Centurion University
Shaping Lives...
Empowering Communities...

LOCAL BIODIVERSITY INCLUDED IN PLANNING AND DEVELOPMENT

Centurion University of Technology and Management (CUTM) integrates local biodiversity conservation into its campus planning and development processes to protect existing ecosystems while supporting sustainable infrastructure growth. The University undertakes regular plant biodiversity assessments to document existing tree/shrub/herb/creeper/weed species and other vegetation cover across different campuses.

According to year 2025 field census, the campus was surveyed to identify existing trees and habitats in support of informed decisions regarding proposed construction and land use. The University's approach to sustainable development emphasizes aligning new buildings, infrastructure and renovation projects with minimal modification of natural topography and landscape pattern in order to prevent soil erosion and ecosystem disturbance, and incorporating water-conservation measures such as rainwater harvesting and wastewater recycling. Green corridors, tree plantations, and designated biodiversity habitats, including the Pollinators' Paradise, further support ecological balance and conservation of native flora, pollinators, and beneficial soil microbes. Through these measures, CUTM seeks to ensure that infrastructure development is mostly guided by environmental considerations in order to safeguard local biodiversity while promoting responsible and sustainable land use

2025 at a Glance

- **Tree Baseline:** The Paralakhemundi campus recorded 4,195 trees representing 80 species across 30 families, documented by location across five campus blocks and 41 sub-units. Native species account for 74.6% of the recorded trees. Bhubaneswar campus plant census records 3,420 individuals explicitly classified as "Tree". The Bhubaneswar census separately lists 120 small trees, 3 entries classified as shrub/tree, and 527 palms.
- **Threatened Tree Species:** Eight tree species of conservation concern are included in the campus inventory, including Endangered teak (Tectona grandis), with 1,043 trees, and red sanders (Pterocarpus santalinus), with three trees.
- **Wildlife Baseline:** The campus biodiversity inventory records 434 wild animal species, including 52 bird species across 32 families and 58 butterfly species.
- **Sustainable Development Standards:** CUTM requires at least 30% of the area surrounding every new building to be retained as green and open space. Green-building targets also address energy efficiency, water conservation, and sustainable material use.
- **2025 Land-Use Audit:** Environmental audits recorded green cover of 37.8% across the 109-acre Paralakhemundi campus and 44–45% across the 48-acre Bhubaneswar campus. At Bhubaneswar, 0.46 acres of new building construction was also recorded.
- **Building Energy Performance:** Annual building energy intensity was calculated at 46.17 kWh/m²/year at Paralakhemundi and 36.13 kWh/m²/year at Bhubaneswar. These values indicate relatively low annual

energy use per unit of floor area. They fall within the respective four-star and five-star reference bands of the BEE commercial-building framework for buildings with less than 50% air-conditioned built-up area, subject to confirmation of the applicable building category, climate zone and calculation methodology.

- **Habitat Conservation Zones:** CUTM maintains diverse habitat and conservation areas, including a micro-forest comprising 68 species, a 5-acre mountain terrace orchard of tropical fruit trees, a collection of 80 varieties of medicinal/aromatic herbs and a global award-winner 4.6 acre Pollinators' Paradise. In addition to the above biodiversity frameworks, three separate orchidariums are maintained at Bhubaneswar campus that houses eight genera of orchids, comprising of both native and exotic ones, totaling more than 1500 orchids. Similarly, CUTM Paralakhemundi campus also has an orchidarium having three different genera housing 550 number of orchids.
- **Green-Cover Enhancement:** More than 250 native tree saplings were planted during the year 2025, including red sandalwood (Pterocarpus santalinus), an endangered tree species, contributing to campus green space and biodiversity conservation.

1. Biodiversity Baseline Used for Planning

Effective biodiversity conservation begins with a comprehensive understanding of the existing ecological environment. Accordingly, Centurion University of Technology and Management (CUTM) conducts systematic inventories of campus flora and survey of local fauna to support environmentally responsible planning and development. The census recorded the number of individual plants by species, classified species as native or introduced, assessed their ecological and economic significance, and mapped their distribution across campus sub-units. Additionally, the girth of 143 mature trees was measured to assess the age of the trees. This systematic documentation establishes a baseline for identifying diverse plant species, and associated habitats in and around proposed development sites before construction begins. By integrating biodiversity data into campus planning, CUTM can identify ecologically significant areas, minimize vegetation loss and habitat disruption, and implement appropriate conservation measures. This evidence-based approach supports responsible infrastructure development while safeguarding campus biodiversity and promoting long-term ecosystem sustainability practices.

