UNIVERSITI MALAYA

2022

UM WATER MANAGEMENT REPORT 2022

Serving the Nation. Impacting the World.

THE GLOBAL GOALS

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1. Some data covers a different range of data collection period due to several reasons: institutional operations data from official bills and data collection on site (on which some are affected by several factors such as renovation works).

2. This report mainly covers data representing the year 2022-2023, however some data reported inclusive of longitudinal initiatives carried out since its respective inception/implementation on campus.

This report, is prepared and published in 2023, and belongs to Water Warriors UM and the Department of Development and Estate Maintenance (JPPHB) UM, under the purview of UM Sustainability and Development Centre (UMSDC).

Water Warriors UM

In the heart of University of Malaya, an initiative known as Water Warriors has taken root with a resolute purpose - the revival and preservation of the campus' water bodies. This environmental project is a testament to the commitment of passionate volunteers who aspire to do more than just talk. Water Warriors aims to introduce the concept of 'citizen science,' which brings together amateur, community, and non-professional scientists in a collective effort to conduct scientific research. The cause relies entirely on the dedication of volunteers who are eager to be actively involved in safeguarding the water resources.

Water Warriors is more than just a project; it's a movement dedicated to the protection and conservation of water bodies within the University of Malaya's campus. What began as an outreach program has evolved into a community-driven endeavor to engage and educate the public on water resource preservation through basic monitoring, a concept commonly known as 'citizen science.' At its core, this program seeks to rekindle a sense of ownership among the community, not only in terms of monitoring but also by actively participating in 'gotong-royong' (community cleanup) activities and reporting water leakages on campus. Additionally, Water Warriors is fervently committed to documenting the diverse flora and fauna of the campus, with a special focus on freshwater habitats encompassing aquatic insects, waterfowl, and wetland plants.

Water Warriors traces its roots back to 2012, emerging as a grassroots initiative and one of the pioneering endeavors under UM Living Labs, focusing on sustainable water management within the campus.

DEPARTMENT OF DEVELOPMENT AND ESTATE MAINTENANCE (JPPHB)

The Department of Development & Estate Maintenance or *Jabatan Pembangunan & Penyelenggaraan Harta Benda* (JPPHB) coordinates Universiti Malaya's efforts to preserve the comfort of its staff, students, and all users of the university's facilities. By forming an effective, committed, and dynamic property management system, we execute the university's development projects competently at minimal cost.

JPPHB provides the following services:

1. Management of engineering services
2. Building and compound maintenance
3. Indoor & outdoor engineering facilities
4. Indoor & outdoor transportation systems
5. Estate management
6. Renovation works
7. Development projects

01

Water Recycling Program Implementation

02

Water Efficient Appliances Usage

03

Consumption of Treated Water

04

Water pollution control in campus area

01 Water Recycling Program Implementation

Recycle Water for Ablution

The rainwater is recycled for the use of ablutions (Muslims) at Academy Islamic Studies Mosque. The rainwater will undergo a few stages of water treatment such as sand filtration and UV filtration before flow to tap. A water meter is installed to measure the amount of rainwater that has been use.

Recycled water is used for garden sprinkler system

Using recycled water from rainwater to water the plants around campus.

Recycled water is used for toilet flush

Using recycled water from rainwater to use for toilets flushing.

Recycled water is used for cooling system

Cooling systems have a closed system. The water is being recycled again.

Perdanasiswa Complex (KPS)
Cooling System

Tunku Chancellor Hall (DTC)
Cooling System

Policy: Universiti Malaya Development Checklist

For new development on campus, it is compulsory to follow the checklist.

6. Green Technologies & Waste Management

Requirements	Yes	No	Remarks
6.1 Have you read GBI rating criterias?			
6.2 Sustainability Strategy – Passive Design. *6.2.1 Sun orientation building composition;* *6.2.2 Natural ventilated spaces;* *6.2.3 Building shapes and facades;* *6.2.3 Natural cooling system;* *6.2.5 Natural lighting system.*			
6.2 Sustainability Strategy – Active Design. *6.2.1 Wind turbine;* *6.2.2 Solar Power;* *6.2.3 Building materials e.g. Low-E glass, low heat absorb brick;* *6.2.4. Rainwater harvesting for irrigation;* *6.2.5 Greywater harvesting for flushing etc.;* *6.2.6 Equipment with "green label".*			
6.3 Development should be eligible to GBI (Green Building Index) Rating			
6.3 Waste Management *6.3.1 Dedicated recycling bins and collection area(s)?* *6.3.2 Wastewater treatment;* *6.3.3 Sewage?* *6.3.4 Wetland?* *6.3.5 Oil and grease trap?* *6.3.6 No direct discharge?*			
6.4 Awareness posters and instructions?			
6.5 Rainwater Management . *6.5.1 Surface water run-off and on-site detention pond* *6.5.2 Usage of material that allows for infiltration of fluids (grasscrete/porous asphalt pavement/permeable pavers) for exposed area such as car parking, pedestrian walkways, etc.*			

Recycled water is used in fishpond

Water pumped into the pond is recirculated and recycled back to be used again in the same pond thus reducing water wastage.

Recycle water at Faculty of Built of Environment

Rainwater collected into 2-unit tanks of 1500 gallons (in total 3000 gallons) on top of the roof of the Faculty of Built Environment. The water is used for secondary usage: cleaning, watering plants.

Recycle water for greenwall

Irrigation for green wall located at the bus stop is using recirculated water system thus reducing water wastage.

Installation of meter at rainwater harvesting tanks

Measurement of rainwater used for each rainwater harvesting system.

02 Water Efficient Appliances Usage

Dual-flush toilet system

These toilets are equipped with set of buttons that allows users to choose between two water settings. A larger flush, usually about 6L, is designed for solid waste and a smaller flush, usually about 3L, is designed for liquid waste.



Retrofitting ablution taps

Installation of water restrictors called “Thimble” for every Mussolah /Mosque in campus. The water restrictor managed to save ~50% of water during ablution. Increase water efficient.

