

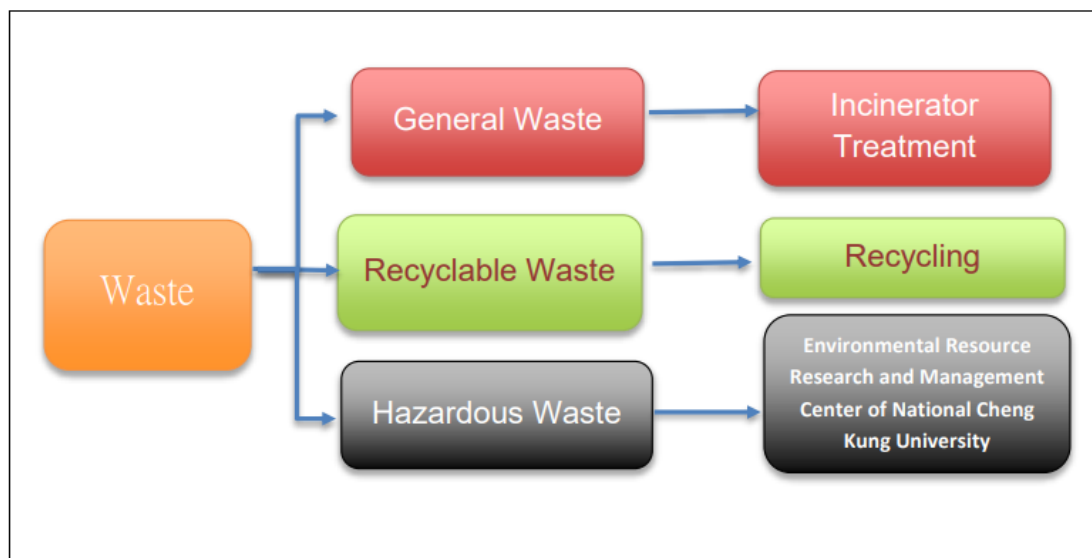
SDG 12.3.1

1.The NUK's waste output can be roughly divided into general waste and recyclable items produced by dormitories and offices, and hazardous waste generated in laboratories, etc. The amount of waste generated by the school is disclosed in the annual sustainability report, and on webpage for the public. The respective treatments are as follows:

(1) General Waste: An Outsourced cleaning vendor regularly collects general waste and puts it in the temporary waste storage area, which will be later transported by rubbish trucks to incineration facilities nearby.

(2) Recyclable Items: After being sorted and thrown into recycling bins by the faculty and students, recyclable items are collected and put in the temporary waste storage area by an outsourced cleaning vendor that will send the items to recycling companies on a regular basis.

(3)Hazardous Waste: Laboratory waste and liquid waste mainly produced by laboratories are collected by the respective laboratories and sent to the Storage Room for Liquid Waste every week. When the waste reaches a certain quantity, our certified contractor will follow the regulations to fill in the transport and clearance delivery slip and hand it over to the Environmental Resource Research and Management Center of National Cheng Kung University. The 3R plan implemented by the NUK is as follow, and the implementation rate is 100%.



2.In order to increase recycling rate, every building in the NUK has set up recycling bins. Student dormitories have also installed a smart waste management system from 2019, using Internet of Things (IoT) to establish an intelligent input port guidance mechanism, full detection

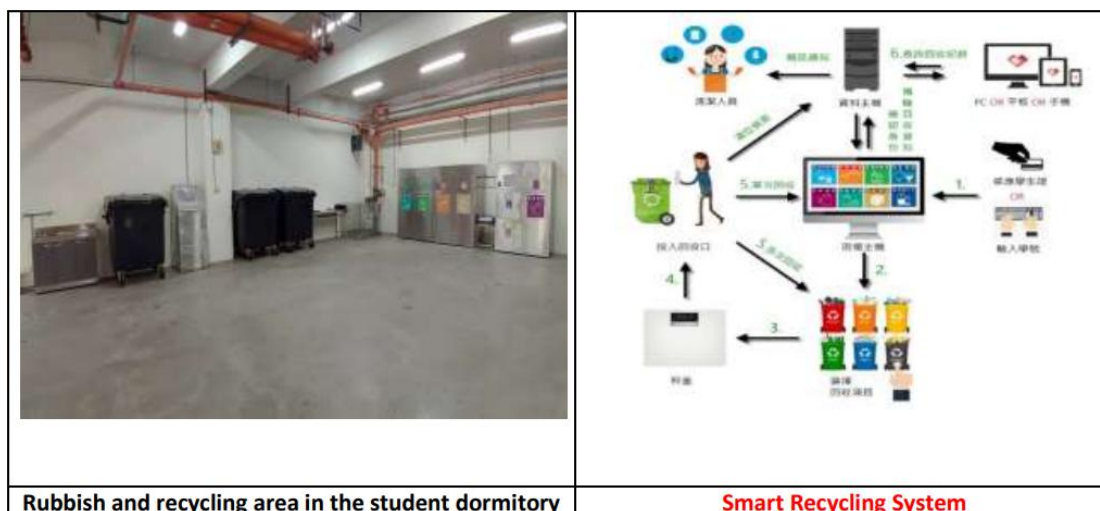
devices, and digital recording of the recovery process, which uses statistical results and analyzes user habits to improve waste removal and resource utilization. For detailed information, please refer to the attached file. The function of the system is stated below.

