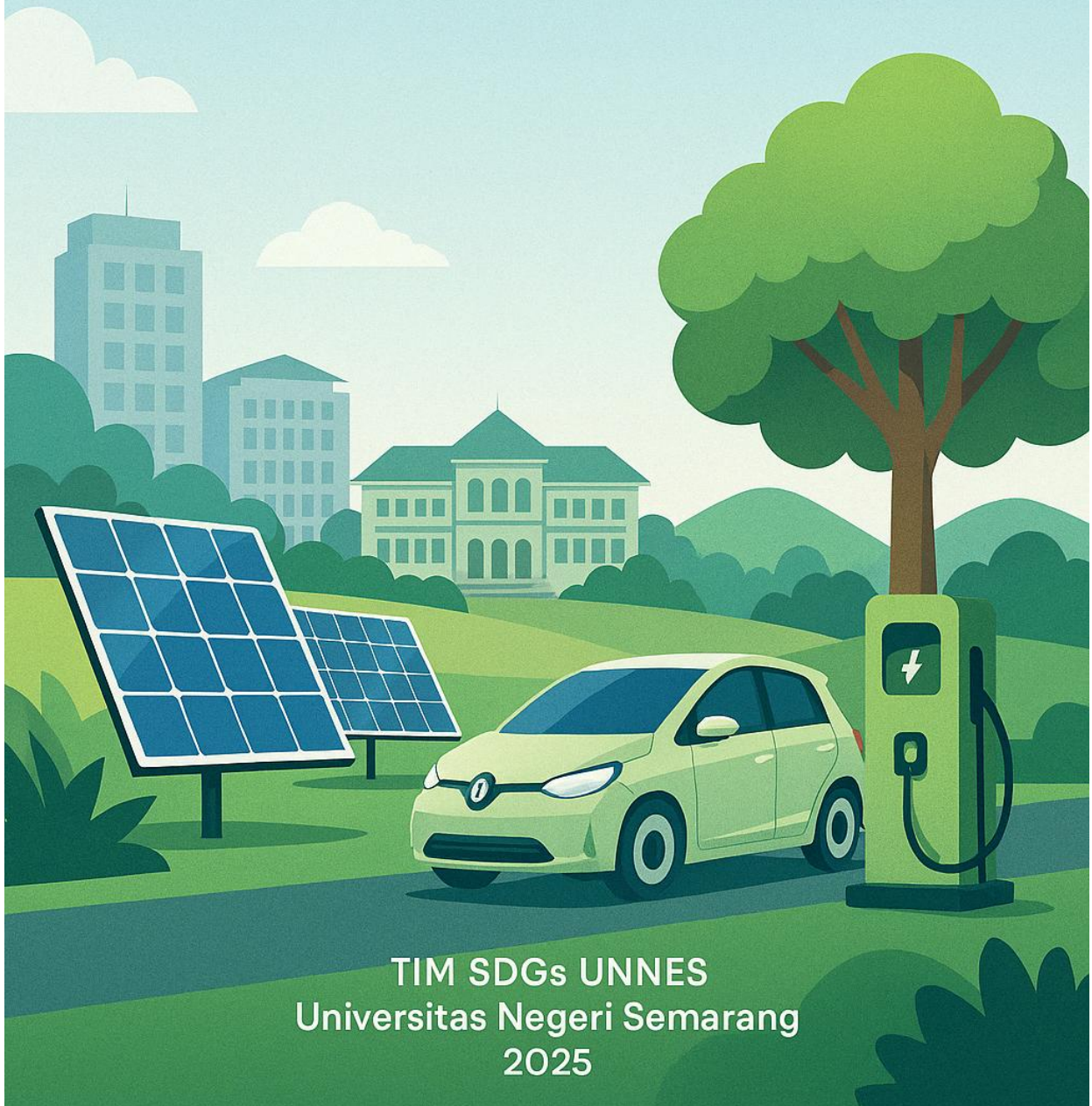




# STRATEGI UNNES MENUJU NET ZERO EMISSION 2050

Clean Future, UNNES Leads the Way



TIM SDGs UNNES  
Universitas Negeri Semarang  
2025

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## **I. LATAR BELAKANG**

Isu perubahan iklim dan pemanasan global telah menjadi perhatian global, di mana emisi karbon dari aktivitas manusia menjadi kontributor utama. Pemerintah Indonesia telah berkomitmen untuk mencapai Net Zero Emission (NZE) pada tahun 2060 atau lebih cepat, dan mendorong seluruh pemangku kepentingan termasuk perguruan tinggi untuk turut serta dalam agenda ini.

