Universitas Sumatera Utara

Transformation Towards the Ultimate

Sustainibility Report

Universitas Sumatera Utara

2024

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"Achieving sustainable development requires the synergy of knowledge, innovation, community empowerment, and cross-sector collaboration. ***Universitas Sumatera Utara*** *plays a strategic role in advancing inclusive and sustainable development with meaningful impact on communities."*

Rector Opening Remarks

With sincere gratitude, Universitas Sumatera Utara proudly presents the Sustainability Report 2024 as a proof to our enduring commitment and responsibility toward sustainable development. This report highlights USU's meaningfull efforts to integrate sustainability principles across its three pillars, education, research, and community service.

The year 2024 marks an important milestone for USU in strengthening its position as a world-class university driven by sustainability. Through innovation, interdisciplinary collaboration, and deep concern for the environment and society, USU remains dedicated to creating meaningful impact for a greener and more inclusive future.

I extend my heartfelt appreciation to the entire academic community and our partners for their invaluable contributions to this sustainability journey. May this report serve not only as a record of achievement but also as an inspiration to keep moving forward together toward a sustainable future.

With kind regards.

Rector of the University of Sumatera Utara

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Advancing Inclusive Education, Economic Empowerment, and Community Resilience

Universitas Sumatera Utara continues to strengthen its institutional contribution to poverty eradication through an integrated approach that combines education-based empowerment, inclusive scholarship programs, and innovation-driven community engagement. As part of its long-term commitment to achieving Sustainable Development Goal 1 (No Poverty), USU ensures that higher education serves as a transformative pathway for breaking the cycle of poverty and advancing social mobility across North Sumatra.

Inclusive Education and Financial Protection for Low-Income Students

USU reaffirms its No Poverty commitment through concrete measures that safeguard educational access for economically disadvantaged students. In 2024, the university implemented a series of financial protection mechanisms, including needs-based scholarships, fee policies that prevent tuition increases, and transparent tuition reduction/deferral schemes.

The scholarship program, managed centrally at the university level, remains a primary instrument for opening study opportunities to students from low-income households. From the

interview and verification process to the final announcement of awardees, this system guarantees merit-based and equitable access to higher education. Following national policy directives, USU also canceled the planned 2024 tuition increase, ensuring that no new student in the Academic Year 2024/2025 bears a higher tuition burden.

The Integrated Service Unit has standardized application mechanisms for tuition reduction across all faculties, ensuring procedural transparency and equal access. In line with Ministerial Regulation No. 2/2024, USU also implemented a tuition relief policy for final-semester students, accompanied by formal rectoral decrees to institutionalize tuition reduction for qualifying applicants. Collectively, these financial protections, coupled with the continued expansion of scholarships, reduce economic barriers from pre-admission through graduation, enabling more students from vulnerable families to pursue higher education.

Innovation for Poverty Reduction and Community Livelihoods

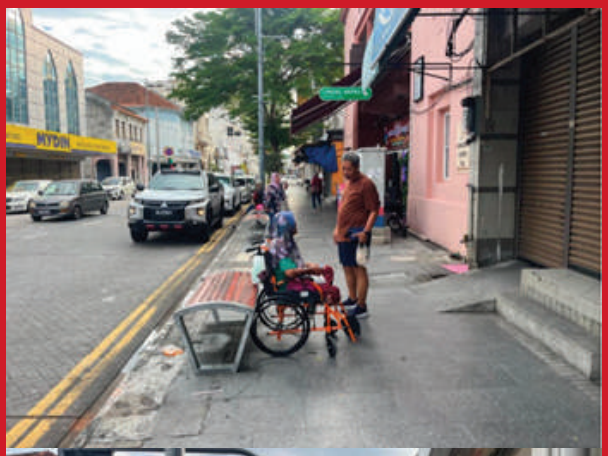
Beyond financial aid, USU advances poverty reduction through innovation-driven research and community-based programs that empower rural and urban populations.

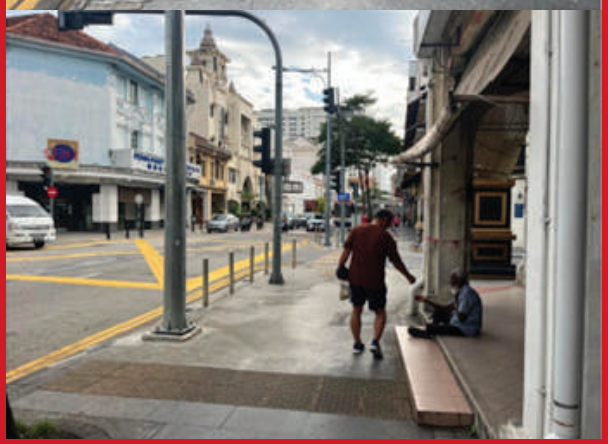
A key example is the Waste-to-Value Initiative in Kelambir Village, where USU researchers and students introduced an integrated waste processing system that converts plastic, paper, and wood waste into valuable products such as recycled pellets, creative paper, and eco-briquettes. This program not only reduces environmental waste but also creates new micro-enterprises, household cost savings, and cleaner public spaces, building a local circular economy that enhances community income and resilience.

In the agricultural sector, USU's Biomass Residue Agribusiness Program promotes straw mushroom cultivation using coconut coir waste as a low-cost substrate. Covering the entire value chain, from production to marketing, the initiative diversifies household income, reduces organic waste, and supports the emergence of rural agri-entrepreneurs, thereby strengthening food security and local economic independence.

