

INSAT Green Guardian App

ISO 14001

ISO 14001 is about showing the university has a plan or a policy, tracking system, goals, and proof that it's improving environmentally.

What we need...

- A way to track accurately eco-actions (recycling, waste management, electricity usage...), on a per-student basis, via well-formulated KPIs



results in...

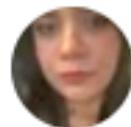
- ISO 14001 and Corporate social responsibility
- Understanding the problem, making decisions, making policies, that aim to achieve long-term sustainable goals, making the KPI numbers go up, by encouraging students.

results in...



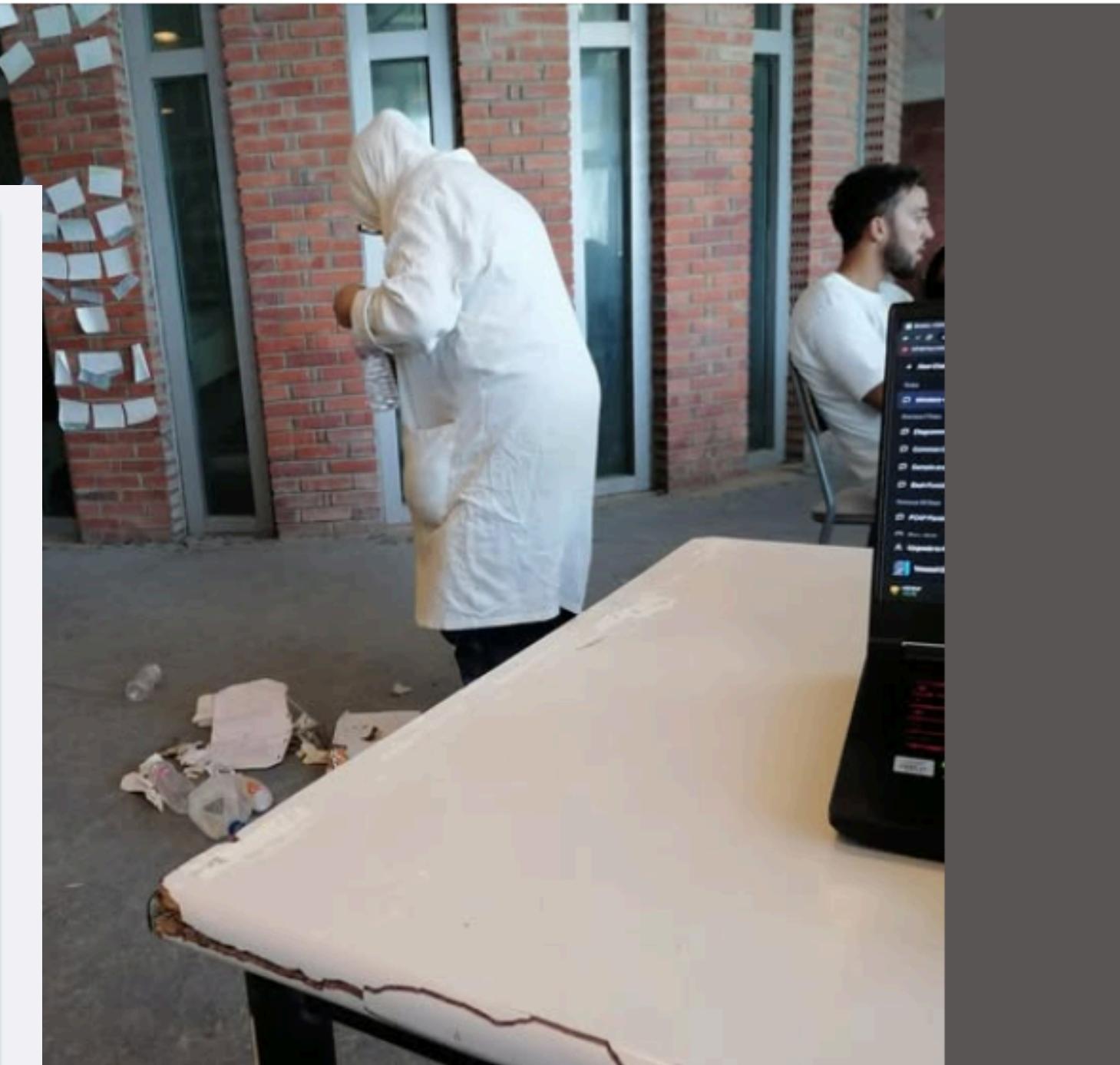
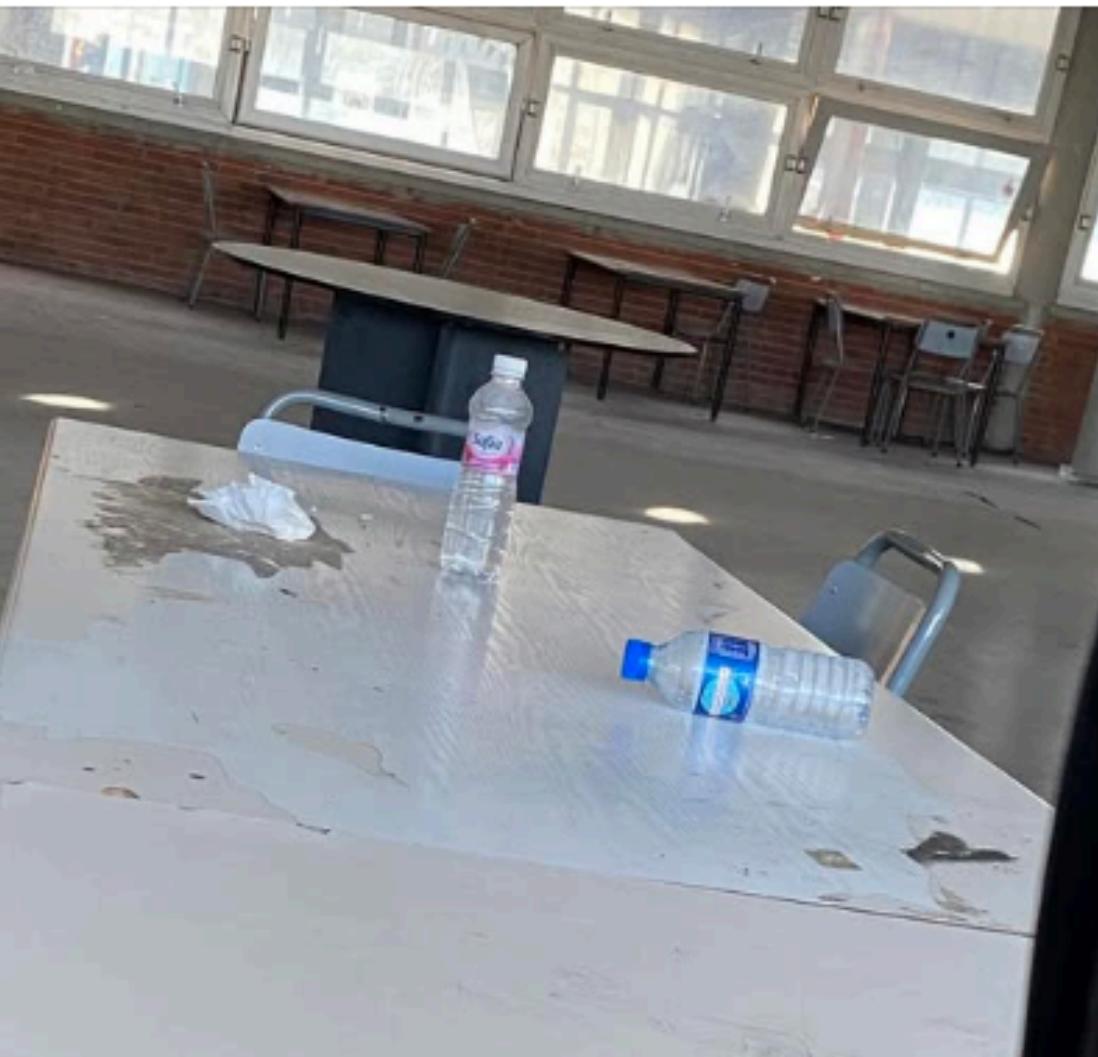
Youssef Omar Bouden
12 October 2023 ·

Mra fi oomor memetek tnadhaflek fi khamjek ya ingénieur 😊



Jouda Ben Rhouma
16 April at 14:19 ·

Belehy eli yokod fi tawla yekel haja yochreb hkeya eli howa !
ylem hajetou fiyedou whowa mech wmafeha bes yestana ken malkach poubelle kiyrawah ytayech
fi darhom ! C vrai fama nes tlem mais on doit les respecter soyez respectueux et responsable brabi
Cordialement 😊



di Chaari and 244 others

15 comments

In short...



