INTERNATIONAL COLLABORATION FOR SDG DATA & RESEARCH

Koneru Lakshmaiah Education Foundation (KLEF), Deemed to be University

INDICATOR	INSTITUTIONAL FOCUS
17.2.3 — International collaboration on gathering or measuring data for the SDGs	Joint research • environmental observations • scientific datasets • international publications • knowledge exchange

1. Executive Summary

KLEF participates in international research collaborations that contribute to the collection, analysis, interpretation and dissemination of scientific information relevant to the Sustainable Development Goals. A particularly strong example is the university's collaboration with the Institute for Space–Earth Environmental Research (ISEE), Nagoya University, Japan. Through this research partnership, KLEF faculty have undertaken analysis of long-term Global Navigation Satellite System (GNSS) Total Electron Content (TEC) observations covering 25 years (1997–2021), comparing Indian, Japanese and global regions to identify extreme ionospheric events and their implications for satellite navigation and aviation.

The university's international research profile is also reflected in 31 KLEF-affiliated co-authored publications spanning 2021–2026, with institutional affiliations across 27 countries. The research portfolio covers clean energy, smart grids, climate variability, agriculture, wastewater, pollution, sustainable materials, mobility, logistics, food systems and sustainable development assessment.

International engagement is reinforced by academic and research mobility agreements, participation in international scientific forums, institutional research policies and the presence of international research collaborators. These activities create channels through which research methods, datasets, analytical approaches and scientific findings can be exchanged across borders.

KEY INDICATOR	INSTITUTIONAL EVIDENCE
International co-authored publications	31 KLEF-affiliated records
Countries represented in publication affiliations	27
Publication period	2021–2026
Flagship scientific data collaboration	ISEE, Nagoya University, Japan — 25-year GNSS-TEC analysis
International academic partnership	UCSI University, Malaysia — MoU signed 9 January 2025
Research infrastructure collaboration	Georgia State University, USA — cosmic-ray muon detector and gLOWCOST network

2. Flagship International Collaboration: KLEF and Nagoya University, Japan

2.1 Joint research on global ionospheric Total Electron Content

KLEF faculty member Dr. D. Venkata Ratnam served as Principal Investigator for the ISEE International Joint Research project titled "Investigation of Extreme Global Total Electron Content Events using Statistical and Fractal Methods." The research examined long-term ground-based GNSS Total Electron Content data over a 25-year period (1997–2021). The analysis covered India (5°–45°N), low-latitude Japan (20°–30°N), mid-latitude Japan (30°–50°N) and global regions.

The project applied Extreme Value Theory, including Generalized Extreme Value (GEV) and Generalized Pareto Distribution (GPD) approaches, to identify rare and extreme ionospheric TEC events and estimate their return periods. The work is relevant to satellite-based radio communication, GNSS navigation and aviation safety because space-weather disturbances can alter ionospheric signal propagation and affect positioning accuracy.

The project report records a research stay at ISEE from 12 October to 7 December 2022 and a poster presentation at Nagoya University on 9–10 November 2022 titled “Extreme Value Analysis of GPS Ionospheric TEC using Long-term Data.” The publication list associated with the project includes collaborative work with ISEE researchers, including Yuichi Otsuka, Atsuki Shinbori, Takuya Sori, Michi Nishioka and Septi Perwitasari.

DATA / METHOD	RESEARCH CONTRIBUTION
Observation source	Long-term ground-based GNSS TEC data
Data period	1997–2021 (25 years)
Geographical coverage	India, low-latitude Japan, mid-latitude Japan and global regions
Analytical methods	Extreme Value Theory; GEV; GPD; peak-over-threshold analysis
Outputs	Extreme-event thresholds, return-period estimates, regional comparisons and research presentations
SDG relevance	SDG 9 (resilient infrastructure and innovation); SDG 13 (climate and environmental resilience)

2.2 International scientific exchange and research dissemination

The ISEE collaboration continued through scientific exchange and knowledge dissemination. On 21 May 2026, Prof. Devanaboyina Venkata Ratnam of KL University delivered the 102nd ISEE/CICR Colloquium on “Large-Scale Traveling Ionospheric Disturbances and GPS Positioning Impact During the May 2024 Super Geomagnetic Storm over the Indian Region.” The study used ground-based GNSS receiver data from 41 IGS stations across low-latitude regions, examined TEC enhancements and depletions, identified travelling ionospheric disturbances and assessed the effect of storm-time TEC perturbations on GNSS positioning accuracy.

This activity demonstrates the use of international research platforms to communicate and discuss measurement-based findings. The data analysis has clear relevance to resilient satellite navigation, geospatial infrastructure, disaster-sensitive communication systems and scientific understanding of space-weather impacts.

