



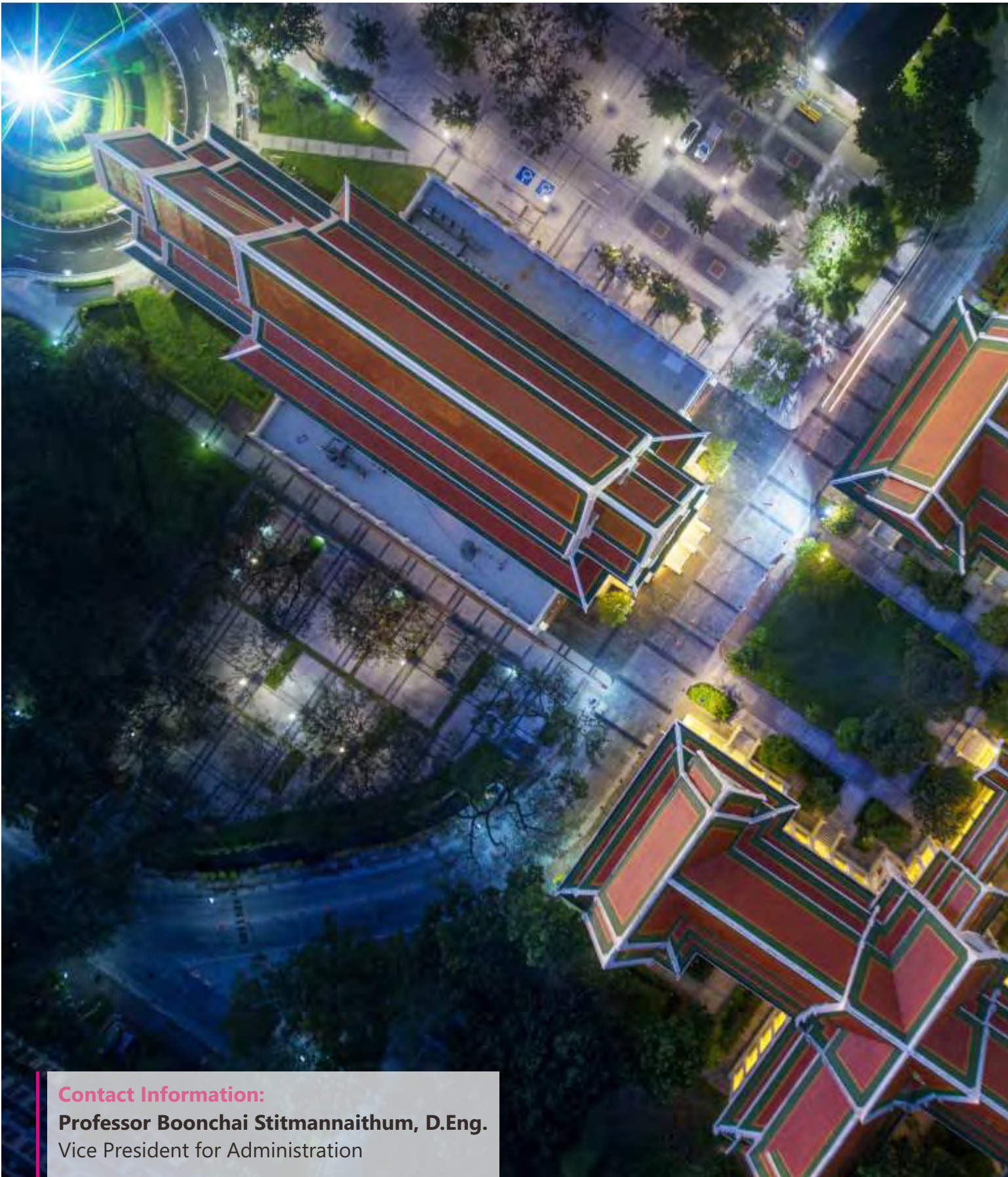
**CHULALONGKORN  
UNIVERSITY**

# Chulalongkorn University Sustainability Report

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Based on **ISCN-GULF Sustainable Campus Charter**





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## President's Statement

The year 2017 marks the 100th anniversary of the establishment of Chulalongkorn University, the first university in Thailand. This Centennial is the historic occasion to honour the University's first century of achievement and to imagine for further accomplishments in the century ahead.

Given the incredible changes over time, Chulalongkorn University has prepared our students and developed knowledge which keep pace with the rapid changing world. We also affirm our commitment to academic standard and high quality researches for the steady step into the second century. We encourage the innovations development, the trend of the future, and enhance our role to be the solution provider in developing the country as well as for being recognized as the academic hub internationally.

Sustainability is one of our core missions stated in the university's four strategies during 2017 - 2020. Chulalongkorn University disseminates the understanding of sustainability through various operations and tries to create the physical environment in the sustainable way for living and studying. We also integrate the United Nation's Sustainable Development Goals (SDGs) in the courses and researches.

In 2017, many programs relating to sustainability were initiated. On behalf of Chulalongkorn University, it is my pleasure to present our 2016-2017 Sustainability Report: Based on the ISCN-GULF Sustainable Campus Charter. This report reflects our commitment to become the sustainable university in the second century.

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











# About Chulalongkorn University



Chulalongkorn University (CU) is the oldest and one of the most prestigious universities in Thailand. The university was founded in 1917 by King Vajiravudh and was named after his father, King Chulalongkorn. The university has played a leading role in national and international development

Located in the central district of Bangkok, Chulalongkorn University covers 1,878,560 square meter tract of land in which approximately 50% of land is solely dedicated to academic activities. As a comprehensive public university, Chulalongkorn University currently offers 448 programs in all area of study in which 93 are international and English programs using English as the medium of instruction.

In academic year 2017, there were 37,208 students of whom about 68% were undergraduates and 32% were graduates. There were 2,848 academic members and 5,002 supporting staffs.







In 2017, the University allocated approximately 2,262 million Thai Baht in research funding to support about 1,900 projects, mostly in physical science and biological science research. In addition, the University also set up the Chulalongkorn University Innovation Hub (CU I-Hub; <http://innovationhub.chula.ac.th>) with three goals: to develop creative thinking, critical thinking and entrepreneurial skills for students and employees; to establish innovations through research, development, and management; and to distribute innovations towards the goals, benefiting broader economy and society. The CU I-hub nurtures talents and develop innovations in four research clusters: 1) aging, 2) food, water, energy, 3) robotics and digital and 4) inclusive community and smart city.

The announcement of the QS (Quacquarelli Symonds) World University Ranking 2017-2018 which was announced on June 8, 2017, ranked Chulalongkorn University top in Thailand, in 50th place in Asia and in 245th place in the world. As for the QS World University ranking by Subject 2017, Chulalongkorn University was ranked in first place among universities in Thailand for seven consecutive years.