Table 1: Plant biodiversity baselines of CUTM campuses

Campus	Plants recorded	Species	Notes
Paralakhemundi	4,195 trees	80 (30 families)	74.6% native; 8 species of conservation concern; tree Shannon index H′ = 2.647
Bhubaneswar	3420 individuals classified as Tree; 120 small trees; 3 shrub/tree entries; 527 palms	83	Fruit, plantation and native trees, spice crops and 1500 orchids; Shannon index H′ = 3.339
Rayagada	438 plants	28	Campus flora census
Balasore	579 plants	26	Includes Endangered red sandalwood and Vulnerable sandalwood

Table 2: Tree species of conservation concern across campuses

Species	Scientific name	IUCN Red List status	Trees on campus
Teak	Tectona grandis	Endangered	1,043
Red sanders	Pterocarpus santalinus	Endangered	20
Sandalwood	Santalum album	Vulnerable	75

Species	Scientific name	IUCN Red List status	Trees on campus
Big-leaf mahogany	Swietenia macrophylla	Vulnerable	1
Satin wood	Chloroxylon swietenia	Vulnerable	1
Karra	Cleistanthus collinus	Vulnerable	3
Bael	Aegle marmelos	Near Threatened	18
Chestnut-leaved oak	Quercus castaneifolia	Near Threatened	1
Harida	Terminalia chebula	Least Concern	6
Baheda	Terminalia bellirica	Least Concern	36

The wildlife survey was conducted across all campuses and documented 434 number of wild animal species, comprising 295 insect species, 58 butterfly species, 52 bird species representing 32 families, 24 spider species, 4 reptiles and amphibians, and one wild boar mammal species. The recorded fauna includes species of conservation significance, such as the King Cobra, classified as Vulnerable, and the Indian Rock Python and Indian Roller, both reported as Near Threatened. To improve the visibility and accessibility of biodiversity information, the University has installed biodiversity information boards and labelled trees across the campuses. These initiatives help communicate the documented biodiversity baseline to students, staff, visitors, campus planners, and other nature lovers while promoting ecological awareness and supporting informed decisions on habitat conservation and future development.

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Fig 1: Plant biodiversity board and labelled trees and plants, Paralakhemundi campus

2. Biodiversity Conservation Planning for New Buildings

Planning Rules for Development

Centurion University of Technology and Management (CUTM) can demonstrate its commitment towards biodiversity-sensitive development by integrating environmental assessments, green corridor, conservation of native tree species, and site-specific designs into campus infrastructure projects.

- **Pre-construction Environmental Assessment:** Environmental and biodiversity assessments are undertaken before major construction projects to identify sensitive habitats, existing vegetation cover, and potential ecological impacts. These assessments support informed planning and measures to minimize ecological disruption.
- **Green and Open Space Allocation:** At least 30% of the area around every new building is retained to safeguard green and open space, supporting vegetation, biodiversity, and groundwater recharge structures. Mandated under CUTM planning provisions, this requirement is formally codified within the university's campus master plan.

- **Tree Preservation and Transplantation:** Existing trees are preserved wherever feasible. If any new construction warrants removing plants from the project site, the University follows process for relocation with minimal damage to roots and they are re-planted to suitable areas later. During the University's expansion phase from 2022 to 2024, about 92 number of mature trees were retained in their original locations and 31 trees were re-planted to designated green zones as per the record.
- **Land-Sensitive Building Design:** Building layouts are planned to respond to the site's natural topography in order to minimize soil erosion, preserve existing vegetation, and maintain natural drainage wherever feasible.