Video: https://tinyurl.com/mrthimble


Low Flow Shower heads

Installation of shower heads for every shower on campus. Reduce water usage and low flow during shower.



Washing machine

Each residential college has its own washing machines. Now, most of the washing machines are water efficient and energy efficient.

Policy: Water efficient products

University Malaya is towards more water efficient products. For upcoming new building and renovation, all toilet fittings (water closet system, tap, urinal equipment, and showerhead) and appliances (washing machines, etc.) must be comply with Water Efficient Products set by the Malaysian Government.

Link: https://www.span.gov.my/category/view/4

UNIVERSITI MALAYA

UM.Q/AR/627/2018/49
7hb Januari 2019

Penyedia Spesifikasi Sebutharga
Semua Bahagian
JPPHB dan PTM
UNIVERSITI MALAYA

Tuan/Puan

SEBUTHARGA/ TENDER BAGI KERJA-KERJA 2019

Merujuk kepada perkara di atas.

2. Selaras dengan perancangan strategik Universiti untuk menyediakan prasarana inklusif dan juga penglibatan universiti secara aktif ke arah kelestarian kampus, saya minta SEMUA sebutharga/ tender bagi kerja-kerja penyelenggaraan yang melibatkan penggantian peralatan/ kelengkapan atau penaiktarafan ruang, infrastruktur atau persekitaran terhadap kemudahan sekitar kampus samada di dalam dan luar bangunan diterapkan rekabentuk sejagat dan mesra alam.

3. Reka bentuk sejagat memungkinkan kemudahan yang disediakan oleh Universiti digunakan oleh semua golongan individu secara inklusif kepada semua peringkat umur sama ada kanak- kanak, warga emas, individu dengan keupayaan fizikal yang terhad termasuk golongan OKU.

4. Antara contoh-contoh kerja-kerja yang dimaksudkan adalah.:

I. Menyediakan penunjuk arah (signage) dan simbol yang jelas dilihat (atau jelas didengari) dan dilengkapi dengan format yang mudah dibaca / difahami oleh OKU (termasuk W3C, Braille, audio visual signage)

II. Pemilihan saiz dan jenis perabot/pintu/kelengkapan tandas yang tidak menyusahkan golongan OKU

III. Jaringan laluan pejalan kaki yang 'seamless' tanpa terputus di serata kampus terutama di ruang-ruang terbuka (sekeliling tasik atau padang sukan)

IV. Kemudahan shuttle bus serta hentiannya yang mesra OKU berkonsepkan reka bentuk sejagat

V. Akses OKU kepada teknologi maklumat dan komunikasi (ICT) termasuk penggunaan Internet

5. Dalam usaha menyediakan persekitaran yang lebih selamat dan bebas halangan kepada semua warga kampus dan juga pelawat, Tuan/Puan boleh merujuk kepada Malaysia Standard MS 1184:2014 untuk butiran lebih lanjut.

JABATAN PEMBANGUNAN & PENYELENGGARAAN HARTA BENDA

6. Selain itu, Tuan/Puan diminta untuk menggunakan spesifikasi yang menggalakkan pembekalan bahan atau kaedah kerja yang mesra alam. Antara 'attribute' yang boleh digunakan adalah seperti berikut:

I. Recycled content
II. Energy efficient
III. Water efficient
IV. Biobased
V. Low toxicity
VI. Durability
VII. Low Volatile Organic Compound (VOC)
VIII. Renewable resources
IX. Packaging
X. Upgradable
XI. Resource conservation
XII. Polybutylene Terephthalate (PBT) free

Di harap Tuan/Puan boleh sama-sama membantu Universiti melaksanakan perancangan ini mulai tahun 2019.

Sekian, terima kasih.

Yang benar,

PROFESOR DR. FAISAL RAFIQ MAHAMD ADIKAN
Timbalan Naib Canselor (Pembangunan)
Universiti Malaya

sk.

Pengarah Pembangunan, JPPHB UM
Pengarah PTM UM
Ketua-ketua Bahagian, JPPHB UM
Ketua-ketua Bahagian, PTM UM

Water Efficient Ablution Taps

Collaborative project between University of Malaya and National Water Services Commission (SPAN). Installation of water efficient ablution taps (more than 100 taps) for 6 mussollah in campus.

Link: Media coverage

Universiti Malaya Eco-Campus Blueprint (UMECB) & UM Sustainability Policy 2021-2030 (2nd Version, Reviewed 2023)

Supporting document to encourage of usage water efficient appliances; part of water conservation program:

Link to **UMECB**

Link to **UMSP2021-2030**

Non-Revenue Water (NRW)

Universiti Malaya taking pro-active measure to reduce Non-Revenue Water on campus. This is to reduce the impact due to the loss of water resources, together with increasing the financial revenue in the sector.

Suspected leakage

To verify treated water using chlorine test

Repair

The table presents data on the number of various appliances and their water efficiency at a specific location

Appliance	**Total number**	**Total number water efficient appliances**	**Percentage**
Toilet	700	500	71%
Urinal	200	140	70%
Tap (wudhu)	700	680	97%
Tap (wash basin)	1500	1300	87%
Shower head	500	480	96%
Washing machine	195	150	77%
Average Percentage of Water Efficient Appliances Installed in UM			**83%**

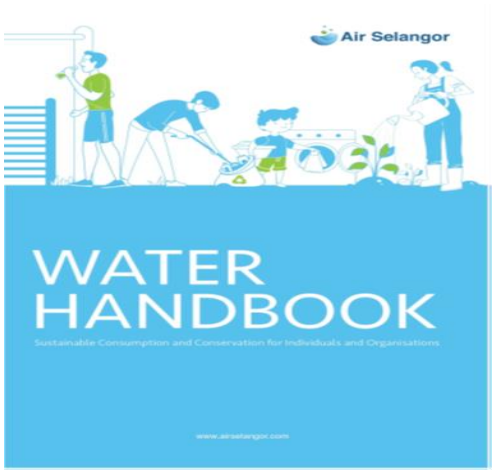
03 Consumption of treated water

>75% treated water consumed

Universiti Malaya campus received water source from Selangor River which located about 60 km. The water is treated and distributed by Air Selangor.

