

Results Report

SWU's (Ongkharak Campus) 2018

Submission to the UI GreenMetric Ranking

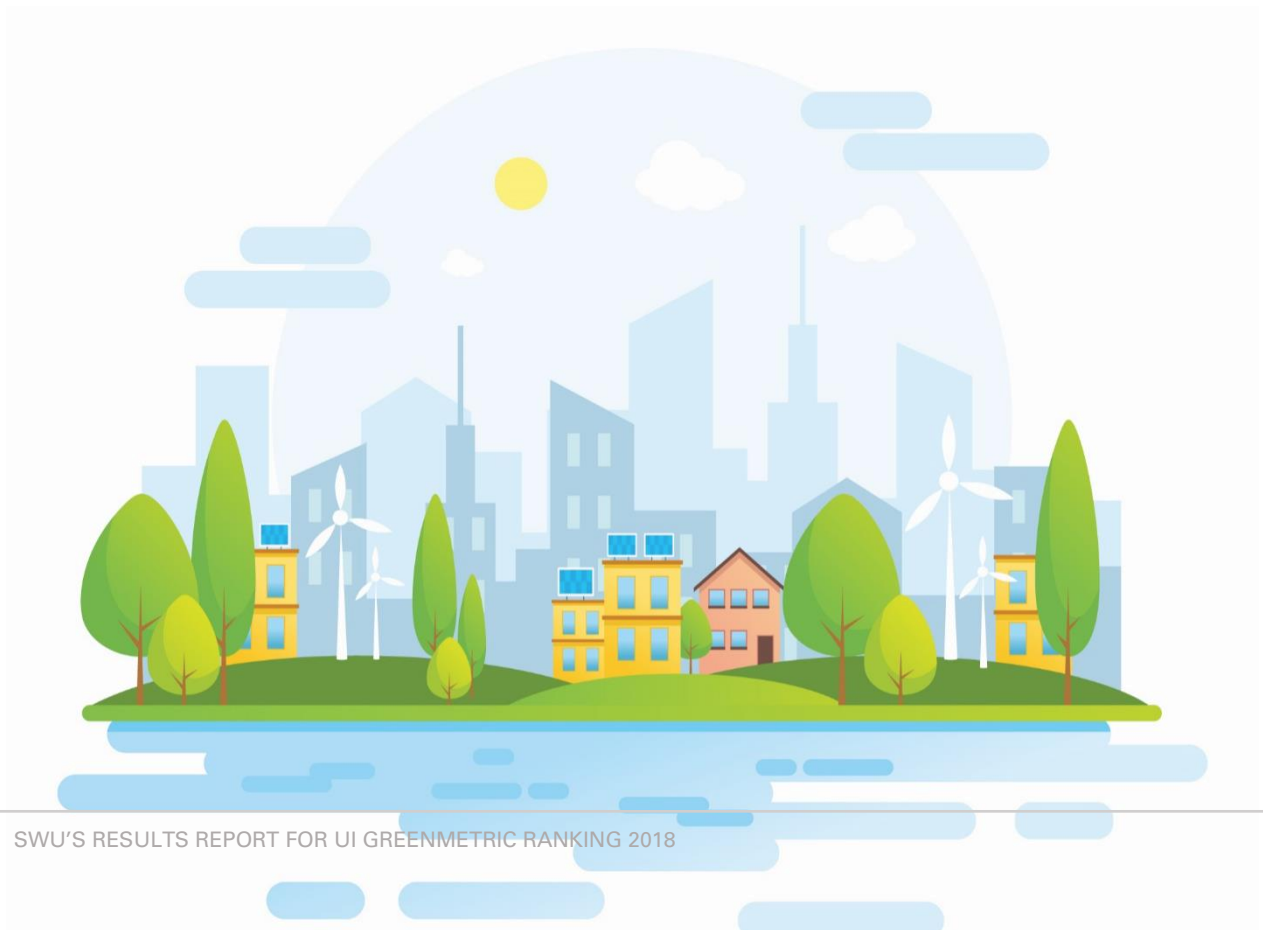


SRINAKHARINWIROT UNIVERSITY



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EXECUTIVE SUMMARY



SWU's projected score for 2018 is **5,550 points** out of a possible **10,000**.

The two categories in which SWU scored highest were Setting & Infrastructure (1,400 out of a possible 1,500) and Transportation (1,450 out of a possible 1,800).

The two categories in which SWU scored lowest were Waste (600 out of as possible 1,800) and Water (250 out of a possible 1,000).

If correct, this projected score of 5,550 will see SWU in the **Top 150** globally (assuming that in 2017 such a score would have placed them in 118th position).

If other Thai universities do not significantly improve their scores from 2017, an SWU score of 5,550 in 2018 is likely to result in **4th place in Thailand**, not far behind Mahidol University, Chulalongkorn University and Kasetsart University.

Some requested evidence was not able to be obtained and hence **800 points** could be contested by the GreenMetric organisers, Universitas Indonesia. It is hoped that the conservative answers given, most of which resulted in minimal scoring for each of the possibly contested questions, will be considered by the organisers and no points deducted from the projected 5,550.

With minimal expenditure in 2019 a further **475 points** should be easily obtainable. Such a gain would likely see SWU enter the GreenMetric **Top 100**.

Additional gains can be made but will require time and effort.

If SWU are to improve their Waste category score, all the waste produced at SWU Ongkharak requires monitoring more closely with volumes recorded on a regular basis.

Several projects already given the green light will help SWU's score for 2019:

- the plan to move parking off-campus,
- the pyrolysis project,
- and the recently-assigned budget for tackling the disposal of sewage.



1. INTRODUCTION

1.1 The Data Collection Team & Timelines

The Data Collection Team was led by Andy Campbell, a British Environmental Consultant with more than ten years' experience in collecting, analyzing and reporting on large environmental datasets. Andy was assisted by local Thai consultants with strong backgrounds in field assessments and the collation and analysis of data.