# Map of Chulalongkorn University





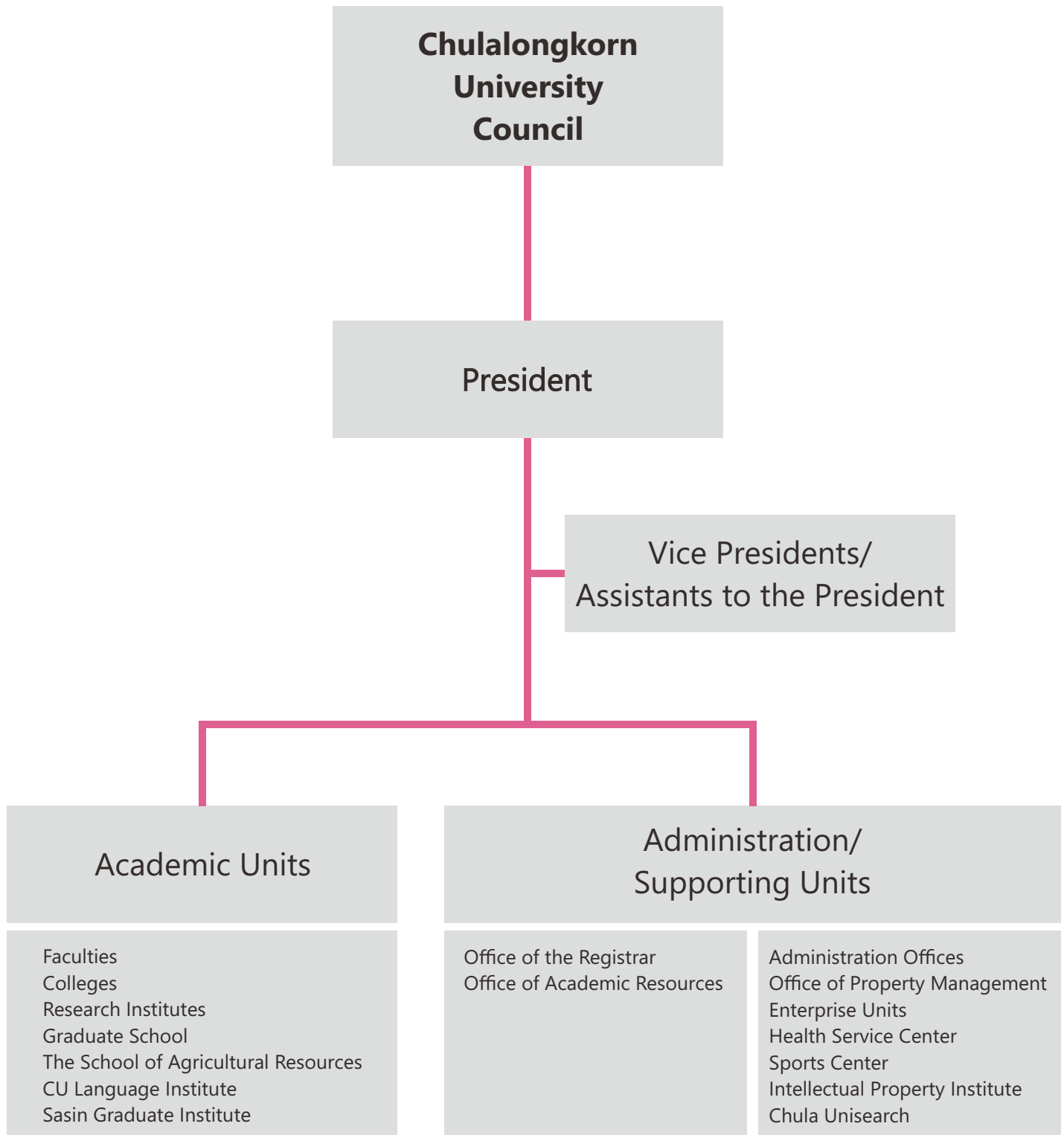
CHULALONGKORN UNIVERSITY  
MAIN AUDITORIUM

SALA PHRA KIEO





# Chulalongkorn University Organizational Structure





# Announcement of Chulalongkorn University Related to the Sustainable University Policy



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."

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 3 sustainable 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 the 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, faculties, 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, faculties, 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)

**(Professor Bundhit Eua-Arporn, Ph.D.)**  
**President of Chulalongkorn University**



# Sustainability at Chulalongkorn University



The year 2017 marks the 100th anniversary of the establishment of Chulalongkorn University in which the university has grown to be the leading university of Thailand. The year 2017 also marks the 10-year anniversary of Chulalongkorn University green initiative with a mission to promote environmental conservation and create a healthy environment suitable for education. During the past ten years, many programs have been initiated to raise an awareness of campus sustainability not only to the on-campus members but also to the members of surrounding communities. Partial success of the programs reflects on multiple awards that were given to the university such as the greenest university in Thailand according to the UI Green Metric University Ranking, the best research

awards in environmental-related fields as well as the winning competition awards for environmental-friendly architecture.

It becomes more apparent in 2017 that the concept of sustainability is fully integrated into academic activities and operational practice. Firstly, one of the university's missions as stated by the President of the University, Professor Bundhit Eua-arporn, Ph.D., is to apply knowledge toward the sustainable development of the country and society. This mission statement, certainly provides the basis for the development of Chulalongkorn University's management strategies. For the academic activities, research funds were administered through various research clusters and





academic programs. For the operational practice, in 2017, the CU Committee on the Campus Sustainability was established to overlook all sustainability aspects on campus. The committee consists of representatives from the administrative board, the academic experts from various fields of study, as well as the staffs from responsible offices. The Office of Physical Resources Management is assigned as the coordinator for sustainability projects on campus. This specific type of arrangement is designed to ensure that the sustainable operations are carried out from the top management to the operational management level. The arrangement also provides an integrative linkage between the academic and the operation side of campus.

Sustainability is an integrative issues which requires collaboration with stakeholders. One of the successful sustainability projects that was initiated in 2016-2017 was the CU Zerowaste project (<http://www.chulazerowaste.chula.ac.th>). In this project, stakeholder engagement was the most important ingredient. The project results showed a reduction of 90% of the plastic bags used (equivalent to ~1,000,000 plastic bags were saved) in which engagement with students and staffs played a crucial role in the success. Network of universities with similar conditions is also important in driving the university sustainable development. In the late 2015, Chulalongkorn University, along with 15 other Thai Universities, founded the Sustainable University Network of Thailand (SUN Thailand) with the ultimate goal to drive Thai society in response to the United Nations' Sustainable Development Goals. Nowadays, the network expands to a total of 27 universities from different parts of Thailand. A quarterly meetings were arranged in which Chulalongkorn University hosted the Annual Sustainable University Conference in 2017.

Chulalongkorn University became a member of the International Sustainable Campus Network (ISCN) on July 2014. This report is the second sustainability report to be published by the University. Performance information is provided for the reporting period of the fiscal year 2016-2017 (October 2016 – September 2017) or the academic year 2016 (August 2016 – July 2017). 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.

For more information on Chulalongkorn University Sustainable Campus, please visit the University's Website: <http://www.green.chula.ac.th>





## Principle 1 - Sustainability Performance of Buildings on Campus





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

Chulalongkorn University aims to create and maintain an environment where our students and staffs can prosper in sustainable surroundings. Upon becoming a green campus, new construction and renovations projects are approached with consideration on various sustainability issues. The detail of each project are analyzed by the committee on design and construction which consist of senior architects, engineers and designers in related fields. In addition, the construction, operation, and maintenance processes are approached with sustainability in mind. At Chulalongkorn University, the Office of Physical Resources Management plays a major role in coordinating and facilitating needs from all stakeholders.

Management Approach to Principle 1 Topics. In 2016-2017, the university still follows the CU Master Plan (in commemoration of the 100th anniversary of its founding) in which the concept of green building design and campus operation and management is embedded. Many initiatives were introduced in 2017.

The overall management approach to the ISCN Principle 1 revolves around two main themes, enhancing the quality of life on campus and improving the sustainability performance of buildings on campus.

As the university had just celebrated the 100th year anniversary, survey of buildings on campus shows variations of building aging conditions. Therefore, in the past few years, many buildings had been retrofitted to provide a 'safer' and efficient learning/working environment. For example, handicapped access was provided to buildings and public spaces on campus. The buildings' air-conditioning system were upgraded with high-efficient systems. The building automation systems were introduced to selected buildings to monitor the real-time energy usage as well as provide collective data for energy management purpose.