(1) Digital recording of individual's recycling history: To systematically integrate student IDs with each individual's recycling history, we will combine our self-designed reward system to encourage recycling and increase the recycling volume.

(2) Intelligent Recycling Chutes: To integrate with touch screen recycling options that divide the recycled items into 8 categories. These categories are plastics, paper containers, bottles, metal cans, aluminum cans, glass, papers, batteries. The system can guide the users to recycle properly.

(3) Intelligent Full-bin Sensor: To install sensors in the recycling bins that will notify cleaning staff by text messages to dump the bins when they're almost full.

(4) Increase the Efficiency of Transport and Clearance of the Recyclables: To analyze users' recycling behaviors with the system data and increase the efficiency of the transport and clearance of recyclables.



3. See the attached files.

(1) The amount of waste generated by the school is disclosed in the annual sustainability report (summary). Website:

<https://ces.nuk.edu.tw/p/412-1011-5978.php?Lang=en>

(2) Smart waste management program.

9-11-1997

Drinking water

▼ Drinking Fountain Test Results

5.1.4 Waste Management

total recycling ratio of 4.36%, which fell short of the target of 10%. The reason for this may be due to the increase in the amount of foreign garbage and the way in which the garbage is handled during certain periods of time, resulting in a decrease in the recycling ratio. The University will continue to strengthen its efforts to reduce the amount of foreign garbage, enhance the separation of garbage, and handle garbage during certain periods of time.

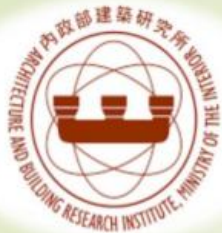
The flow chart illustrates the treatment process for campus waste. It begins with a central node labeled "Campus wastes" which includes a recycling symbol. This central node branches into three categories of waste: "General business waste", "Recycle", and "Hazardous business waste". Each category then leads to a specific treatment facility: "General business waste" is sent to an "Incinerator", "Recycle" is "Recycled by the recycling vendors", and "Hazardous business waste" is "Treated by Environment Resource Research and Management Center of NCKU".

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graph LR
    CW((Campus wastes)) --> GBW((General business waste))
    CW --> R((Recycle))
    CW --> HBW((Hazardous business waste))
    GBW --> I[Incinerator]
    R --> RV[Recycled by the recycling vendors]
    HBW --> TRM[Treated by Environment Resource Research and Management Center of NCKU]
  
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Hazardous waste			Non-hazardous waste		
Treatment	On-site	Off-site	Treatment	On-site	Off-site
Incineration (incl. recycling)	-	7.17	Incineration (incl. recycling)	-	289.02
Landfill	-	-	Landfill	-	-
Others	-	-	Others	-	13.19
Subtotal	-	7.17	Subtotal	-	302.21
total		7.17	total		302.21
Total waste			309.38		

Sustainability Environmental Performance | 85



SDG-Driven Sustainable Mobility

Attachment 2

Item II: Smart Waste Management



General Affairs Division

Smart Waste Management (1/3)

Implementation: Smart recycle, smart full detection

12.3.1

- Experiment on student dorms as community recycling area, construct IoT management system and smart model.

1. Improve the site:

- floor
- lightings
- ventilation
- new paint & work space
- planning traffic flow
- Install kitchen waste refrigerator to avoid mix-up with other waste.

◆ Waste recycle collection area in student dorms



Before clean-up

After clean-up



Smart Waste Management (2/3) Implementation: Smart recycle, smart full detection

12.3.1

1. Digitize recycling history:

Integrate student ID to record personal recycling process, use rewards to promote recycling.