Universitas Negeri Semarang (UNNES) sebagai kampus konservasi memiliki tanggung jawab strategis untuk menjadi pelopor dalam implementasi kebijakan rendah karbon. Langkah menuju NZE sejalan dengan visi UNNES sebagai universitas berwawasan konservasi dan bereputasi internasional, serta mendukung pencapaian Sustainable Development Goals (SDGs).

## **I. BACKGROUND**

The issue of climate change and global warming has become a global concern, where carbon emissions from human activities are the main contributors. The Indonesian government has committed to achieving Net Zero Emission (NZE) by 2060 or sooner, and encourages all stakeholders including universities to participate in this agenda.

Semarang State University (UNNES) as a conservation campus has a strategic responsibility to be a pioneer in implementing low-carbon policies. The steps towards NZE are in line with UNNES' vision as a global reputable, pioneer of education brightness with conservation insight university, will supports the achievement of the Sustainable Development Goals (SDGs).

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## II. ROADMAP UNNES MENUJU NZE 2050

Roadmap ini dibangun dalam tiga fase utama:

### Fase I: Fondasi Aksi Hijau (2023–2030)

- **Audit Energi Tahunan & Edukasi:** Melakukan audit energi gedung dan kampus serta edukasi civitas.
- **Kendaraan Hijau:** Memulai penggunaan motor listrik untuk operasional kampus.
- **Peningkatan Energi Terbarukan:** Target 25% konsumsi energi berasal dari sumber terbarukan (solar panel & biomassa).
- **Penanaman & Inventarisasi Pohon:** Menyusun database pohon dan mangrove sebagai dasar perhitungan cadangan karbon.
- **Program Konservasi Air & Lahan:** Penerapan biopori, sumur resapan, dan tangkapan air hujan.

### Fase II: Transisi Sistemik (2031–2040)

- **Transportasi Bersih:** 50% motor dan 25% mobil operasional menggunakan listrik.
- **Energi Berkelanjutan:** 65% energi kampus bersumber dari EBT.
- **Zona Hijau Kampus:** Penambahan hutan kampus, taman, dan green belt.
- **Optimalisasi Blue-Green Infrastructure:** Revitalisasi kolam, arboretum, dan ruang terbuka hijau.
- **Reduksi Emisi Scope 1 & 2:** Pengurangan bertahap emisi listrik dan bahan bakar.

### Fase III: Netralitas Karbon Total (2041–2050)

- **>50% Mobil Listrik:** Seluruh kendaraan operasional menggunakan energi bersih.
  - **80% Energi Terbarukan:** Capaian dominasi EBT untuk seluruh kebutuhan kampus.
  - **Offset Emisi Total:** Melalui peningkatan cadangan karbon dari vegetasi kampus.
  - **Smart Campus & Monitoring:** Sistem pemantauan digital berbasis AI untuk emisi karbon dan konsumsi energi.
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## II. UNNES ROADMAP TOWARDS NZE 2050

This roadmap is built in three main phases:

### Phase I: Green Action Foundation (2023–2030)

- **Annual Energy Audit & Education:** Conducting energy audits of buildings and campuses and educating the community.
- **Green Vehicles:** Starting the use of electric motorbikes for campus operations.
- **Increasing Renewable Energy:** Targeting 25% of energy consumption to come from renewable sources (solar panels & biomass).
- **Tree Planting & Inventory:** Compiling a database of trees and mangroves as a basis for calculating carbon reserves.
- **Water & Land Conservation Program:** Implementing biopores, infiltration wells, and rainwater catchments.

### Phase II: Systemic Transition (2031–2040)

- **Clean Transportation:** 50% of motorbikes and 25% of operational cars use electricity.
- **Sustainable Energy:** 65% of campus energy comes from renewable energy.
- **Campus Green Zone:** Addition of campus forests, parks, and green belts.
- **Optimization of Blue-Green Infrastructure:** Revitalization of ponds, arboretums, and green open spaces.
- **Scope 1 & 2 Emission Reduction:** Gradual reduction of electricity and fuel emissions.

### Phase III: Total Carbon Neutrality (2041–2050)

- **>50% Electric Cars:** All operational vehicles use clean energy.
- **80% Renewable Energy:** Achievement of renewable energy dominance for all campus needs.
- **Total Emission Offset:** Through increasing carbon reserves from campus vegetation.
- **Smart Campus & Monitoring:** AI-based digital monitoring system for carbon emissions and energy consumption.

