Carbon Management and Emission Reduction Process

Centurion University has established a structured and multi-dimensional approach to carbon management and the reduction of carbon dioxide emissions. Guided by its commitment to sustainability and environmental stewardship, the university has implemented a range of innovative, science-driven strategies aimed at minimizing its environmental footprint while fostering ecological balance across its campuses. From expanding green cover and biodiversity, promoting renewable energy solutions such as biogas, bio-oil, and solar power, to advancing climate-resilient agriculture, Centurion University demonstrates leadership in creating a low-carbon, sustainable academic ecosystem. Key initiatives such as the micro-forestry program, automated polyhouses, real-time air quality monitoring (Aurassure), and regular plantation drives contribute directly to atmospheric carbon dioxide reduction and ecosystem restoration. Additionally, the university has embraced sustainable mobility by integrating electric vehicles and designing pedestrian-friendly pathways, further reducing emissions associated with campus transportation. The institution's environmental monitoring systems, energy-efficient infrastructure, and use of clean technologies represent a comprehensive model of environmental responsibility.

Green campus

Centurion University boasts an impressive green cover spanning approximately 70% of its campus, comprising dense tree plantations, landscaped gardens, and actively maintained cultivated green spaces. This abundant vegetation not only enhances the campus's visual and ecological appeal but also plays a vital role in carbon sequestration, helping to absorb atmospheric carbon dioxide. As a result, it significantly contributes to climate change mitigation and the improvement of ambient air quality, reinforcing the university's commitment to environmental sustainability.

Number of trees (N): 14,562

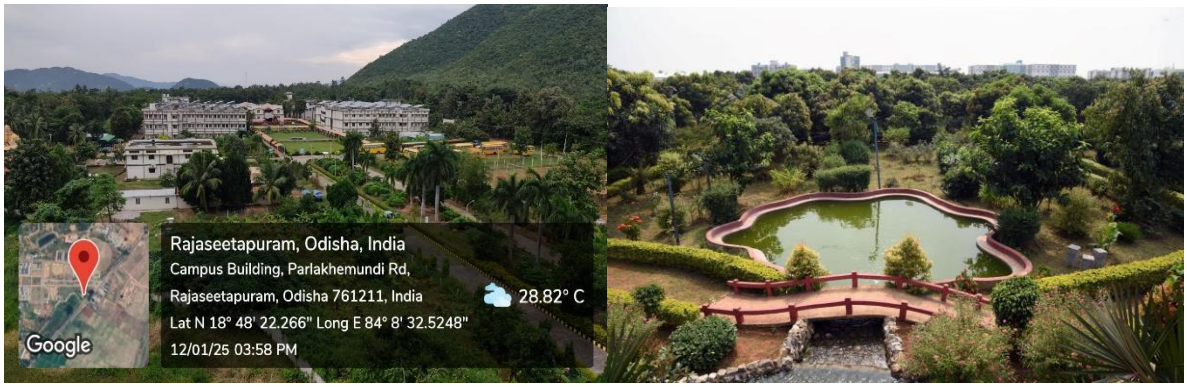
Average CO_2 sequestered per tree per year (S): 21.77 kg CO_2/tree/year

Step-by-step calculation:

- ➔ Multiply 14,562 × 20 = 291,240
- ➔ Multiply 14,562 × 1.77:
  - ◆ 14,562 × 1 = 14,562
  - ◆ 14,562 × 0.77 = 14,562 × (77 / 100) = (14,562 × 77) / 100
    - 14,562 × 77 = 14,562 × 70 + 14,562 × 7
    - 14,562 × 70 = 1,019,340
    - 14,562 × 7 = 101,934
    - Sum = 1,019,340 + 101,934 = 1,121,274
    - Divide by 100 = 11,212.74
  - ◆ Total 14,562 × 1.77 = 14,562 + 11,212.74 = 25,774.74
    Add to 14,562 × 20 = 291,240 + 25,774.74 = 317,014.74 kg CO_2/year

Convert to tonnes: 317,014.74 ÷ 1000=317.01 tCO_2/year

Total carbon sequestered: ≈ 317 tonnes CO_2 /year



Landscape at Pollinator Paradise inside the Campus

Pollinator Paradise

Promotion of E-Vehicles and Pedestrian Pathways on Campus

Centurion University actively encourages the use of electric vehicles (e-vehicles) and the development of pedestrian-friendly pathways as part of its commitment to sustainability and environmental responsibility. By operating a fleet of 22 e-vehicles for on-campus transportation, the university significantly reduces its carbon emissions, as these vehicles produce zero tailpipe emissions, contributing to cleaner air and improved public health.