The university also realizes that successful improvement of sustainability performance rely on systematic data collection. Therefore, the management approach set in 2016-2017 focused on upgrading data collection and analysis process in many area of university operations which includes the amount of resources consumed on campus (i.e. energy, water, chemicals) as well as the amount of emission to the environment (i.e. waste, hazardous waste). With a more accurate data, the university can gauge its sustainability performance and properly select future targets and initiatives.



# Main initiatives and results in 2017

Topics	Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017
<b>1. Resource Use</b>				
1.1 Energy use (per floor area)	To provide baseline energy consumption data of buildings on campus.	-	91.51 kWh/m <sup>2</sup> /yr	75.24 kWh/m <sup>2</sup> /yr
1.2 Embedded (grey) building energy			No data	
1.3 Water use	To provide baseline water usage on campus		1,538,736 m <sup>3</sup> /yr	1,503,576 m <sup>3</sup> /yr
1.4 Energy and Water costs, and saving achieved			Total electricity cost: \$10,512,469.01 (315,374,070 THB) Total water cost: \$837,375.10 (26,801,252 THB)	Total electricity cost: \$13,631,872.53 (408,956,176 THB) Total water cost: \$901,619.30 (27,048,579 THB)
1.5 Overall purchased products/material		1. "CU Lesspaper" project which promote the use of electronic document (instead of paper-based document) was launched.  2. CU printing house started to order printing paper from local suppliers to reduce CO <sub>2</sub> emission during shipping.  3. Promote the use of eco-friendly paper and recycled paper.	Approximate total printing paper used ~43,630 ream	Approximate total printing paper used ~34,470 ream (~21% reduction on printing paper used)



Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>2. Waste, recycling, local emissions, and non-compliance</b>					
2.1 Waste and recycling	To reduce the amount of waste on campus. The goal is set to reduce 30% of all waste types in 5 years.	<ol style="list-style-type: none"> <li>Promote the waste management program with the cradle-to-grave approach under the "CU Zero Waste" Project.</li> <li>Recycling of on-campus leaf waste for soil fertilizer.</li> <li>Promote the use of non-polystyrene foam food container from on-campus canteen.</li> <li>Promote the use of personal cup for beverage consumption under the project "CU My Cup"</li> </ol>			Total waste: 2,109.53 tons/yr Total recycle waste: 414.31 tons/yr Approximate distribution by waste type: Plastic 36%, paper 31%, food waste 19%, glass 4%, hazardous waste 3%, metal 2%, fabric 2%, wood, 1%, others 2% "CU My Cup" project reduce the usage of plastic beverage container approximately 57,600 cups/yr
2.2 Waste cost and saving achieved			Cost of hazardous waste disposal (by incineration): \$11,145.83 /yr/25t (334,375 THB/yr/25t)	Cost of hazardous waste disposal (by incineration): \$17,833.33 /yr/25t (535,000 THB/yr/25t)	
2.3 Emission contributing to local air pollution			No data	No data	
2.4 Incident of non-compliance with environmental regulations	Chulalongkorn University will be a zero-accident organization by 2021 and strives towards being an exemplary organization of sustainable SHE management by 2022.	The university set up the Chulalongkorn University Safety, Health and Environment Center (SHECU) to develops, manages, monitors, supports, co-ordinates and provide services regarding the safety, health and environment affairs to the units within the university in 2016.	No data	No data	

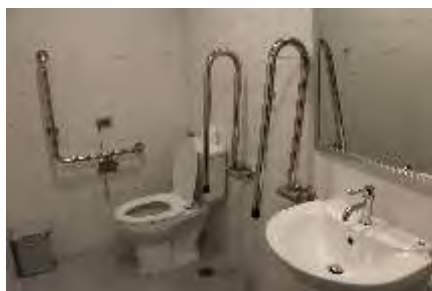


Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>3. Research/IT facilities and sustainability</b>					
3.1 Energy use in laboratories/IT facilities	To provide baseline energy consumption in laboratory facilities.	The university conducted an in-depth research in the analysis of energy consumption in selected laboratories on campus.	Average consumption: 130.51 kWh/m <sup>2</sup> /yr Median consumption: 96.55 kWh/m <sup>2</sup> /yr	Average consumption: 133.86 kWh/m <sup>2</sup> /yr Median consumption: 89.63 kWh/m <sup>2</sup> /yr	
3.2 Chemical consumed		The university promote the use of Chemtrack and Wastetrack software to monitor the amount of chemical consumption and disposal in teaching/research activities.	Amount of chemical consumed by phases of chemical matters: Solid 9,910.21 kg Liquid 9,358,86 litre Gas 463.28 m <sup>3</sup>	Amount of chemical consumed by phases of chemical matters: Solid 2,657.62 kg Liquid 14,637.51 litre Gas 290.10 m <sup>3</sup> (See Appendix D for more details)	
3.3 Hazardous waste from research/IT facilities			Total solid and liquid chemical waste: 2576.04 kg of solid waste 31,711.05 litre of liquid waste	Total solid and liquid chemical waste: 12,228.97 kg of solid waste 45,473.24 litre of liquid waste	

#### 4. Users

##### 4.1 Handicap access

The university incorporate 'universal design' principle in new building and renovation projects. Handicapped access to buildings and public spaces on campus were provided. New handicapped restrooms were installed in existing buildings.





Topics	Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017

#### 4. Users

##### 4.2 Indoor air quality

There is no systematic management of indoor air quality for building on campus. However, a few units have established indoor air quality program for monitoring purposes. For 2016-2017, the university upgraded a few on-campus canteen with improved exhaust ventilation system. High-performance air-conditioning systems were installed to maintain comfortable thermal environment. In new buildings and renovation projects, a separate space with good ventilation is provided as a copy room.

##### 4.3 Stakeholder participation in planning (integrated design)

The Office of Physical Resources Management who is in charge of the university's design/construction affairs promotes the participatory design process in newer design/construction project. The process involve survey of users' needs and preferences with the goal to develop design proposals that best meet the requirements from stakeholders.



#### 5. Building design aspects

5.1 Sustainable building standards applied and explored  
To provide a suitable learning environment that meet sustainability standards

Architects and engineers are encouraged to integrate green design principles into the design of new buildings and renovation projects on Chulalongkorn University campus. The buildings are regulated by the Energy Conservation Promotion Act of 1992 as well as other rules and regulations.

5.2 Long-term use and flexibility

In 2017, the university's commitment to sustainability reflects by the appointment of the Campus Sustainability Committee to overlook all aspects that are related to sustainability from policy, action plan to implementation strategies. The university also appoint the Committee on energy conservation to overlook the energy consumption with the highest efficiency through an energy management program. For the issue of long-term use and flexibility, for new building and renovation projects, architects and engineers are encouraged to use construction material are durable and low toxicity level.

In 2016-2017, a few units across campus have been exploring the use of smart building control system to control and monitor energy consumption of workplace.



Topics	Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017

**5. Building design aspects**

5.3 Life-cycle costing	To provide a suitable learning environment that meet sustainability standards		No data	No data
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5.4 Landscape integration of building design		The building and landscape design manual was produced for architectural and landscape design to ensure that university buildings and ground are used effectively. In 2017 large trees were planted to increase the tree canopy area. A few vacant land plots have been reclaimed as green area.	No data	Total area on campus covered in forest and planted vegetation: 54.5%
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## Principle 2 - Campus-wide Master Planning and Target Setting





## **Principle 2: To ensure long-term sustainable campus development, campus-wide master planning and target-setting include environmental and social goals.**

As the university celebrates its centennial anniversary of its founding and steps forward into the 2nd century, the campus needs to be transformed to meet the needs of users and responds to changes in technology. Year 2016-2017 is considered to be the period of transition for Chulalongkorn University. While the planning of university still adheres to the Chulalongkorn University 100th Anniversary Model plan, nevertheless, internal and external changes that occur during the past few years had urged for revision in campus-wide physical planning as well as its operational services. Therefore, the master plan project for the university in 2nd Century is being initiated in 2017 with the goal to develop the new master plan for the university.

