SDG 12 Responsible Consumption and Production

Karunya Institute of Technology and Sciences (KITS) follows the principle of 3Rs (Reduce, Reuse and Recycle) model to address the challenges of waste management in its 720 acre campus. Being a residential campus with 7773 students in 15 resident halls (hostels) and 663 faculty/staff members, many of whom reside on campus in the 17 apartment complexes, the 3R model is effective in dealing with the different types of waste namely; solid, liquid and e-waste. KITS is committed to promoting sustainability and corporate social responsibility through the effective management of its solid waste and grey water. The waste management system of KITS includes:

- Solid waste management
- Liquid waste management
- E-waste management

12.1 Research on responsible consumption and production

Significant researches on waste management such as e-waste management, biomedical waste management and organic waste management are carried out at KITS and solutions to waste reduction techniques are published in reputed journals.

12.1.1 Responsible Consumption and Production: CiteScore

Faculty members and students are actively engaged in research that promotes responsible consumption and production. These study discoveries present novel techniques to trash reduction, reuse, and recycling. KITS has about 105 publications on this topic, including research articles, review papers, book chapters, and conference proceedings. The Cite Score 239.8 of scholarly papers measures their influence and relevance.

Sl.No	Title	Authors	Year	Scopus Source title	Cite Score
1	Laccase: A potential biocatalyst for pollutant degradation	Dong, C.-D.| Tiwari, A.| Anisha, G.S.| Chen, C.-W.| Singh, A.| Haldar, D.| Patel, A.K.| Singhania, R.R.	2023	Environmental Pollution	16
2	Synergizing artificial intelligence, 5G, and cloud computing for efficient energy conversion using agricultural waste	Agrawal, A.V.| Shashibhushan, G.| Pradeep, S.| Padhi, S.N.| Sugumar, D.| Boopathi, S.	2023	Sustainable Science and Intelligent Technologies for Societal Development	-
3	Waste management beyond the COVID-19 pandemic: Bibliometric and text mining analyses	Ranjbari, M.| Shams Esfandabadi, Z.| Gautam, S.| Ferraris, A.| Scagnelli, S.D.	2023	Gondwana Research	12.9
4	A study of the printed circuit board (pcb) e-waste recycling process	Selvakumar, S.| Adithe, S.| Isaac, J.S.| Pradhan, R.| Venkatesh, V.| Sampath, B.	2023	Sustainable Approaches and Strategies for E-Waste Management and Utilization	-

5	Recent developments of radiation shielding concrete in nuclear and radioactive waste storage facilities – A state of the art review	Kanagaraj, B.| Anand, N.| Diana Andrushia, A.| Naser, M.Z.	2023	Construction and Building Materials	13.8
6	Development and strength assessment of eco-friendly geopolymer concrete made with natural and recycled aggregates	Kanagaraj, B.| Kiran, T.| N, A.| Al Jabri, K.| S, J.	2023	Construction Innovation	7.1
7	Engineering properties, sustainability performance and life cycle assessment of high strength self-compacting geopolymer concrete composites	Kanagaraj, B.| Anand, N.| Johnson Alengaram, U.| Samuvel Raj, R.	2023	Construction and Building Materials	13.8
8	Physical characteristics and mechanical properties of a sustainable lightweight geopolymer based self-compacting concrete with expanded clay aggregates	Kanagaraj, B.| Anand, N.| Praveen, B.| Kandasami, S.| Lubloy, E.| Naser, M.Z.	2023	Developments in the Built Environment	7.4
9	Techno-socio-economic aspects of Portland cement, Geopolymer, and Limestone Calcined Clay Cement (LC3) composite systems: A-State-of-Art-Review	Kanagaraj, B.| Anand, N.| Samuvel Raj, R.| Lubloy, E.	2023	Construction and Building Materials	13.8
10	Burning of Municipal Solid Waste: An Invitation for Aerosol Black Carbon and PM2.5 Over Mid–Sized City in India	Mahato, D.K.| Sankar, T.K.| Ambade, B.| Mohammad, F.| Soleiman, A.A.| Gautam, S.	2023	Aerosol Science and Engineering	3.0
11	Influence of elevated temperature exposure on the interfacial shear strength capacity of binary blended high strength self-compacting geopolymer concrete	Kanagaraj, B.| Anand, N.| Raj R, S.| Lukose, J.| Andrushia, D.| Lubloy, E.	2023	Case Studies in Construction Materials	7.6
12	Facile synthesis of waste-derived carbon/MoS2 composite for energy storage and water purification applications	Durairaj, A.| Liu, J.| Lv, X.| Vasanthkumar, S.| Sakthivel, T.	2023	Biomass Conversion and Biorefinery	7.0
13	Micro- to macro-scaling analysis of PM2.5 in sensitive environment of Himalaya, India	Kimothi, S.| Chilkoti, S.| Rawat, V.| Thapliyal, A.| Gautam, A.S.| Gautam, S.	2023	Geological Journal	4.2

14	Investigation on residual bond strength and microstructure characteristics of fiber-reinforced geopolymer concrete at elevated temperature	Vijaya Prasad, B.| Anand, N.| Kanagaraj, B.| Kiran, T.| lubloy, E.| Naser, M.Z.| Arumairaj, P.D.| Andrushia, D.	2023	Case Studies in Construction Materials	7.6
15	Microstructure investigation, strength assessment, and thermal modelling of concrete exposed to different heating cooling regimes	Anand, N.| Thanaraj, D.P.| Andrushia, D.| Lublóy, É.E.| Kiran, T.| Kanagaraj, B.| Kodur, V.	2023	Journal of Thermal Analysis and Calorimetry	8.5
16	Pull-Out behavior and microstructure characteristics of binary blended self-compacting geopolymer concrete subjected to elevated temperature	Kanagaraj, B.| Anand, N.| Diana Andrushia, A.| Kiran, T.| Lubloy, E.	2023	Alexandria Engineering Journal	11.2
17	Hybrid PV/T Heat Pump System with PCM for Combined Heating, Cooling and Power Provision in Buildings	Prakash, K.B.| Almeshaal, M.| Pasupathi, M.K.| Chinnasamy, S.| Saravanakumar, S.| Rajesh Ruban, S.	2023	Buildings	3.4
18	Post-fire flexural behaviour and performance of unrestrained cold-formed steel built-up section beams: Experimental and numerical investigation	Jaya kumar, G.| Kiran, T.| Anand, N.| Anbarasu, M.| Lubloy, E.	2023	Case Studies in Construction Materials	7.6
19	Influence of fire-resistant coating on the physical characteristics and residual mechanical properties of E350 steel section exposed to elevated temperature	Jaya Kumar, G.| Kiran, T.| Anand, N.| Al-Jabri, K.	2023	Journal of Structural Fire Engineering	2.2
20	Biotechnological interventions for improving the seed longevity in cereal crops: progress and prospects	Choudhary, P.| Pramitha, L.| Aggarwal, P.R.| Rana, S.| Vetriventhan, M.| Muthamilarasan, M.	2023	Critical Reviews in Biotechnology	20.8
21	Performance of clay masonry prisms with light weight plaster exposed to standard fire exposure	Kiran, T.| Anand, N.| Andrushia, A.D.| Kodur, V.| Mathews, M.E.| Arulraj, G.P.	2023	Fire and Materials	4.6
22	Axial compressive behaviour and physical characteristics of high strength self-compacting geopolymer concrete	Kanagaraj, B.| Anand, N.| Jerry, R.| Samuvel Raj, R.| Lubloy, E.	2023	Construction and Building Materials	13.8

	(HSGC) columns exposed to elevated temperature				
23	Evaluating groundwater contamination: An examination of a municipal solid waste dump yard in southern India's Manchester City	Ringle Raja, S.| Kanagaraj, B.| Eunice, S.	2023	Resources, Conservation and Recycling Advances	11.7
24	Implementation of Industry 4.0 in Supply Chain Management in the Healthcare Industry	Kuruvilla, J.M.| Kathrine, G.J.W.| Stewart Kirubakaran, S.| Prem Prasad, G.| Evangelina, G.	2023	Proceedings of the 2nd International Conference on Edge Computing and Applications, ICECAA 2023	-
25	Investigation of the Post-Fire Performance and Flexural Behaviour Modeling of FRC Exposed to a Standard Fire	Varghese, A.| N, A.| Andrushia A, D.| Lubloy, E.| Arulraj G, P.	2023	Structural Engineering International	2.6
26	Design and implementation of UWB-based cyber-physical system for indoor localization in an industry environment	Shyam, S.| Devaraj, S.J.| Ezra, K.| Delattre, J.| Lynus, G.K.	2023	Intelligent Edge Computing for Cyber Physical Applications	-
27	Web-Crippling Capacity of High Performance Cold-Formed Lipped Steel Sections Subjected to Elevated Temperature	Jayakumar, G.| Kiran, T.| Nammalvar, A.| Prasad Sah, T.| Mathews, M.E.| Anbarasu, M.| Dar, A.R.	2023	Buildings	3.4
28	Residual properties of geopolymer concrete for post-fire evaluation of structures	Kanagaraj, B.| Anand, N.| Andrushia, D.| Kodur, V.	2023	Materials	5.8
29	Microalgae and nano-cellulose composite produced via a co-culturing strategy for ammonia removal from the aqueous phase	Tseng, Y.-S.| Patel, A.K.| Haldar, D.| Chen, C.-W.| Dong, C.-D.| Singhania, R.R.	2023	Bioresource Technology	20.8
30	Managing Human-Elephant Cohabitation: Strategies for Mitigating Conflict and Encouraging Coexistence	Pratap, C.B.| D'Souza, A.| Athulya Velt, V.H.| Princess I, L.| Ashwini, V.V.H.| Joice, P.	2023	E3S Web of Conferences	0.9
31	Reward based Smart Waste Disposal System using RFID	Abraham, M.| Sreeraj, S.| Milton, D.| Yohannan, A.A.| Paulraj, G.J.L.	2023	2nd International Conference on Sustainable Computing and Data Communication	-

