

AI + SDGs = ∞  
ESG + AI = ∞



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 **SDGs**

SUSTAINABILITY REPORT  
TAMKANG UNIVERSITY

2022

7 AFFORDABLE AND  
CLEAN ENERGY





# AFFORDABLE AND CLEAN ENERGY

## Measures towards affordable and clean energy

To increase the proportion of clean energy, reduce global greenhouse gas emissions, and fulfill our school's commitment to net-zero emissions by 2050, we have set a mid-and-long-term goal for school affairs development as "AI+SDGs=∞", and established the following action guidelines:

1. Energy Saving: Improve the energy efficiency of buildings and equipment, strengthen energy-saving advocacy, and conduct energy waste audits.
2. Carbon Reduction: Under the three-pronged approach of "carbon reduction, carbon fixation, and negative carbon emission", we will accelerate the reduction of carbon emissions.
3. Renewable Energy: Continuously install solar panels, increase the proportion of green electricity, and conduct data and information collection. We will continue to collaborate with fields such as information, computer science, electrical engineering, and electric power to cultivate talents in the field of renewable energy.

4. Smart Campus: Use digital technology to assist in teaching and administration, reduce carbon emission rates, and improve process efficiency.

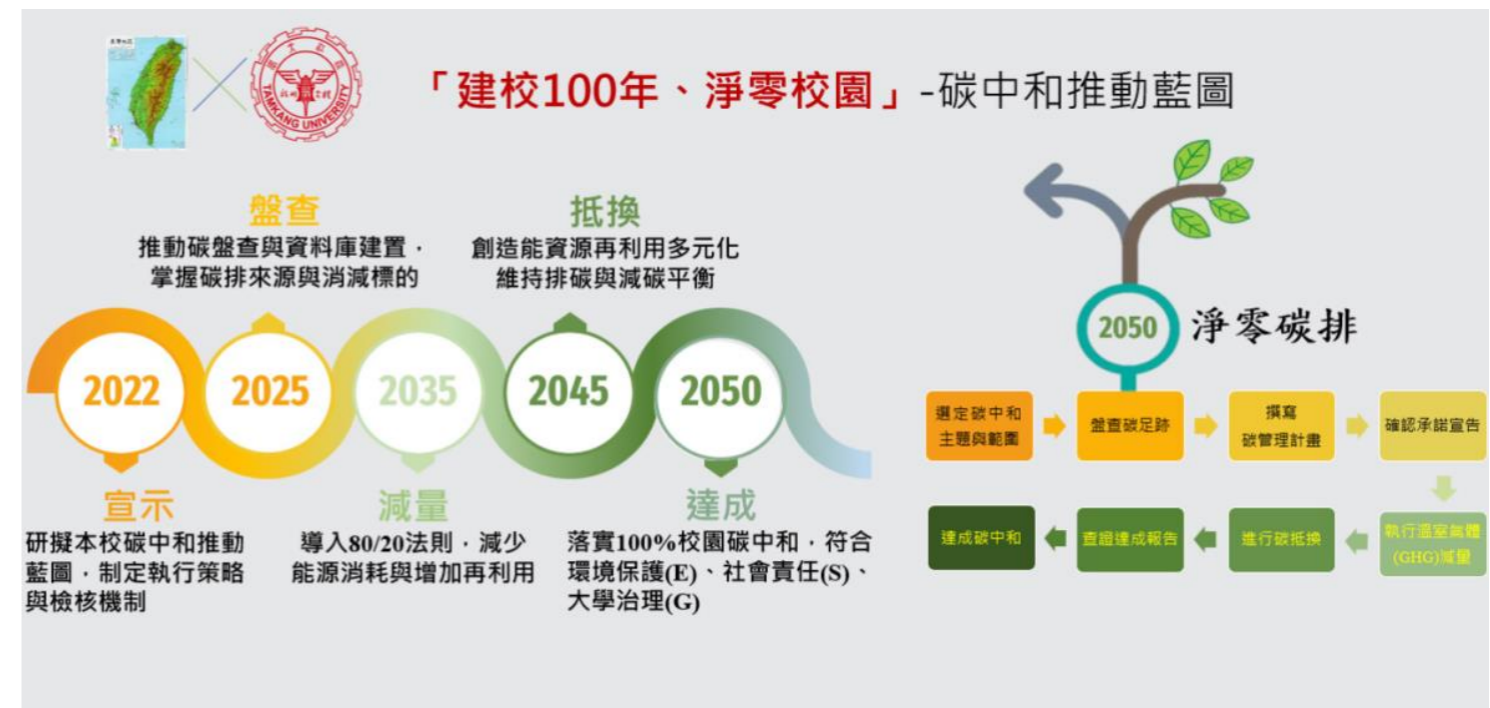
### TKU Action—Energy-efficient renovation and building

The university applies relevant building standards to improve energy efficiency, reduce energy consumption, and avoid energy waste, including: :

1. Green building standards: The university stipulates that new (modified) builds must refer to the energy management-related indicators of the national green building standards EEWH (Ecology, Energy, Waste Reduction, Health). From the production of building materials to the planning, design, construction, use, management and demolition of buildings, the minimum consumption of earth resources, the use of the least energy and the manufacture of the least waste acts as the criteria. The first phase of the construction project of the Lanyang Campus of the university was

approved by the Ministry of the Interior in September 2006 and issued the green building label; the Hsu Shou-Chlien International Conference Center completed on the Tamsui Campus in 2018 was also awarded a silver-level green building label in May 2019.

2. Green procurement: When purchasing hardware and software equipment, consumables, and construction engineering materials, the university will give priority to manufacturers who can provide the five major green label products: environmental protection labels, energy-saving labels, water-saving labels, green building materials labels, and carbon labels.
3. New and regenerated buildings: According to the resolution of the Campus Planning Committee of the university, no new buildings will be built in the next 5 years (2020-2024). In the future, if there are new construction plans for the Tamsui campus, the Taipei Campus and the Lanyang campus, priority will be given to evaluating the durability of the old buildings and moving towards the principle of space



activation and reuse, that is, the reconstruction of the original site will be the main focus, and the non-permeable paving of the campus will not be increased, which can reduce the impact of the campus environment and avoid the waste of building materials resources .

