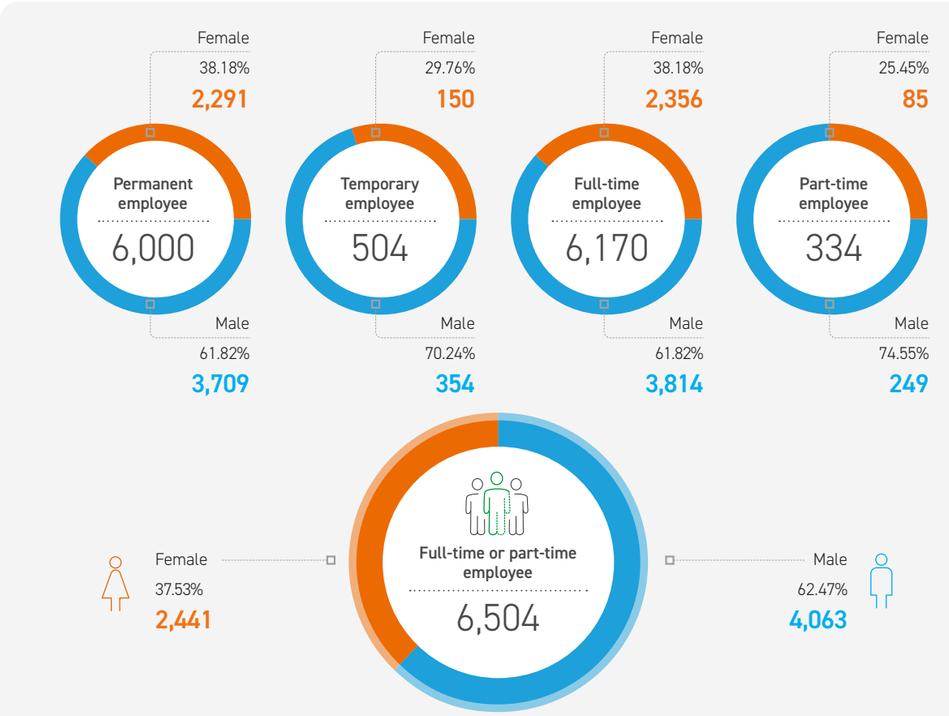
Employee Overview

ITRI values human rights equality(Note), ensuring that all employees have equal opportunities in employment and development. In the formulation of policies related to employment, development, and training, ITRI preserves the diversity and flexibility of talent, creating a diverse talent structure that facilitates Taiwan's industrial competitiveness and sustainable talent development. As of yearend 2022, ITRI had a total of 6,000 permanent employees p.161 and 504 temporary employees. Among the permanent employees, 38.18% were female, 1,144 (25.75%) of whom were engaged in research and engineering positions. Among supervisors, the percentage of female ones is 29.5% p.162, demonstrating that women at ITRI had equal employment and promotion opportunities and were as well significantly recognized for their achievements. In addition to female employees, ITRI actively recruited elite talents from different countries, employing 75 foreign nationals. Also, it recruited 54 employees with disabilities p163. ITRI provides a friendly work environment and equal employment opportunities, ensuring that people from different backgrounds enjoy fair and diverse career development opportunities.

Note: ITRI's supervisors and employees have not been discriminated or treated unfairly based on their races, classes, languages, thoughts, religions, political inclination, native places, birthplaces, genders, sexual orientations, ages, marital status, appearances, facial features, physical or mental disabilities, zodiac signs, blood types, or any other factors.

Employee type in 2022

unit: 1 person



Note: Permanent employee: Employees whose term of employment as stated in their employment contracts with ITRI is permanent; Temporary employee: Employees whose term of employment as stated in their employment contracts with ITRI has a fixed duration.

Employee Diversity and Inclusion Indicators

- Female employee p.161 38.18%
- Employee with a master's degree or above p.163 83.12%
- Female supervisor p.162 29.5%
- Employee aged 30 and under p.162 14.56%
- Female employee engaged in research and engineering-type work p.162 25.75%
- Foreign employee (Note 2) p.163 1.15%
- Employee with disability (Note 1) p.163 0.83%
- Indigenous employee (Note 1) p.163 0.11%

Notes: 1. Although ITRI is committed to providing job opportunities for individuals with disabilities and indigenous peoples, the nature of its work has led to a shortage of applicants, resulting in the annual hiring of employees with disability and indigenous employees both failing to reach the legal requirement of 1%. Accordingly, ITRI has paid employment contributions in compliance with the law, and will continue to enhance recruitment efforts with an open and inclusive mindset to meet the legal requirements and goals outlined in regulations.
2. Foreign employees refer to those holding citizenship of other countries, including new immigrants.

Project Highlight **Establishment of the Omega Zone Base in Hualien**

To improve the diversity of the employment, ITRI established the Omega Zone Base in Hualien as the Eastern Taiwan Commercialization and Industry Service Center. This initiative involved investing more resources in the Hualien-Taitung regions to establish local entrepreneurial platforms. Additionally, remote working style were introduced and satellite offices were set up to encourage talents to return to their hometowns. These endeavors not only provided more local internship, entrepreneurship, and employment opportunities for young and indigenous people in Hualien and Taitung, but also contributed to addressing social problems such as rural labor migration, seniors living alone, and urban-rural development disparities.

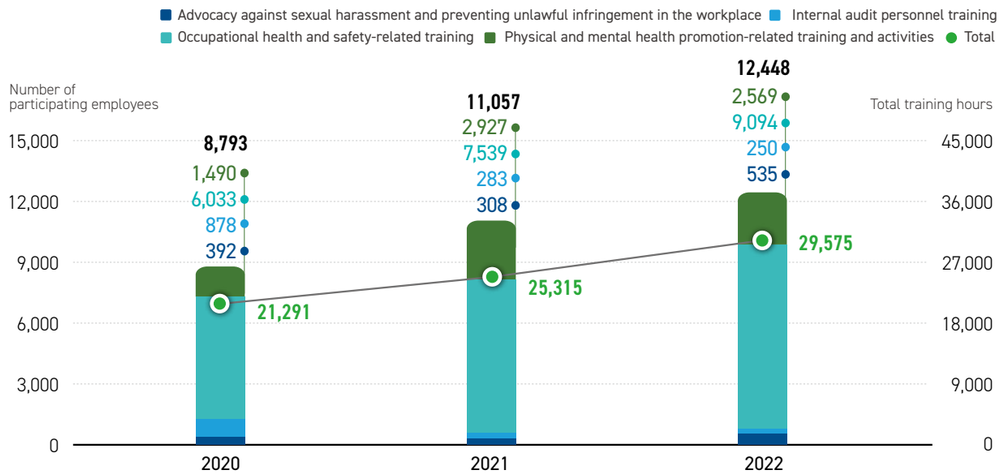
Human Rights Protection

ITRI supports the International Human Rights Conventions and strictly prohibits any actions that infringe upon or violate human rights. It has established the "Prevention Plan for Unlawful Infringement during the Execution of Duties" in order to establish a workplace culture that is safe, dignified, non-discriminatory, equal, mutually respectful, and inclusive, upholding policies, strengthening employees' awareness of respecting human rights, and adhering to local regulations at all global operating locations. The institute is dedicated to creating a workplace environment that promotes gender equality, diversity, and inclusion. Every year, ITRI conducts relevant education and training on human rights protection and diversity inclusion, covering topics such as occupational health and safety, integrated management personnel training, employee physical and mental health promotion-related training and activities, and advocacy against sexual harassment and preventing unlawful infringement in the workplace. The training hours totaled to nearly 30,000 hours, with 12,448 employees completing their training. In 2022, there were no reported incidents of discrimination, child labor, hindrance to freedom of association, forced labor, or violations of indigenous peoples' rights and interests. In the future, ITRI will continue to focus on strengthening the promotion of human rights issues to successfully elevate its management efficiency and employee satisfaction.

The Management Mechanism for Human Rights Protection

Objective	Safeguard the legal rights and interests of ITRI's employees	Prevent sexual harassment	Prevent unlawful infringement in the workplace
Management regulations	The Employee Complaint Handling Regulations	The Sexual Harassment Prevention and Handling Regulations	The Prevention Plan for Unlawful Infringement during the Execution of Duties
Handling procedure	• If employees encounter improper treatment regarding their rights and interests during work and find that issues cannot be effectively resolved through the normal management system, they can file grievances in accordance with the Employee Complaint Handling Regulations to safeguard their rights. • Upon receiving a complaint, the Complaint Review Committee first informs the Office of Human Resources, which then initiates the complaint mediation procedure. The mediation period is limited to a maximum of two months. If no consensus can be reached during the mediation, a Complaint Review Committee meeting is officially convened, with a formal decision to be finalized within one month.	• Upon receiving a sexual harassment case, ITRI immediately initiates an investigation and convenes a Sexual Harassment Complaint Handling Committee to determine its validity or invalidity, proposing appropriate disciplinary measures if necessary. • The complaint handling process is conducted with a principle of confidentiality, protecting the privacy, rights, and other legally recognized personal interests of the parties involved. Depending on the mental and physical condition of the complainants, they may be referred directly or provided professional medical treatment, psychological counseling, and legal assistance. • After the adjudication of sexual harassment cases, ITRI's Office of Human Resources conducts tracking, reviews, and supervision within six months to ensure the effective implementation of the disciplinary or corrective measures, aiming to prevent any retaliation issues or the recurrence of similar incidents from reoccurring.	• The Integrated Management System Committee oversees and supervises the execution of the aforementioned plan, with the Quality and Risk Management Office responsible for forming the Unlawful Infringement Prevention Team to discuss and deliberate on the relevant implementation. The Health and Safety Management Department aids in identifying and assessing hazards, evaluating the effectiveness of implementation, and tracking improvements made. • Upon receiving complaints of unlawful infringement during the execution of duties, investigations should be initiated, and review committee meetings may be convened when deemed necessary. The committee will determine the validity of the complaint cases, based on the severity of the situation, recommend appropriate disciplinary or corrective actions. • In principle, the case handling process is guided by objectivity, fairness, justice, and confidentiality. When deemed necessary, assistance is provided for referral to professional personnel, providing psychological counseling and emotional management support.
Engagement channels/ effectiveness:	• Internal prevention and advocacy platform: The ITRI Office of Human Resources website features a dedicated page on "unlawful infringement and gender equality". • Diverse complaint channels: President's mailbox, the Complaint Review Committee, HR supervisors of each laboratory and center, the unlawful infringement complaint hotline, and mailbox. • ITRI is committed to providing its employees with smooth complaint channels and procedures to safeguard their rights and interests. Regarding detailed statistics on recent complaint cases, please refer to the integrity management-related performance and complaint mechanism section. p.038		

Educational Training on Diversity and Inclusion



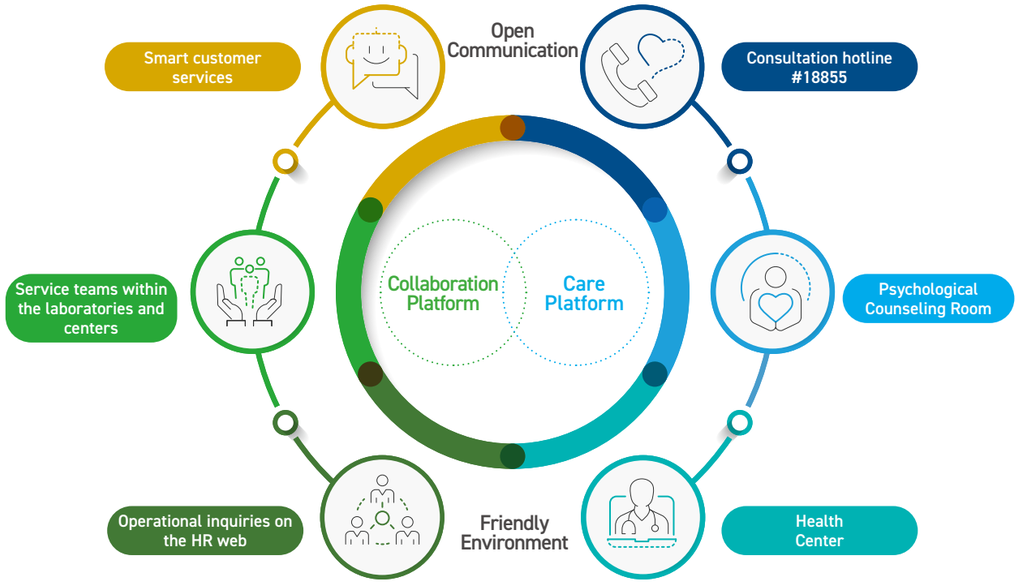
Notes: 1. The number of participating employees include both those attending physical training sessions and those participating online, covering both domestic or international locations.
2. The unit for training duration is hours.

Employee Communication

ITRI actively listens to and highly values its employees' opinions. The president delivers a biannual institutional report to all employees, communicating ITRI's key development directions and business performance achievements. Additionally, ITRI holds labor-management meetings with labor unions and hosts employee representative meetings regularly, maintaining a positive and friendly two-way communication relationship with its employees.

In 2022, ITRI held a total of 5 labor-management meetings, 2 employee representative meetings, and 2 organization-wide employee opinion surveys. The percentage of employees voluntarily joining the union was 11.1%. To further comprehensively gather feedback from its employees, ITRI has established the "Employee Consultation Services", providing its employees a convenient channel for immediate communication. Concerning major occupational health and safety issues, such as setting health and safety goals and plans as well as investigating accidents and incidents, employee representatives were invited to participate, and their opinions were sought. For any specific, important, or time-sensitive issues, ITRI promptly convened ad-hoc meetings with employee representatives for communication and engagement, ensuring that the voices of the employees were actively conveyed.

Employee Consultation Services



Employee Engagement Results in 2022

Communication method	President's ITRI report	Labor-management meeting	Employee representative meeting	Employee opinion survey
Number of times issued/held/conducted	2 times	5 times	2 times	2 times
Issues communicated	• Communicated on 6 issues • Communication Content: organizational positioning, R&D results, business performance, talent recruitment, organizational sustainable development, and future prospects	• Communicated on 9 issues • Communication Content: employee complaint processing, attendance performance, remuneration, promotion, employee participation in political activities, and the adding of paternity leave for male employees	• Communicated on 7 issues • Communication Content: employee benefits, surrounding public facilities and environments, improvements of transportation, the organizing of charity events, etc.	• "Organization-wide Employee Opinion Survey" and "Organization-wide Safety Culture Survey p.103 • Learned about ITRI employees' opinions on ITRI's missions, strategic layout, leadership styles, and organizational culture • Understanding the awareness on organizational safety culture and the safety needs of colleagues

Notes: 1. ITRI regularly holds labor-management meetings and employee representative meetings to maintain a favorable two-way communication relationship with labor unions and its employees.
2. For specific or timely issues, ITRI communicates and exchanges opinions with labor unions and its employee representatives promptly.
3. The percentage of ITRI employees joining labor unions increased from 10.7% in 2021 to 11.7% in 2022.

Project Highlight **Organization-wide Employee Opinion Surveys**

To gain a concrete understanding of all employees' perceptions of ITRI's mission, strategic layout, leadership styles, and organizational culture; and to listen to their feedback comprehensively, ITRI conducted an "Organization-wide Employee Opinion Survey" in 2022. A total of 4,737 employees participated in the survey, yielding 1,192 feedback responses with a participation rate of 71%. An independent survey and statistical analysis by an external third-party organization revealed that the employees expressed the highest satisfaction with ITRI's measures and actions for "Realizing Potential," "Providing Trusted Leadership," and "Team Collaboration," and highly endorsed the training and learning resources made available to them. The feedback received served as a crucial basis for ITRI's organizational improvements and talent development. In ITRI's subsequent management team meetings, 4 specific areas such as "incentive and rewards," "career development," "leadership," and "team morale" have been discussed and addressed by supervisors from various laboratories and centers. Nearly half of the initiatives were related to talent development, such as promoting career development dialogues and fostering innovative and out-of-the-box thinking, progressively optimizing ITRI's talent development practices within the organization and strengthening its operational effectiveness.

Employee Feedback from the Organization-wide Employee Opinion Survey

Top 3 areas employees felt the strongest about

1. Realizing Potential

ITRI provided diverse training models/enriched learning resources, assisting its employees in growing and realizing their potential.

2. Providing Trusted Leadership

ITRI's senior management team cares about ITRI employees' health and welfare (e.g., ITRI distributed rapid test kits during the COVID-19 pandemic and encouraged them to work remotely).

3. Team Collaboration

Maintaining good collaboration among different laboratories and centers within the organization.

Top 3 areas employees anticipated the most

1. Inspiring Vision

Confidence in ITRI's R&D capacity and industrial contributions (e.g., driving industrial development and creating economic value)

2. Encouraging Challenges

ITRI's employees were encouraged to challenge the traditional ways of working.

3. Participating and Voicing

ITRI's employees were empowered to make decisions that contribute to improving their work quality.

Statistics on Employee Complaint Cases

Year	2020	2021	2022
Number of complaint cases	2	4	2

Note: In 2022, ITRI received two employee complaint cases, one involving employee performance and the other involving workplace sexual harassment. These cases were reviewed and addressed by the committee in accordance with relevant management regulations (e.g., performance was reassessed and disciplinary actions were taken, respectively). Future efforts will also focus on refining performance appraisal mechanisms and strengthening the promotion of human rights issues in order to safeguard the personal rights and interests of ITRI employees in their works and personal lives.

3-1-3 Talent Attraction GRI 401-1

ITRI actively invests its resources to recruit globally talented and promising professionals, contributing to Taiwan's industrial development and organizational sustainable operations. Every year, ITRI sets talent recruitment and cultivation goals for each laboratory and center to ensure an ample supply of elite talents, continuously leading innovation, driving industrial development, and creating overall economic value. ITRI hopes that all employees can unleash their potential at work, serving as an effective bridge between industries, the government, schools, and research sectors, aligning with national policies and the United Nations' SDGs in collaboration with various industries.

Talent Recruitment

ITRI leverages the establishment of school-research collaboration platforms, management of employer brands and social media, hosting global recruitment expositions, and initiatives like the "Star Program" to recruit next-generation talents. Additionally, ITRI actively participates in government talent promotion projects, adopting a multi-faceted and online-merge-offline approach to construct a recruitment channel, with a view to accelerating industrial talent cultivation and attracting diverse talented professionals. In 2022, ITRI recruited 627 permanent employees, including 76 foreign employees, 330 senior employees, and 51 supervisors. ITRI also recruited international talents, with a current workforce comprising 53 permanent foreign employees. Furthermore, ITRI is committed to expanding its talent recruitment sources worldwide through various measures, such as introducing flexible remote working policies, engaging in the joint appointments or secondments of university professors, broadening school-research cooperation projects, establishing collaborative alliances, and implementing interdisciplinary collaboration, actively welcoming global talents and elites to join the institute.

Establish collaboration platform

Collaborated with domestic and international academic and research institutions/ organizations to create collaborative opportunities for talented individuals

- Expanded talent partnerships with external units, such as engaging in "Interdisciplinary Joint Appointment" with the National Health Research Institutes to carry out mutually beneficial talent exchange
- Reached an agreement with the European Association of Research & Technology Organisations (EARTO; Europe's largest R&D organization) and the RTOs International Network (RIN) for talent exchange
- Signed collaboration agreements with 21 schools, initiating a pioneering large-scale school-industry bridging program in the field of machinery
- Participating in school-industry collaboration projects involving a total of 1,438 faculty and students

Host talent-recruitment events

Hosted and participated in various talent-recruitment events to connect with talented individuals on campuses

- Organized over 10 talent-recruitment events with various schools, attracting more than 2,000 participants
- Hosted the inaugural "Global Online Talent Fair" and 12 technical seminars, drawing nearly a thousand participants and achieving a 32% increase in resume submissions compared with the previous year
- Participated in 3 online talent-recruitment events held by Contact TAIWAN in the Netherlands, North America, and Japan, resulting in receiving 24 resumes from outstanding talents overseas

Support national projects

Actively participated in national industrial talent cultivation projects and promoted cooperation with schools

- Implemented over 9 national industrial talent projects in the current year
- Participated in projects including the DIGI+ Talent Accelerator & Jumpstart Program, The Project of Semiconductor Advanced Practical Ability Development for Talents, Project for Development of National Industrial Engineering Talents (Talent Base Project), Customized Practical Talent Capability Improvement Project (Co-Education Project), Development Application Base of Engineering Talents, and High Level Industrial Professionals Cultivation Program

工程人才（在校生）進行實務專題成果發表

帶領工程人才（在校生）至友達光電參訪交流

Develop diverse internship projects

Planned internship projects such as the "Star Program," providing opportunities for nurturing talents and offering workplace experience training

- Offered internship and international cooperation opportunities for students. Additionally, allowing students to engage in cross-departmental rotations for diverse apprenticeships as well as industrial analyst training
- Recruited 24 interns for the year, with 4 of whom joining ITRI (provided training to a cumulative total of more than 177 interns)

Create employer brands

Operated professional community platforms such as LinkedIn to attract talents from various industries

- ITRI's LinkedIn platform witnessed a 117% increase in followers, a 172% increase in job posting views, and a 141% increase in job applicants
- Received LinkedIn's annual Best Employer Award for Continuous Innovation in Employer Branding
- Received the award of Most Attractive Employer to Engineering/IT Students in Top Taiwanese Universities from Universum

The new employee rate in 2022 was 10.45%, showing an increase of 2.87% compared to 2021.

New Employees

When recruiting new employees, ITRI adheres to the principles of diversity, inclusion, ensuring equal opportunities for personnel selection. Through an open and transparent process, outstanding talents from various fields are selected. In 2022, the new permanent employee rate was 10.45%, showing an increase of 2.87% compared to 2021. To bridge the gap between theoretical learning and practical application, ITRI actively employs interns, providing young students with opportunities to explore various technological applications and engage in industrial learning. Interns with exceptional performances may enjoy priority qualification for employment, creating a win-win situation for youth employment as well as ITRI achieving its innovations and R&D targets. In 2022, a total of 1,054 temporary employees were hired, with individuals below the age of 30 accounting for 87.86%. To assist new employees in quickly adapting to their new working and living environments, ITRI not only provides relocation and settlement (including dormitory living) assistance but also offers dedicated orientation and training for new employees. This helps accelerate the integration of talented young employees into the work environment and living conditions.

New Employee Percentages in 2022 (Note 1)

Type		Permanent employees		Temporary employees (Note 3)	
		Number	Percentage	Number	Percentage
Gender	Male	381	60.77%	701	66.51%
	Female	246	**39.23%**	353	**33.49%**
Age	Under 30	245	39.07%	926	87.86%
	30~49	352	56.14%	111	10.53%
	Over 50	20	4.78%	17	1.61%
Total number of new employees		627		1,054	
Total number of employees		6,000			
New employee rate (Note 2)		**10.45%**			

Notes: 1. The data was based on the number of employees (including staff at domestic and international locations) as of Dec. 31, 2022.
2. New employee rate = Total number of new employees for the year / total number of employees for the year.
3.Because temporary employees were short-term employees, they were not counted as a part of the total number of employees.

3-1-4 Talent Cultivation GRI 401-1、404-1

ITRI values talent cultivation. To promote human resource development, ITRI has established management regulations such as Manpower Development Regulations as well as Performance Appraisal and Annual Appraisal Regulations, aiming to cultivate technological expertise and professional management talents. By driving organizational cultural transformation and establishing talent cultivation mechanisms, ITRI upholds and implements its 3 major cultural philosophies of "Innovative Thinking," "Open Communication," and "Responsive Management" in talent cultivation and human resource management.

Training and Development

The human resource development system of ITRI consists of 4 major dimensions, which are "Formal Training," "Performance Development," "Self-learning," and "Knowledge Sharing." This system balances the short, medium, and long-term developmental needs of the organization while ensuring that the talent management system evolves over time. In 2022, ITRI introduced diverse learning resources, strengthened capabilities of supervisors, provided internal lecturer training, and hosted innovative entrepreneurship learning classes, crafting a multifaceted learning roadmap for employees. Additionally, ITRI advocated a diverse and interdisciplinary learning culture, forming project teams through interdepartmental collaboration models to assist in talent development and enhance organizational operational efficiency. Employees received an average of 42.95 hours of training, marking a 27.6% increase in total training hours compared to the previous year. The total expenditure on employee education and training also increased by 46.22% from the previous year, shaping a learning-oriented organizational culture and a co-benefit-centric working atmosphere.

Human Resource Development System

Formal Training

Organized various training, digital classes, and external training

- Organizational philosophies and core value-related training (e.g., new employee training)
- Professional skill training
- Managerial skill training
- General skill training

Self-learning

Focused on self-initiated personal development projects such as in-service training, online learning, participation in academic societies, and multi-channel reading and learning

- ITRI-funded learning
- Self-funded learning
- Participation in academic societies
- Online and learning platforms

Knowledge Sharing

Promoted mutual learning among staff to gain the needed information, and encouraged learning actions to enhance organizational learning effectiveness

- Experience sharing
- Practical communities
- Internal learning
- Collaborative platform websites

Performance Development

(Supervisors) Assisted employees in planning training and development plans (i.e., individual development plans (IDPs)) beneficial for organizational growth and personal learning through performance management systems and communication processes, and helped employees recognize the relevance and importance of their work as well as their contributions to achieving ITRI's related work objectives

- On-job training
- Special work assignments
- Assigning teaching or sharing

Employee Training Statistics

Type	Male	Female	Total
Total education and training time (in hours)	132,632	125,111	257,743
Average education and training time (in hours)	35.8	54.6	-
Number of employees educated and trained	3,709	2,291	6,000
Total investment amount (in $)		**50,543,922**	
Per capita investment amount in education and training (in $)		**8423.98**	
Average hours of training received per employee (in hours)		**42.95**	

Notes: 1. The data was based on the number of employees as of Dec. 31, 2022, including staff from both domestic and international locations.
2. The data includes permanent employees, and excludes the data of temporary employees, those on unpaid leave, and non-employees.

Supervisor Training: Leadership Development Projects

To address organizational management and cultural transformation, ITRI has implemented leadership development projects. As of the end of 2022, it introduced a total of 6 types of leadership development projects and hosted more than 38 supervisor training events with a cumulative participation of 6,790 individuals. Through various projects, lectures, training, overseas training, and the establishment of supervisor learning and exchange communities, ITRI had been accelerating the training of supervisors' capabilities at all levels.

Project	Content	Session	Total number of supervisors trained
Supervisor Successor Project	Conducted an annual assessment of the talent pool of supervisor at all levels, focusing on key areas of development such as team leadership, business communication, and operational management	9	329
Supervisor Live Broadcast Room	Through the transmission of experience, sharing of practical case studies and discussions, improving leadership mindset, business strategies, and legal compliance literacy of supervisors at all levels	6	957
Advanced Business Lecture	Invited external corporate leaders or domain experts to share their insights, inspiring supervisors at all levels in terms of their management strategies and international perspectives	5	4,739
Training Camp for New Supervisors	Fostered the role perceptions and managerial skills of new supervisors and created opportunities for interdisciplinary exchanges	4	137
Project Leader Training	Strengthened supervisors' business thinking, proposal articulation, the effectiveness of business communication in customer management, enhancing management capabilities	14	626
International Talent Cultivation	Selected elite talents for short-term assignments at overseas locations to develop their international perspectives, establish their interpersonal networks, and promote international cooperation and development	-	2 (Note)
Total		**38**	**6,790**

Note: The International Talent Cultivation Project was interrupted due to the COVID-19 pandemic and resumed in the second half of 2022.

