

Chulalongkorn University Sustainability Report 2017-2018

Based on ISCN-GULF Sustainable Campus Charter



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Vorapat Inkarojrit

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President's Statement



Sustainability is one of the defining challenges of our time. As an integral member of Thai society, Chulalongkorn University affirms its commitment to deliver the highest academic standards and highest quality research, with the ultimate goal of providing innovative and sustainable solutions in response to rapid change at both the national and international levels.

At Chulalongkorn University, Campus Sustainability is deeply embedded in our university's strategic goals, visions and policies. We engage in creating knowledge and experience that foster campus sustainability and environmental stewardship. The university's sustainability committee has dedicated itself to advising the university community on issues related to improving the campus's sustainability in the areas of academics, operations, physical environment and engagement. In addition, we have expanded our emphasis on social sustainability. In the year 2018, the results from our sustainability initiatives become more apparent and are reflected in research, teaching and operational practices. Achievements are evident across the university.

On behalf of Chulalongkorn University, it is my pleasure to present our 2017-2018 Sustainability Report based on the ISCN-GULF Sustainable Campus Charter. This report reflects our commitment to becoming a more sustainable university and continuing to provide a model to our society and our planet.

A handwritten signature in black ink, which appears to read "B. Eua-arporn".

Professor Bundhit Eua-arporn, Ph.D.
President of Chulalongkorn University

Chulalongkorn University: An Overview



Chulalongkorn University (CU) was the first institution for higher learning established in Thailand. The university was founded in March 1917 by King Vajiravudh (King Rama VI) and was named after his father, King Chulalongkorn (King Rama V). Throughout the past 102 years, Chulalongkorn University has played a leading role in national and international development. Chulalongkorn University graduates have served the people by applying their knowledge and expertise for the betterment of society and making contributions towards

the development of the nation in all relevant areas.

Located in the central district of Bangkok, the capital of Thailand, the Chulalongkorn University campus covers a tract of land covering approximately two million square meters, of which about 50% is dedicated solely to academic activities. Currently, Chulalongkorn offers nearly 500 programs in all areas of study, of which approximately 20% are international programs that use English as the medium of instruction. In academic year 2018, there were 39,801 regular



students and 26,689 online students enrolled, and the university employed 8,042 academic members and support staff.

In academic year 2018, from the total university budget of 23.58 billion Thai Baht (786 million USD), the University allocated about 2.017 billion Thai Baht (67.26 million USD) for research funds, of which approximately 47% went to sustainability-related projects. The QS (Quacquarelli Symonds) World University Rankings of 2018-2019 ranked

Chulalongkorn University as the top university in Thailand, 57th in Asia, and 271st in the world. According to the Universitas Indonesia (UI) GreenMetric World University ranking, Chulalongkorn University is the 96th highest ranked university in the world, with the highest score among Thai universities on Energy and Climate Change, Waste, and Education and Research criteria.

For the period 2017–2020, in order to raise the University to an even higher level of excellence, Chulalongkorn University is progressively implementing four main strategies to fulfil the University's Vision and Missions as follows:

Vision

To be a world-class national university, generating knowledge and innovation for the creative and sustainable transformation of Thai society.

Mission 2017–2020

1. Develop graduates who possess academic knowledge, advanced skills, a sense of public responsibility, and leadership qualities.
2. Be a pioneer in the development of knowledge, while creating innovations in teaching and research.
3. Produce internationally recognized academic research and output.
4. Apply knowledge learned towards the sustainable development of the country and society

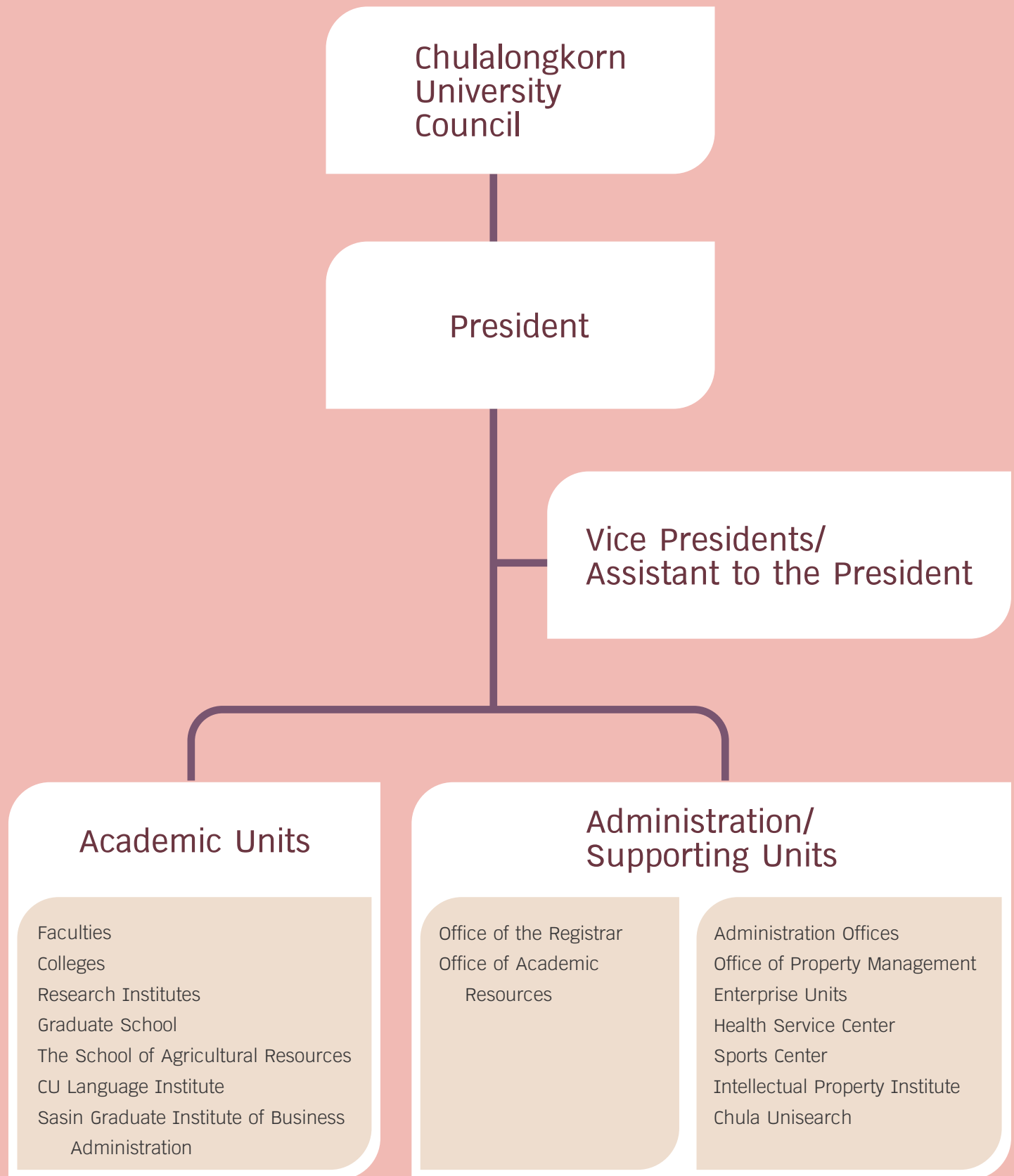
The Strategies

1. Human Capital
2. Knowledge and Innovation
3. Local Transformation
4. Global Benchmarking

For more information on Chulalongkorn University, please visit the University's website at <http://www.chula.ac.th/en/>



Chulalongkorn University Organizational Structure



Sustainability at Chulalongkorn University 2017-2018

Introduction

Sustainability is one of the most critical challenges of this generation and the next. Chulalongkorn University frames sustainability as part of its broader social responsibility agenda, in which one of the university's missions is to apply the knowledge learned towards the sustainable development of the country and society.

Chulalongkorn University is fully committed to sustainability and environmental stewardship. In shaping the physical environment of the campus, the sustainable university initiative, which was developed from the green campus initiative, has provided guidance in these areas since the first master plan was set forth nearly three decades ago. Other sustainability related initiatives have been created with the mission of promoting environmental conservation, raising awareness of the sustainable campus concept, and creating a healthy environment suitable for campus activities. In the past, the success of the programs has been reflected through multiple awards that have been presented to the university. Currently, we have begun to see positive behavioral changes among the members of the Chulalongkorn University community in support of sustainable campus enhancements. Although awareness of environmental problems has been incrementally raised, we believe that these small changes will lead to intrinsic and more sustained behavioral change over time.