### ***TKU Action—Upgrade buildings to higher energy efficiency***

1. Renewing energy-consuming equipment: The Tamsui campus allocates a budget for energy-saving improvement projects every year, which includes upgrading the energy-consuming air-conditioning equipment of an older model to a new type of high-performance air-conditioning equipment; replacing traditional lighting with LED energy-saving lighting system; and efficiently supervising the operation of

various equipment through the campus energy monitoring and management system. In 2020, 16.3 million new Taiwan dollars was used to implement the replacement of the library chiller mainframe with a centrifugal energy-saving mainframe; in 2021, subsidy from the Energy-saving guarantee performance project of the Energy Bureau of the Ministry of Economic Affairs.

2. Prioritize the purchase of first-class energy-efficient equipment: Replace the fixed-frequency split air conditioners in the Foreign Language Building with multi-link variable-frequency air conditioners; replace traditional boilers with heat pump hot water equipment; replace traditional lighting fixtures with high-efficiency energy-saving lighting fixtures.



3. Set up rooftop solar photovoltaic system: In 2021, we collaborated with the alumni company SINBON Electronics to bring green power to the campus. A solar photovoltaic system was set up on the top floor of the Tamsui campus gymnasium and swimming pool, with a total of 1,636 solar photovoltaic panels being installed in the process. The total wattage of the system is 542.52kW. As of the end of July 2023, the total power generation capacity was 1,054,128 kWh, and the carbon reduction benefit was 536.55 metric tons of CO<sub>2</sub>e. Starting in March 2022, a canopy-type solar photovoltaic system with a total capacity of 99.9 kW was installed on the roof of the Taipei campus. As of the end of July 2023, the total electricity generated amounted to 52,024 kWh, resulting in a carbon reduction benefit of 26.48 metric tons of CO<sub>2</sub>e.

4. Installation of solar panels: Solar panels are installed on the walls and roofs of the second, third, and fourth floors of the Department of Architecture. The electricity obtained can provide power to exhaust fans on all floors of the department to keep the studio ventilated smoothly. In the future, a wind catcher tower will also be installed on the roof to reduce the indoor temperature in summer.

5. School dormitory renovation plan: The school's dormitory renovation plan “Next Step, New East Village” was fully subsidized by the Ministry of Education. Through the renovation and revitalization of the old spaces on the campus, the plan will create a campus environment that supports students to develop creative public life and integrates life and learning.



## ***TKU Action—Carbon reduction, fixation, and negative emission***

1. Energy saving air-conditioning: The energy-saving improvement project budget is prepared every year, and the energy-consuming air-conditioning equipment of the older model is replaced with a new high-efficiency air-conditioning equipment.
2. Lighting energy conservation: The budget is prepared year by year, and the traditional lamps in the teaching space and office space are replaced with LED energy-saving lamps.
3. Increasing renewable energy: By building solar panels, and collecting information and data, green electricity is brought into the campus. We shall also continue to cooperate with information engineering, engineering, electrical engineering, electricians, and

other fields to cultivate talents in the field of renewable energy.

4. Reduction of contracted electricity capacity: In the 2022 academic year, the Tamsui campus continued to target a 1% reduction in the Energy Use Intensity (EUI) to reduce contracted electricity capacity.
5. Green procurement: When purchasing hardware and software equipment, consumables, and construction engineering materials, the university will give priority to manufacturers who can provide the five major green label products: environmental protection labels, energy-saving labels, water-saving labels, green building materials labels, and carbon labels.
6. The advancement of sustainable transportation: The school has partnered with bus companies to introduce electric buses, aiming to reduce carbon emissions from transportation. The school has installed electric



vehicle charging stations on campus to facilitate the use of electric vehicles. The school encourages the replacement of official vehicles with electric models as a priority. This not only reduces the school's carbon footprint but also sets a good example for students and staff.

7. Carbon sequestration through planting: A total of 90 species of trees are widely planted in the Danshui campus, totaling 1,692 trees, with a total carbon sequestration amount exceeding 478,899kgCO<sub>2</sub>e. The campus also uses ecological ponds to pilot microalgae cultivation for carbon sequestration.
8. Negative emission planting: Using regenerative organic farming methods, kitchen waste compost is mixed into the soil as a base fertilizer, increasing the microorganisms in the soil for absorption and utilization by plants, thereby reducing the concentration of carbon dioxide in the atmosphere.

## ***TKU Action—Plans to reduce consumption***

The university holds an annual meeting of the Environmental Sustainability Promotion Committee to discuss the energy-saving plans of the three campuses in the new academic year, and to regularly supervise and review the implementation of each campus plan. In response to the problem of climate change and warming, and in line with the Ministry of Economic Affairs' promotion of the "1% annual power saving" plan for government agencies and schools, the Tamsui campus still aims to reduce the EUI value by 1% in the 2023 academic year, and has formulated a project plan to reduce overall energy consumption, including:

1. Interface upgrade and expansion project of the existing energy monitoring and management system.



- The improvement project of the central air-conditioning main unit of the College of Education.
- The improvement project of high-light lighting in the basketball area of the sports field.
- Traditional classroom lighting improvement project.

Additionally, in cooperation with the General Affairs Office to guide the implementation of energy-saving management in each building, the energy managers precisely record the electricity consumption situation of each space, conducts electricity consumption analysis, and according to the analysis, provide guidance to units with higher energy consumption for energy-saving management, as well as discussing and improving the electricity consumption situation of each space.

The energy usage intensity (EUI) of the Tamsui campus decreased from 116.52 kWh/

m<sup>2</sup>.yr in the 2015 year to 97.64 kWh/m<sup>2</sup>.yr in the 2022 year. The 2022 year saved approximately 4.21 million degrees of electricity compared to the 2015 year.

### TKU Action—Energy wastage identification

The university introduced ISO50001 in 2015, enabling organizations to establish systems and processes to improve energy performance, including energy efficiency, use, and consumption. It is suitable for different organizational forms and energy use requirements, including performance supervision and measurement, documentation of important management processes and performance reports, equipment design and procurement processes, etc., to demonstrate compliance with regulations and stakeholder requirements. The university conducts energy review operations on each campus every year following the require-

ments of the ISO50001 energy management system, to spot energy-intensive units and equipment, and further implement energy consumption management. In the past five years of operation, we have spotted and improved the main causes of electricity consumption on the campus (for example, the top 20 electricity-consuming units). Through the 80/20 rule, we have implemented and internalized the energy baseline, energy performance indicators, and other inspection tools to the general affairs units of each campus for continuous processing.