- Strong contribution to green space monitoring, waste tracking, and student involvement in sustainability initiatives.

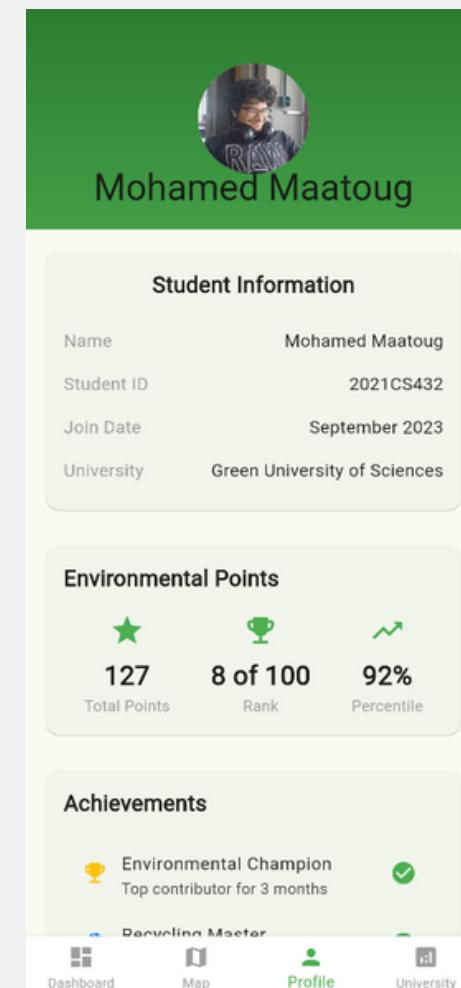
Our solution offers!



- Real-time gamified mobile app for student eco-activity via IoT Technology
- AI-driven insights and forecasting (predicting growth for next year) to guide sustainable decisions and university policy.
- Green space maps and interactive views of local nature and open areas.

For our prototype...