Policy on Campus Sustainability

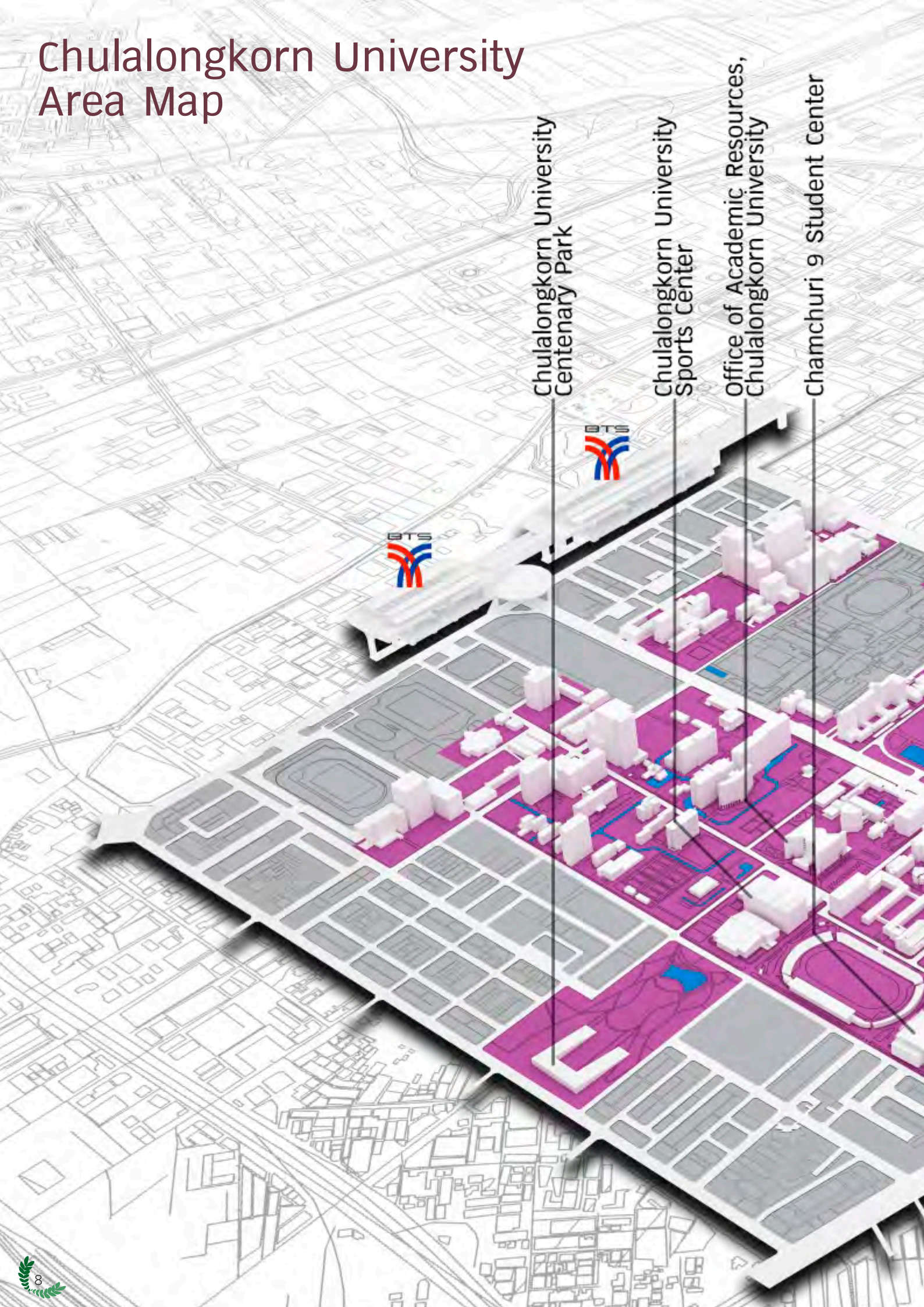
In 2017, the President of the University, Professor Bundhit Eua-arporn, Ph.D., set up the CU Committee for Campus Sustainability to oversee all sustainability programs on campus. The committee consists of representatives from the administrative board, academic experts from various fields, as well as operational staff from various responsible offices. Currently, staff from the Environmental Research Institute and the Office of Physical Resources Management have been assigned to coordinate the activities of the committee.

This arrangement allows the sustainable policy to be carried out with direction and support from the top management to the operational management levels. In addition, the arrangement provides an integrative linkage between the academic and campus operational practices. Since 2018, the university has put even more emphasis on student and staff engagement by inviting representatives to take part in the decision-making processes and implementation of the projects, themselves.

Perhaps, the most important development in 2017 was the Chulalongkorn University Announcement Regarding its Sustainable University Policy (see Appendix A). The announcement is based on the application of the Philosophy of the Sufficiency Economy developed by the late King Bhumibol Adulyadej (King Rama IX), along with the Sustainable Development Goals (SDGs) set by the United Nations in order to drive the university to adopt the best sustainability practices in five different areas: (1) infrastructure and physical features, (2) development for staff living, (3) resource and environmental management, (4) teaching and research, and (5) administration and social engagement. Since its announcement, the Sustainable University Policy has paved the way for integration of sustainability practices in university operations. In 2018, Chulalongkorn University announced the policy on Single-Use Plastic Waste Reduction Measures at Chulalongkorn University and surrounding business areas, including Suanluang, Samyan, Siam Square, and Chamchuri Square (see Appendix B). The policy was implemented in accordance with the CU Zero Waste Project, with the goals of reducing the amount of waste to a minimum and raising awareness of the negative impacts of single-use plastic waste.

With regard to new construction and renovation projects on campus, the details of each project are analyzed and approved by the Committee on Design and Construction, which consists of senior architects, engineers and designers in related fields. This policy was implemented to ensure that all proposed projects take sustainability and safety issues into full consideration.