To further minimize the environmental footprint, the university has established well-designed pedestrian pathways that seamlessly connect various parts of the campus. These paths not only promote walking and cycling but also enhance the campus experience by offering safe, green, and aesthetically pleasing routes. The restriction of conventional vehicle entry in certain zones and the promotion of bicycle usage underscore Centurion University's dedication to building a greener, healthier, and more vibrant campus environment.

Use of e-vehicle inside the campus

Pedestrian Pathways inside the University campus

Use of different types of e-vehicles inside the campus for Transportation

Solar-Powered E-Cycles

Centurion University has developed an innovative solar-powered hybrid e-cycle system designed to promote sustainable mobility through the use of renewable energy. This system integrates a conventional bicycle with an electric geared motor, enhancing propulsion efficiency while allowing for solar-based battery charging. The e-cycle is equipped with a 250W permanent magnet DC (PMDC) un-geared motor, capable of supporting loads up to 85 kg. A solar panel rated at 20 watts, 21.79 volts, and 1.29 amperes is integrated to enable efficient on-the-go charging. Performance tests demonstrate that the e-cycle can achieve speeds of approximately 23.5 km/h and a travel range of up to 40 km per charge, with improved efficiency observed when operating in solar-assisted mode compared to battery-only operation. As part of its commitment to green innovation and technology transfer, Centurion University delivered 150 e-cycle charging stations to TTL Bangalore in 2021, reinforcing its role in advancing clean transportation solutions at a national level.

Solar powered cycle

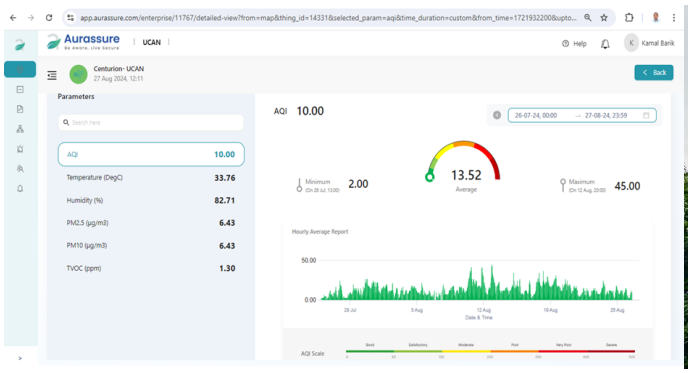
Micro-Forestry Initiative at Centurion University

Centurion University has implemented a micro-forestry project spanning 448 square meters, featuring a dense plantation of 350 native plants at a rate of 4 plants per square meter. This initiative adopts the Miyawaki method, a renowned afforestation technique developed by Japanese botanist Professor Akira Miyawaki, which accelerates the growth of natural forests through close spacing and the use of indigenous species. The micro-forest includes a rich diversity of 57 native species, encompassing fruit-bearing trees, forest varieties, and pollinator-attracting flowering shrubs. Designed to replicate the natural ecosystem, this compact forest fosters biodiversity, enhances carbon sequestration, and contributes to a self-sustaining green environment on campus. The project reflects the university's broader commitment to ecological conservation and sustainable campus development.

Micro-Forest at Centurion University

Aurassure: Real-Time Environmental Monitoring at Centurion University

Centurion University has deployed the Aurassure environmental monitoring system to strengthen its commitment to sustainability and well-being across campus facilities. Aurassure is a cutting-edge solution that provides real-time data on key environmental parameters, supporting optimal conditions for academic, research, and operational excellence. The system continuously monitors and records crucial indicators such as air temperature (°C), humidity (%), particulate matter (PM2.5 and PM10 in µg/m³), and total volatile organic compounds (TVOC in PPM)—with updates captured every minute. This data-driven approach enables the university to make informed decisions, enhance indoor and outdoor air quality, and promote a healthier, more sustainable campus environment.