Student Mobile App



IoT via Bluetooth Low Energy



Dashboard, analytics,
gamification

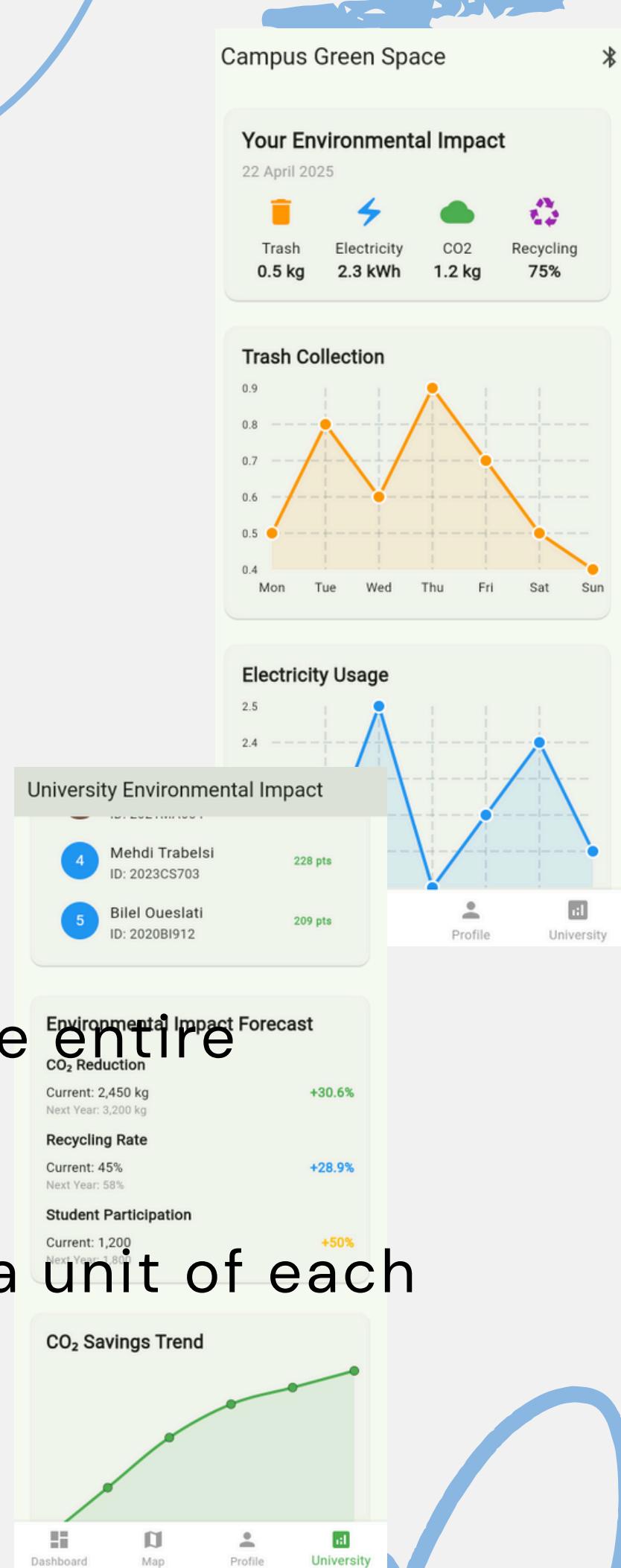
Sensors, IoT, Computer Vision

Smart Bin



Real-time dashboard for tracking eco-actions

- Data received from our smart bins (and other smart objects) via BLE (Internet of Things) is displayed in a nice comprehensive dashboard. Our sqlite database holds data for all the students. We gamify these stats and KPIs by turning them into points to encourage students (that could potentially be spent).
- We compile data over all students to have broad scores for the entire university, mentioning most contributing students
- We calculate CO2 emissions via the average CO2 emission of a unit of each type of trash (paper, plastic...)



Data analysis and AI forecasting

- Using data collected all over the university, we employ a linear regression AI model to predict how our university's all KPIs, this is how we make realistic goals that depend on how well we are currently doing, and challenge ourselves to achieve them.

Computer Vision

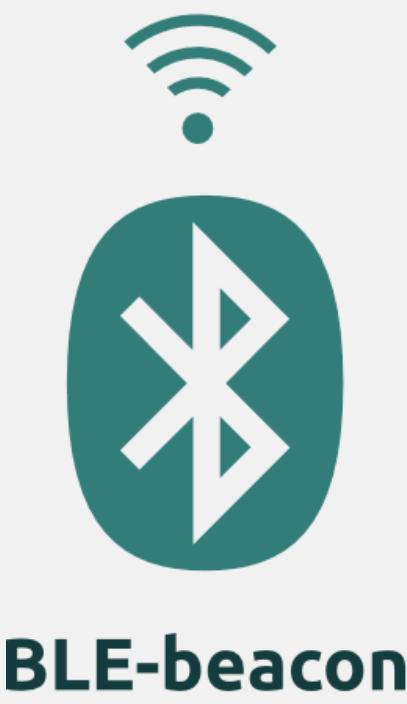
- We employed Computer Vision to detect waste type properly, to detect correct recycling (e.g. putting plastic in the right bin) using our own trained model.
- Our model was fine-tuned off of YOLOv8

100% accuracy!!!



IoT - BLE

- We use BLE (Bluetooth Low Energy) which is built in the ESP32 we use to transfer the sensor data and computer vision data to our mobile app
- We successfully detect the closest mobile app which should be the student that put stuff in the bin, to properly reward the student



Rewarding - How it works



Ultrasonic sensor detects something in the bin, which is probably trash



ESP Cam32 sends image to ESP32 to perform computer vision to identify trash type

If plastic is identified in plastic bin

Increase student waste collected

Increase recycling score

If non-plastic is identified in plastic bin

Increase student waste collected

Decrease recycling score

We have to be pragmatic!

Our pragmatic bin: enforcing policy



Technical feasibility: Cheap

Economic feasibility: Easy, we made one in less than 24 hours!

Fancy smart bin: being expensive



Technical feasibility: Haaaaard

Economic feasibility: Expensive...