				Systems, ICSCDS 2023 - Proceedings	
32	IoT-based BIM integrated model for energy and water management in smart homes	Mathews, M.E.| Shaji, A.E.| Anand, N.| Andrushia, A.D.| Chin, S.C.| Lubloy, E.	2023	Intelligent Edge Computing for Cyber Physical Applications	-
33	G lycosyl hydrolases of Bacillus spp. from the vermicasts of epigeic Eudrilus eugeniae for biomass valorization	Chandra, D.M.| Thankappan, S.| Uthandi, S.	2023	Biomass Conversion and Biorefinery	7.0
34	IoT and Industry 5.0 Revolutionizing Agriculture: A Comprehensive Review of Sustainable Advancements in Precision Farming	Mohan, K.J.| Mary, I.T.B.| Paul, J.J.	2023	IET Conference Proceedings	0.3
35	Nanofluids in Production of Sustainable Biofuels and Bioplastics	Vezhavendhan, R.| Kanakavalli, P.B.| Arigela, S.H.| Chandrashekhar, A.| Sathish, R.| Joshi, S.K.| Isaac, J.S.	2023	Oxidation Communications	0.7
36	Assessment of Metakaolin Blended Palm Kernel Shell Solid Concrete Blocks as a Sustainable Building Material	John, N.| Tensing, D.| Vincent Sam Jebadurai, S.| Srisanthi, V.G.	2023	IOP Conference Series: Earth and Environmental Science	1.0
37	Evaluating the Soil Nutrient Status using GIS and Remote Sensing Technology-A Case Study at Coimbatore District	Alex Immanual Jeyasingh, R.| Suguna Devakumari, M.| Poonguzhali, R.S.| Katharine, S.P.| Jeeva, S.C.	2023	Agricultural Science Digest	0.5
38	Standardization of organic manures on growth of winter cherry (Withania somnifera)	Suresh, V.| Kousalya, R.| Gopu, B.| Kabariel, J.| Rajkumar, A.	2023	Research Journal of Pharmacy and Technology	1.4
39	Biodegradation Assay of Heavy Metals and Dyes Decolorization in Textile Industrial Effluent using Laccase Isolated from Pleurotus ostreatus	Johnnie, D.A.| Issac, R.| Prabha, M.L.| Gomez, L.A.	2023	Journal of Pure and Applied Microbiology	2.0
40	Microbiota in sustainable degradation of organic waste and its utilisation in agricultural industry	Sinduja, M.| John, J.E.| Suganthi, R.| Ragul, S.| Balaganesh, B.| Mathiyarasi, K.| Kalpana, P.| Sathya, V.	2023	Microbiomes for the Management of Agricultural Sustainability	-
41	An Innovative Embedded System based Solution for Waste Management	Chitra, R.| Guntanala, G.| Bille, S.| Moguluri, Y.| Singamshetty, J.	2023	Proceedings of the 2023 2nd International Conference on	-

				Electronics and Renewable Systems, ICEARS 2023	
42	Energy Consumption of Composite Structure in Various Regions in India: A BIM Approach	Arun Kumar, B.| Daniel, C.| Amudhan, V.| Devarajan, S.| Tahara, R.M.K.| Arunraj, E.| Arun Solomon, A.	2023	Civil Engineering and Architecture	1.4
43	Plant-based biopolymers for wastewater pollutants mitigation	Harshan, K.| Rajan, A.P.| Kingsley, D.| Sheikh, R.A.| Aashmi, J.| Rajan, A.P.	2023	Biopolymers: Environmental Applications	-
44	Circular economy oriented future building information processing: PSO for CNN approach	Chen, X.| Li, Z.| Dinesh Peter, J.| Slowik, A.	2023	Applied Soft Computing	15.8
45	Revolutionizing the food industry: The transformative power of artificial intelligence-a review	Zatsu, V.| Shine, A.E.| Tharakan, J.M.| Peter, D.| Ranganathan, T.V.| Alotaibi, S.S.| Mugabi, R.| Muhsinah, A.B.| Waseem, M.| Nayik, G.A.	2024	Food Chemistry: X	7.2
46	A Study on AI-ML-Driven optimizing energy distribution and sustainable agriculture for environmental conservation	Glady, J.B.P.| D'Souza, S.M.| Priya, A.P.| Amuthachenthiru, K.| Vikram, G.| Boopathi, S.	2024	Harnessing High-Performance Computing and AI for Environmental Sustainability	-
47	Advanced deep learning approach for enhancing crop disease detection in agriculture using hyperspectral imaging	Zekrifa, D.M.S.| Lamani, D.| Chaitanya, G.K.| Kanimozhi, K.V.| Saraswat, A.| Sugumar, D.| Vetrithangam, D.| Koshariya, A.K.| Manjunath, M.S.| Rajaram, A.	2024	Journal of Intelligent and Fuzzy Systems	4.2
48	Limestone calcined clay cement (LC3): A sustainable solution for mitigating environmental impact in the construction sector	Kanagaraj, B.| Anand, N.| Johnson Alengaram, U.| Samuvel Raj, R.| Karthick, S.	2024	Resources, Conservation and Recycling Advances	9.8
49	Sustainable management of tea wastes: resource recovery and conversion techniques	Duarah, P.| Haldar, D.| Singhania, R.R.| Dong, C.-D.| Patel, A.K.| Purkait, M.K.	2024	Critical Reviews in Biotechnology	4.0
50	Advancements and environmental considerations in portland cement-based radiation shielding concrete:	Kanagaraj, B.| Anand, N.| Raj, S.| Lubloy, E.	2024	Cleaner Engineering and Technology	14.6

	Materials, properties, and applications in nuclear power plants– review				
51	Behavioural studies on binary blended high strength self-compacting geopolymer concrete exposed to standard fire temperature	Kanagaraj, B.| Anand, N.| Raj R, S.| Lubloy, E.	2024	Ain Shams Engineering Journal	12.2
52	Impact of Cloud Computing on the Future of Smart Farming	Johnraja, J.I.| Leelipushpam, P.G.J.| Shirley, C.P.| Princess, P.J.B.	2024	Signals and Communication Technology	1.0
53	Assessing variability and hydrochemical characteristics of groundwater fluoride contamination and its associated health risks in East Singhbhum district of Jharkhand, India	Ambade, B.| Sethi, S.S.| Patidar, K.| Gautam, S.| Alshehri, M.	2024	Journal of Hazardous Materials	24.6
54	Beyond the surface: Microplastic pollution its hidden impact on insects and agriculture	Gautam, S.| Rathikannu, S.| Katharine, S.P.| Marak, L.K.R.| Alshehri, M.	2024	Physics and Chemistry of the Earth	6
55	Application of artificial intelligence tools in wastewater and waste gas treatment systems: Recent advances and prospects	Behera, S.K.| Karthika, S.| Mahanty, B.| Meher, S.K.| Zafar, M.| Baskaran, D.| Rajamanickam, R.| Das, R.| Pakshirajan, K.| Bilyaminu, A.M.| Rene, E.R.	2024	Journal of Environmental Management	14.4
56	Sustainability and durability performance evaluation of geopolymer concrete with industrial effluent as alternative to conventional river sand	Kanagaraj, B.| Anand, N.| Lubloy, E.	2024	Developments in the Built Environment	7.6
57	Smart home energy management systems in India: a socio-economic commitment towards a green future	George, T.| Selvakumar, A.I.	2024	Discover Sustainability	2.6
58	Quantifying the Effects of the National Clean Air Programme on Air Quality Parameters in Chandigarh: A Scientific Assessment	Dhote, L.| Sharma, P.| Dogra, S.| Arulrajan, P.| Pandey, P.| Kansal, A.| Dhiman, M.| Gautam, A.S.| Gautam, S.	2024	Aerosol Science and Engineering	3.5
59	Influence of coatings on residual strength of geopolymer concrete columns subjected to fire	Kanagaraj, B.| Anand, N.| Raj R, S.| Jerry, R.| Lukose, J.| Lubloy, E.	2024	Case Studies in Construction Materials	9.7