### **Management Approach to Principle 2 Topics**

The development approach to Principle 2 in 2016-2017 still follows the Chulalongkorn University 100th Anniversary Model plan which focuses on developing sustainable physical environment and fostering the quality of life on campus. In general, the development strategy consists of the following topics:

#### **1. Land use and space allocation**

As an urban campus, the university open space is very limited. The planning of the new buildings should maximize the available space. An urban park is preferable in replacing campus vacant land plot and deteriorating structures.

#### **2. Transportation and parking**

The main strategy in this topic are to provide Chulalongkorn University community members with the ease-of-access travel between different locations on campus, to reduce the number of vehicle on campus, and to support the low-carbon emission policy. Therefore, many modes of transportation have been upgraded since 2016. For example, starting in October 2017, the university provided all electric-vehicle shuttle bus system that link the internal campus area with existing Bangkok Mass Transit system. Toyota Ha:mo (<https://www.cutoyotahamo.com>), the ultra-compact Electrical Vehicle car-sharing service, was introduced in August 2017. The completion of Chulapat 14 building with multi-level parking structure marks the fourth parking building on-campus. The number of bicycles in the bike-sharing system was increased (<http://www.cubike-chula.com>).

#### **3. Health and well-being**

The University is committed to provide a sustainable environment that support learning and working activities. In 2016-2017, the university's facility operation was rethought with the ultimate goals to provide a safe and healthy campus environment. Currently, many services are provided to Chulalongkorn University members. For example, the Chulawellness center (<http://www.chulawellness.com>) and the Chula Student Wellness center (<http://www.sa.chula.ac.th/wellness>) provide developmental consultancy services to both students and staffs. The CU Sport complex (<http://www.cusc.chula.ac.th>), a multi-floor sport/fitness center, provides accessible and dynamic recreation experiences to engage CU community members and public in growth and wellbeing.

#### **4. Urban integration**

One of the advantages for Chulalongkorn University is its location in which the campus members have easy access to adjacent commercial areas such as Siam Square shopping district as well as Sam Yan and Saun Laung Community. Due for completion in late 2019 Sam Yan Mitrtown (<http://www.samyan-mitrtown.com>), a mixed-use urban development project, is anticipated to hype up urban activities on the south side of the campus. Last, but not least, Stadium One (<http://stadiumone.net>), a low-rise urban renovation project focusing on sport related activities, is expected to boost the formerly established sport industry activities on the northwest side of the campus. Overall, the university is in the process of revising the masterplan to accommodate the changes in urban landscape as well as to ensure a seamless integration between educational facilities and adjacent commercial zones.

#### **5. Diversity and Equality**

Chulalongkorn University is committed to creating an environment where diversity is celebrated and everyone is treated fairly, regardless of gender, disability, ethnic origin, religion or belief, sexual orientation, marital status, age, or nationality.



# Main initiatives and results in 2017

Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>1. Institution-wide carbon target</b>					
1.1 Carbon emissions	To study GHG emissions from activities on campus.	GHG Emissions program was initiated in FY2013-2014. The first phase involved the evaluation of GHG emission from on-campus transportation related activities. In FY2016-2017, the scope of the study is expanded to cover all scope of activities.		GHG Emission (FY2016) Total: 54,955 tCO <sub>2</sub> eq Per capita: 1.21 tCO <sub>2</sub> eq - Scope 1 (Direct emission): 0.034 tCO <sub>2</sub> eq - Scope 2 (Indirect emission): 1.180 tCO <sub>2</sub> eq Transportation: 373.5 tCO <sub>2</sub> eq	
				GHG Emission (FY2017) Total: 64,785 tCO <sub>2</sub> eq Per capita: 1.44 tCO <sub>2</sub> eq - Scope 1 (Direct emission): 0.038 tCO <sub>2</sub> eq - Scope 2 (Indirect emission): 1.397 tCO <sub>2</sub> eq Transportation: 522.3 tCO <sub>2</sub> eq	
<b>2. Master Planning</b>					
2.1 Coverage of campus area	To develop the master plan that meets the needs of the future direction of higher education.	The Chulalongkorn University 2 <sup>nd</sup> Century Master planning project was launched in 2017. The project which covers the master planning of the educational and adjacent business district is expected to complete in 2018. The scope of the project includes the proposal of CU master plan, facility plan and infrastructure plan.	27.26 %	Total main campus area: 983,441 m <sup>2</sup> . Total area covered in forest: 33% Total area covered in planted vegetation: 21.5% Total area for water absorption: 31.6%	
<b>3. Transportation</b>					
3.1 Frequency of traffic survey	To provide a baseline data of transportation system which will aid the planning of university's infrastructure.	The traffic survey project has been conducted annually since 2015.	Number of vehicles entering the university daily: 23,323	Annually Number of cars entering the university daily: 9,097 Number of motorcycles entering the university daily: 4,717	



Topics	Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017
<b>3. Transportation</b>				
3.2 Bicycle and pedestrian access	To promote alternative transportation methods on campus.	1. A university-wide health/fitness program that promotes 'walking' was set up in 2016 to improve health condition of university staff members. 2. An additional covered walkway (800 m) will be added to the existing system in 2019.	1. A dedicated campus-wide bike lane is completed. 2. Covered walkway is built enabling students and staffs to move between locations while being protected from the sun and the rain.	Average number of bicycles on campus daily: 1,290
3.3 Estimated commute distance or commute energy use per person			No data	No data
3.4 Urban mobility integration planning	To reduce the use of personal vehicles on campus.	All new electric shuttle bus system will be provided free-of-charge in FY 2018. The system consists of 5 bus routes, linking various parts of the campus with the Bangkok mass transit system.	University shuttle bus service between Bangkok mass transit system and the campus center.	Number of Shuttles: 32 Average number of passengers of each shuttle: 55 Total shuttle trips per day: 357
3.5 Campus Fleet			Number of cars, buses & trucks: 188 All powered by gasoline or diesel.	Number of cars, buses & trucks: 176 All powered by gasoline or diesel.
<b>4. Food</b>				
4.1 Food supply chain and environmental impacts			No data	No data
4.2 Fair trade food sourcing			No data	No data