Dashboard of Aurassure System

Aurassure system installed inside the Campus

Plantation Drive

Centurion University actively undertakes plantation drives as a strategic and natural approach to carbon sequestration. By increasing green cover both within and beyond the campus, these initiatives play a vital role in absorbing atmospheric carbon dioxide, thereby contributing to

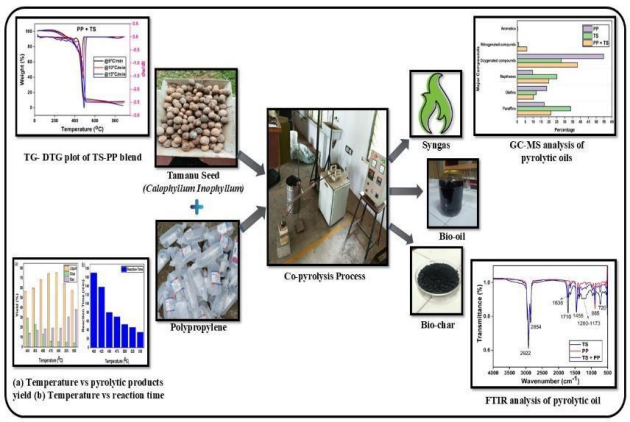
the university's broader efforts to mitigate climate change. Additionally, such drives foster environmental awareness and responsibility among students, faculty, and staff. In observance of World Nature Conservation Day on 28th July 2024, the NSS unit of the Paralakhemundi campus organized a successful plantation drive focused on establishing a guava orchard. This initiative aimed to raise environmental consciousness and reinforce the university's commitment to sustainability. The event witnessed active participation from 85 NSS volunteers, reflecting strong student engagement in environmental conservation efforts.

Plantation Drive on World Nature Conservation Day

Biogas and Bioenergy Initiatives

Centurion University has adopted biogas technology on its campuses as a sustainable solution for converting organic waste into clean, renewable energy. These biogas units not only offer an alternative fuel source but also play a crucial role in reducing methane emissions and supporting effective carbon footprint management. In addition to biogas, the university is actively involved in carbon capture and bioenergy projects, including the production of bio-oil from biomass and agricultural waste. This initiative promotes a circular economy by utilizing organic residues to generate energy, thereby decreasing dependence on fossil fuels and contributing to the reduction of greenhouse gas emissions. Through these efforts, Centurion University across both the campuses reinforces its commitment to sustainable energy practices and climate change mitigation. The unit processing approximately 0.025 tonnes (25 kg) of cow dung per day produces around 1 cubic meter of biogas daily, equivalent to 6 kWh of energy. This substitution of grid electricity results in an estimated carbon saving of about 1.8 tonnes of CO_2 per year.

Biogas Plant at Centurion University Campus



Bio-oil Production from Biomass

Automated Polyhouse Systems

As part of its broader carbon capture and sustainability initiatives, Centurion University has established automated polyhouse facilities to promote climate-resilient agricultural practices. These controlled-environment agriculture systems enable precise regulation of temperature, humidity, and irrigation, significantly reducing the dependency on chemical inputs and excessive water consumption. By optimizing resource use and enhancing productivity, the automated polyhouses contribute to a lower agricultural carbon footprint, while also fostering sustainable and resilient food production systems.

Automated Polyhouse at Centurion University campus

Empowering Climate-Resilient Farming Through Technology at Centurion University

At Centurion University's Paralakhemundi campus, the newly established automated polyhouse is transforming traditional agriculture into a high-tech, climate-resilient practice. As part of the agricultural team, I've had the opportunity to manage the cultivation of high-value crops such as cherry tomatoes, capsicum, and leafy greens under controlled conditions. Advanced sensors and automation allow precise regulation of temperature, humidity, and irrigation, significantly reducing water usage and minimizing chemical inputs. The result is healthier crops, faster growth cycles, and reduced waste. Beyond cultivation, I've gained valuable skills in operating digital systems, analyzing data, and maintaining optimal growing conditions—experiences that were previously unimaginable to me as a rural woman farmer. This polyhouse not only enhances productivity but also serves as a hands-on learning platform for students, demonstrating how technology and innovation can drive sustainable, climate-smart agriculture.

