



SUSTAINABILITY REPORT TAMKANG UNIVERSITY

2021



7 AFFORDABLE AND CLEAN ENERGY

TAMKANG UNIVERSITY

No.151, Yingzhuan Rd.,
Tamsui Dist., New Taipei City 251301,
Taiwan (R.O.C.)
Tel:+886-2-2621-5656

AFFORDABLE AND CLEAN ENERGY

Measures towards affordable and clean energy

Continuously increasing the proportion of clean energy has a key impact on whether global greenhouse gas emissions can be reduced. The university's measures to increase the proportion of clean energy include:

1. Introduction of international standards: In 2003, the ISO14001 environmental management standard was implemented; in 2006, the Tamsui campus built an energy-saving monitoring system; in 2013, the campus greenhouse gas emission verification was carried out according to the ISO14064-1 standard; in 2015, the ISO50001 energy management standard was introduced and approved.
2. Set up an organization in charge: The "Environmental Sustainability Promotion Committee" was founded, with the Executive Vice Principal as the chairman, and is responsible for supervising, reviewing and reviewing the implementation effectiveness of various energy-saving plans, as well as the energy-saving plans that must be proposed each school year, and the actuality of its implementation.

3. Renewing energy-saving equipment: A budget is reserved for energy-saving improvement projects every year, and also for replacing old energy-consuming equipment with new high-efficiency equipment.

4. Increasing renewable energy: By building solar panels and collecting relevant information and data, the university actively brings green electricity to the campuses. We will continuously cooperate with industries of information engineering, engineering, electrical engineering, electricians, and other fields to cultivate talents in the field of renewable energy.

5. Reduce the contracted capacity: From 2020 onwards, by reducing the contractual capacity between the school and the Taiwan Power Company, the degree of dependence on coal (or gas) power generation has been reduced. The contracted capacity of Area A on the Tamsui Campus was reduced from

4,999KW to 3,950KW and from 3,100KW to 2,600KW for Area B. The contracted capacity on the Lanyang Campus was reduced from 790KW to 600KW. In 2021, the contracted capacity remained the same.

6. Green procurement priority: When purchasing software and hardware equipment, consumables, and construction materials, the school places priority on products that have been certified with the five kinds of green labels: the environmental protection label, energy saving label, water saving label, green building material label, and carbon label.

7. The advancement of sustainable transportation: A shuttle bus that runs between the MRT station and the campus has been set up, as well as bus terminals around the campus that directly connects to downtown Taipei and Tamsui. Bus routes within the school, pedestrian areas, and other measures provide students and



teachers the convenience of coming and leaving the campus to various urban areas, reduce energy consumption and air pollution, and increase mobility.

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 EEWB (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 .

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. 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 539.88KW, which is expected to reduce carbon emissions by 277 tons per year. As of the end of June 2022, the total power generation capacity was 402,876 kWh (KW/h), and the carbon reduction benefit was 202.24 metric tons of CO₂e. It is expected that more than 10 million kWh of green electricity will be generated in the next 20 years, which is equivalent to the

carbon adsorption capacity of 14.2 Daan Forest Parks.

3. 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.

4. 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.

Carbon reduction and emission reduction

Good energy management, efficient energy use, and a continuous increase in the share of renewable energy have a key impact on reducing global greenhouse gas emissions.

The school first passed the ISO14064-1 greenhouse gas emission verification in 2013. The scope of GHG inventory includes category 1: direct greenhouse gas emissions, such as the use of gasoline and diesel in schools, etc.; category 2: indirect greenhouse gas emissions caused by input energy, such as purchased electricity. After investigation, it was found that the school's greenhouse gas emissions mainly come from purchased electricity, accounting for more than 92% of the total emissions. Therefore, setting a power-saving target is the primary action plan to reduce carbon emissions. Then, the ISO50001 energy management system was introduced, and the campus energy review operation was carried out to grasp the energy-intensive units and equipment, and further implement energy consumption management. After five years of operation, the school has spotted the bulk of electricity consumption on campus (for example:

the top 20 electricity consumers). Through the 80/20 rule, the school's general affairs unit is continuing to promote related work with verification tools such as energy baselines and energy performance indicators. Specific practices include:

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. 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.
5. The advancement of sustainable transportation: A shuttle bus that runs between the MRT station and the campus has been set up, as well as bus terminals

around the campus that directly connects to downtown Taipei and Tamsui. Bus routes within the school, pedestrian areas, and other measures provide students and teachers the convenience of coming and leaving the campus to various urban areas, reduce energy consumption and air pollution, and increase mobility.

In 2021, the school's carbon emissions were 12,193.74 metric tons, a decrease of 7.68% compared with the previous year.