New Employee Training: Newcomer Camp

In response to the domestic COVID-19 situation, the 2022 online version of the Newcomer Camp was designed, combining online live broadcasts and offline learning activities together to guide new employees to understand the environment and integrate into the organization, establish cross-disciplinary networks, and enhance their team cohesiveness. The participation rate of new employees reached 100%. The new employees also provided fresh perspectives and improvement suggestions such as green ideas for achieving net-zero carbon emissions, suggestions for environmental and service improvements, observations of the organization, and expectations for future development.

Self-learning Platform

ITRI provided diverse and abundant online and offline learning resources, enabling its employees to utilize their free time to learn and autonomously choose their required learning content and methods. The system also recommended suitable courses based on the employees' individual learning data and preferences, shaping ITRI's learning-oriented organizational culture, improving its overall working performance, and enhancing its employees' self-value through self-learning. In 2022, the usage of autonomous learning resources reached 231,962 person-times, which was a growth of 1.77 times compared to the previous year.

ITRI Learning Project

Training objectives

Cross-disciplinary learning and personal growth

Learning focus

Business management, leadership development, global perspectives, business thinking, and industry trends

LinkedIn Learning Platform

Training objectives

Cross-disciplinary learning and aligning with international standards

Learning focus

More than 10,000 courses covering subjects such as innovation, management, design, and software skills, and more

Learning Newsletter

Training objectives

Culture shaping and open communication

Learning focus

Leadership management culture, advocacy of new systems or measures, learning new knowledge, and event promotion

Project Highlight **Innovation and Entrepreneurship Learning Award**

To shape the culture of innovation and entrepreneurship, ITRI presented the Innovation and Entrepreneurship Learning Award, encouraging its employees to actively participate in entrepreneurial lectures, camps, and competitions, making good use of self-learning resources. The aim is to cultivate entrepreneurial thinking and innovative talents. In 2022, a total of 11,190 employees participated in ITRI's Innovation and Entrepreneurship Learning Courses, showing a growth of 2.22 times compared to the previous year.

A total of 11,190 individuals participated in ITRI's Innovation and Entrepreneurship Learning Courses, marking a growth of 2.22 times compared to the previous year.

3-1-5 Talent Retention

GRI 2-19、2-20、201-1、201-3、202-1、401-3、404-1、404-3、405-2

ITRI is dedicated to offering its employees competitive overall remuneration, extensive benefits, a safe work environment, transparent performance evaluations, and robust retirement plans. It aims to create a supportive, flexible, and friendly workplace to enhance employee commitment and organizational engagement, attracting and retaining talents to support organizational long-term growth.

Remuneration Policies

To ensure competitive and fair remuneration to its employees (in comparison with the human resource market) to achieve the goals of recruiting, retaining, and motivating talented employees, ITRI has formulated rigorous remuneration policies. Based on the level of responsibilities and performance of its employees, ITRI offered salaries above the industry average, raised the basic starting salaries for new hires and expanded the flexibility in salary adjustments for talented professionals. In cases involving key talents, specific technical fields, or situations such as salary compression, ITRI made structural assessments and adjustments when necessary.

In compliance with the Regulations Governing the Management and Supervision of Foundations by the Ministry of Economic Affairs and in accordance with ITRI's financial performance in the previous year, ITRI distributed year-end bonuses, performance bonuses, and special achievement rewards. Differentiated bonuses were also provided based on each employee's performance.

Furthermore, to reward employees for exemplifying ITRI's core values, demonstrating outstanding performance and having concrete achievements, various awards/rewards were established, including the Outstanding Research Award, Industrialization Contribution Award, Service Excellence Award, Quality Excellence Award, Annual Thesis Award, Patent Rewards, Immediate Rewards, and Senior Service Award. These awards aim to motivate the staff to continuously improve and enhance their personal value.

Female-to-male remuneration ratio

Management level	2020	2021	2022
Upper-level management	0.89 : 1	0.90 : 1	0.84 : 1
Mid-level management	0.92 : 1	0.93 : 1	0.92 : 1
Business supervisors	0.84 : 1	0.83 : 1	0.82 : 1
Entry-level employees	0.88 : 1	0.88 : 1	0.88 : 1

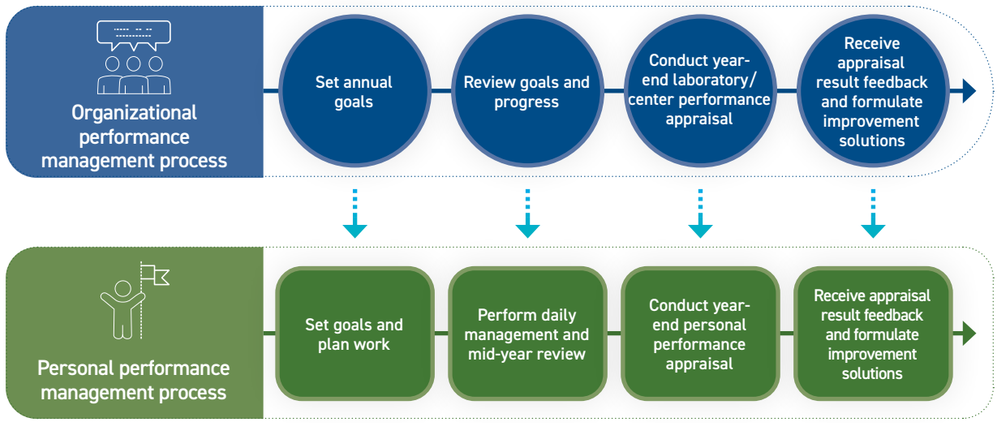
Notes: 1. The data was based on permanent employees with more than one year of service at either ITRI's domestic or international locations.
2. The salary comparison shows a slight difference between remuneration of male and female, mainly due to variations in job responsibilities, fields, and seniority at the institute.
3. The salaries included the employees' base salaries and bonuses.
4. Upper-level management referred to functional supervisors who were vice supervisors or above; mid-level management referred to level 1 or level 2 functional supervisors or deputy functional supervisors; business supervisors referred to non-functional supervisors; and entry-level employees referred to regular employees.

Performance Management

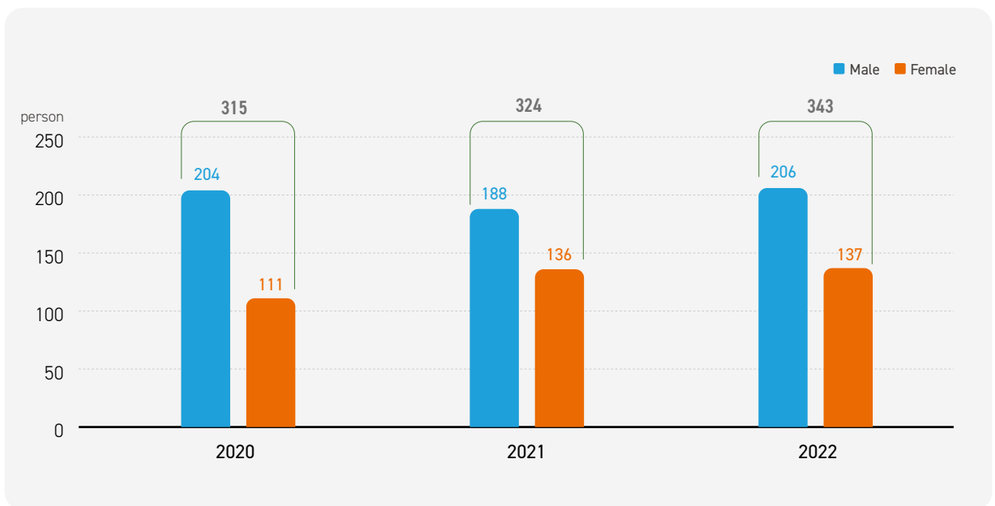
ITRI assisted employees in their growth and development by setting performance targets and holding regular performance discussions. All ITRI supervisors had received practical training in performance management, and the performance appraisals of all employees were conducted based on fair and just considerations. The performance appraisal criteria were established according to the organizational operational targets, the linkage of each laboratory/center's targets with the individual employees' targets, and comprehensively evaluated based on employees' achievements of working objectives, job contributions, and behavioral attitudes. Talent development plans were implemented to enhance employees' individual capabilities and performance outcomes. The appraisal results served as the basis for rewards and annual promotion decisions.

In 2022, 100% of ITRI's employees underwent regular performance appraisals, excluding those who had joined the company in the same year, those who were on special leaves, those who were on unpaid leaves (that resulted in them working less than three months), or those with special reasons that had been checked and ratified. Employees with outstanding performance were promoted after the evaluation. In 2022, a total of 343 employees were promoted, 39.94% of whom were female. The number of female promotions has shown a growing trend in the past two years, indicating the transparent and accessible opportunities for promotion and development for female employees at ITRI.

Organizational and Personal Performance Management Processes



Employee Promotion-related Information



Benefits and Employee Care

ITRI regards its employees as essential partners. To improve their physical and mental health and well-being, ITRI has established the Joint Welfare Committee for Employees and Temporary Workers (referred to as the "Welfare Committee") responsible for planning and promoting employee welfare activities, ensuring a balance between employees work and life. Various welfare measures, exceeding legal requirements, are provided, such as a diverse annual leave policy, travel subsidies, family and housing support, the Employee Recreation Center, the Health Center, and the Counseling Service Room. These measures cater to the threefold balance of employees' work, family, and health. In 2022, the total expenditure on employee welfare p.163 reached NT$1.26 billion.

Moreover, to continuously advocate the concept of work-life balance and contribute to social welfare, ITRI introduced tailored leave plans exceeding legal requirements for different employee groups, such as special leaves, tocolysis and parental leaves (for female employees), and volunteer leaves. In 2022, an additional 20 days of prenatal checkup and parental leaves were introduced for male employees. For the year, the number of male employees applying for parental leaves doubled compared to the previous year; the number of employees applying for unpaid parental leaves was 51, whereas the number of employees applying for family care-type leaves was 364. These welfare measures not only benefited the employees and showed ITRI's recognition of the support and dedication provided by employees families.

Employee Benefits

Monetary benefits

- 8% labor pension contribution
- Labor/health/group insurance
- Special reward leaves
- Travel subsidies
- Marriage/funeral/celebration cash gifts
- Birthday cash gifts
- Childbirth-related subsidies
- Holiday gifts


Travel subsidies


Insurance and benefits


Welfare Committee gifts (e.g., eco-friendly cups)

Convenient living

- Employee dormitories
- Employee restaurants
- Shuttle vehicles
- Welfare and convenience stores
- Cafés and fast-food restaurants
- Affiliated stores
- Banks and post offices
- National Health Insurance pharmacies


Dormitories


Employee restaurants


National Health Insurance pharmacies

Health and leisure

- On-site medical services provided by physicians of the Health Center
- Psychiatric outpatient departments
- Annual employee health checkups
- Counseling Service Room
- YoHo Club and welfare funds
- Company club activities
- Travel activities
- Sports activities
- Health promotion activities
- Physical, mental, and spiritual health lectures


YoHo Club


Sports activities

Counseling Service Room

Family care

- Unpaid parental leaves
- Tocolysis and parental leaves for female employees
- Prenatal checkup and paternity leaves for male employees
- Parental leaves for male employees
- Family care leaves
- Dependents' group insurance
- Daycare centers, preschools, and after-school care centers
- Lactation rooms
- Scholarships for employees' children

Kuangming Preschool


Daycare center

Kuangyen Preschool

Happy workplace

- Flexible working hours
- Remote work
- Nationwide mobile offices
- Leaves exceeding legal requirements
- Family days and parent-child activities
- Art and cultural activities and lectures
- Libraries
- Singles' gatherings
- Retirement and alumni associations


Parent-child plays

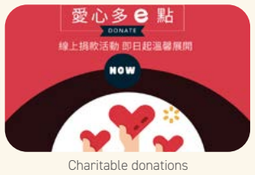

Mobile offices


Libraries

Social welfare-related participation

- Social welfare activities and lectures
- Sustainable, net-zero emission-focused promotion and lectures
- Charitable donations
- Social care volunteers
- Volunteer leaves


Beach cleaning day at the Nanliao Harbor



Charitable donations

Sustainable development lectures

Employees Returning to Work and Their Retention Rates after Unpaid Parental Leaves

Year		2020		2021		2022	
Category		Male	Female	Male	Female	Male	Female
2022	Number of employees eligible for parental leaves (A)	542	296	473	283	409	285
	Number of employees applying for unpaid parental leaves (B)	8	30	9	41	16	35
	Application rate (B/A)	1.48%	10.14%	1.90%	14.49%	3.91%	12.28%
	Number of employees returning to work after unpaid parental leaves (C)	14	39	7	30	8	48
	Number of employees applying to return to work (D)	9	30	7	30	5	42
2021	Number of employees returning to work (E)	9	42	9	30	7	30
	Number of employees returning to work and worked for at least one year (F)	7	41	6	28	5	27
Percentage of employees returning to work (D/C)		**64.29%**	**76.92%**	**100.00%**	**100.00%**	**62.50%**	**87.50%**
Retention rate (F/E)		**77.78%**	**97.62%**	**66.67%**	**93.33%**	**71.43%**	**90.00%**

Notes: 1.The employees who did not stay were all due to family reasons and chose to resign voluntarily.
2. Unpaid parental leaves are handled in accordance with Article 16, Paragraph 1 of the Gender Equality in Employment Act, and all employees are entitled to relevant rights and interests.

Employee Family Care-type Leaves in 2022

Family care leave		Maternity (paternity/prenatal checkup) leaves		Tocolysis and parental leaves	
Female	Male	Female	Male	Female	Male
36	16	96	123	79	14

Note: The total number of employees applying for family care leave, maternity leave, paternity leave, or tocolysis and parental leave in 2022 totaled 364.

Turnover Rates

To lower turnover rates, ITRI has established diverse talent recruitment mechanisms through various channels, instructed supervisors in career dialogues with their subordinates and assisted employees in career development. Simultaneously, ITRI designed talent retention plans such as reasonable remuneration as well as opportunities for growth and promotion. In response to the trend of sub-replacement fertility and increasing competition of talent market in the technology industry, turnover rates have increased in fields such as the information and communication industry as well as the semiconductor industry; in 2022, ITRI's employee voluntary turnover rate was 9.08%. To address the issues of talent recruitment and retention, to attract and retain talented personnel, and to elevate the competitiveness of employees within the institute, ITRI has actively formulated initiatives such as designing incentives and rewards, providing employees with career development opportunities, and optimizing the overall employee experiences.

Employee Turnover Statistics (Permanent Employees: by Gender and Age)

Year		2020		2021		2022	
Category		Number	Percentage	Number	Percentage	Number	Percentage
By gender	Male	364	72.51%	371	67.95%	525	73.12%
	Female	138	27.49%	175	32.05%	193	26.88%
By age	Under 30	105	20.92%	97	17.77%	119	16.57%
	30~49	254	50.60%	283	51.83%	446	62.12%
	Over 50	143	28.49%	166	30.40%	153	21.31%
Total number of resigned employees (Note 1)		502	100%	546	100%	718	100%
Turnover rate (Note 2)		**8.13%**		**8.98%**		**11.97%**	
Voluntary turnover rate (Note 3)		**5.33%**		**6.31%**		**9.08%**	

Notes: 1. The data was based on the number of permanent employees including employees at both domestic and international locations as of Dec. 31 of each year.
2. Turnover rate = Total number of resigned employees for the year / total number of employees for the year.
3. Voluntary turnover is defined as resignation for reasons excluding retirement, lay off, technology transfer, death, and dismissal, etc.
4. Temporary employees were not included in this table because they were hired on a fixed-term basis, different from permanent employees.
5. Future efforts will be focused on optimizing the overall remuneration design, promoting career development plans, and enhancing internal communication and cohesiveness to actively strengthen talent retention.

3-2 Friendly Workplace GRI 403

ITRI's employees serve as the essential foundation for ITRI's growth, competitiveness, and sustainable development. A healthy and safe work environment not only enhances work efficiency but also contributes to ensuring the quality of employees' lives. Thus, ITRI has continuously strived to construct a safe, healthy, and friendly workplace, fostering an organizational culture that is innovative, open, and responsive. Through the adoption of multidimensional methods to promote occupational health, ITRI strives to create a high-quality, safe, and healthy workplace conducive to a balanced development of the occupation, physical, and mental well-being of all employees.

3-2-1 Vision and Policies

To create a safe and healthy work environment and declare ITRI's commitment to occupational health and safety, ITRI's president has signed the Integrated Management Policies. Also, the Health and Safety Work Guidelines were in place to regulate responsibilities for safety and health of all ITRI employees at all levels and various workplaces. These efforts were made based on ISO 45001-the Occupational Health and Safety Management System. Furthermore, ITRI adopted a risk-oriented approach, balancing the specific needs of R&D with localized measures, and consistently utilizing PDCA to promote occupational health and safety management.

In addition to providing a safe and healthy working environment, ITRI offered a range of activities and sports services to promote the physical and mental health of its employees. These activities and services included health checkups, health screenings, and other initiatives. In 2022, ITRI was awarded the "Health Promotion Label" issued by the Health Promotion Administration, Ministry of Health and Welfare, demonstrating ITRI's commitment to creating a workplace that is happy, healthy, friendly, and safe, and fostering an environment conducive to talent development and retention.

3-2-2 Occupational Health and Safety

GRI 403-1~5、403-7~10

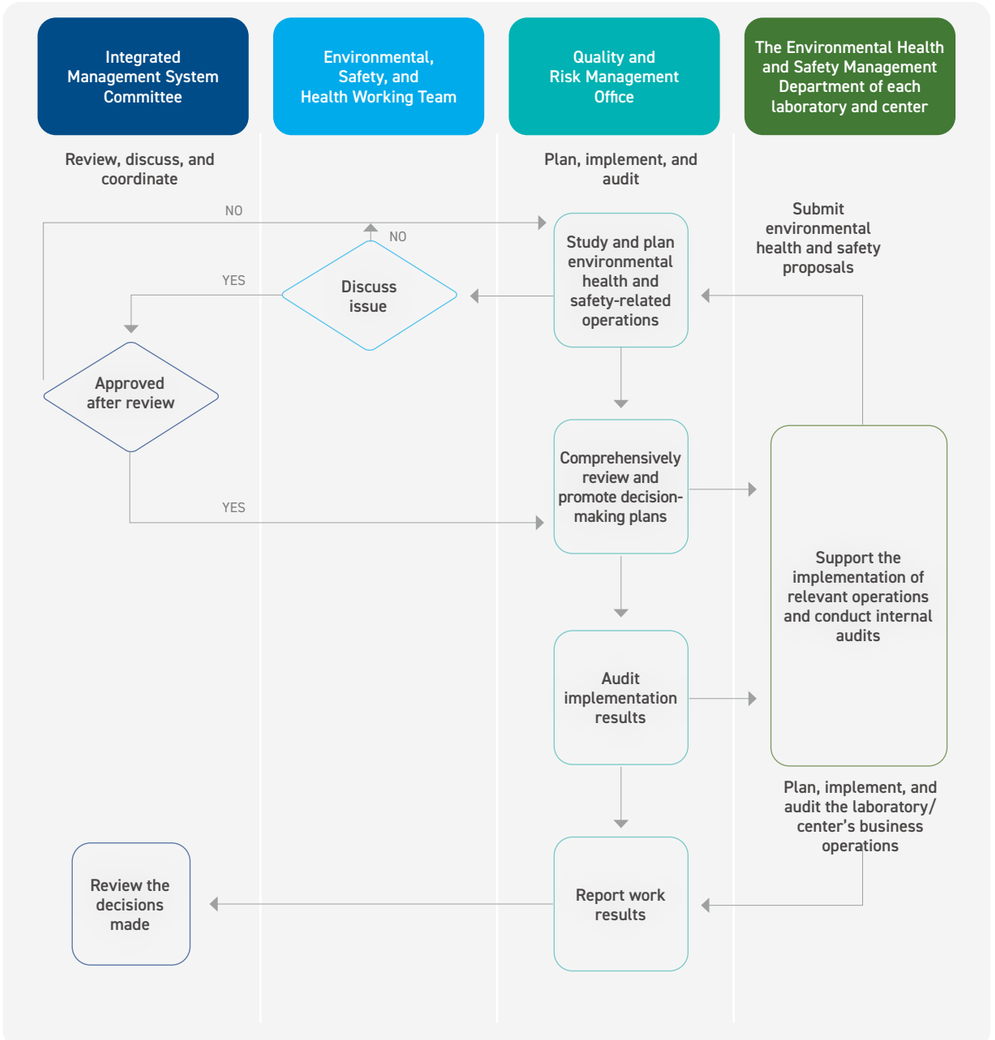
In 2015, ITRI obtained OHSAS 18001 (Occupational Health and Safety Assessment Series) certification. And in 2020, it underwent system conversions and obtained ISO 45001 certification. To date, the institute has been consistently maintaining the validity of the ISO 45001 certification. Given that various laboratories within ITRI are involved in R&D activities with different hazard categories, ITRI established the Quality and Risk Management Office to collaborate with the environmental health and safety management departments of each laboratories and centers to promote various occupational health and safety operations. Additionally, ITRI formed the Integrated Management System Committee for cross-departmental integration of occupational health and safety management matters. In 2022, ITRI's Occupational Health and Safety Management System met, covering all ITRI campuses and workers, with the internal and external audit coverage rate achieving 100% p.101 over the past three years.

ITRI obtained **ISO 45001** Occupational Health and Safety Management System Certification.

Management Structure

The core of ITRI's occupational health and safety management mechanism is the "Integrated Management System Committee", consisting of the integrated management representatives, professional committee members, and employee representatives from various laboratories and centers. The Quality and Risk Management Office, acting as the executive secretary, was responsible for formulating and planning workplace safety, health, environmental protection, fire prevention, and radiation protection-related strategies and principles. Quarterly meetings were convened to review, coordinate, and confirm the implementation status of the management items stipulated in the Occupational Health and Safety Act, ensuring compliance with occupational health and safety-related laws and regulations. Also, the environmental health and safety representatives from various laboratories and centers formed the Environmental, Safety, and Health Working Team. The team was responsible for developing and implementing relevant management measures for issues such as safety, health, environmental protection, fire prevention, radiation protection, and other issues. Through comprehensive management, the team ensured compliance with health and safety-related laws and regulations throughout the institute.

ITRI Environmental Health and Safety Management Structure

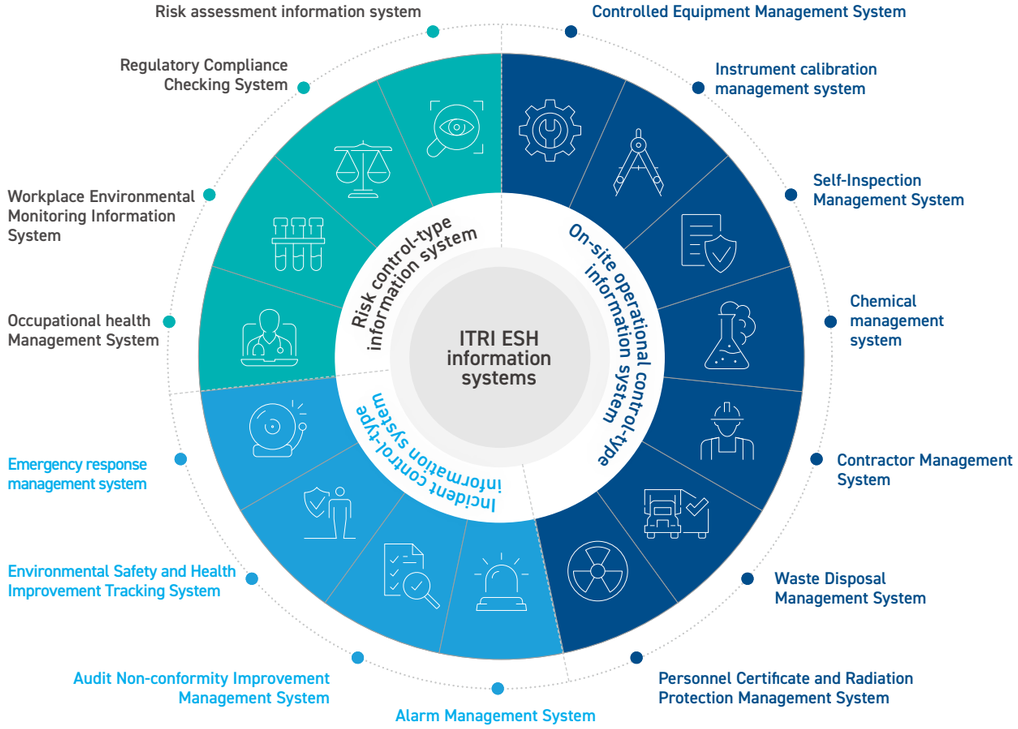


Management IT Systems

There are multiple campuses and diverse R&D activities in ITRI, encompassing various categories such as biochemistry, mechatronics, and information technology, etc. To ensure the efficiency and quality of ITRI's environmental health and safety management, ITRI had continuously developed and improved its environmental health and safety-related IT systems, enabling all campuses and R&D activities to operate on a consistent management principle and operational platform, facilitating effective communication and appropriate management.

The "on-site operation control-type" IT system provided platforms for various laboratories and centers for on-site operation management, reducing administrative efforts for handling operational control separately. The "incident control-type" IT system consolidated abnormal events from all campuses and laboratories & centers, allowing for centralized tracking and management. The "risk control-type" IT system was policy-guided, enabling various laboratories & centers to systematically identify hazards, analyze and assess risks, improvement planning, and tracking through the system. With the support of these IT systems, ITRI strived to achieve the operational consistency of its localized measures and the effectiveness of its paperless operations. In recent years, ITRI has continued to move towards the use of smart systems and integrated use of data, constantly refining and improving its systems.

ITRI Environmental, Safety and Health (ESH) information systems



IT systems

- Human resources management system
- Job handover management system for resigned employees
- Project management system
- Procurement management system
- Happy Learning Web, etc.

Continuous improvement in system refinement

Systematic, user demand-centric operation (e.g., paperless operation) → System optimization (smartization) → Database application

Advocacy and Training

Enhancing the awareness and knowledge of occupational health and safety across the institute to achieve "health and safety" is essential to promoting occupational health and safety. ITRI, in compliance with relevant regulations, provided occupational health and safety education and training to new employees and supervisors; 3 hours of occupational health and safety training to all employees every three years; and statutory occupational health and safety training for professionals. The completion rate for these training sessions was 100%. Additionally, activities such as the selection of exemplary cases of environmental safety management, the call for occupational health and safety promotional materials, and the periodic advocacy on themed occupational health and safety issues were held to facilitate employees' participation in occupational health and safety activities, to increase employees' awareness of occupational health and safety, and to improve the employees' occupational health and safety-associated practical skills. In addition to organization-wide activities, each laboratory and center organized specific health and safety training and advocacy tailored to its needs. In 2022, a total of 12,448 participants attended occupational health and safety training sessions.