### TKU Action—Divestment policy

Starting from 2020, by reducing the contracted capacity between the university and the Taiwan Power Company, the degree of dependence on coal-fired (or gas-fired) power generation has been reduced. For the Tamsui campus, the contracted capacity of area A has been reduced from 4,999 KW to 3,950 KW and from 3,100 KW to 2,600 KW for area B.

The contracted capacity of the Lanyang Campus has also been reduced from 790KW to 600KW.

The above contractual capacity was remained in 2022 .

## Energy use density

- Energy consumption per sqm: 87020.856/284,804=30.555%
- Total energy consumption (Gigajoules): 87020.856
- Building area of university buildings (square meters): 284,804

## Energy and the community

The university actively helps the community understand the importance of energy



efficiency and clean energy, and then promotes actions to realize renewable energy. The relevant actions are divided into four aspects: cooperation between universities, implementation of government projects, universities holding hands, and encouraging development and innovation. A brief description is as follows:

1. Collaboration between universities: The university responded to and signed the “Talloires Declaration.” In 2013, it jointly initiated the “Green University Union of Taiwan” with National Taiwan Normal University and other colleges and universities. As one of the permanent member schools, the university continues to participate in the union's discussions on various environmental and energy issues, including green campus practices, setting green energy power generation issues, and internalizing the United Nations SDGs goals. In addition, from 2019 to 2021, the president of the university also served as the supervisor of the Alliance.
2. Implementation of governmental plans: Teaching faculties from several departments of the university have contributed their strengths in the field of energy, including the Department of Architecture, the Department of Chemical Materials, the Department of Water Environment, the Department of Finance and Industry, and the Department of Economics. They continuously collaborate with industry, government, and universities to exert influence through different roles, including serving as committee members or judges, implementing research projects, or conducting institutional training.

3. Hand in hand co-planning: To implement “glocalization”, TKU plays the role of a locomotive, leading primary and secondary schools in Tamsui, Lanyang, and even the North Coast to grow together. At the end of 2019, the school gathered several primary schools, local NGO groups in Tamsui, and the Tamsui District Office to issue the “Declaration on Ecological Sustainability of Tamsui,” which can be described as uniting the forces of the public and private sectors to jointly demonstrate the determination shown by the Tamsui area towards ecological conservation and environmental protection.
4. Encourage development and innovation: “Futurization” is one of the three educational concepts of TKU, and the most direct way to practice futurization is to uphold the spirit of PDCA and continue to develop and innovate to respond to changes in the world. All units within the university must not only upgrade and transform (track A) but also strive for innovation and transformation (track B). Outside the university, industry-academia cooperation projects support the development of low-carbon economy or technology start-ups; under the limited resources, TKU continues to strive for funding and support, foster new ventures that are in line with the green economy, and implement the mission of universities to take from society and contribute to society.

### ***TKU Action—Local community outreach for energy efficiency***

TKU actively assists the local community in understanding the importance of energy

efficiency and clean energy. Related actions include:

1. Campus SDGs Environmental Sustainability Workshop: Jointly organized by the school and seven primary schools around Tamsui. After reaching a consensus, action plans concerning three different levels, the government, schools, and individuals were proposed:
  - (1)The government should replace thermal power generation with green energy for species protection and hillside maintenance;

- (2)Institutes should implement environmental education and reduce resource consumption;
  - (3)Individuals should reduce the use of plastic products, land-based garbage, and various wastes, and take inventory of personal carbon footprints.
2. Community video dissemination: Promoting the “Environmental Protection Journal” project, using “participatory documentary model” and “narrative communication” concepts, combined with the school's film and television project planning and production courses, to carry out “community video stories” recording the stories of influential people and institutions that have contribut-



ed to the development of a sustainable environment in Tamsui areas, including ecological environment, pollution prevention and control, resource recycling, and community environmental protection, and provide a back-end network platform as a collection to construct effective communication methods.

3. Teaching Practice Research Program: Faculty members from the Graduate Institute of China Studies of our university invited teachers from Jinshan High School to discuss issues related to nuclear waste and local revitalization in Jinshan. Through the Deep Plowing in Linmei & Glocalization project, they visited three elementary schools in Yilan with the theme of environmental protection and used DIY projects and games to teach students about the importance of environmental conservation and waste sorting.

4. Environmental Education and Propaganda: To support the school's energy and environmental, health and safety goals, the Department of Mass Communication collaborated with local photography studios to regularly handle and recycle the chemicals used for photo development and enlargement to reduce its environmental impact.

### **TKU Action—100% renewable energy pledge**

In response to the “Paris Climate Agreement” and the sustainable development goals called for by the United Nations, the university has promised to achieve net zero carbon emissions by 2050 and continues to promote the realization of the commitment to 100% renewable energy through cooperation pro-

jects, research projects, and activities. Related actions include:

1. Campus SDGs Environmental Sustainability Workshop: Jointly organized by the school and seven primary schools around Tamsui. After reaching a consensus, action plans concerning three different levels, the government, schools, and individuals were proposed.

(1)The government should replace thermal power generation with green energy for the sake of species and hillside protection.

(2)Schools should implement environmental education and reduce resource consumption.

(3)Individuals should reduce the use of plastic products, garbage, and various types of waste, and take stock of their personal carbon footprints.

2. Release of sustainability report: The university published the 2020 Tamkang University Social Responsibility and Sustainability Report in June 2021 to review the implementation and effectiveness of sustainability actions. On August 25, 2022, the school announced the release of the 2021 Tamkang University Sustainability Report. With a better focus on the communication and dialogue between stakeholders, the 2021 report adopted more efficient tools and analyzed major issues, following the international standard GRI guidelines. A third party has been entrusted for certification to further ensure that the content of the report is concise and specific, and can present the university's actions and determination to promote sustainability goals.

3. Partnership with the industry: The university actively cooperates with solar photovoltaic system companies to bring green energy to campus. In the first phase, priority has been given to the installation of solar photovoltaic systems on the roof of the swimming pool and gymnasium on the Tamsui campus. The installation commenced in 2021 and the power generation started in September. In the second phase in 2022, it was set up on the roof of the Taipei campus, which has been completed in March 2023. The solar photovoltaic system on the roof of the Lanyang campus was also started in August 2023, with completion expected in October.