Plan to reduce consumption

The university has introduced the ISO50001 Energy Management System to undertake campus energy review operations to master energy-intensive units, spaces, and equipment, and further implement energy consumption management. Through the 80/20 rule, using energy baselines, energy performance indicators and other inspection tools, the school's general affairs unit continuously promotes energy efficiency-related work.

In addition, 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 2022 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.
2. The improvement project of the central air-conditioning main unit of the College of Education.
3. The improvement project of high-light lighting in the basketball area of the sports field.
4. 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 rec-



ord 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 electricity bill of the Tamsui Campus has fallen from its peak of NTD 91.26 million/year to NTD 66.28 million/year in 2020, and to NTD 62.69 million/year in 2021. Electricity consumption has decreased year by year.

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 requirements 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.

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 2021 .

Energy use density

- Energy consumption per sqm: $88,159.6908/284,929=30.941\%$
- Total energy consumption (Gigajoules): 88159.6908
- Building area of university buildings (square meters): 284,929

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, im-

plementation 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.

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 visit to incineration plant: The school's USR project team led the community to visit regional incineration plants to understand the internal operation of the incineration plant, the source and whereabouts of resources, and public hazard prevention and control measures to help people understand the energy consumption during resource disposal and pay attention to the importance of clean energy.

3. 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 contributed 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.

4. Academia and industry collaboration: A team from the Department of Water Resources and Environmental Engineering of the University collaborated with Rongcheng Paper to conduct a multi-year research and development project on issues in paper mills such as zero carbon emissions, pollution prevention and waste reduction, energy integration and utilization, as well as an AI control program, to implement clean and smart production.

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 projects, research projects, and activities. Related actions :

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. The second phase will be the installation on the roof of the Taipei campus in 2022.

Energy efficiency services for industry

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

1. Energy efficiency assessment, evaluation, and data collection:

- (1) Energy efficiency assessment service:

The school's incubation center provides stationed manufacturers with the service of assessing their enterprise's energy usage efficiency and provides free program suggestions.

For example, under the guidance of the school's incubation center, a demonstration farm has been set up by the stationed manufacturer "RPG Limited Co., Ltd.", and many local bean dregs wastes and sludge that

cannot be processed are provided to the company for the black soldier flies it raises. In agriculture, it can also be used as fodder for livestock and fertilizer for plants; in business, it can also be used as a facial mask, which can deal with the pollution sources abandoned by some factories and provide value-added products.

- (2) R&D performance evaluation:

From 2018 to 2020, the teachers of the Department of Chemical Materials served as the review committee overseeing the application submitted by Formosa Plastics and CNPC regarding petroleum fund compensation for the import of petroleum used in the manufacturing of petrochemical raw materials, as well as the performance evaluation committee of the Technology research and Development Team in the energy field. From 2019 to 2020, they served as members of the Technical Review Committee of the Energy Technology Project plan.

- (3) Promotion of renewable energy:

The university and the alumni company SINBON Electronics work together to bring green power to the campus, build solar panels, and collect data and data, and continue to cooperate with information engineering, information technology, electrical engineering, electricians, and other fields to cultivate talents in the field of renewable energy.

2. Academia and industry collaboration:

- (1) The Department of Information Engineering of the university cooperates with the Marine and Underwater Science and Technology Research Center, consulting companies and enterprises to implement academia and industry collaboration projects, and also to conduct energy efficiency assessments and research on renewable energy solutions to improve energy efficiency and provide clean energy. Related projects include: "Shimen Reservoir Right Bank Pumped Hydroelectric Power Generation Project Feasibility Assessment Plan" and "Tower Hindrance ultraviolet photometer video discharge Detection and Quantitative Analysis".

- (2) A team from the Department of Water Resources and Environmental Engineering of the University collaborated with Rongcheng Paper to conduct a

multi-year research and development project on issues in paper mills such as zero carbon emissions, pollution prevention and waste reduction, energy integration and utilization, as well as an AI control program, to implement clean and smart production.

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, and from 2019 to 2021 served as a supervisory school, 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 Service Center of Pingzhen Industrial Zone, it provides ESG transformation and upgrading services for 136 manufacturers in the park.
3. The Department of Chemical and Materials Engineering of the university cooperates with the Institute of Industrial Technology to conduct research on "Process design and energy consumption and economic analysis of carbon dioxide hydrogenation production chemicals."
4. The Center for Ocean and Underwater Technology Research cooperates with enterprises to implement the "Second Phase Renewal and Reconstruction Plan for Gas-fired Units of Xingda Power Plant" to provide the government with relevant recom-

mendations on clean energy and energy-saving technology policies.