Effectiveness of Annual Environmental Health and Safety Training and Advocacy

Selection of exemplary cases of environmental safety management

10 nominees
5 winners

Organization-wide physical/live streaming courses

45 sessions
1,842 employees completed the training

Organization-wide digital classes

23 sessions
4,254 employees completed the training

Periodic advocacy

8 times throughout the year

Inspections and Audits

Management systems rely on thorough planning and implementation to be effective. Rigorous and efficient inspections and audits are essential to confirm the effectiveness of management systems and identify opportunities for improvement. Thus, ITRI places great importance on audits and inspections of occupational health and safety management, cooperating with the inspections and audits conducted by all competent authorities, performing ISO 45001 certification audits as well as operational environment monitoring and automatic checking in accordance with relevant regulations, and planning internal audits and specific checks among other inspections and audits. In 2022, each campus underwent 23 external inspections conducted by competent authorities in areas such as occupational health and safety management, environmental protection management, and fire prevention. Additionally, ITRI independently conducted equipment inventory, inspections, and tracked improvements for "machinery processing equipment", "radiation protection equipment and hazardous machinery", and "old, heated, and long-running equipment". All improvement opportunities identified during the inspections were addressed and completed within the specified time frames.

Annual Inspection and Audit Situation

Review of safety standards on processing equipment

Inspections of radiation protection equipment and hazardous machinery

Firefighting safety enhanced for old, heated, and long-running equipment

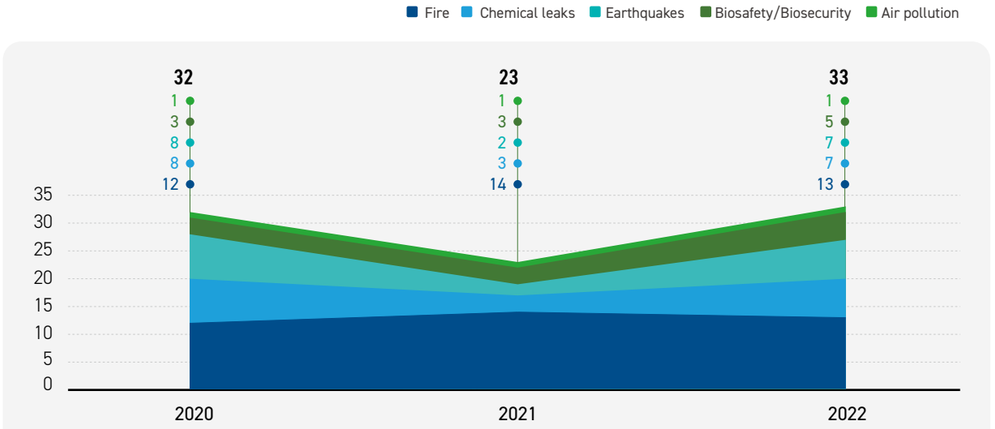
Occupational Health and Safety Management Audit Coverage: Internal and External Audits

Note: ITRI's promotion and establishment of the "ISO 45001 Occupational Health and Safety Management Systems" cover all ITRI campuses. In 2022, the audits have covered all ITRI employees and a total of 7,768 non-employees, achieving a coverage rate of 100%.

Emergency Response Drills

ITRI continued to advance its occupational health and safety management by conducting various accident/incident response drills. Through practical drills and systematic training, the abilities of ITRI's employees to respond to accidents and mitigate risks were enhanced. In 2022, ITRI organized a total of 33 emergency response drills, including scenarios such as fire, chemical leaks, earthquakes, biosafety/biosecurity, and air pollution, with a total participation of 1,122 individuals.

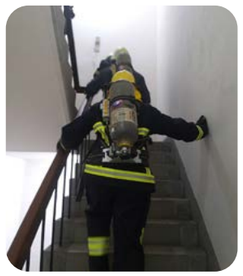
Annual Emergency Response Drills



Note: The data in the above table covers domestic and international ITRI locations, and the unit of measurement is the number of sessions held.

Annual Emergency Response Drill Situation

District-wide fire evacuation drill at the Central Taiwan Innovation Campus in 2022



Physical training for response drill teams

Chemical leak response drill

Fire-fighting drill for general ITRI employees

Earthquake evacuation drill

Project Highlight **Organization-wide Safety Culture Survey**

To objectively learn about employees' consensus on organizational safety culture and their safety needs, ITRI conducts an organization-wide safety survey every five years. In 2022, a questionnaire was distributed to all ITRI's employees, with a total of 2,630 employees participating in the survey, achieving a response rate of 35.6%. The survey revealed the high approval of the employees in terms of safety perception, related educational training, personal protective equipment, training and response, and safety commitment and leadership within the organization. However, areas such as trust in health and safety, safety communication, accident reporting, and compliance with health and safety regulations still required improvements. Thus, ITRI had proposed continuous improvement measures for situations such as low safety approval among employees, differences in accident investigation perceptions, and unreported false alarms. Regular follow-ups on the effectiveness of implementation were performed to ensure the safety and health of the working environment for all employees.

Safety culture

Safety culture was formed by **individual** and **group values, attitude, beliefs competencies,** and **behavioral patterns**, all of which determine the organization's commitment, style, and proficiency to/in health and safety management

Questionnaire planning

The questionnaire framework was based on the HSL Safety Climate Tool, consisting of **9 major dimensions** (totaling 61 questions as well as open-ended questions)

Survey implementation

- Target audience: All employees
- **Completed questionnaires: 2,630 (35.6%)**
- Respondent composition: 2,235 general employees and 395 supervisors

Accidents, Incidents, and Occupational Injuries

Accidents and incidents serve as valuable opportunities for ITRI to improve its management system. Consequently, the institute diligently reports, investigates, and improves its tracking processes for all incidents, ensuring compliance with regulations. Monthly data compilation and follow-ups on incidents are performed across various laboratories and centers. For general incidents, a special report is presented to the Environmental, Safety, and Health Working team upon the closure of the case. For significant incidents, a special report is presented to the Integrated Management System Committee to facilitate experience sharing. Moreover, ITRI has established an "Accident/Incident Learning Database" to analyze and compile recent cases, enabling the reflection on experiences and preventing the recurrence of workplace accidents.

In 2022, there were a total of 23 minor injury accidents, with the majority being slip or fall accidents due to employees being distracted or missing steps on staircases. To reduce such minor injuries, ITRI conducted root cause analyses for these employ injury accidents, proposed corresponding improvement plans, optimized processing procedures. Employees were also reminded consistently through internal promotion to be cautious of the safety of their surroundings, such as stepping on empty stairs, and to enhance their safety consciousness.

Note: In 2022, the disabling injury frequency rate was 0.38, lower than that of 0.72 for "Professional, Scientific, and Technology Service Industries" reported by the Ministry of Labor (according to the Ministry of Labor's disability injury frequency statistics, considering those with a loss of more than 1 day).

Occupational Hazards Statistics

Data	2020	2021	2022
Working hours	21,774,406	21,306,767	21,001,423
Disabling Injury Severity Rate	0	0	0
Incidents Resulting in Work-Related Fatalities (%)	0	0	0
Number of recordable occupational injuries	8	12	23
Total recordable injury rate (TRIR) (%)	0.07	0.11	0.22
Occupational disease rate (ODR)	0	0	0
Lost day rate (LDR)	0.94	2.19	1.55
Absence Rate (AR) (%)	0.004	0.01	0.01

Notes: 1. The data includes employees from both domestic and international locations of ITRI.
2. According to the Occupational Health and Safety Act, all diseases, injuries, disabilities, or deaths of workers caused by buildings, machinery, equipment, raw materials, materials, chemicals, gases, vapors, dusts, etc., at the place of duty, or as a result of work activities, or due to other occupational causes are classified as work-related injuries and must be included in the calculation of disabling injury frequency rate/disabling injury severity rate. Non-work-related injuries, such as falls in restaurants or parking lots due to personal factors, are not included in the calculation.
3. Calculation for the Total Recordable Injury Rate (TRIR) is as follows: (Number of recordable occupational injuries / total working hours) * 200,000.
4. Calculation for the Occupational Disease Rate (ODR) is as follows: (Number of occupational disease incidents / total working hours) * 200,000.
5. Calculation for the Lost Day Rate (LDR) is as follows: (Total lost days / total working hours) * 200,000.
6. Calculation for the Absenteeism Rate (AR) is as follows: (Total absenteeism hours / total working hours) * 100%.
7. Over the past three years, ITRI has seen an increase in its TRIR. However, there have not been any significant increases in disabling injury frequency rate. This indicated an increase in minor injury accidents that did not require medical treatment and did not result in lost work hours.

3-2-3 Employee Health Promotion

GRI 403-6、403-7

ITRI places significant importance on the health and well-being of its employees. In 2022, ITRI hosted a total of 492 employee health promotion activities, attracting 119,809 participants. By organizing annual health checkups for employees, providing health examination items exceeding regulatory requirements, establishing National Health Insurance clinics and pharmacies on campuses, implementing the health information management system titled "ITRI Employee Health", and organizing various health promotion activities and lectures every year, ITRI aimed to plan comprehensive health management and care services for employees. Each campus also had its occupational physician specialists providing health check result consultations on-site, adaptive interviews (e.g., maternal protection interviews) for selected workers or employees, and abnormal workload assessments. Additionally, ITRI has a Counseling Service Room, offering professional psychological counseling services and diverse courses for physical, mental, and spiritual growth, ensuring complete support and care for its employees' physical, mental, and spiritual well-being.

In 2022, ITRI hosted a total of 492 employee health promotion activities, attracting 119,809 participants.

Employee Health Promotion Performance (Note 1)

Activity type	2020		2021		2022	
	Number of participants	Number of sessions held	Number of participants	Number of sessions held	Number of participants	Number of sessions held
Health checkups (Note 2)	6,784	56	6,678	56	6,522	56
Health education advocacy (Note 3)	744	12	3,608	15	396	24
Sports activities (Note 2)	106,255	112	75,951	63	106,360	180
On-site services provided by occupational physicians (Note 4)	953	175	796	176	746	169
Health promotion	1,227	6	790	6	1,720	9
Health screening	1,758	45	3,532	55	4,065	54

Notes: 1. The data covered both employees and non-employees, as well as domestic and international locations..
2. Health checkups included "employee health examinations," whereas sports activities included "weight loss and YoHo Club activities".
3. Health education advocacy activities included "Good Health Lectures Series," first aid education and training, health quiz with prizes, and travel health education during the COVID-19 pandemic.
4. On-site services provided by occupational physicians included administering flu shots and COVID-19 vaccination; performing various types of ultrasound examinations, follow-up examinations for hepatitis B and C, low-dose lung CT scans, self-service fundus examinations, and providing health care to women.

Project Highlight

The Pandemic Prevention Response Team Safeguarding the Health of All ITRI Employees

In response to the COVID-19 pandemic, ITRI established the "ITRI Pandemic Prevention Response Team" on January 30, 2020. Led by the chief operating officer and complying the regulations stipulated by the Ministry of Health and Welfare's command center, the team agilely and responsively adjusted its epidemic prevention measures and completed the various stages of epidemic prevention management tasks, safeguarding the health of all ITRI employees.

Epidemic Prevention Response Measures

Epidemic prevention and protection

- Strengthened access control management, requiring visitors to fill out health declarations and provide proof of vaccination; and dynamically adjusted the SOP for campus gate control to reduce the risk of the epidemic spreading inward
- Enhanced cleaning and disinfection frequency in public areas, conference rooms, and shuttle vehicles, and provided disinfectant hand sanitizers
- Implemented zoning and diversion on the entire campus (e.g., offered takeout options in the restaurants), and introduced epidemic prevention slogans to raise employees' awareness of epidemic prevention, reducing the risk of internal transmission
- Prepared epidemic prevention supplies (e.g., rapid test kits) in advance to spare employees from queuing and scrambling to purchase
- Developed a COVID-19 reporting system, provided care to employees diagnosed with COVID-19, and offered them psychological counseling resources and life assistance

Care to employees diagnosed with COVID-19

- Since the first employee being diagnosed with COVID-19 in early June 2021, medical staff and the Office of Human Resources have worked closely, providing support and assistance to the diagnosed employees to make them feel warm
- Provided full-pay sick leaves for employees diagnosed with COVID-19, and offered employees the opportunity to apply for remote work during the self-health management period
- Offered paid leaves for vaccination and organized three vaccination sessions on campus, benefiting nearly a thousand employees
- Provided dormitories and meals for employees diagnosed with COVID-19, and offered care to foreign employees and those who were unable to return home, and provided employees with pregnant spouses reassuring places to recuperate
- Offered telemedicine outpatient services to provide nearby assistance to employees and their families who were diagnosed with COVID-19, and delivered medication to the quarantine dormitories when necessary

CHAPTER

4 NET-ZERO SUSTAINABLE ENVIRONMENT

In response to global climate action and aligning with Taiwan's Pathway to Net-Zero Emissions in 2050, ITRI has taken steps to contribute to the endeavor in environmental sustainability. With the institute-wide environmental policies signed by its president, ITRI has initiated a bottom-up effort, incorporating climate change adaptation and response measures into its operational strategies and set ambitious mid-term and long-term targets, aiming for a 50% reduction in carbon emissions by 2030 and achieving institute-wide net-zero emissions by 2050. In correspondence with the authority and responsibility of different aspects, ITRI has established the Net Zero and Sustainability Strategy Office, the Net-zero Sustainable Environment Task Force under the ITRI Sustainability Committee, and the Environmental Safety and Health Task Force under the Integrated Management Committee. Through the collaborative efforts of these laboratories & centers, ITRI is committed to leveraging innovative technologies and critical techniques in environmental management, focusing on greenhouse gas management, energy management, water resource management, and waste management. It is also involved in initiatives such as promoting green buildings, undertaking low-carbon investments, accelerating digitalization and intelligent system management, developing alternative energy resources, and conducting inspection and verification in environmental management. With these multifaceted approaches, ITRI aims to develop green and low-carbon campuses, transforming them into living labs for the demonstration of green technologies and promoting a sustainable and low-carbon lifestyle.

Highlights

Low-carbon Investment

- The inauguration of ITRI's 7th green building. (Note 1)
- The investment of over NT$ 90 **million** in low-carbon facilities.
- Average green cover ratio of ITRI campuses reaches 276.25%.

Energy Resource Management (Note 2)

- A decrease in electricity consumption by 4.23 **million** kWh (a reduction of 2,093.9 metric tons of CO_2e).
- An annual recycled water volume accounts for 15.09%.
- An annual reduction in general waste by 8.32%. (Note 3)

Renewable Energy

- Renewable Energy Generation of nearly 2.05 **million** kWh, representing a growth of 71.72% compared to 2021. (Note 4)
- Renewable energy supply accounts for 8.97% of the contract capacity.

External Verification

- Obtained the **ISO 14001:2015** Environmental Management Systems certification.
- Obtained the **ISO 14064-1:2018** Greenhouse Gases Emissions Certification and established baseline year. (Note 5)

Note: 1. Planned and constructed in compliance with green building standards, ITRI's 7th green building (Hall 2 of the Kuang-Fu Campus in Hsinchu) was officially inaugurated in 2022 and received certification from the Green Building Labeling System of Ecology, Energy Saving, Waste Reduction & Health (EEWH) in March 2023. It is therefore included in this disclosure.

2. The scope of the inspection for the energy resource management covers the ITRI Headquarters, Kuang-Fu Campus, and Southern Region Campus. The Open Lab of the headquarters is excluded, as it is made available by ITRI to external companies, which have control over the lab. The data presented reflects the differences between 2022 and the preceding fiscal year.

3. The general waste generated by ITRI excludes hazardous waste and large waste items from laboratories (such as old office furniture).

4. The renewable power generated by the photovoltaic (PV) systems at the ITRI Headquarters, Kuang-Fu Campus, and Southern Region Campus is supplied for internal use. The annual growth is measured in comparison to the previous year.

5. The scope of the inspection for the ISO 14064-1:2018 Organizational Level GHG Inventory covers ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, and Guang Ming New Village. They also passed the external verification by a third-party inspection agency, China Productivity Center (CPC), in June 2023.

4-1 Low-carbon Operation

4-1-1 Vision and Guidelines

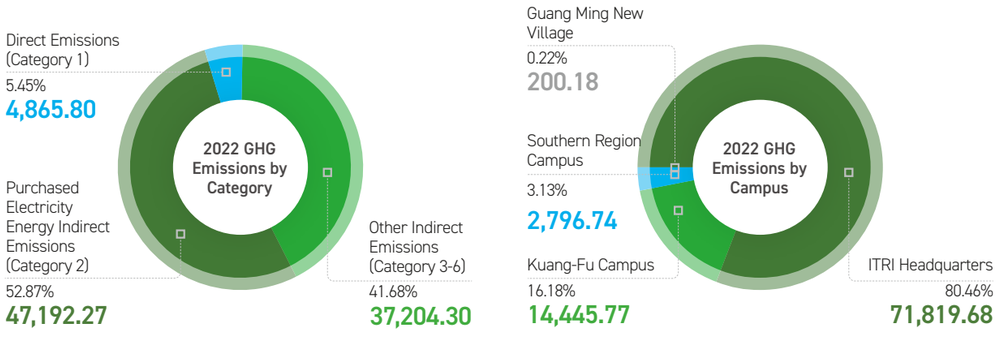
In light of the potential impacts of climate change risks on national development and the overall operation of the organization, ITRI has considered greenhouse gas management as one of the key strategies for its sustainable development. In line with the four aspects of the Net Zero and Sustainability Strategy Office (please refer to 5-1-2 Net-Zero Transition p.130), ITRI is promoting internal carbon reduction actions and has established a Greenhouse Gas Inventory Promotion Task Force. This task force, composed of relevant laboratories & centers, reviews the progress of projects of net-zero sustainable environmental initiatives in ITRI and establishes relevant improvement mechanisms. Through effective environmental management measures, ITRI aims to achieve its carbon reduction targets at various stages, contributing to the mitigation of the negative impacts of greenhouse gas emissions on global warming.

4-1-2 Greenhouse Gas Inventories GRI 305-1~305-3

With 2022 as the base year, ITRI had its Greenhouse Gas Inventory Task Force and relevant laboratories & centers conduct voluntary organizational-level greenhouse gas emission inventories in compliance with ISO 14064-1 standards. Using the operational control as the principle for determination, ITRI collaborated with all of its campuses to investigate emission sources and activity data, taking stock of greenhouse gas emissions generated by various operational facilities and activities. ITRI's total greenhouse gas emissions in 2022 amounted to 89,262.367 metric tons of CO_2e. The primary source of emissions comes from purchased electricity, accounting for 53% of the overall carbon emissions. The scope of the inventories cover ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, and Guang Ming New Village. The comprehensive results and data of the inventories obtain the external verification by CPC, a third-party verification agency, in compliance with ISO 14064-1:2018. The Category 1 and Category 2 emissions meet the reasonable assurance level recognized by the competent authority. In the future, ITRI will continue to conduct greenhouse gas inventories and external verification, with a view to analyzing carbon emission hot spots and energy consumption based on the data derived from the inventories, striving to progressively realize its carbon reduction targets and relevant initiatives.

Annual Greenhouse Gas Emissions

unit: CO_2e



Note:
1. The relevant coefficients for Category 1 are calculated using the Greenhouse Gas Emissions Factor Management Table V 6.0.4 of the Ministry of Environment.
2. The emissions factors for Category 2 are calculated using the value of 0.495 $kgCO_2e/kwh$, as announced by the Bureau of Energy of the Ministry of Economic Affairs in the 2022 Electricity Carbon Emissions Factor.
3. The relevant coefficient for Category 3-6, which mainly involve indirect greenhouse gas emissions from transportation, are calculated using the emissions factors published on the Carbon Footprint Information Platform.
4. The scope of the inventories covers office areas, laboratory areas, dormitory areas, and canteens at the ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, and Guang Ming New Village. Carbon emissions generated by companies stationed at ITRI facilities and outsourcing companies are temporarily not included in the calculation.
5. The seven greenhouse gases included in the annual inventories are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3).
6. Due to the fact that part of its services involves the R&D processes of the semiconductor industry, ITRI's direct emissions of greenhouse gases are dominated by SF_6 (57.11%), followed by HFCs (17.56%), CO_2 (14.84%), CH_4 (8.68%), N_2O (0.89%), PFCs (0.88%), and NF_3 (0.04%).

4-1-3 Green Campus GRI 302-4

At the 15th Conference of the Parties (COP15) of the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, 2009, specific global targets for reducing greenhouse gas emission have been established. In response to the international trend, Taiwan has also stipulated its National Climate Change Adaptation Action Plan. To position itself as a green and low-carbon campus and a model for green living, ITRI has been implementing its Green Campus Project since 2011, investing its own funds in five main aspects: environmentally friendly surroundings, low-carbon lifestyle, green R&D, smart energy saving, and green transportation. ITRI has been engaged in comprehensive planning and adjustments to both software and hardware facilities on campuses. Specific measures encompass the transformation of smart and green buildings, shaping a low-carbon culture and living space, the construction of low-carbon green infrastructure, renovating outdated buildings into intelligent structures, and the establishment of campus-wide smart grid and monitoring facilities. Since its initiation in 2011, the Green Campus Project has helped ITRI save over 10 million kWh of electricity and attain a green cover ratio exceeding 200%. In addition to the continuous implementation of these measures, ITRI has also transferred relevant technologies to private companies, verifying the effectiveness of its energy-saving and carbon-reduction technologies while benefiting others.

Green Campus Project

Environmentally friendly surroundings

- Constructed underground rainwater recycling systems to annually harvest up to 16,000 tons of rainwater for plant irrigation and to enhance green cover ratio.
- Established ecological ponds for regulating ambient temperature and enhancing biodiversity.

Green R&D

- Solar windows for power generation.
- Light & Light™ LED light bulbs.

Smart energy saving

- Campus-wide smart grid and monitoring systems.
- Electrical load management systems for power saving control.
- Frequency conversion equipment: High-efficiency magnetic-bearing chillers, inspecting and replacing outdated motors with IE3 motors.
- Indoor human centric lighting and smart lighting control systems.
- Smart energy-saving control systems for conference rooms and offices.

Low-carbon lifestyle

- Switched office lighting to LED panel light with light guide films.
- Installed solar water heater systems in dormitories.
- Developed computer smart sleep mode software that automatically adjusts for optimization by learning users' habits.
- Added carbon footprint labels to foods in staff canteens.
- Utilized rooftop greening to reduce heat conduction.

Green transportation

- Electric shuttle bus services for commuting between ITRI campuses and THSR stations.
- Official-use electric scooters in place of fuel-based scooters.
- On-campus U-BIKE (shared bikes) for transportation between different hall buildings.

R&D Results

- Smart building energy management systems
- Energy information platform (iPower, the predecessor of the current EIP platform)
- DALI lighting control management system
- Rooftop insulation coatings
- High-efficiency magnetic-bearing chillers
- High-efficiency variable-frequency centrifugal chillers
- Optimization of air conditioning systems
- Frequency conversion technology for box type air conditioners

4-1-4 Green Buildings GRI 302-4

Green buildings can, on one hand, decrease the environmental impacts of operational activities and, on the other hand, enhance the quality of the work environment and the lifespan of the buildings. ITRI has retrofitted existing buildings and constructed green buildings, demonstrating its commitment to realizing low-carbon operation. The ITRI Headquarters consists of over 80 buildings, with the oldest one being over 40 years old, while others have a history of over 20 years. Through the initiation of the Green Campus Project in 2011, ITRI has investigated and improved the energy consumption of existing buildings, transforming them into green buildings. After being retrofitted with energy-saving designs, Hall 64 of the ITRI Headquarters reduced its energy consumption by 29% and was therefore certified and ranked as a Top 2% building by the US Energy Star in 2012. Hall 10 of the ITRI Headquarters achieved a 43% reduction in energy consumption, earning it the honor of being the only existing (not newly constructed) building at ITRI rated as the Diamond Level in the Green Building Labeling System of EEWH.

Regarding the construction of self-owned buildings, ever since Huying Hall at the Southern Region Campus won its first Green Building Label of EEWH in 2011, ITRI has been applying green building construction methods to all of its new buildings. It has incorporated physical building designs, such as sun shading, heat insulation, and thermal preservation, along with insulation materials and ventilation facilities, with the aim of minimizing the energy consumption of the buildings. Also, strategies such as utilizing sunlight, ventilation, and constant temperature ground water have been employed to maintain consistent temperature and humidity levels as well as good air quality. Additionally, it has introduced energy consumption diagnosis, electricity-saving, and management technologies to improve the energy efficiency of its buildings.

As of the publication year of the report, ITRI has won seven Green Building Labels of EEWH and two Intelligent Building Labels with seven self-constructed green buildings. One of its retrofitted buildings has also been rated as the Diamond Level of the Green Building Labeling System of EEWH. These achievements demonstrate ITRI's ongoing commitment to energy conservation through sustainable building practices and its determination to establish itself as a model for promoting sustainable buildings among corporate entities.

Hall 2 of Kuang-Fu Campus is completed and inaugurated, marking the 7th green building in our institution.

Green Building Results

2011

Huying Hall, Southern Region Campus (dormitory)

★ Diamond Level of the Green Building Labeling System of EEWH
(ITRI's first award-winning building)

2015

Hall 10, ITRI Headquarters

★ Diamond Level of the Green Building Labeling System of EEWH
(The only award-winning retrofitted building of ITRI. After the retrofit, its energy use intensity has decreased to 63.8, which is more than half the average energy use intensity of office buildings in Taiwan.)

2015

Central Taiwan Innovation Campus, Ministry of Economic Affairs

★ Diamond Level of the Green Building Labeling System of EEWH
★ Diamond Level of the Intelligent Building Labeling System
(Taiwan's first building project that has received recognition from both labeling systems.)

2018

Hall 90, ITRI Headquarters (new dormitory for single staff)

★ Diamond Level of the Green Building Labeling System of EEWH

2020

Hall 1, Kuang-Fu Campus

★ Diamond Level of the Green Building Labeling System of EEWH

2021

Shalun Green Energy Technology Demonstration Site

★ Diamond Level of the Green Building Labeling System of EEWH
★ Diamond Level of the Intelligent Building Labeling System

2022

Hall 2, Kuang-Fu Campus

★ Gold Level of the Green Building Labeling System of EEWH
(The construction of the building started in 2017. It was inaugurated in 2022 and officially obtained a Green Building Label in 2023.)

Hall 2, Kuang-Fu Campus, completed and inaugurated in 2022.

- Established wind field and sun path simulation.
- Introduced natural wind and light to reduce the use of air conditioning and artificial lighting.
- Incorporated surface water and rainwater recycling systems to harvest water for lawn irrigation. Implemented wastewater recycling and reuse mechanisms.
- Initiated energy and resource recycling and reuse programs, resulting in overall energy consumption decreasing year by year.

Note: The Central Taiwan Innovation Campus has reapplied and obtained another Green Building Label and Intelligent Building Label. Although Huying Hall at the Southern Region Campus and Hall 10 at ITRI Headquarters have not renewed their labels, they continue to operate in compliance with green building energy conservation standards, hence included in this disclosure.