My name is Sushila Patra, and I've been working with the agricultural team at Centurion University's Paralakhemundi campus for the past five years. Recently, I had the opportunity to be trained and work inside the university's newly established automated polyhouse facility. Unlike open-field farming, the polyhouse uses advanced sensors and automation to control temperature, humidity, and irrigation. Initially, I was amazed at how little water was needed and how healthy the plants looked without heavy chemical inputs. I started managing the cultivation of high-value crops like cherry tomatoes, capsicum, and leafy greens—all grown in a clean, protected environment. With fewer pests and optimal growing conditions, the crops matured faster and were of better quality. This not only reduced waste but also improved our harvest cycles. I learned how to operate the digital systems, monitor data, and even correct imbalances in humidity levels—all skills I never imagined I'd gain as a rural woman farmer. The polyhouse has become a classroom for students, and I'm proud to help them understand how climate-resilient agriculture works in real time.

Use of Solar Pump in Farms at Centurion University

Centurion University has installed three solar-powered pumps across its agricultural farms to promote sustainable and eco-friendly irrigation practices. These pumps harness solar energy to draw water efficiently, reducing dependence on conventional electricity and diesel-powered systems. By adopting clean energy technology, the university not only lowers its carbon footprint but also provides a live demonstration of sustainable farming methods to students and local communities. This initiative aligns with the university's commitment to SDG-7 and offers hands-on learning opportunities in renewable energy applications.

Solar-Powered Irrigation: Transforming Farming and Sustainability at Centurion University

"My name is Biranchi Narayan Rout, and I work on the agricultural farm at Centurion University, Paralakhemundi Campus. For years, irrigation was a major challenge due to frequent power cuts and the high cost of diesel pumps. That changed when the university installed three solar-powered pumps to promote sustainable farming. Initially uncertain about their effectiveness, I soon witnessed a transformation—solar pumps provided uninterrupted water supply, helping me save over ₹5,000 in one crop cycle. With consistent irrigation, my crop yields improved, and I began growing vegetables like okra and leafy greens alongside traditional crops. The savings allowed me to invest in better inputs, and the reliability of the system gave me the confidence to explore more. Students from the university now regularly visit our farm to learn about solar irrigation, and I proudly share my experience with them. What began as a clean energy intervention became a turning point in my journey—empowering me not just as a farmer, but as a contributor to sustainable development and hands-on education."

Green Mobility through Bus Network

To address emissions from daily commuting, the University has strengthened its campus and inter-campus bus network. This initiative significantly reduces the dependence on private vehicles, thereby lowering greenhouse gas emissions associated with student and staff travel. It also fosters inclusivity by providing affordable and reliable mobility solutions for rural students. Over time, the bus network has contributed to a decrease in per capita commuting-related emissions, supporting the University's climate commitments.

Solar Rooftops and Solar Pumps

As part of its clean energy transition strategy the University has installed solar rooftop panels across academic blocks, hostels, and administrative buildings, replacing fossil-fuel–based electricity with renewable solar power. Solar-powered irrigation pumps are widely promoted in collaboration with rural communities and student projects. These reduce reliance on diesel

pumps while cutting operational costs for farmers. Together, these measures ensure energy self-reliance, long-term savings, and substantial carbon emission reductions, while providing hands-on training in renewable energy technologies for students.

Sustainable Agriculture Practices

In its agricultural fields and community projects, the University emphasizes climate-smart farming such as promotion of natural composting techniques helps reduce dependence on chemical fertilizers, thereby lowering nitrous oxide emissions. Adoption of organic soil management and integrated pest control minimizes the ecological damage associated with conventional farming. These practices not only improve soil health and crop yield but also represent a long-term strategy for reducing greenhouse gas emissions and enhancing climate resilience in agriculture.