### **TKU Action—Provide energy efficiency services for industry**

TKU provides services to local industries to actively promote energy efficiency and clean energy. Related actions include:

1. The Champion Incubation Center collaborated with our faculty members and industry consultants to form a professional counseling team to provide low-carbon and smart diagnosis and guidance to industrial area businesses.

2. In collaboration with the Taiwan Environmental Protection Foundation, we offer training courses on sustainability and carbon reduction, aiming to enhance the



knowledge of sustainability, energy efficiency, and circular economy among businesses within the industrial area.

3. In partnership with the Taiwan Environmental Education Foundation, we offer ISO-14064 Greenhouse Gas Accounting internal auditor training for industrial area employees to take certification examinations.

4. The Center for Ocean and Underwater Technology Research collaborates with Sinotech Engineering Consultants, Ltd. to conduct the “Feasibility Assessment Project for the Shimen Right Bank Pumped Hydro Power Generation Project,” which involves energy efficiency assessments and research on renewable energy solutions to enhance energy efficiency and provide clean energy.

5. As our university was honored with the “Energy Saving Benchmark Award” by the Ministry of Economic Affairs in 2022, we organized an observation seminar related to the award in June 2023, allowing 120 individuals from various sectors to visit our campus for energy-saving and carbon reduction activities for free. 120 people participated in the event, and it concluded successfully. In August 2023, our university was recognized as a supporting unit by the Ministry of Economic Affairs’ “Industrial Decarbonization Assistance Project.” The Research and Development Office arranged a team of specialized faculty members to assist several companies within the Pingzhen, Dayuan, Hsinchu, and Guishan industrial zones in their low-carbon transformation applications.

### ***TKU Action—Take part in policy development for clean energy technology***

The university provides information and support to the government on clean energy and energy-saving technology policies. The relevant actions are as follows:

1. Tamkang University is one of the founding and permanent member schools of the “Green University Union of Taiwan”: In 2013, universities and colleges within our country concerned about environmental protection and sustainable development jointly initiated the establishment of the “Green University Union of Taiwan”. Tamkang University is one of the founding members and permanent member schools. From 2019 to 2021, it served as a supervisory school and has been serving as a director school since 2022, on the issue of energy conservation and carbon reduction in colleges and universities and the practice of the SDGs, continuing to exert our influence.

2. Aiding Pingzhen Industrial Zone in carrying out ESG upgrade guidance counseling: Under the Green Supply Chain Law formulated by the European Union, Taiwanese SMEs must meet the requirements of ESG indicators in order to enter the world supply chain. Tamkang University is one of the seven alliance schools of the European Union Center (EUTW) in Taiwan. Its ESG counseling team has professional teachers and experienced professional consultants. Through cooperation with the Pingzhen and Dayuan Industrial Park Service Centers, the

university provides services to the manufacturers in these two industrial parks for sustainable business transformation and upgrading.

3. The Department of Water Resources and Environmental Engineering collaborates with the Ministry of Environmental on various projects, including “Integration of Sulfidized nano zerovalent iron and PMS for remediation of TCE contaminated groundwater,” “The development of aerobic biodegradation techniques for dichloroethene in groundwater - the investigation of biodegradation pathways of chloroethenes,” “Nano Iron/Activated Carbon Flow-Electrode Capacitive Deionization (FCDI) System for Remediation of Arsenic-Rich Groundwater,” and “Application of Hybrid Intercalation/Capacitive Deionization Sys-

tem for Removal of Ammonia-Nitrogen and Nitrate-Nitrogen in Groundwater,” among others. These projects assist the government in addressing groundwater pollution issues through related research.

4. The university collaborated with local junior high and elementary schools in Tamsui to promote campus decarbonization policies. Under the “An AC for Each Classroom ” policy, providing energy-saving strategies and recommendations, such as transforming the security guard room at Wenhua Elementary School into a green energy education facility.

5. The university participated in the Earth Day event organized by the Education Bureau, New Taipei City on April 22, promoting the “Zero Carbon Emission” initiative through







poster exhibitions at the New Taipei City Environmental Education Center.

### ***TKU Action—Provide assistance to low-carbon innovation***

The TKU Champion Incubation Center provides regularly counseling for startups that apply low-carbon economy or technology, assists resident businesses in applying for government projects, provides information on loans and startup funds, and develops environmental software development projects. The incubation center also offers courses to help startups with fundraising and marketing, and facilitates collaboration between startups and our university's faculty in academia-industry partnerships.

The university's Office of Research and Development oversees 10 research centers and a publishing center, responsible for university-wide industry-academia collaboration, patent applications and maintenance, technology transfer, and startup incubation.

In fostering and supporting startups related to the low-carbon economy or technology, our university's efforts include:

1. Collaborating with the resident company Hua Jing Environmental Protection Technology Co., Ltd., we jointly assist industrial park companies in applying for the “Diagnosis & Guidance of Upgrading, Transformation, Smartification, and Low Carbon Transition” and the “Smartification and Low Carbon Case Subsidy” projects from the Ministry of Economic Affairs, In-

dustrial Bureau. With the carbon footprint verification and decarbonization technology of Hua Jing Environmental Protection Technology Co., Ltd., we help industrial park businesses transition to low-carbon operations.

2. The teachers of the water resources and environmental engineering department of our school have a total of 5 patents in the field of “waste incineration and fly ash recycling” and cooperate with environmental protection startups to transfer technology to assist the development of low-carbon economy and technology start-ups.
3. The Research and Development Office assists the emerging green energy company KILOWATT Co., Ltd. in acquiring the necessary advisory resources, while facilitating the effective matching and integration of green energy-related resources.

4. In August 2023, our university obtained the qualification as a counseling unit for the Industrial Decarbonization Guidance Project by Industrial Bureau, Ministry of Economic Affairs. The Research and Development Office has arranged a team of specialized faculty members to counsel several companies within Pingzhen, Dayuan, Hsinchu, and Guishan industrial areas, assisting them in their low-carbon transition applications.