Biodiversity-Sensitive Construction Practices:

- **Permeable Pathways:** Interlocking pathways without continuous cement paving are used in selected green zones to maintain soil permeability and facilitate rainwater infiltration into deeper layer.
- **Porous Surfaces and Green Roofs:** Permeable paving and green roofs are promoted where technically suitable to improve rainwater infiltration, reduce surface runoff, and mitigate atmospheric heat being trapped. These approaches align with principles of recognized green-building and environmental planning.
- **Vertical Gardens on Existing Structures:** Five prefabricated portable cabins on the Bhubaneswar campus, used as study rooms, laboratories, display centres and parents' waiting rooms, have been converted into green structures with extensive vertical gardens. Thousands of potted plants, including money plant, Rhoeo, Calathea, purple heart, spider plant and coleus, together with seasonal flowering herbs, cover the cabin walls. The plant cover shades the walls and reduces heat gain, cools the surroundings through evapotranspiration, and provides nectar and pollen for bees, butterflies and other insects when the herbs are in flower. Because the gardens grow vertically on existing structures, they add vegetation without using additional ground area, and they serve as a visible demonstration of nature-based design for students and visitors.
- **Wildlife-Sensitive Lighting:** Solar lighting is installed along selected walking trails surrounding green areas, with lighting placement and intensity intended to minimize disturbance to nocturnal wildlife.
- **Water Conservation and Management:** Rainwater harvesting, low-flow water fixtures, and greywater recycling are incorporated into building and landscape planning where applicable. These measures support water conservation, reduce freshwater demand, and encourage groundwater recharge.

Table 3: Green-building strategy for campus development

Aspect	CUTM practice	Benefit for biodiversity and environment
Topography alignment	Preserves natural topography; minimizes soil erosion and ecological disruption	Protects habitats and natural water cycles
Material use	Prioritizes local, recycled and eco-certified materials	Lower carbon footprint; less extraction from natural land
Energy efficiency	Passive solar design, high-performance insulation, efficient HVAC, rooftop solar	Lower operational energy use and emissions
Water management	Low-flow fixtures, rainwater harvesting, greywater recycling	Improved water use efficiency and conservation of water for vegetation and wetlands
Green certification	Aims for LEED or GRIHA certification of new buildings	Independent verification of performance
Education	Buildings used as live laboratories for students and research	Builds sustainability skills

Aspect	CUTM practice	Benefit for biodiversity and environment
Community involvement	Workshops and participatory design with staff and students	Shared responsibility for the campus environment
Creation of unique green corridors and vertical gardens	CUTM has more than 15 numbers of vertical gardens around its startup buildings and green corridors at Bhubaneswar and Paralakhemundi campuses.	Helps to support pollinator conservation, air quality improvement, minimize heat build up as well as qualifying for energy efficient green buildings.

Table 4: Green-building goals and targets for new buildings

Feature	Metric	Target	2025 measurement
Energy Use Intensity (EUI)	kWh/m²/year	30% lower than conventional campus buildings	46.17 at Paralakhemundi (BEE 4-star band); 36.13 at Bhubaneswar (BEE 5-star band)
Water consumption	Litres per capita per day	Below 80 litres per capita per day	Paralakhemundi uses an estimated 4.5–5 lakh litres a day in total, including farms and livestock units; about 3,75,000 litres of treated wastewater a day is reused for irrigation
Water consumption	Litres per capita per day	Below 80 litres per capita per day	Bhubaneswar uses an estimated 5.5–6 lakh litres a day in total, including farms and livestock units; about 4,25,000 litres of treated wastewater a day is reused for irrigation
Recycled or local materials	% of total materials	At least 50% locally sourced or recycled	All construction and demolition waste reused for campus land filling and landscaping; plastic waste made into paver blocks for walkways
Green certification	LEED / GRIHA level	At least LEED Silver or GRIHA 3-star	New constructions follow green-building norms: LED lighting, natural ventilation, energy-efficient appliances
Community participation	Workshops or seminars per year	At least 4 per year	—
Student integration	Courses with green-building topics	Architecture, Civil Engineering and Environmental Studies	—



Fig. 2. Source of nectar for bee colonies

Monitoring Land Use and Construction: Environmental Audit

An independent environmental audit of Centurion University of Technology and Management (CUTM) was conducted on 17–18 June 2025 by the Centre for Envotech and Management Consultancy, an organisation empanelled with the Odisha State Pollution Control Board (OSPCB) and accredited by the National Accreditation Board for Education and Training (NABET). The audit systematically assessed and mapped campus land use, including areas occupied by existing infrastructure and newly constructed buildings, to evaluate the relationship between built-up areas and green cover. The findings provide an evidence-based baseline for monitoring changes in vegetation, assessing the potential environmental impacts of infrastructure development, and guiding future campus planning. This process supports biodiversity conservation, the protection of green spaces, and the sustainable management of campus land.