Assistance to low-carbon innovation

The "TKU Champion Incubator Center" provides regular counseling for new start-ups applying low-carbon economy or technology, assists resident companies in applying for government projects, provides information on loans and start-up funds, and develops environmental software development and application projects. The Incubation Center also offers courses to guide new ventures in fundraising and marketing, and to match industry-academia cooperation with our teachers.

The R&D Office of the school is responsible for academia and industry collaboration, patent application maintenance, technology transfer, and new innovations. There are 10 research centers and publishing centers under its jurisdiction, among which the water resources center uses the green system to assist in the analysis of reservoir data, real-time monitoring, and flood prevention and control; the subsea center studies the extraction of deep seawater, and researches and develops edible commodities.

In nurturing and supporting low-carbon economy or technology start-ups, the school's relevant activities include:

1. Aided the stationed manufacturer "Hua Jing Environmental Protection Technology Co., Ltd." In applying for the "Green Circular

Testing Program for Retaining and Building Wealth (CITD Program)" of the Industrial Bureau of the Ministry of Economic Affairs, and is responsible for inspection, analysis, and research.

2. The teachers of the water environment department of our school have a total of 5 patents in the field of "waste incineration and fly ash recycling" and cooperates with new environmental protection companies to transfer technology to assist the development of low-carbon economy and technology start-ups.
3. Assisted "Taiwan Environmental Protection Culture and Education Foundation" in applying for the Ministry of Economic Af-

fairs' Service Industry Innovation R&D Program (SIIR Program) "Waste Incineration Fly Ash Recycling Production Wastewater Ceramic Filter Membrane Full Recycling and Cleaning Process."

4. Guiding the stationed manufacturer "RPG Limited Co., Ltd." to set up a demonstration farm, which adapts raised black soldier flies in decomposing kitchen waste and sludge and turning the waste into animal feed and plant fertilizer in agriculture. In industrial use, the product of the farm can also be used in the production of facial masks. This project can deal with the pollution sources discarded by some factories and provide value-added products.





SDG7

可負擔的潔淨能源

潔淨能源措施

持續提升潔淨能源的占比，對於是否能降低全球溫室氣體排放，具有關鍵影響。本校提升清潔能源占比的措施包括：

1. 國際標準導入：2003 年實施 ISO14001 環境管理標準；2006 年淡水校園建置節能監控系統；2013 年依據 ISO14064-1 標準辦理校園溫室氣體排放量查證；2015 年導入並通過 ISO50001 能源管理標準。
2. 設置專責組織：成立「環境永續推動委員會」，由行政副校長擔任主任委員，負責督導、審查及檢討各項節能計畫的執行效益，以及每一學年度必須提出的節能計畫，並確實予以落實。



年度關鍵成果

- 連續 7 年達成節電率每年至少 1% 的目標
 - 2021 年碳排放量 12,193.74 公噸，較前年減少 7.68%
 - 2015-2021 年間，六度榮獲「新北市政府環境保護局綠色採購績優單位優等獎」
 - 2021 年 7 月起，架設共 1,636 片太陽能光電板，系統總瓦數 539.88kW，發電效益為每年 54 萬 5,385 度
3. 更新節電節能設備：每年編列節能改善工程預算，將舊有耗能設備汰換為新式高效能設備。
 4. 增加再生能源：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。
 5. 降低契約容量：2020 年起，透過降低本校與台灣電力公司間契約容量，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。2021 年仍維持上述契約容量。
 6. 綠色採購優先：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。
 7. 促進永續交通：包括設置捷運站與校園間的接駁車、校區周邊設置直達台北市區及淡水市區的公車總站、公車路線進入學校、行人徒步區等措施，提供學生及教師進出校園至各市區便利性，減少能源消耗、空氣污染，並增加機動性。

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）將不再新建新大樓。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. 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 539.88KW，預計每年減少 277 噸碳排放量。截至 2022 年 6 月底止，總計發電量為 40 萬 2,876 度(KW/時)，減碳效益為 202.24 公噸 CO₂e。預計未來 20 年將產生超過 1,000 萬度綠電，等同 14.2 座大安森林公園的碳吸附量。
3. 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。
4. 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。

減碳及降低碳排放

本校重視節能減碳工作，首先於 2013 年通過 ISO14064-1 溫室氣體排放量查證。溫室氣體盤查範圍包含類別一：來自直接溫室氣體排放，如校內使用汽柴油等；類別二：以輸入能源造成間接溫室氣體排放，例如購買之電力。盤查後，發現本校溫室氣體排放主要來自外購電力，約占全體排放總量之 92% 以上，故設定節電目標做為減少碳排放之首要行動方案。而後導入 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。運作五年來已掌握住校園用電大宗（例如：前 20 大用電單位），後續透過 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相關工作。具體作法包括：