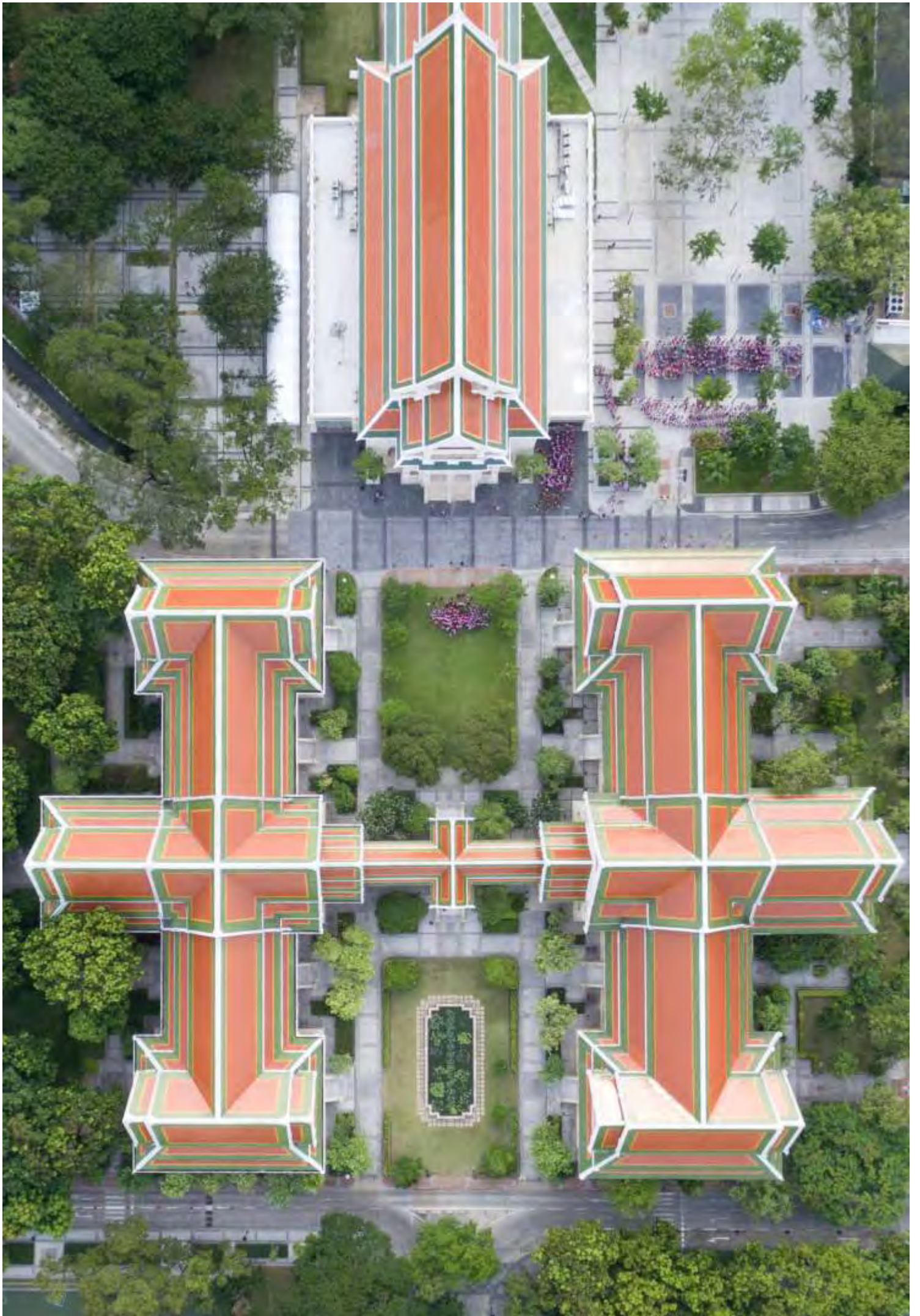


Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>4. Food</b>					
4.3 Food safety	To ensure the quality of food and beverage provided in campus canteens.	The food safety program was initiated in 2014 by the Faculty of Allied Health Science which involved the testing of chemical additives in food, food safety practice, and customers' satisfaction survey.	Voluntary program participation.	Mandatory program for all canteen vendors.	
<b>5. Social Inclusion and Protection</b>					
5.1 Diversity (faculty, staff, and students)	<ol style="list-style-type: none"> <li>To become a world-class national university</li> <li>To stimulate a multi-cultural learning experience.</li> </ol>	<ol style="list-style-type: none"> <li>Various types of scholarships were available for international students, especially students from ASEAN countries.</li> <li>Established grants to support international collaboration.</li> <li>Provided exclusive dormitory for international students and staff.</li> </ol>	<ol style="list-style-type: none"> <li>Number of international students: 589</li> <li>Number of international faculty members/researchers: 61</li> </ol>	<ol style="list-style-type: none"> <li>Number of international students: 556</li> <li>Number of international faculty members/researchers: 83</li> <li>Number of Memorandum of Understanding with international partners: 834</li> <li>Number of inbound/outbound exchange students: 1,031/1,274</li> </ol>	
5.2 Incident of discrimination			No data	None	
5.3 Access to education (in case of substantial fees)	To extend educational opportunity to exceptional students with limited financial support.	Provide full and partial scholarship programs for qualified students.	<ol style="list-style-type: none"> <li>Number of scholarship: 1,564</li> <li>Amount of scholarship: \$1,184,840.84 (35,545,255.20 THB)</li> </ol>	<ol style="list-style-type: none"> <li>Number of scholarship: 1,601</li> <li>Amount of scholarship: \$1,505,633.33 (45,169,000.00 THB)</li> </ol>	

Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>5. Social Inclusion and Protection</b>					
5.4 Open access spaces for interaction	1. To stimulate interaction of students from multidiscipline. 2. To provide open platform for hosting student's activities.	A new type of co-learning space is planned for opening in 2018.	Established 8 research clusters which provide platform for faculties and students to collaborate and exchange research ideas on an issue-based basis.		
5.5 Access to services and commerce		1. Supporting facilities are provided to all staff and students including the CU Health Service Center, the CU Sport Complex, Dormitories, banks, convenient stores, and etc.  2. Extending operating hours of facilities such as the Center for Academic Resources, the CU Sport Complex, and etc.	Chula Student Wellness Center was established with the main goal to provide consultant service to staff and students.  Number of consultant service provided: 2,029		
5.6 Participative campus planning integrating users and neighbors	To assure that campus planning and the built environment are driven by the needs of all stakeholders.		The committee on campus planning and built environmental design was set up. The committee meets once a month to discuss issues that are related to campus planning and the built environmental design. The committee encourages the integration of the participatory design process in new and renovation projects.		
5.7 Working conditions, including minimum wages, collective bargaining, and health and safety	Provision of safely and healthy working environment, including other non-work related well-beings.	1. Chulalongkorn University will be a zero-accident organisation by 2021 and strives towards being an exemplary organisation of sustainable SHE management by 2022.  2. Basic social welfares are provided as written in Labour law with extra benefits.	The CU Safety, Health and Environment (SHE) Task Force was established. The first task was to enhance safety practice in chemical laboratories.	1. The CU Safety, Health and Environment (SHE) Task Force was upgraded to be one of the functional units under direct supervision of the president.  2. The university allocates budget for upgrading laboratory physical environment.	