Table 5: Land use and land cover of the two main campuses, environmental audit

Land use	Paralakhemundi (109 acres)	Bhubaneswar (48 acres)
Green cover	36.67 acres (37.8%), includes botanical garden and forest park, orchards, wetlands, jungle and garden areas	21.5–22 acres (44–45%), including a 9.68-acre botanical garden and forest park, 4.5 acres of jungle and 0.91 acres of wetland
Buildings	38.74 acres (39.9%)	10.45 acres (21.7%)
Buildings under construction	Commercial vermicompost unit, 0.50 acres	0.46 acres
Roads	2.82 acres	2.76 acres
Playgrounds and open recreation	6.43 acres	5.12 acres

Green cover accounts for more than 30% of the total land area across campuses of Centurion University of Technology and Management (CUTM), reflecting the University's commitment to sustainable land use and biodiversity conservation. Recent infrastructure developments at the Paralakhemundi campus include the new VEC building, administrative block, staff quarters, and temple. At the Bhubaneswar campus, the environmental audit noted that substantial vegetation cover had been retained despite the addition of new educational buildings. To guide future campus development, the audit team recommended integrating construction activities with the natural landscape and minimizing ecological disruption. It also emphasized regarding protection and conservation of key ecological spaces, including the botanical garden, forest park, wetlands, fruit orchards, micro-forest, and Pollinators' Paradise. These areas serve as important carbon sinks and biodiversity-rich habitats, supporting vegetation, pollinator activity, and local wildlife.

- Rooftops covering approximately 879,556 sq. ft., along with paved surfaces, contribute to rainwater harvesting at the Paralakhemundi campus. Rainwater is channelled into collection tanks and recharge pits to support water conservation, groundwater recharge, and sustainable water management. The campus receives an average annual rainfall of approximately 1,512.3 mm, providing significant potential for rainwater harvesting.
- CUTM has installed over 10,500 LED lighting fixtures and more than 570 solar-powered LED streetlights across its six campuses. All campus buildings use LED lighting to promote energy efficiency and reduce electricity consumption. To protect biodiversity, unnecessary illumination is avoided near butterfly gardens, flowering plants, water bodies, and areas with dense tree cover. Darker corridors are maintained wherever feasible to facilitate the undisturbed movement of nocturnal wildlife and minimise the ecological impacts of artificial lighting
- Six percolation ponds have been constructed on second and third order streams over fractured and weathered rocks, facilitating effective water conservation and carbon capture through improved green cover.

Pond No.	Location	Length (m)	Width (m)	Area (m^2)	Depth (m)	Total Capacity (m^3)
1	Near STP No. 4	90	40	3600	1.8	6480
2	Opposite to VC Bungalow	20	20	400	1.8	720
3	Tribal Village	35	20	700	3	2100
4	Near FMP lab	82	21	1722	3	5166
5	Near MBA building	27	11	297	3	891
6	Near Cowshed	56	38	2128	3	6384
					Total	**21741**

3. Habitat Zones Maintained on University Land

Areas of high biodiversity value on the campuses and University farms are maintained as habitat zones. Table 6 gives their 2025 status.

Table 6: Protected habitat zones and their 2025 status

Habitat zone	2025 status	Biodiversity role
Terrace Orchard, University farm at Ranadevi	5 acres of terraced hill land; mango, guava and jackfruit added by 39 NSS volunteers on 31 January 2025	Fruit trees for birds and insects; soil and water held on slopes
Micro-forest	68 species; Shannon index H′ = 3.750	Dense native vegetation and bird habitat
Medicinal and aromatic plant collection	80 species from 40 families at Paralakhemundi including stevia, as well as two numbers of medicinal gardens at Bhubaneswar campus having more than 30 species of popular medicinal herbs	Conserves threatened medicinal plant species outside the forest ecosystem.
Pollinators Paradise, Bhubaneswar	Rated “Highly Commended” (Nature Positive) at the International Green Gown Awards 2025; 58 butterfly species recorded at Paralakhemundi	Serves as source of nectar for bee colonies and host plants for butterfly larvae, shelter for birds and small creatures