## SDG7

## 可負擔的潔淨能源

## 潔淨能源措施

為提升潔淨能源占比，降低全球溫室氣體排放量，實現本校 2050 年淨零排放的承諾，以「AI+SDGs=∞」為校務發展中長期目標，訂定行動方針：

1. 節能：提升建築、設備能效，加強節能宣導，進行能源浪費審查。
2. 減碳：以「減碳、固碳、負碳」三管其下，加速減少碳排放。
2. 再生能源：持續建置太陽能板，擴大綠電占比，並進行資料、數據搜集，與資訊、資工、電機、電工等領域持續合作，以培養再生能源領域人才。
3. 智慧校園：以數位科技輔助教學、行政，提升效率、降低碳排放率。



賀 本校榮獲111年度經濟部節能標竿獎 金獎



## 年度關鍵成果

- 榮獲 111 年度經濟部節能標竿金獎，並獲選為 112 年觀摩示範單位。
- 成立「淡江大學微軟數位培力中心」，以數位轉型，加速實踐永續發展目標。
- 與遠傳電信簽署「5G 元宇宙淨零碳排校園」MOU，為電信業者與大專院校針對元宇宙、淨零碳排兩大關鍵議題達成產學合作合台首例。
- EUI 由 104 年度 116.52kWh/ m<sup>2</sup>.yr 降至 111 年度 97.64kWh/ m<sup>2</sup>.yr。111 年較 104 年節省電力約 421 萬度。
- 110 年 7 月起，架設共 1,636 片太陽能光電板，110 年 9 月至 112 年 8 月 31 日累計發電 110 萬 724 度，減碳 56 萬 269kgCO<sub>2</sub>e。

## 建築方面的節能措施

本校應用相關建築標準，以提升能源使用效能、減少能耗，避免能源浪費，包括：

1. 綠建築標準：本校規定新（改）建大樓須參照綠建築標準之能源管理相關指標，從建材生產到建築物規劃、設計、施工、使用、管理及拆除之一系列過程中，以消耗最少地球資源，使用最少能源及製造最少廢棄物為準則。本校蘭陽校園第一期建築工程於 2006 年 9 月獲得內政部核定頒發綠建築標章後，淡水校園 2018 年興建完成之守謙國際會議中心大樓，亦於 2019 年 5 月獲得綠建築標章銀級。
2. 綠色採購：本校針對軟硬體設備、耗材及建築工程材料等辦理採購時，以能提供環保標章、節能標章、省水標章、綠建材標章及碳標籤等 5 大綠色標章產品之廠商優先承做。
3. 再生建築：依據本校校園規劃委員會決議，近 5 年（2020-2024 年）將不再新建大樓。未來淡水校園、台北校園及蘭陽校園如有新建築計畫，將優先將舊建築物評估其耐久性並朝空間活化再利用為原則，即以原地現址重建為主，不增加校園非透水鋪面，可降低校園環境衝擊及避免建材資源浪費。

## 建築能源效率升級

1. 舊有設備汰換：淡水校園每年皆編列節能改善工程預算，包括將舊機型之耗能空調設備更新為新式高效能空調設備；將傳統式燈具汰換為 LED 節能燈具；藉由校園能源監控管理系統有效率監管各設備運作狀況。2020 年以 1,630 萬元執行圖書館冰水主機汰換成離心式節能主機；2021 年另獲得經濟部能源局節能保證績效專案補助。
2. 優先採購一級能效設備：外語大樓定頻分離式冷氣汰換為多聯式變頻冷氣機；將傳統式鍋爐汰換為熱泵熱水設備；將傳統燈具汰換為高效率節能燈具。
3. 建築物頂樓設置太陽能光電系統：2021 年與校友企業信邦電子 (SINBON Electronics) 攜手將綠電帶入校園，於淡水校園體育館、游泳館頂樓設置太陽能光電系統，共架設 1,636 片太陽能光電板，系統總瓦數 542.52kW。截至 2023 年 7 月底止，總計發電量為 105 萬 4,128 度(kW/時)，減碳效益為 536.55 公噸 CO<sub>2</sub>e。2022 年 3 月起於台北校園屋頂增設棚架式太陽能光電系統，系統總瓦數 99.9kW，截至 2023 年 7 月底止，總計發電量為 5 萬 2,024 度(kW/時)，減碳效益為 26.48 公噸 CO<sub>2</sub>e。



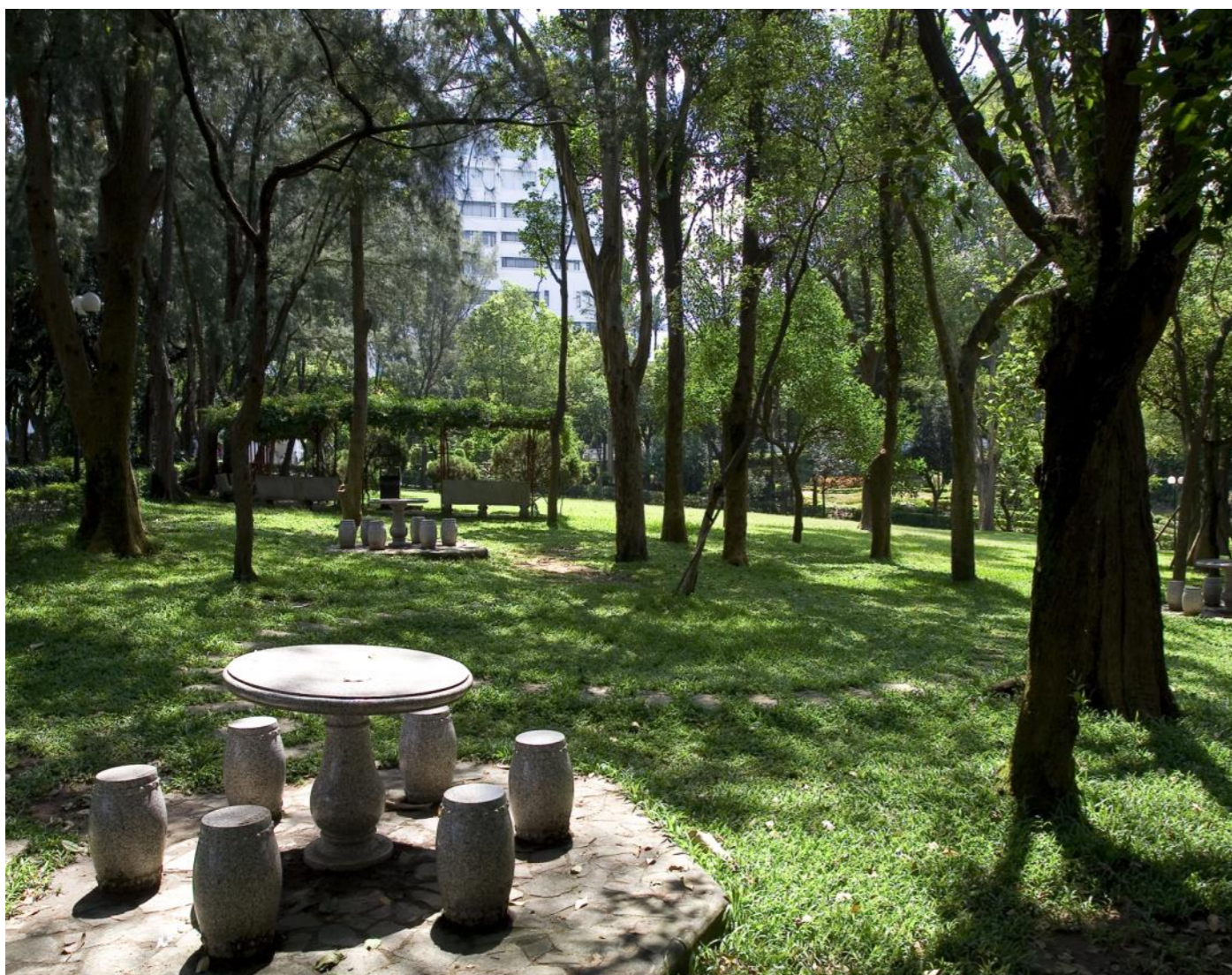
4. 牆面設置太陽能板：建築系系館二、三、四樓牆上與屋頂都裝上太陽能板，所獲電力能提供系館各樓層之抽風機使用，以保持工作室通風流暢。之後亦將於屋頂裝置捕風塔，以降低夏日室內溫度。
5. 宿舍改造計畫：本校宿舍改造計畫「下一步，新東村」獲教育部全額補助。該計畫透過校園舊有空間的改造、活化，打造支持學生發展有創意的公共生活，融合生活與學習的校園環境。