Research and outreach

Universiti Malaya working together with Air Selangor to preserve and protecting water resources through research and Air Selangor would utilise the research outcomes to increase the effectiveness in the public awareness campaign, education and sustainable water practices.

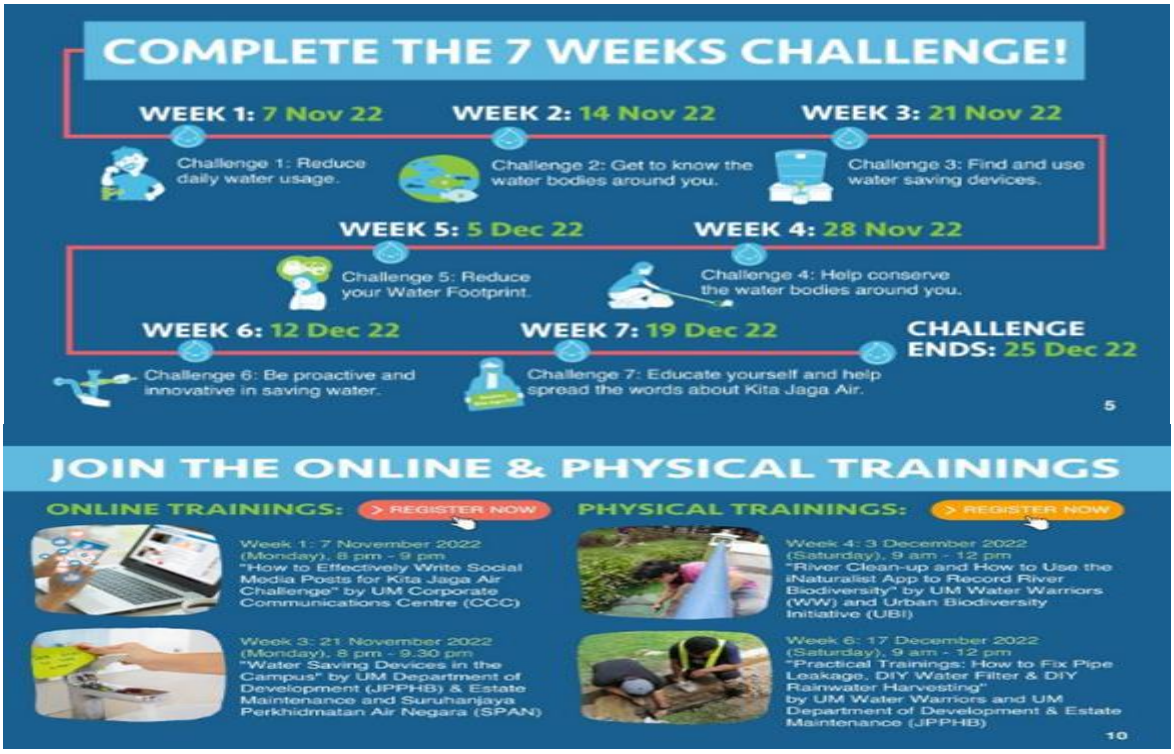


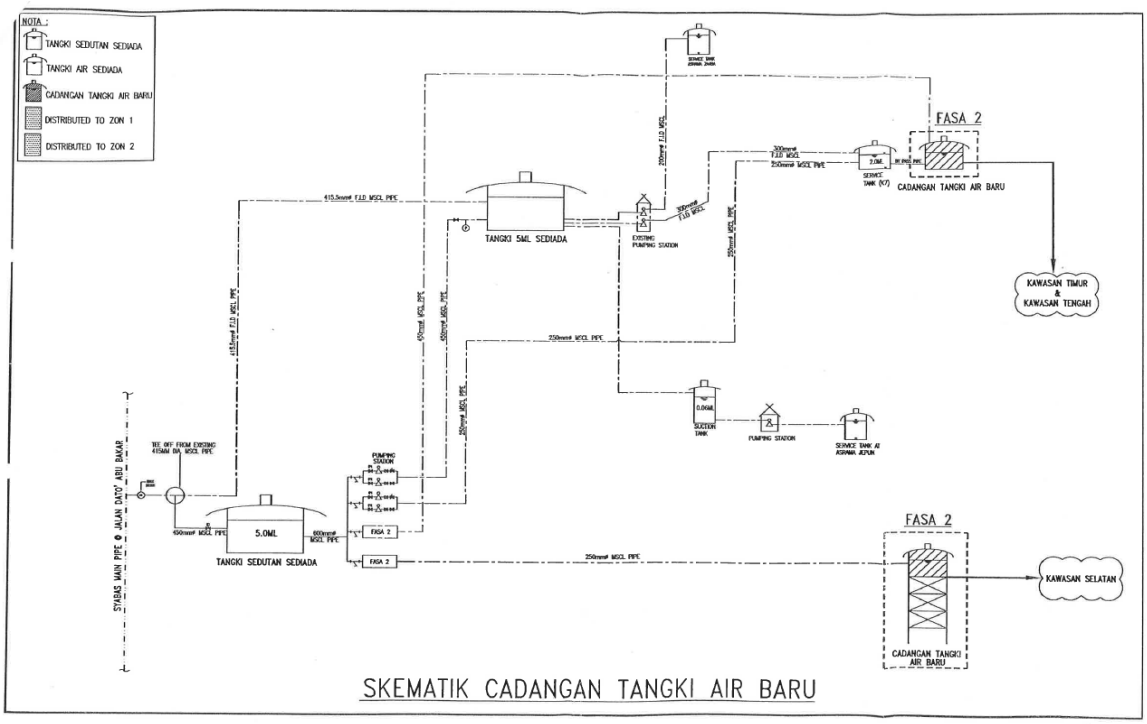
Link: News

Link: Water Handbook

Awareness & public engagement

"Kita Jaga Air Challenge" ("Contest") is co-organized by Universiti Malaya and Pengurusan Air Selangor Sdn Bhd ("Organizers") which is solely responsible for the execution and management of the Contest. This Contest aims to incentivize users in setting long-term water conservation goals by reducing their daily water consumption and instil place-based river care.





