

OPEN ELECTIVE · OLE341-AID

Sustainable Development — Glossary of Important Terms

A single-reference list of the key terms from all four units, in the order they're introduced. Useful for quick revision, for setting quiz definitions, or as a standalone handout alongside the full student booklet and unit decks.

Unit I — Foundations of Sustainable Development and Green Computing · 5 hours

Term	What it means
Sustainable development	Meeting the needs of the present without compromising the ability of future generations to meet their own needs (the Brundtland definition, 1987).
SDGs (Sustainable Development Goals)	The UN's seventeen goals, adopted in 2015, each targeted for 2030, covering everything from clean energy to education to climate action.
Triple Bottom Line	Judging an activity or technology on three fronts at once: environmental, economic, and social impact (coined by John Elkington).
Green IT 1.0 / 2.0	1.0 focused narrowly on energy-efficient hardware and power management. 2.0 broadens this to the full technology lifecycle and to using IT as a sustainability tool elsewhere in the economy.
Digital carbon footprint	Total greenhouse gas emissions caused, directly and indirectly, by digital devices, networks, and data infrastructure across their lifetime.
GHG Protocol	The globally used framework for reporting an organisation's greenhouse gas emissions, split into Scope 1, 2, and 3.
Scope 1 emissions	Direct emissions from sources an organisation owns or controls (e.g. fuel burned in a company vehicle or backup generator).
Scope 2 emissions	Indirect emissions from purchased electricity, steam, heating, or cooling — usually the largest category for data centres and cloud platforms.
Scope 3 emissions	All other indirect emissions in the value chain: hardware manufacturing, employee travel, cloud services used, e-waste disposal, upstream supply chain.
CO₂e (carbon dioxide equivalent)	A common unit for expressing the combined warming effect of different greenhouse gases on one scale.

Unit II — Lifecycle Sustainability and Circular Economy · 6 hours

Term	What it means
Embodied energy	The total energy used to extract, produce, and transport a product before it's ever switched on or used.

Term	What it means
Circular economy	An economic model that keeps materials in use for as long as possible, replacing the older take-make-dispose pattern.
Reduce, reuse, recycle	The circular economy's three moves, in order of environmental preference: prevent impact at the design stage, extend a product's life, then recover materials as a last resort.
E-waste	Electronic devices discarded at the end of their useful life, whether processed formally (registered recyclers) or informally (unregulated processing).
Extended Producer Responsibility (EPR)	A regulatory approach making producers responsible for their product's end-of-life management, including meeting recycling targets — the core mechanism of India's E-Waste (Management) Rules, 2022.
Urban mining	Recovering valuable materials (gold, copper, silver, rare earths) from discarded electronics rather than newly mined ore.
Life Cycle Assessment (LCA)	A standardised, four-phase method for measuring a product's total environmental impact across its entire life.
LCA's four phases	(1) Goal and scope definition, (2) inventory analysis, (3) impact assessment, (4) interpretation.
ISO 14040 / 14044	The international standards defining how an LCA should be structured and carried out.
Functional unit	The basis of comparison used in an LCA (e.g. “one laptop used for four years”), so two products can be compared fairly.

Unit III — Green Software Engineering and Sustainable AI · 6 hours

Term	What it means
Green software engineering	Writing and architecting software with energy efficiency treated as a real design goal, not an afterthought.
Carbon-aware scheduling	Timing computing jobs to run when the electricity grid's mix is cleanest, lowering emissions without changing the code itself.
Green AI	An approach (from Schwartz et al.) that reports and optimises for compute, data, and energy efficiency alongside model accuracy, rather than treating efficiency as a footnote.
Model compression	Reducing a trained model's size while preserving most of its original accuracy.
Pruning	Removing weights or neurons that contribute little to a model's output, making it smaller and faster to run.
Quantization	Using lower-precision number formats (e.g. 8-bit instead of 32-bit) for a model's weights, cutting memory and compute cost.
Training vs. inference energy	Training is the one-time cost of building a model; inference is the repeated cost of using it — which can exceed training's total cost over a model's lifetime.
ESG analytics platform	Software used to track and report an organisation's environmental, social, and governance metrics on an ongoing basis.

Unit IV — Sustainable Data Centers, Cloud Infrastructure and Carbon Management

· 8 hours

Term	What it means
PUE (Power Usage Effectiveness)	Total facility power divided by IT equipment power. Theoretical ideal is 1.0; industry average is roughly 1.5–1.6.
CUE (Carbon Usage Effectiveness)	Total CO ₂ emissions from a facility divided by its IT equipment energy use — PUE's logic applied to carbon.
WUE (Water Usage Effectiveness)	Total water used (mostly for cooling) divided by IT equipment energy.
Virtualisation	Running several logical servers on one physical machine, raising utilisation and cutting idle capacity.
Workload consolidation / right-sizing	Combining underused workloads onto fewer servers so infrastructure matches actual demand rather than sitting mostly idle.
Edge computing	Processing data closer to where it's generated instead of sending everything to a central data centre, reducing network and data-centre load for some workloads.
Green audit	A systematic assessment of an IT facility's energy, water, and emissions performance against benchmarks.
ESG reporting	Environmental, Social, and Governance reporting — disclosing an organisation's sustainability performance to investors and regulators.

Term	What it means
BRSR (Business Responsibility and Sustainability Reporting)	India's mandatory ESG disclosure framework, enforced by SEBI, for the country's top listed companies.
Carbon credits / carbon markets	A system letting organisations that cut emissions below an agreed baseline earn and trade tradeable credits, creating a financial incentive for efficiency.
MRV (Measurement, Reporting, Verification)	The process that checks whether claimed emission reductions are genuine, keeping carbon markets and ESG disclosures honest.