Of the 69 questions, 26 required direct input from SWU. This was achieved through communication between Andy and the SWU Sustainability Office at Ongkharak. And also via 2 official meetings with the SWU Ongkharak Sustainability Committee at which Andy presented, on 15th June 2018, a Plan of Action for the GreenMetric Project and then, on 12th September 2018, a GreenMetric Status Update.

Between June and September, Andy made 5 separate trips to the Ongkharak Campus to collect data. In addition, several questions could be answered using online tools such as the Daft Logic website for measuring areas.

The data collection was deemed complete on Friday 12th October 2018 and the official submission finalized on Monday 15th October.

1.2 Score Summary

SWU's final score was 5,550 out of a possible 10,000. If applied to the 2017 ranking this would have seen SWU in 118th place globally and 4th in Thailand behind Mahidol University (86th), Chulalongkorn University (90th) and Kasetsart University (96th).

However, it is unknown at this point where on the ranking SWU will be placed in 2018. This is because each year most universities improve their scores and hence the same score each year will end up in a slightly lower placing in subsequent years. It is envisaged that SWU - if all answers are accepted by Universitas Indonesia – will end up around 150th place in 2018 with their score of 5,550.

It is not known at this point how strict Universitas Indonesia will be in their marking of the answers. We were unable to obtain the requisite evidence for every question. Hence it is possible that SWU's projected score of 5,550 may be reduced, with a worst-case scenario score of 4,750. This lowest possible score will result if Universitas Indonesia reject all of the problematic answers highlighted in Table 1 in which 800 points could be deducted from our envisaged score of 5,550. A score of 4,750 would have seen SWU end up in 244th place in 2017. However, even if such a worst-case scenario did materialize it is envisaged that the highlighted problems could be easily overcome for the 2019 submission with a resultant leap up the rankings.



Table 1 – Possibly contentious answers

Q.	CRITERIA	PROBLEM	POINTS THAT COULD BE LOST
1 Setting & Infrastructure (SI)			
1.16	Total university budget (in US dollars)	We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.	
1.17	University budget for sustainability effort (%)	We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.	
1.18	Percentage of University budget for sustainability effort within a year	Calculated using 1.16 and 1.17.	200
3 Waste (WS)			
3.1	Recycling program for university waste (% recycled)	No data was available for the volume of waste produced at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
3.3	Organic waste treatment (% recycled)	No data was available for the volume of waste produced at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
3.4	Inorganic waste treatment (% recycled)	No data was available for the volume of waste produced at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
3.5	Toxic waste treatment (% recycled)	No data was available for the volume of waste produced at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
4 Water (WR)			
4.1	Water conservation program implementation (% conserved)	No data was available for the volume of water conserved at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
4.2	Water recycling program implementation (% recycled)	No data was available for the volume of water recycled at SWU. Hence, we gave a conservative answer, hoping for the minimum score, using photographs as evidence.	75
6 Education (ED)			
6.4	Total research funds dedicated to sustainability research (in US dollars)	We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.	
6.5	Total research funds (in US dollars)	We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.	
6.6	The ratio of sustainability research funding divided by total research funding	Calculated using 6.4 and 6.5.	150
Total points in contention			800

1.3 Road Map for Improving SWU's Score and Ranking Position in 2019

The following assumes that Universitas Indonesia are not strict in their acceptance of the possibly contentious answers presented in Table 1 and hence SWU's projected score of 5,550 is correct for 2018.

With minimal expenditure, SWU can improve their score by **475 points** in 2019 by undertaking the following:

- Question 4.1 relates to water conservation. By placing 2-3 litres of plastic water bottles in every toilet cistern on campus SWU could gain an additional **75 points**.
- Question 4.3 relates to water efficient appliances. If SWU can replace 800 water appliances with efficient versions, a further **50 points** can be gained.
- Question 5.9 relates to zero emission vehicles on campus. The easiest points can be gained by removing the fee charged to students wishing to use the university-provided bicycles. An immediate **50 points** will result.
- Question 6.9 relates to the number of student organisations connected with sustainability. The answer given this year was "4". If one more sustainability-related student organization can be formed SWU can gain an easy **75 points**.
- Question 6.10 relates to the existence of a university-run sustainability website. It is understood that SWU are in the process of creating one. If this is up-and-running by October 2019 and the plan is for it to be updated regularly then an easy **150 points** can be gained here.
- Question 6.12 relates to the publication of a Sustainability Report. If this is published by October 2019 and the plan is for it to be updated regularly then an easy **75 points** can be gained here.

An additional **475 points** would mean a total score of **6,025 points** in 2019. When equated to 2017's ranking this means a position of **62nd** and should be good enough to see **SWU in the Top 100 for 2019**.





2. SWU'S GREENMETRIC SUBMISSION

2.1 'Setting & Infrastructure' (SI)

SWU's 2018 score for 'Setting & Infrastructure' is **1,400** out of a possible **1,500**.

The rural setting at Ongkharak was a major factor in achieving an almost perfect score for this category. The only question for which full marks were not gained related to forest cover.

It is unlikely that any more points can be gained in this category in 2019 due to the high score already obtained.

Table 2 – SWU's GreenMetric 'SI' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
1 Setting & Infrastructure (SI) = 15% of total score				
1.1	Type of higher education institution (HEI)	Comprehensive		
1.2	Climate	Tropical wet & dry		
1.3	No. of campus sites	2		
				

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Description:

Srinakharinwirot University (SWU) has nineteen faculties spread across two campuses. The older social science faculties are at the Prasarnmit Campus in downtown Bangkok. The newer health science faculties, plus the Faculty of Engineering, are at the Ongkharak Campus, 70km NE of Bangkok. The Ongkharak Campus is the larger of the two – both in land footprint and number of students – and hence is designated the main SWU campus for this GreenMetric submission.