Schematic diagram of Universiti Malaya water supply distribution system

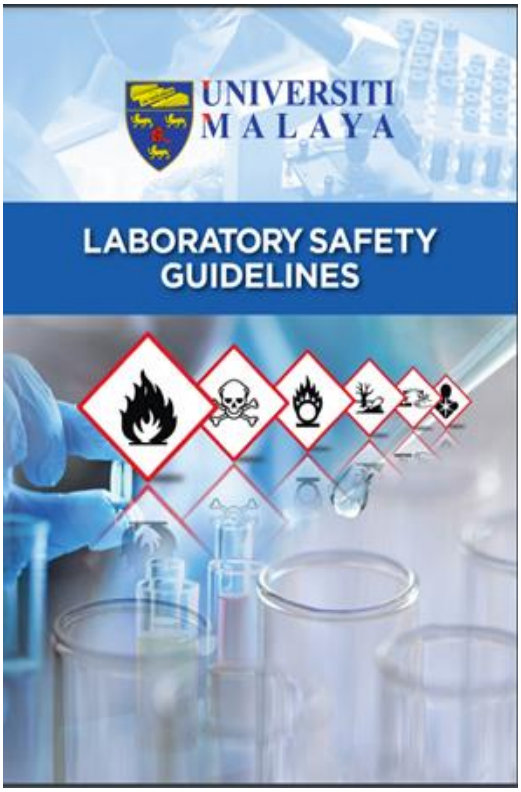
04 Water pollution control in campus area

Importance of Installing Oil & Grease Traps in Cafés for Wastewater Treatment

Every café needs to install oil & grease traps at wastewater discharge before connecting to sewage lines for treatment.

Best management practices at the laboratory.

Proper disposal and handling chemical waste: UM - Laboratory Safety Guidelines



TREATMENT AND DISPOSAL OF LABORATORY CHEMICAL WASTES

158. The disposal of any waste should be endorsed by an internal LCWM Committee.

159. Toxic or hazardous wastes should not be disposed of down the sink, drain or into the atmosphere.

160. Acidic or alkaline wastes should be neutralized before it is disposed down the sink or the drain or disposed into a pit. Waste chemicals should be disposed off quickly to avoid accumulation of large stocks.

161. Chemicals immiscible with water must not be discarded into sinks or drains. Flammable solvents must similarly not be discarded.

162. All waste solvents should be collected in the appropriate waste containers and clearly labelled. The wastes containers should not be filled to the brim. Always leave some air space.

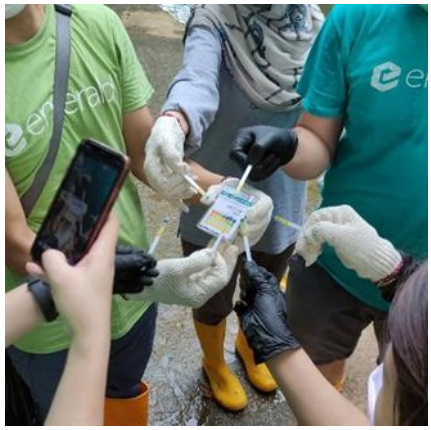
163. Where solvent mixtures are collected, the name of each solvent component should be specified. Avoid mixing waste solvents.

164. Incompatible chemicals should not be mixed (refer to **Annex M** and **Annex N**). For example, waste chloroform should never be mixed with ether solvents because it may react dangerous with impure acetone.

165. Waste mercury should be collected by means of a suction pump and placed in glass bottle, sealed and handle separately for disposal.

Water Quality Monitoring

Citizen science water quality monitoring by citizen scientists among students and staff of Universiti Malaya



Monitoring of Varsity Lake, Universiti Malaya

Since Varsity Lake is used for recreational activities, the water quality needs to be achieved Class IIB which is suitable for body contact (based on standard by Department of Environment, Malaysia). Furthermore, one of the targets for the university and part of key performance indicators for top management is to ensure the water quality achieved/maintain Class IIB

BACAAN INDEKS KUALITI AIR TASIK VARSITI (2019-2022)

1) Enam (6) parameter diambil bacaan bagi mengukur tahap *WQI (Water Quality Index)* Tasik Varsiti seperti yang berikut:

   a. *pH*
   b. *Dissolved oxygen (DO)*
   c. *Total Suspended Solid (TSS)*
   d. *Chemical Oxygen Demand (COD)*
   e. *Biological Oxygen Demand (BOD)*
   f. *Ammoniacal Nitrogen (NH_3-N)*

2) Rumusan bacaan parameter yang diambil sepanjang 2019-2022

BIL.	TAHUN	BULAN			
		SUKUAN I	SUKUAN II	SUKUAN III	SUKUAN IV
1.	2019	-	Mei	Ogos	November
2.	2020	-	-	Julai	Oktober
3.	2021	Mac	Oktober	November	Disember
4.	2022	Mac	-	-	-

3) Lokasi kawasan pensampelan air tasik varsiti

BACAAN PARAMETER 2021-2022

Mac 2021

Samples	pH	DO (mg/L)	DO (%)	Temp (°)	TSS (mg/L)	COD (mg/L)	BOD (mg/L)	NH_3-N (mg/L)	WQI	Class
Check Point 1	6.97	6.87	92.24	31.80	32	80.67	2.88	0.04	82.78	II
Check Point 2	7.03	6.32	85.46	32.30	19	60.00	6.00	0.05	81.40	II
Check Point 3	7.16	6.63	90.80	33.00	39	64.67	6.76	0.03	79.70	II

Samples	SubIndex pH	SubIndex DO	SubIndex TSS	SubIndex COD	SubIndex BOD	SubIndex NH₃N	WQI	Class
Check Point 1	99.4135	100	80.1341	25.7997	91.8909	96.3000	82.7855	II
Check Point 2	99.2755	93.8774	86.6980	37.7543	77.0436	95.2500	81.4043	II
Check Point 3	98.7400	97.2215	76.8544	34.7287	73.7053	97.3500	79.6973	II