Chulalongkorn University Area Map



Chulalongkorn University
Centenary Park

Chulalongkorn University
Sports Center

Office of Academic Resources,
Chulalongkorn University

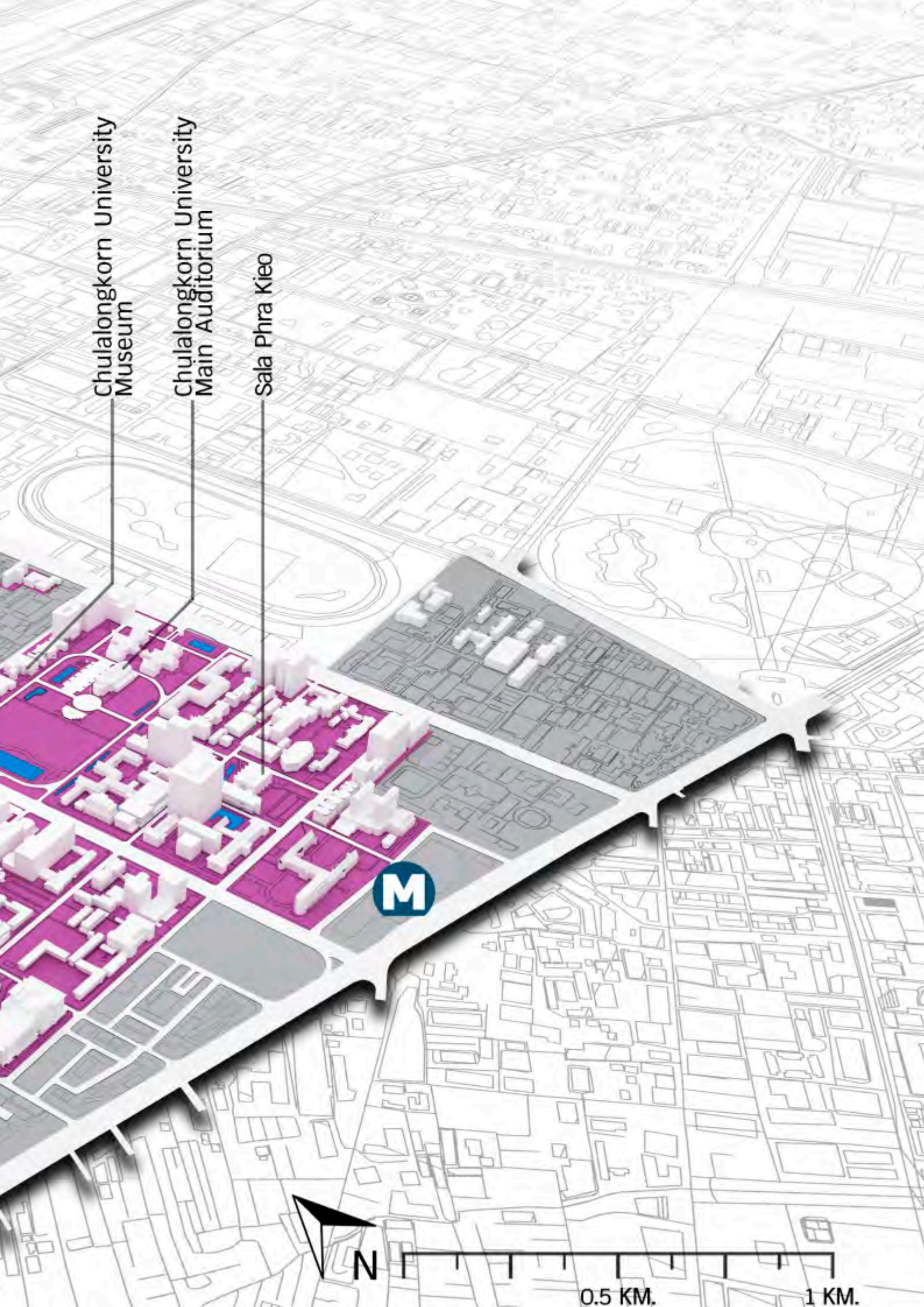
Chamchuri 9 Student Center



Chulalongkorn University
Museum

Chulalongkorn University
Main Auditorium

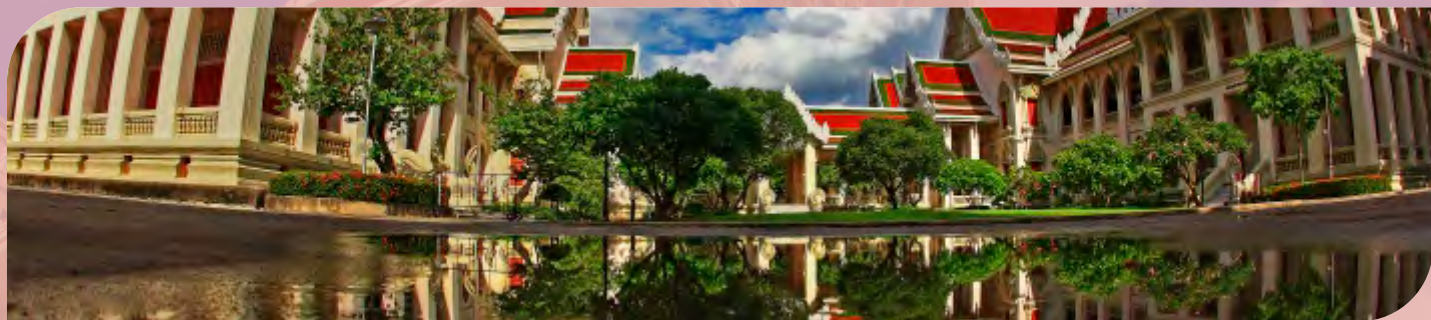
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1 KM.

Reflection on Progress and Achievements Related to Sustainability



In 2018, the university continued its efforts to improve its standing as a leading sustainable university at both national and international levels. With collaboration from various academic departments across campus, many projects were conducted to collect baseline data needed for further performance analysis, as well as the testing of sustainability concepts, products, processes and operations of university campus. For example, the Department of Civil Engineering conducted a traffic survey project; the Department of Biology conducted a biodiversity survey of living plants and animals on campus; the Department of Environmental Engineering conducted the Greenhouse Gas Emission Measurement project, and the Department of Environmental Science conducted the Waste Quantity and Waste Composition Survey project.

Chula Zero Waste is a multi-year project that is fully-funded by the university. In cooperation with the Environmental Research Institute, the Office of Physical Resource Management initiated this project to develop a complete waste management system with a cradle-to-grave approach. Following its earlier establishment, in 2018, the Chula Zero Waste project expanded its scope to cover the reduction of single-use plastic on campus. A new 100% biodegradable drinking cup was developed in collaboration with Chulalongkorn University's Petroleum and Petrochemical College. The use of the Chula Zero Waste cup is now mandatory in all campus canteens.

The environmental, economic and societal changes in the 21st Century pose challenges for Chulalongkorn University that require the institution to prepare for and adapt to such changes. Therefore,

the office of Physical Resource Management, in collaboration with the Urban Design and Development Center (UDDC), has prepared the new campus master plan for the education area of Chulalongkorn University, with the full master plan expected to be completed in 2019.

In recent years, "Living Laboratory" has been one of the most popular strategies used by universities worldwide to address sustainability issues on their campuses. Chulalongkorn University recognizes the great potential of adopting "Living Laboratory" as a holistic framework for the campus community to engage with campus sustainability challenges; therefore, in 2018, many sustainability-focused living laboratory projects were initiated, using the university campus as a testing ground to develop sustainability concepts, products, processes and operations. The living laboratory projects provide the opportunity for stakeholders on campus to integrate academic and non-academic sustainable solutions to meet sustainability goals in a real-world context. For example, the Energy Research Institute conducted a project on the Assessment of Electricity Generation Potential from Solar Rooftops of Buildings on the Chulalongkorn University Campus; the office of Physical Resource Management improved the water quality of campus ponds and ditches by developing and installing a series of aerators, the Property Management Office of Chulalongkorn University.

There are many facets to the university's sustainability strategy, in which three core areas have been identified: economic development, social development and environmental development. In 2018, Chulalongkorn University in partnership with

Korea Foundation for Advanced Studies was pleased to organize the Bangkok Forum 2018 International Conference with the goal of enriching knowledge about sustainable development and social sustainability at the regional and international levels. This conference is an example of the strong interest among the Chulalongkorn University community in the many dimensions of sustainability which, in turn, open up further discussion on social sustainability issues among students and staff.

In addition, the university provides a number of supporting facilities and has established many programs for on- and off-campus members of the community. For example, Chulapat 14 building, the most recently constructed building on campus, was designed and built to provide a state-of-the-art science laboratory space for innovation and development projects. The adjoining multi-story carpark provides an alternative to less efficient on-ground parking space on campus. CU Play+Learn Space, is an adaptive-reuse interior space renovation project in which a rundown lecture hall was redesigned and turned into a co-learning space in the middle of the campus. The space provides an additional venue for students to meet and learn outside of conventional classrooms. The university has also implemented various transportation initiatives such as the free low-emission vehicle on-campus shuttle service (CU Pop Bus), the low-emission shared vehicle project (CU Ha:mo, Muvmi, CU Bike), the expansion of covered walkway project and others, with the goal of reducing the use of private vehicles on campus.

Partnerships are vital to the implementation of sustainable development as stated in the SDG 17: Partnerships for Achievement of Goals. As an educational institute, Chulalongkorn University, along with other universities in Thailand, formed a network of universities to drive the development of sustainable development programs specifically for university campuses. This network is called the Sustainable University Network of Thailand (SUN Thailand).

The university has also participated in the annual meetings of various campus sustainability organizations such as the UI GreenMetric Conference, the Southeast Asian Sustainable Network (SEASN), and the International Sustainable Campus Network Conference.

One of the most exciting projects of 2018 was the Chulalongkorn University 2nd Century Master Plan Project, initiated by the Office of Physical Resources Management. The project calls for the revision, rethinking, and redesign of the campus physical master plan to meet the needs of educational activities in the 21st century. By applying the forward-looking methods to the planning process, university stakeholders are able to anticipate and respond to changes proactively, allowing adaptation to be achieved smoothly.

In conclusion, Chulalongkorn University aims to create and maintain a campus where students and staff can prosper in a sustainable environment. The preparation and review of previous sustainability reports allows the university to understand its sustainability performance. Nevertheless, an ongoing challenge is that many unknown parameters still exist. Therefore, the management approach of 2017-2018 continues to focus on systematic data collection and analysis processes. It is anticipated that, with more accurate data, the university can effectively gauge its sustainability performance and properly select future targets and initiatives. In addition to data collection and analysis, various programs, projects, and initiatives related to campus sustainability have been established in collaboration with academic units, supporting units and industry partners. Example of programs, projects, and initiatives carried out in the 2017-2018 period can be found in Appendix C. For more information on the Chulalongkorn University Sustainable Campus, please visit the University's Website: <http://www.green.chula.ac.th>



Main Initiatives and Results 2017-2018



Chulalongkorn University became a member of the International Sustainable Campus Network (ISCN) in July, 2014. This is the third sustainability report to be published by the University, providing performance data for the reporting period of the fiscal year 2017-2018 (October 2017 – September 2018) or the academic year 2017 (August 2017 – July 2018). The boundaries of this report encompass all units of Chulalongkorn University except the Faculty of Medicine, Chulalongkorn University Demonstration Primary School, Chulalongkorn University Demonstration Secondary School, and the King Chulalongkorn Memorial Hospital.

The report is divided into three sections. The first section describes the background of Chulalongkorn University, as well as the university's sustainability management approaches. The second section reviews the main sustainability initiatives and results 2017-2018 based on the ISCN's three principles. The last section comprises the appendices which display detailed information about example projects on campus and related data.

Principle 1

Sustainable Performance Related to Buildings on Campus



Principle 1: To demonstrate respect for nature and society, sustainability considerations should be an integral part of planning, construction, renovation, and the operations of buildings on campus.

