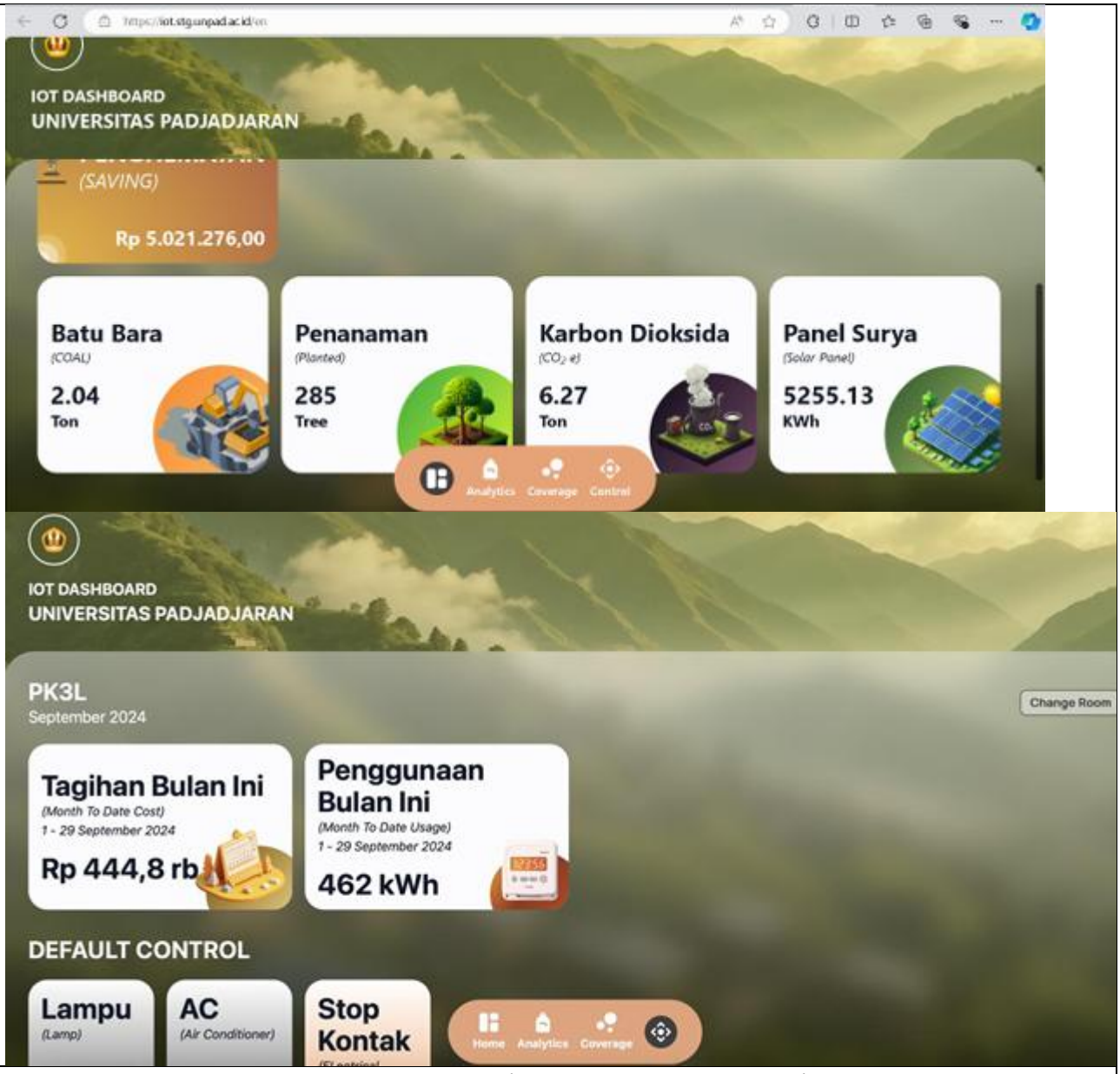
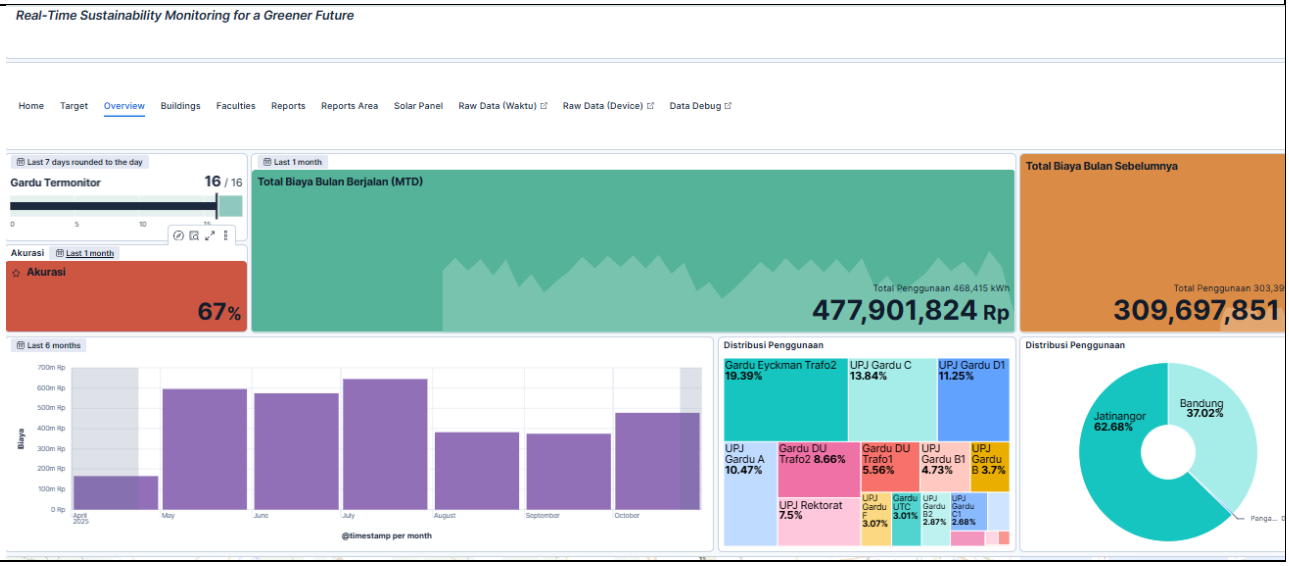
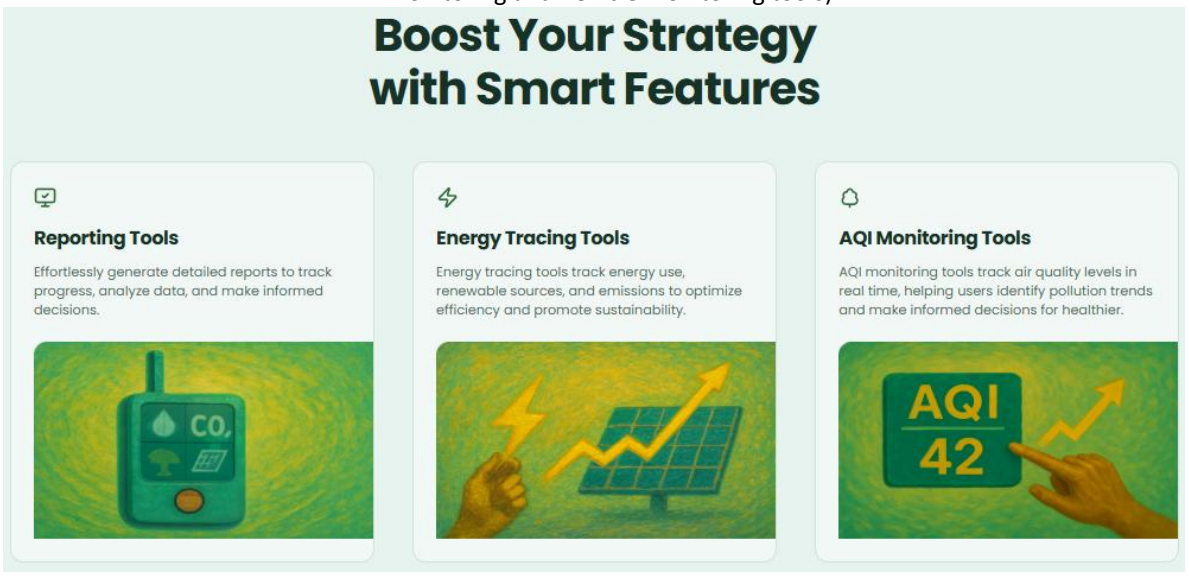
Planning, Implementation, Monitoring, and/or Evaluation of all programs related to Energy and Climate Change through the Utilization of Information and Communication Technology (ICT)