Habitat zone	2025 status	Biodiversity role
Apiculture unit	28 bee boxes; 22 active colonies in 2025; three honey bee species	Pollination and fruit set of campus vegetation
Orchidarium	550 orchid plants of five species in Paralakhemundi and 1500 orchid plants of 8 different genera of native and ornamental species in Bhubaneswar campus.	Propagation and conservation of native orchids as indoor and on old native trees.
Restored ponds	Desilted, invasive weeds recycled for composting, native aquatic plants replanted and native carp stocked	Wetland habitat and groundwater recharge
Crop Cafeteria, Rajaseetapuram	Native, traditional and locally adapted crop varieties grown through the Kharif, Rabi and Zaid seasons	Conserves local crop diversity
Bird-friendly green zones	Nest boxes, bird feeders, summer water stations and native shrubs; minimal pesticide use	Shelter and food for house sparrows and other resident birds



Fig 3: Orchidarium, M.S. Swaminathan School of Agriculture



Fig 4: Hive inspection at the apiculture unit, January 2025





Fig 5. Vertical gardens on prefabricated portable cabins

4. Ecological Zoning and Spatial Planning

On November 19th of year 2025, the School of Engineering and Technology at Centurion University of Technology and Management (CUTM), in collaboration with Esri India and Indian Society of Geomatics, organized the International Conference on *GeoAI and Smart Mapping for a Sustainable Tomorrow*, bringing together 173 participants. A featured case study demonstrated the application of Geographic Information Systems (GIS)-based multi-criteria decision-making and Geospatial Artificial Intelligence (GeoAI) to delineate land-use zones around Raimona National Park in Assam. This approach supports the identification of ecologically sensitive areas, the establishment of appropriate buffer zones around protected habitats, and the identification of areas potentially suitable for development. By integrating ecological considerations into spatial planning, these techniques can help guide infrastructure development away from vulnerable ecosystems and minimize adverse environmental impacts.

Complementing these initiatives, CUTM's campus biodiversity census provides baseline information on existing vegetation and habitats, while its drone-based surveying capabilities strengthen the collection and analysis of spatial data. More than 20 students and faculty members are reported to hold licences issued by the Directorate General of Civil Aviation (DGCA) for operating drones. Together, these capabilities enhance the University's capacity to apply GIS, GeoAI, and aerial mapping technologies to biodiversity assessment, ecological zoning, and environmentally responsible land-use planning.



Fig 6: International GIS Day, 19 November 2025



Table 7: Plantation drives in 2025

Date	Location	Organiser	Participants and planting
31 Jan 2025	Terrace Orchard, Ranadevi	NSS Unit, Paralakhemundi	39 NSS volunteers; mango, guava and jackfruit
2 Jul 2025	Bhubaneswar campus	Department of Botany with CSIR–IMMT	47 participants; more than 30 native medicinal and shade-giving saplings
7 Jul 2025	Kusumati Chhanaghara High School	CSR Cell with the Gram Panchayat	13 University volunteers with Gram Panchayat volunteers and Green Brigades
10 Jul 2025	Primary School, Rattini, Srikakulam	RAWE students and NSS Unit	Neem, mango, guava and flowering plants
15–19 Jul 2025	Paralakhemundi campus and surroundings	NSS Unit, Paralakhemundi	126 NSS volunteers; more than 200 saplings
28 Jul 2025	World Nature Conservation Day plantation	NSS	47 NSS volunteers
Jul 2025	World Nature Conservation Week plantation drive	NSS	45 NSS volunteers
15 Aug 2025	Paralakhemundi campus	Youth Red Cross Unit	38 volunteers; 20–25 saplings
Sep 2025	Rayagada campus	CUTM Rayagada	25 students
24 Oct 2025	Bhubaneswar campus	CSR Cell and Green Brigades	15 students participated; 35 number of white sandalwood and coffee saplings planted

6.Conclusion

CUTM based its planning on a detailed, location-based record of campus biodiversity: 4,195 trees of 80 species, 8 of them of conservation concern, and 434 wild animal species on the Paralakhemundi campus, with flora censuses of its Bhubaneswar, Rayagada and Balasore campuses. New buildings are planned around this record under rules that

keep at least 30% of each building's surroundings green, retain or transplant existing trees, follow the natural topography and use biodiversity-sensitive construction, with green-building targets for energy, water and materials. The June 2025 environmental audit tracked land use and new construction on both main campuses and found green cover of 37.8% and 44–45%, and building energy use within the 4-star and 5-star bands. Habitat zones from the micro-forest to the Pollinators Paradise are maintained on University land, more than 250 number of tree saplings were added during plantation program of year 2025.