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
1. Resource Use					
1.1 Energy use	To provide baseline energy consumption data for buildings on campus.	Installation of high-performance air-conditioning system.	75.24 kWh/m ² /yr	88.29 kWh/m ² /yr (+17%)	
1.2 Embedded (grey) building energy	No data				
1.3 Water use	To provide baseline water consumption data for further analysis.	Replacement of handheld toilet sprayer with water spray toilet seat.	1,503,576 m ³ /yr	1,329,570 m ³ /yr (-12%)	
1.4 Energy and water costs and saving achieved			Total electricity cost: \$13,631,872.53 (408,956,176 THB)	Total electricity cost: \$14,462,877.13 (433,886,314 THB) (+6.09%)	
			Total water cost \$901,619.30 (27,048,579 THB)	Total water cost: \$802,086.16 (24,062,585 THB) (-11.03%)	
1.5 Overall purchased products/materials		“CU Less paper project” which promotes the use of electronic documents on campus.	Approximate total printing paper used ~34,470 reams (~21% reduction of printed paper used)	No data	

Principle 1

(continued)

Topic		Goals and Initiatives		Results		
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018		
2. Waste, recycling, local emissions, and non-compliance						
2.1 Waste and recycling	<p>The university aims to alter the attitudes, values and behaviors of the CU community with regard to proper waste management habits. The objectives are to:</p> <ol style="list-style-type: none"> 1. Reduce the amount of waste on campus 2. Protect all persons from waste-related health risks 3. Encourage the use of reusable or refillable items 4. Promote proper waste management practices 	<p>Projects under CU Zero Waste program</p> <ol style="list-style-type: none"> 1. Development of CU 100% Biodegradable Cup 2. Policy on Ban on use of one-time plastic bag 3. Raise CU community awareness of good waste management practices 4. Upgrade waste separation and disposal operations 5. Support the use of reusable food/drink containers 	<p>Total waste: 2,109.53 tons/yr</p> <p>Total recycled waste: 414.31 tons/yr</p> <p>“CU My Cup” project to reduce the usage of plastic beverage containers: ~57,600 cups/yr</p> <p>Approximate distribution by waste type:</p> <p>Plastic 36%, paper 31%, food waste 19%, glass 4%, hazardous waste 3%, metal 2%, fabric 2%, wood 1%, others 2%</p>	<p>Total waste : 1,910.50 tons/yr (-9.43%)</p> <p>Total recycle waste : 305.55 tons/yr (-26.25%)</p> <p>Approximate distribution by waste type:</p> <p>Plastic 26.57%, paper 25.03%, food waste 35.23%, glass 4.27%, hazardous waste 0.02%, metal 0.36%, fabric 1.43%, wood 0.62%, rubber 0.47, others 5.21%</p>		
2.2 Waste disposal cost and saving achieved			<p>Cost of hazardous waste disposal (by incineration): \$17,833.33/yr/25t (535,000 THB/yr/25t)</p>	<p>Cost of hazardous waste disposal (by incineration): \$17,833.33/yr/25t (535,000 THB/yr/25t)</p>		
					<p>Cost of waste disposal by incineration: \$1050 (31,500 THB)</p>	
					<p>Cost of waste disposal by local municipality: \$17,386.67 (521,600 THB)</p>	

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
2.3 Emissions contribution to local air pollution	No data				
2.4 Incidents of non-compliance with environmental regulations	Center of Safety, Health and Environment developed strategic plan with a mission to create a zero-accident university.	Systematic data collection and reporting, especially on safety related issues.	No data		Incidents of non-compliance with environmental regulations: none Low-risk accidents: 12 Medium-risk accidents: 4 High-rise accidents: none
3. Research/IT facilities and sustainability					
3.1 Energy use in laboratories/IT facilities		Developed systematic data collection and analysis processes for further analysis of energy use in laboratories/IT facilities.	Average consumption: 133.86 kWh/m ² /yr Median consumption: 89.63 kWh/m ² /yr		No data
3.2 Chemical consumed	The university uses CHEMTRACK and WASTETRACK software to monitor the amount of chemical consumption and disposal in teaching/research activities.		The amount of chemical consumed (by chemical form): Solid 2,657.62 kg Liquid 14,637.51 liters Gas 290.10 m ³		Please see Appendix D for amount of chemical consumed (by UN Class)
3.3 Hazardous waste from research/IT facilities			12,228.97 kg of solid chemical waste 45,473.25 liters of liquid chemical waste		11,646.05 kg of solid chemical waste (-4.76%) 45,057.25 liters of liquid chemical waste (-0.91%)

Principle 1

(continued)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
					45,057.25 liters of liquid chemical waste (-0.91%) Please see Appendix E for amount of hazardous waste, classified by type of waste.
4. Users					
4.1 Handicapped access	To provide access for disable persons.	“Universal Design” principles became mandatory in new building and renovation projects.	No data		Number of renovation projects focusing on handicapped ease of use: 5 Budget spent: \$266,264 (7,987,921 THB)
4.2 Indoor air quality	To ensure suitable learning and working environments for students and staff.	Set up toolkit for indoor environmental quality diagnosis; Upgraded exhaust ventilation system of on-campus canteen; Installed high-performance air-conditioning system.	No data		Budget allocated for indoor environmental quality assessment tools: 999,830 THB (\$33,327.67)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
4.3 Campus community participation in planning (integrated design)	The Office of Physical Resources Management, in charge of the university's design and construction affairs, promotes a participatory design process in all construction projects. Each process involves a survey of users' needs and input to the development of design proposals that best meet the requirements of the campus community.		No data		The CU 2 nd Century Master Plan utilizes the foresight method, which promotes campus community participation in development of the new campus master plan.
5. Building design aspects					
5.1 Sustainable building standards applied and explored	Architects and engineers are encouraged to integrate green principles into the designs of new building and renovation projects on the campus of Chulalongkorn University. Buildings are regulated by the Energy Conservation Promotion Act of 1991, as well as other rules and regulations. In 2017, the university's commitment to sustainability was reflected in the implementation of the Campus Sustainability Initiative, from policy formulation and action plan to implementation strategies. The university also appointed a committee on energy conservation to oversee the energy consumption system with the aim of achieving the highest efficiency possible through an energy management program. A set of sustainable building design guidelines is being developed and is expected to be completed in 2020.				Installation of BEMS, a smart building control system to control and monitor energy consumption in the workplace.
5.2 Long-term use and flexibility	With respect to the issues of long-term use and flexibility, in new building and renovation projects, architects and engineers are encouraged to use construction materials that are durable with low toxicity. The university promotes the adaptive reuse approach for space renovation projects.				CU Play+Learn Space Project: An outdated lecture hall was renovated and turned into a co-learning space

Principle 1

(continued)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
5.3 Life-cycle costing	No data				
5.4 integration of landscape and building design	To increase total campus 'green' area.	A building and landscape design manual was produced for architectural and landscape designers to ensure that the campus buildings and grounds are designed with sustainable approaches. Supporting staff were trained on trimming and care of trees.	Total area of campus covered in forest and planted vegetation: 54.5%	Number of projects focusing on landscape design: 7	





Principle 2

Campus Wide Master Plan and Target Setting



Principle 2: To ensure long term development of a sustainable campus, campus wide master plan and target setting including environmental and social goals.

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
1. Institution-wide carbon target					
1.1 Carbon emission	To study GHG emissions from campus activities.	A GHG emission program was initiated in collaboration with staff from the Faculty of Engineering.	GHG Emission (FY2017) Total: 64,785 tCO ₂ eq Per capita: 1.44 tCO ₂ eq - Scope 1 (Direct emission): 0.038 tCO ₂ eq - Scope 2 (Indirect emission): 1.397 tCO ₂ eq Transportation: 522.3 tCO ₂ eq	GHG Emission (FY2018) Total : 52,364.83 tCO ₂ eq Per capita : 1.48 tCO ₂ eq Transportation : 1,154.65 tCO ₂ eq	
2. Master plan					
2.1 Coverage of campus area (%) per master planning initiative	Most, if not all, campus areas are covered by master planning initiative.		No data	95%	
3. Transportation					
3.1 Frequency of traffic survey	To provide baseline data on the transportation system which will aid in planning the university's infrastructure.	The traffic survey project has been conducted annually since 2015.	Annually Number of cars entering the university daily: 9,097 Number of motorcycles entering the university daily: 4,717	Annually Number of cars entering the university daily: 17,830 Number of motorcycles entering the university daily: 11,152	
3..2 Bicycle and pedestrian access	To promote alternative modes of transportation on campus.	Free shared bicycle program, covered walkway.	Average number of bicycles on campus daily: 1,290	Average number of bicycles on campus daily: 1,097 Length of pedestrian covered walkway: 3,220 meter	

Principle 2

(continued)



Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
3.3 Estimated commuting distance or commuter energy use per person	The commuting distance per person on campus was calculated as part of the traffic survey project. The commuter energy use per person is expected to be examined in 2020.		No data		Average on-campus walking distance: 0.73 km/person/day
3.4 Urban mobility integration planning	Provide free-shuttle service that connects the campus with the urban public transportation nodes. Provide car-sharing system, including one-person electric vehicles (Ha:mo), and multi-person electric vehicles (Muuvmi).		Number of shuttles: 32 Average number of passengers of each shuttle: 55 Total shuttle trips per day: 357		Number of shuttles: 36 Average number of passengers of each shuttle: 50 Total shuttle trips per day: 426 Number of one-person EVs: 32
4. Food					
4.1 Food supply chain and environmental impacts	To ensure the high quality of food and beverage services provided in university canteens, the food safety program, which involves the testing of chemical additives in food, food safety practices, and surveys of customer satisfaction, was initiated in 2014 in collaboration with the Faculty of Allied Health Sciences. Minimum food safety program requirements were adjusted. Mandatory program for all canteen vendors was implemented.		No data		Average customer satisfaction score: 75/100
4.2 Fair trade food sourcing	No data				

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
5. Social inclusion and protection					
5.1 Diversity (faculty, staff and students)			1. International students: 556 2. International faculty members/ researchers: 83 3. MOU with intl. partners 834 4. Exchange students: 1,031/1,274	1. International students: 1,118 2. International faculty members/ researchers: 91 Please see Appendix F and G for international staff and student data.	
5.2 Incidents of discrimination	<p>Chulalongkorn University is committed in creating equity both in the workplace for staff and in the education for students. We follow the Gender Equality Act B.E. 2558, Promotion and Development of Quality of Life for Persons with Disabilities Act, B.E. 2550 and B.E. 2556, Education Provision for Persons with Disabilities Act B.E. 2551, and other related laws and regulations to provide opportunity and to take positive steps to eliminate bias in education and employment.</p>		None	None	
5.3 Access to education (in case of substantial fees)			Number of scholarships: 1,601 Total amount of scholarships: \$1,505,633.33 (45,169,000 THB)	Number of scholarships: 1,715 Total amount of scholarships: \$1,646,023.33 (49,380,700 THB) (+9.32%)	

Principle 2

(continued)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
5.4 Open access spaces for interaction and recreation	To promote a learning environment that is suitable for the 21 st century.	Development of co-learning spaces across campus. Promote online learning methods.	Established 8 research clusters which provide platforms for faculty and students to collaborate and exchange ideas on an issue-based basis.	CU Play+Learn Space. Chula MOOC Chula MOOC Achieve	
5.5 Access to services and commerce	Create campus environment that is suitable for learning, working and living.	Extending operating hours of facilities such as the Center for Academic Resources.	Chula Student Wellness Center's number of consultant services provided: 2,029	Number of personal consultant services provided: 1,506 Number of online consultant services provided: 7,278	
5.6 Participatory campus planning, integrating users and neighbors	To insure that campus planning and the built environment are designed based on the needs of all stakeholders.	The committee on campus planning and the built environment was set up to discuss issues that are related to campus planning and the built environment. The committee encourages the integration of a participatory design process in new and renovation projects. The Office of Property Management of Chulalongkorn University (PMCU) is responsible for the design and construction of projects that are located in the commercial zone.			
5.7 Working conditions, including minimum wages, collective bargaining, and health and safety	The Office of Human Resources Management is in charge of issues related to working conditions. Provision of safety and health is under the Center of Safety, Health and Environment. The university also has the Chulalongkorn University Health Services Center, providing primary care for students and staff. The Chulalongkorn University Safety, Health, and Environment (SHECU) was set up to oversee workplace health and safety issues.		1. The CU Safety, Health and Environment Task Force was upgraded to be one of the functional units under the direct supervision of the president. 2. The university allocated funds to upgrade laboratory environments.	SHECU set up a policy and action plan on workplace health and safety issues. Workshops and training programs are offered to Chulalongkorn University community members.	

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
6. Land use and biodiversity					
6.1 Land and building reuse (brownfield development, adaptive renovations)	 	<p>1. Chulalongkorn Centennial Park was completed in 2016 and has become an urban oasis for the university and surrounding communities.</p> <p>2. A policy was set to turn vacant unused campus buildings into green leisure areas.</p> <p>3. Chaloe Rajakumari 60 Building park was designed and opened as art and urban farm for recreation and student activities.</p>	<p>CU Play+Learn Space, a co-learning space, provided for students. The space was renovated from an old lecture hall. During examination weeks, the space is open 24/7. Additional co-learning spaces will be provided in 2019-2020.</p>		
6.2 Landscaping impacts and biodiversity		A biodiversity survey is conducted by the Department of Biology annually.	<p>Numbers of species surveyed:</p> <p>Trees 260, Birds 96, Insects 12, Non-insect invertebrates 10, amphibians 8, reptiles 20, mammals 6</p>	<p>Numbers of species surveyed:</p> <p>Trees 260, Birds 137, Insect 12, Non-insect invertebrates 10, amphibians 8, reptiles 20, mammals 6</p>	

Principle 3

Integration of Facilities, Research, and Education



Principle 3: To align the organization’s core mission with sustainable development principles, facilities, research, and education should be linked to create a “living laboratory” for sustainability.

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
1. Integration					
1.1 Programs and projects that connect facilities, research and education			Number of events related to the environment and sustainability: 124	Number of events related to sustainability. (annual average for the part 3 years) : >47. Please see Appendix C for examples of programs and projects	
1.2 Labeling of courses that have an integrated perspective on sustainability as a key component			Number of courses that have an integrated perspective on sustainability as a key component: 1,202 Total courses offered: 11,385	Number of courses/ subjects offered that are related to sustainability: 1,241 Total courses offered : 11,102 Please see Appendix I for examples of courses.	
1.3 Cross-discipline Courses and/or research	Chulalongkorn University Research clusters consisting of the following: 1. Advanced materials 2. Aging 3. ASEAN studies 4. Automation/Robotics 5. Climate change and disaster management 6. Energy 7. Food 8. Health 9. Social Development and Human Security		Chulalongkorn University put more emphasis on multi-disciplinary and cross-disciplinary education with focus on sustainability. Various programs offered at the undergraduate and graduate levels; for example, Program in Technopreneurship and Innovation Management, Program in Environment, Development and Sustainability, Program in Risk and Disaster Management, etc. Please see Appendix H for examples of programs offered.		

Principle 3

(continued)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
2. Social Integration					
2.1 Programs and projects that connect campus use with industry, government and/or civil society		The CU Social Engagement program, which covers Bangkok, Saraburi, Nan and Chonburi provinces was initiated.	1. Number of projects under “One Functional Unit – One Community (OFOC) Program”: 97 2. Number of projects under “Strengthen Saraburi Program”: 14	1. Number of projects under “One Functional Unit – One Community (OFOC) Program”: 40 2. Number of projects under “Strengthen Saraburi Program”: 19	
2.2 Programs to further student interaction and social cohesion on campus		The Office of Student Affairs developed many programs to help students achieve their academic goals, as well as to help prepare to be citizens of the 21 st Century.	No data	1. Number of projects related to personality and leadership: 5 2. Number of projects related to morals and ethics: 60 3. Number of projects related to social responsibility: 7 4. Number of projects related to internationalization: 9	
2.3 Courses that use participatory and project-based teaching		The Office of General Education offered various courses that use participatory and project-based teaching methods.	Examples of courses: Our Environment Pollution Control	Details of courses offered are available in Thai at http://www.gened.chula.ac.th	

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
2.4 Behavioral programs aimed at more sustainable actions by students, staff or external community members			Number of student organizations related to the environment and sustainability: 127	Number of students project related to the environment and sustainability: 208	
3. Research and education projects related to laboratory/IT facilities and sustainability					
3.1 Research and education on mitigating energy use in laboratories/ IT facilities			None	No data	
3.2 Research and education on mitigating hazardous waste from research/IT facilities	The Center of Excellence on Hazardous Substance Management and the Chulalongkorn University Safety, Health, and Environment office conducted research on mitigating hazardous waste from research/IT facilities. Details, written in Thai, can be found at http://www.hsm.chula.ac.th and http://www.shecu.chula.ac.th		Systematic survey of safety practices in laboratories, including the mitigation of hazardous waste from research facilities was conducted.	Systematic survey of safety practices in laboratories, including the mitigation of hazardous waste from research facilities was conducted.	
4. Resources committed to campus sustainability					
4.1 Existence of an organization-wide sustainability policy that integrates academic and operational issues			Sustainability is one of the issues stated in the University strategy 2017-2020 The university set up the Committee on Sustainability in 2017 to help integrate academic activities with operational and management issues. Funding for sustainability operation: \$866,666.67 (26,000,000 THB)		

Principle 3

(continued)

Topic		Goals and Initiatives		Results	
Priority Topic	Objectives and Targets	Key Initiatives	Performance 2016-2017	Performance 2017-2018	
4.2 Commitment to external sustainability principles and initiatives			Chulalongkorn University established connections with national and international organizations and participated in the university's sustainability performance evaluation program including: 1. ISCN-GULF Sustainable Campus Charter, 2. UI Green Metric World University Ranking, 3. Sustainable University Network of Thailand (SUN Thailand), 4. Southeast Asia Sustainability Network (SEASN) 5. ASEAN University Network – Health Promotion Network (AUN-HPN)		
4.3 Dedicated resources (processes, human and financial resources) for campus sustainability			Total research funds dedicated to environmental and sustainability research: \$18,049,786 (592,090,085 THB)	Total research funds dedicated to environmental and sustainability research : \$31,620,138 (948,604,147 THB)	(+60.21%)
4.4 Economic value of education vs. cost	No data				
4.5 Student Opportunity	No data				

Appendix A:

Announcement of Chulalongkorn University Related to the Sustainable University Policy B.E. 2560 (2017 A.D.)