Oktober 2021

Samples	pH	DO (mg/L)	DO (% sat)	Temp (°C)	TSS (mg/L)	COD (mg/L)	BOD (mg/L)	NH_3-N (mg/L)	WQI	Class
Check Point 1	7.62	7.42	98.83	30.00	15.00	96.00	6.67	0.02	**79.58**	II
Check Point 2	7.95	7.33	95.07	30.50	14.00	70.40	13.33	0.03	**76.52**	II
Check Point 3	7.54	7.26	99.46	33.00	19.00	70.40	7.50	0.02	**80.64**	II

Samples	SubIndex DO	SubIndex BOD	SubIndex COD	SubIndex NH_3-N	SubIndex TSS	SubIndex pH	WQI	Class
Check Point 1	100.00	74.17	18.98	98.40	88.85	95.60	**79.58**	II
Check Point 2	100.00	50.55	31.29	97.35	89.40	91.70	**76.52**	II
Check Point 3	100.00	70.75	31.29	98.40	86.70	96.34	**80.64**	II

November 2021

Samples	pH	DO (mg/L)	DO (% sat)	Temp (°C)	TSS (mg/L)	COD (mg/L)	BOD (mg/L)	NH_3-N (mg/L)	WQI	Class
Check Point 1	8.16	7.80	95.63	28.5	17.33	66.56	7.00	0	**80.91**	II
Check Point 2	8.10	7.14	92.61	30.50	18.44	67.00	6.50	0	**81.29**	II
Check Point 3	7.24	8.06	98.82	28.50	15.56	65.43	3.00	0	**85.20**	II

Samples	SubIndex DO	SubIndex BOD	SubIndex COD	SubIndex NH_3-N	SubIndex TSS	SubIndex pH	WQI	Class
Check Point 1	100.00	72.79	33.56	100.50	87.59	88.54	**80.91**	II
Check Point 2	100.00	74.89	33.30	100.50	86.99	89.50	**81.29**	II
Check Point 3	100.00	87.71	34.26	100.50	88.54	98.45	**85.20**	II

Disember 2021

Samples	pH	DO (mg/L)	DO (% sat)	Temp (°C)	TSS (mg/L)	COD (mg/L)	BOD (mg/L)	NH_3-N (mg/L)	WQI	Class
Check Point 1	8.07	7.11	87.17	28.97	15.11	22.50	1.33	0.03	89.9622	II
Check Point 2	8.27	6.94	85.08	28.33	17.11	64.00	5.50	0.07	79.6327	II
Check Point 3	8.38	6.71	82.26	28.50	16.89	27.50	3.33	0.07	85.2113	II

Samples	SubIndex DO	SubIndex BOD	SubIndex COD	SubIndex NH_3-N	SubIndex TSS	SubIndex pH	WQI	Class
Check Point 1	95.0682	94.7741	71.4474	97.3500	88.7882	89.9624	**89.9622**	II
Check Point 2	93.8944	79.2586	35.1501	92.8350	87.7061	86.6709	**79.6327**	II
Check Point 3	91.2844	86.3141	65.7853	92.8350	87.8243	85.2189	**85.2113**	II

Mac 2022

Samples	pH	DO (mg/L)	DO (% sat)	Temp (°C)	TSS (mg/L)	COD (mg/L)	BOD (mg/L)	NH_3-N (mg/L)	WQI	Class
Check Point 1	8.20	7.00	85.82	27.20	12.33	8.67	1.67	0.01	93.6588	II
Check Point 2	8.00	6.47	88.54	27.60	8.00	24.67	2.00	0.003	88.7692	II
Check Point 3	7.40	6.61	81.04	27.00	2.33	12.33	2.33	0.023	92.0587	II

Samples	SubIndex DO	SubIndex BOD	SubIndex COD	SubIndex NH_3-N	SubIndex TSS	SubIndex pH	WQI	Class
Check Point 1	94.1431	93.3359	87.5689	99.4500	90.3193	87.8780	**92.3703**	II
Check Point 2	88.5461	91.9400	68.9373	100.185	92.7672	91.0000	**88.7692**	II
Check Point 3	90.1824	90.5441	82.7011	98.0850	96.0928	97.4620	**92.0587**	II

DOE Water Quality Index Classification

PARAMETER	UNIT	CLASS				
		I	II	III	IV	V
Ammoniacal Nitrogen	mg/l	< 0.1	0.1 – 0.3	0.3 – 0.9	0.9 – 2.7	> 2.7
Biochemical Oxygen Demand	mg/l	< 1	1 – 3	3 – 6	6 – 12	> 12
Chemical Oxygen Demand	mg/l	< 10	10 – 25	25 – 50	50 – 100	> 100
Dissolved Oxygen	mg/l	> 7	5 – 7	3 – 5	1 – 3	< 1
pH	-	> 7	6 – 7	5 – 6	< 5	> 5
Total Suspended Solid	mg/l	< 25	25 – 50	50 – 150	150 – 300	> 300
Water Quality Index (WQI)		< 92.7	76.5 – 92.7	51.9 – 76.5	31.0 – 51.9	< 31.0

Water Classes And Uses

CLASS	USES
Class I	Conservation of natural environment. Water Supply I – Practically no treatment necessary. Fishery I – Very sensitive aquatic species.
Class IIA	Water Supply II – Conventional treatment required. Fishery II – Sensitive aquatic species.
Class IIB	Recreational use with body contact.
Class III	Water Supply III – Extensive treatment required. Fishery III – Common, of economic value and tolerant species; livestock drinking.
Class IV	Irrigation
Class V	None of the above.

Constructed wetland @ waste central centre

To ensure the leachate is treated before discharging to the water bodies.

Monitoring of water supply by Air Selangor

Gross pollutant trap installed on campus. To remove litter, debris and coarse sediment from stormwater.