	exposure: An experimental investigation				
60	Evaluation of mechanical, durability and sustainability performance of geopolymer concrete using sodium silicate waste as source material	Kanagaraj, B.| Anand, N.| Samuvel Raj, R.| Lubloy, E.	2024	Case Studies in Construction Materials	9.7
61	Farm-era: Precision Farming with GIS, AI Pest Management, Smart Irrigation, Data Analytics, and Optimized Crop Planning	Reddy, K.P.| Roshni Thanka, M.| Edwin, E.B.| Ebenezer, V.| Stewart Kirubakaran, S.| Joy, P.	2024	7th International Conference on Inventive Computation Technologies, ICICT 2024	-
62	Nano-bentonite as a sustainable enhancer for alkali activated nano concrete: Assessing mechanical, microstructural, and sustainable properties	Samuvel Raj, R.| Arulraj, G.P.| Anand, N.| Kanagaraj, B.| Lubloy, E.	2024	Case Studies in Construction Materials	9.7
63	Assessing LDPE microplastics' impact on green gram (Vigna radiata L. Wilczek) cultivation: A greenhouse pot experiment	Sravya, G.C.| Gautam, S.| Kumar, K.U.| Poonguzhali, R.S.| Manuel, R.I.	2024	Physics and Chemistry of the Earth	6
64	Innovations in poly(3-hydroxybutyrate-co-3-hydroxyvalerate) and nanocomposites for sustainable food packaging via biochemical biorefinery platforms: A comprehensive review	Dey, P.| Haldar, D.| Sharma, C.| Chopra, J.| Chakrabortty, S.| Dilip, K.J.	2024	International Journal of Biological Macromolecules	10.3
65	Machine learning techniques for route optimizations and logistics management description	Reyana, A.| Kautish, S.	2024	Computational Intelligence Techniques for Sustainable Supply Chain Management	-
66	Genome editing of Plant Growth-Promoting Microbes (PGPM) towards developing smart bioformulations for sustainable agriculture: Current trends and perspectives	Thankappan, S.| Binodh, A.K.| Kumar, P.R.| Kurien, S.| Narayanasamy, S.| Prabina, J.B.| Uthandi, S.	2024	Genome Editing in Bacteria (Part 2)	-
67	Utilizing banana peduncle as an affordable bio-adsorbent for efficient removal of lead ions from	Muthusamy, P.| Murugan, S.| Mandal, S.K.| Mishra, B.| Mohanta, Y.K.| Sarma, H.| Narayan, M.	2024	Sustainable Chemistry for the Environment	2.3

	water and industrial effluents				
68	A Comprehensive Food Identification and Waste Reduction Solution with Built-in Nutritional Tracking using Machine Learning	Jonathan, J.| Benjamin, R.M.| Prasad, G.P.	2024	Proceedings - 2024 8th International Conference on Inventive Systems and Control, ICISC 2024	-
69	Plant-based biopolymers for wastewater pollutants mitigation	Harshan, K.| Rajan, A.P.| Kingsley, D.| Sheikh, R.A.| Aashmi, J.| Rajan, A.P.	2024	Physical Sciences Reviews	2.6
70	Smart Waste Bins using DCNN and Internet of Things	Ande, A.| Sundar, G.N.| Thomas, R.| Nair, V.| Narmadha	2024	2nd International Conference on Emerging Trends in Information Technology and Engineering, ic-ETITE 2024	-
71	Spatial analysis and assessment of soil erosion in the southern Western Ghats region in India	B, A.| K.R, R.| R, S.R.| M, M.D.| K, R.	2024	Environmental Monitoring and Assessment	5
72	Dynamics of Microbial Ecology, Particulate Matter, and Bacterial Aerosols in Agriculture: Implications for Health and Sustainability	Gautam, S.| Rathikannu, S.| T, J.J.| Bhagat, P.S.| Singh, V.V.| Lakra, A.R.	2024	Water, Air, and Soil Pollution	4.6
73	Crop Recommendation and Disease Prediction Using IOT and AI	Sathya Priya, K.| Ancy Jenifer, J.| Janani, S.P.| Shilpa Aarthi, M.| Kavitha, T.	2024	Proceedings of the 2024 10th International Conference on Communication and Signal Processing, ICCSP 2024	-
74	Deep Learning in Smart Manufacturing: Advancements, Applications, and Challenges	Natarajan, G.| Bai, S.C.P.A.| Balasubramanian, S.| Elango, E.	2024	Intelligent Computing and Optimization for Sustainable Development	-
75	A comprehensive study on engineering and sustainability characteristics with emphasizing on 3R's approach in building construction	Raj R, S.| Arulraj, G.P.| Anand, N.| Kanagaraj, B.| Naser, M.Z.| Lubloy, E.	2024	Heliyon	4.1

76	Natural and synthetic fiber reinforced recycled aggregate concrete subjected to standard fire temperature	Kanagaraj, B.| Shaji, S.| Jafrin, M.| Raj R, S.| Anand, N.| Lubloy, E.	2024	Heliyon	4.1
77	Unlocking potential: temperature-driven morphology and electrolyte influence on chemical-free pineapple peel-derived amorphous carbon for enhanced electrochemical performance	Shadap, M.| Vinofia, S.| Subbiah, K.| Suryakanth, J.| Ayyasamy, S.	2024	Ionics	4.5
78	Mitigation of drought stress effects on alfalfa (*Medicago sativa* L.) callus through CaO nanoparticles and graphene oxide in tissue culture conditions	Yazicilar, B.| Nadaroğlu, H.| Alayli, A.| Nadar, M.| Gedikli, S.| Bezirğanoğlu, İ.	2024	Plant Cell, Tissue and Organ Culture	4.8
79	Sustainable Management and Advanced Techniques of Synthetic Microfiber Waste Through Circular Economy	Iyer, A.| Nambiar, K.S.| Murugan, S.	2024	Environmental Science and Engineering	0.5
80	Design of Greenhouse System with Internet of Things and Machine Learning	Pari Pugazh, M.| Arul Xavier, V.M.| Shyni, S.S.	2024	10th International Conference on Advanced Computing and Communication Systems, ICACCS 2024	-
81	Challenges and strategies for waste food anaerobic digestion: insights and future directions	Shabbirahmed, A.M.| Somu, P.| Yang, H.-H.| Hiruthyaswamy, S.P.| Karua, C.S.| Yadav, A.K.	2024	Environment, Development and Sustainability	11.1
82	Sustainable groundwater development using semi-supervised learning and community-led total forestry and pasture approach	S, U.M.| Alphy, A.| Deivasikamani, G.| Prakash, U.| Shadrach, F.D.| Kumar, M.A.| Manoj, S.	2024	Groundwater for Sustainable Development	9.5
83	Integrating the NDVI-Random Forest Classification for Vegetation Analysis - Yercaud Hills, India	Navin, M.S.| Aravind Sidharth, B.G.| Richard, G.J.	2024	2nd IEEE International Conference on Data Science and Information System, ICDSIS 2024	-

84	Morphological and Productivity Response of Chickpea (Cicer arietinum L.) to Nano Biofertilization	Abisankar, M.S.| Augustine, R.| Manuel, R.I.| Kumar, S.M.S.	2024	Legume Research	1.7
85	Recovery of Elements Using Green Plants for Potential Valorization of Waste Metals	Mamatha Bhanu, L.S.| Mitra, A.| Iyer, A.| Gupta, D.K.| Chatterjee, S.	2024	Valorization of Resources from Urban Mined Materials: World Scientific Series on Advances in Environmental Pollution Management - Volume 3	-
86	Adaptive Water Quality Potability Prediction and Analysis Through GEM Continual Learning Algorithm for Sustainable Resource Management	Jeremy David, C.| Shibin, D.	2024	10th International Conference on Advanced Computing and Communication Systems, ICACCS 2024	-
87	VGG-16 based Deep Learning Approach for Plant Species Detection	Praveen, B.| Isravel, D.P.| Malar Dhas, J.P.	2024	2024 International Conference on Advances in Modern Age Technologies for Health and Engineering Science, AMATHE 2024	-
88	Optimizing Waste Management: Integrated Pollution Detection and Systematic Reporting for Sustainable Disposal	Samuel Prabakaran, M.| Sophia, S.| Sophas Samuel, S.	2024	Proceedings of the 2nd IEEE International Conference on Networking and Communications 2024, ICNWC 2024	-
89	Effect of sea sand in the behaviour of fresh concrete partially replaced with M-sand	Neethu, S.| Tensing, D.| Vincent Sam Jebadurai, S.	2024	Research on Engineering Structures and Materials	2
90	Avenues and opportunities of detoxification of micropollutants from industrial effluent using advanced biological treatment techniques	Kandasamy, S.| Babu, S.A.| Dwaraka, S.J.B.| Naveenkumar, M.| Nandakumar, N.P.| Subbiah, K.	2024	Emerging Innovative Trends in the Application of Biological Processes for Industrial	-