### III. STRATEGI OFFSET KARBON UNNES

#### 1. Perhitungan Jejak Karbon

Mengadopsi metodologi standar nasional (SNI 7724:2011) dan konversi internasional (carbonfootprint.com), jejak karbon dihitung dari:

- Konsumsi listrik (ton CO<sub>2</sub> eq)
- Konsumsi BBM (ton CO<sub>2</sub> eq)
- Aktivitas transportasi kampus
- Emisi tidak langsung dari air, makanan, dan limbah

#### 2. Peningkatan Cadangan Karbon

- **Reforestasi & Urban Forest:** Penanaman jenis pohon bernilai simpanan karbon tinggi (jati, mahoni, sengon).
- **Mangrove & Riparian Planting:** Rehabilitasi kawasan pesisir untuk penangkapan karbon bawah permukaan.
- **Biodiversity Mapping:** Pendataan dan pemetaan spesies tumbuhan dalam kawasan kampus.
- **Kawasan Karbon:** Penetapan zona konservasi karbon (karbon park) untuk monitoring dan pendidikan.

#### 3. Inovasi Teknologi & Tata Kelola

- **Sistem Informasi Karbon:** Dashboard emisi berbasis data real-time untuk pengambilan keputusan strategis.
- **Smart Grid & Panel Surya:** Pemasangan solar panel secara bertahap di gedung akademik dan asrama.
- **Kebijakan Green Procurement:** Belanja barang/jasa yang berwawasan rendah karbon.

### **III. UNNES CARBON OFFSET STRATEGY**

#### **1. Carbon Footprint Calculation**

Adopting the national standard methodology (SNI 7724:2011) and international conversion (carbonfootprint.com), the carbon footprint is calculated from:

- Electricity consumption (tons CO<sub>2</sub> eq)
- Fuel consumption (tons CO<sub>2</sub> eq)
- Campus transportation activities
- Indirect emissions from water, food, and waste

#### **2. Increasing Carbon Stocks**

- Reforestation & Urban Forest: Planting tree species with high carbon storage value (teak, mahogany, sengon).
- Mangrove & Riparian Planting: Rehabilitation of coastal areas for below-surface carbon capture.
- Biodiversity Mapping: Data collection and mapping of plant species in the campus area.
- Carbon Area: Determination of carbon conservation zones (carbon parks) for monitoring and education

#### **3. Technology Innovation & Governance**

- Carbon Information System: Real-time data-based emissions dashboard for strategic decision making.
- Smart Grid & Solar Panels: Phased installation of solar panels in academic buildings and dormitories.
- Green Procurement Policy: Purchasing goods/services with a low carbon perspective.

#### IV. KEY PERFORMANCE INDICATOR

Tahun	Emisi Co2 (ekv)	Energi Terbarukan	Kendaraan Listrik	Kenaikan Cadangan Karbon
2025	Baseline Audit	20 %	5 %	1.0 %
2030	-15%	30 %	10 %	1.4 %
2040	-35%	50 %	20 %	2.1 %
2050	NZE	60 %	40 %	4.0 %

Year	CO2 Emission (eq)	Renewable Energy	Electric Vehicle	Carbon Stock / Storage
2025	Baseline Audit	20 %	5 %	1.0 %
2030	-15%	30 %	10 %	1.4 %
2040	-35%	50 %	20 %	2.1 %
2050	NZE	60 %	40 %	4.0 %

#### V. PENUTUP

Strategi ini merupakan langkah awal UNNES untuk mengintegrasikan agenda Net Zero Emission secara terstruktur, terukur, dan partisipatif. Komitmen ini tidak hanya menjadi wujud kepedulian terhadap krisis iklim, tetapi juga bagian dari positioning UNNES dalam peta global universitas berkelanjutan. Ke depan, strategi ini dapat dijadikan acuan dalam indikator pemeringkatan internasional seperti THE Impact Ranking dan QS Sustainability Ranking.

This strategy is UNNES' initial step to integrate the Net Zero Emission agenda in a structured, measurable, and participatory manner. This commitment is not only a form of concern for the climate crisis, but also part of UNNES' positioning on the global map of sustainable universities. In the future, this strategy can be used as a reference in international ranking indicators such as THE Impact Ranking and QS Sustainability Ranking.