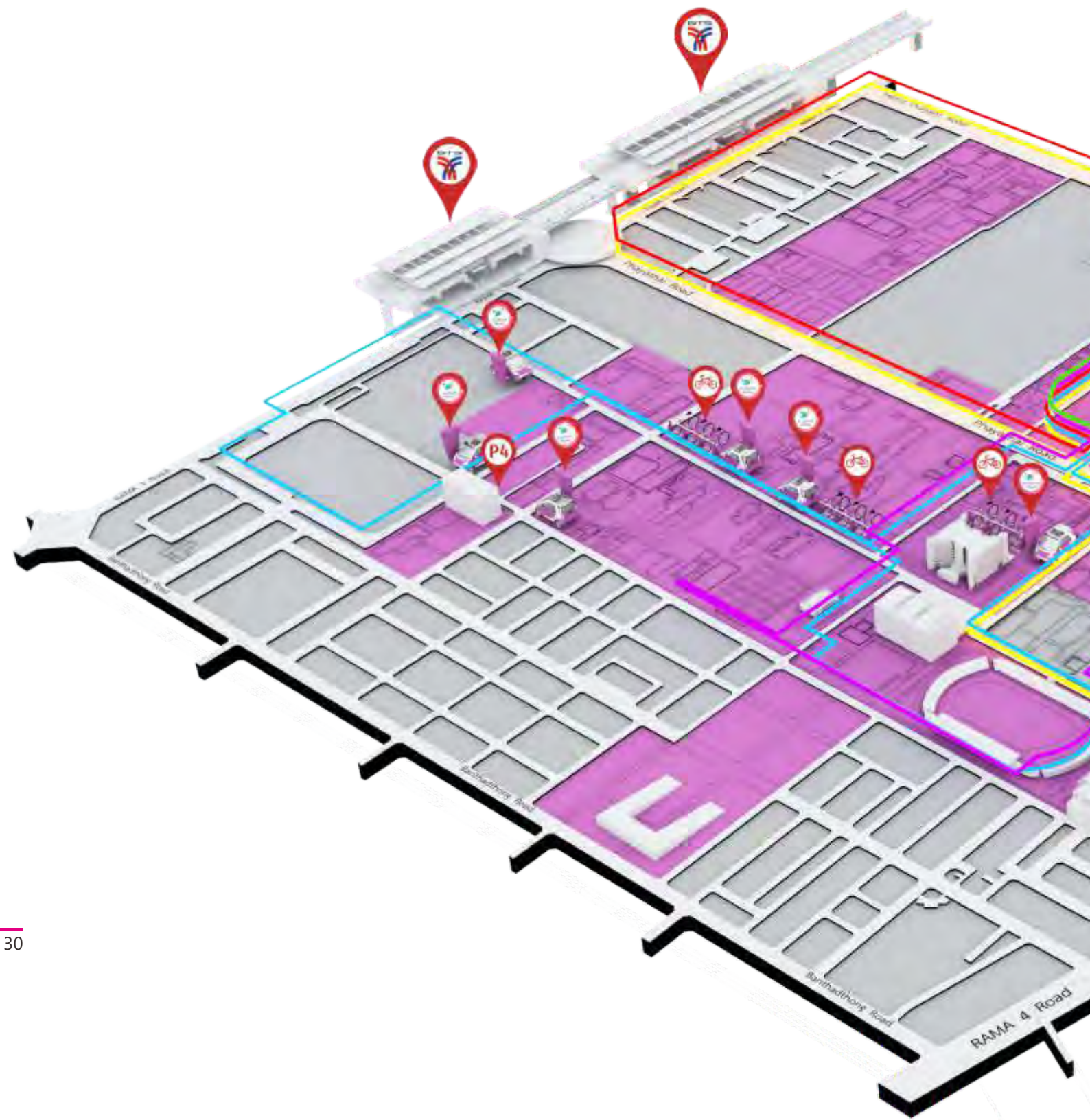


Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>5. Social Inclusion and Protection</b>					
5.8 Student recruitment and geographical representation	First year undergraduate students are admitted to the university via the direct admission and central admission system.	The direct admission system was set up to expand the educational opportunity for students from remote geographic locations and students with special talents for admittance.	No data	A total number of new undergraduate students: 6,740	9.04% of new undergraduate students were admitted through direct admission system.
<b>6. Land uses and biodiversity</b>					
6.1 Land and building reuse (brownfield development, adaptive renovations)	To ensure efficient land utilization for maximal benefits.	The committee on campus planning and built environmental design gives policy and direction for campus development.	<p>1. 100<sup>th</sup> Anniversary public park, a brownfield development was expected to complete in 2016.</p> <p>2. Chulachakrabongse Plaza: A development project that turned a former 25m swimming pool structure to public park.</p> <p>3. The Faculty of Engineering Water Reservoir: Former parking lot turned into a reservoir for flood protection and reduce water runoff to adjacent public area.</p>	<p>1. 100<sup>th</sup> Anniversary public park was completed in 2016 and becomes an urban oasis for the university and surrounding communities.</p> <p>2. A policy is set to turn vacant unused campus building to green leisure area.</p> <p>3. Chaloem Rajakumari 60 Building park was designed and opened as art and urban farm for recreation and student activities.</p>	
6.2 Landscaping impacts and biodiversity	To preserve and restore intact native ecosystems within the campus.	The Department of Biology, Faculty of Science set up an annual program to survey biodiversity of the campus area.	No data	A number of species: Trees 260 Birds 96 Insect 12 Non-insect invertebrates 10 Amphibians 8 Reptiles 20 Mammals 6	





# Chulalongkorn University Transportation System



**EV Shuttle Bus Line:**

- █ 1. Sala Phra Kieo - Siam Square
- █ 2. Sala Phra Kieo - BTS National Stadium Station
- █ 3. Sala Phra Kieo - Faculty of Medicine
- █ 4. Sala Phra Kieo - Chamchuri 9 Building
- █ 5. Sala Phra Kieo - CU iHouse



- P1 1. Chamchuri 9 Building
- P2 2. Mahachakri Sirindhorn Building
- P3 3. Faculty of Political Science
- P4 4. Chulapat 14 Building
- BTS Bangkok Transit System (BTS)
  - Siam Station
  - National Stadium Station
- M Metropolitan Rapid Transit (MRT)
  - Sam Yan Station
- Bike CU Bike Station
- HaMo CU TOYOTA Ha:Mo Station



### Principle 3 - Integration of Facilities, Research, and Education







**Principle 3: To align the organization's core mission with sustainable development, facilities, research, and education should be link to create a "living laboratory" for sustainability.**

Management Approach to Principle 3 Topics  
 It becomes more apparent that full institutional commitments and dedicated resources are key factors contributing to the success of becoming a sustainable university. The university sustainable policy must be carried out not only as a top-down strategy but also as a bottom-up approach. At Chulalongkorn University, the sustainable policy was announced in 2017. The university implements the plan of the sustainable university in 3 sustainable development aspects; environmental, economical and social. The actions are executed in the following five types of activities including: 1) setting and infrastructure; 2) health and well-being; 3) resources management; 4) education and research; and 5) administration and social engagement. The University has applied the Philosophy of the Sufficiency Economy developed by King Bhumibol Adulyadej of Thailand and the Sustainable Development Goals (SDGs) set by the United Nations to drive the institute to have the best practice in sustainability. The

university has set up a sustainable operational unit within the Office of Physical Resources Management to oversee campus sustainable operational issues in which the vice president and an assistant to the president were assigned to take charge with this operation. Most, if not all sustainable campus activities and projects were reviewed and driven through the Committee on Campus Sustainability.

As an academic institute, it is inevitable that environmental-related education and research is a critical tool in the promotion of sustainability on campus. In 2016-2017, the university administered various projects through existing undergraduate and graduate programs as well as through various university research clusters. A considerable effort was made to highlight the relevance of industry-higher education linkages which benefit the university and the industry by the promotion of new knowledge and discoveries. Lastly, to acknowledge the importance of the university as the agent of change for Thailand, Chulalongkorn University initiated the University Community Engagement program to strengthen the relationship between university and communities with the ultimate goal to provide academic supports for solving real-world problems.



# Main initiatives and results in 2017

Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>1. Topical Integration</b>					
1.1 Programs and projects that connect facilities, research, and education	To raise awareness on sustainability of campus users.	Many units including the Office of the Physical Resources Management (PRM), Energy Research Institute (ERI), and research clusters initiated many programs and research project that connect facilities, research, and education.	<p>Research projects included:</p> <ol style="list-style-type: none"> <li>1. Energy conservation of buildings on campus.</li> <li>2. Evaluation of green architecture design for buildings on campus.</li> <li>3. Chulalongkorn University traffic and greenhouse gas emission survey.</li> </ol>	Number of events related to environment and sustainability: 124	
1.2 Labeling and number of courses that have an integrated perspective on sustainability as a key components	To increase students' knowledge on sustainability issues.	Providing sustainability focused undergraduate and graduate programs. Please see Appendix A for more details.	<p>Number of courses that have an integrated perspective on sustainability as a key components: 596</p> <p>Total courses offered: 11,603</p>	<p>Number of courses that have an integrated perspective on sustainability as a key components: 1,202</p> <p>Total courses offered: 11,385</p> <p>Please see Appendix B for more details.</p>	
1.3 Courses and/or research that transcends disciplines		Establishing research clusters that integrate sustainability perspective as a major or minor components	<p>Chulalongkorn University Research clusters consisting of the following:</p> <ol style="list-style-type: none"> <li>1. Advanced material</li> <li>2. Aging</li> <li>3. ASEAN Studies</li> <li>4. Automation/Robotics</li> <li>5. Climate Change and Disaster Management</li> <li>6. Energy</li> <li>7. Food</li> <li>8. Health</li> <li>9. Social Development and Human Security</li> </ol> <p>Four strategic areas including:</p> <ol style="list-style-type: none"> <li>1. Aging Society</li> <li>2. Sustainable Development</li> <li>3. Inclusive Community and Smart City</li> <li>4. Digital Economy and Robotics</li> </ol>		