				Wastewater Treatment	
91	Thermophilic Microbes: Their Role in Plant Growth Promotion and Mitigation of Biotic Stress	Kumar, S.| Rahman, M.| Gayithri, M.| Anjali| Bouket, A.C.| Naveenkumar, R.| Ranjan, A.| Rajput, V.D.| Minkina, T.| Singh, R.K.	2024	Extremophiles for Sustainable Agriculture and Soil Health Improvement	-
92	Energy Meter Data Analysis and Tariff Optimization for Consumption Management	Akkara, S.| Selvakumar, A.I.	2024	Proceedings of the 2024 International Conference on Advancement in Renewable Energy and Intelligent Systems, AREIS 2024	-
93	Characterization of Enhanced Magnetorheological Fluid Damper and Its Influence on Sustainable Hard Turning of SS410	Ajay Vasanth, X.| Sam Paul, P.| Lawrance, G.| Rajkumar, V.| Senthilkumar, K.	2024	SAE Technical Papers	1.1
94	Metals Recovery from Electrical and Electronic Waste	Iyer, A.| Nambiar, K.S.| Gupta, D.K.| Murugan, S.	2024	Valorization of Resources from Urban Mined Materials: World Scientific Series on Advances in Environmental Pollution Management - Volume 3	-
95	Scouting rice (*Oryza sativa* L.) landraces for moisture stress tolerance using morphometric diversity analysis	Kathiresan, P.K.| Binodh, A.K.| Thankappan, S.| Francis, N.| Selvaraj, R.| Ramasamy, N.K.| Alagarswamy, S.	2024	Plant Science Today	1.1
96	Fabrication methodology and hardness influenced by hybrid layer of a novel Entada Rheedii and banana fibre reinforced epoxy resin composite	Unnikrishnan, C.P.| Christy, T.V.| Raja, R.	2024	Journal of Maritime Research	0.3
97	Soil zinc dynamics over time on applied organics, bacterial inoculant and zinc fertilizers in calcareous soil of southern India	Bose, K.S.C.| Selvi, D.| Vinothini, R.| Balaganesh, B.| Kumar, V.V.| Venkatesh, V.| Kumaran, V.R.S.	2024	Plant Science Today	1.1

98	Artificial Intelligence for Precision Agriculture	Raj, P.| Gayathri, N.| Kathrine, G.J.W.	2024	Artificial Intelligence for Precision Agriculture	-
99	Biocalcification-Based Stabilization of Cadmium-Enriched Phytoremediation Biomass Using Advenella sp. AV1	Shah, V.| Mahanty, B.| Daverey, A.	2024	Water, Air, and Soil Pollution	4.6
100	Circular Models and Strategies to Reduce and Reuse Food Waste	Sharath, K.N.| Ranganathan, T.V.	2024	Novel Approach to Sustainable Temperate Horticulture	-
101	Role of Digital Twins in Promoting Sustainability in Commerce	Venkatesan, R.| Benny, B.| Shirley, C.P.| Berin Jeba Jingle, I.	2024	Proceedings - 2024 4th International Conference on Pervasive Computing and Social Networking, ICPCSN 2024	-
102	Development of CNN Model for Detecting Groundnut Leaf Diseases Using Mobile Net	Sree, Y.S.S.| Reddy, V.C.| Dolly, D.R.J.	2024	Proceedings of 2024 International Conference on Science, Technology, Engineering and Management, ICSTEM 2024	-
103	A study on the assessment of pollution and strategies for rejuvenation of Bharathapuzha river in Kerala, India	Anto, C.A.| Verghese, V.| Kurian, P.K.| Cyriac, M.G.| Archana, S.	2024	International Journal of Water	0.4
104	Multi-class Classification and Pretrained Sustainable Agriculture Model for Plant Leaf Disease Detection Using Resnet-101	Teja, A.R.| Stephen, S.| Subathra, M.S.P.| Ewards, S.E.V.| Mahmood, Md.R.| Mohan, A.| George, S.T.	2024	IET Conference Proceedings	0.4
105	Active and Intelligent Antimicrobial Coating Systems	Dineshkumar, T.| Sangeetha, S.| Pragalyaashree, M.M.| Freeda Blessie, R.	2024	Food Coatings and Preservation Technologies	-

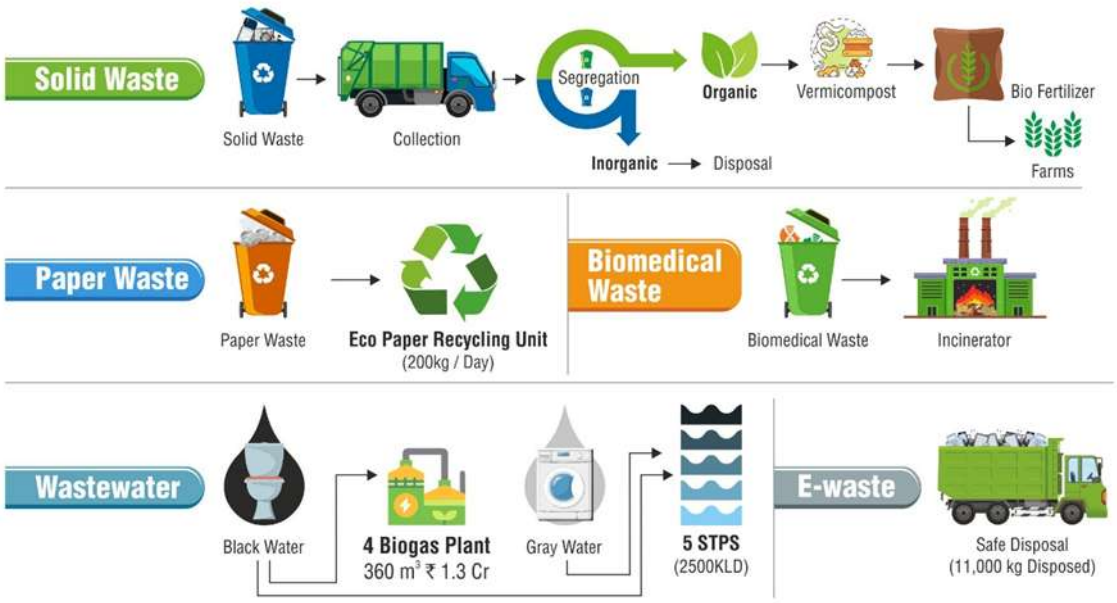
[12.3] Proportion of recycled waste

[12.3.1] Waste tracking

Measure the amount of waste generated and recycled across the university

3R (Reduce, Reuse and Recycle) Program for University Waste

Karunya Institute of Technology and Sciences (KITS), is committed to promote sustainability and corporate social responsibility. As a leading technical educational institution, we are committed to procuring goods and services in a manner that aligns with sustainable values and promotes environmental and social wellbeing. KITS being a residential institution with 8500 students and 800 faculty/staff living in the 15 resident halls and 15 apartment complexes spread across 750-acre campus, several strategies have been adopted to implement the Sustainable Development Goals of UN, for effective management of solid waste, grey and black water.



Type of Waste	Treatment / Management
Solid Waste	Collection, Segregation and disposal of waste Organic waste: Aerobic composting ,Vermicomposting
Paper Waste	Eco-Paper Recycling Unit to treat 75-100 k/day of waste paper
E-Waste	3,500 kg/year generated and disposed through authorized agency of Pollution Control Board
Biomedical Waste	250-300kg/year generated and disposed through authorized agency of Pollution Control Board
Kitchen and Food Waste	20% of the food waste is utilized through Biogas Plant. 80% used for piggeries.

Scientific and Technological Intervention in Waste Management at KITS:

Faculty and students are involved in pilot projects, demonstration related to waste management. At the Water Institute – a Centre of Excellence, the following research activities are pursued with grants from MoEF&CC and DST, GoI.

- Evaluating the performance of the unit operations in the STPs, based on modeling and simulation studies
- Periodic monitoring and characterization of the raw and treated effluents from STPs
- Biochar preparation using agricultural farm waste for purification of contaminated water
- Isolation of microbes from campus STPs for the bioremediation of waste water and treatment of effluents from small scale textile dyeing units in and around Coimbatore
- Treatment of used cutting fluid from mechanical workshops on campus using the Petroleum Remediation Product (PRP®), a NASA product from UniRem Technology, Pittsburgh, USA
- Treatment of greywater using microbial fuel cells
- Recycling and reuse of detergent water using electrocoagulation technology
- A conceptual model on decentralized wastewater treatment at household and community level

Waste generation and collection

Solid Waste Management and Recycling:

- To manage solid waste, collection bins have been placed at different locations on campus. After segregation, the biodegradable waste is subject to degradation by organic composting and the bio-fertilizer is utilized in the 329-acre experimental farm for academic, research and community development activities.
- Considering the health and hygiene of the students, 2 incinerators have been installed in the ladies' residence.

Liquid Waste Management:

The grey and black water from the residences are treated in the 5 Sewage Treatment Plants (STP) installed on campus, at an investment of Rs. 300 lakhs. 2500 KLD of wastewater is treated through the primary, biological and tertiary units that are fitted with screens to remove large non-biodegradable and floating solids such as rags, papers, plastics, tins, containers and wood chips**, a fluidized bed bio-reactor for** aerobic treatment of degradation of wastewater and a filtration system to remove suspended matter, micro-organisms and algae, and a sludge drying bed. The water is reused for gardening and irrigation through 118 outlets on campus.

The four Biogas plants of 360 cu.m capacity generate 114 kg of cooking gas/day (equivalent to 6 commercial gas cylinders) through the treatment of black and grey water from resident halls. The facility was installed with an investment of Rs. 130 lakh.

Hazardous Waste:

KITS follows the UGC guidelines, 2011 with regard to usage and storage of chemicals for academic and research purposes.

3,500 kg/year of E-waste generated and disposed through authorized agency of Pollution Control Board and biomedical waste of 250-300kg/year generated and disposed through authorized agency of Pollution Control Board.

PAPER Waste

a) Preamble

- Every recycled ton of paper saves approximately 17 trees and saves approximately 462 gallons of oil.
- Recycling paper reduces the air and water pollution from paper manufacturing unit
- Handmade paper from recycled materials is one of the dreams of our father of nation Mahatma Gandhi. It is our duty to join hands to make his dream come true.

b) Waste Paper in Karunya Campus

- It is estimated that around **75 - 100 Kg** (30,000 – 35,000 kg for 300 days in a year) of waste paper is segregated from waste generated in the Campus daily.