With the aspiration to be the University of Academic Excellence with social and environmental responsibility, Chulalongkorn University has applied the Philosophy of the Sufficiency Economy and the Sustainable Development Goals set by the United Nations to drive the institute to have the best practice in sustainability within the International Sustainable Campus Network (ISCN). To achieve this goal, the university has delivered the Sustainable University policy as follows.

1. This announcement is called the “Announcement of Chulalongkorn University Related to the Sustainable University Policy B.E. 2560 (2017 A.D.).”
2. This announcement will come into force as from the day following the date of announcement.
3. Chulalongkorn University will implement the plan of the sustainable university in three development aspects; environmental, economical and social. The actions will be executed in the following five types of activities.

(1) Infrastructure and physical feature

The university has developed a master plan, landscape and infrastructure system, building design and development of transportation system to benefit environmental sustainability.

(2) Development for staff living condition

The university encourages the security of food and beverage consumption, the hygiene control in laboratory and working areas as well as the improvement for well being condition.

(3) Resources and environmental management

The university implements the efficient and sustainable management for energy consumption, climate change, waste and hazard waste management and water usage.

(4) Teaching and research aspect

The university integrates sustainability within academic courses as well as promotes the institute as the research centre for innovation for sustainability.

(5) Administration and social engagement

The university develops the sustainable administration management that liaises with students, faculty, local community groups, local businesses and stakeholders from society.

4. With the engagement from all parties, Chulalongkorn University launches the master plan of sustainable university and action plan for the 5 activities The university will appropriately allocate budget and resources to achieve the plan.

5. Implementing the sustainable university is the mission and responsibility of the university executives, faculty, students and all staffs to collaborate and support the plan execution The university thus empowers all parties through environmental awareness, communication and collaboration towards the sustainable university.

Announced on the 30th Day of January B.E. 2560 (2017 A.D.)
(Professor Bundhit Euaarporn, Ph.D.)
President

Appendix B:

Chulalongkorn University Announcement on the Single-Use Plastic Waste Reduction Measures at Chulalongkorn University B.E. 2561 (2018 A.D.)

Chulalongkorn University has announced and implemented a policy, guidelines for practice and waste management operating plans to reduce the amount of waste that must be sent to a land fill to a minimum, with more awareness about the amount of single-use plastic disposables around the university, as plastic waste is not naturally disintegrated and can greatly affect both land and marine ecosystems.

Therefore, under the power in accordance with Section 27 and Section 32 of Chulalongkorn University Act B.E. 2551 (2008 A.D.), the announcement shall be enacted as follows:

1. This announcement shall be called "Chulalongkorn University Announcement on the Single-Use Plastic Waste Reduction Measures at Chulalongkorn University B.E. 2561 (2018 A.D.)"

2. This announcement shall come into force for:

(1) education areas as within 120 days after the date of announcement.

(2) business areas within 365 days after the date of announcement.

3. In this announcement, "Shops" shall refer to places that sell goods and provide services to the buyer in the education areas such as convenience stores, Chulalongkorn University BookStore, CO-OP Stores, coffee shops, shops at the market, shops at the canteen, and places that sell goods and provide services to the buyer in the business areas at Suanluang, Samyan, Siam Square and Chamchuree Square.

4. Shops must stop giving the buyer free plastic bags, except for cooked ready-to-eat food. The seller must charge no more than 2 Baht for a 100% recyclable plastic bag, bioplastics or paperbag. The seller shall lend the buyer a bag in exchange for a depositor shall set up a bag donation box to assist buyers in need.

5. Shops at the canteen must change from single-use plastic glasses to coated-paper cups or washable or reusable glasses. The buyer who brings his/her own cup or glass must receive discounts for beverages.

6. Shops must not use polystyrene foam containers and oxo-degradable plastic bags, which later become micro-plastic residues in the environment.

7. Shops must not use and distribute single-use plastic spoons, forks or straws, unless requested by the buyer or after the seller is certain that the buyer wants them.

8. The university shall not accept or consider any case of customer complaint when the seller does not give the buyer a single-use plastic bag or other types of plastic container at the shops in both education and business areas due to the university policy. This shall be done for justice for the seller.

9. Shops in the education area must comply with this announcement for the better health of other individuals and a better environment.

Shops in the business area must comply with Item 6 and Item 7. Item 4 shall be enacted based on the discretion of each shop. The shop shall at least implement a measure to campaign about single-use waste reduction and urge the buyer to not take a plastic bag when buying fewer products.

10. The President of the university shall be the one who maintains this announcement and has the power to establish guidelines in order to enforce this announcement.

In the case of any misrepresentation or the misuse of enforcement of the announcement, the President shall have the right to scrutinize or issue orders as appropriate.

Announced on 23rd November B.E. 2561 (2018 A.D.)

(Professor Bundhit Euaarporn, Ph.D.)
President

Appendix C:

Examples of Programs, Projects, and Initiatives 2017–2018



1. Biodiversity Survey Project

by the Department of Biology, Faculty of Science

Chulalongkorn University, with an area of 1,153 rai located in the heart of Bangkok, has encountered constant social and environmental challenges. Chulalongkorn University has adopted several paradigms of the United Nations (UN) paradigm of Sustainable Development Goals, especially the SDG11: Sustainable Cities and Communities. This paradigm contributes to the harmonious cohabitation between humans and the environment. Such policy and strategic planning have continually promoted more green space on campus. Today, Chulalongkorn University is considered a major green area in the heart of Bangkok with high biodiversity. The Department of Biology, Faculty of Science conducts a biodiversity survey to measure the fertility of the campus area every year, as part of the curriculum. With respect to animals, 96 bird species and more than 56 other kinds of animals have been found living in the area. It has also been found that the number of animals increases every year, attesting to the richness of the land ecosystems and sustainable coping with climate change.



2. University Traffic Survey Project

by the Department of Civil Engineering, Faculty of Engineering

The University of Indonesia (UI) ranks universities as World Green University on the issue of university sustainability. The indicators used in determining the rankings are related to 6 aspects, one of which is the transportation indicator, accounting for 18 percent of all indicators. The transportation system is a major factor in carbon dioxide emissions, which is linked to the air pollution issue within the university. Therefore, Chulalongkorn University has implemented a policy to limit the number of vehicles entering the university and promoted public transportation as well as walking to motivate students, lecturers and staff to walk more on campus and avoid using vehicles that emit carbon dioxide.



To attain basic information, the university received cooperation from the Department of Civil Engineering, Faculty of Engineering in conducting a survey of traffic within the university. The data were collected from the closed-circuit cameras (CCTV) and a questionnaire for evaluating the transportation indicators. The data of daily traffic volume were analyzed for 2018.



Additional survey was conducted to study the commuting behavior among the sample personnel and students within the study area of Chulalongkorn University. The study adopted a self-assessment questionnaire and sample interviews. The study was divided into two parts. The first part focused on the commute into the university, which means the commute with the most distance from somewhere to the university. It was found that most staff and students (30%) used the sky train (BTS), followed by the use of private cars (12%). The other part of the study focused on the commute around campus. Most people preferred walking while the second most popular means of transportation was the shuttle bus. Comments written on the questionnaire were that the public transportation system within the university was not fully effective; in particular, the shuttle bus schedule was not clearly specified, and the number of vehicles was too small, compared to the number of users during rush hours.

Appendix C:

(continued)

3. Greenhouse Gas Emission Measurement Project (CO₂ Emission Project) by the Department of Environmental Engineering, Faculty of Engineering

The university is an organization that uses energy from electricity and fuel. As a result, it emits a high level of greenhouse gases. In cooperation with the Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University aims at a significant reduction in greenhouse gas emissions by 2020. From the survey results with regard to greenhouse gas emissions, it can be concluded that Chulalongkorn University consists of various types of buildings, including office buildings, school buildings, laboratories, research institutes, service institutions and dormitory buildings. The survey found that one of the main causes of greenhouse gas emissions in the university is electrical energy used in air-conditioning systems, lighting systems and appliances, producing 53,409.2 tons of carbon dioxide equivalent. Another cause is liquid petroleum gas (LPG) used in canteens, which produces 699.9 tons of carbon dioxide equivalent. Lastly, transports and vehicles using fuel cause 373.54 tons of carbon dioxide equivalent. Based on the data, the average greenhouse gas emission is 1.21 tons of carbon dioxide per person.