1.4 Main campus setting

Rural



Description:

Encompassing more than 1.8 million square metres, Srinakharinwirot University's Ongkharak campus is a beautiful and leafy campus located approximately 70-kilometers away from Bangkok. HRH Princess Maha Chakri Sirindhorn Medical Center is located here alongside the Faculty's new educational and administrative building. Students based at Ongkharak include first year and clinical year students who are provided with onsite dormitories and enjoy numerous facilities including a swimming pool, indoor badminton courts, tennis courts, futsal areas, and other exercise facilities. The main medical library is located at the Faculty's new building at Ongkharak campus.

1.5 Total main campus area (m²)

1,802,847 m²

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Output : Current Area

1802846.97 m² | 1.80 km² | 445.49 acres | 180.28 hectares | 19405683.29 feet² | 0.70 square miles | 0.52 square nautical miles

Description:

Used Daft Logic website (a Google Maps Area Calculator Tool) to obtain the answer of 1,802,847 m².

1.6	Total main campus ground floor buildings (m ²)	127,865 m ²		
1.7	Total main campus buildings area (m ²)	299,690 m ²		
1.8	The ratio of open space area towards total area	92.91% (1,802,847 - 127,865 / 1,802,847) x 100%	300/300	
1.9	Total area on campus covered in forest (%)	6.9% (124,632 / 1,802,847) x 100%	100/200	To get an extra 50 points here SWU would need to plant 38,000 m ² of trees.
1.10	Total area on campus covered in planted vegetation (%)	35.38% (637,872 / 1,802,847) x 100%	300/300	
1.11	Total area on campus for water absorption besides forest and planted vegetation (%)	64.91% ((1,802,847 - 380,120 - 124,632 - 127,865) / 1,802,847) x 100%	200/200	

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
1.12	Total number of regular students (part time and full time)	8,102	150	
1.13	Total number of online students (part time and full time)	0		
1.14	Total number of academic and admin staff	2,332		
1.15	The total open space area divided by total campus population	161 m ² / person (1,802,847-127,865 / 10,434)	300/300	
1.16	Total university budget (in US dollars)	USD6,822,000		We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.
1.17	University budget for sustainability effort (%)	USD1,406,000		We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.
1.18	Percentage of University budget for sustainability effort within a year	21% (1,406,000 / 6,822,000) x 100%	200/200	



2.2 'Energy & Climate Change' (EC)

SWU's 2018 score for 'Energy & Climate Change' is **1,100** out of a possible **2,100**.

Zero points were scored for both smart building implementation and the minimal use of renewable energy sources.

It is envisaged that the easiest gains to be made in this category can be found in a continuation of the aircon and LED replacement programs with a simple 75 points to be had once the Pyrolysis campaign is underway.

But to make significant gains will require capital outlay in reducing the electricity consumption on campus by more than 10%, with measurements taken and ensuring that renewable energy sources account for more than 1% of electricity supply. If these can be achieved, in conjunction with the Pyrolysis campaign it will be possible to boost the Energy & Climate Change score to **1,300** out of a possible **2,100**.

Table 3 – SWU's GreenMetric 'EC' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
2 Energy & Climate Change (EC) = 21% of total score				
2.1	Energy efficient appliances usage	77.5%	200/200	
   				

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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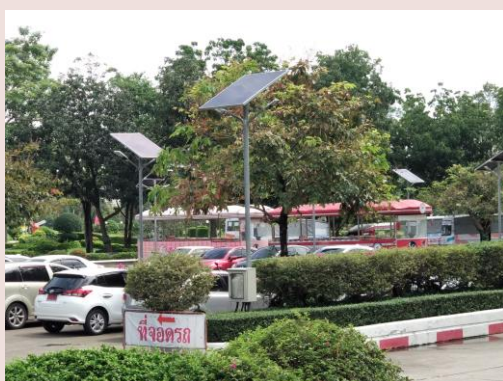
Description:

SWU (Ongkharak Campus) recently (in 2018) replaced 30,000 of their 34,000 36-watt halogen lightbulbs with 18-watt LED bulbs.

Additionally, they are, at the time of writing, replacing 375 of their 5,185 aircon units with brand new energy efficient units (some inverters and some VRFs).

So, the percentage of energy efficient appliances in use is $(30,000+375) / (34,000+5,185) \times 100\% = 77.5\%$

2.2	Total main campus smart building area (m ²)	0		
2.3	Smart Building implementation	0	0/300	To convert the old, analogue buildings at SWU into smart buildings will be costly. However, there may be some options cheap enough to score at least some points here: http://www.commissioning.org/downloads/2015/Sim-O'Loughlin.pdf To score 75 points would require just 3,000 m² of the total 300,000 m² floor space of buildings to be converted using smart technology.
2.4	Number of renewable energy sources in campus	2 Solar Biomethane	150/300	The planned Pyrolysis campaign, once completed, will gain an additional 75 points here.
2.5	Renewable energy produced on campus per year	Minimal		It is recommended that the amount of electricity produced by the parking lot solar panels be measured for next year's submission.



Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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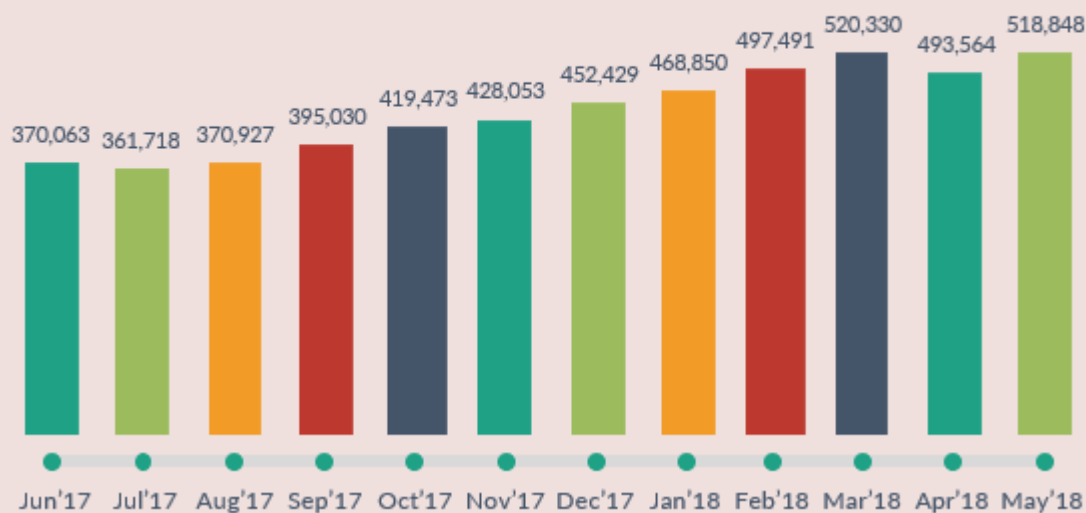
Description:

Srinakharinwirot University (SWU) have two sources of renewable energy supplying power at their Ongkharak Campus:

- 1) Solar powered lighting in several carparks and in newly-installed pedestrian walkways.
- 2) A bio-methane plant on campus

2.6	Electricity usage per year (kWh)	5,296,775 kWh
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SWU (Ongkharak Campus) Electricity Consumption 2017-2018 (kWh)



Description:

Total electricity usage per year = 5,296,775 kWh

2.7	The total electricity usage divided by total campus population (kWh per person)	508 kWh / person 5,296,775 / 10,434	225/300
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Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
2.8	Ratio of renewable energy produce / production towards total energy usage per year	<1%	0/200	To obtain the minimal 50 points here would require renewable energy sources to contribute more than 1% of the total electricity usage of 5,296,775 kWh (e.g. 52,968 kWh). A study would be required to determine the cost of achieving this – see Q.2.5 as a first step (measuring the amount of electricity currently produced by the parking lot solar panels).
2.9	Elements of green building implementation as reflected in all construction and renovation policy	3 elements Building Manager Natural Day-lighting Tinted Windows	225/300	To get an extra 50 points here SWU would need to plant 38,000 m ² of trees.

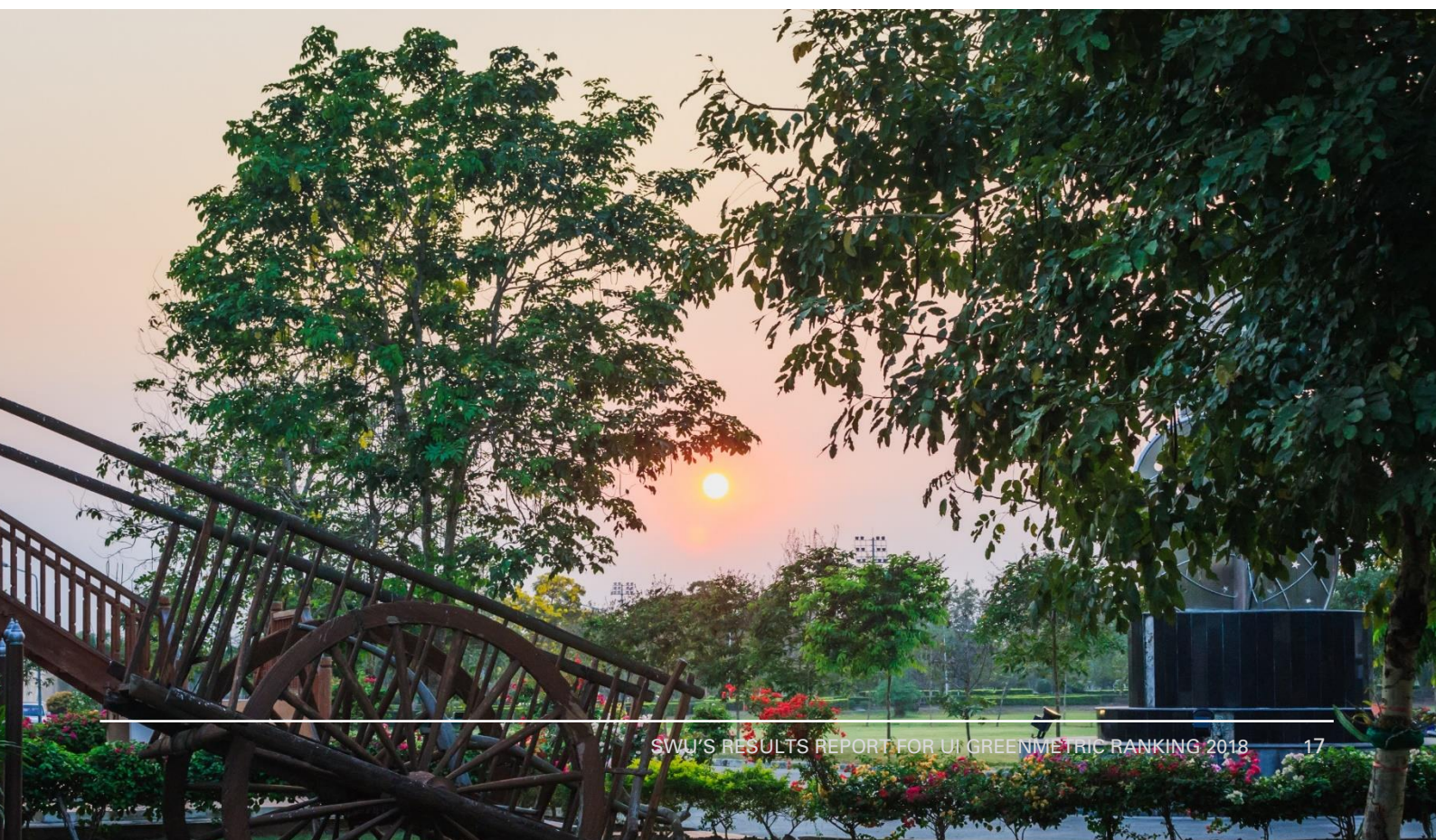


Description:

- Natural day-lighting is found in many of SWU Ongkharak's faculty buildings.
- Tinted windows are used in all new building construction and in renovated buildings.
- Additionally, each building has a dedicated Manager to ensure minimum energy usage occurs.