Total volume organic waste produced

Type of organic waste	Total Produced (ton per day)
Food waste	2.5
Leafy biomass, vegetable cuttings etc.	2.5 to 4
Night soil	1

Biological Waste Management

KITS being a residential institution with 8500 students and 800 faculty/staff living in the 15 resident halls and 15 apartment complexes spread across 750-acre campus. Approximately, 2.5 tons per day of food waste is generated from 15 residential halls. A total of 2.5- 4 tons per day of leaf litter, crop residues and vegetable wastes are collected from hostels, garden, trees and other plants.

Inorganic waste

KITS being a residential institution with 8500 students and 800 faculty/staff living in the 15 resident halls and 15 apartment complexes spread across 750-acre campus. Approximately, 25 – 30 tons of plastics and metal scraps are generated per month.

Total volume inorganic waste generated

Type of inorganic waste	Total Produced (ton)
Plastic and metal scraps	25 – 30 tons /month

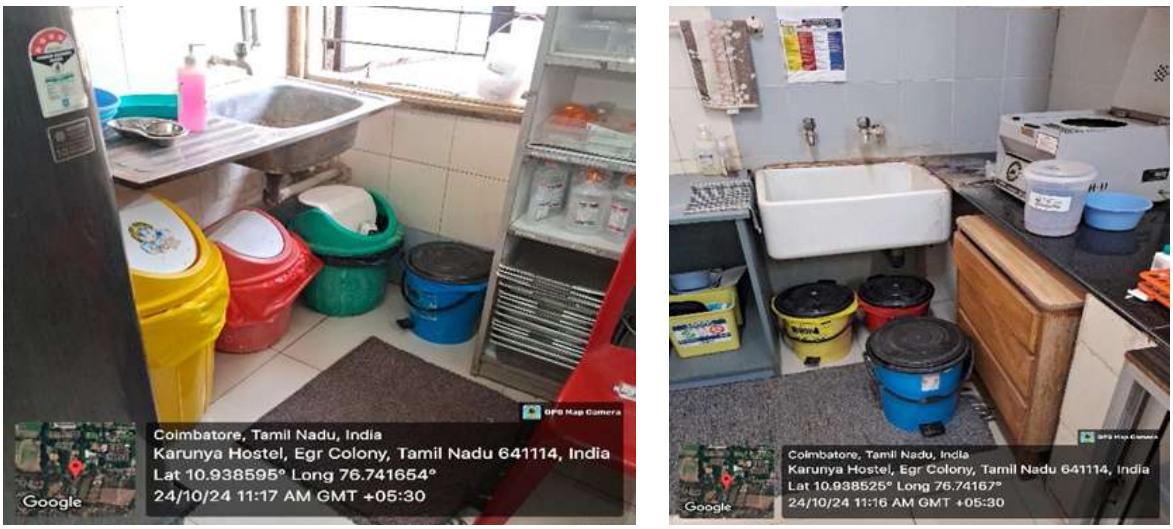
E-waste generated

Waste Management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes". Being an Educational Institutional Campus, Karunya University houses around 10,000 residents in campus. So, a huge amount of waste of different kinds is generated. Accumulation of uncollected mixed garbage paves the way for the spread of perilous diseases and contamination of natural resources such as water, air and land. Hence it is imperative that the waste generated has to be handled in a professional way to ensure an environmental friendly residential campus. Implementation of an effective solid waste management project shows a way to "Zero Garbage Zone' and prevents us from the ill effects of garbage. In 2017, 1500 kg of e-waste generated was handed over to private vendors (authorized by the TN PCB) for disposal. In 2021- 2022, 5810 kg, in 2022-23, 3946kg and in 2023-24, 3770 Kg. of e-waste was generated.

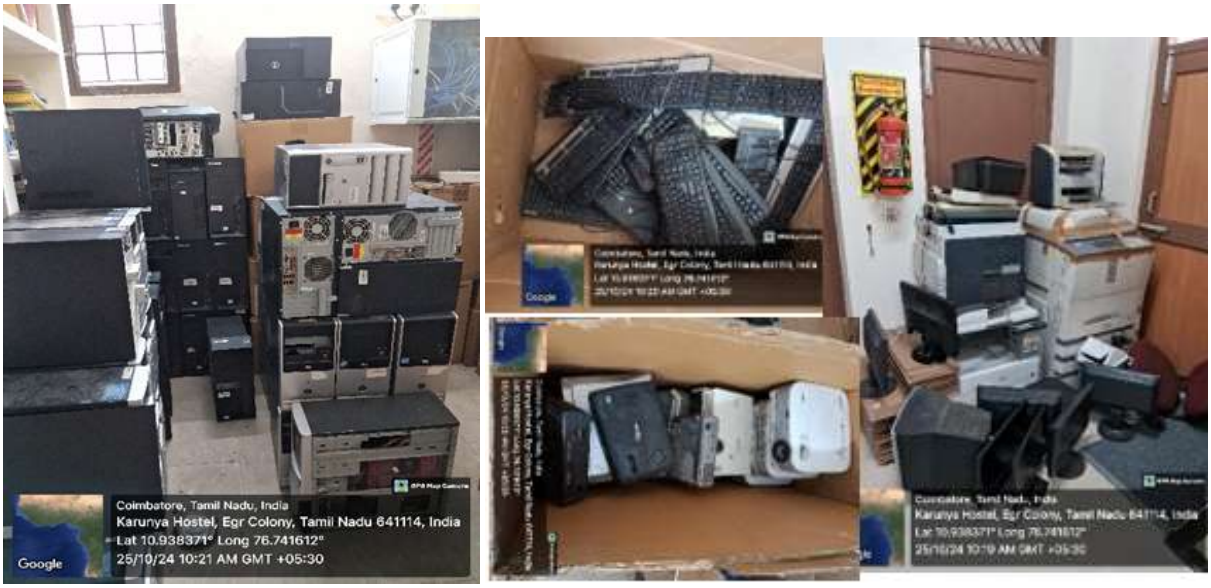
Total volume toxic waste produced

Bio-medical waste

Being an Educational Institutional Campus, Karunya University houses around 10,000 residents in campus. Karunya Community Hospital generates 18 – 25 kg of biomedical waste per month.



Collection of Biomedical waste



E-Waste Collection

12.3.2. Amount of Waste recycled

Paper and plastic waste

PAPER RECYCLING PLANT

a) Preamble

- Every recycled ton of paper saves approximately 17 trees and saves approximately 462 gallons of oil.
- Recycling paper reduces the air and water pollution from paper manufacturing unit
- Handmade paper from recycled materials is one of the dreams of our father of nation Mahatma Gandhi. It is our duty to join hands to make his dream come true.

b) Waste Paper in Karunya Campus

- It is estimated that around **75 - 100 Kg** (30,000 – 35,000 kg for 300 days in a year) of waste paper is segregated from waste generated in the Campus daily.

c) Paper Recycling Plant

- Making use of the above quantity of waste paper, the **Eco-friendly Paper Recycling Plant** is functioning in the Campus since January 2017.
- Total cost of the Plant is Rs.25.0 Lakhs.
- Currently, Paper Boards (Grey Board) are produced and sold to vendors, quantifying around 25 – 30 tons of paper board every year.
- Products like files, folders and decorative articles can be made using the paper boards.
- Students visit the paper recycling facility for developing entrepreneurial, research and leadership skills.
- Besides its commercial prospects, the recycling activity will create awareness on 'Waste Management' among the stakeholders of all Karunya institutions.

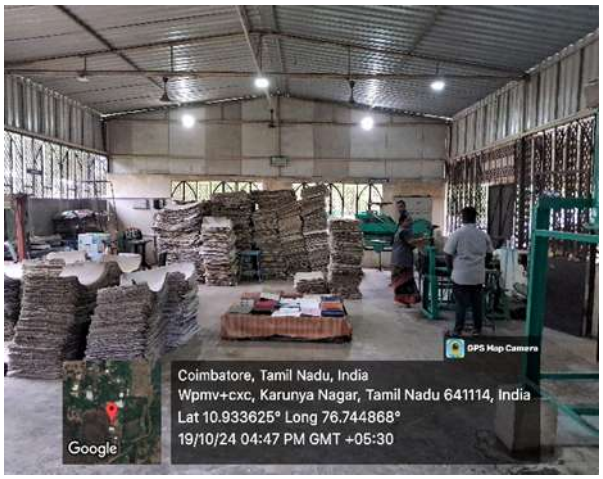
https://www.youtube.com/watch?v=za4I46LcU0g&t=4s

Gasification of Plastic Waste (Project title: Design of 2 TPD Rotary Kiln Gasification Pilot Plant with high CV syngas production)

Cost : Rs. 6.12 crores
Duration: 2021-2024

The project will demonstrate a working model for industries/ governments and would be an opportunity for the stakeholders to understand how their plastic waste can be disposed in an environmentally friendly manner while producing energy, which will partially offset the cost of waste management.