Topics		Goals and Initiatives		Results	
Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014	Performance 2016- 2017	
<b>2. Social Integration</b>					
2.1 Programs and projects that connect campus uses with industry, government, and/or civil society	To connect campus users with industry, government and/or civil society.	A number of programs and projects have been developed with industry/government partners.	The "CU Social Engagement" was initiated which covers Bangkok, Saraburi, Nan, and Chonburi province: 1. Number of projects under "One Functional Unit – One Community (OFOC)": 97 2. Number of projects under "Strengthen Saraburi Program": 14		
2.2 Program to further student interaction and social cohesion on campus			No data	No data	
2.3 Courses that use participatory and project based teaching	To stimulate and motivate students in workshops and lectures		Examples of courses: 0201151 Our Environment 0201251 Pollution Control		
2.4 Behavioral programs aiming at more sustainable actions by students staff, or external community members		Each year, Chulalongkorn University students from various faculties set up many projects that reach out and provide services to external communities.	No data	Number of student organizations related to environment and sustainability: 127	
<b>3. Research and education projects on laboratory/IT facilities and sustainability</b>					
3.1 Research and education on mitigating energy use in laboratories/IT Facilities	To benchmark energy consumption of the buildings on campus	Providing support for a master thesis on the energy benchmarking of Chulalongkorn University chemical laboratories	Energy index was derived for typical buildings on campus.	Energy index was derived for chemical laboratory on campus.	
3.2 Research and education on mitigating hazardous waste from research/IT facilities			Pilot survey was conducted.	Systematic survey of safety practice in laboratory including the mitigation of hazardous waste from research facilities was conducted.	



Topics	Goals and Initiatives		Results	
	Priority topics	Objectives and Targets	Key Initiatives	Performance 2013- 2014
<b>4. Commitments and resources for campus sustainability</b>				
4.1 Existence of an organization-wide sustainability policy that integrates academics with operational issue	CU as a world-class national university that generates the knowledge and innovation necessary for the creative and sustainable transformation of Thai society.		"Sustainability" is one of the issues that was stated in the University's strategy 2017-2020.	
4.2 Commitment to external sustainability principles and initiatives	To introduce sustainability into education as well as campus operation through partnership with external organization	Chulalongkorn University, together with 15 leading universities in Thailand founded the Sustainability University Network of Thailand (SUN Thailand) in 2015 with the goal to develop sustainability framework for Education in Thailand. In 2017, Chulalongkorn University hosted the 2nd Annual Conference entitled "Innovation and Partnership for Sustainable Society".	1. ISCN-GULF Sustainable Campus Charter 2. UI Green Metric World University Ranking 3. Thai Green Building Institute 4. Sasin Center for Sustainability Management 5. Sustainable University Network of Thailand (SUN Thailand)	
4.3 Dedicated resources (processes, human and financial resources) for campus sustainability		The Energy and Environment Unit under the Office of Physical Resources Management oversees the issues that are related to operation of campus sustainability	Total research funds dedicated to environmental and sustainability research: \$20,624,057 (618,721,730 THB)	Total research funds dedicated to environmental and sustainability research: \$18,049,786 (592,090,085 THB)
4.4 Economic value of education vs. cost			No data	No data
4.5 Economic opportunities for students post-graduation.			No data	No data

## Appendix A: Example of Academic Programs with Focus on 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 <a href="http://www.grad.chula.ac.th">http://www.grad.chula.ac.th</a>
Faculty of Architecture	M.Arch., M.Sc., M.URP., M.L.A., Ph.D.	Program in Architecture (Architecture and Environmental Technology) Program in Architecture (Innovative Design and Ecological Architecture) Program in Urban and Regional Planning Program in Landscape Architecture <a href="http://www.arch.chula.ac.th">http://www.arch.chula.ac.th</a>
Faculty of Engineering	B.Eng., M.Eng., Ph.D.	Program in Environmental Engineering Program in Metallurgical Engineering Program in Water Resources Engineering Program in Survey Engineering Program in Mining and Petroleum Engineering Program in Chemical Engineering Program in Geo Resources Engineering
Faculty of Science	B.Sc., M.S., Ph.D.	Program in Biological Science, Natural Science, Physical Science, Technological Science, and Multidisciplinary program <a href="http://web.sc.chula.ac.th">http://web.sc.chula.ac.th</a>
School of Agricultural Resources	B.A.	Program in Agricultural Resources Administration <a href="http://www.cusar.chula.ac.th/">http://www.cusar.chula.ac.th/</a>
The Petroleum and Petrochemical College	M.Sc., Ph.D.	Program in Petroleum Technology Program in Petrochemical Technology Program in Polymer Science <a href="http://www.ppc.chula.ac.th">http://www.ppc.chula.ac.th</a>



## Appendix B: Example 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 Impact 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 Innovative 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 Environment Economics of Natural Resources and Environment
Faculty of Education	Education and Sustainable Social Development Environment for Health Environmental Education for Sustainable Development

Academic Unit	Course
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
Faculty of Political Science	Environmental Politics and Policy Human Rights and Gender Problems in The 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 Balances 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)



## Appendix C: Example of Related Activities, Projects and Programs on Sustainability

Unit	Activity, Project and Program
Office of the Physical Resources Management	Chula Zero Waste Program <a href="https://www.facebook.com/chulazerowaste/">https://www.facebook.com/chulazerowaste/</a>
	Chula Let it Green Program <a href="https://www.facebook.com/chulaletitgreen/">https://www.facebook.com/chulaletitgreen/</a>
Sasin Center for Sustainability Management (SCSM)	A collaboration between Sasin Graduate Institute of Business Administration of Chulalongkorn University and the Corporate Responsibility & Ethics Association for Thai Enterprise (CREATE). The SCSM emphasizes the importance of partnerships that work toward social, environmental, and economic balance and provides all-year round activities and events. <a href="http://www.sasin.edu/what-we-offer/thought-leadership/scsm/">http://www.sasin.edu/what-we-offer/thought-leadership/scsm/</a>
	Sasin's Journey: From Academic Excellence to Social Significance.
Center of Excellence on Petrochemical and Materials Technology	1 <sup>st</sup> InnoMat Innovation in Materials by Chulalongkorn University
	A media conference on A bioplastics Innovation Contest 2017.
Center of Excellence on Hazardous Substance Management	Training session on ChemTrack and Wastetrack program for chemical consumption and hazardous waste management.
School of Agricultural Resources Management	Regional Symposium on 'Mapping and Assessing University-based Farmer Extension Services in ASEAN through an Agro-ecological/ Organic Lens'. Chulalongkorn University, Bangkok. February 23, 2017.
Environmental Research Institute	Academic seminar: From land waste to ocean debris: The crisis.