2.10	Greenhouse gas emission reduction program	LED program is Scope 2	150/200	
2.11	Please provide total carbon footprint (CO ₂ emission in the last 12 months, in metric tons)	4,690 tons		

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
	CO₂ (electricity) = $(5,296,775 / 1000) \times 0.84 = 4,449.3$ metric ton CO₂ (bus) = $(10 \times 20 \times 2 \times 240 / 100) \times 0.01 = 9.6$ metric ton CO₂ (cars) = $(732 \times 2 \times 1.8 \times 240 / 100) \times 0.02 = 126.5$ metric ton CO₂ (motorcycle) = $(1,206 \times 2 \times 1.8 \times 240 / 100) \times 0.01 = 104.2$ metric ton CO₂ (total) = $4,449.3 + 9.6 + 109.2 + 104.2 = 4,690$ metric ton Description: SWU's (Ongkharak Campus) total carbon footprint for the previous 12 months was 4,690 metric tons.			
2.12	Total carbon footprint divided by total campus population (metric ton per person)	0.45 (4,672.3/10,434)	150/300	To gain an extra 75 points here we need to reduce the ratio down to <0.42 metric ton / person. Assuming the campus population will stay the same, this means reducing the total carbon footprint to less than 4,278 tons. The carbon from transportation was minimal at 240.3 tons of the total 4,672. Hence the easiest savings will come from reducing electricity usage by approximately 10%. The replacement of 375 older aircon units, coupled with the LED replacement campaign and tinted windows on the Faculty of Engineering will certainly help. A study would be required to determine how many more aircon units would need replacing to gain the required electricity savings to obtain an extra 75 points.



2.3 'Waste' (WS)

SWU's 2018 score for 'Waste' is **600** out of a possible **1,800**.

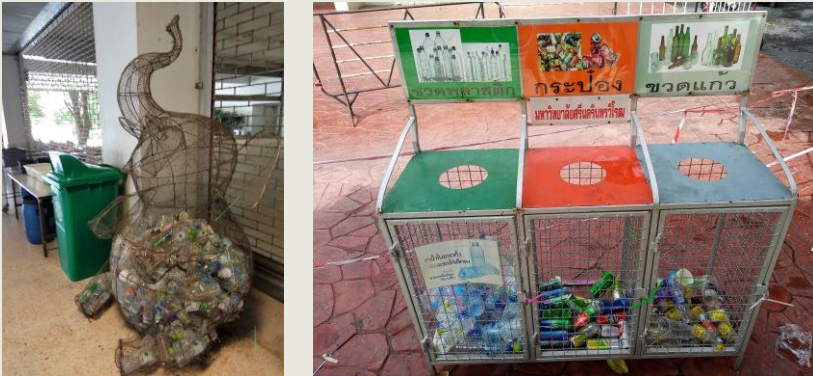
Maximum points were obtained for the excellent campus-wide campaigns to reduce the use of paper and plastic on campus.

However, minimal scores were obtained for the other 5 questions in this category. This can mainly be attributed to the apparent lack of measurement of the amount of waste created at Ongkharak campus. Until the amount of waste is measured it will not be possible to achieve a better score for the questions relating to recycling, organic, inorganic and toxic waste.

It is understood that a multi-million-baht budget has just been assigned to improve the treatment of sewage – this will undoubtedly help improve the score for this question from its current '0'.

Without the amount of produced waste being measured it is difficult to estimate any possible gains for 2019. Hence a conservative score of **675** out of a possible **1,800** may be achieved if the planned sewage treatment works enables SWU to answer that the bulk of sewage is treated conventionally.

Table 4 – SWU's GreenMetric 'WS' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
3 Waste (WS) = 18% of total score				
3.1	Recycling program for university waste (% recycled)	<25%	75/300	All SWU's produced waste needs monitoring more closely with volumes of waste recorded on a regular basis. Without monitoring it will not be possible to achieve a better score here.
				

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Description:

Recycle bins are found all over the campus. As can be seen in these photos, they are well utilised. Plastic, aluminium, and glass are separated at the point of disposal.

We do not have exact figures for the amount of waste that is recycled. But given the ubiquity and high utilization of recycle bins it is conservatively estimated that between 1-25% of waste is recycled.

3.2	Program to reduce the use of paper and plastic on campus	4 Water fountains Cloth bags 3rd party campaign Re-use paper	300/300	
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Description:

- Reduce use of paper
- Reduce use of plastic water bottles by providing free water distribution
- Reduce use of plastic bags by providing ALL fresher students with cloth bags
- Overall program to reduce waste – from 9th August 2018, 3rd party vendors (shops, restaurants, and a hospital) instructed to minimize handing out plastic bags and plastic food containers

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
3.3	Organic waste treatment (% recycled)	<25%	75/300	Good photos obtained this year but all SWU's produced waste needs monitoring more closely with volumes of waste recorded on a regular basis. Without monitoring it will not be possible to achieve a better score here.



Description:

35% of the 1.8 million sq.m. of Ongkharak Campus is covered in vegetation with a further 7% covered in trees / forest. This results in a lot of organic waste. As these photos show, this organic waste is collected and treated to turn it into fertilizer.

We do not have exact figures for the amount of organic waste that is recycled. But given the aforementioned large amount that is collected and treated naturally, it is conservatively estimated that between 1-25% of organic waste is recycled.