Gross pollutant trap installed on campus.

To remove litter, debris and coarse sediment from stormwater.

Gambar 1.0 : GPT di Kolej Kediaman Raja Dr. Nazrin Shah, Universiti Malaya

Gambar 2.0 : GPT di Kompleks Perdana Siswa, Universiti Malaya

UM Development Checklist

Every development needs to conduct water quality monitoring to ensure the surrounding environment meets with water quality standards.

DEVELOPMENT CHECKLIST
UNIVERSITY OF MALAYA

1.5.1 Protect and retain all trees that are 30 cm or more Diameter at Breast Height (DBH) or of rare/ threatened/ endangered species from injury or removal except where permission with condition has been issued. *1.5.2 Landscape design and planning. To provide outdoor space greater than or equal to 30% of the total site area (including building footprint). A minimum of 25% of that outdoor space must be vegetated (turf grass does not count as vegetation) or have overhead vegetated canopy.* *1.5.3. List of trees to be planted for the project and the number of trees. (plant the landscaped site area using native trees only);* *1.5.4 Shrubs-type of landscape and the forecasted maintenance costs (annual);* *1.5.5 At least 20% of innovative green area elements integrated within the building; (water saving through special water tab, refer Thimble Project by UM Sustainable Development Network)* *1.5.6 If surface parking is permitted and provided, plant shade trees throughout the parking lot interior at a minimum ratio of one tree planted for every five parking spaces supplied;* *1.5.7 Types of grass to be planted and their specifications;* *1.5.8 Water features and artificial water features?* *1.5.9 Plan on pollution control and other environmental mitigating measures;* *1.5.10 Water bodies. For example, natural and manmade features.* *- Integrated and long-term water management policy in UM (i.e. lake, rivers and groundwater);* *- Aim for Class I – II for all water bodies in UM* *- Consistent and integrated database and monitoring of water related data (e.g. surface water and groundwater flow, water quality, water consumption, water harvesting, etc.)* *- Increase use of greener, natural and inclusive technologies to manage water related needs in UM*			

Sampah Snagger

A groundbreaking initiative designed to address this pressing water pollution problem at its source. Sampah Snagger combines the Malay word for garbage, and the act of snagging something away usually by quick action. These mini trash barriers, constructed using locally available materials, can be easily installed in small rivers, streams, lakes, and ponds, granting communities the empowerment to build and maintain them. This approach fosters a sense of ownership and responsibility within the community towards their waterways.

River Ranger 2.0

Training of Sungai Pantai community watershed to monitor and conduct citizen science programs. This program is conducted by a local NGO – Global Environment Centre (GEC).

http://www.riverranger.my/

Sewage Disposal

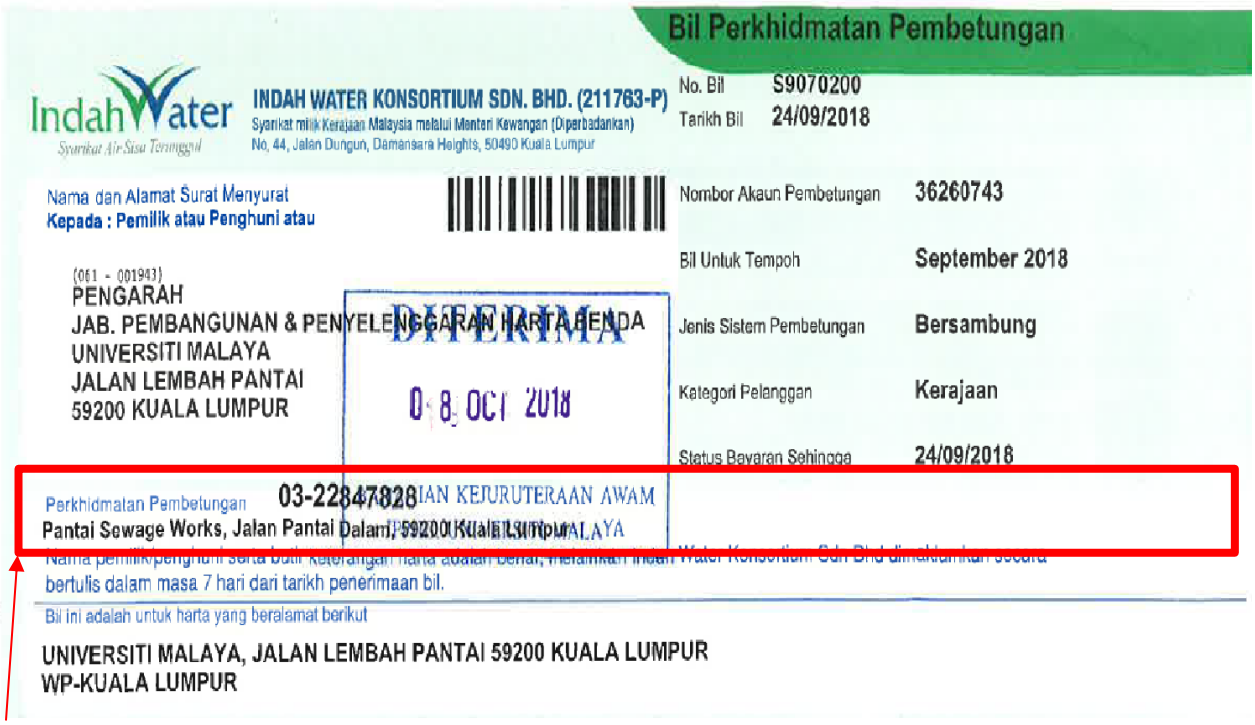
Pantai 2 Sewage Treatment Plant is a project under the 10th Malaysia Plan to upgrade sewage treatment capacity in the catchment area of beach from the existing capacity of 550,000 PE to 1,423 million PE.