From such data, the university has devised both short-term and long-term plans to reduce energy consumption such as consuming fuel from transportation, reducing electricity usage and using renewable energy. In addition, other general policies have been set for a reduction in greenhouse gas emissions, such as promoting teaching and learning courses related to greenhouse gas reduction, reducing energy and water consumption, reducing wastewater discharge, reducing waste (solid waste), reducing leakage of refrigerant from air conditioning system (air conditioner cleaners) and reducing chemical fertilizer use.

4. Chula Zero-Waste Project by the Environmental Research Institute

Chulalongkorn University, in cooperation with the Environmental Research Institute and the Physical Administration Office, saw the importance of waste management around the university. Therefore, the university initiated the Chula Zero-Waste project to develop waste management systems, to integrate knowledge on waste reduction, waste sorting and hazardous waste management into the curriculum, and practical activities at all levels of education, and to recognize the importance of waste reduction and waste sorting. Chulalongkorn University has set a 5-year plan for sustainable garbage and hazardous waste management, with a strong determination to reduce the amount of waste 20% by 2021, compared to the baseline data in 2017.

The performance shows that the most substantial progress has been the reduction of waste generation from its source; in particular, the reduction and discontinuation of the use of foam and plastic bags, the My Cup project, the My Bottle project and the Zero-Waste Cup project. The university is determined to urge all departments to reduce and separate waste as well as to issue announcements regarding the use of solid waste management practices, which will help all departments to implement measures according to the guidelines.

In addition, to reduce the amount of waste that must be sent to landfills to a minimum and to raise awareness of the amount of single-use plastic disposables as plastic waste is not biodegradable, which greatly affects both land and marine ecosystems. Chulalongkorn University has worked cooperatively with the Environment Research Institute to push forward a policy,



practice and waste management operating plan. One such measure is the Single-Use Plastic Waste Reduction Project, campaigned by the university. Merchants and food stalls around campus have been required to stop giving the buyer plastic bags. Sellers in the cafeteria have been required to change from plastic glasses to 100% biodegradable paper glasses. Moreover, they have been asked to ban the use of polystyrene foam containers and plastic bags. The seller must also stop the distribution of single-use plastic spoons, forks and straws, unless requested by the buyer.



5. Waste Quantity and Waste Composition Survey Project by the Department of Environmental Science, Faculty of Science

This project aims to study the waste quantity and elements of waste at the garbage collection point of each department in Chulalongkorn University which contributes to proper waste management. The university has received cooperation from the Department of Environmental Science, Faculty of Science to study the quantity and composition of garbage in various departments around the university. Data showed most waste is food waste outside canteens (35.25 % by weight). The second most found waste around campus is paper (25%) such as paper boxes, milk cartons, and paper food containers. The third is general plastic (19%) consisting of plastic bags and plastic straws, which will be sorted according to size, cleaned, and dried before transportation to the physical administration office to continue burning. This project has enabled the university to develop a work plan to properly manage waste of different types.



6. Assessment Project of Electricity Generation Potential from Roof-Mounted Photovoltaic by the Energy Research Institute

At present, the cost of installing a roof-mounted solar power generation system is greatly reduced, enabling departments and units around campus to install one at lower costs so that electricity can be generated for internal use, which can partially reduce the cost of electricity utilities. The university realized the trend of using renewable energy and therefore requested cooperation from the Energy Research Institute to evaluate the potential of electricity from solar energy installed on the roofs of buildings around Chulalongkorn University.

The survey results showed that many buildings in Chulalongkorn University are equipped with electrical features that are suitable for the installation of roof-mounted solar power generation systems. The use of electrical energy in Chulalongkorn University buildings is in the form of a load profile that corresponds to the electricity generation from solar energy. That is, more electricity is used during the daytime, which is the same time that the solar energy production system is capable of working. Electricity from solar energy can generate a lot of electricity. In the same way, little or no electricity is employed during the evening to night time, like the electricity generating system from solar energy that can produce less or no electricity. The installation of the solar power generation system installed on the roof of buildings around Chulalongkorn University is likely to create an investment value as it can reduce the electricity cost during the daytime when the cost is high.

This project has urged many departments and units around the university to become interested in energy generation and usage of solar energy as a renewable source of energy.

Appendix C:

(continued)

7. Bangkok Forum 2018 International Conference by Chulalongkorn University

Chulalongkorn University, together with the Korea Foundation for Advanced Studies, organized the Bangkok Forum 2018 International Conference between 24 - 25 October 2018 at Chulalongkorn University to create knowledge about sustainable development at the regional and international levels through discussion and information sharing, and to create new ideas as well as prepare for the Asian region to develop cooperation and a partnership toward a sustainable future based on the concept of "Future Sustainable Asia" by HRH Princess Maha Chakri Sirindhorn. HRH Princess Maha Chakri Sirindhorn presided over the academic conference and presented a special lecture on Wednesday, October 24, 2018 at 09.00 hrs. at the Chulalongkorn University Auditorium. In addition, experts who presented at this special lecture on various topics of interest included:

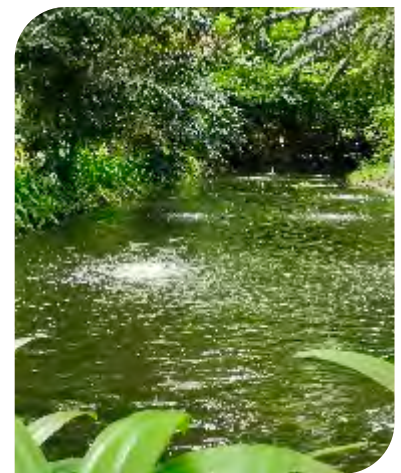
- Dr. Supachai Panichapak, former Secretary-General of the United Nations Conference on Trade and Development and former Director of the World Trade Organization on the topic of "Future Governance for Sustainable Asia"
 - Dr. Noeleen Heyzer, senior advisor to the UN Secretary-General on dispute resolution by mediation on the topic "Towards an Inclusive and Sustainable ASEAN"
 - Dr. Hongjoo Hahm, Acting Director of the Asian and Pacific Economic and Social Committee (UNESCAP) on the topic "The Challenges of SDGs in the Asia Pacific Region"
- There was also an academic discussion forum between local and international experts on social sustainability issues.



8. Quality improvement by installing a series of aerator-type aerators by the Physical Administration Office

Ponds and ditches in the university fulfill the natural and biological integrity. In addition, such ponds and ditches also store rainwater to prolong the drainage of rainwater before it goes out into the public drainage system, which can help reduce flood problems in the university area.

At present, the environment of ponds and ditches around the university has been changed. It was found that the water quality in the ponds and ditches exceeded the standards set by the Office of Physical Administration. Therefore, there is a project to improve water quality in the ditches and wells around Chulalongkorn University, adding oxygen into the water by developing a system and installing aerators under the water surface. From the preliminary data collection, it was found that such methods improved water quality, reduced wastewater, and made use of the treated wastewater for other uses, such as watering plants around campus. This corresponds with the university policy of saving and reusing wastewater.



9. Chulalongkorn University's Centenary Park by the Property Management Office, Chulalongkorn University

Chulalongkorn University's Centenary Park, located on an area of approximately 29 rai, is a green area in the heart of Bangkok. It was designed to be not only a park, but also a green space for knowledge sharing between university students and the community as well as between humans and the environment in accordance with the United Nations' Sustainable Development Goals. The 100-year-old park is an area maintained by the Property Management Office, Chulalongkorn University. The project was designed by alumni of the Faculty of Architecture with the concept of free design and shape from the growth of a Chamchuri root branch, which is flexible, easy to adjust according to the context and connect the Urban Green Infrastructure at the community level with



the road network system and various green areas. There are various types of native plants, planted under the urban forestry concept. The prototype of the park was designed to absorb more soil water. The area of the park consists of a water retention area, a constructed wetland, a porous park, a retention pond and a detention pond to slow down rain before being released to the public drainage system, the water-absorbing area of “monkey cheeks”, and the green roof of the multipurpose building.

10. General education courses by the General Education Center, Chulalongkorn University

The General Education Center has opened a total of 15 general education courses to promote sustainable development skills as one of all 7 skills developed by the center. The content of the courses is consistent with the 17 domains of the United Nations' Sustainable Development Goals (SDGs), such as the meaning and structure of urban and rural societies with a focus on social, economic and cultural sustainable development, proposed peaceful solutions to social problems, the development of agricultural products in Thai society that promotes economy at a community level, creation of production innovations and research that promotes national stability. Mainly, these topics help increase the quality of life of people in both urban and rural society.



