Annual Report
on SDG 7 Affordable and Clean Energy

7.4 Energy and the community

7.4.5 Does your university as a body provide assistance for start-ups that foster and support a low-carbon economy/technology?

Thaksin University supports the development of low-carbon technologies that underpin start-ups and green-technology entrepreneurs. Through the Biotechnology Program, Faculty of Science and Digital Innovation, the university provides researchers, laboratory facilities and support for prototype development of Carbon Capture Microbial Fuel Cell (CC-MFC/CMFC) technology, led by Pimprapa Chaijak in collaboration with the Thailand Institute of Nuclear Technology (Public Organization) and Princess of Naradhiwas University. All research was invented from October 2005 due to the funding support requirement.

These technologies turn agro-industrial waste from southern Thailand — coconut processing waste, palm oil mill effluent and swine wastewater — into bioelectricity, while fixing CO_2 through microalgae and co-producing high-value products such as bacterial nanocellulose and nutraceuticals. Three peer-reviewed papers published in 2026 report power densities of up to 12.05 W/m³, CO_2 fixation of up to 0.13 g/L/day and pollutant removal of 73–93%. This knowledge and these prototype technologies are ready to be transferred to start-ups, community enterprises and local entrepreneurs to build clean-energy and circular-economy businesses that support a low-carbon economy.

In addition, the university supports low-carbon innovations that are transferred to communities and entrepreneurs. The Biomass Heat Exchanger runs on low-cost waste wood in a closed system and emits less PM2.5 than open burning; it is covered by patent application No. 2201006806 and petty patent No. 2303001118 and is in use in communities in Phatthalung and Satun provinces. Other innovations include the Combined Heat Energy Drying Facility (solar plus

biomass heat) for community products, natural rubber life jackets that replace synthetic polymers, Ojifume perfume made from pomelo peels as a circular-economy product, and a mobile application for estimating tree carbon stock (copyrighted on January 21, 2025). These innovations give farmers, community enterprises and start-ups a base for building low-carbon businesses.

Evidence: Low-carbon technology research supported by Thaksin University (2025)

No.	Publication / Citation	Low-carbon technology	Key outcomes
1	**Carbon capture – microbial fuel cell for energy, bacterial nanocellulose and nutraceuticals production from coconut processing waste** Thammasorn W, Rothjanawan K, Siriwong P, Kongthong A, Chaijak P. (2026). Asian Journal of Agriculture and Biology, e2025258. DOI: 10.35495/ajab.2025.258	ระบบ CC-MFC เปลี่ยนของเสียจากการแปรรูปมะพร้าวเป็นไฟฟ้า พร้อมตรึง CO_2 ด้วยสาหร่าย Chlorella sp. BF03 และผลิตแบคทีเรียลนาโนเซลลูโลสและสารเสริมอาหาร (Converts coconut-processing waste into electricity, fixes CO_2 with microalgae, and co-produces bacterial nanocellulose and nutraceuticals)	Power density 0.77 W/m²; OCV 697.50 mV; BNC 0.54 g/L/day; CO_2 fixation 0.13 g/L/day
2	**Integrated laccase-producing consortium and silver nanoparticles (AgNPs)-based carbon capture microbial fuel cell (CMFC) for**	ระบบ AgNPs-CMFC บำบัดน้ำเสียปนเปื้อนยาปฏิชีวนะ (เพนิซิลลิน) และน้ำเสียฟาร์มสุกร พร้อมผลิตไฟฟ้าและตรึง	Penicillin removal 93.15%; power density 12.05 W/m³; CO_2

No.	Publication / Citation	Low-carbon technology	Key outcomes
	penicillin degradation, energy recovery, and carbon fixation Rothjanawan K, Sola P, Changkit N, Chaijak P. (2026). Journal of Degraded and Mining Lands Management, 13(2), 9905–9915. DOI: 10.15243/jdmlm.2026.132.9905	คาร์บอน (Treats antibiotic-contaminated and swine wastewater while recovering energy and fixing carbon)	fixation 0.03 g/L/day
3	**Enhanced bioelectricity recovery and melanoidin degradation in CO_2-capturing microbial fuel cells via biochar-immobilized whole-cell biocatalysts** Thipraksa J, Yooyen T, Sola P, Palasai W, Chaijak P. (2026). Communications in Science and Technology, 11(1), 250–258. DOI: 10.21924/cst.11.1.2026.1996	MFC ดักจับ CO_2 ที่ใช้ไบโอชาร์จากทะลายปาล์มเปล่า (BC600) ตรึงจุลินทรีย์ผลิตเอนไซม์แลคเคส บำบัดเมลานอยดินในน้ำเสียโรงงานสกัดน้ำมันปาล์ม (Uses empty-fruit-bunch biochar to immobilise laccase-producing microbes for palm-oil-mill effluent treatment with CO_2 capture)	Melanoidin removal 73.15%; OCV 619.17 mV; power density 1.00 W/m³; CO_2 fixation 0.13 g/L/day

No.	Publication / Citation	Low-carbon technology	Key outcomes
Ojifume: A Perfume from Pomelo Peels (น้ำหอมจากเปลือกส้มโอ)	Makes perfume from agricultural waste instead of synthetic chemicals; circular-economy product	Product innovation from local agricultural waste	**Ojifume: A Perfume from Pomelo Peels** (น้ำหอมจากเปลือกส้มโอ)
Mobile application for measuring tree height and estimating carbon stock accumulation (แอปพลิเคชันวัดความสูงต้นไม้และประเมินการสะสมคาร์บอน)	Real-time tree-height and carbon-stock estimates that support carbon inventories and climate planning	Copyrighted on January 21, 2025	**Mobile application for measuring tree height and estimating carbon stock accumulation** (แอปพลิเคชันวัดความสูงต้นไม้และประเมินการสะสมคาร์บอน)

Additional evidence link:

- Google Scholar (Pimprapa Chaijak): https://scholar.google.com/citations?user=JfmLxN8AAAAJ&hl=th&oi=ao
- Publication 1: https://doi.org/10.35495/ajab.2025.258
- Publication 2: https://doi.org/10.15243/jdmlm.2026.132.9905
- Publication 3: https://doi.org/10.21924/cst.11.1.2026.1996