Catchment area covers 6,700 hectares of the New Town Sentul, Sentul Raya, part of the commercial center of Kuala Lumpur, Bangsar, Bukit Kiara recreation area, part Old Klang Road and Petaling Jaya and others including **Universiti Malaya**. The main sewage treatment plant is built below ground level whilst the sludge treatment facility is above the ground level, over 17 ha of land area which also includes an above ground recreational park and amenities. Pantai 2 RSTP utilizes the Advanced Anaerobic-Anoxic-Oxic (A2O) process that is effective in removing nitrogen and phosphorus in the wastewater compared to the conventional treatment system. The plant is designed for Standard A effluent discharge quality as prescribed in the Environmental Quality (Sewage) Regulations 2009.

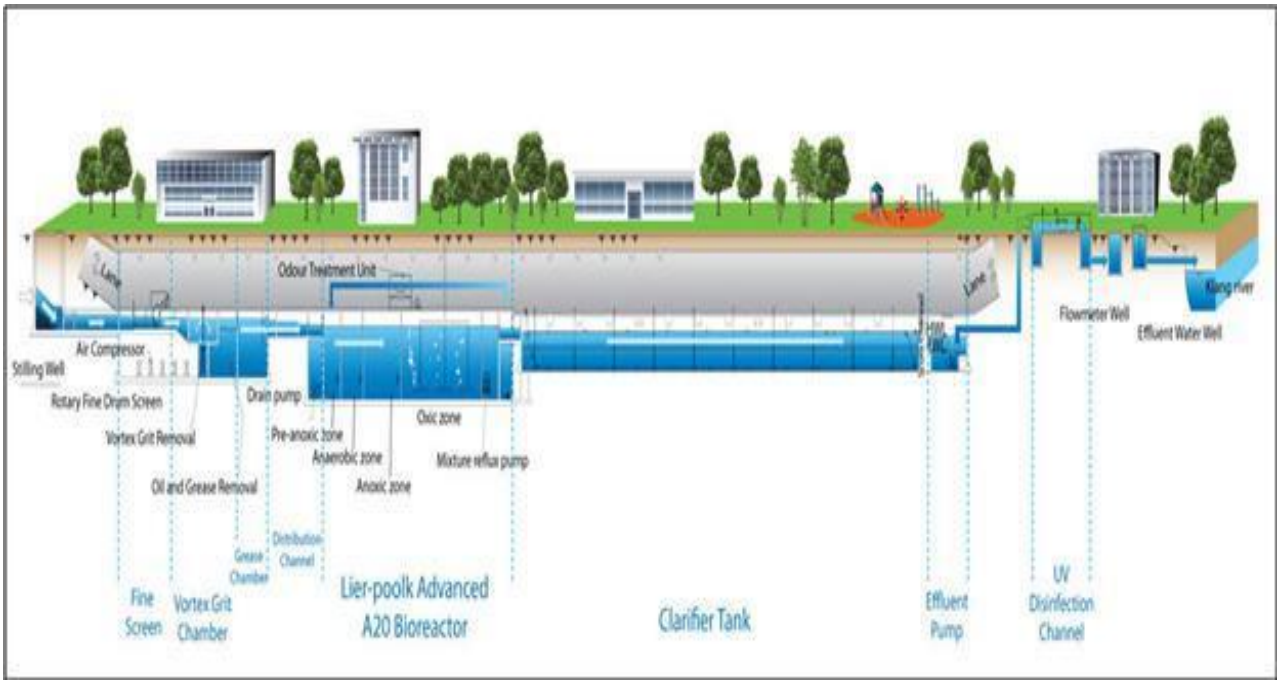
Various elements of green technology have been incorporated into the project design Pantai 2 Sewage Treatment Plant and in between is the reuse of treated effluent (cleaning & landscaping purposes) and electricity generation through biogas engine (biogas obtained through the sludge treatment).

Additional Link:
https://www.iwk.com.my/cms/upload_files/files/English%20Brochure-Pantai%202.pdf