IoT Dashboard 2024 (Feture energy monitoring only)



New Feture for IoT Dashboard (Energy monitoring, AQI Monitoring, reporting Tools, water monitoring, waste monitoring and Vehicle monitoring tools)



IoT Dashboard

Stage	Activities/ Programs	ICT Utilization	Evidence	Timeline	Responsible Team/ Department
Planning	Development of an IoT-based system for monitoring energy use and renewable energy generation through the website http://iot.stg.unpad.ac.id. Feasibility studies were conducted using GIS mapping and renewable energy simulation software to identify suitable locations for	IoT architecture design, GIS mapping, renewable energy simulation software	Feasibility reports, system design documentation	Jan 2024 – Mar 2024	Directorate of Planning and Information System and Digital Transformation (DPSITD)

Stage	Activities/ Programs	ICT Utilization	Evidence	Timeline	Responsible Team/ Department
	solar, wind, and hydro energy installations.				
Implementation	Installation of IoT sensors and smart meters to monitor real-time electricity consumption and renewable energy production from solar panels at the Directorate building. Dashboard integration for centralized data visualization and reporting.	IoT sensors, cloud database, energy data visualization dashboard	IoT dashboard (http://iot.stg.unpad.ac.id), installation logs, energy usage data	Apr 2024 – Dec 2024	DPSITD
Monitoring	Continuous monitoring of campus energy performance using IoT dashboard. Analysis of electricity consumption trends and renewable energy generation for performance evaluation and sustainability reporting.	IoT-based monitoring system, analytics dashboard	Energy consumption reports, renewable energy performance analytics	Ongoing (2024–2025)	DPSITD
Evaluation	Evaluation of dashboard performance in 2025 led to system revisions and addition of environmental monitoring features, including Air Quality Index, Vehicle Counting and Carbon Footprint Estimation,	IoT dashboard with enhanced sustainability modules, remote sensing and GIS integration	Updated dashboard system, evaluation report, system revision documentation	Jan 2025 – Ongoing	DPSITD

Stage	Activities/ Programs	ICT Utilization	Evidence	Timeline	Responsible Team/ Department
	Waste Sorting Dashboard, Water Usage Dashboard, Expanded Renewable Energy (solar, wind, pico-hydro, micro-hydro), and Jagawana Dashboard for land-use monitoring using remote sensing. These improvements strengthened ICT's role in supporting Unpad's sustainability management and climate action.				

Description:

Planning

In the planning stage, Universitas Padjadjaran developed the concept and framework for integrating energy and environmental data across campus through an Internet of Things (IoT)-based dashboard, http://iot.stg.unpad.ac.id. Directorate of Planning and Information System and Digital Transformation (DPSITD) collaborated to identify key sustainability indicators such as electricity usage, renewable energy generation, and building-level energy efficiency. Feasibility studies were conducted using GIS mapping and renewable energy simulation software to determine suitable locations for solar panels and other renewable energy installations. The planning also included data architecture design to enable real-time monitoring and long-term data storage for analysis.

Implementation

During implementation, the IoT dashboard was deployed and connected to various energy meters and solar power inverters installed in university buildings. In **2024**, the dashboard functioned primarily to **monitor electricity consumption** in selected buildings and track **renewable energy generation** from the solar panels at the Directorate building. The system used IoT sensors and cloud-based data integration to collect and visualize energy data in real-time. This phase established a digital infrastructure that allowed the university to efficiently manage energy resources and identify areas for potential energy savings.

Monitoring

The **monitoring phase** utilized the IoT dashboard to continuously collect, process, and display energy-related data. Energy consumption trends and renewable energy production data were analyzed to evaluate the performance of the installed systems. The dashboard served as a central monitoring hub for energy management, providing performance analytics and generating reports that informed operational decisions. Data accuracy and network stability were routinely checked by the ICT and Energy Management teams to ensure system reliability and usability for ongoing sustainability reporting.

Evaluation

In **2025**, a comprehensive evaluation was carried out to assess the effectiveness and scope of the existing IoT dashboard. Based on the 2024 performance review, several **revisions and feature enhancements** were implemented to expand the system's environmental monitoring capabilities. These revisions included:

- Addition of an **Air Quality Index (AQI) dashboard** for monitoring and reporting air pollution levels.
- **Vehicle counting and carbon footprint estimation module** to calculate CO_2 emissions based on traffic flow entering the campus.
- **Waste sorting dashboard** to monitor solid waste segregation performance and promote recycling behavior.
- **Water consumption dashboard** to track and optimize the use of water resources.
- Expansion of the **Renewable Energy dashboard** to include new sources such as **wind energy**, **pico-hydro**, and **micro-hydro** systems, in addition to solar power.
- Introduction of the **Jagawana dashboard**, which utilizes **remote sensing and GIS data** to monitor land-use and vegetation changes within the university area.

Through this evaluation and system revision, **http://iot.stg.unpad.ac.id** evolved into a **comprehensive environmental and energy monitoring platform**, integrating multiple sustainability parameters. This ICT-based system now supports planning, implementation, monitoring, and evaluation of Unpad's sustainability programs in energy management and climate change mitigation, ensuring continuous improvement through data-driven evaluation and technological innovation.