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 2021 學年度以降低淡水校園 EUI 值 1% 為目標，預計用電量降低 23.4 萬度。
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：本校淡水校園師生通勤方式普遍以捷運轉公車為主，因此本校規劃公車可行至校內，設置捷運站與校園間的接駁車，平均 3-5 分鐘一班的車次，滿足教職員生通勤的需求；此外，並設有公車直達台北市區及淡水市區，提供學生及教師進出校園至各市區便利性，減少能源消耗、空氣污染，並增加機動性。目前正協調新北市政府增設電動版自行車站點中。

2021 年本校碳排放量為 12,193.74 公噸，較前一年相比減少 7.68%。

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。

淡水校園的電費從最高峰新臺幣 9,126 萬元/年，2020 年降至新臺幣 6,628 萬元/年，2021 年降至新臺幣 6,269 萬元/年，用電量逐年降低。

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。

2021 年仍維持上述契約容量。



能源利用密度

每平方米的耗能：30.941%

總耗能（千兆焦耳）：88,159.6908

大學建築的建築面積（平方米）：28,429

能源與社區

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. 產學合作：本校工學院水資源及環境工程學系團隊與榮成紙業合作，將針對紙廠之零碳排、污染預防與減廢、能源整合利用、AI 程序控制等議題，進行多年期研發，落實清潔與智慧生產。

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。

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. 能源效率評估、評鑑及數據蒐集：

(1) 能源效率評估服務：本校育成中心提供進駐廠商經營企業時能源使用效率的評估，並提供免費方案建議，例如進駐廠商「紅配綠植明地有限公司」在本校育成中心的輔導下已成立示範場，將當地許多無法處理的廢棄豆渣與汙泥，提供給該公司供其所飼養的的黑水蛇食用，黑水蛇不但可以分解上述廢棄物，在農業上也可以做為畜牧的飼料與植物的肥料；在商業方面，亦可產為面膜，處理了部分工廠廢棄的汙染源，並提供附加價值產品。

(2) 研發績效評鑑：化材系教師於 2018 至 2020 年間，擔任台塑、中油公司輸入石油供作製造石化原料進料申請石油基金退費審查委員，以及能源領域技術研發組績效評鑑委員，並於 2019 至 2020 年擔任能源科技專案計畫技術審議委員會委員。

(3) 再生能源推廣：本校與校友企業信邦電子 (SINBON Electronics) 攜手將綠電帶入校園，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。

2. 產學合作：

(2) 本校資訊工程學系與海洋及水下科技研究中心與顧問公司及企業合作，執行產學合作計畫，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，相關之計畫案包括：「石門右岸抽蓄水力發電計畫可行性評估計畫」與「鐵塔礙子紫外光儀影片放電偵測與量化分析」。

(3) 本校工學院水資源及環境工程學系團隊與榮成紙業合作，將針對紙廠之零碳排、污染預防與減廢、能源整合利用、AI 程序控制等議題，進行多年期研發，落實清潔與智慧生產。

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 Univer-



sity 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，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。透過與平鎮工業區服務中心的合作，提供園區 136 家廠商 ESG 轉型升級之服務。
3. 本校化學工程與材料工程學系與財團法人工業技術研究院合作，進行「二氧化碳氫化生產化學品之製程設計暨能耗與經濟分析」
4. 海洋及水下科技研究中心與企業合作執行「興達電廠燃氣機組第二期更新改建計畫」，向政府提供清潔能源和節能技術政策之相關建議。

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。

本校研發處負責全校產學合作、專利申請維護、技術移轉以及新創育成。下轄 10 個研究中心與出版中心，其中水資源中心運用綠系統，協助水庫資料分析、即時監控，防治洪水災害；海下中心研究抽取海底深層水，研究開發成可食用商品。

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. 協助進駐廠商「化境環保科技股份有限公司」，向經濟部工業局申請「擋土建財綠色循環檢測計畫（CITD 計畫）」，負責檢驗分析研究；
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. 協助「財團法人台灣環保文教基金會」申請經濟部服務業創新研發計畫（SIIR 計畫）「垃圾焚化飛灰循環利用生產廢水陶瓷濾膜之全回收清潔製程」
4. 輔導進駐廠商「紅配綠植明地有限公司」成立示範場，將當地許多無法處理的廢棄豆渣與汙泥，提供給該公司供其所飼養的黑水虻食用，黑水虻不但可以分解上述廢棄物，在農業上也可以做為畜牧的飼料與植物的肥料；在商業方面，亦可產為面膜，處理了部分工廠廢棄的污染源，並提供附加價值產品。