4-1-5 Campus Greening

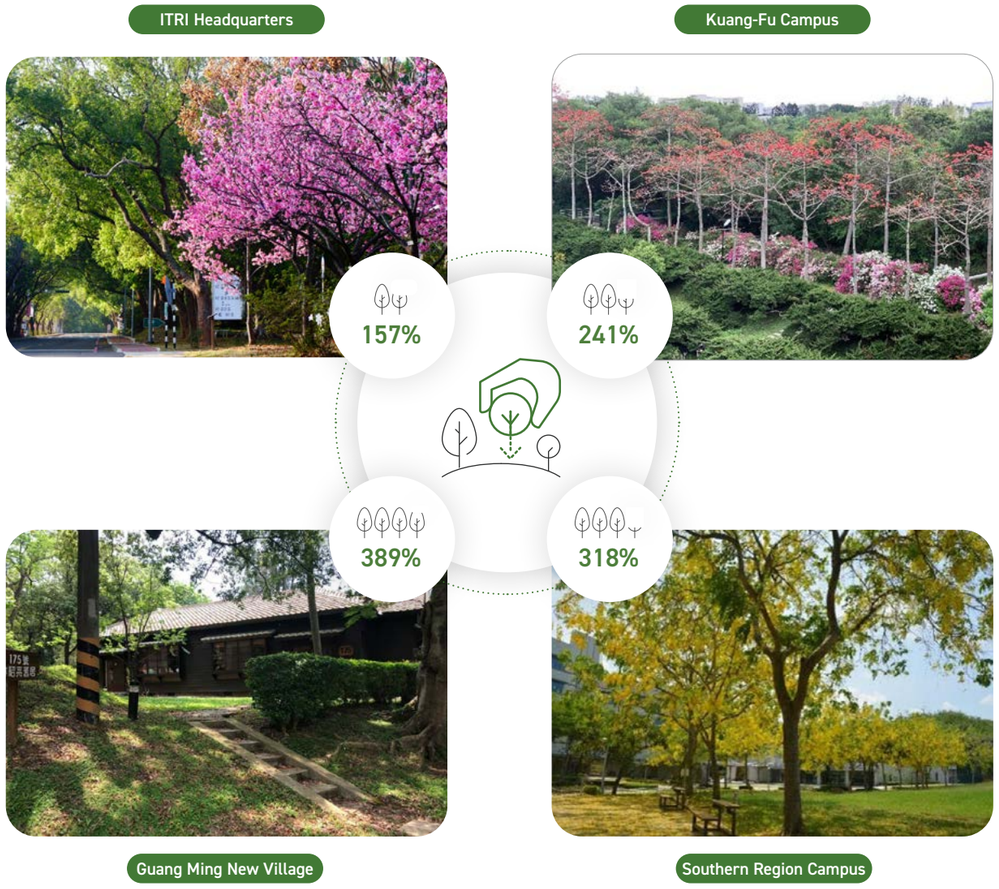
According to the Global Risks Report 2023 published by the World Economic Forum (WEF), six out of the top ten global risks over the next decade are environmental risks. These include natural disasters, extreme weather events, biodiversity loss, and ecosystem imbalance.

Dedicated to ensuring environmental balance and ecological sustainability across its different campuses, ITRI has taken measures, such as implementing environmental greening initiatives, planting and maintaining various plants, and providing habitats, to reduce the potential damages of its operational activities to communities and the environment, fostering a biodiversity-friendly environment. As of 2022, the green cover ratio across its four main campuses is 276.25%, with the trees in these campuses storing approximately 148.944 tons of CO_2e of greenhouse gases annually.

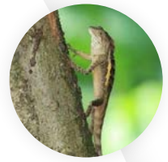
Average green cover ratio of the four main campuses:

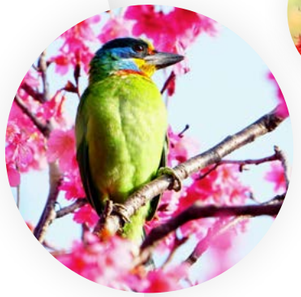
276.25%

Ratio of green cover



Note: The green cover ratio is calculated based on the planting data (tree height, tree diameter, tree canopy width, and lawn area) and statutory vacant land area of each campus.





Regional Ecological Conservation and Species Diversity

ITRI campuses cover expansive lands and are suitable for species conservation and natural observation. To ensure biodiversity, ITRI has implemented measures, such as planting and maintaining various trees, as well as installing owl nest boxes, contributing to the creation of a rich and natural ecological environment. In addition to protected species like collared scops-owls breeding on campus, a diverse range of fauna including blue magpies, embroidered barbets, egrets, turtles, flying squirrels, pangolins, beetles, bees, and butterflies can also be observed on these campuses, demonstrating a healthy and positive natural ecological cycle.

To facilitate the healthy growth of trees, ITRI collects approximately 110,000 kilograms of fallen leaves annually and transforms them into compost by adding microorganisms, molasses, and rice bran. The compost is then recycled for use in plants, including cherry blossoms and cuckoos, across its campuses to improve soil composition and promote healthy plant growth.

In 2022, ITRI renovated and revitalized the Guang Ming New Village, emphasizing ecological designs while still preserving the original landscape features and historical textures of the village. It also collaborated with Tsing Hua University on the renovation of the Chengkung Lake on campus. These efforts aim to create an overall eco-friendly environment in Hsinchu that fosters beneficial mutualisms among all living beings.

4-1-6 Digital Transformation GRI 302-4、305-5

Considering that one of the core elements for the realization of low-carbon operation lies in the progress of digital transformation, ITRI has applied organizational culture adjustments and digital technology tools to foster business innovation and operational transformation, specifically reducing the impacts of organizational operation on the environment. Since 1999, it has been constructing institute-wide Enterprise Resource Planning (ERP) systems and electronic approval and signing platforms. Over the years, it has completed a comprehensive west of management resource systems, such as human resources, finance, and materials systems. In addition, it has established 61 core business information systems, 180 information systems related to business management, 110 relevant websites and systems, and over 350 types of electronic forms. These measures have helped ITRI advance toward the goals of business innovation, paperless workflows, and process automation. In 2022, following the principles of ensuring the balance of both information security and smooth operation, ITRI successfully reduced paper usage by over 940,000 sheets, equivalent to a reduction of 7.14 metric tons of CO_2e. In addition, it has further enhanced the green procurement function in its I-Shop System (Note). The annual proportion of procurement of products with green or eco labels has reached 4%, with a consistent year-on-year growth. These results demonstrate ITRI's practical measures to taking concrete steps in achieving comprehensive digital transformation and net-zero sustainability.

Note: I-Shop System is a procurement platform designed for procurements with a total amount of NT$ 5,000 or less.

Results of the Promotion of Digitization

- Digitalize the reimbursement process and expense receipts, transitioning approximately 67% of procurements from paper-based reimbursement to e-reimbursement.
- Establish an online inspection commission services network and provide electronic copies of reports.
- Digitalize the assessment process of patent maintenance to enable the automatic screening of patents that meet the criteria for abandonment; provide relevant information for online assessment and approval.

- Introduce electronic signature platforms in place of the traditional paper-based printing and signature process.
- Upgrade the electronic approval and signing platforms with the responsive web design (RWD), allowing the webpage layout to automatically adjust based on the display of different devices, providing users with a comfortable viewing interfaces.
- Digitalize scientific research platforms.
- Digitalize the seal application process to replace the paper-based workflow.
- Revise and upgrade information systems, such as the platforms for project code application and contractor operation management.

- **Integrate options for green products** into the I-Shop System, resulting in approximately 4% of procurement being for products with green or eco labels.

4-2 Energy Management GRI 302-4

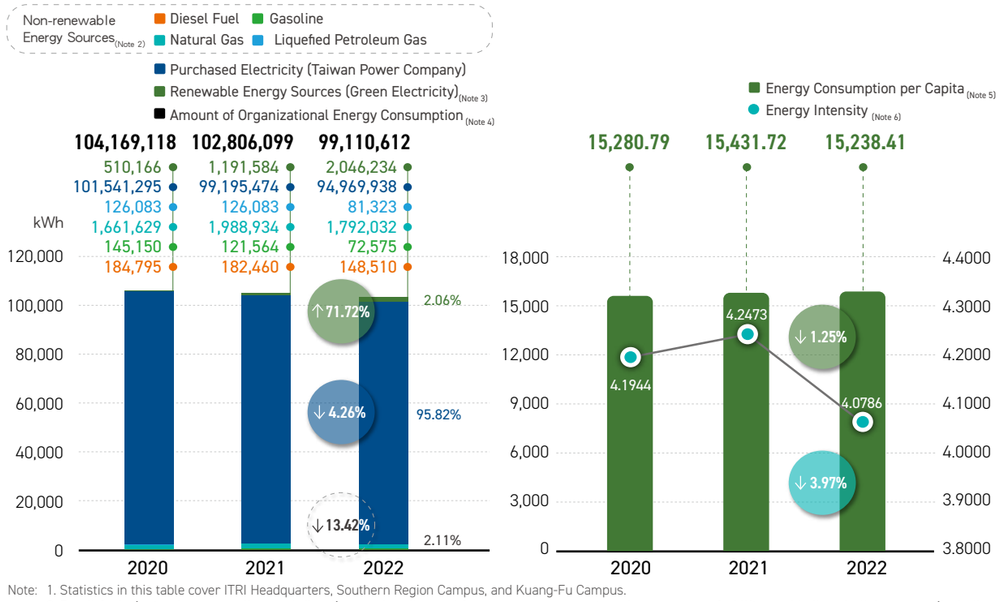
4-2-1 Vision and Guidelines

According to the statistics of International Energy Agency (IEA), two-thirds of global greenhouse gas emissions come from the production and utilization of energy. Addressing greenhouse gas emissions through energy management has become imperative and inevitable for organizations to implement carbon management strategies. In consideration of its R&D capacity and operational needs, ITRI has defined the rights, responsibilities, and requirements for significant energy usage in alignment with its Safety, Health, Quality, Environmental and Energy Management System Manual. With 2022 as the base year, short-, mid-, and long-term energy management targets have been established, aiming to achieve a 30% reduction in electricity consumption and increase the share of renewable energy supply to 30% of the contract capacity by 2030. It has also adopted three key strategies: green building design, net-zero equipment and high-efficiency facilities, and indigenously developed IoT management systems. These strategies, combined with the implementation of installing PV equipment, implementing power diagnosis practices, and introducing indigenously developed energy-saving technologies, aim to disseminate successful energy management cases from within the institution to the industry. In the future, ITRI is committed to realizing green operations and achieving net-zero transition.

4-2-2 Energy Use GRI 302-1~302-3

ITRI's operational activities primarily involve technology R&D and application promotion, with laboratories and standard office spaces being the main types of workspaces. As a result, electricity constitutes the majority of its energy consumption, accounting for approximately 95.82% of the total energy usage. The distribution of energy usage in 2022 reveals a notable reduction in the direct use of energy (non-renewable energy sources), with a decrease of 13.42% compared to 2021. Additionally, the indirect energy usage from purchased electricity registers a 4.26% decrease from 2021. With a continuous downward trend for three consecutive years, the overall organizational energy consumption in 2022 is 3.59% lower compared to 2021, demonstrating the effectiveness of ITRI's energy-saving initiatives.

Distribution of Energy Usage (Note 1)



Note: 1. Statistics in this table cover ITRI Headquarters, Southern Region Campus, and Kuang-Fu Campus.
2. Fossil fuels (natural gas, gasoline, and diesel) are primarily used for emergency generators, lawn mowers, forklifts, and boilers in living areas (including dormitories and canteens).
3. In addition to sources from Taiwan Power Company, part of the electricity used in ITRI comes from renewable energy sources supplied by its self-built PV systems. For more detailed information, please refer to 4-2-7 (p.120).
4. The calculation of organizational energy consumption involves the sum of non-renewable energy sources, purchased electricity, and renewable energy sources (solar energy). It does not include the usage in the Open Lab.
5. Energy intensity per capita is calculated by dividing the total amount of organizational energy consumption of each year by the total number of staff of each year.
6. Energy intensity is calculated by dividing the total amount of organizational energy consumption of each year (in kWh) by the total amount of revenue of each year (in thousand NT$).

4-2-3 Energy-saving Measures GRI 302-4

Electricity emissions are the main source of greenhouse gas emissions in ITRI. For effective management of electricity and energy, ITRI has stipulated energy-saving strategies and corresponding action plans to reduce energy consumption. These plans focus on optimizing equipment, enhancing management practices, and implementing effective control measures.. With the three key strategies of installing net-zero equipment and high-efficiency facilities, promoting energy-saving practices among staff, and establishing the Energy Information Platform (EIP) and IoT management systems, ITRI is committed to increasing energy efficiency, raising environmental protection and net-zero awareness among laboratories & centers and staff, and optimizing energy control via information systems. These initiatives will contribute to an overall reduction in energy consumption during operation and the comprehensive realization of all energy-saving measures across campuses.

Energy-saving Strategies and Action Plans

Aspects	Energy-saving Equipment	Energy-saving Management	Energy-saving Control
Strategies	Install net-zero equipment and high-efficiency facilities	Promote energy-saving practices among employees	Indigenously develop and install IoT management systems and the EIP.
Methods	Increase energy efficiency by integrating and replacing energy-consuming facilities.	Encourage all laboratories & centers to join the effort to promote a low-carbon lifestyle by initiating from a management perspective.	Optimize energy control through the use of information systems, building application management for energy conservation, and utilizing energy management tools to optimize facility energy efficiency.
Annual Results	• The adoption of high-efficiency variable frequency chillers across all campuses has reached 38%. • The adoption of IE3/4 motors across all campuses has reached 33%. • The adoption of LED lighting across all campuses has reached 51%. • The adoption of high-efficiency energy-saving transformers across all campuses has reached 50%. • Integrate air conditioning systems by replacing magnetic bearing compressors. Promote internal subsidy programs for equipment replacement and upgrade.	• Promote digitization and telecommuting (reduce carbon emissions from official commuting). • Incorporate the impacts of its significant energy use into the initial risk assessment of projects. • Include energy performance standards and energy efficiency into evaluation items in the procurement process. • Conduct energy-consuming experiments during off-peak hours. Take stock of electricity usage areas and consolidate and adjust high energy-consuming laboratories. • Reduce the electricity consumption of spare and standby equipment and manage electrical loads during the summer. • Disclose information about the energy usage status and energy saving performance through the monthly "Net-zero Hero Ranking Chart." • Achieve 100% completion rate for the annual compulsory 4-hour "Training on Environmental Education" program for staff.	• Establish the EIP and a data analysis application for the reference of laboratories & centers to manage electricity usage. • The load factor of the air-conditioning systems in Comprehensive Research Halls 51-53 at ITRI Headquarters is maintained between 75% and 85%. • Store ice during off-peak hours at night to supply air conditioning during peak hours by utilizing melted ice. • Interconnected supply of air conditioning chilled water • Networked control of fan coil units, along with the setting of temperature limits for air-conditioned indoor spaces in the summer. • Adjust the temperature of the ice water supply. • Schedule control and flexible operation of equipment.

4-2-4 Net-zero Investments

To align carbon reduction investments with the carbon reduction performance across laboratories & centers and drive the organization as a whole toward low carbon development, ITRI established the Carbon Reduction Fund in February 2022. This fund, dedicated to investments in net-zero equipment, consists of 18% of the electricity expenses charged from each laboratory & center in the previous year and an equivalent amount allocated by ITRI. In 2022, ITRI used 15% of the fund for the installation of carbon reduction equipment in public areas and redistributed 85% to all laboratories & centers for the implementation of carbon reduction practices.

The annual self-funded investment exceeding NT$ 90 million was allocated to net-zero emission equipment, with the majority of the funds being used for the upgrade of air-conditioning systems, lighting, electric and other equipment (such as energy monitoring, air supplying and exhausting, and wastewater treatment facilities). In addition to assessing the management and maintenance of the mechanical integrity (MI) of equipment, when replacing and installing equipment, ITRI simultaneously assesses the electricity usage and lifespan of the equipment and evaluates their payback periods before investment to determine the priority of equipment replacement. Through investing in high-efficiency net-zero equipment and adopting corresponding management measures, ITRI has progressively completed its energy management endeavor.

Self-funded investments in Net-zero Emission Equipment

Types	Energy-saving Lighting	Energy-saving Air Conditioning	Energy-saving Electricity	Others
Replacement / New Installation	• High-efficiency lighting equipment	• Variable-frequency/ magnetic-bearing chillers • High-efficiency cooling towers	• Solar photovoltaic module power generation devices • High-efficiency transformers	• Energy consumption recording / monitoring devices • Air supplying and exhausting equipment
Items for the Procurement of Energy-saving Equipment	6 items	12 items	8 items	17 items

Investments in Self-Owned Net-zero Emission Equipment

unit: Thousand NT$

Air Conditioning
49.70%
44,866

Lighting
17.85%
16,115

Electricity
17.98%
16,231

Others
14.46%
13,057

4-2-5 Promoting Energy-saving Practices among Staff

To effectively pursue its low-carbon operational objectives and align the organizational culture and development vision with net-zero sustainability, ITRI has leveraged international platforms and management structures to facilitate discussion and collaboration with stakeholders. This includes adjusting workflows, evaluating R&D plans, establishing procurement assessment standards, and optimizing the office environment. Through the collective efforts of all laboratories & centers, ITRI has conducted energy-saving assessments and planning from the source, fostering sustainability awareness and encouraging actions related to environmental protection and sustainability among staff and throughout the value chains. Through internal and external collaboration, this collective effort creates momentum from within, contributing to the realization of a low-carbon lifestyle and effective realization of green and low-carbon development, creating shared value for all.

Annual Performance Highlights of Sustainability Promotion

2050 Net-zero Sustainability Information Platform

Through the "Net-zero Hero Ranking Chart," ITRI discloses information about the energy usage status and energy-saving achievements of all laboratories & centers on a regular basis. This initiative is designed to enhance the awareness and cohesion of staff from each laboratory & center in terms of energy conservation and carbon reduction. The website also serves as a platform for sharing the latest information on net-zero and sustainability.

Training on Environmental Education

Through its Happy Learning Web, ITRI has invited professional lecturers to provide training on environmental education to its staff. These programs include certification courses on ISO environmental management systems, net-zero carbon management, successful corporate cases of carbon reduction measures, and practical promotion of SDGs. The goal is to align the environmental awareness of the with the current pace of environmental practices and enable them to integrate these principles into both work and life.

* ITRI has achieved a 100% completion rate for the annual mandatory 4-hour "Training on Environmental Education" program for staff. In addition to the mandatory courses, there are other elective courses available for staff to choose the topics they are interested in learning.

4-2-6 Intelligent Energy Monitoring System

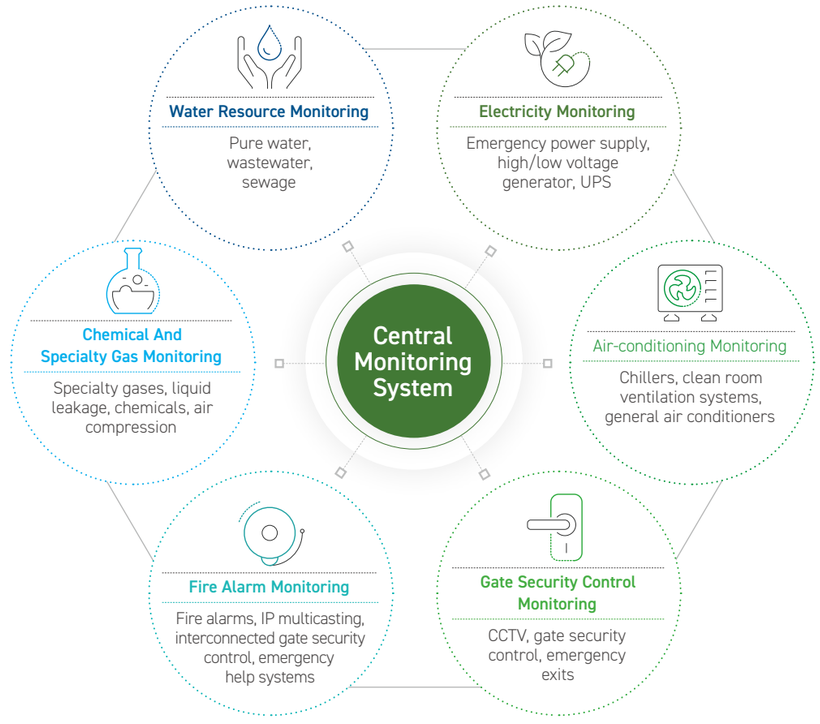
The data-based energy control information systems can significantly improve an organization's energy-saving management effectiveness, strengthen maintenance and safety monitoring, and reduce operational risks. With its self-developed EIP portal and IoT management systems, ITRI is able to connect energy-consuming and sensing equipment to the IoT network and information platform to effectively manage its equipment assets which are vary in type, large in quantity, and widely deployed.

The systems can monitor facilities such as electrical equipment, air conditioners, gate security control, water-resource equipment, chemical and specialty gas equipment, fire alarms, etc., on campuses. This allows ITRI to gain the real-time insight into the energy consumption status across the campuses and, therefore, conduct the analysis of the characteristics of electrical loads. Through the use of these information tools, ITRI's electricity management has evolved from experiential management to digital management. Precise historical data can also be leveraged for subsequent dispatch and abnormality handling, utilizing the information systems to "visualize" electricity usage and perform optimal control. This includes measuring and managing electricity consumption and collecting and analyzing users' habits on electricity usage, complemented with energy-saving analysis and smart management through the integration with the maintenance and management systems by the administration division. Currently, there are over 300,000 dection points across the campuses deployed with facility monitoring systems.

Campus	Trend	Item
All campuses; each campus	The past year; the past six months	electricity; water resource; and gas

- Real-time / daily / monthly / annual accumulative data
- Inquiries can be displayed by year or campus.

Monitoring Systems

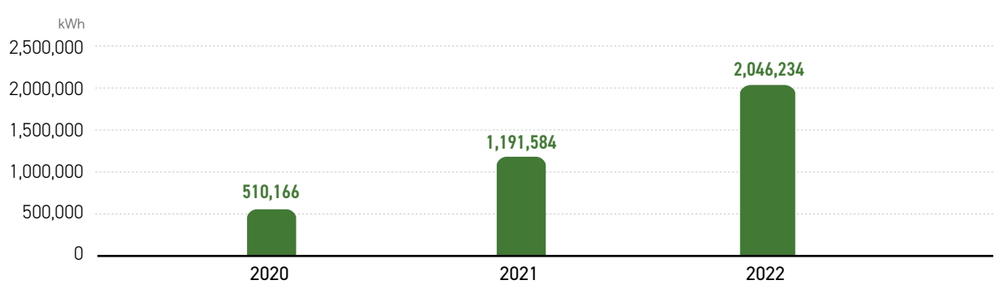


4-2-7 Renewable Energy

Given the critical role of renewable energy in transforming its campuses into living labs for the demonstration of net-zero emissions, ITRI is committed to increasing the share of renewable energy in the contract capacity on a year-on-year basis. Initiatives involved in the efforts toward the objective cover the active transformation of electricity supply, establishment of renewable energy facilities, and utilization of green electricity matching platforms. These efforts aim to enhance the rate of green electricity supply. Following the installation of solar water heating systems (heat pumps) in the dormitory areas since 2013, ITRI has sequentially installed rooftop solar panels and processing systems on ITRI Headquarters, Kuang-Fu Campus, and Southern Region Campus. Through solar power generation and supply, the purchased electricity during peak hours and the contract capacity (basic electricity fee) have been significantly reduced, achieving benefits such as reducing the heat loads of roof slabs and load transfer during semi-peak hours.

ITRI's efforts in the installation of renewable energy systems for power supply have been recognized by the Bureau of Standards, Metrology, and Inspection of the Ministry of Economic Affairs with a renewable energy certificate. In recent years, the PV equipment has been continuously updated and improved by the institute, such as adding real-time monitoring systems to enhance the flexibility of electrical load dispatch and improve the efficiency of renewable energy power generation. The total electricity generated by the PV systems across ITRI campuses in 2022 increased by 71.7% compared to 2021, indicating significant increases for two consecutive years. The proportion of renewable energy supply to contract capacity has reached 8.97%. Additionally, ITRI has provided green electricity to industries in need of carbon reduction through green electricity trading and matching platforms .

Solar Power Generation Statistics



Campus-wide Renewable Energy Installation

Bird's eye views of solar panel installation across ITRI campuses in 2022

4-3 Water Resource Management

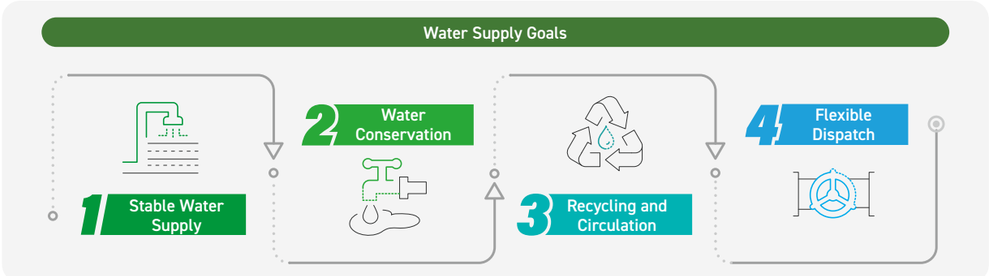
GRI 303-1~303-2、303-4~303-5

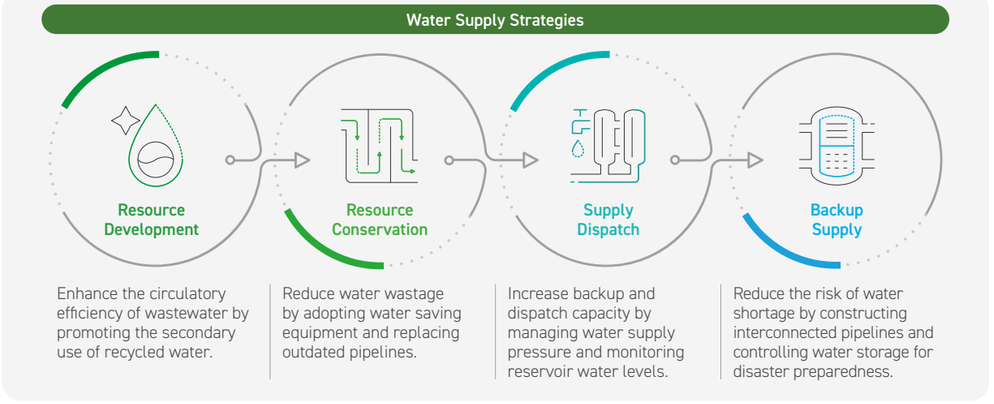
4-3-1 Vision and Guidelines

Water resources plays a crucial role in maintaining the well-being of the environment and individuals, serving as a key element in supporting the sustainable development of an organization. However, due to the impact of extreme weather conditions in recent years, rapid changes have been observed in the water supply environment, resulting in a global water shortage crisis. With high-tech and electronic industries constituting a major part of the industrial structure, Taiwan has faced a year-on-year increase in the demand for production capacity and water usage. Additionally, the leakage rate caused by aging pipelines has only added to the severity of the water supply situation. Hence, in response to the abovementioned issues, it is critical for all industries to plan comprehensive water resource management measures early on to address the complicated issues related to water supply, usage, and conservation.

With 2021 as the base year, ITRI has conducted a comprehensive inventory of water consumption across its campuses. Water resources management initiatives have been formulated, employing strategies of sourcing, conservation, dispatch and backup, to achieve the goals of stable water supply, water conservation, water reuse, and flexible dispatch. Additionally, to ensure that the disposal of wastewater and waste liquids generated by its laboratories complies with regulatory requirements, ITRI has been progressively upgrading its wastewater and sewage treatment facilities and functionalities. Coupled with leveraging its own water reclamation techniques, ITRI performs the optimization of wastewater and sewage treatment, the addition of advanced treatment processes, and the recycling and reuse of wastewater. With these measures, ITRI effectively conserves water resources, reducing environmental impact, stabilizing water resource circulation, and addressing water resource supply and demand issues while strengthening disaster preparedness. The ultimate goal is to ensure access to clean, sustainable, and affordable water resources for all citizens. In the future, ITRI will continue to implement measures such as the digitalization of water resource management, water circulation and dispatch applications, and water reclamation from wastewater recycling. This will allow for a continuous increase in water supply efficiency and water usage effectiveness to achieve the expected 10% water conservation target by 2030.