11. Chula Master Plan Project, 2nd Century Education Area, Chulalongkorn University by the Urban Design and Development Center

The changes in the 21st century, especially in the economy and society, have posed challenges for many universities to prepare and adapt to such changes. Chulalongkorn University as a leading university in Thailand, founded in 1917, is about to enter its second century with a vision that focuses on creating knowledge and innovation for sustainable development of Thai society. The university has responded to the needs of society that are in line with the development potential of urban planning that is flexible in substance, methods and tools, and organization under the concept of "adjust - change - open". That is, adjustments can be made from existing substances, such as buildings and open spaces that are used less to become a space for co-learning. Time for gate opening and closing as well as extracurricular activities on campus can be extended to increase the duration of activities and access to the public. The infrastructure and public utilities can be improved under the concept of Green Infrastructure to be a prototype area of innovative education and a sustainable university for everyone. The project was designed for Chulalongkorn University and surrounding communities to be a variety of learning commons, divided into 6 zones: ZONE 1: KNOWLEDGE QUARTER XP consists of many faculties that will work together to create multidisciplinary innovations; ZONE 2: ONE HEALTH consists of space for knowledge sharing for research in the field of health sciences, ZONE 3: SOCIAL DEMO consists of space for integrated knowledge for the Faculty of Communication Arts and Law, ZONE 4: 24 HOUR SCHOOL consists of student dormitories and various sports centers designed to connect with other areas for students and staff to be able to fully use such spaces, ZONE 5: BICENTENNIAL AXIS is an improved core area of Chulalongkorn University that creates an ecosystem that is open to everyone and also promotes innovation based on the university's vision and ZONE 6: PUBLIC SHOWCASE consists of a space to connect with the surrounding community that is like a home to welcome everyone into the area and showcase knowledge, works and innovations of students and personnel to the public.



Appendix D:

Chemical Consumed by UN Class Data 2017-2018

UN Class	Weight (kg)
Class 1: Explosive	-
Class 2: Gases	3,603.43
Class 3: Flammable Liquids	35,496.57
Class 4: Flammable Solids	667.12
Class 5: Oxidizing Substance	3,256.36
Class 6: Toxic and Infections	9,299.52
Class 7: Radioactive material	1.96
Class 8: Corrosive Substances	13,685.78
Class 9: Miscellaneous Dangerous Substances and Articles	1,166.16
Total	67,176.90

* Data from Center of Excellence on Hazardous Substance Management as of September 30, 2018

Appendix E:

Amount of Hazardous Waste 2017-2018

Type of wastes	Liquid (litre)	Solid (kg)
I: Special Waste	1,518.89	638.61
II: Cyanide Waste	230.33	4.73
III: Oxidizing Waste	657.55	155.28
IV: Mercury Waste	351.3	5.86
V: Chromate Waste	414.45	7.03
VI: Heavy Metal Waste	4,520.32	394.77
VII: Acid Waste	3,255.33	75.81
VIII: Alkaline Waste	1,713.78	100.43
IX: Petroleum Products	5,315.88	63.26
X: Oxygenated Waste	17,079.47	109.48
XI: NPS Containing	2,528.18	68.75
XII: Halogenated Waste	3,355.67	29.26
XIIIa: Combustible Solid	46.25	4,116.03
XIIIb: Incombustible Solid	91.38	1,771.42
XIV: Miscellaneous Aqueous Waste	2,627.63	94.37
XV: Degraded Chemical Waste	1,350.84	3,828.96
Total	45,057.25	11,464.05

* Data from Center for Safety, Health, and Environment of Chulalongkorn University
(October 2017-September 2018)

Appendix F:

International Student Data 2017-2018

Student	Number
Total Number of Student	37,311
Total Number of Thai Student	36,193
Total Number of Non-Thai Student	1,118
Australia	7
Austria	5
Bangladesh	12
Belgium	7
Bhutan	7
Brazil	2
Brunei	2
Cambodia	46
Canada	9
China	156
Denmark	6
Egypt	1
Ethiopia	1
Finland	6
France	71
Germany	57
India	31
Indonesia	77
Iran	3
Italy	11

Student	Number
Japan	41
Korea	45
Laos	30
Malaysia	11
Myanmar	166
Nepal	7
Netherlands	13
Nigeria	8
Norway	5
Philippines	17
Saudi Arabia	1
Singapore	9
Spain	3
Sri Lanka	5
Sweden	15
Switzerland	7
Taiwan	33
Turkey	1
UK	18
USA	40
Vietnam	84
Others	42

Appendix G:

International Faculty Member and Researcher Data 2017-2018

Faculty Member and Researcher	Number
Total	2,943
Total Number of Thai Faculty Members and Researchers	2,852
Total Number of Non-Thai Faculty Members and Researchers	91
American	17
Australian	7
Austrian	2
Belgian	1
British	15
Canadian	6
Chinese	6
Filipino	3
French	6
German	6
Irish	2
Italian	4
Japanese	4
Korean	3
Malaysian	1
Moroccan	1
Polish	1
Portuguese	1
Russian	2
Spanish	3

Appendix H:

Examples of Academic Programs Related to Sustainability

Academic Unit	Degree Offer	Program and Website
Graduate School	M.A., M.Sc., Ph.D.	Program in Environment, Development and Sustainability Program in Environmental Management Program in Energy Technology and Management Program in Risk and Disaster Management Program in Cultural Management Program in Hazardous Substance and Environmental Management Program in European Studies, Southeast Asian Studies http://www.grad.chula.ac.th
Faculty of Architecture	M.Arch., M.Sc., M.URP., M.L.A., Ph.D.	Program in Architecture, Urban and Regional Planning, Landscape Architecture, Urban Strategies http://www.arch.chula.ac.th
Faculty of Engineering	B.Eng., M.Eng., Ph.D.	Program in Environmental Engineering, Metallurgical Engineering, Water Resources Engineering, Survey Engineering, Mining and Petroleum Engineering, Chemical Engineering, Georesources Engineering, Civil Engineering https://www.eng.chula.ac.th/en/
Faculty of Science	B.Sc., M.S., Ph.D.	Program in Biological Science, Natural Science, Physical Science, Technological Science, and Multidisciplinary program http://web.sc.chula.ac.th
School of Agricultural Resources	B.A.	Program in Agricultural Resources Administration http://www.cusar.chula.ac.th
The Petroleum and Petrochemical College	M.Sc., Ph.D.	Program in Petroleum Technology, Petrochemical Technology, Polymer Science http://www.ppc.chula.ac.th
Faculty of Allied Health Science	M.Sc.	Program in Food and Nutrition https://www.ahs.chula.ac.th/ahs-chula/
Faculty of Political Science	M.A.	Program in Governance, International Development Studies, Sociology and Anthropology, International Relations, Public Administration http://www.polsci.chula.ac.th
School of Integrated Innovation	B.A.Sc.	Program in Integrated Innovation http://inter-bascii-chula.com/
Faculty of Political Science	M.A.	Program in Governance, International Development Studies, Sociology and Anthropology, International Relations, Public Administration http://www.polsci.chula.ac.th
School of Integrated Innovation	B.A.Sc.	Program in Integrated Innovation http://inter-bascii-chula.com/

Appendix I:

Examples of Courses with Focus on Sustainability

Academic Unit	Course
Graduate School	Adaptation Policy Framework- Climate Change Impacts and Policy Applied Energy Technology and Management Ecology and Nature in Mainland Southeast Asia Renewable Energy Resources and Utilization Social Impacts and Conflict in Development Understanding Environment, Development and Sustainability
Faculty of Architecture	Architectural and Environmental Conservation Brownfield Land Reclamation and Development Building and Environmental Laws and Regulations Ecology for Landscape Architecture Energy Conservation in Building Design Facility Operations Maintenance and Energy Management Innovation Design Landscape Architectural Management Sustainable Design Urban Management
Faculty of Arts	Physical Systems of the Environment
Faculty of Commerce and Accountancy	International Legal Environments
Faculty of Communication Arts	Communication for Social Mobilization Media Planning and Production for Sustainable Development Public Relations in Environment
Faculty of Economics	Agricultural and Environmental Economics Economics of the Environment Economics of Natural Resources and Environment
Faculty of Education	Education and Sustainable Social Development Environment for Health Environmental Education for Sustainable Development
Faculty of Engineering	Environmental Impact Assessment Geo-Environment Engineering Hazardous Waste Treatment Materials and Sustainable Development Nanotechnology for Sustainable Society Principles for Environmental Engineering Management Resources Recovery and Waste Recycling Safety Engineering Solar Cell Technology Wastewater Engineering and Design Water Resources Planning and Management
Faculty of Law	Environmental Law

Academic Unit	Course
Faculty of Political Science	Environmental Politics and Policy Human Rights and Gender Problems in Asia and Pacific
Faculty of Psychology	Psychology for conservation of Nature
Faculty of Science	Energy from Biomass and Waste Environment and Sustainable Development Food Standards and Safety Materials and Energy Balance Pollution Control and Waste Management
College of Public Health Sciences	Introduction to Environmental Health
School of Agricultural Resources	Agricultural and Environmental Management
The Petroleum and Petrochemical College	Alternative Energy Sources Creativity and Innovation (Strategic Planning in Innovative Industrial R&D)
General Education Courses	Human Being and Eco Way of Life in the Globalize Context Agro Waste Money Guard Water Management of Public Disaster Coastal Environment Urban Global Warming Global Warming and Adaptation Environment and Daily Life

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