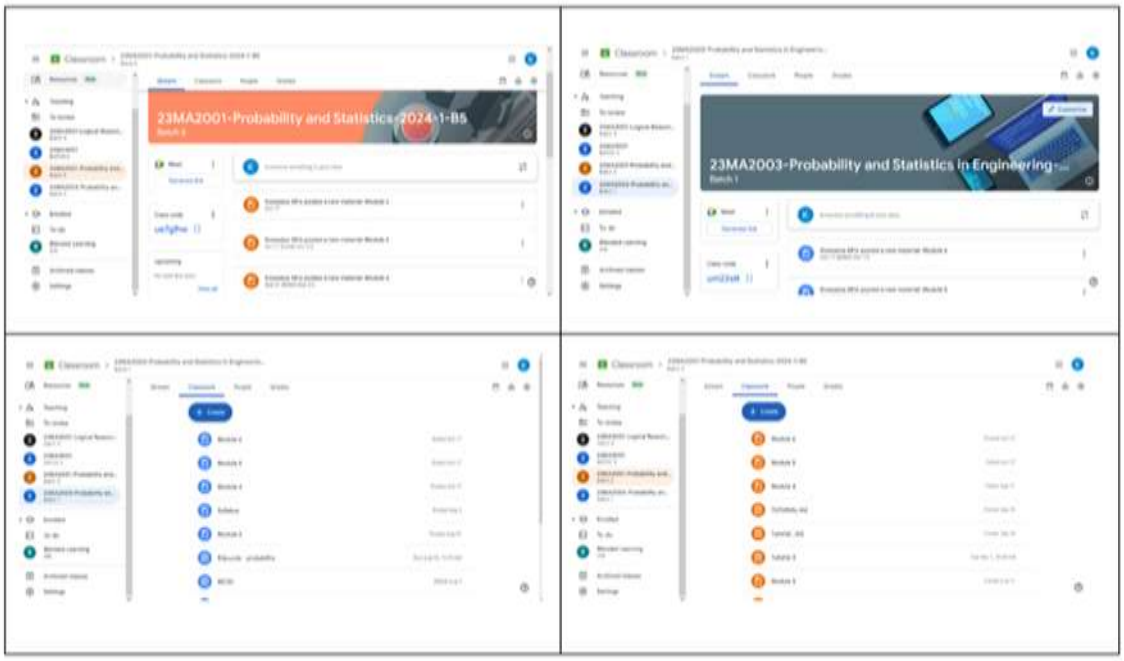
Program to Reduce the use of Paper and Plastic on Campus



Paper recycling plant

Plastic Gasification Unit at KITS

Sign Boards for Plastics



Digital Notes for Students

Use of Glass Bottles in Conferences

Awareness Programme for the Students on Reduced Paper Use and Recycling of Paper

Biological Waste Management

The crop residues, the dry leaves collected from hostels, garden, trees and other plants are recycled by Vermicomposting pits (4 Nos) in our Karunya farm. Nearly 4 tonnes of campus waste is recycled per year. Food waste generated in the campus is disposed of through a private vendor for his piggery units.

Vermicompost Unit in North farm-KITS

Recycling of Solid and Liquid Wastes in Hostels

Currently, around 70% of the night soil and 20 % of the food waste generated in the hostel zones (both ladies and gents) of Karunya Campus are treated by existing biogas plant of 80 m^3 capacity. The treated effluent from biogas plant is diverted to Bethany STP for storage and utilized for irrigation/gardening. The gas generated is utilized for cooking purpose. Also, the sludge obtained from STP is disposed of on the land, which can be utilized as bio-fertilizer after composting. Four biogas plants are under operation to treat the organic waste generated from kitchen and toilets in all Ladies hostels and Gents hostels (Hebzipha & Angelina, FDR and Bethany).

Vermicomposting

The crop residues, the dry leaves collected from hostels, garden, trees and other plants are recycled by Vermicomposting pits (4 Nos) in our Karunya farm. Nearly 4 tonnes of campus waste is recycled per year. Food waste generated in the campus is disposed-off through a private vendor for his piggery units.

BIO-GAS PROJECT

i) Bio-gas – An overview

- A ***biogas plant*** is a decentralized energy system, which can lead to self-sufficiency in heat and power needs, and at the same time reduces environmental pollution.
- Biogas is a gas mixture which is generated when organic compounds are fermented in the absence of air (anaerobic fermentation). This gas mixture is mainly made of carbon dioxide (CO_2) and methane (CH_4). Methane is a combustible gas, which means it can be burned. It can be used as a sustainable renewable fuel for cooking and lighting.
- Organic matter such as manure (human or animal) is used to feed the plant. The process of anaerobic fermentation will then take place here, to generate biological gas (biogas).

ii) Bio-gas plants in Karunya Campus

Since being a residential campus, the night soil and food waste generated in the hostel zones (both ladies and gents) of Karunya Campus are treated by biogas plant installed in the following locations:

Sl. No.	Location	Capacity of the Bio-gas Plant	Year of Installation	Cost of the Plant (in Lakhs)	Savings in terms of LPG Cylinders (19Kg) /Day	Savings in terms of cost /Year (Rs.)
1	FDR Campus	$100m^3$	2017	32.0	2 Nos.	6.60 Lakhs
2	JMR Campus	$80m^3$ (Multi feed)	2010	26.0	2 Nos.	6.60 Lakhs
3	Ladies Hostel (PRG Campus)	$100m^3$	2017	32.0	2 Nos.	6.60 Lakhs
4	Ladies Hostel (EVR Campus)	$80m^3$	2017	26.0	1.5 Nos.	4.90 Lakhs

- The treated effluent from biogas plant is diverted to the STP for storage and utilized for irrigation/gardening. This will reduce the organic load coming to two STPs of capacity 6 and 4.5 lakh litres of sewage and their operational & maintenance cost.

- The biogas produced from the plant can be utilized for cooking, and the residual dung or the digested slurry left after generating *biogas* can be used as manure for agricultural purposes

iii) Sewage treatment plants in Karunya Campus

STP-Father Duraisamy Residence

Feed given to STP: Water from FDR, EGR & Hephzibah Hostels.

Capacity of the STP is : 4, 00,000 LPD
Number of beds available to remove the sludge : 12
Sludge removal from STP : Once in 4 days
Number of beds filled : 4

Bed dimensions
Length of the bed : 3.15m
Breadth of the bed : 1.89m
Height of the bed : 0.75m

Volume of 1 bed is given by = length*breadth*height
= 3.15*1.89*0.75
= 4.4651 Cubic meter

Volume of 4 beds = 4*4.4651
= 17.8605 Cubic meter

Water Treated daily
Water Recycled at Father Duraisamy Residence : 2, 40,000 LPD

Sludge Utilisation

Sludge is utilised in farming and gardening purposes and the details are given below

- JMR & JVR – Backside (Fields)
- SYNDICATE BANK, NEW AUDITORIUM- Garden
- Hephzibah & Angelina Residence – Garden
- Then fields extend up to SEMMEDU (outer).

Paper Recycling Process and Production of New Stationary Product

Commercial vermicomposting unit at the North Farm

Sewage Treatment Plant

Biogas plant in residential unit at KITS

Inorganic Waste Treatment

Waste Management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes". Being an Educational Institutional Campus, Karunya University houses around 10,000 residents in campus. So a huge amount of waste of different kinds is generated. Accumulation of uncollected mixed garbage paves the way for the spread of perilous diseases and contamination of natural resources such as water, air and land. Hence it is imperative that the waste generated has to be handled in a professional way in order to ensure an environmental friendly residential campus. Implementation of an effective solid waste management project shows a way to "Zero Garbage Zone' and prevents us from the ill effects of garbage. In 2017, 1500 kg of e-waste generated was handed over to private vendors (authorized by the TN PCB) for disposal. In 2019, 4630 kg of e-waste was generated and in 2020 about 4200 kg, in 2022, 5556 kg and in 2023 1,550 Kg. of e-waste was generated.

Metal scraps – The metal scraps collected from campus are sold to local vendors. In 2019-20, 9109 kg of materil was sold at a price of Rs, 312526. In 2020-21, 33771 kg of material was sold at a price of Rs, 17,28,377. In 2021-22, 34056 kg of material was sold at a price of Rs, 1258299. In 2022-23, 39243 kg of material was sold at a price of Rs, 1974535.

Gasification of Plastic Waste (Project title: Design of 2 TPD Rotary Kiln Gasification Pilot Plant with high CV syngas production)

Cost : Rs. 6.12 crores, Duration: 2021-2024

Plastic Gasifying unit at KITS

E-Waste handling

- In compliance to the E-Waste Management Rules, 2016, Government of India,e-waste materials collected from Karunya Institutions are being segregated and being sold to agencies which are authorized by the Polution Control Board (PCB) for handling e-waste.

- The details of sale of e-waste during the last 5 years are as below:

Sl.No.	Year	Qty. Disposed	Name of the agency (Authorized by the PCB) with address
1)	2020	4,200 Kg.	M/s Green Era Recyclers, SF No. 344/2, Sivanandha Industrial Complex, Dr.MS Udhayamurthy Nagar, Door No. 37, Thadagam Road, Edayarpalayam, Coimbatore – 641 025.
2)	2021	Nil.	
3)	2022	5,556 Kg.	
4)	2023	3946 Kg.	
5)	2024		

Certificate no.: GER2324011 Authorisation no.: 01/EWM Date: 29-05-2023

Certificate of E-waste Recycling

This is to certify that 1550 KG of E-waste collected from

Karunya Institute of Technology & Sciences

dated on 29-04-2023 against manifest number Inv. No - KERT0002 has been

recycled in an environmentally friendly manner.