<b>Unit</b>	<b>Activity, Project and Program</b>
Faculty of Veterinary Science	Chulalongkorn University Veterinary Rural Study at Nan Province 2017
	Chulalongkorn University Anti-Rabies Camp 2017
Social Research Institute	"Urban Agriculture/City Farms and Socioecological Rehabilitation in Urban Areas" December 20-21, 2016.
	"Equality in Energy Management and Sustainable Development Goals: A Challenge" Social Policy Forum February 20, 2017.
Faculty of Science	Training session on waste reduction and waste sorting for on-campus food vendors.
Chulalongkorn University Communication Center	Asia Pacific Regional Internet Governance Forum ๒๐๑๗. July 26-29, 2017.
Office of Human Resources Management	"Pui Nun FIT2017" as part of the "Chula Smart Healthy" Project
The College of Public Health Sciences	The 11 <sup>th</sup> IASSCS Conference: "Breaking Boundaries: Sexuality, Gender, Reproduction, Health and Rights" July 12-15, 2017
Faculty of Engineering	THA 2017: International Conference on Water Management and Climate Change toward Asia's Water-Energy-Food Nexus. January 25-27, 2017.
Office of Academic Affairs	CU International & Cultural Night 2016
Office of Strategy Management and Budgeting	The 4 <sup>th</sup> Engagement Thailand Annual Conference. July 5-7, 2017.



## Appendix D: Chemical Consumed by UN Class 2016- 2017

<b>UN Class</b>	<b>Solid (kg)</b>	<b>Liquid (litre)</b>	<b>Gases (m<sup>2</sup>)</b>
Class 1: Explosive	-	-	-
Class 2: Gases	-	275.90	205.90
Class 3: Flammable Liquids	6.57	9,793.61	1.00
Class 4: Flammable Solids	55.98	6.25	-
Class 5: Oxidizing Substance	93.88	102.77	-
Class 6: Toxic and Infections	84.16	2,077.87	-
Class 7: Radioactive materia	-	-	-
Class 8: Corrosive Substances	333.21	1,747.60	-
Class 9: Miscellaneous Dangerous Substances and Articles	35.48	9.67	83.00
Others (None Class)	2,049.00	1,620.35	1.20
<b>Total</b>	<b>2,657.62</b>	<b>14,637.51</b>	<b>290.10</b>

## Appendix E: Amount of Hazardous Waste 2016-2017

Type of wastes	Liquid (litre)	Solid (kg)
I: Special Waste	1,934.81	3,297.88
II: Cyanide Waste	463.31	3.62
III: Oxidizing Waste	314.06	46.40
IV: Mercury Waste	410.81	10.26
V: Chromate Waste	608.15	3.36
VI: Heavy Metal Waste	4,095.03	134.28
VII: Acid Waste	3,035.48	52.15
VIII: Alkaline Waste	1,752.81	212.28
IX: Petroleum Products	8,654.66	301.06
X: Oxygenated Waste	15,510.52	176.96
XI: NPS Containing	2,950.10	117.62
XII: Halogenated Waste	3,679.77	53.38
XIIIa: Combustible Solid	102.70	5,950.22
XIIIb: Incombustible Solid	7.50	1,562.62
XIV: Miscellaneous Aqueous Waste	1,751.72	97.10
XV: Degraded Chemical Waste	201.83	209.82
Total	45,473.26	12,229.01



## Appendix F: International Faculty Member and Researcher Data 2016- 2017

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<b>Full-Time Faculty Members</b>	<b>Number</b>
Total Number of Full-Time Faculty	2,678
Total Number of Thai Full-Time Faculty	2,660
Total Number of Non-Thai Full-Time Faculty	18
American	5
British	3
Chinese	2
French	2
German	3
Korean	1
Romanian	1
Russian	1
Total Number of Part-Time Faculty	102
Total Number of Thai Part-Time Faculty	39
Total Number of Non-Thai Part-Time Faculty	63
American	16
Australian	3
Austrian	2
Belgian	1
British	7
Canadian	6
Chinese	1
Filipino	3
French	3
German	3
Irish	2
Italian	3

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<b>Full-Time Faculty Members</b>	<b>Number</b>
Japanese	4
Korean	1
Malaysian	1
Moroccan	1
New Zealand	1
Russian	1
Spanish	4
<b>Researchers</b>	<b>Number</b>
Total Number of Researcher	127
Total Number of Thai Researcher	125
Total Number of Non-Thai Researcher	2
Chinese	1
Japanese	1



## Appendix G: Student Data 2016- 2017

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<b>Students</b>	<b>Number</b>
Total Number of Student	36,566
Total Number of Thai Student	36,010
Total Number of Non-Thai Student	556
American	18
Austrian	1
Bangladeshi	10
Belizean	1
Bhutanese	7
Brazilian	1
British	6
Bruneian	1
Cambodian	42
Cameroonian	3
Canadian	5
Chinese	96
Danish	1
Egyptian	1
Eritrean	1
Ethiopian	1
Filipino	14
French	5
German	4
Indian	24
Indonesian	53
Iranian	3
Iraqi	1
Japanese	15

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<b>Students</b>	<b>Number</b>
Kenyan	1
Korean	33
Kyrgyzstani	1
Laotian	24
Libyan	1
Malagasy	1
Malawian	3
Malaysian	10
Mexican	1
Mozambican	2
Myanmar	52
Nepalese	7
New Zealand	1
Nigerian	4
Pakistani	5
Russian	2
Singaporean	2
South African	2
Spanish	2
Sri Lankan	5
Sudanese	1
Swiss	2
Taiwanese	13
Ugandan	1
Vietnamese	66



# References

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## English

- Association for the Advancement of Sustainability in Higher Education. (2017). STARS 2.1 Technical Manual. Retrieved from AASHE website: <https://stars.aashe.org/pages/about/technical-manual.html>
- International Sustainable Campus Network (ISCN) and Global University Leaders Forum (GULF). (2016). Implementation Guidelines to the ISCN-GULF Sustainable Campus Charter. Retrieved from ISCN website: <https://www.international-sustainable-campus-network.org/downloads/charter-and-guidelines/443-iscn-gulf-charter-guidelines/file>
- Global Reporting Initiatives. (n.d.). G4 Sustainability Reporting Guidelines. Retrieved from GRI website: <https://www.globalreporting.org/Pages/resource-library.aspx>
- Universitas Indonesia. (n.d.) UI GreenMetric: Overall Rankings 2017. Retrieved May 31, 2018, from UI GreenMetric website: <http://greenmetric.ui.ac.id/overall-ranking-2017/>

## ภาษาไทย

- ฝ่ายการงบประมาณ สำนักบริหารยุทธศาสตร์และการงบประมาณ จุฬาลงกรณ์มหาวิทยาลัย. (2560). “รายงานประจำปี จุฬาลงกรณ์มหาวิทยาลัย ปีบัญชี 2560 (1 ตุลาคม 2559 – 30 กันยายน 2560).” กรุงเทพฯ : สำนักบริหารยุทธศาสตร์และการงบประมาณ จุฬาลงกรณ์มหาวิทยาลัย.
- สำนักบริหารระบบกายภาพ จุฬาลงกรณ์มหาวิทยาลัย. (2554). มาตรฐานการออกแบบอาคารและสถานที่. กรุงเทพฯ : สำนักบริหารระบบกายภาพ จุฬาลงกรณ์มหาวิทยาลัย.
- ศูนย์ความปลอดภัยอาชีวอนามัยและสิ่งแวดล้อม จุฬาลงกรณ์มหาวิทยาลัย (2560). “รายงานประจำปี 2560 ศูนย์ความปลอดภัย อาชีวอนามัยและสิ่งแวดล้อม จุฬาลงกรณ์มหาวิทยาลัย (สรุป).” สืบค้นเมื่อวันที่ 31 พฤษภาคม 2561, ในเว็บไซต์ ศูนย์ความปลอดภัยอาชีวอนามัยและสิ่งแวดล้อม จุฬาลงกรณ์มหาวิทยาลัย: <https://www.shecu.chula.ac.th/home/content.asp?Cnt=56>



## **Chulalongkorn University Sustainability Report 2016-2017:**

Based on ISCN-GULF Sustainable Campus Charter

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