3. Other International Collaboration Initiatives

3.1 Georgia State University, USA — cosmic-ray muon detector and global network

KLEF’s Department of Electronics and Communication Engineering formalised a Memorandum of Understanding with Georgia State University (GSU), USA, under which a cosmic-ray muon detector was installed at the Space Technology and Atmospheric Science Laboratory. The detector was integrated into the global gLOWCOST network, creating an opportunity to contribute observations to an international scientific measurement network.

This collaboration provides a direct research-infrastructure pathway for collecting and sharing cosmic-ray observations. Such measurements can support research on atmospheric and space-environment processes and encourage comparative analysis with observations from other participating locations. The collaboration is relevant to SDG 9 through scientific infrastructure and innovation, and to SDG 17 through international research partnership.

3.2 UCSI University, Malaysia — academic and research cooperation

KLEF and UCSI University, Malaysia, signed a Memorandum of Understanding on 9 January 2025. The agreement provides for academic and research staff exchange and student mobility programmes. These mechanisms support the movement of researchers, exchange of expertise, joint academic activities and the development of collaborative research initiatives.

3.3 International research engagement through ISEE

The ISEE schedule for designated and visiting professors lists Prof. Venkata Ratnam Devanaboyina with KL University, India, for the period 1 April to 31 July 2026. The ISEE/CICR colloquium programme also records his May 2026 scientific presentation. Together, these records demonstrate sustained academic interaction with an international research institute.

4. Institutional Framework Supporting International Collaboration

KLEF’s institutional strategy recognises global collaboration and international research as important dimensions of its academic and research development. Its institutional self-study documentation records established collaborations with international universities and professional bodies, expansion in international research collaboration, and a global student community representing 34 countries.

The Research Promotion Policy provides for a Research Board headed by the Vice-Chancellor, supports interdisciplinary research, encourages publication in Scopus- and Web of Science-indexed journals, and promotes research links with national and international agencies. The institutional framework also provides support for faculty visits to national and international research laboratories and institutions to promote high-quality collaborative research.

These arrangements enable faculty members and research groups to develop international projects, exchange research expertise, undertake collaborative analysis, present findings and build sustained institutional relationships.

5. International Co-authored Research Portfolio

KLEF-affiliated international publications provide a broad evidence base of research undertaken with collaborators whose institutional affiliations span 27 countries. The subjects include climate and environmental analysis, energy systems, sustainable agriculture, water, pollution, materials, transport, supply chains, finance and SDG assessment. The register below identifies each publication, its year, international affiliation countries and indicative SDG relevance.

SDG alignment is indicative and based on the subject indicated by each publication title. For formal SDG reporting, each article should be checked against its abstract, methods, findings and actual data contribution.