We thank you for your efforts in contributing towards clean & green environment.

Your next due date for disposal 25-10-2023

GreenEra RECYCLERS

Aspire · Elate · Recycle

+91 8300223526 / +91 9361328436

No 37, Sivanandha Industrial Complex, Dr. MS Udayamurthy Nagar, Thadagam Road, Edayarpalayam, Coimbatore - 641025

info@thegreenera.in

thegreenera.in

Note: As per CPCB Guidelines, the E-waste materials shall not be stored more than 180 days & should be disposed off to the PCB authorized E-waste Handler.

For Green Era Recyclers

Green Era Recyclers is authorised by TNPCB

Certificate of e-waste recycling

GREEN ERA RECYCLERS

ELATE | RECYCLE | ASPIRE

E-waste Recycling facility Authorized By TNPCB

Authorization No : 01/ EWM

Certificate No: GER21220076 Issue Date: 18-04-2022

CERTIFICATE OF E-WASTE RECYCLING

This is to certify that 1136 kg of E-waste collected from Karunya Institute of Technology & Sciences dated on 18-03-2022 against manifest number 63 which shall be recycled and disposed of in a scientific and environmental friendly manner.

We thank you for your efforts in contributing towards clean and green environment

Authorized signatory

Name Prasanth Omanakuttan

Designation Managing Partner

ADDRESS : SF No. 344/2, Sivanandha Industrial Complex, DR.M.S. Udhayamurthy Nagar, Door No.37, Thadagam Road, Edayarpalayam, Coimbatore- 641 025

CONTACT : +91 83002 23526 prasanth@thegreenera.in www.thegreenera.in
+91 93613 28436 info@thegreenera.in

Certificate of e-waste recycling

Karunya
INSTITUTE OF TECHNOLOGY AND SCIENCES
(Declared as Deemed to be University under Sec. 3 of the UGC Act, 1956)
NAAC, UGC & AICTE Approved

A++ NAAC

I. Athisayamani Asirvatham,
Administrative Officer

KITS/AO/STR/SWM/WO/253/'24
March 25, 2024

To
M/s Green India Process,
16/1, Nethaji Nagar,
Chettipalayam Main Road,
Podanur,
Coimbatore – 641 023
Attn.: Mr. Allwin Prabhu (Mobile: 97864 91777)

Sir,

Sub.: Shifting of waste materials from Karunya Campus to the Government authorized waste dump yard – extension of contract period – ordered – reg.
Ref.: Work order vide KITS/AO/STR/SWM/WO/252/'23 dated 05.04.2023.

—xxx—

With reference to the above, we are pleased to inform that the period of contact mentioned in the work order cited under reference is extended upto **31/03/2025**.

All other points mentioned in the above-mentioned work order will remain the same.

Administrative Officer

Cc to: The Registrar, KITS / Director (Trust)
Director (Students) / Director (Security & Intelligence)
Chief Wardens/ Principals (EMHSS/KCS)/ Chief Engineer/ Senior Manager
Manager (Guest House)/Stores Officer
File

Karunya
INSTITUTE OF TECHNOLOGY AND SCIENCES
(Declared as Deemed to be University under Sec. 3 of the UGC Act, 1956)
MoE, UGC & AICTE Approved

A++ NAAC

I. Athisayamani Asirvatham,
Administrative Officer

KITS/AO/STR/SWM/WO/ 254/'24
March 25, 2024

To
M/s Metro Support Services,
78, Rangammal Colony,
NGGO Colony Post,
Coimbatore – 641 022
Attn.: Mr. D. Ivan Rajadurai (Mobile: 9087793999)

Sir,

Sub.: Operating Paper Recycling Plant – extension of contract period – ordered – reg.
Ref.: Work order vide KITS/AO/STR/SWM/WO/251/'23 dated 31.03.2023.

—xxx—

With reference to the above, we are pleased to inform that the period of contact mentioned in the work order cited under reference is extended upto **31/03/2025**.

All other points mentioned in the above-mentioned work order will remain the same.

Administrative Officer

Cc to: The Registrar, KITS / Director (Trust)
Director (Students) / Director (Security & Intelligence)
Chief Wardens/ Principals (EMHSS/KCS)/ Chief Engineer/ Senior Manager
Manager (Guest House)/Stores Officer
File

Kovai Biowaste Management Pvt Ltd

Client Consolidated Report

From	2891		01-02-23		To	28-02-23	Client ID	2203OCOCB0001							
			Vehicle				WASTE DETAILS								
Date	Client Old Id	Client Id	Vehicle No	In Time	Out Time	Contact Person	Yellow		Red		Blue		Container		Total
							Bag	Weight	Bag	Weight	Bag	Weight	Bag	Weight	
02-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:45:00	15:00:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
06-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	15:20:00	15:35:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
09-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	15:38:00	15:53:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
13-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:37:00	14:52:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
20-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:54:00	15:09:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
TOTAL							5	5	5	5	5	5	5	5	20

Kovai Biowaste Management Pvt Ltd

Client Consolidated Report

From	2891		01-01-23		To	13-01-23	Client ID	2203OCOCB0001							
			Vehicle				WASTE DETAILS								
Date	Client Old Id	Client Id	Vehicle No	In Time	Out Time	Contact Person	Yellow		Red		Blue		Container		Total
							Bag	Weight	Bag	Weight	Bag	Weight	Bag	Weight	
02-01-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AL6314	12:41:00	12:56:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
05-01-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	17:52:00	18:07:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
09-01-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	13:53:00	14:08:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
12-01-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	13:43:00	13:58:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
TOTAL							4	4	4	4	4	4	4	4	16

Kovai Biowaste Management Pvt Ltd

Client Consolidated Report

From	2891		01-11-22		To	11-11-22	Client ID	2203OCOCB0001								
			Vehicle				WASTE DETAILS									
Date	Client Old Id	Client Id	Vehicle No	In Time	Out Time	Contact Person	Yellow		Red		Blue		Container		Total
							Bag	Weight	Bag	Weight	Bag	Weight	Bag	Weight	
03-11-2022	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	15:28:00	15:43:00	ATHISAY AMANI	1	1	1	1	1	1	1	0	3
07-11-2022	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:12:00	14:27:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
10-11-2022	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	15:24:00	15:39:00	ATHISAY AMANI	1	1	1	1	1	0	1	0	2
TOTAL							3	3	3	3	3	2	3	1	9

Kovai Biowaste Management Pvt Ltd

Client Consolidated Report

From	2891		01-02-23		To	07-02-23	Client ID	2203OCOCB0001								
			Vehicle				WASTE DETAILS									
Date	Client Old Id	Client Id	Vehicle No	In Time	Out Time	Contact Person	Yellow		Red		Blue		Container		Total
							Bag	Weight	Bag	Weight	Bag	Weight	Bag	Weight	
02-02-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:45:00	15:00:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
TOTAL							1	1	1	1	1	1	1	1	4

Kovai Biowaste Management Pvt Ltd

Client Consolidated Report

From	2891		01-05-23		To	26-05-23	Client ID	2203OCOCB0001								
			Vehicle				WASTE DETAILS									
Date	Client Old Id	Client Id	Vehicle No	In Time	Out Time	Contact Person	Yellow		Red		Blue		Container		Total
							Bag	Weight	Bag	Weight	Bag	Weight	Bag	Weight	
04-05-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	15:03:00	15:18:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
11-05-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	13:55:00	14:10:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
15-05-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	17:21:00	17:36:00	ATHISAY AMANI	1	1	1	1	1	1	1	0	3
18-05-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	14:00:00	14:15:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
22-05-2023	2891	2203OCOCB0001-KARUNYA HOSPITALS	TN66AD8917	19:19:00	19:34:00	ATHISAY AMANI	1	1	1	1	1	1	1	1	4
TOTAL							5	5	5	5	5	5	5	4	19

Karunya
INSTITUTE OF TECHNOLOGY AND SCIENCES
(Declared as Deemed to be University under Sec. 3 of the UGC Act, 1956)
MoE, UGC & AICTE Approved

A++ NAAC

I. Athisayamani Asirvatham,
Administrative Officer

KITS/AO/STR/SWM/WO/252-/'23
April 5, 2023

To
M/s Green India Process,
16/1, Nethaji Nagar,
Chettipalayam Main Road,
Podanur,
Coimbatore - 641 023.
Attn.: Mr.Allwin Prabhu (Mobile: 97864 91777)

Sir,

Sub.: KITS – Shifting of Solid Waste from Karunya Campus – work order issued – reg.
Ref. : Quotation submitted by M/s Green India Process dated 20.03.2023.

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We are pleased to entrust the subject-cited work with the following specifications, rate and terms & conditions:

Sl. No.	Description of the work	Rate per month (Rs.)
1	a) To supply the required quantity of waste collection bags at the waste collection points (approximately 25 points) at KITS, Hostels, Staff Residences, EMHSS, KCS, Guest House, Karunya Hospital, and Students Meditation Centre without segregation; and b) To arrange for shifting of solid waste packages to the Government authorized waste dumping yard.	Rs. 6,200/- per trip of minimum 30 bags (app. 1 ton) of waste material (GST Extra)

Terms & Conditions:

1. Monthly bills along with photocopies of Gate-pass shall be submitted to the Officer Incharge before 5th of following month for which payments will be made before 15th of following month.
2. Payments will be released based on the satisfactory completion of the above scope of works.
3. The period of contract for this work order will be from 01/04/2023 to 31/03/2024, which may be extended further on mutual consent.
4. The Contractor shall obtain out-pass for shifting waste materials from the competent authority of each Campus.
5. Uniform, ID Cards, PPE, etc. should be issued to all workers by the Contractor.
6. The workers will not be permitted to use smartphones/mobile phone with camera inside Karunya premises.