## 減碳、固碳、負碳

1. 空調節能：每年皆編列節能改善工程預算，將舊機型之耗能空調設備更新為新式高效能空調設備。
2. 照明節能：逐年編列預算，汰換教學空間及辦公空間的傳統燈具，更新成 LED 節能燈具。



3. 再生能源：將綠電帶入校園，建置太陽能板，並進行資料、數據搜集，與資訊、資工、電機、電工等領域持續合作，以培養再生能源領域人才。
4. 降低契約電量：淡水校園在 2022 學年度持續以降低淡水校園 EUI 值 1% 為目標。
5. 綠色採購：針對軟硬體設備、耗材及建築工程材料等辦理採購時，以能提供環保標章、節能標章、省水標章、綠建材標章及碳標籤等 5 大綠色標章產品之廠商優先承做。
6. 永續交通：與客運公司合作推動電動巴士計畫；校內建置電動車充電樁，並鼓勵公務車優先汰換成電動車款。
7. 植栽固碳：淡水校園內廣植喬木樹種共 90 種，共 1,692 棵，總固碳量超過 478,899kgCO<sub>2</sub>e；利用校園生態池試辦微藻養殖固碳。
8. 植栽負碳：以再生有機農法，將廚餘發酵土混入土壤作為基肥，增加土壤中微生物，供土壤吸收及植物利用，降低大氣中二氧化碳的濃度。



## 節能計畫

本校導入 ISO50001 能源管理系統，辦理校園能源審查作業，以掌握能耗密集之單位及空間設備，進一步實施能耗管理。透過 80/20 法則，以能源基線、能源績效指標等檢核工具，由學校總務單位持續推動提升能效相關工作。

另外，本校每年皆召開環境永續推動委員會議，研討 3 個校園新學年度之節能計畫，定期督導並檢討各校園計畫執行情形。為因應氣候變遷暖化問題、符合經濟部推動政府機關及學校「每年節電 1%」計畫，2022 學年度淡水校園仍以降低 EUI 值 1% 為目標，制定降低整體能耗的工程計畫，包括：

1. 能源監控管理系統介面升級及擴充工程。
2. 教育學院中央空調主機改善工程。
3. 操場籃球區高燈照明改善工程。
4. 宮燈教室照明改善工程。

另外配合由總務處輔導各樓館執行節能管理工作，能管員確實記載各空間用電情形，進行用電分析，依該分析向耗能較高之單位進行輔導節能管理工作，討論及改善各空間用電情形。

淡水校園 EUI 由 104 年度 116.52kWh/ m<sup>2</sup>.yr 降至 111 年度 97.64kWh/m<sup>2</sup>.yr。111 年較 104 年節省電力約 421 萬度。



## 能源浪費審查

本校自 2015 年導入 ISO50001，使組織建立系統與過程以改善能源績效，包括能源效率、使用及消耗。它適用於不同組織形式及能源使用要求，包括：績效監督量測、重要管理流程文件化與績效報告、設備之設計與採購流程等，以展現符合法規及利害關係者要求。本校每年依據 ISO50001 能源管理系統條文要求，辦理各校園能源審查作業，以掌握能耗密集之單位及空間設備，進一步實施能耗管理。運作五年來已掌握住校園用電大宗（例如：前 20 大用電單位），並持續透過 80/20 法則加以改善，將能源基線、能源績效指標等檢核工具，內化至各校園總務單位持續辦理。

## 降低對高排碳產業的依賴度

2020 年間，透過本校與台灣電力公司間契約容量的降低，達成減少對於燃煤（或燃氣）發電的依賴程度；淡水校園 A 區契約容量從 4,999KW 降為 3,950KW，B 區契約容量從 3,100KW 降為 2,600KW，蘭陽校園契約容量亦從 790KW 降低至 600KW。