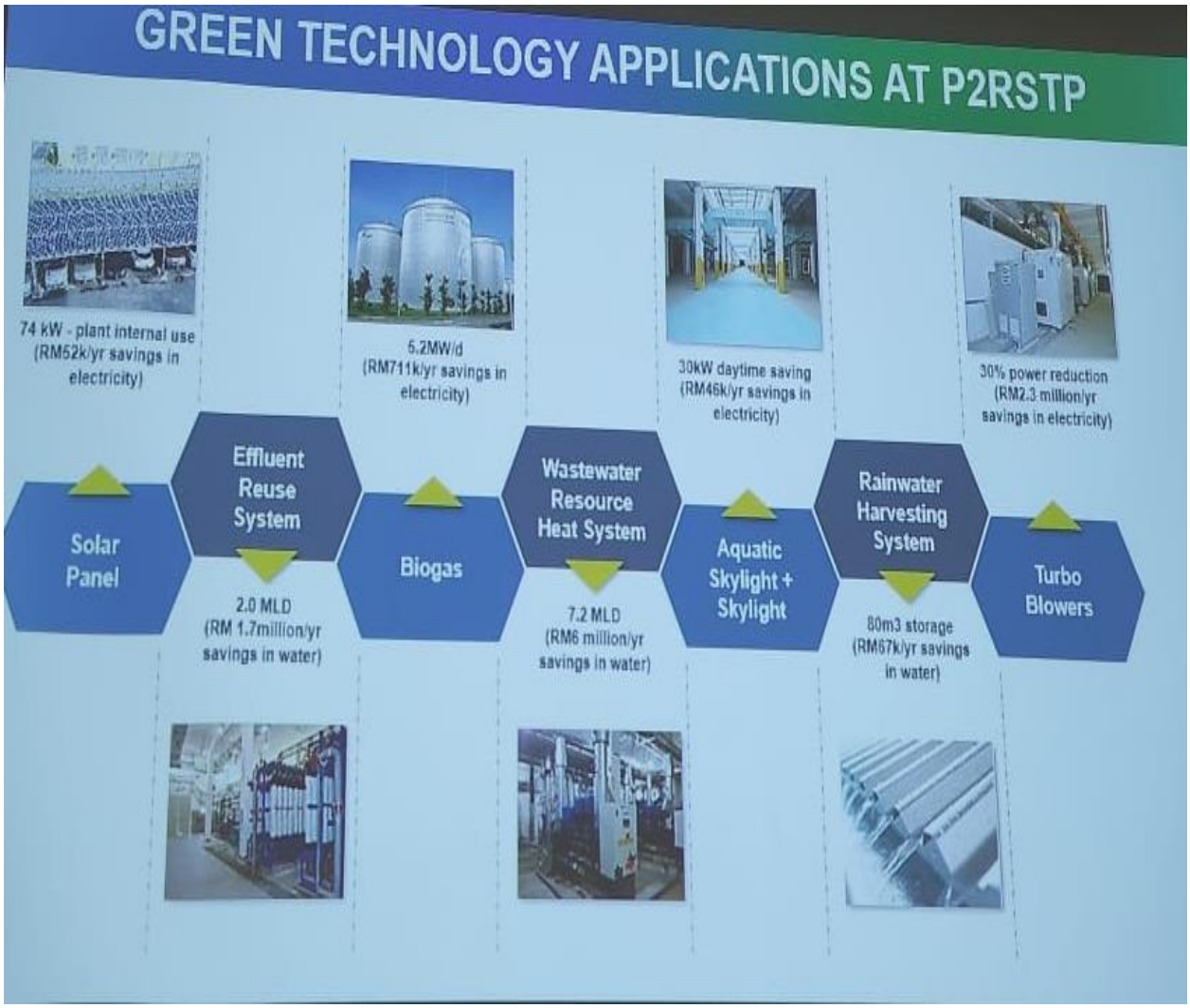
Treatment for up cycling



Indication of location address for Universiti Malaya sewerage treatment plant



Cross section Pantai Regional Sewage Treatment Plant
Sewerage Disposal (Universiti Malaya, Malaysia)



Green Technology Application Services at Pantai 2 Regional Sewage Treatment Plant as subscribed by Universiti Malaya:

- Solar panel
- Effluent reuse system
- Biogas
- Wastewater resource heat system
- Aquatic skylight + skylight
- Rainwater harvesting system
- Turbo blower

RESOURCE RECOVERY

IWK facilities produce green resources in the form of biosolids, bio-effluent and biogas.

Green Technology (GT) Initiatives - Biosolids to Nutrient for Land Application

Research & Development over the past decade had established the nutrient value (2- 5% Nitrogen Phosphorus and Kalium, NPK) that can be recovered from biosolids produced at IWK. Approximately 52,000 tons/year of biosolids is available to be utilised as biofertiliser. IWK currently has 2 types of this category, namely, biosolids as soil conditioner and BioPellens; a pelletised form of biosolids that has been proven through a study by Universiti Putra Malaysia to be good for landscape plants. Field applications and pilot studies similarly showed positive results in biomass yield in non-food crops as well as growth of landscape plants. It is also beneficial for the environment as nutrients are recycled in a sustainable manner.

Additionally, through stakeholder's engagement, IWK managed to promote the reuse of biosolids to Local Authorities for landscape plants. In 2018, around 18 tonnes of biosolids were recycled as BioPellens for beneficial use. With concerted efforts to promote green applications, it is anticipated the recycling rate will increase further.

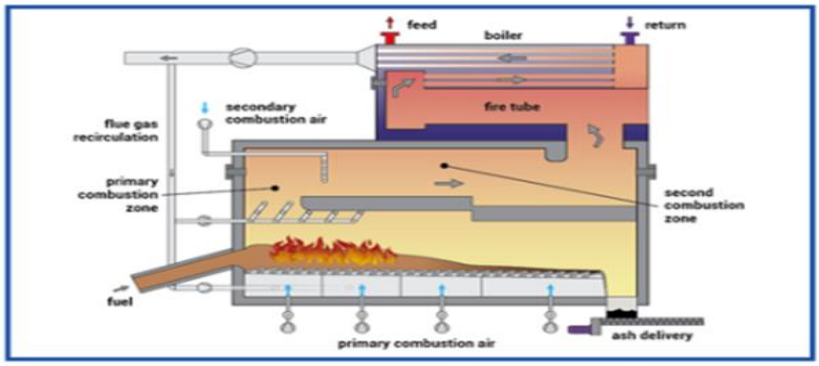
GT Initiatives - Biosolids to Building Material

Apart from nutrient recovery, biosolids can also be converted to building material such as bio-pavers and bricks for walkways. R&D into building material blending biosolids, clay and cement had been conducted and development of an economically sustainable product is being further explored with select players in the building material industry and a local university.

Biosolids as Biomass Fuel to Energy

The energy value contained in dry biosolids holds another potential for conversion to solid biofuel by mixing with coal for co-firing applications. Analysis of typical biosolids from IWK plants in Malaysia shows calorific value ranging from 2,000 to 3,500 kcal/kg. Approximately 52,000 tons/year of biosolids can be converted to solid biofuel to produce about 28 MWh of renewable energy/day.

This initiative will not only reduce waste disposal in landfills but also curb emission of greenhouse gases and reduce dependency on fossil fuel for the production of electricity. IWK is keen to explore opportunities via pilot projects with interested parties to install and operate Biomass Power Plant to convert biosolids to solid biofuel as feed stock for industrial applications.



Scheme of the biomass combustion plant and operating parameters.

Source: Indah Water Konsortium (IWK)

Water Security at National Level

Two Universiti Malaya members actively contributed to the stakeholders (expert) engagement at national level on Water Sector Transformation 2040 (WST2040) spearheaded by the Prime Minister's Department (Economic Planning Unit) and the Academy of Sciences Malaysia (ASM):

- Dato' Prof. Dr. Azizan Hj. Abu Samah (HICOE Institute of Ocean and Earth Sciences – IOES)
- Associate Professor Dr. Zeeda Fatimah Mohamad [Department of Science & Technology Studies, Faculty of Science UM, UM Sustainability and Development Centre (UMSDC) and Water Warriors UM]

Report is available online at Ministry of Economy Malaysia website published in October 2022: HERE

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