Change comes in human form

How much does it cost? Here's our Bill of Material for the prototype!

ESP32:	32DT
ESP Cam32:	30DT +
Ultrasonic sensors x2:	12DT +
Bins x2:	20DT +
Cost of Development:	Free +
	= 94DT!

Not to mention, it has negligible energy costs, could use solar panels as renewable energy, and could be cheaper with better suppliers

For reference, that's cheaper than a pair of sneakers! (One sneaker can make 3 bins)



And much cheaper than recycling bins on the market (179£)

Two removable inner buckets for easy cleaning



Himalaya Recycling Sensor Bin 35L+25L

★★★★★ (2)

Sale £239.99 £179.99

Himalaya Sensor Recycling Bin a spacious 60L (35L + 25L) stacked two compartment bin with an energy efficient and innovative motion sensor opening.

Quantity

— 1 +

Add to cart

⌚ 3 YEAR WARRANTY. DESIGNED AND ENGINEERED TO LAST

Description

The EKO Himalaya Sensor Recycling Bin with its spacious 60L (35L + 25L) two stacked compartment design, has an energy efficient and innovative motion sensor opening mechanism with longer battery life, making it the perfect bin for eco conscious, busy households.

The motion sensor function makes this bin super hygienic due to its 'no touch' open and close function. Should you not wish to use the hands free sensor option the bin also offers a manual touch function. The base compartment with step-on pedal is great for easy storage of recyclables and optimal space saving makes this hands-free bin super easy to use.

The super hygienic Himalaya bin is made of a high quality fingerprint resistant, brushed stainless steel to give a refined finish.

And that's just for our prototype, with cheaper (possibly foreign) suppliers and mass produced, we estimate it'll cost

- Bins could be manufactured instead of bought (each bin may contain 2Kgs of plastic, whose price is little over 0.72\$ pre-manufacturing)
- ESP32 could be replaced with ESP8266 (much cheaper at 16DT)
- Cam32 and sensors could be found at a cheaper price
- This way we estimate bins would cost 30-40DT instead

Manufacturing 10 bins would cost a humble 400DT, but would have immense impact!

Our bin is
economically and
technically feasible!

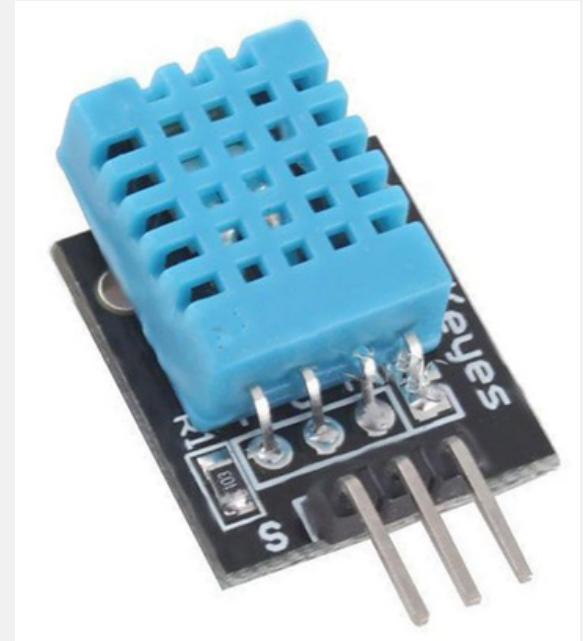
What other features we have?

- Detecting how full the bin is, and displaying it on the map, to properly manage unloading bins and tracking which bins need to have more space
- More greenspace technology, by measuring tree humidity, and displaying it on our app



What other ideas we have?

- Temperature Detection, for lit cigerattes thrown in the bin (could cause fires)



- To monitor electricity usage in classrooms, we propose installing low-cost IoT sensors that track how long lights remain on. Using a basic setup with an LDR (light sensor), ESP8266 microcontroller, and Wi-Fi connectivity, each unit can cost as little as 25DT per classroom. These sensors collect data on light usage duration, helping identify wasted electricity—especially during breaks or after school hours. And recording how much electricity is used per student. For 200 classrooms, this can cost up to 5000DT, and much less with much more elaborate infrastructure (1 ESP8266 per classroom is overkill)

**Thank you
very much!**