2022 年仍維持上述契約容量。

## 能源利用密度

每平方米的耗能：30.555%

總耗能（千兆焦耳）：87020.856

大學建築的建築面積（平方米）：284,804

## 能源與社區

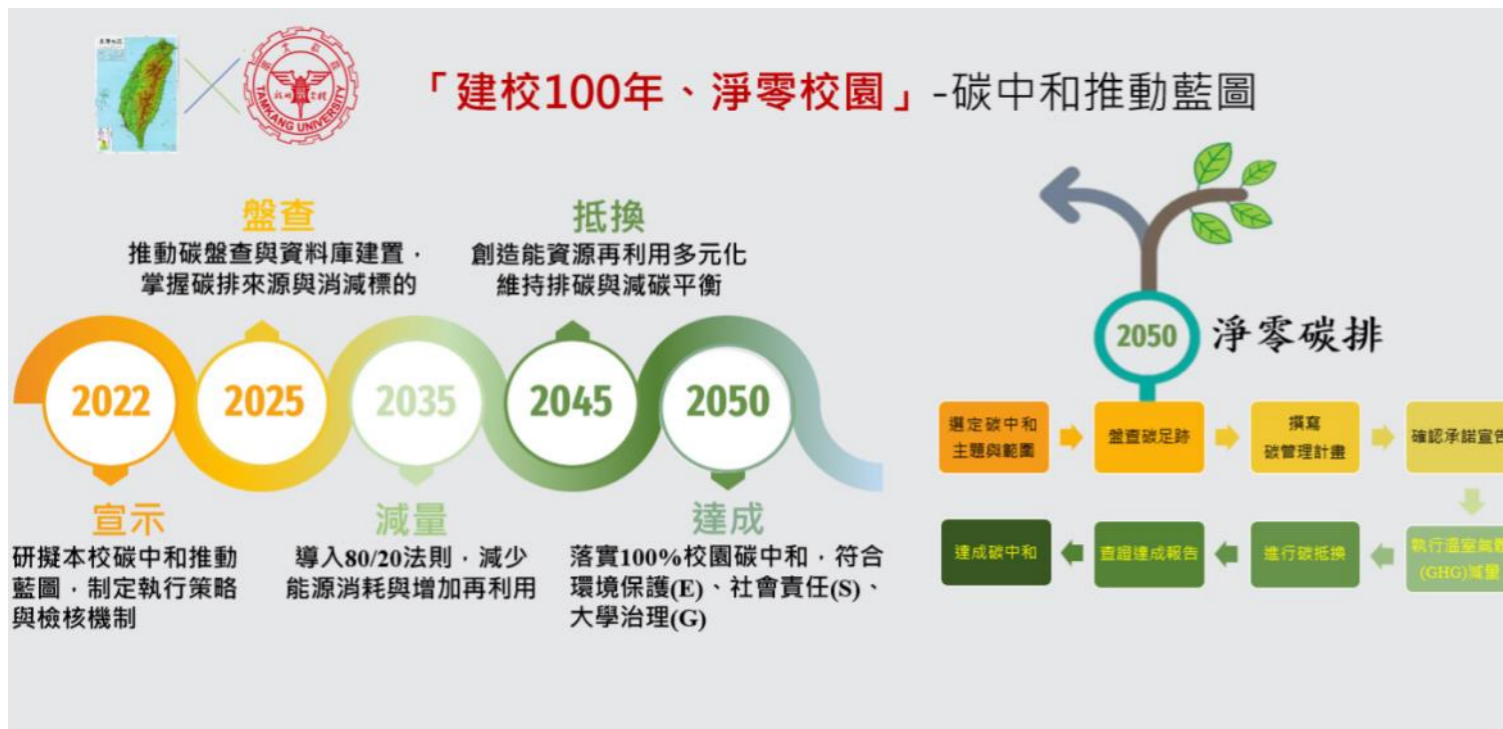
本校積極協助社區瞭解能源效率和潔淨能源的重要性，進而促成實現可再生能源的行動，相關作為分為大學之間的合作、執行政府計畫案、大學大手牽小手，及鼓勵開發與創新四個面向，簡要說明如下

1. 大學之間的合作：本校響應並簽署「塔樂禮宣言」（The Talloires Declaration），於 2013 年與國立臺灣師範大學等大專院校共同倡議催生「臺灣綠色大學聯盟」，作為永久會員學校之一，持續參與聯盟各項環境與能源議題的研討，包含綠色校園實踐作為，設置綠能發電議題，及內化聯合國 SDGs 目標等；自 2019 至 2021 年，本校校長亦擔任該聯盟監事。
2. 執行政府計畫案：本校數個系所教師皆在能源領域貢獻所長，包含建築系、化材系、水環系、資工系及經濟系等，透過擔任評審委員、執行研究計畫或負責機關培訓等不同身分，持續與產官學界合作發揮影響力。
3. 大學大手牽小手：為了落實「全球在地化」本校扮演火車頭角色，帶領淡水、蘭陽，甚至北海岸地區中小學共同成長；2019 年底，本校了結合七所小學、淡水在地 NGO 團體，以及淡水區公所，共同發表「生態永續淡水宣言」，凝聚公私部門力量，展現淡水地區對於生態保育與環境保護的決心。
4. 鼓勵開發與創新：「未來化」係為本校三化教育理念之一，而為實踐未來化最直接的途徑就是秉持 PDCA 的精神，不斷地開發與創新，以因應世界的變局。校內各單位不但要升級轉型（A 軌），還要力求創新轉型（B 軌），校外則透過產學合作案，支持低碳經濟或技術的新創企業發展；在自身資源有限下持續爭取經費挹注，扶植符合綠色經濟的新創企業，落實大學取之於社會，貢獻予社會的使命。

## 社區能源效率教育

本校積極協助當地社區認識能源效率和清潔能源的重要性，相關作為包括：

1. 「校園 SDGs 環境永續工作坊」：本校與淡水周邊七所小學共同舉辦，凝聚共識，針對政府、學校、個人層面分別提出三項行動方案：
  - (1) 政府應以綠色能源代替火力發電，進行物種保護與山坡地維護；
  - (2) 學校應落實環境教育並減少資源耗用；
  - (3) 個人則應減少使用塑膠製品、降地垃圾及各類廢棄物，及盤點個人碳足跡等。



2. 《環保志》計畫：以「參與式紀錄片模式」和「敘事傳播」的概念，結合本校影視專案企劃與製作的課程，進行「社區影像」，記錄淡水區永續環境有貢獻和影響力的人物和機構的故事，包含生態環境、污染防治、資源循環和社區環保等面向，提供後端網路平台作為典藏，建構有效之傳播方法。
3. 教學實踐研究計畫：本校大陸所教師邀請金山高中教師演講討論金山核能廢棄物處置與地方創生議題。藉由深耕林美、在地國際計畫，前往宜蘭玉田、三民及龍潭三所小學，以環境保護為主題，透過 DIY 製作及遊戲，教導同學們環境保護、分類的重要性。
4. 環保教育宣導：本校大傳系配合配合學校能源及環境安全衛生目標執行，與社區之照相館等合作，將照片沖洗、放大所使用藥劑依規定定期回收及管理，減少對環境之影響。