...2

Work order of materials shifted to government approved dumping yard

KARUNYA INSTITUTE OF TECHNOLOGY & SCIENCES
(Declared as Deemed to be University under Section – 3 of the UGC Act 1956)
Karunya Nagar, Coimbatore – 641 114

18.12.2023

Report of the Quantification study on Solid Waste generated in the Campus (December 2023)

With reference to the O/o vide KITS/PVC (SIR)/OO/ 21 / 2023 dated 08.11.2023, the following committee have conducted the audit on various categories of solid waste materials generated in the campus:

1. Dr. Jibu Thomas, Professor & HOD (Biotechnology)
2. Dr. P.Levin Anbu Gomez, Assistant Professor (Biotechnology)
3. Dr. A.Obadiah, Assistant Professor (Physical Sciences)
4. Mr.C.Rajan, Stores Officer

The above committee visited the waste collection points at the following areas for the above mentioned audit purpose:

1) KITS Main Campus
2) Gents Residences / Mess
3) Ladies Residences / Mess
4) Karunya Hospital
5) Karunya Guest House
6) Students Meditation Centre
7) Canteens

The waste generated at the University Campus are categorized as below:

- Biodegradable Organic Waste (Food Waste / Leafy Biomass, etc.)
- Recyclable Waste (Waste Paper, Plastic, Metal waste, etc.)
- Mixed Waste Materials
- E-Waste
- Biomedical Waste

Observations:

1. The audit was conducted in the respective areas. We had observed the Organic waste and it was internally divided to be Food, Leafy Biomass and Night soil.
2. The recyclable waste was observed and further divided to waste paper and Plastic, metal wastes.
3. The Mixed waste (unsegregated waste) was observed, collected from the academic campus, hostels, mess and the same has been transported to Government authorized waste dumping area.
4. E-waste was also observed to be found from the Computer Technology Centre/laboratories and was segregated accordingly.
5. Bio-medical waste was observed to be found from the Hospital.

Findings:

1. The organic waste comprised to a total of 3,313 kg per day.
2. The recyclable waste comprised to a total of 186 kg per day.
3. The mixed waste comprised to a total of 1,860 kg per day.
4. The E-waste comprised to a total of 10 kg per day.
5. The Bio-medical waste comprised to a total of 1 kg per day.

Summarizing the waste management system, the system is effective and is efficient in handling the solid waste and the University has thereby optimized and maintained the 3R's of Solid waste management.

The overall quantity of solid waste (5,370 kg per day) has been collected, segregated and processed in accordance with guidelines given by the Pollution Control Board.

Details on the total waste collected in the campus are given below:

Sl. No.	Location	Organic Waste / Day (in Kg.)			Recyclable Waste / Day (in Kg.)		Mixed Waste / Day (Shifted to the Govt. authorized waste dumping area) (in Kg.)	E-Waste / day (in Kg.)	Bio-Medical Waste / Day (in Kg.)
		Food Waste, Veg. waste	Leafy Biomass	Night Soil	Waste Paper	Plastic, Metal, etc.			
1)	KITS Main Campus	30	400	1000	17	23	400	10	0
2)	FDR / EGR	84	200		8	15	300	0	0
3)	AR / HR	93	200		7	12	250	0	0
4)	JMR/BRR/BR/JVR	219	350		18	20	350	0	0
5)	Ladies Hostels	242	400		18	35	500	0	0
6)	Students Meditation Centre	7	50		4	2	40	0	0
7)	Karunya Hospital	5	20		3	2	15	0	1
8)	Karunya Guest House	3	10		1	1	5	0	0
	Total	**683**	**1630**	**1000**	**76**	**110**	**1860**	**10**	**1**

(C.Rajan) (Dr.A.Obadiah) (Dr.P. Levin Anbu Gomez) (Dr. Jibu Thomas)

Waste and Resources Management Policy

Karunya Institute of Technology and Sciences

WASTE AND RESOURCES MANAGEMENT POLICY

I. RELEVANCE AND SCOPE

1. Karunya Institute of Technology and Sciences (after this, KITS or Institute) understands its legal and ethical responsibilities to protect, conserve and work for a sustainable environment.
2. The Institute has highlighted its commitment to sound environmental management in other policy statements on different aspects of SDG. Some of the significant aims and deliverables for all aspects of sustainability, including waste management, are highlighted herein.
3. The Institute highlights socially relevant research in its Mission statement with water, food, healthcare and sustainable energy as its thrust areas. KITS is committed to making the Earth a better place to live in, a share of which can be achieved through the efforts of the Institute to work responsibly, ethically and morally in managing the campus and surrounding areas.
4. This Waste and Resource Management Policy ("the Policy") is intended to promote sound environmental management on the campus and surrounding areas through the participation of the entire KITS community. It outlines the Institute's commitments regarding sustainable waste management for the waste generated from its operations to reduce the negative impacts on the environment and avoid harm to human health.
5. This Policy highlights the Institute's determination to enhance waste and resource management from all perspectives, focusing on waste minimisation and working with the suppliers to introduce a circular economy.

6. This Policy demonstrates the determination of KITS to the Sustainable Development Goals, especially those on Sustainable Cities and Communities, Responsible Consumption and Production, Life Below Water, and Life on Land.
7. Waste and Resources Management Policy applies to all wastes, including hazardous waste, arising from the activities of the Institute on the campus. The partners of KITS shall follow the waste disposal procedures stipulated by the LSGs and the statutory bodies.
8. With its wastewater treatment and biogas plants, plastic waste to energy plant, and paper recycling plant, the KITS aims at a zero waste campus by 2040.

II. DEFINITIONS OF WASTE AND ADHERENCE TO ENACTMENTS

9. Waste may be defined as: "Any substance or object one discards, intends to discard or is required to discard".
10. The Institute is committed to compliance with waste legislation, statutory obligations, and codes of practice. It also manages all waste materials to minimise environmental impact and risk to public health by implementing and maintaining a standard environmental management system.
11. The Waste and Resources Management Policy of KITS has been drafted, considering the Ministry of Environment, Forests and Climate Change guidelines of the Government of India and the Central and State Pollution Control Boards. The National Environment Policy - 2006 highlighted waste disposal and the significance of recycling and treating waste.
12. The KITS Policy takes into cognisance the relevant and significant Enactments of the Government of India, such as The Solid Waste Management Rules – 2016, The Draft Liquid Waste Management Rules – 2024, The Hazardous Wastes (Management, Handling and Transformity Movement) Rules – 2008, The Plastic

Waste (Management and Handling) Rules – 2011, The Bio-Medical Waste (Management and Handling) Rules – 1998, The Batteries (Management and Handling) Rules – 2001, and The E-Waste (Management and Handling) Rules – 2011, and other stipulations of LSGs, UGC and statutory bodies.

13. In line with the principles of the waste hierarchy, the community in KITS shall work towards: Prevent – avoid creating waste; Reduce – minimising the amount of waste produced; Reuse – repair, refurbish or relocate items; Recycle – promote segregation of waste to increase the quantity of waste recycled; Recovery – send non-recyclable waste to energy recovery; and Dispose of – this will only be used as a last resort if all other options are exhausted.
14. The community shall also focus on Eliminating disposable items, including single-use plastic, where there is a clear case and a viable alternative exists; Collecting and analysing data (amount of waste generated by site and disposal method); setting waste improvement targets and monitoring and report annual data and progress against waste targets;
15. The KITS community shall also work with the suppliers, contractors, and partners to ensure this Policy's fulfilment and implementation on the campus and the surrounding areas.
16. The entire community, with the cooperation of Controlling Officers, shall work towards:
    - Integrating the principles of the circular economy into operations and procurement decisions to minimise waste generated,
    - Providing suitable training to staff involved in waste management to effectively implement the Policy,

- Engaging with academic departments to promote and support teaching and research on sustainable waste and resource management,
- Developing a Waste and Resources Strategy and Action Plan to support the implementation of this Policy,
- Ensuring that the relevant SDGs in the area are addressed.

III. ROLES AND RESPONSIBILITIES

17. The Chief Engineer (Construction and Maintenance)) is primarily responsible for managing compliance with the Policy in the entire campus/estate and ensuring adequate resources are available to deliver on its implementation.
18. The Deans of Schools shall ensure the implementation of policy on their premises, including laboratories and other units.
19. The Sustainability Team, the Deans of Schools, and the Chief Engineer shall review the progress made in implementing this Policy.
20. All stakeholders, including staff, students, contractors, suppliers, business partners and visitors, are responsible for adhering to this Policy.
21. Suggestions or complaints should be submitted to the Registrar, who, together with the University Coordination Committee, shall address all suggestions and complaints.
22. Regarding the complaints, the Vice Chancellor will be the final appealing authority.

THIS POLICY WILL BE REVISED FROM TIME TO TIME AS DEEMED NECESSARY