Water Resource Management | Water Supply Goals and Strategies





4-3-2 Water Resource Usage

Tap water serves as the primary water source for ITRI campuses. To significantly enhance the efficiency of water resource usage, ITRI has focused on reinforcing water resource management and optimizing water use efficiency. In 2021, ITRI's water consumption decreased by 20% due to the cancellation of activities and temporary closure of facilities during the COVID-19 pandemic. In 2022, adhering to the principle of "reusing every drop of water three times," ITRI has introduced a multi-channel recycling mechanism for different types of water resources and wastewater it produces. As a result, the annual volume of recycled water increased by 1.78%. However, due to the lifting of pandemic restrictions and the resumption of normal activities, a slight increase was observed in water consumption per capita (2.54%). Moving forward, ITRI will continue to implement water conservation measures to achieve the water-saving targets at different stages.

Annual Water Consumption and Recycling

Tap Water Consumption	Unit	2020	2021		2022	
			Water Resource Consumption	Growth Rate (During Pandemic)	Water Resource Consumption	Growth Rate (After Pandemic)
Water Consumption	Cubic Meter (M^3)	702,739	556,544	-20.80%	557,149	0.11%
Water Consumption per Capita	Cubic Meter (M^3) / person	103.09	83.54	-18.96%	85.66	2.54%
Total Recycled Water	Cubic Meter (M^3)	58,389	82,579	41.43%	84,051	1.78%

Note: 1. The statistics include the data of ITRI Headquarters, Kuang-Fu Campus, and Southern Region Campus.
2. Tap water consumption per capita is calculated by dividing the total water consumption on all campuses by the total number of staff.

4-3-3 Management Measures

With its internally developed Mobile Rapid Leakage Screening and Early Warning System for Smart Pipeline Networks, ITRI effectively manages and monitors water usage across various sources (tap water, recycled water, rainwater). This involves the implementation of specific measures, such as installing smart water meters and relevant equipment components, utilizing IoT monitoring, incorporating AI technology for intelligent maintenance and leakage control, upgrading outdated pipelines, adopting water-saving devices, and monitoring water levels and managing leakage in a real-time manner. These concrete initiatives enable ITRI to increase the utilization of recycled water, decrease leakage rates, stabilize water supply throughout the organization, and facilitate flexible mobilization of water resources. All these practices aim for efficient conservation and utilization of water resources.

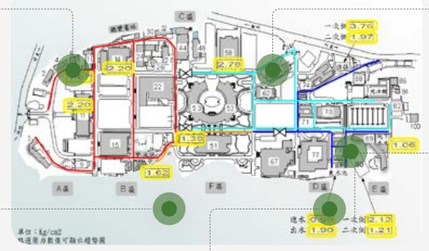
Establishment of Smart Water Networks

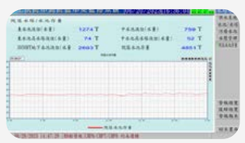
Introduce Equipment IoT
Establish smart water meters and equipment monitoring networks

Manage Water Supply Pressure
Monitor the operation status of water supply by observing water pressure

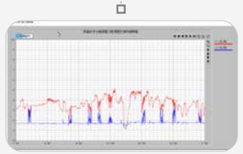
Display Water Storage Status across Campuses
Ensure safe water reserves across campuses in a real-time manner

Electronic water meter IoT


Monitor the pressure of water supply pipeline networks across campuses


Monitor the statistics of the water storage status across campuses


Monitor the water levels of all water reserves


Analyze the water pressure at the inlet and outlet


Manage smart water supply loops

Water Resource Management Measures

Tap Water Management
- Digitalize water monitoring and management, install electronic water meters, monitor the pressure of water supply pipeline networks, monitor the water levels of all water reserves
- Implement on-campus field verification of smart leakage diagnosis systems for monthly inspections and repairs of leaking pipelines.

Recycled Water Management
- Recycle process cleaning water, RO discharge water, cooling tower discharge water, and air conditioning condensate water for use in toilet flushing or as a water supplement for cooling towers.

Recycled Rainwater Management
- Recycle rainwater for use in garden irrigation and as a water supplement for cooling towers.
- Establish rainwater recycling facilities, harvesting 16,000 tons of rainwater a year for plant irrigation and enhancing the ratio of green cover.

Water Restriction Management
- Implement stage-wise water restriction and response measures across campuses in accordance with Taiwan's water level indicator lights.

2022 Water-saving Measures

	Resource Development	Water Conservation	Effective Utilization of Water Resources
Main Principles	Increase Water Recycling and Reuse	Decrease Leakage Rates and Water Waste	Stabilize Water Supply and Ensure Flexible Mobilization
Water-saving Measures	• Recycle wastewater from water dispensers • Recycle wastewater from air conditioners • Recycle rainwater and water from raft foundations for irrigation • Recycle discharge water from experiment processes • Integrate the utilization of recycled water, aiming to reuse every drop of water three times.	• Reduce leakage rates through digital prediction • Implement AI technology for monitoring water leakages. • Replace with water-saving equipment • Upgrade outdated pipelines	• Implement stage-wise water restriction and response measures across campuses in alignment with Taiwan's water level indicator lights. • Manage water supply pressure • Display water storage status and monitor reservoir water levels • Implement smart loops to support water supply • Establish interconnected pipelines • Control water storage for disaster preparedness

4-3-4 Wastewater and Sewage Treatment GRI 2-25

To minimize the impacts and risks of the wastewater generated during its operation on neighboring communities and surrounding environment, all ITRI laboratories & centers collect, classify, and store wastewater and sewage generated by research activities in their laboratories in accordance with the *Wastewater and Sewage Discharge Management Procedures*. The wastewater from laboratories is discharged to the wastewater and sewage treatment facilities in each campus. ITRI has established water quality monitoring equipment for independent testing and analysis. Based on the water quality and quantity, as well as the discharge pipelines, wastewater and sewage treatment facilities are established, allowing specific control of critical water quality data and timely adjustments to treatment strategies. The abovementioned efforts are aimed at ensuring the wastewater discharged from each campus is in compliance with both national and regional regulations and standards.

In 2022, ITRI Headquarters and Kuang-Fu Campus have upgraded the automatic Instrumentation and control equipment, planning to leverage ITRI's proprietary technologies to enhance treatment effectiveness, enabling real-time online monitoring of water quality, and improving the performance of wastewater and sewage treatment to reduce pollution in rivers. In the future, depending on water conditions, ITRI will continue to utilize its own water reclamation technologies to optimize wastewater and sewage treatment, establish advanced treatment procedures, so as to achieve the goal of effective wastewater recycling and water resource conservation.

Sources and Treatments of Wastewater and Sewage

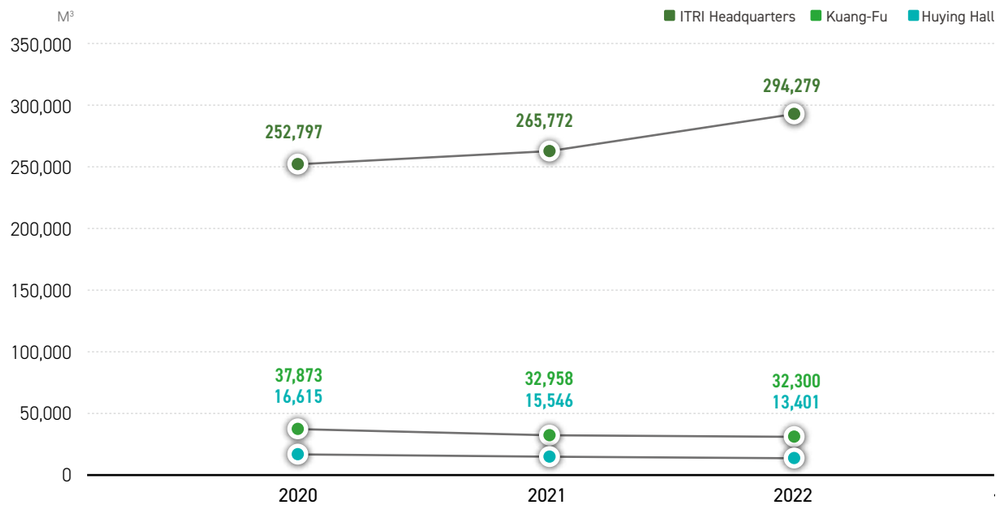
Experimental Wastewater

- Dense waste liquids: Dense waste liquids are collected and classified for outsourcing waste treatment.
- Washing wastewater is collected and directed to wastewater and sewage treatment facilities until it meets regulatory standards before being discharged. Alternatively, it may be collected and outsourced for waste treatment in accordance with the regulations governing industrial waste disposal.

On-campus Domestic Sewage

- Domestic sewage is collected and directed to wastewater and sewage treatment facilities and is discharged after treatment in compliance with regulatory standards.

Total Annual Volume of Treated Effluent Discharged from Wastewater Treatment Facilities by Campus.



Note: 1. The statistics include the data of ITRI Headquarters, Kuang-Fu Campus, and Southern Region Campus. The other campuses are temporarily not included due to differences in operational control and operating patterns. (The wastewater treatment facility of the Shalun Demonstration Site was inaugurated in June, 2021).
2. The influent water volume at each campus's wastewater treatment facility is subject to seasonal variations, the volume of project undertakings, and factors related to the initial, intermediate, and final stages of project implementation. However, the wastewater treatment facilities established by ITRI are designed to efficiently manage the influent water in real-time, ensuring no adverse effects on the environment.

4-4 Waste and Exhaust Gas Management

GRI 2-25、2-27、305-6~305-7、306

4-4-1 Vision and Guidelines

To prevent the depletion of natural resources and promote sustainable resource utilization, ITRI is dedicated to the appropriate waste disposal while actively seeking opportunities for recycling and reusing resources. This involves collaborating with both internal and external stakeholders (such as green technology experts and recovery enterprises) to establish professional teams to discuss waste reduction strategies, improve recycling processes, and expand the range of recyclables. Additionally, it has actively engaged in proactive communication with relevant laboratories & centers and suppliers to enhance waste conversion and recycling efficiency through measures such as waste reduction and increased resource recycling rates. All these efforts are aimed at reducing environmental impacts and negative consequences, thereby achieving the goal of environmental sustainability.

Guidelines for Waste and Exhaust Gas Management

General Wastes

ITRI actively promotes the 5R principle, which stands for "reduce, reuse, recycle, recover, and replace," in its office environment, educating its staff to return misplaced resources to the recycling system for repurposing and reutilization, and promoting the circulation and reuse of materials.

Research Experimental Wastes

In addition to appropriate disposal of hazardous experimental wastes, ITRI also advocates for waste reduction by adopting a circular resource approach during research experiments and processes. It actively promotes the use of environmentally friendly chemicals as alternatives to highly polluting hazardous substances. Additionally, it introduces or utilizes feasible recycling techniques, seeking to convert wastes into usable resources through multi-faceted efforts.

Exhaust Gases

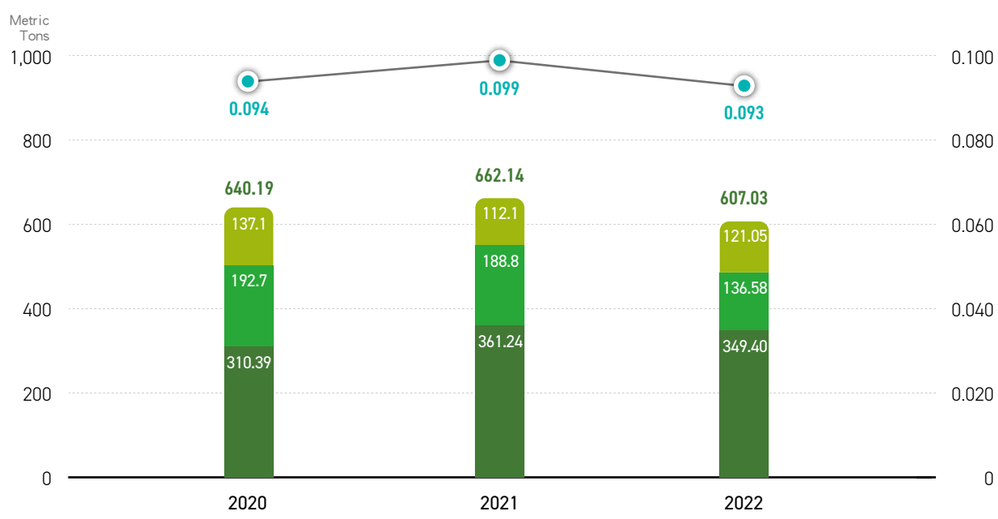
ITRI collects and manages exhaust gases based on their characteristics, applies for permits for stationary pollution source installation and operation, and designates dedicated personnel to strengthen the management of exhaust gas, aiming to reduce air pollution and minimize negative impacts on both human health and the ecological environment.

4-4-2 General Waste Disposal

To minimize wastes and encourage resource recycling, ITRI has implemented measures to categorize general wastes. Waste sorting bins have been placed in public spaces within office areas to collect various recyclables such as paper, paper containers, iron and aluminum cans, glass, plastic bottles, and large items. After sorting, these wastes are entrusted to legal waste clearance and disposal service providers for proper disposal and recycling. ITRI has also promoted waste paper recycling and paperless initiatives, with the former one transforming destructed documents into paper pulp for reuse, with an effort to decreasing the volume of waste paper. In terms of large items such as old office furniture and other waste materials, ITRI instructs its staff and on-campus companies to conduct resource sorting before handing them over to legal waste clearance and disposal service providers for proper disposal.

Additionally, ITRI provides incentives to encourage its staff to use reusable, rather than single-use, tableware, aimed at promoting waste reduction among its employees. It also actively collaborates with recovery enterprises to explore more opportunities for resource recycling, and partners with social welfare organizations to facilitate the reuse of available resources. In 2022, the total amount of 607.03 tons of general waste generated by ITRI has represented a reduction of 8.3% compared to 2021. Moving forward, it aims to increase the types and proportions of recyclables to further mitigate the negative environmental impact of waste.

Statistics of General Wastes



Note: 1. The general waste statistics include the data of ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, Central Taiwan Innovation Campus, Southern Taiwan Innovation & Research Park, and Shalun Green Energy Technology Demonstration Site.
2. Recyclable categories include paper, paper containers, iron and aluminum cans, glass, and plastic bottles.
3. Wastes per capita is calculated by dividing annual total amount of wastes by the total number of staff.

Reduction Measures for General Wastes

	Source Reduction	Enhanced Resource Recycling and Reuse	Concept and Behavior Shift
Main Principles	Reduce and recycle packaging materials Extend the use of office furniture	Refine resource recycling processes and transform waste into recyclable materials.	Utilize promotion and incentives to enhance environmental awareness among staff.
Waste Reduction Measures	• Negotiate with suppliers to reduce packaging materials. • Incorporate "suppliers self-recycling packaging materials" into procurement standards. • Enhance the circulation of second-hand office furniture through digital platforms. • Replace the current paper-based printing with digitalization.	• Expand the range of recyclables to include paper towels, paper tableware, Styrofoam, packaging foam, and plastic cup lids.	• Discourage the provision of single-use tableware at canteens, encourage staff to bring their own reusable and eco-friendly tableware, and set up dedicated stations for recycling disposable tableware at canteens. • Offer discounts for meals remaining unsold beyond a specific time period to encourage the reduction of food by promoting the appreciation of food. • Offer discounts to customers who bring their own reusable travel mugs for drinks. • Install waste classification zones in public spaces.

4-4-3 Experimental Waste Disposal

As a national research and development institute, ITRI predominantly generates experimental wastes from chemical laboratories and pilot plants. These research or experiments involve a wide range of raw materials and chemicals, which are small in quantity, diverse in types, and complex in properties. The amount of experimental wastes generated fluctuates periodically depending on the developmental nature and duration of the research or experiments. To achieve the goal of waste reduction in laboratories, ITRI focuses on treating and reducing the experimental wastes based on the quantity generated and types involved. It prioritizes the signing of contracts with recovery enterprises, giving priority to items such as the recovery of waste foundry sand and waste ferric chloride etching solution. ITRI also advocates for the purification and reuse of waste liquids during the experimental process and the screening of waste liquids for use as nutrient bases in wastewater treatment. All these measures contribute to waste reduction through resource recycling approaches.

Statistics of Experimental Wastes by Type

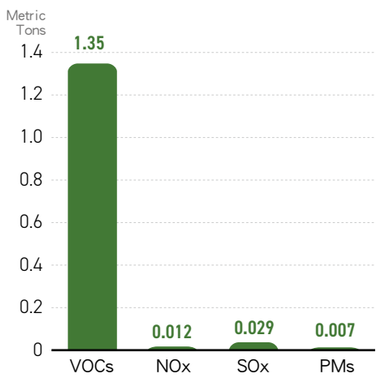
Note: Experimental waste statistics include the data of ITRI Headquarters, Kuang-Fu Campus, Southern Region Campus, Central Taiwan Innovation Campus, Southern Taiwan Innovation & Research Park, and Shalun Green Energy Technology Demonstration Site.

4-4-4 Air Pollution Control

In addition to engaging in various scientific and technological research and development activities, ITRI equally dedicates efforts to air pollution control as part of the initiatives to minimize environmental impacts. In compliance with legal regulations, all ITRI laboratories have applied for permits for stationary pollution source installation and operation, and dedicated personnel are assigned. Stringent air pollution control and management measures are implemented to reduce the emissions of air pollutants, including volatile organic compounds (VOCs), nitrogen oxide (NOx), sulfur oxide (SOx), and particulate matters (PM). ITRI's air pollution control equipment varies depending on the types and characteristics of pollutants being treated. Specialized equipment is installed to perform processes such as absorption, combustion decomposition, specifically for exhaust gases from processes involving specific toxic, flammable, and perfluorinated compounds. The treated gases are then directed to central scrubbers for water rinsing and neutralization treatment.

ITRI undergoes emissions concentration testing for air pollutants by testing agencies approved by the Ministry of Environment in an annual basis. Since its establishment, ITRI has consistently outperformed the standards specified by the Ministry of Environment in this regard, with the results from testing emissions from various exhaust pipes having consistently been below the prescribed emissions standards. In 2022, according to the testing results, the reported emissions for VOCs were 1.35 metric tons, NOx were 0.012 metric tons, SOx were 0.029 metric tons, and PMs were 0.007 metric tons.

Annual Air Pollutant Emission Status



Exhaust Gas Management Measures

General Exhaust Gas Management

- Collect and treat organic compounds separately based on their acidity, alkalinity, and volatility.
- Apply for permits for stationary pollution source installation and operation and designate dedicated personnel.

Special Exhaust Gas Management (Specific Toxic, Flammable, and Perfluorinated Exhaust Gases from Processes)

- Install exhaust gas treatment equipment for processes to perform special treatments such as absorption and combustion.
- Direct treated gases to central scrubbers for water rinsing and neutralization treatment.
- Conduct emission concentration testing on air pollutants.

CHAPTER

5 SOCIAL IMPACT

As one of Taiwan's largest industrial R&D institutions, ITRI is committed to leveraging technology to boost local industrial upgrading and foster the sustainable development of Taiwan's industries. Concurrently, ITRI applies their technology development strategies to address societal needs. By providing technology education, service teams, and public services to the industries and the public, ITRI leverages the soft power of technology, aiming to have a positive impact on the domestic industries and overall society. With technology and innovation being utilized as a solid foundation for societal development, ITRI intends to create positive outcomes for Taiwan's industries and society, leading them towards steady growth and a brighter future.

Highlights

Reach

- The impacts have reached 25,227 individuals.

Startups

- Established 4 startups (accumulated the establishment of **157** startups and business groups.)
- Cultivated 1,000 professionals in carbon management for the industries.

Public Benefits

- 10 applications from the public benefit technology development programs in the current year (accumulated a total of **94** applications).
- Accumulated 46 cooperative organizations/groups.

Volunteer Participation

- Volunteer participation: 1,326 individuals. (cumulated contribution: **20,000 +** person-days)

5-1 Applications in the Industries | Net-Zero Sustainability Transition

5-1-1 Vision and Guidelines

In the face of global climate change and the sweeping trend towards net zero emissions, it has triggered not only a green revolution in the industry chain but also crucially impacts the overall national economy. Recognizing this, in March 2022, Taiwan released Taiwan's Pathway to Net-Zero Emissions in 2050 which outlines relevant initiatives and the country's comprehensive carbon reduction objectives. The Pathway comprises four major transition projects in "Energy, Industries, Daily Life, and Society" as well as two governance frameworks in "Technology R&D" and "Climate Regulations", which are complemented by "12 critical strategies" that integrate resources from various domains.

As a solid supporter of domestic industries, ITRI not only spearheads technology R&D but also serves as a driving force for innovation among SMEs. The Institute established the "Net-Zero and Sustainability Strategy Office" in 2021 to help the industries go through net-zero transformation. Besides combining cross-disciplinary technological R&D from four distinct perspectives in the supply, use, manufacturing, and environment aspects, ITRI assembles experts from various domains to provide diversified net-zero-related support with cutting-edge technologies and services to the industry. These solutions also showcase the innovative value of green technology.

ITRI collaborates with experts from the industry, government, and academia to jointly promote net-zero initiatives and leads Taiwan's industries towards net-zero sustainability through technology innovations.

5-1-2 Net-zero Transitions

GRI 203-2、302-4、305-5

ITRI plays a crucial role in Taiwan's Pathway to Net-Zero Emissions in 2050, leading the industries towards net-zero systematically by actively investing in the R&D of relevant technologies and services, establishing an integrated platform and service team to provide guidance for industrial sustainability transformation and disseminate related knowledge. In addition to setting up a one-stop service for net-zero transition with cutting-edge technologies and government resources, ITRI also held several net-zero sustainability forums and industry matchmaking events. Through cross-disciplinary strategic integration of net-zero applications, ITRI collaborates with the supply chain to promote net-zero transformation through the transfer and adoption of key technologies.

The Net-Zero Sustainability Transition Project for Industries, initiated by ITRI in 2022, covers 48 essential technology areas and service categories. Examples include gathering experienced professionals in the industries to collectively promote the "Development of Electric Vehicle Charging Technologies" to accelerate Taiwan's industry in electric vehicle charging technology and related services. Additionally, the establishment of the Net Zero and Sustainability School and Net Zero and Sustainability Talent Alliance and Sustainable Carbon Management Platform to systematically cultivate green talents within the industry. Through key technology transfer and adoption, ITRI collaborated with external supply chains to promote net-zero transition projects such as the "Southern Taiwan Science Park Reclaimed Water Project" - wastewater recycling and reuse in semiconductor plants, the technology to capture, reuse, and convert CO_2 into carbon fixation chemicals, and the "Intelligent Carbon Reduction Scheduling System". Furthermore, the Institute also offers various solutions (e.g. carbon management initiatives in businesses, assisting businesses in conducting carbon emission health checks, recycling waste resources, introducing energy management technologies) to help SMEs swiftly adapt to the global net-zero trend, seize opportunities for net-zero transition, and align with Taiwan's overall net-zero objective and policies.

The Net-Zero Sustainability Transition Project for Industries

Zero emissions during power generation

Actively deploy renewable energy infrastructure, as well as set up green energy power generation systems and virtual power plant dispatch systems to increase clean energy power supply.

Taiwan's Pathway to Net-Zero Emissions in 2050
12 Key Strategies
- Wind/Solar PV
- Hydrogen
- Innovative Energy
- Power Systems & Energy Storage

Technology Type
- Hydrogen Energy
- Geothermal Energy
- Solar Power
- Power Management

Technology/Services
10 cases

Change user behaviors

Assist in reducing process carbon-related emissions, promoting the recycling of energy and resources as well as the treatment of end waste and exhaust gas through the introduction of AI smart systems and carbon emission detection.

Taiwan's Pathway to Net-Zero Emissions in 2050
12 Key Strategies
- Energy Saving
- Carbon-free & electric vehicles
- Green Lifestyle

Technology Type
- Information and Communications Technology
- Machinery
- 5G Energy-Saving
- Energy-Saving Equipment
- Packaging Materials
- Electric Vehicles
- Biomass Materials

Technology/Services
10 cases

Energy Supply

Low Carbon Manufacturing

Demand and Usage

Environmental Sustainability

Net-zero Services

Low/zero carbon manufacturing and productions

Reduce the consumption of fossil fuel and enhance energy efficiency through solid energy conservation in buildings, electrification of official vehicles and boilers, and the promotion of shared platforms.

Taiwan's Pathway to Net-Zero Emissions in 2050
12 Key Strategies
- Resource Recycling & Zero Waste

Technology Type
- Semiconductor
- Laser Processing
- Agriculture-Industry Circular Hub
- Smart Scheduling

Technology/Services
14 cases

CO_2 Capture and Utilization (CCU)

Assist the industries in carbon management and introducing related technologies such as direct carbon capture, carbon capture and utilization, energy resource management, and circular economy models.

Taiwan's Pathway to Net-Zero Emissions in 2050
12 Key Strategies
- Carbon capture, utilization, and storage (CCUS)
- Carbon Sinks

Technology Type
- Carbon Capture and Utilization
- Carbon Fixation
- Carbon Sinks

Technology/Services
10 cases

Establish an industry net-zero sustainability platform

Assist businesses in developing strategies for achieving net-zero solutions that align with government policies and global trends from aspects such as industry trends, corporate education, carbon emission health checks, to technology introduction.

Technology Type
- Net-Zero Certifications
- Net-Zero Funds
- Net-Zero Talents

Technology/Services
4 cases

Electric Vehicle Charging Technology and Product Development

External Impact

E (Environment)

promotes low-carbonization in the transportation industry

G (Governance)

Over 50 members

assists in the establishment of new start-ups, establishing common charging protocols for the industry, and collaborating with over 50 members to form an industry alliance.

As the world continues to promote vehicle electrification, it is estimated that the number of electric vehicle (EV) charging piles worldwide will double from 2.354 million fixtures in 2022 to 14.62 million by 2027. Taiwan also aims to achieve full electrification of all cars by 2040. To address relevant technology gaps, ITRI is actively collaborating with businesses to conduct pertinent research and technological development, and assist the industry in developing high-value-added and domestically made charging module products.

To accelerate the development of EV charging technology and services in Taiwan, ITRI collaborated with local scooter operators to jointly develop the Taiwan E-scooter Standard (TES), a common charging standard for electric scooters. In 2020, ITRI established the Electrical Vehicle Power Supplementation Technology Promotion Alliance and assembled over 50 members (relevant operators in the charging ecosystem) to discuss EV charging issues and technology developments. The alliance also focuses on discussing and advancing electric vehicle charging topics, assisting in the formulation of demonstration operation standards for EVs, and establishing Chinese National Standards (CNS) for scooter charging to align with international markets. Furthermore, ITRI also assisted the Industrial Development Bureau (IDB) in establishing the charging standards for the Smart Electric Vehicle Demo Operation Project. In addition to developing advanced technologies, ITRI continues to develop the proactive safe charging systems as well as systems that integrate electric vehicles and microgrids.

ITRI has also been actively involved in facilitating the establishment of EV charging infrastructure for operators, contributing to the development of 2 startup companies specializing in the development of AC and DC charging devices and providing charging services. The first startup, eTreego Co., founded in 2017, has become a major supplier of EV charging equipment in Taiwan, with a market share exceeding 60%. The company has already entered markets in Japan and the U.S., continuing to expand the installation of charging equipment. The other is Gochabar, established in 2023, serves as the first charging service and operating software company in Taiwan. Gochabar offers technology services for charging systems and charging solutions, having secured orders for 9,000 high-power DC charging devices in the US market.