2. Smart input guide:

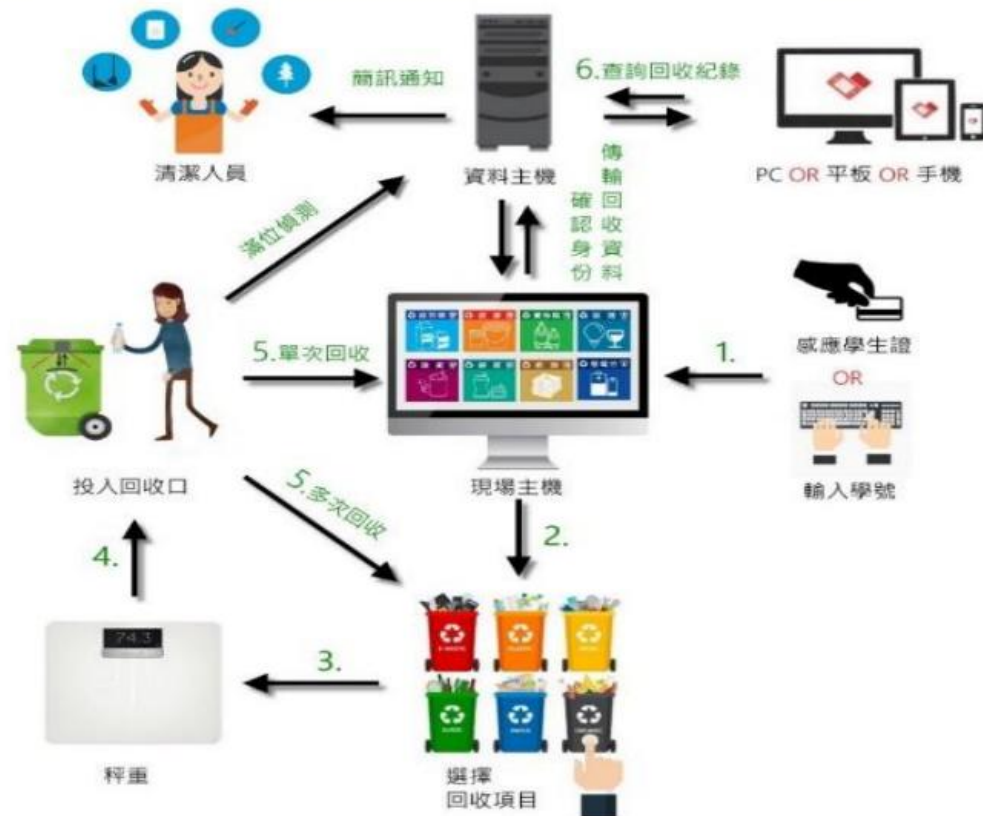
Use touch screen to select recycling category (in 8, e.g. plastic, bottles, batteries) for correct input port.

3. Smart full detection dumpster:

When the dumpster is nearly full, it informs the cleaner to handle the waste.

4. Efficient clearing management:

Use statistics and analysis of user habits to improve clearing strategy.



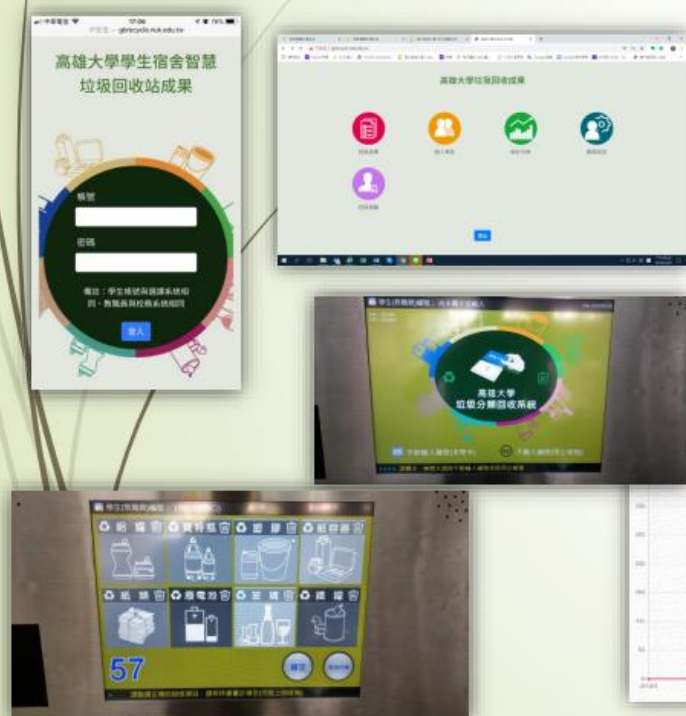
Smart Waste Management (3/3)

Implementation: Smart recycle, smart full detection

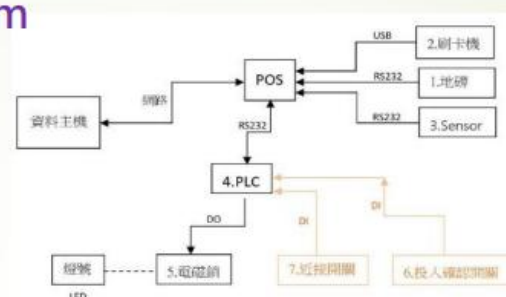
12.3.1

◆ Smart recycling management system

<http://gbrecycle.nuk.edu.tw/>

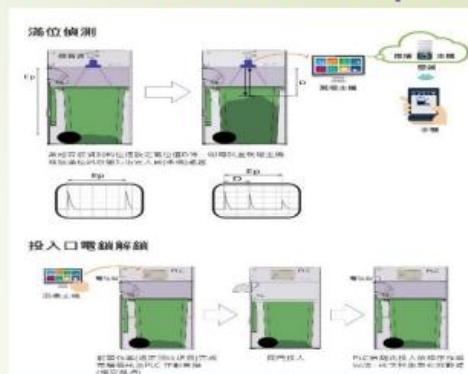


◆ Electric lock for input port



guiding signal, input port control & input sensor

◆ Full detection dumpster



1. Install full detection device and use the iot for systematic management.
2. The device informs the cleaner when full, to save time and manpower and increase efficiency.