## 促進 100% 可再生能源

本校響應《巴黎氣候協定》以及聯合國號召的永續發展目標，承諾將於 2050 年達到淨零碳排，並持續透過合作案、研究計畫、活動，促進實現 100% 可再生能源的承諾，相關作為包括：



1. 「校園 SDGs 環境永續工作坊」：由本校與淡水周邊七所小學共同舉辦，凝聚共識後針對政府、學校、個人層面分別提出三項行動方案：
  - (1) 政府應以綠色能源代替火力發電，進行物種保護與山坡地維護；
  - (2) 學校應落實環境教育並減少資源耗用；
  - (3) 個人則應減少使用塑膠製品、降地垃圾及各類廢棄物，及盤點個人碳足跡等。
2. 發布永續報告書：本校於 2021 年 6 月發佈「2020 淡江大學社會責任與永續報告書」，審視永續行動之執行與成效；於 2022 年 8 月發布「2021 淡江大學永續報告書」，進一步聚焦利害關係人的溝通對話，運用更有效率的工具，針對重大議題進行分析，依循國際規範 GRI 準則，委託第三方進行認證，使報告內容精準、具體，呈現本校推動永續目標的行動及決心。
3. 合作案：本校積極與太陽能光電系統公司合作，第 1 階段優先於淡水校園游泳館、體育館屋頂設置太陽能光電系統，於 2021 年暑假動工，9 月開始運作發電。2022 年第 2 階段則設置於台北校園屋頂，已於 2023 年 3 月完工，蘭陽校園屋頂之太陽能光電系統亦於 2023 年 8 月起動工，預計 10 月完工。



## 協助產業提升能源效率

本校為當地工業提供服務，積極促進能源效率和清潔能源，相關作為包括：

1. 新育成中心與校內教師以及業界顧問組成專業輔導團隊針對工業區廠商進行低碳化智慧化診斷輔導。
2. 與台灣環保文教基金會合作，開設永續低碳化相關培訓課程，提升工業區內廠商永續節能以及循環經濟相關概念知識。
3. 與台灣環保文教基金會合作，開設 ISO-14064 溫室氣體盤查內部查證員課程供工業區企業員工考試認證。
4. 海洋及水下科技研究中心與中興工程顧問公司合作，進行「石門右岸抽蓄水力發電計畫可行性評估計畫」，進行能源效率評估與研究可再生能源方案，以提高能源效率並提供清潔能源
5. 2022 年，本校榮獲經濟部「節能標竿獎」金獎殊榮，特於 2023 年 6 月 20 日舉辦節能標竿獎系列觀摩研討會，免費提供 120 個名額給各界蒞校進行節能減碳觀摩活動，活動實際參與人數為 120 名，圓滿落幕。2023 年 8 月，本校取得經濟部工業局推動「產業低碳化輔導計畫」輔導單位資格，研究發展處安排相關專長教師團隊輔導平鎮、大園、新竹及龜山工業區內數家公司，協助進行低碳化轉型申請。

## 協助政府制定潔淨能源政策，發展節能科技

本校在清潔能源和節能技術政策方面，向政府提供訊息和支持，相關作為如下：

1. 本校為「臺灣綠色大學聯盟」創始會員及永久會員學校之一：2013 年，我國關心環境保護及永續發展之大專校院，共同倡議成立「臺灣綠色大學聯盟」(Green University Union of Taiwan)，本校為創始會員及永久會員學校之一，並於 2019 至 2021 年擔任監事學校，2022 年起擔任理事學校，就大專校院節能減碳與實踐 SDGs 的議題，持續發揮影響力。
2. 本校育成中心協助平鎮工業區進行 ESG 升級輔導：歐盟制訂的綠色供應鏈法上路，台灣中小企業必須符合 ESG 各項指標規定方能打入世界供應鏈。淡江大學是台灣歐盟中心 (EUTW) 七個盟校之一，其 ESG 輔導團隊擁有專業師資與經驗豐富的專業

顧問群。透過與平鎮與大園工業區服務中心的合作，提供兩個工業園區 廠商永續經營轉型升級之服務。

3. 水環系與行政院環保署合作，進行「以硫化奈米零價鐵及高硫酸複合鹽整治技術處理受三氯乙烯污染之地下水」、「地下水中二氯乙烯好氧生物分解技術開發-氯烯類污染物生物降解路徑研究」、「奈米鐵/活性碳流動電極電容去離子系統整治含砷地下水」、「複合型嵌入式/電容去離子系統應用於移除地下水之氮與硝酸氮」等計畫，協助政府針對解決地下水污染問題進行相關研究。
4. 與淡水地區國中、小學協力推動校園低碳化政策，在「班班有冷氣」政策下提供節能策略與方案建議，例如文化國小校內打造警衛室成為綠能教育場所。
5. 參與新北市教育局主辦 4 月 22 日世界地球日活動，於新北市環境教育中心以海報展方式推廣淨零碳排議題





## 支持低碳新創企業

本校「建邦中小企業創新育成中心」提供應用低碳經濟或技術的新創企業定期輔導，協助進駐廠商申請政府計畫案，提供貸款與創業基金相關資訊，發展環境軟體開發應用計畫。育成中心亦開設課程，輔導新創企業募資與行銷，並媒合與本校教師之產學合作。

本校研發處下轄 10 個研究中心與出版中心，負責全校產學合作、專利申請維護、技術移轉以及新創育成。

本校在培育和支持低碳經濟或技術的新創企業方面，相關作為包括：

1. 與進駐培育之廠商「化境環保科技股份有限公司」，共同合作，協助工業園區廠商向經濟部工業局申請「升級轉型智慧化與低碳化診斷輔導」以及「智慧化與低碳化個案補助」計畫。透過「化境環保科技股份有限公司」的碳盤查與減碳技術，協助工業園區企業進行低碳化轉型。

2. 本校水環系教師將「垃圾焚化飛灰資源化」領域共 5 項專利，與新創環保公司合作，進行技術移轉，以協助低碳經濟與技術之新創企業的發展。
3. 研發處協助新興綠能企業「千瓦光電股份有限公司」取得所需顧問資源，同時促進綠色能源相關資源的有效配對與整合。
4. 本校 2023 年 8 月取得經濟部工業局推動「產業低碳化輔導計畫」輔導單位資格，研究發展處安排相關專長教師團隊輔導平鎮、大園、新竹及龜山工業區內數家公司，協助進行低碳化轉型申請。