In 2022, ITRI completed the 350kW high-power fast-charging device certification equipment. In 2023, ITRI plans to collaborate with the Metal Industries Research & Development Centre (MIRDC) to embark on the technology development program – AI Smart Charging and Power Scheduling Technology Development Project, to develop charging device technologies that are smart and equipped with battery safety auto-detection. In the coming years, ITRI will continue its efforts in developing next-generation EV charging technology, smart EV charging management systems as well as monitoring and enhancing the testing capacities of EV charging equipment to improve product certification capabilities. ITRI ceaselessly explores the possibilities of EV charging developments and maps out product development plans to meet future EV charging demands.

Net Zero and Sustainability School along with Net Zero and Sustainability Talent Alliance

External Impact

E (Environment)

provides case studies and teaching materials of net-zero sustainability technology. Currently, there are 54 course modules and e-learning course units components, along with 3 professional certification courses.

S (Social)

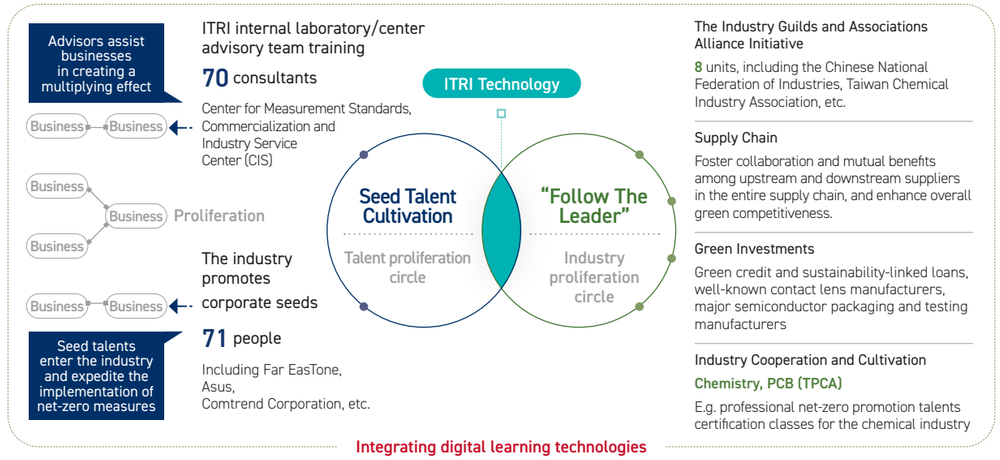
cultivate seed talents through organizing 44 professional training courses. This initiative has resulted in the development of 70 consultants and 71 corporate seeds. A total of 469 companies have benefited.

G (Governance)

collaborates horizontally with ITRI's laboratories and developed 45 ITRI technology case elearning content and related referrals, set up an exclusive information platform to expedite the proliferation of green talents.

ITRI is actively assisting companies in building capabilities for net-zero transitions and initiating relevant initiatives in response to *"Taiwan's Pathway to Net-Zero Emissions in 2050"*. To address the issue of talent shortage in the industry, ITRI collaborated with 8 major industry associations to establish the Net Zero and Sustainability Talent Alliance. The alliance sets up the "Net Zero and Sustainability School" with 2 core objectives: "Building Carbon Footprint Verification (CFV) Capacities" and "Enhancing Corporate Carbon Reduction technology". It systematically integrates and plans training courses, connects industry leaders in net-zero from industry, academia, and research sectors, incorporates advanced net-zero technologies into learning content. The School strives to cultivate local green professionals and improve Taiwan's overall green competitiveness by offering more than 50 professional net-zero courses across 5 main areas (sustainable carbon management, energy supply, low-carbon technology, recycling, and carbon negative value-adding) for businesses at different stages of carbon reduction work to customize their curriculum.

The establishment of the "Net Zero and Sustainability School" and "Net Zero and Sustainability Talent Alliance" follows 2 main strategies: "Seed Talent Cultivation" and "Follow The Leader". These initiatives connect experts and consultants from industry, academia, and research sectors to create a net-zero knowledge platform. Through the online and offline blended learning, they penetrate various industry chains. Benchmark enterprises are encouraged to lead and engage upstream and downstream vendors, systematically sharing new insights, domestic and international net-zero trends, and relevant certification standards. In the future, we will continue to accumulate e-learning components for net-zero solutions across various industries, modularize and expand the quantity of net-zero sustainability-related courses (emerging issues such as sustainable energy, low-carbon introduction, and recycling) as well as course coverage in the industry. Through analyzing industry and product characteristics and introducing international instructors, thereby highlighting course features, enhancing uniqueness, and strengthening application flexibility. This ensures the fulfilment of sustainability talent training needs for various industries and key clients (enterprises, schools, talent alliances).



Carbon Management for Sustainable Future

With the rising tide of carbon issues (such as carbon credits, carbon trading, and carbon tax) in the international arena, Taiwan, playing a crucial role in the global production and manufacturing chains, is facing pressure from the supply chain and aligning with national net-zero policies. Industries are required to expedite their carbon management processes, which involves nurturing green talents capable of managing and understanding organizational and product carbon emissions data, planning effective strategies and tactics for carbon reduction to fulfill international social responsibilities towards achieving net-zero. While the majority of domestic businesses are SMEs, all businesses, regardless of type, can effectively complete their "Organizational Greenhouse Gas (GHG) Inventory" and "Product Carbon Footprint Calculations" through ITRI's Carbon Management for Sustainable Future and establish their fundamental corporate carbon management model.

The Carbon Management for Sustainable Future offers two types of assistance, including database and application tools, to align with the carbon management and measurement needs of organizations in different industries. It includes 3 core functions: database, carbon footprint calculation, and green design. Additionally, the ITRI College also organizes "Carbon Footprint Management Workshops" for middle and upper-level management staff, guiding carbon management personnel in various industries to progress from conceptual understanding to practical implementation, gradually establishing carbon footprint calculation, analysis, and reduction capabilities.. Apart from offering corporate membership services, the Platform also collaborates with various industries and provides customized services (e.g. carbon management education and training, mentoring, and technology transfers) based on their needs. Over 1,000 members have been served on this Platform. Throughout the year, a total of 17 courses focusing on carbon management were planned, including carbon footprint management practice workshops, industry college workshops, corporate carbon footprint analysis manager certifications, carbon footprint workshops, and environmental construction program workshops.

To provide more carbon management capabilities for enterprises and meet the needs in various industries, ITRI will continue to invest in the development of new Platform features, for example, carbon emission calculation in scope 3 of the Organizational GHG Inventory, while refining the functionality and comprehensive supporting measures based on the requirements of different industries. By integrating education training and practical operations, ITRI seeks to offer the most effective solutions for sustainable carbon management for industries.

13 CLIMATE ACTION
17 PARTNERSHIPS FOR THE GOALS

External Impact

E (Environment)

organized 17 carbon management workshops to assist the industry in constructing basic capabilities in carbon footprint calculation and carbon management.

S (Social)

cultivated **1,000** carbon management professionals for various industries.

G (Governance)

assisted the supply chain in independently completing carbon footprint calculation and basic carbon management

Wastewater Recycling And Reused In Semiconductor Factories - Southern Taiwan Science Park Reclaimed Water Plant

External Impact

E (Environment)

purify industrial wastewater and reclaim it into industrial water. The reclaimed water plant has a daily capacity to provide approximately 20,000 metric tons of reclaimed water.

S (Social)

alleviate water-use pressure in regions facing water scarcity.

G (Governance)

Taiwan's first privately-owned reclaimed water plant and the first application case within the globe.

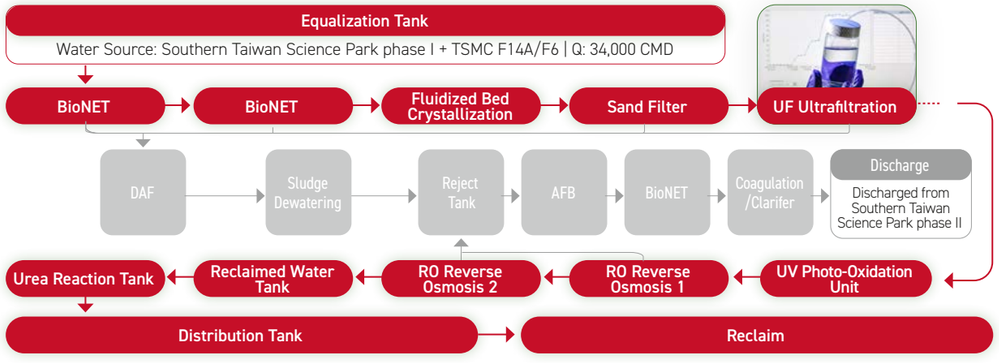
6 CLEAN WATER AND SANITATION

Taiwan's semiconductor industry holds a competitive advantage, ranking first globally in wafer manufacturing and chip packaging and testing. The semiconductor manufacturing process requires the use of ultrapure water. If industrial effluent is used as a water source, the wastewater must undergo a rigorous purification and reclaiming procedure to meet the standards of semiconductor precision processes. ITRI collaborated with an engineering firm responsible for treating the reclaimed water at Southern Taiwan Science Park, contributing its extensive R&D and technology deployment experiences in the field of water resource applications (such as water treatment, water recycling, and micropollutant analysis). Through technology transfer and practical engineering, ITRI assisted industries in the Park in implementing projects related to wastewater reclamation.

The Southern Taiwan Science Park Reclaimed Water Plant is a collaborative effort involving ITRI, domestic semiconductor manufacturers, and engineering firms. ITRI contributed throughout the process, including laboratory testing, system integration, and engineering construction stages. The project utilized treated effluent from the Southern Taiwan Science Park wastewater treatment plant as the source water, treating it for use in semiconductor manufacturing processes. It is not only Taiwan's first privately-owned reclaimed water plant but also the world's first application case. The Reclaimed Water Plant, inaugurated in mid-September 2022, produces approximately 20,000 metric tons of reclaimed water per day. This achievement significantly alleviates water supply pressure in the greater Tainan region and marks a significant milestone for global water resource circulation.

ITRI employed BioNET, fluidized bed crystallization (FBC) wastewater treatment, and anaerobic fluidized bed (AFB) technologies with reverse osmosis (RO) and ultrafiltration (UF) pre- and post-treatment procedures to address the complex water quality of the influent water. This ensures that the water quality satisfies the stringent requirements and that the concentrated drainage also complies with management standards. Furthermore, ITRI has implemented the "High-Sensitivity High-Matrix Urea Detection System" to rigorously monitor the concentration of urea in the reclaimed water (urea < 5ppb). The technology streamlines the treatment process and supports plant-wide urea trend verification, ensuring that the water quality of the reclaimed water plant satisfies the semiconductor-grade reclaimed water standards.

ITRI continues to develop water treatment and reclaiming technologies that are more energy-efficient, aiming to assist domestic enterprises in achieving the net-zero goals of reducing water usage and energy consumption with mature and stable technologies. The Institute strives to assist local semiconductor manufacturers in reaching the corresponding targets for water resource circulation by 2025 (daily reclaimed water volume sufficient for 2nm semiconductor processes in the Southern Taiwan Science Park new factory area, 100% reclaimed water used in the Hsinchu Science Park new factory area, and over 60% reclaimed water substitution rate for all Taiwan factories by 2030), improving organizational operational resilience, and implementing sustainable actions for water recycling.



Technologies for Carbon Capture and Green Chemical Conversion

Domestic petrochemical, steel, cement, and power plants emit over 200 million tons of CO_2 annually, accounting for over 70% of Taiwan's total emissions. In the trend towards net-zero emissions, these carbon-intensive industries are under immense pressure for carbon reduction and transformation. As a result, ITRI invested in the development of key catalysts and process technologies for CO_2 Capture and Utilization (CCU). Through the capture and transformation process using catalysts, the emitted CO_2 is converted into green chemicals such as methanol, methane, alkenes and olefins, polyols, and carbonate esters. This new technology aims to provide applications for domestic industries to promote net-zero transformations and establish a sustainable net-zero circular economy in the industries.

ITRI is committed to developing new process technologies for effective CO_2 capture with a primary focus on the flue gas emitted from the end of carbon-intensive industrial processes. Following its capture and separation from the flue gas, the process effectively reduces costs and improves energy efficiency through the integration of factory residual heat and renewable energy resources. Being capable of producing Green Chemicals, the CCU technology has enormous potential for application in the industry. Take methanol produced from CO_2 as an example. Methanol serves as a crucial raw material in the chemical industry, and data from 2021 indicate that the global methanol production reached 100 million tons, projected to increase to 500 million tons by 2050. The efficient reduction of carbon emissions in the chemical industry can be achieved by employing CO_2 to produce green methanol, a sustainable alternative to traditional fossil fuel resources. Therefore, this technology stands as a key solution for the industry to attain net-zero carbon emissions.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION

External Impact

E (Environment)

Carbon reduction of **4,900** metric tons –

the experimental pilot plant captures 15 metric tons of CO_2 annually and achieves a carbon reduction of 4,900 metric tons.

S (Social)

collaborated with carbon-intensive industries, academia, and government agencies to strive towards low-carbon transformation.

G (Governance)

Invested NTD **1.2** billion

finalized 17 technology licensing contracts to promote net-zero transformations of domestic industries, and facilitated over NTD 1.2 billion of domestic/foreign investments.

This project has completed 17 technology licensing between 2022 and 2023, resulting in a total revenue of NTD 44,086,000 from R&D outcomes. Furthermore, it played a pivotal role in facilitating the acquisition of more than NTD 1.2 billion of domestic/foreign investments. It has so far drawn interest from a wide range of industries and has established collaborations with many businesses. Examples include a partnership with China Steel Corporation (CSC), leading to the establishment of the Co-production of Steel and Petrochemicals Demo Pilot Plant at the Xiaogang factory area, facilitating a NTD 2 billion investment by China Steel to construct a LD-converter gas carbon capture and utilization pilot plant with an annual carbon capture capacity of 4,900 tons. The project has also assisted Chinese Petroleum Corporation (CPC) in setting up a demo system for carbon capture and synthesis methanol production in their Dalin facility, constructing a complete carbon circular economy model with an investment totaling more than NTD 55 million. Furthermore, the project has spurred CHIMEI Corporation to invest in technologies to synthesize CO_2 into dialkyl carbonates (DRC) and polycarbonates (PC), followed by the implementation of field validations. Compared to existing production methods, it is anticipated to reduce carbon emissions by 17%.

ITRI utilizes the CCU demo site established in collaboration with the industry as a foundation. By expanding the industry's investment in CCU technology, it facilitates industrial upgrading and transformation, establishing new industry value chains and clusters. ITRI continues to work with carbon-intensive industries, academia, and the government to keep on promoting this project. In the future, with the potential introduction of carbon taxes, these products will be more competitive than those derived from conventional petrochemical refining processes. Additionally, this will further accelerate the transformation of the petrochemical industry, attracting industry adoption of CCU technologies for chemical production and steering Taiwan's overall carbon-intensive industry towards the goal of net-zero emissions.

Carbon Reduction Intelligent Scheduling System

External Impact

E (Environment)

5% ~ 10% reduction in shipping fuel usage results in a 10% ~ 15% reduction in carbon emissions.

S (Social)

Utilizing intelligent scheduling systems to reduce the workload of fleet dispatching and alleviate the demand for manpower.

G (Governance)

improve operational efficiency, resulting in a 90% reduction in fleet scheduling time, satisfying a 98% fleet deployment rate, 100% for in and out of dock arrangement rate, and 100% for new ship delivery arrangement rate.

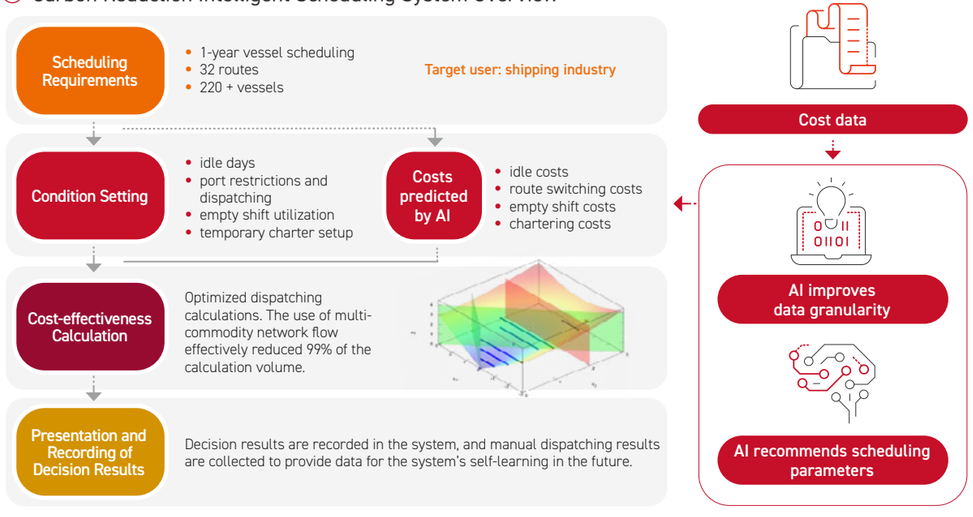
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

90% of the total volume of international trade and tariff is via the ocean. If the shipping industry were considered as a nation, its carbon emission would rank seventh globally, demonstrating the significant impact on carbon emissions and thus drawing attention from international organizations. On-duty ships are highly susceptible to external factors (e.g. port congestion, delays in loading and unloading due to labor shortage, the Russia-Ukraine war, and unexpected city lockdowns because of the pandemic). These factors contribute to a high level of unpredictability of the industry and result in a year-over-year increase in fuel consumption and carbon emissions. To consistently provide stable maritime transportation services, shipping companies and ITRI are collaborating to seek intelligent ways to effectively reduce carbon emissions and enable rapid scheduling adjustments. The goal is to improve operational efficiency by replacing labor-intensive and time-consuming manual operations, aiming to enhance the flexibility of fleet scheduling and enable quick responses to various unforeseen circumstances.

The patented Carbon Reduction Intelligent Scheduling System was developed in collective efforts by the ITRI team and operators through 3 key technologies: "data mining and deep learning technologies" (to improve prediction accuracy), "mathematical optimization modeling" (combined with website systems to produce fleet scheduling results), and "customized mathematical models produced by communicating with users and learning business logic from the communication". These 3 crucial technologies have achieved the successful development of the patented Carbon Reduction Intelligent Scheduling System. With the assistance of the system, not only has the efficiency of shipping routes increased and fuel costs decreased, but carbon emissions have also been reduced. Through the dispatching system developed by ITRI, it provides real-time route sequencing, calculates the overall route dispatching within 5 hours, and assists in solving port congestion issues.

ITRI will continue to refine this intelligent scheduling system to ensure that both the effectiveness of carbon reduction and economy are elevated, while also preparing for the transition to low-carbon green energy. In the future, the core model of this scheduling system can also be applied to other industries, such as steel, manufacturing, and traditional industries, etc., in an effort to improving the operational efficiency of more industries.

Carbon Reduction Intelligent Scheduling System Overview



5-2 Charity and Public Welfare

5-2-1 Visions and Guidelines

Making Taiwan a Better Place through Public Services that Involve Technology

ITRI's "Public Welfare Committee" was established in 2011 with the sustainable vision of "Making Taiwan More Beautiful". In addition to promoting industrial developments, we also strive to exercise our CSR, care for our communities, and enhance contributions to social welfare. ITRI focuses on 3 main aspects, which are respectively "Technology Application and Services", "Technology Education Promotions", and "Corporate Volunteers", followed by the integration of core technology R&D results, technological expertise, and the energy of corporate volunteer resources. Moreover, surplus funds are allocated to support public services each year, addressing issues related to emergency relief, public safety and care for the underprivileged. ITRI actively spreads this philosophy to the industry sector, aiming to encourage more companies to join efforts in fulfilling the social responsibility of the technology sector.

5-2-2 Charitable Activity

GRI 203-1、203-2、302-4

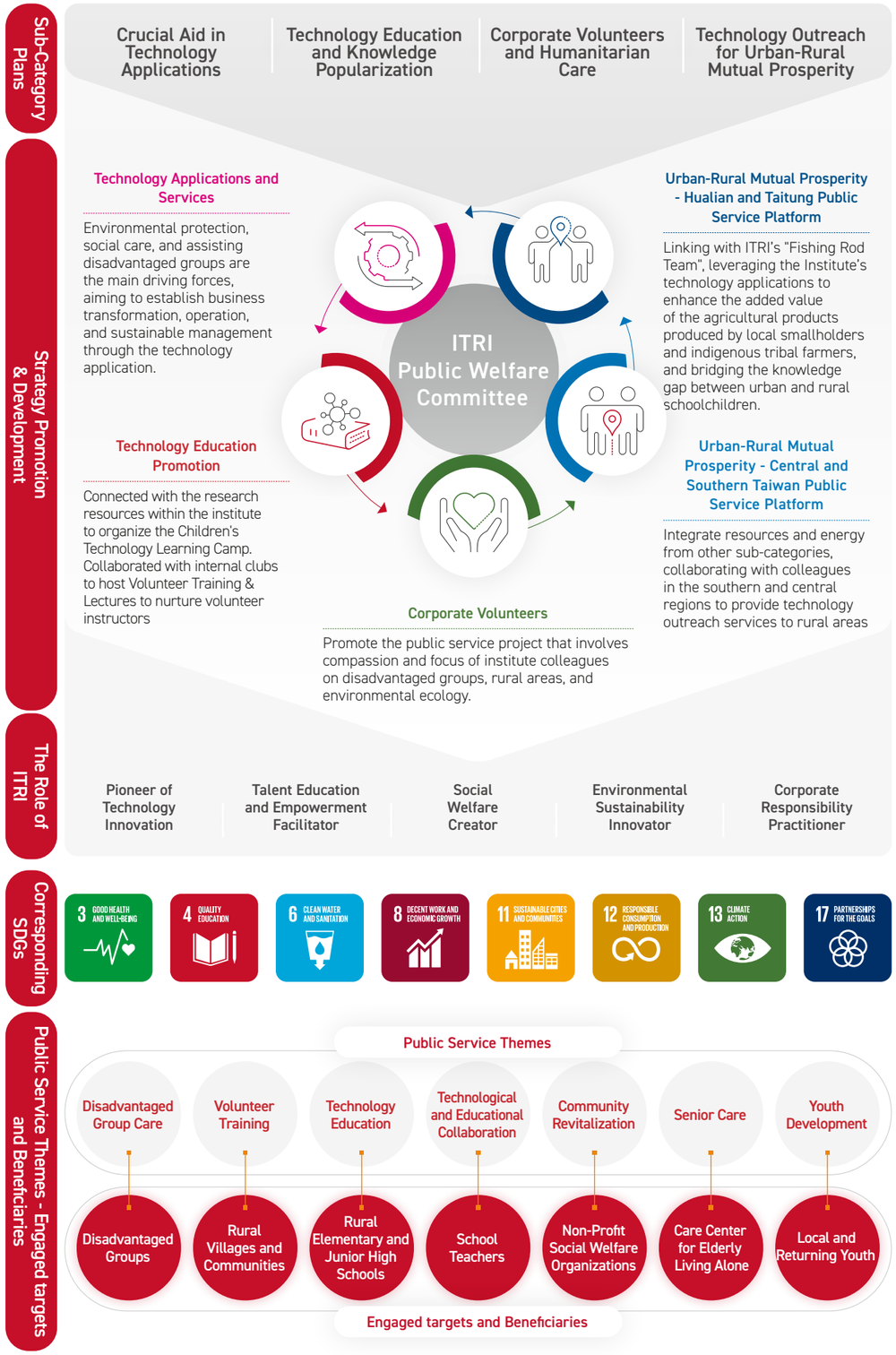
ITRI consistently promotes its Public Service Technology Platform, utilizing its technological expertise to engage in social welfare. It adheres to the spirit of "technological research driving industrial development, creating economic value, and enhancing social well-being", and further extends the application of its research outcomes to address public welfare. In addition to consolidating internal and external resources, ITRI focuses on youth cultivation, rural education, regional revitalization, and environmental conservation. It also pays attention to care for vulnerable communities, utilizing technological values as a robust foundation for improving the social environment. Through the application of its soft power of technology application, ITRI actively mobilizes various sectors to collectively enhance social well-being, The Public Service Technology Platform connects social welfare institutions, corporate partners, and government agencies, ensuring that all participating groups and individuals receive abundant rewards

To continuously and effectively manage social engagement activities, ITRI refers to the Impact Principles of the London Benchmark Group (LBG) as the basis for decision-making and planning in social engagement. ITRI strives to create and generate more effective public value, shaping an organizational culture that is "people-oriented" to support the development of practical technologies and products which align with human needs. In the future, we will actively collaborate with government agencies, corporate partners, and social welfare groups to work together globally and make the world a better place, jointly creating the values of a better society.

LBG Evaluation and Analysis on ITRI's Public Service Engagements

Partner Organizations/Groups	Sessions held	Media Exposure Benefits
46	53 public service events	233 media exposures
Manpower/Hour	Technology Applied Public Service Projects	Media value of NTD 7 million
496 individuals throughout the year	10 applications in the current year	Media Reach
A total of 11,000 person/days	94 applications accumulated	17,052 Facebook visits
Amount	Youth Empowerment	Number of people benefited
NTD 7,938,936	800 youths	4,908 individuals
Supplies	Trained Volunteers	Local Participation
200 units of recyclable materials	830 individuals	56 communities, villages, and schools
16 bikes and relevant equipment		

Public Service Program Promotions and Corresponding SDGs



Crucial Aid in Technology Applications

Utilizing cutting-edge technologies to establish a brighter future has always been ITRI's crucial mission. The institute ceaselessly contributes to society through our unique technology innovation, playing a role as a public service platform. Through social welfare technologies, ITRI meets the needs of marginalized communities and compensate for resource scarcity in rural areas within society. The objective is to collectively address urgent assistance issues and promote social and environmental protection.

As an industrial research and development organization, ITRI actively leverages our strengths to contribute to the public through technology. In addition to integrating the R&D capabilities of various laboratories and centers within the organization, we aim to assist the underprivileged, offer medical treatment, emergency relief, and enhance medical care. Taking into consideration the subsequent planning for commercialization and operation, we connect with businesses to sustain ongoing investments. This further allows us to extend our research results to contribute to public services and enhance the well-being of society.

Significant technology applications throughout the fiscal year include the collaborative use of independently developed water purifying devices by ITRI and social welfare organizations, the implementation of solar power generation systems through industry-academia collaboration, and a variety of easy-to-operate and lightweight disaster relief medical devices. These initiatives not only enhance the reach of the scope of technology applications for public services, but also enable the provision of public services to a greater number of vulnerable individuals in need. In the future, ITRI will continue to safeguard Taiwan with technology and collaborate with more partners to produce even greater positive benefits, making Taiwan a better place.

6 laboratories and centers
ITRI's internal laboratories and Centers contribute through technological innovations.

12 businesses
Contribute to public services collectively with other enterprises/ organizations.

10 projects
Technological R&D results applied in public services.