PUBLICATION	YEAR	INTERNATIONAL AFFILIATIONS	INDICATIVE SDGs	DOI
01. Decarbonizing Logistics: Unveiling the Role of Clean Energy in Achieving Sustainable Development Goal 7 Through a Theory–Context–Characteristics–Methodology Perspective	2026	Iraq, Uzbekistan	SDG 7, SDG 8, SDG 9, SDG 11, SDG 12, SDG 13	10.1002/sd.71820
02. Emerging Contaminants in Wastewater: Mitigation Approaches for Environmental Management and Future Sustainability	2026	South Korea	SDG 3, SDG 6, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15	10.3390/w18070860
03. Future Agricultural Landscape Development: A MADM Model for Analysis	2026	Oman	SDG 2, SDG 12, SDG 13, SDG 15	10.1002/9781394310630.ch4
04. Optimization of IOT-Based Energy Management Systems Using Machine Learning Algorithms in Smart Buildings	2026	Turkey	SDG 7, SDG 9, SDG 11, SDG 13	10.25258/ijddt.16.12s.86
05. Optimizing calcium carbide residue based geopolymer composite using multi-criteria decision-making approach with uncertainty quantification	2026	Saudi Arabia	SDG 8, SDG 9, SDG 11, SDG 12	10.1007/s41062-026-02681-3
06. Performance and sustainability assessment of green HFO-based refrigerant mixtures for residential air conditioning	2026	Saudi Arabia	SDG 7, SDG 9, SDG 11, SDG 13	10.1002/ep.70411
07. Smart Greenhouses and Controlled Environment Agriculture	2026	Cyprus	SDG 2, SDG 12, SDG 13, SDG 15	10.1007/978-981-92-1491-4_9
08. Transforming Water Cultures in Rural Andhra Pradesh: A Cultural Studies Perspective on the Jal Jeevan Mission	2026	United States	SDG 6, SDG 11	10.10118/SSFJ/2610939
09. A Deep Learning Driven Multimodal Framework Integrating Remote Sensing and Biomedical Data for Spatio-Temporal Environmental Pollution Analysis and Health Risk Prediction	2025	Kuwait, United Kingdom, Uzbekistan	SDG 3, SDG 6, SDG 9, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15	10.28978/nesciences.1811158
10. Augmenting traffic flow efficiency using multi-agent systems (MAS)	2025	United Kingdom	SDG 9, SDG 11	10.1007/s41870-025-02452-w
11. DRIVING SCM AND HR TRANSFORMATION WITH AI THROUGH THE ROLE OF LEADERSHIP AND INNOVATION AS MEDIATORS	2025	United States, Uzbekistan	SDG 9	10.70102/afts.2025.1834.1048
12. Enabling a Green Economy Through FinTech and AI: Opportunities and Challenges	2025	Malaysia	SDG 8, SDG 9, SDG 10, SDG 12, SDG 17	10.1109/IIPEM65914.2025.11548069
13. Molecular Evolution of Invasive Species and their Ecological Impacts on Global Fisheries and Aquaculture Systems	2025	Kazakhstan	SDG 13, SDG 14, SDG 15	10.28978/nesciences.1811167
14. Solar drying technologies: Selection criteria, technical feasibility, economic viability, and recent advances for sustainable agricultural practices	2025	Malaysia	SDG 2, SDG 7, SDG 9, SDG 11, SDG 12, SDG 13, SDG 15	10.47836/ifrj.32.2.02
15. A critical investigation into the impact of big data in the food supply chain for realizing sustainable development goals in emerging economies	2024	Egypt, United States	SDG 2, SDG 8, SDG 9, SDG 12, SDG 13, SDG 15, SDG 16, SDG 17	10.2174/9789815256680124010016
16. Access Barriers for Marine Products Exporters in Andhra Pradesh	2024	Ethiopia	SDG 13, SDG 14, SDG 15	10.22452/IJIE.vol16no3.3
17. An integrated interval-valued Pythagorean fuzzy WISP approach for industry 4.0 technology assessment and digital transformation	2024	Saudi Arabia, Serbia, Taiwan	SDG 9	10.1007/s10479-023-05355-w
18. An optimization model-based DEA-MARCOS approach for assessing EU countries towards achieving sustainable development goals	2024	Azerbaijan, Lebanon, Lithuania, Malaysia, Turkey, United Arab Emirates	SDG 16, SDG 17	10.1016/j.envsci.2024.103913
19. Coordinating electric vehicle charging with multiagent deep Q-networks for smart grid load balancing	2024	Saudi Arabia	SDG 7, SDG 9, SDG 11, SDG 13	10.1016/j.suscom.2024.100993
20. ICT-Based Teaching Aids to Enhance English Language Proficiency of Indian Engineering Students	2024	Saudi Arabia	SDG 4, SDG 10	10.17507/tpls.1412.04
21. Sustainable power management in light electric vehicles with hybrid energy storage and machine learning control	2024	China, Ethiopia, Jordan	SDG 7, SDG 9, SDG 11, SDG 13	10.1038/s41598-024-55988-5
22. A q-rung orthopair fuzzy combined compromise solution approach for selecting sustainable third-party reverse logistics provider	2023	Saudi Arabia, Serbia	SDG 8, SDG 9, SDG 12	10.1108/MD-01-2022-0047
23. ASSESSMENT OF SUSTAINABLE WASTEWATER TREATMENT TECHNOLOGIES USING INTERVAL-VALUED INTUITIONISTIC FUZZY DISTANCE MEASURE-BASED MAIRCA METHOD	2023	Italy, Saudi Arabia	SDG 3, SDG 6, SDG 11, SDG 12	10.22190/FUME230901034M

24. An IVIF-Distance Measure and Relative Closeness Coefficient-Based Model for Assessing the Sustainable Development Barriers to Biofuel Enterprises in India	2023	Italy, Saudi Arabia	SDG 7, SDG 9, SDG 11, SDG 13	10.3390/su15054354
25. Corporate Social Responsibility Reports: A Big Data Approach	2023	Peru, South Africa	SDG 8, SDG 9, SDG 10, SDG 12, SDG 17	10.1109/ICACITE57410.2023.10182491
26. Enhancing thermal performance and energy Efficiency: Optimal selection of steel slag crumb rubber blocks through Multi-Criteria decision Making	2023	United Arab Emirates	SDG 7, SDG 8, SDG 9, SDG 11, SDG 12, SDG 13	10.1016/j.conbuildmat.2023.134094
27. Evaluation of risks impeding sustainable mining using Fermatean fuzzy score function based SWARA method	2023	Greece, Turkey, United Kingdom	SDG 8, SDG 9, SDG 11, SDG 12	10.1016/j.asoc.2023.110220
28. Examining the Impacts of Climate Variability on Agricultural Phenology: A Comprehensive Approach Integrating Geoinformatics, Satellite Agrometeorology, and Artificial Intelligence	2023	United States	SDG 2, SDG 8, SDG 9, SDG 11, SDG 12, SDG 13, SDG 14, SDG 15	Not listed
29. Intuitionistic fuzzy fairly operators and additive ratio assessment-based integrated model for selecting the optimal sustainable industrial building options	2023	Italy, Saudi Arabia	SDG 9	10.1038/s41598-023-31843-x
30. Smart and Power Grid Systems - Design Challenges and Paradigms	2022	Denmark, United States	SDG 7, SDG 9, SDG 11, SDG 13	Not listed
31. A STUDY OF STOCK PERFORMANCE OF SELECT IPOS IN INDIA	2021	Saudi Arabia	SDG 8, SDG 9, SDG 10, SDG 12, SDG 17	Not listed