3.4	Inorganic waste treatment (% recycled)	<25%	75/300	In the Water Consumption spreadsheet (see Section 4) there are references to a 'Waste & Water Treatment Plant', a 'Prototypical Factory for Agricultural Waste Processing', and a 'Waste Separation Plant' - these needs investigating next year for photos and measurements of waste amounts.
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Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Description:

Recycle bins are found all over the campus. As can be seen in these photos, they are well utilised. Plastic, aluminium, and glass are separated at the point of disposal.

Additionally, there is an energetic campaign underway to encourage the entire population at SWU (Ongkharak Campus) to reduce the amount of waste each person produces.

We do not have exact figures for the amount of inorganic waste that is recycled. But given the ubiquity and high utilization of recycle bins, it is conservatively estimated that between 1-25% of inorganic waste is recycled.

3.5	Toxic waste treatment (% recycled)	<25%	75/300	It is possible that the Faculty of Medicine has a formal process for dealing with toxic waste. E.g. separated at point of disposal and sent to a subcontractor to dispose of it professionally and safely. But we could not find this information in 2018.
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Description:

Toxic waste is separated at the point of disposal. This is facilitated by bins being placed at strategic locations around campus where toxic waste is likely to be produced.

We do not have exact figures for the amount of toxic waste that is recycled. But given the encouragement to use toxic waste bins provided it is conservatively estimated that between 1-25% of toxic waste is recycled.

3.6	Sewerage disposal	Dumped untreated	0/300	SWU have just assigned a multi-million-baht budget to help address this problem so should score better next year.
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2.4 'Water' (WR)

SWU's 2018 score for 'Water' is **250** out of a possible **1,000**.

This is the lowest scoring category by percentage - minimum points were scored for each of the 4 questions.

As with the 'Waste' category, without the amount of water runoff, recycling and treatment use being measured it is difficult to estimate any possible gains for 2019. Hence a conservative improved score of **375** out of a possible **1,000** may be possible if 2-3 litres of plastic water bottles are placed in all toilet cisterns and if a program to replace 800 water appliances with efficient versions can be undertaken.

Table 5 – SWU's GreenMetric 'WR' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
4 Water (WR) = 10% of total score				
4.1	Water conservation program implementation (% conserved)	<25%	75/300	To gain an extra 75 points here may be as simple as placing 2-3 litres of plastic water bottles in every toilet cistern on campus. It could then be claimed that a water conservation program is in the early stage of implementation and that more than 25% of water is conserved. But to get even higher scores would require the measurement of potential surface runoff volume.
  Description: As evidenced by the photos above, water supply at SWU (Ongkharak Campus) is not an issue. There are a number of large lakes and interconnecting waterways throughout the campus. Although water runoff is not measured, it is conservatively estimated that between 1-25% is conserved.				

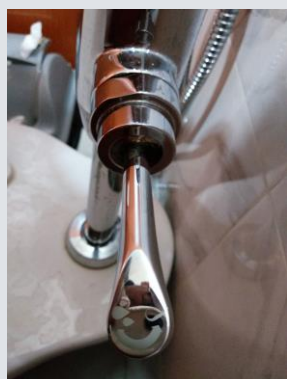
Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
4.2	Water recycling program implementation (% recycled)	<25%	75/300	This is a tricky question for which to improve the score. Waste water rates need to be measured and more than 25% recycled. With the planned sewage treatment program, it may be possible to achieve a higher score here at a later date.



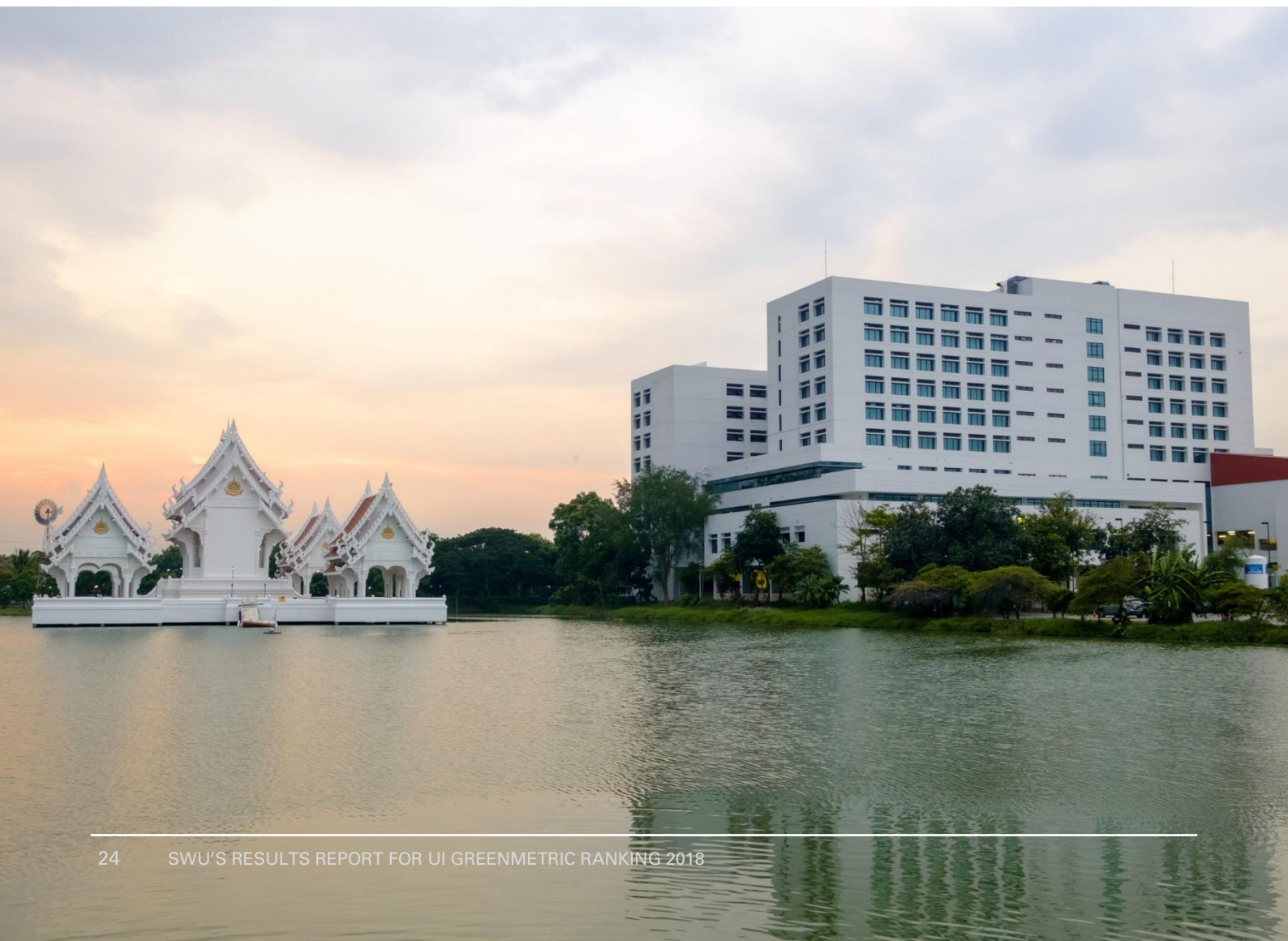
Description:

The several large lakes and interconnecting waterways throughout the campus serve as both repositories for conserving water runoff and also as a source from which the vast swathes of vegetation across campus can be watered. Although water recycling is not measured, it is conservatively estimated that between 1-25% of the water is recycled.

4.3	The use of water efficient appliances (water tap, toilet flush etc.)	8.1%	50/200	Of the approximately 5,007 water appliances on campus, only 440 of them are deemed efficient. This equates to 8.1%. To gain an extra 50 points here would require a further 800 water efficient appliances to be installed.
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Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
Description: 440 of the 5,007 water appliances (taps and flushes) found across SWU's Ongkharak Campus are classed as efficient. This equates to $440 / 5,007 \times 100 = 8.1\%$				
4.4	Treated water consumed (%)	<25%	50/200	A first step to gaining an extra 50 points here would be the measurement of what percentage of water consumed comes from treated water. It is known that water plants are used to treat some water. But it is not known if this treated water is then used on campus.



2.5 'Transportation' (TR)

SWU's 2018 score for 'Transportation' is **1,450** out of a possible **1,800**.

Maximum points were obtained for 4 of the 8 questions in this category.

Gains are expected to be made in 2019 by the planned move of a significant number of parking spaces to an off-campus area. If this results in a more than 10% reduction in the number of parking spaces on campus, and an associated 30% reduction in the number of cars and motorbikes on campus each day, an extra 150 points can be gained.

The easiest points can be achieved by the removal of the fee charged for the university bicycles; a quick 50 points.

If the planned off-campus parking results in a 30% reduction in the number of cars and motorcycles on campus, 10% reduction in the number of on-campus parking spaces and the charge for the university bicycles is removed then an improved score of **1,650** out of a possible **1,800** is feasible.

Table 6 – SWU's GreenMetric 'TR' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
5 Transportation (TR) = 18% of total score				
5.1	Number of cars actively used and managed by university	100		This figure was a guess. We will need a definitive number for next year's submission.
5.2	Number of cars entering the university daily	632		
5.3	Number of motorcycles entering the university daily	1,206		
5.4	The ratio of total vehicles (cars and motorcycles) divided by total campus population	0.19 $(100+632+1,206) / 10,434$	100/200	A more accurate assessment next year (by having somebody conduct a 2-3-day count of cars and motorbikes entering the campus each day) may reduce the vehicle count and hence gain an extra 50 points here. If the campus population stays the same, the total vehicle counts each day will need to be less than 1,300 (it is currently estimated at 1,938).
5.5	Shuttle services	Yes, very regular electric shuttles on 4 routes, all free	300/300	

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Description:

SWU Ongkharak Campus has a fleet of electric shuttle buses transporting students and staff across campus all day long, from 0600 to 2100. There are 4 routes taken by the buses which are well utilized due to the number of vehicles provided and their frequency of travel.

5.6	Number of shuttles operated in your university	10		
5.7	Average number of passengers in each shuttle	12		
5.8	Total trips of each shuttle service per day	20		
5.9	Zero Emission Vehicles (ZEV) policy on campus	Bicycles provided but charged	150/200	A very easy extra 50 points can be obtained by simply removing the charge for the university-owned bicycles.



Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Description:

SWU (Ongkharak Campus) have a fleet of SWU-owned bicycles available to all students and staff. But there is a nominal fee. We have a network of bicycle paths providing safe roads for bike users throughout the campus.

Additionally, we also have a fleet of electric shuttle buses that are free to use. And also an electric car charging station.

5.10	Average number of Zero Emission Vehicles (e.g. bicycles, canoe, snowboard, electric car, etc.) on campus per day	1,608 98 SWU-owned bicycles 1,500 privately-owned bicycles 10 electric shuttle buses		
5.11	The ratio of Zero Emission Vehicles (ZEV) divided by total campus population	0.15 (1,608 / 10,434)	200/200	
5.12	Total parking area (m ²)	37,751 m²		
5.13	Ratio of parking area to total campus area	2.09% (37,751 / 1,802,847)	150/200	It is understood SWU plan to move some of the parking off-campus. Even so, to get maximum points here SWU would need to halve the number of parking spaces currently on campus.