Net-Zero Transformation

Urine Microbial Fuel Cell (MFC) Application and Promotion Program for Net Zero Carbon Emissions

Emergency Relief

Water Purification Device Applications- Providing Clean Drinking Water in Remote/Under-Developed Countries and Disaster Areas

Bringing Light into Rural Areas with the Industry, Academia, and Research Sector

Smart Excavators for Public Service Projects: Increasing Disaster Rescue Efficiency

Smart Medtech

ITRI's Wireless Mobile Ultrasound Scanner: Bringing Smart Medtech into Rural Areas for Chronic Disease Screening

Smart Medtech E-Cart Go: Using Mobile Health to Safeguard Senior Health in Rural Areas

Integrated AR Technology Applied in Dizziness Detection among Community Seniors Program

Glucose PC Monitoring and Control Services Program for Diabetics in Rural Regions

The Erlin-Lelin Food Bank & Medical Care Sharing Model Trial Program in Erlin Township

Insurance Claim Calculation Support Program for Cancer Patients

Water Purification Device Applications - Providing Clean Drinking Water in Remote/Under-Developed Countries and Disaster Areas

According to the 2021 report from the UN World Meteorological Organization (WMO), the number of natural disasters caused by climate change, such as floods and heat waves, has increased fivefold in the past 50 years, resulting in over 2 million deaths. It is worth noting that more than 91% of the disasters occurred in developing countries, therefore, there is an urgent need to develop water purifying devices suitable for use in developing countries or remote areas.

Since 2022, ITRI has been collaborating with organizations such as World Vision and the Tzu Chi Foundation to extend the application of water purifying devices, ITRI's Qwater gadget and Portable UVC LED Water Sterilizer System, to disaster-stricken areas, aiming to protect public health by reducing the risk of waterborne pathogens in water sources, ensuring that vulnerable populations in developing countries and rural areas can have access to drinking water that meets safety standards.

External Impact

S (Social)

beneficiaries exceeding 450 people, the Portable UVC LED Water Sterilizer System provides over 1000 liters of purified water per day, and Qwater can filter 1100 liters of water per day (serving 7,500 people for daily drinking).

G (Governance)

developed two types of water purifying devices that are further applied in developing countries and remote areas to provide clean drinking water.

Equipment	Q WATER	UVC LED
Applications	• Taoyuan Municipal LuoFu Elementary School • Beijing Farm/Mount Wutai, Shanxi Province • Tibetan Community in Southern India/slums in Yangon, Myanmar • Warsaw Municipal Water Supply and Sewerage Company (MPWiK) • Typhoons Soudelor/Fung-wong/Haiyan	• Mountain areas in Hualien and Taitung and rural areas on Orchid Island • 2019: established Taiwan's first UVC-LED direct-drinking water module production line. • Partnered with the National Science & Technology Center for Disaster Reduction and Tzu Chi Foundation to integrate Portable UVC LED Water Sterilizer Systems into disaster relief applications. • Worked with World Vision to provide daily clean drinking water for the residents in the mountain areas in Hualien and Taitung and rural areas on Orchid Island, reducing the risk of diseases caused by waterborne pathogens.
Objective	**Clean Drinking Water for Daily Use and Disaster Relief Applications |** Provide vulnerable populations with drinking water that meets the standards for portable water, reducing the risk of diseases caused by waterborne pathogens.	
Pain Points	The commonly used gravity-based water purifying products internationally typically feature a single UF (Ultra Filtration) filter unit. In cases where there is high variability in the quality of the raw water, it can easily clog the UF membrane. This not only increases the frequency of replacements but also leads to higher costs and operational inconvenience.	Traditional UV mercury lamps are characterized by mercury poisoning, high operating voltage, and a lifespan of approximately 1 year.
Principle	Different types of pretreatment (e.g. with BioNET technology or sand filtering) can be customized according to the quality of the raw water to reduce the membrane load in water purification. Adjustments of the treatment methods can also be made in water purification according to variations in raw water quality.	By utilizing the principle of ultraviolet disinfection, the raw water is exposed to ultraviolet light, and thus disrupting the structure of DNA and RNA, ended with rendering microbiomes incapable of reproduction.
Benefits	• Easy to operate, convenient for transportation, consumable are easy to replace, and less prone to malfunctions. • The consumables are straightforward, and the assembly unit is simpler than traditional equipment, allowing for quick assembly (within 20 minutes). • Efficiently purifies highly turbid water, suitable for treating various water sources (river water, seawater, underground water, lake water, brackish water, etc.)	• The UVC LED Chip is small in size, eco-friendly, low energy consumption, with a lifespan of 4-5 years • The product has been recognized by the National Sanitation Foundation (NSF) and R&D 100 Awards. • Passed UV testing by SGS and the Food Industry Research and Development Institute (FIRDI). (Simulation scenario: when the water is severely contaminated with significantly elevated levels of coliform bacteria, it can be completely removed, achieving a sterilization rate of >99.99%). • Highly efficient, energy-saving, with no chemical residue.




Bringing Light into Rural Areas with the Industry, Academia, and Research Sector

The Dali and Datong Villages, which are situated at an altitude of over 1,000 meters in mountain areas inside the Taroko National Park (Xiulin Township, Hualien County), in which there are still more than 20 households of Truku indigenous people engaged in farming and living. However, there is no electricity infrastructure in the area due to the treacherous terrain and is therefore known as the "Village of Darkness". With resources from the industry, academia, and research sectors as well as National Dong Hwa University and several solar power vendors that donated solar energy equipment, the ITRI Public Services team ventured into the remote mountain villages to install the first 5 kW class stand-alone solar power generating and managing systems to replace the existing diesel generators and equipment. The innovative system integrates solar power generating and managing systems with lithium iron phosphate batteries weighing over 100 kg, with a daily storage capacity of approximately 10 to 12 kWh, sufficient for home electricity use (e.g. refrigerators, lighting, electric fans, etc.). The Public Services team also passed on basic techniques on how to effectively utilize the solar power generating and managing systems to achieve longer-term sustainable supply of green energy electricity to brighten the "Village of Darkness" with love.

Public service initiatives are like fireflies in the dark in that, despite their faint glow, when collective efforts come together, it can bring brightness. Similarly, this project brought together relevant stakeholders and resources to extend electricity to rural mountain villages, illuminating the indigenous regions in Hualien. We look forward to the next journey and collaboration, hoping that through such initiatives, more power problems in remote areas can be addressed.

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

External Impact

E (Environment)

Renewable Energy – installation of 5 kW class stand-alone solar power supply systems.

S (Social)

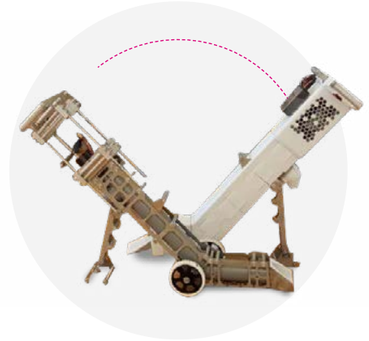
benefiting nearly 50 people

benefited 2 townships, 12 households, and nearly 50 individuals.

Smart Excavators for Public Service Projects: Increasing Disaster Rescue Efficiency

Taiwan is located in a region prone to frequent earthquakes and typhoons, often resulting in significant mudslide disasters. However, it is typically difficult to access landslide disaster areas, making the removal and disposal of waste sludge a major challenge in post-disaster recovery. To accelerate the reconstruction of disaster-stricken areas, ITRI developed a "Screw-Type Sediment Removal Machine" which utilizes the Archimedes screw principle to replace the manual process of using shovels. The mud would be rolled horizontally then discharged it at the bucket height and. The machine is characterized by its compact size, lightweight design, and simplified controls. It offers high maneuverability and can be operated by a single person. Furthermore, to maximize machine performance, ITRI used lightweight, 3D-printed carbon fiber screws to reduce power consumption, improve the sensitivity and accuracy of AI detection. Hopefully, the smart machines will aid affected individuals to normal life as soon as possible.

The ITRI Public Welfare Committee has signed an MOU for the [Public Service Technology Smart Service Platform] with the Tzu Chi Foundation. Both parties will jointly engage in public service technology initiatives such as conduct field verifications and assist in product development in the fields of Rural Technology, Emergency Relief, Recycling, Green Energy Technology, Net-Zero Carbon Emissions, Smart Care, and Smart Machinery. Through the combination of the volunteers' experiences with our R&D capabilities, the aim is to continuously enhance Taiwan's overall disaster relief efficiency through the development of public service technology initiatives.



10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

External Impact

S (Social)

benefiting 15 rural communities – provide rapid screening services for early diagnoses and assist the elderly in health management.

G (Governance)

developed the Screw Type Sediment Removal Machine to increase disaster rescue efficiency.

ITRI's Wireless Mobile Ultrasound Scanner: Bringing Smart Medtech into Rural Areas for Chronic Disease Screening

Due to the high rate of comorbidities and complications among Taiwan's large population of individuals with chronic illness, regular checkups are necessary to monitor symptoms that may be overlooked. However, traditional health checkups are limited by the availability of equipment and can only be conducted at designated medical facilities. For patients with mobility difficulties or living in remote areas, the distance and inconvenience could deter them from undergoing checkups regularly and consequently miss the optimal time for treatment. In response to this problem, ITRI developed a Wireless Mobile Ultrasound Scanner "ITRI SONO" which miniaturizes the traditional large ultrasound machine to the size of a mobile phone. It can be continuously used for about 1.5 hours and provides real-time imaging on mobile phones or tablets via WiFi, facilitating early diagnosis for individuals. ITRI also partnered with the Yunlin Branch of the National Taiwan University Hospital to launch the "Apollo Project" in Tuku Township, Yunlin County. The Project provides community members with free "Carotid Artery Ultrasound" examination services, allowing residents to check for stenosis, blockage, or congenital developmental abnormalities in the carotid vessels and assess the risks of related diseases through early diagnosis.

ITRI will continue to develop mobile medical equipment that allows medical workers to conduct health examinations anytime, anywhere by integrating domestically-produced soft/hardware with innovative Smart MedTech solutions. These technologies will significantly benefit residents in remote communities or less accessible areas, enhancing medical efficiency, reducing healthcare difficulties, preventing diseases in advance, and safeguarding the health and safety of the population.

3 GOOD HEALTH AND WELL-BEING | 10 REDUCED INEQUALITIES | 11 SUSTAINABLE CITIES AND COMMUNITIES

External Impact

S (Social)

benefiting 15 rural communities – provide rapid screening services for early diagnoses and assist the elderly in health management.

G (Governance)

developed the Wireless Mobile Ultrasound Scanner and its derivative products/technologies, collaborating with medical care systems.

3 GOOD HEALTH AND WELL-BEING | 10 REDUCED INEQUALITIES | 11 SUSTAINABLE CITIES AND COMMUNITIES

External Impact

S (Social)

570 disabled seniors served - provides community-based rapid screening services and early diagnoses. Cumulatively delivering rapid screening services to more than 20 long-term care (LTC) organizations and communities.

G (Governance)

developed the vital sign measuring smart medical kit - e-cart go, and collaborated with medical care systems.

Smart MedTech E-Cart Go: Using Mobile Health to Safeguard Senior Health in Rural Areas

Gongliao District is located in the remote northeast corner of New Taipei City. The area faces significant population outflow, and the proportion of elderly people living alone is high. Yet compared to cities, medical resources here are relatively scarce, posing a pressing need to address healthcare access for the elderly. ITRI cooperated with the New Taipei City Government and developed a vital sign measuring smart medical kit - e-cart go – for healthcare professionals from the Gongliao District Health Center, facilitating at-home medical examinations, allowing the elderly patients to receive real-time medical treatment. The kit incorporates devices such as a blood pressure meter, a wound care machine, an ultrasound scanner, a portable 12-Lead Electrocardiogram, a thermometer, and an otoscope; the kit can further be connected with examination medical devices. This enables real-time services such as abdominal ultrasounds, bladder residual urine volume measurements, analysis of wound inflammation and blood circulation information, and ultrasound and electrocardiograms. Additionally, this device integrates AIoT smart technology to interpret cardiac rhythms in real-time during consultations, enabling medical professionals to instantly grasp complete patient examination information on-site and proceed with necessary treatments.

This initiative overcomes geographic limitations and increases the mobility and convenience of medical care through the introduction of the lightweight e-cart go kits into rural areas. It significantly alleviates the issue of elderly disabled individuals in Gongliao facing difficulties in seeking medical treatment outside their homes. It also caters to the health needs of elderly living alone or having limited mobility. In the future, ITRI will continue to actively provide senior residents with home-based health services and offer essential Mobile Health Care Services to address the healthcare challenges faced by seniors in remote areas.

Technology Education | Spreading Knowledge in Communities

Lifestyle transformation stands as one of the crucial strategies for sustainable development in Taiwan's Pathway to Net-Zero Emissions in 2050. ITRI is committed to innovative R&D development as well as net-zero emission coaching services. This commitment not only brings solutions for industrial transformation but also creates new opportunities for basic science education and environmental sustainability.

ITRI has already introduced several accessible testing venues for innovative technology as well as science and technology-related educational events to promote technology education among the public and students in rural areas. We aim to expose more people to engage with the latest technologies and possess technological literacy, as well as to cultivate awareness of environmental and societal sustainability among rural children and the general public. These educational initiatives intend to lay the foundation for net-zero lifestyle transformations, and through technology education, cultivate the seeds for Taiwan's Pathway to Net-Zero Emissions in 2050.

ITRI collaborated with the industry, academia, research sectors, and nonprofit organizations to convert the Institute's abundant technological resources into educational materials. Through innovative interactive design in diverse settings and volunteer services, ITRI promotes science and environmental education through public lectures, teacher training, and general science outreach. By promoting science and technology education in rural areas, we aim to expose the children to new technological knowledge, foster awareness of environmental and societal sustainability, and ultimately influence peers and families. This, in turn, achieves a broader impact in the realm of public services.

8
Technology Education Camps

Cultivated **54**
little technology experts

751
colleagues participated

3
volunteer lectures

Public Service Lectures

Public Service Seminar - Tzu Chi's Sustainability and Vision – The Net-Zero Emission Initiative

Volunteer & Lecturer Recruitment and Training

Cross-Domain (Technology and Humanities) Seed Teacher Training Camp

Volunteer Recruitment – The Fools the World needs

Promotion of Technology Education

Shalun Green Energy Technology Camp

Digital Technology Education – "Hydrogen Energy Technology" Popular Science Education

Children's Technology Camp – The Rise of Green Technology

ESG Environmental Protection & Sustainability Popular Science Education

Hualien and Taitung Green Energy Technology Education Camp

Environmental Sustainability and Energy Development Popular Science Education for Rural Elementary Schools

Sending Love to Remote Regions X Education for Sustainability

The Innovating a Better Future Exhibition

Cross-Domain (Technology and Humanities) Seed Teacher Training Camp

Recognizing considerable learning disparities between students in urban and rural areas in basic education due to the unequal distribution of education resources between two areas and the differences in diverse learning opportunities, ITRI collaborated with Tzu Chi Foundation to organize the Cross-Domain (Technology and Humanities) Seed Teacher Training Camp at Tainan's Shalun Green Energy Technology Demonstration Site in the hope of benefiting society with their combined expertise. The Training Camp combines two key features - technology R&D and humanistic care - to create a virtual-reality integrated multi-domain training session, with a view to cultivating seed instructors with cross-domain capabilities in science and humanities, and becoming sustainable seeds to promote popular science education in underprivileged rural areas.

In addition to having a sufficient awareness of humanistic care, patient companionship and step-by-step guidance are also required to convert rigid and complex technological content into engaging and understandable popular science educational materials. During the Training Camp, ITRI's Green Energy Technology Team collaborated with 21 seed teachers, guiding over 50 disadvantaged students from remote areas in a fun blend of online and offline activities known as OMO challenge. The game, which integrates ITRI's net zero technologies with Tzu Chi's humanitarian and environmental perspectives, allowing children to learn explore knowledge about net-zero emission and introduced them to various innovative technologies in the Shalun Green Energy Technology Demonstration Site. Through the activities, students are encouraged to actively observe, discover, and solve problems, understand that technology is not beyond their reach, and that energy conservation is closely related to their daily lives, fostering their motivation to learn.

Going forward, ITRI will continue to collaborate with various government agencies and social welfare institutions, injecting new vitality into popular science education in disadvantaged rural areas. By doing so, we aim to spark new momentum, create a positive ripple effect that spreads across Taiwan, contributing our efforts to the sustainable development of the country.

External Impact

S (Social)

trained **21** seed teachers with cross-domain (technology & humanities) capabilities, impacting **50** rural students through the activity.

The Innovating a Better Future Exhibition

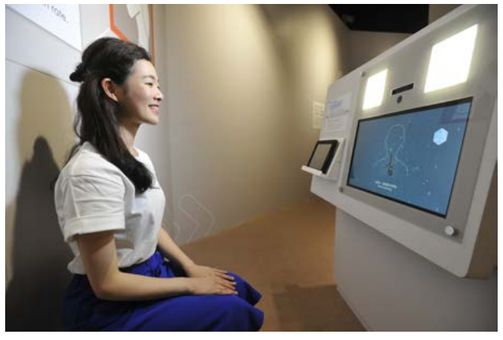
ITRI and the National Science and Technology Museum jointly established the Innovating a Better Future Exhibition to enhance the public's understanding of scientific knowledge as well as inspire school children's interest in science and technology. This family-friendly attraction is pioneering in exploratory learning and smart interactive experiences in Taiwan. Leveraging ITRI's R&D technologies and combining them with the educational display platform of the National Science and Technology Museum to create a technology wonderland that integrates virtual reality with real-life experiences.

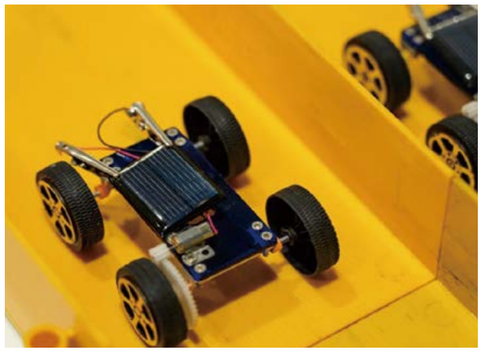
Unlike previous static science exhibitions, Innovating a Better Future transforms knowledge from textbooks into three-dimensional experiences by combining interactive experiences with curriculum content. 34 cutting-edge technologies from ITRI are presented in the exhibition's 8 major display areas (Test Lab, Circular World, Secret Chamber, Interstellar Concourse, Spacetime Terminal, Health Window, Smart Living, Inspire the Future) which fall under three main themes: Sustainable Environment, Quality Health, and Smart Living. The exhibition includes the "ICT Orchestral Interactive Water Globe" which produces music through blowing air, the "Nano-filtration Membrane" that can efficiently purify water and desalinate seawater, and the "Thermoelectric Energy Harvesting and Power Management" which generates electricity with body temperature. Through various popular science education activities, interactive games, and experiential learning opportunities, the lab provides a joyful and free exploration for families, sparking their imagination and fostering innovative thinking.

External Impact

S (Social)

240,000 **visits**; hosted 50 popular science education activities and benefited over 118,000 individuals.





Sending Love to Remote Regions X Education for Sustainability

Rural education not only needs to have diverse characteristics and foresight but also requires linking with local resources to ensure the long-term effects of public service. ITRI collaborated with National Dong Hwa University in Hualien to launch the "Remote Area Long-term Onsite Caring Program" to provide science and technology education for children in elementary and junior high schools in remote areas of Hualien and Taitung. This Program calls for passionate university students with expertise in digital information and science to participate in science education and volunteer training for elementary and junior high school students in remote areas of Hualien and Taitung to improve their scientific literacy and encourage them to implement energy conservation and carbon reduction practices.

The curriculum is based on green energy technology, combining Dong Hwa University's energy teaching with practical activity material design. By connecting energy with daily life issues, young students are guided to implement energy conservation and carbon reduction practices. For example, students will be asked to contemplate the issue of global warming through hands-on activities such as making hand-crank flashlights. The curriculum has been incorporated into the Hualien County Government Elementary School curriculum and is conducted as a regular weekly information and science education program at Hualien's Xilin Elementary School and Beilin Elementary School. We strive to extend the long-term benefits and impact of science education in rural areas by linking the program with local resources and implementing regular and fixed-point science education.

External Impact

S (Social)

benefited 4 townships and 4 rural schools, impacted 193 individuals, and involved 12 volunteers through the project

Corporate Volunteers | Humanistic care

Colleagues at ITRI are called on to voluntarily serve as volunteers for public services to assist in the implementation of various technology applications and public welfare resources in local communities. Furthermore, ITRI also integrated resources from internal societies, numerous laboratories and centers as well as external NGOs to jointly promote the "Clubs and Us – Public Service program", and collaborated with stakeholders from various sectors to organize public service activities.

The target beneficiaries of volunteer services mainly focus on disadvantaged groups, indigenous children and seniors, and residents in rural areas. Various parties are encouraged to consistently leverage their strengths to actively participate in social care activities, thereby expanding the impact and long-term benefits of these public service initiatives. ITRI's internal societies persevered in providing public services in remote areas this year despite the pandemic. In addition to donating laptops, tables, chairs, u-BIKEs, and other equipment, They simultaneously consider the significance of both philanthropy and innovative recycling. These efforts enhance the Institute's overall social value.

4
types of beneficiaries

36
social welfare organizations benefited

13
groups/laboratories and centers working together

13
ITRI internal and external charity events

Public Service-Themed Events

- Showing Love to the Planet - Donate Receipts, Get Free Tree Saplings
- Reducing Carbon Footprints - Eleven Years of Tankan Charity Sales
- Tribute to the Sea - Fall Beach Cleaning Event

Public Service Events ITRI's Societies & laboratories/centers Participated In

- 2022 Net-Zero Carbon Emissions and Resource Sustainability
- Decommissioned Computer Recycling Program - Donations to Social Welfare Organizations
- 2022 Sending Love to Indigenous Communities I & II
- ITRI u-BIKE Charity Donation
- Life & Lifestyle X Environmental Education Activities
- Disadvantaged Student Experience Education
- Fall Beach Cleaning Event – opening your EYE
- ITRI Office Desk Charity Donation
- Taiwan Spinocerebellar Ataxia Association Field Trip - Volunteer Companions
- Online Learning GoGoGo

Showing Love to the Planet - Donate Receipts, Get Free Tree Saplings

ITRI initiated a Charity Tree Planting Event on Earth Day to mitigate the impact of climate change on the overall environment and help social welfare organizations affected by the decline in donations during the pandemic. ITRI colleagues were asked to exchange various tree saplings with used receipts. In addition to increasing carbon sequestration volume and reducing carbon emissions, planting trees can enhance the aesthetic appeal and greenery of the working environment, creating a better habitat for organisms. Furthermore, through tree planting education, colleagues are encouraged to embrace environmental greening concepts, thereby promoting source sustainability and protecting our planet.

The 4,072 receipts collected during the event were donated to the Children Are Us Foundation and the Taiwan Fund for Children and Families, Hsinchu Branch. In addition to increasing carbon sequestration volume and reducing carbon emissions, the 814 indigenous tree species (such as Green Maple, Broad-leaved Podocarpu, Taiwan Gordonia, Japanese Cleyera, Monostyle St. John's Wort, Tashio's Hawthorn, etc.) planted by ITRI colleagues also support the scalable growth of native species, thereby preserving the distinctive characteristics of our local ecosphere.

13 CLIMATE ACTION | 15 LIFE ON LAND

External Impact

S (Social)

4072 receipts donated, 2 social welfare organizations benefited

Reducing Carbon Footprints - Eleven Years of Tankan Charity Sales

ITRI partners with businesses, academic associations, and NGOs to organize tankan (orange) charity sales, collaborating with local fruit farmers to promote their environmentally friendly produce. These charity sales, which have been held for eleven consecutive years, not only address the sales challenges faced by small farmers in the local area but also encourage people to subscribe to eco-friendly produce. Additionally, businesses are facilitated to engage in philanthropic procurement, donating proceeds from sales to local social welfare organizations, with an effort to harness collective efforts to contribute to environmental sustainability and support local communities.

In 2022, over 12,000 kilos of tankans from low-pesticide and eco-friendly cultivation by fruit farmers in Chunglin, Hsinchu were sold at the charity sale. Through explanations and demonstrations by fruit farmers and ITRI volunteers, we encourage the public to adopt a net-zero and low-carbon diet aligned with the principle of "Choose Seasonal, Less Processed" advocated by the Health Promotion Administration, Ministry of Health and Welfare, benefiting both the environment and public health. Moreover, under this principle, it is also encouraged that choosing fresh seasonal fruits for cooking instead of processed products is not only nutritious but also trustworthy.

8 DECENT WORK AND ECONOMIC GROWTH | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 17 PARTNERSHIPS FOR THE GOALS

External Impact

S (Social)

Raised NTD **450,000** in charitable funds and donated to **24** NGOs

Technology Outreach into Remote Areas | Prosperity for Both Urban and Rural Areas

Leveraging resources from its operational bases in Taiwan's Central and Southern regions, ITRI integrates resources from technical laboratories and centers in the central and southern regions as well as the Hualien-Taitung region, along with the participation of community volunteers, to provide services surrounding communities. The Institute mainly engages in initiatives such as social service visits, technology outreach into rural areas, and revitalization of indigenous community to provide long-term care and support to local disadvantaged groups.

ITRI provides local and rural public services by utilizing its strengths in material chemistry, agriculture & industry, and processing technologies. To bring technology education to remote locations, for example, local features can be combined with 3D printing technology, hands-on technology experiences, and agricultural application technologies. These charitable initiatives, which are organized in remote mountain areas and offshore islands, enhance community industrial value, focus on local youth to help them revitalize the local economy, promoting economic development and improving livelihoods. The commitment to public welfare continues uninterrupted.

12 technological revitalization and promotion programs

6 indigenous community revitalization programs

5 processed products developed

6 science and technology outreach events in remote areas

4 online after-school tutoring sessions

Technology Outreach into Remote Areas

- Tainan Home Of Philanthropy Service Program- Technological and Vocational Experience Sharing and Exchange
- Application of 3D Printing Technology
- Public Service Program: Recycling Agricultural and Industrial Waste into Artwork
- Taro Fragrance Extraction and Application
- Application of Test Field Results of Vermicomposting
- Application of Biology and Bio-Products
- Renewable Energy - Hydrogen Production Experience Program

Local Revitalization

- Applying Visual Identification Technology to Upcycle Oyster Shells
- Old Communities, New Lives - Dachen 1st Village
- Reusing Agricultural Waste on Orchid Island – The Spring of Lily Flowers
- Love Expands - The Masuaz Family House of Bahuan Village
- The Tminun Weaving Workshop for Teen Moms
- Rural Community Revitalization Support Program – Value-Added Technologies for Ramie and Bitter Tea

The Tminun Weaving Workshop for Teen Moms

The rate of teen moms under the age of 19 in the Hualien area ranks first in Taiwan. Early school dropout leads to difficulties in employment, coupled with disparities in urban and rural development and uneven distribution of educational resources. The situation poses economic, parenting, mental impact, and social stigma for teen moms and their children.

ITRI and the Woodpecker Life Association have collaborated on the "Remote Community Care Program" in Hualien's indigenous communities to address the issues of early pregnancy and employment among women. Utilizing the premises of a decommissioned elementary school, the project established the Tminun Weaving Workshop for Girls, to assist in training traditional tribal women in weaving techniques, fostering their ability to independently produce and sell their wares. By integrating the weaving skills of teen moms with second-hand clothes, the project embraces traditional weaving techniques, develops unique tribal textiles, connects with neighboring businesses, establishes physical retail outlets, and provides online shopping services. This enhances their employment capabilities, enabling them to achieve economic independence and support the next generation.