6. International Reach and SDG Thematic Coverage

Countries represented in the institutional co-authorship network include:

Azerbaijan, China, Cyprus, Denmark, Egypt, Ethiopia, Greece, Iraq, Italy, Jordan, Kazakhstan, Kuwait, Lebanon, Lithuania, Malaysia, Oman, Peru, Saudi Arabia, Serbia, South Africa, South Korea, Taiwan, Turkey, United Arab Emirates, United Kingdom, United States, Uzbekistan.

SDG	THEME	PUBLICATION RECORDS WITH INDICATIVE RELEVANCE
2	Zero Hunger	5
3	Good Health and Well-being	3
4	Quality Education	1
6	Clean Water and Sanitation	4
7	Affordable and Clean Energy	9
8	Decent Work and Economic Growth	10
9	Industry, Innovation and Infrastructure	22
10	Reduced Inequalities	4
11	Sustainable Cities and Communities	17
12	Responsible Consumption and Production	16
13	Climate Action	17
14	Life Below Water	5
15	Life on Land	9
16	Peace, Justice and Strong Institutions	2
17	Partnerships for the Goals	5

The strongest thematic connections are with SDG 7 (clean energy), SDG 9 (industry, innovation and infrastructure), SDG 11 (sustainable cities), SDG 12 (responsible consumption and production), SDG 13 (climate action), SDG 6 (water and sanitation), SDG 2 (food systems) and SDG 17 (partnerships). The ISEE GNSS-TEC research is particularly important because it includes long-term observations, multi-region analysis and explicit scientific data methods.

7. International Scientific Forums and Knowledge Exchange

KLEF researchers engage with international scientific platforms to present research findings, exchange methods and interact with researchers from other countries. The Asia Oceania Geosciences Society (AOGS) Annual Meeting is a relevant regional platform for geoscience, atmospheric science, climate and space-environment research. The supplied institutional narrative identifies participation and scientific dataset sharing at the AOGS Annual Meeting in Singapore. For the final evidence dossier, the specific KLEF presentation should be supported by the conference programme, abstract, presentation certificate or poster record.

The ISEE colloquium and the 2022 ISEE project poster presentation provide independently identifiable examples of international scientific dissemination associated with KLEF faculty and data-oriented research.

8. Overall Assessment for Indicator 17.2.3

KLEF demonstrates meaningful international collaboration relevant to the gathering, analysis and interpretation of data for sustainable development. The strongest evidence is the ISEE–Nagoya University joint research project led by a KLEF faculty member, which analyses a 25-year GNSS-TEC dataset across India, Japan and global regions using established statistical methods. The 2026 ISEE colloquium presentation further demonstrates international dissemination of measurement-based research on geomagnetic-storm impacts and GNSS positioning.

The Georgia State University collaboration, involving a cosmic-ray muon detector connected to the global gLOWCOST network, adds an important example of shared research infrastructure and international observation networks. The UCSI University MoU and the broader international co-authored publication portfolio demonstrate additional channels for cross-border academic and research cooperation.

Collectively, these initiatives support KLEF's contribution to international scientific knowledge networks and the evidence base needed to understand and address sustainable development challenges. They are particularly relevant to SDG 9, SDG 13 and SDG 17.

9. References

1. Institute for Space–Earth Environmental Research (ISEE), Nagoya University. 2022 ISEE/CICR International Joint Research Programme — project report: "Investigation of Extreme Global Total Electron Content Events using Statistical and Fractal Methods." Open reference
2. ISEE/CICR. Colloquium record, 102nd ISEE/CICR Colloquium, 21 May 2026 — Prof. Devanaboyina Venkata Ratnam, KL University. Open reference
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4. UCSI University. "UCSI University and KLEF India Sign Collaborative MoU," 9 January 2025. Open reference
5. KLEF. Research Promotion Policy — Research Board, interdisciplinary research, international agency links and collaborative research support. Open reference
6. Prof. Venkata Ratnam Devanaboyina. Public announcement of KLEF–Georgia State University MoU, cosmic-ray muon detector installation and gLOWCOST integration. Open reference