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
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Output : Total Area(s)

37751.00 m² | 0.04 km² | 9.33 acres | 3.78 hectares | 406348.39 feet² | 0.01 square miles | 0.01 square nautical miles

Description:

Total campus area = 1,802,847 m²

Parking area = 37,751 m²

Ratio of parking area to total campus area = $(37,751 / 1,802,847) \times 100\% = 2.09\%$

5.14	Transportation program designed to limit or decrease the parking area on campus over the last 3 years (from 2015 to 2017)	Planning on moving a lot of parking outside the campus and increasing electric shuttle use on campus	50/200	If on-campus parking can be decreased by up to 10% an extra 50 points can be gained. With a decrease of more than 10% resulting in an extra 100 points. It is recommended that an accurate count of parking spaces is undertaken before the planned move of parking off-campus. This would then allow a definitive number to be given for the percentage decrease in number of parking spaces.
5.15	Transportation initiatives to decrease private vehicles on campus	Bike sharing, car sharing, buses from Bangkok and shuttles on campus	200/200	
5.16	Pedestrian path policy on campus	Many paths available, all safe and all with disabled ramps	300/300	

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
		 Description: 1. Safety marking along the entire covered walkway routes. 2. Well-lit for pedestrians to use the walkways at night. 3. Frequently placed ramps for pedestrians with physical disabilities.		
5.17	Approximate daily travel distance of a vehicle inside campus only (km)	1.8 km		



2.6 'Education' (ED)

SWU's 2018 score for 'Education' is **750** out of a possible **1,800**.

No more than half points were scored on any of the questions. Hence there is room for improvement here.

Almost certain maximal gains are expected to be made in 2019 by the 'going live' of the SWU sustainability website and the planned publishing of an annually amended Sustainability Report. These two together will result in an extra 225 points.

Additionally, relatively easy points can be gained by increasing the number of student organisations related to sustainability by just one (75 points) and the number of sustainability related events by 12 (75 points).

With very little effort, given the aforementioned recommendations, an improved score of **1,125** out of a possible **1,800** is feasible in 2019.

Table 7 – SWU's GreenMetric 'ED' Answers and Evidence Submitted for the 2018 Ranking

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
6 Education (ED) = 18% of total score				
6.1	Number of courses / modules related to sustainability offered	66		
Description: Number of courses/modules related to environment and sustainability offered in 2018 = 66 courses [We included a 16-page list of 'sustainability' related subjects in our submission to the UI GreenMetric but have omitted here for simplicity's sake.]				
6.2	Total number of courses / modules offered	5,023		
		Updated 9 August 2018		
ED 1	The ratio of sustainability courses towards total courses/modules	Sustainability 66 Total course 5,023 } <u>1.31%</u> (KMUTT (2017) = 13%)		
Description: Total number of courses/modules offered in 2018 = 5,023 courses				
6.3	The ratio of sustainability courses divided by total courses / subjects	1.13% (66 / 5,023) x 100	75/300	An additional 100 courses would have to relate to sustainability to gain an extra 75 points here.

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019								
6.4	Total research funds dedicated to sustainability research (in US dollars)	USD848,584		We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.								
SWU have just assigned THB27,800,000 to research the possibility of converting plastic waste into a biofuel (pyrolysis). This figure is assigned to 2018’s sustainability research budget. Data is not available for the years 2016 and 2017. Description: THB27,800,000 has been assigned to a pyrolysis project. At an fx rate of THB32.7 to USD1 this equates to USD848,584.												
6.5	Total research funds (in US dollars)	USD8,509,019										
SWU (Ongkharak Campus) Research Budget 2016-2018 in million USD <table><caption>SWU (Ongkharak Campus) Research Budget 2016-2018 (in million USD)</caption><thead><tr><th>Year</th><th>Budget (million USD)</th></tr></thead><tbody><tr><td>2016</td><td>7.76</td></tr><tr><td>2017</td><td>9.39</td></tr><tr><td>2018</td><td>8.41</td></tr></tbody></table>					Year	Budget (million USD)	2016	7.76	2017	9.39	2018	8.41
Year	Budget (million USD)											
2016	7.76											
2017	9.39											
2018	8.41											
Description: Total research fund in 2016 = USD7,757,006 Total research fund in 2017 = USD9,387,281 Total research fund in 2018 = USD8,409,209 The averaged annum last 3 years of research fund = USD8,509,019												
6.6	The ratio of sustainability research funding divided by total research funding	9.97% (USD848,584 / USD8,509,019) x 100	150/300									
6.7	Number of scholarly publications on sustainability published	26	150/300	We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.								

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
6.8	Number of events related to sustainability	6	150/300	An extra 75 points are available here if the number of events related to sustainability can be increased to 18 or more – an easy task for such a large and green university. We were supposed to submit an average for the past 3 years but only had data for 2018. This may be questioned by UI and needs to be rectified for 2019.



Sustainable Community Forest Project



SWU Love and Care for Sanseab Project



Science to Sustainable Community Development in Sakaew Province Project



Dam Project for Na Haew Community as Social University Concept

ED 4 Sustainability events



Green University Ambassador 2018

A small contest during an orientation period on the 9th August 2018 of seeking for an ambassador from faculties and colleges to represent the university on SWU Green University campaign.

Q.	CRITERIA	ANSWER	SCORE	IDEAS FOR IMPROVING SCORE IN 2019
	ED 4 Sustainability events  SWU Market says no to Plastic Asst. Prof. Dr. Panuwat Joyklad, Assistant to the President for Physical and Environmental Development visited SWU Market on 'International Plastic Bag Free Day' 3rd July to campaign for less plastic bag and foam consumption at the market. Description: Number of events related to environment and sustainability = 6 events			
6.9	Number of student organisations related to sustainability	4	150/300	Adding just one more student organisation related to sustainability will gain an extra 75 points here.
6.10	Existence of a university-run sustainability website	SWU is in the process of creating a website	50/200	SWU will almost certainly increase their score by 150 points here next year given the website is currently in preparation.
6.11	Sustainability website address if available	green.swu.ac.th		
6.12	Existence of published sustainability report	In preparation	25/100	SWU should obtain maximum points here next year with the planned publication of a Sustainability Report.



For more information, contact the Environmental Sustainability team.

Environmental Sustainability team
Srinakharinwirot University (Ongkharak Campus)
Rangsit - Nakhon Nayok Rd
Nakhon Nayok
26120



green.swu.ac.th

Photo by Mumean Photo