In addition, ITRI also assisted in the establishment of the Masuaz ("sowing seeds" in the Bunun language) Family House in the Bahuan Village in Hualien. The venue supports local families in creating a wholesome and friendly environment for children to grow and hosts parent-child learning sessions as well as lectures on parenting, legal assistance, and baby-caring training to enhance the residents' parental knowledge.

External Impact

S (Social)

supported 16 teen moms and 23 children

Applying Visual Identification Technology to Upcycle Oyster Shells

ITRI conducted a survey in Chiayi and found that the lacking element in local youth education is not equipment or teaching tools but dedicated social service teams and volunteers willing to provide ongoing support. As Taiwan's largest oyster cultivation area, Chiayi produces approximately 90,000 tons of waste oyster shells annually, causing serious environmental pollution issues. The oyster shell visual recognition guidance technology was created by ITRI's public service and R&D teams in response to the abovementioned two issues. Through the incorporation of local aesthetics, oyster shell upcycling, and marine environmental education, we aim to extend the value of waste oyster shells. ITRI's team introduced this new technology along with net-zero carbon emission concepts and the recycling of marine waste to young students in remote areas, allowing them to become familiar with the technology. Starting from the southwest coast of Taiwan, we strove to alleviate the problem of waste oyster shells through recycling and upcycling encompassing approaches such as transforming the waste oyster shells into creative products with distinctive local features, all aimed at addressing the issue of oyster shell pollution.

Furthermore, ITRI later extended this technology to social welfare organizations, including the Taiwan Fund for Children and Families, Tainan Branch; Taiwan Fund for Children and Families, Chiayi Branch; Talentfield-Chiayi, Chiayi Senior Dining Hall, and Taiwan Wild Field School. The project allows the disadvantaged children, youth, and the seniors within these organizations to learn professional skills, creating a circular aesthetic using oyster shells. This initiative aims to activate self-sufficiency, autonomy, and self-sustainability.

External Impact

S (Social)

reached 4,213 individuals

6 technology education events organized

213 students in Tainan and Chiayi influenced

Appendix 1: GRI Standards Index

General Disclosures

Statement of Use	ITRI has reported the contents between January 1, 2022, and December 31, 2022, in accordance with the GRI Standards.
GRI 1 Used	GRI 1: Foundation (2021)
Applicable GRI Sector Standards	NA

Disclosure		Corresponding Chapters/Sections	Page No.
GRI 2: General Disclosures (2021)			
2-1	Organizational Details	About ITRI	P18
2-2	Entities Included in the Organization's Sustainability Reporting	Scope of the Report	P2
2-3	Reporting Period, Frequency, and Contact Point	Reporting Period and Publishing Cycle	P2
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Material Topic: Technology Innovation and R&D

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3-3	Management of Material Topics	Material Topic Management	P32-P33
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Material Topic: Sustainable, Net Zero Transformation

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Material Topic: Organizational Culture and Integrity Governance

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		ITRI 2035 Technology Strategy & Roadmap	P60-P61
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GRI 204: Procurement Practice			
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Appendix 2: Related Data

Table 1: Employee Statistics, by Type

Employee Type		2020		2021		2022	
		Number of People	%	Number of People	%	Number of People	%
Permanent Employees	M	3,972	64.34%	3,862	63.53%	3,709	61.82%
	F	2,201	35.66%	2,217	36.47%	2,291	38.18%
	Total	6,173	100.00%	6,079	100.00%	6,000	100.00%
Temporary Employees	M	461	71.58%	406	69.64%	354	70.24%
	F	183	28.42%	177	30.36%	150	29.76%
	Total	644	100.00%	583	100.00%	504	100.00%
Full-time Employees	M	4,144	64.59%	3,977	63.57%	3,814	61.82%
	F	2,272	35.41%	2,279	36.43%	2,356	38.18%
	Total	6,416	100.00%	6,256	100.00%	6,170	100.00%
Part-time Employees	M	289	72.07%	291	71.67%	249	74.55%
	F	112	27.93%	115	28.33%	85	25.45%
	Total	401	100.00%	406	100.00%	334	100.00%
Total (All types)	M	4,433	65.03%	4,268	64.06%	4,063	62.47%
	F	2,384	34.97%	2,394	35.94%	2,441	37.53%
	Total	6,817	100.00%	6,662	100.00%	6,504	100.00%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year.
2. The statistics include employees in both domestic and overseas operations. In 2022, there were 5 employees in the US., 1 in Germany, and 1 in Japan.
3. Total (All types) = Permanent Employees + Temporary Employees = Full-time Employees + Part-time Employees.

Table 2:【Statistics of New Employee Hires (Temporary Employees | By Gender and Age)】

Type \ Year		2020		2021		2022	
		Number of People	%	Number of People	%	Number of People	%
Gender	M	767	68.18%	1,216	61.23%	701	66.51%
	F	358	31.82%	770	38.77%	353	33.49%
Age	Less than 30	979	87.02%	1,293	65.11%	926	87.86%
	30 – 49	126	11.20%	540	27.19%	111	10.53%
	50 and above	20	1.78%	153	7.70%	17	1.61%
Total Number of New Employee Hires		1,125		1,986		1,054	

Table 3: Employee Statistics, by Job Type

Job Type \ Year	2020				2021				2022			
	M	F	Number of People	% of F	M	F	Number of People	% of F	M	F	Number of People	% of F
Research / Engineering	3,559	1,146	4,705	24.36%	3,455	1,137	4,592	24.76%	3,299	1,144	4,443	25.75%
Management	381	1,050	1,431	73.38%	380	1,074	1,454	73.87%	379	1,141	1,520	75.07%
Others	32	5	37	13.51%	27	6	33	18.18%	31	6	37	16.22%
Total Number of People	3,972	2,201	6,173	35.66%	3,862	2,217	6,079	36.47%	3,709	2,291	6,000	38.18%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year, including employees in both domestic and overseas operations.
2. The calculation represents the percentage of full-time employees by job type.

Table 4: Employee Statistics, by Age

Type \ Year	2020		2021		2022	
	Number of People	%	Number of People	%	Number of People	%
Less than 30	1,132	16.61%	1,043	15.66%	947	14.56%
30 – 49	3,935	57.72%	3,889	58.38%	3,795	58.35%
50 and above	1,750	25.67%	1,730	25.97%	1,762	27.09%
Total	6,817	100.00%	6,662	100.00%	6,504	100.00%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year, including employees in both domestic and overseas operations (5 in the US and Canada, 1 in Germany, and 1 in Japan).
2. The calculation represents the percentage of all employees (permanent + temporary) by age, not including employees on unpaid leave or non-employee workers.

Table 5: Employee Statistics, by Management Level

Type \ Year	2020				2021				2022			
	M	F	Number of People	% of F	M	F	Number of People	% of F	M	F	Number of People	% of F
Senior Management	63	8	71	11.27%	59	10	69	14.49%	58	15	73	20.55%
Middle Management	517	141	658	21.43%	524	152	676	22.49%	529	159	688	23.11%
Business Supervisor	593	287	880	32.61%	609	316	925	34.16%	634	337	971	34.71%
Frontline Staff	2,799	1,765	4,564	38.67%	2,670	1,739	4,409	39.44%	2,488	1,780	4,268	41.71%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year, including employees in both domestic and overseas operations (5 in the US and Canada, 1 in Germany, and 1 in Japan).
2. The calculation represents the percentage of permanent employees by gender and management level, not including temporary employees, employees on unpaid leave, or non-employee workers.
3. Senior management refers to deputies (and above) in the leadership roles in the president's office and departments. Middle management refers to the first and second-level managers and their deputies in functional roles in departmental laboratories and centers. Business supervisors are non-functional managers. Frontline staff refers to general employees.

Table 6: Employee Statistics, by Diversity Index

Type \ Year	2020		2021		2022	
	Number of People	%	Number of People	%	Number of People	%
Physically and Mentally Disabled	65	0.95%	60	0.90%	54	0.83%
Indigenous Peoples	12	0.18%	10	0.15%	7	0.11%
Other Nationalities	69	1.01%	74	1.11%	75	1.15%
Total	146	2.14%	144	2.16%	136	2.09%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year, including employees in both domestic and overseas operations (5 in the US and Canada, 1 in Germany, and 1 in Japan).
2. The calculation represents the percentage of all employees (permanent + temporary) by diversity index, not including employees on unpaid leave or non-employee workers.
3. Other nationalities refer to employees with foreign nationalities, including new immigrants.
4. ITRI is dedicated to hiring individuals with physical/mental disabilities and from indigenous backgrounds. However, due to the specific nature of the positions it offers, there has been a shortage of applicants from these backgrounds. As a result, the employment rate of the year has not reached the legal requirement of 1%, and ITRI has accordingly made deposits to the designated employment fund account as required by regulations. It will increase its efforts in this regard to enhance recruitment with a diverse, inclusive, and open mindset, striving to meet regulatory requirements.

Table 7: Employee Statistics, by Educational Background

Type \ Year	2020		2021		2022	
	Number of People	%	Number of People	%	Number of People	%
PhD Degree	1,382	22.39%	1,336	21.98%	1,278	21.30%
Master's Degree	3,738	60.55%	3,711	61.04%	3,709	61.82%
Bachelor's Degree	753	12.19%	749	12.32%	758	12.63%
Associate Degree	232	3.76%	220	3.62%	199	3.32%
Senior High School and Below	68	1.11%	63	1.04%	56	0.93%
Total	6,137	100.00%	6,079	100.00%	6,000	100.00%

Note: 1. The statistics represent the number of in-service employees as of December 31 of each year, including employees in both domestic and overseas operations (5 in the US and Canada, 1 in Germany, and 1 in Japan).
2. The calculation represents the percentage of permanent employees by educational background, not including temporary employees, employees on unpaid leave, or non-employee workers.
3. The percentage of ITRI staff with a master's degree or above reaches 83.12%.

Table 8: Non-Employee GRI 2-8

Type \ Year	2020		2021		2022	
	Number of People	%	Number of People	%	Number of People	%
M	330	25.96%	320	25.22%	307	24.29%
F	941	74.04%	949	74.78%	957	75.71%
Total	1,271	100.00%	1,269	100.00%	1,264	100.00%

Note: 1. The statistics represent the number of in-service workers as of December 31 of each year.
2. Non-official employees refer to dispatched workers from agencies which have signed labor contracts with ITRI, who are assigned to locations designated by ITRI, and who receive instruction, supervision, and management from ITRI staff while providing services.
3. Dispatched workers to ITRI primarily engage in R&D support tasks, routine tasks, and non-core business tasks.

Table 9: Statistics of Employee Benefit Expenditures

Year	2020	2021	2022
Total Amount of Employee Benefit Expenditures	1,247,539,021	1,279,738,311	1,265,805,983

Note: 1. The amount in the table is shown in New Taiwan dollars.
2. This includes retirement pensions, employer-covered insurance premiums, funds for laboratory/center-level employee welfare committees, leisure activities, travel, scholarships for employees' children, institute-wide major events, maintenance of sports facility, club activities, and charitable donations.

Table 10: Gender Ratio in Promotion across Job Levels

Type \ Year	2020				2021				2022			
	M	F	M	F	M	F	M	F	M	F	M	F
Principal Level and Above	24	4	85.71%	14.29%	19	5	79.17%	20.83%	21	12	63.64%	36.36%
Senior Specialist Level	90	41	68.70%	31.30%	82	47	63.57%	36.43%	92	40	69.70%	30.30%
Specialist Level	83	59	58.45%	41.55%	76	72	51.35%	48.65%	89	73	54.94%	45.06%
Deputy Level and Below	7	7	50.00%	50.00%	11	12	47.83%	52.17%	4	12	25.00%	75.00%
Total	204	111	64.76%	35.24%	188	136	58.02%	41.98%	206	137	60.06%	39.94%

Appendix 3: Independent Verification

ISO 45001:2018 Occupational Health and Safety Management System (Certified by BSI)

bsi.

Certificate of Registration

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM - ISO 45001:2018

This is to certify that: Industrial Technology Research Institute
No. 195, Sec. 4, Chung Hsing Rd.
Chutung Town
Hsinchu County
310401
Taiwan

財團法人工業技術研究院
臺灣
新竹縣
竹東鎮
中興路四段195號
310401

Holds Certificate No: **OHS 739489**

and operates an Occupational Health and Safety Management System which complies with the requirements of ISO 45001:2018 for the following scope:

1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.

The client is originally certified by SGS with Certificate No. TW18/00319 before 2020-11-18.
[Previously certified to BS OHSAS 18001:2007 since 2018-05-08]
1. 產業科技研發 2. 知識型服務 3. 技術衍生加值

For and on behalf of BSI:

Chris Cheung, Head of Compliance & Risk - Asia Pacific

Original Registration Date: 2020-04-15
Latest Revision Date: 2021-03-24

Effective Date: 2021-05-08
Expiry Date: 2024-05-07

Page: 1 of 3

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A Member of the BSI Group of Companies.

ISO 20000-1:2018 Information Technology Service Management System (Certified by SGS)

Certificate TW08/00241

SGS

The management system of
INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE
No. 195, Sec. 4, Chung Hsing Road, Chutung, Hsinchu 310, Taiwan (R.O.C.)
has been assessed and certified as meeting the requirements of
ISO/IEC 20000-1:2018

For the following activities
The IT service management system of the INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE supporting the provision of all internal IT services consisting of the 18866 Help Desk for all employees via the IT Service Center in accordance with the Service Catalogue.

This certificate is valid from 09 May 2023 until 09 May 2026 and remains valid subject to satisfactory surveillance audits.
Issue 8: Certified since 09 May 2008

Authorised by
Stephen Pan
Deputy Director

SGS Taiwan Ltd.
No. 106-1, Wu Kung Road, New Taipei Industrial Park, Wu Ku District, New Taipei City 24803, Taiwan
t +886 (02) 2299 3939 - www.sgs.com.tw

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QUALITY MANAGEMENT SYSTEM - ISO 9001:2015

This is to certify that: Industrial Technology Research Institute
No. 195, Sec. 4, Chung Hsing Rd.
Chutung Town
Hsinchu County
310401
Taiwan

財團法人工業技術研究院
臺灣
新竹縣
竹東鎮
中興路四段195號
310401

Holds Certificate No: **FS 739488**

and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope:

1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.

The client is originally certified by SGS Certification with Certificate No. TW09/00160 before 2020-11-18.
1. 產業科技研發 2. 知識型服務 3. 技術衍生加值

For and on behalf of BSI:

Chris Cheung, Head of Compliance & Risk - Asia Pacific

Original Registration Date: 2009-04-07
Latest Revision Date: 2021-03-24

Effective Date: 2021-04-07
Expiry Date: 2024-04-06

Page: 1 of 3

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Taiwan Headquarters: 2nd Floor, No.37, Jihu Rd., Neihu Dist., Taipei 114, Taiwan, R.O.C.
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Certificate No: **FS 739488**

Location	Registered Activities
Industrial Technology Research Institute No. 195, Sec. 4, Chung Hsing Rd. Chutung Town Hsinchu County 310401 Taiwan 財團法人工業技術研究院 臺灣 新竹縣 竹東鎮 中興路四段195號 310401	1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.
Industrial Technology Research Institute No. 321, Sec. 2, Kuang Fu Rd. East Dist. Hsinchu City 300044 Taiwan 財團法人工業技術研究院 臺灣 新竹市 東區 光復路二段321號 300044	1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.
Industrial Technology Research Institute No. 8, Gongyan Rd. Liujia Dist., Tainan City 734045 Taiwan 財團法人工業技術研究院 臺灣 台南市 六甲區 工研路8號 734045	1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.

Original Registration Date: 2009-04-07
Latest Revision Date: 2021-03-24

Effective Date: 2021-04-07
Expiry Date: 2024-04-06

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ISO 14064-1:2018 Organizational Level GHG Inventory Standards (Certified by CPC)

中國生產力中心 CPC China Productivity Center

意見書編號：VB018-112014

溫室氣體查證意見書

2022 年溫室氣體排放資訊

財團法人工業技術研究院

中興院區（新竹縣竹東鎮中興路四段 195 號）
光復院區（新竹市光復路二段 321 號）
六甲院區（台南市六甲區工研路 8 號）
光明新村（新竹市光復路二段光明新村）

經本中心依據 ISO 14064-3:2019 完成查核並符合下列標準要求

ISO 14064-1：2018

財團法人工業技術研究院依證聲明的資料與資訊為歷史性質，本中心依 ISO 14064-3:2019 規範對其於 2022 年 01 月 01 日至 2022 年 12 月 31 日的組織活動溫室氣體排放量進行自願性方案查證，查證結果符合 ISO 14064-1:2018 規範，據此給予無保留意見如下：

- **合理保證等級**：類別 1 及類別 2
  直接溫室氣體排放量 4,865.798 公噸二氧化碳當量。
  輸入能源之間接溫室氣體排放量為 47,192.267 公噸二氧化碳當量。

【責任聲明】財團法人工業技術研究院負責溫室氣體報告之聲明，本中心責任為對其所報告之溫室氣體聲明的準確性，及間於蒐集、分析和審查資訊的基礎系統和過程提供獨立查證。

TAF Validation and Verification VB018

CPC

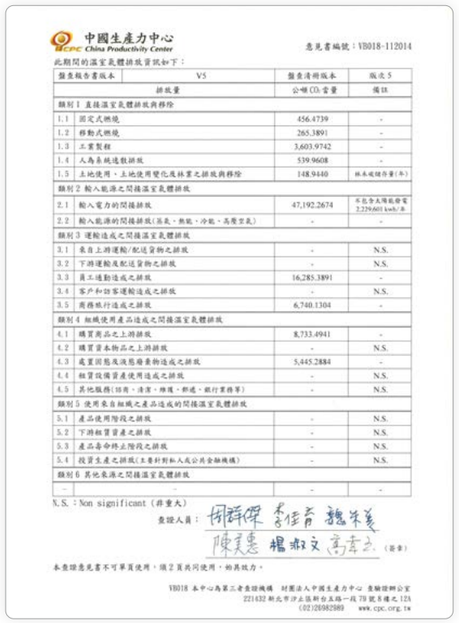
財團法人中國生產力中心
總經理

張寶誠

意見書發行日：2023-08-02

本查證意見書不可單頁使用，頭2頁共同使用，始具效力。

VB018 本中心為第三者查證機構 財團法人中國生產力中心 查驗證明辦公室
221432 新北市汐止區新台五路一段 79 號 8 樓之 12A
(02)26982989 www.cpc.org.tw



中國生產力中心 CPC China Productivity Center

意見書編號：VB018-112014

此期間的溫室氣體排放資訊如下：

盤查報告書版本	V5	盤查清冊版本	版次 5
	排放量	公噸 CO_2 當量	備註
類別 1 直接溫室氣體排放與移除			
1.1	固定式燃燒	456.4739	-
1.2	移動式燃燒	265.3891	-
1.3	工業製程	3,603.9742	-
1.4	人為系統逸散排放	539.9608	-
1.5	土地使用、土地使用變化及林業之排放與移除	148.9440	林木碳儲存量(年)
類別 2 輸入能源之間接溫室氣體排放			
2.1	輸入電力的間接排放	47,192.2674	不包含太陽能發電 2,229,601 kwh/年
2.2	輸入能源的間接排放(蒸氣、熱能、冷能、高壓空氣)	-	-
類別 3 運輸造成之間接溫室氣體排放			
3.1	來自上游運輸/配送貨物之排放	-	N.S.
3.2	下游運輸及配送貨物之排放	-	N.S.
3.3	員工通勤造成之排放	16,285.3891	-
3.4	客戶和訪客運輸造成之排放	-	N.S.
3.5	商務旅行造成之排放	6,740.1304	-
類別 4 組織使用產品造成之間接溫室氣體排放			
4.1	購買商品之上游排放	8,733.4941	-
4.2	購買資本物品之上游排放	-	N.S.
4.3	處置固態及液態廢棄物造成之排放	5,445.2884	-
4.4	租賃設備資產使用造成之排放	-	N.S.
4.5	其他服務(特有、清潔、修理、郵遞、銀行業務等)	-	N.S.
類別 5 使用來自組織之產品造成的間接溫室氣體排放			
5.1	產品使用階段之排放	-	N.S.
5.2	下游租賃資產之排放	-	N.S.
5.3	產品壽命終止階段之排放	-	N.S.
5.4	投資生產之排放(主要針對私人或公共金融機構)	-	N.S.
類別 6 其他來源之間接溫室氣體排放			
-		-	-

N.S.：Non significant（非重大）

查證人員：

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VB018 本中心為第三者查證機構 財團法人中國生產力中心 查驗證明辦公室
221432 新北市汐止區新台五路一段 79 號 8 樓之 12A
(02)26982989 www.cpc.org.tw

Certificate No: **FS 739488**

Location	Registered Activities
Industrial Technology Research Institute No. 2, Wenxian Rd. Nantou City Nantou County 540219 Taiwan 財團法人工業技術研究院 臺灣 南投縣 南投市 文獻路2號 540219	1. The provision of advanced technology research and development (R&D) 2. The provision of knowledge-based services 3. The provision of intellectual property (IP) business and new ventures.

Original Registration Date: 2009-04-07
Latest Revision Date: 2021-03-24

Effective Date: 2021-04-07
Expiry Date: 2024-04-06

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ISO 27001:2013 Information Security Management System (Certified by SGS)

Certificate TW11/10272, continued

INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE

ISO/IEC 27001:2013

The following business processes and software development:
(1) Research Project Information Platform in OASR - Research Project Information Platform Process Owner.
(2) Technical Bulletin System in TTLC - Technical Bulletin System Process Owner.
(3) Patent Management System in TTLC - E Division.
(4) Electronic Research Notebook in ITSC - Electronic Research Notebook Process Owner.
(5) Engagement Management System in BDC - Engagement Management System Process Owner.
(6) Contract Review System in TTLC - Contract Review System Process Owner.
(7) NDA Management System in BDC - NDA Management System Process Owner. IST1 - NDA Management System Process Owner. ITSC - NDA Document Management System Process Owner.
(8) Non-tech Confidential Document Management System in ITSC - Non-tech Confidential Document Management System Process Owner.
(9) PeopleSoft/Human Capital Management in HR.
(10) iTR Health Management System in HR - iTRI Health Management Process Owner.
(11) SAP/Financial Accounting System in FAC - AR/AP Members, SAP/Financial Accounting System Process Owner.
(12) E-mail System in ITSC - G300 Department.
Data Analytics Process for Project Received Customer Data and project members and Related IT services: Data Center, Software Development, Performed in ICL-INIT Division.
ITSC Web Hosting Service, Data Center, Network Management, Remote Backup and 18899 Call Center.
This is in accordance with the Statement of Applicability, version 10.

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Certificate TW11/10272

The management system of

INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE

No. 195, Sec. 4, Chung Hsing Road, Chutung, Hsinchu 310, Taiwan (R.O.C.)

has been assessed and certified as meeting the requirements of

ISO/IEC 27001:2013

For the following activities:
The Scope of Registration appears on page 2 of this certificate

This certificate is valid from 09 May 2023 until 31 October 2025 and remains valid subject to satisfactory surveillance audits.

Issue 9. Certified since 09 May 2011
Certified activities performed by additional sites are listed on subsequent pages.

Authorised by
Jonathan Hall
Global Head - Certification Services

SGS United Kingdom Ltd
Rossmere Business Park, Ellesmere Port, Cheshire, CH65 3EN, UK
t +44 (0)151 350 6666 - www.sgs.com/

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Certificate TW11/10272, continued

INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE

ISO/IEC 27001:2013

Issue 9
Sites
INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE No. 195, Sec. 4, Chung Hsing Road, Chutung, Hsinchu 310, Taiwan (R.O.C.) The following business processes and software development: (1) Research Project Information Platform in OASR - Research Project Information Platform Process Owner. (2) Technical Bulletin System in TTLC - Technical Bulletin System Process Owner. (3) Patent Management System in TTLC - E Division. (4) Electronic Research Notebook in ITSC - Electronic Research Notebook Process Owner. (5) Engagement Management System in BDC - Engagement Management System Process Owner. (6) Contract Review System in TTLC - Contract Review System Process Owner. (7) NDA Management System in BDC - NDA Management System Process Owner. IST1 - NDA Management System Process Owner. ITSC - NDA Document Management System Process Owner. (8) Non-tech Confidential Document Management System in ITSC - Non-tech Confidential Document Management System Process Owner. (9) PeopleSoft/Human Capital Management in HR. (10) iTR Health Management System in HR - iTRI Health Management Process Owner. (11) SAP/Financial Accounting System in FAC - AR/AP Members, SAP/Financial Accounting System Process Owner. (12) E-mail System in ITSC - G300 Department. Data Analytics Process for Project Received Customer Data and project members and Related IT services: Data Center, Software Development, Performed in ICL-INIT Division. ITSC Web Hosting Service, Data Center, Network Management, Remote Backup and 18899 Call Center. This is in accordance with the Statement of Applicability, version 10.
INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE Liuja backup server room No.8, Gongyan Rd., Liuja Dist., Tainan City 734, Taiwan (R.O.C.) Remote Backup function

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Page 3 of 3

ISO 14001:2015 Environmental Management System (Certified by BSI)

bsi.

Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2015

This is to certify that: Industrial Technology Research Institute
Headquarters
No. 195, Sec. 4, Chung Hsing Rd.
Chutung Town
Hsinchu County
310401
Taiwan

財團法人工業技術研究院院部
臺灣
新竹縣
竹東鎮
中興路四段195號
310401

Holds Certificate No: **EMS 782302**

and operates an Environmental Management System which complies with the requirements of ISO 14001:2015 for the following scope:

The provision of environmental management systems' planning, auditing and execution.
環境管理系統的規劃、稽查及執行

For and on behalf of BSI:

Michael Lam - Managing Director Assurance, APAC

Original Registration Date: 2023-06-12
Latest Revision Date: 2023-06-12

Effective Date: 2023-06-12
Expiry Date: 2026-06-11

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Certificate No: **EMS 782302**

Location	Registered Activities
Industrial Technology Research Institute Headquarters No. 195, Sec. 4, Chung Hsing Rd. Chutung Town Hsinchu County 310401 Taiwan 財團法人工業技術研究院院部 臺灣 新竹縣 竹東鎮 中興路四段195號 310401	The provision of environmental management systems' planning, auditing and execution.
Industrial Technology Research Institute Headquarters No. 321, Sec. 2, Kuang Fu Rd. East Dist. Hsinchu City 300044 Taiwan 財團法人工業技術研究院院部 臺灣 新竹市 東區 光復路二段321號 300044	The provision of environmental management systems' planning, auditing and execution.
Industrial Technology Research Institute Headquarters No. 8, Gongyan Rd. Liu-jia Dist. Tainan City 734045 Taiwan 財團法人工業技術研究院院部 臺灣 台南市 六甲區 工研路8號 734045	The provision of environmental management systems' planning, auditing and execution.

Original Registration Date: 2023-06-12
Latest Revision Date: 2023-06-12

Effective Date: 2023-06-12
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Certificate No: **EMS 782302**

Location	Registered Activities
Industrial Technology Research Institute Headquarters No. 2, Wenwian Rd. Nantou City Nantou County 540219 Taiwan 財團法人工業技術研究院院部 臺灣 南投縣 南投市 文獻路2號 540219	The provision of environmental management systems' planning, auditing and execution.

Original Registration Date: 2023-06-12
Latest Revision Date: 2023-06-12

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INNOVATING
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Industrial Technology Research Institute

No. 195, Sec. 4, Chung Hsing Rd., Chutung, Hsinchu County 310401, R.O.C.

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