Innovation for Poverty Reduction and Community Livelihoods

Recognizing that poverty also manifests in urban settings, USU scholars have undertaken comparative research on urban poverty management in collaboration with international partners. A recent study analyzing approaches to begging management in Southeast Asian cities produced evidence-based, humane policy recommendations that balance economic, cultural, and psychological dimensions. These findings contribute to improving social protection systems and promoting pathways for reintegration, offering city governments practical tools to address chronic street-level poverty while preserving human dignity.





Empowering Knowledge for Humanity

USU's research and innovation excellence is internationally recognized. Dr. Nurzainah's achievement as a recipient of the Hitachi Global Foundation Asia Innovation Award illustrates the university's global leadership in developing solutions to socio-economic challenges. Her research exemplifies USU's belief that science and technology are vital instruments for reducing structural poverty and promoting inclusive growth.

Through an integrated framework that combines education accessibility, financial inclusivity, community innovation, and policy engagement, Universitas Sumatera Utara continues to translate knowledge into tangible social impact. These multidimensional efforts not only address the symptoms of poverty but also tackle its structural causes, empowering individuals, strengthening communities, and advancing the province's economic resilience.

By uniting philanthropy, partnerships, and scientific innovation under a single vision of "knowledge for humanity," USU reaffirms its leadership in driving SDG 1 (No Poverty) at both regional and national levels, building a more self-reliant, equitable, and prosperous North Sumatra from the ground up.

End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture

Sustainable agriculture is the key to ending hunger and ensuring a healthy future for generations to come

2 ZERO HUNGER

The pursuit of SDG 2, Zero Hunger at Universitas Sumatera Utara reflects a comprehensive and science-based strategy that goes beyond increasing yields, it aims to ensure sustainable, nutritious, and inclusive food systems. Through interdisciplinary research, community engagement, and technological innovation, USU develops practical solutions that improve food productivity, nutritional value, and environmental balance. The university's initiatives encompass smart agriculture, functional food development, eco-efficient farming inputs, and the valorization of underutilized natural resources, all grounded in local relevance yet connected to global sustainability standards.

Sharing Meals, Building Resilience: USU's Food Security Actions for Students and Neighbors

Universitas Sumatera Utara advances campus and community food security through routine meal-sharing and inclusive social support. A flagship initiative is the Friday meal program, popularly known as "Nasi Berkah", which provides free boxed meals after congregational prayers at campus mosques, easing students' daily food costs while fostering solidarity among worshippers, staff, and local residents. Framed as a weekly act of mutual care, the program complements broader welfare efforts across faculties and units.

USU also integrates nutrition education and outreach (e.g., balanced-diet counseling linked to national "Makan Bergizi" initiatives) and has mobilized targeted meal support during crises, including partnerships that supplied ready-to-eat food for medical personnel. Together, these actions strengthen household food access, improve dietary practices, and embody USU's sustained commitment to SDG 2 (Zero Hunger) while reinforcing co-benefits for health and social cohesion.

Collaboration Reduces Stunting and Strengthens Food Security in Serdang Bedagai

Universitas Sumatera Utara demonstrates its strong commitment to Sustainable Development Goal 2 (Zero Hunger) through a collaborative research and community empowerment program aimed at reducing childhood stunting in Serdang Bedagai Regency. The initiative brings together researchers from the Faculty of Medicine and Faculty of Public Health (FKM USU), local government agencies, and community health workers to tackle the root causes of malnutrition through evidence-based strategies.

USU's research team conducted comprehensive studies on the nutritional status, dietary diversity, and socio-economic conditions of families at risk. Based on these findings, targeted interventions were designed to improve maternal and child nutrition through education, counseling, and food diversification programs. Mothers, midwives, and posyandu cadres received hands-on training on balanced diets, local food utilization, and hygiene practices to ensure sustainable behavioral change.

The collaboration between USU and the Serdang Bedagai District Health Office resulted in measurable improvements in child nutrition and a notable reduction in local stunting rates. This initiative not only strengthens food and nutrition security but also enhances community resilience and human capital development. Through science-based community engagement, USU reaffirms its vital role in eradicating hunger and improving public health across North Sumatra.

Sustainable Agro-Technology for Food Security

Research at USU has introduced controlled-release biocomposites made from breadfruit starch and modified bentonite as eco-friendly carriers for

agricultural inputs. This innovation minimizes pesticide overuse by releasing active ingredients in a regulated manner, reducing chemical runoff and safeguarding both soil and water ecosystems. By supporting farmers with safer, cost-efficient pest management technologies, the research promotes sustainable intensification, a key pathway toward reliable and environmentally responsible food production.

Sustainable Agro-Technology for Food Security

USU's studies on Red Palm Oil (RPO) exemplify how nutrition science can reinforce food security. The research analyzes RPO's superior β-carotene content, highlighting its role in addressing vitamin A deficiency and boosting immunity. Findings reveal that proper cooking methods, such as moderate-heat stirring, help preserve essential nutrients. This evidence supports public education campaigns that advocate healthy cooking practices and wider community access to nutrient-rich, locally available oils, strengthening the nutritional dimension of food security.

Smart Farming and Digital Agriculture

Through its Smart Farming Program in Banyumas Village, Langkat, USU applies Internet of Things (IoT) and Machine Learning (ML) technology to enhance self-sufficiency and reduce dependence on food imports. IoT sensors collect real-time data on weather, soil health, and crop growth, while ML models analyze this data to generate predictive insights, helping farmers decide optimal planting times, irrigation schedules, and crop types. The program has demonstrated how digital transformation in agriculture can increase yields, lower production risks, and empower rural farmers to make data-driven decisions for sustainable livelihoods.

Functional Foods for Health and Nutrition

USU's work on jackfruit seed-based resistant starch explores how indigenous resources can produce functional foods that regulate blood sugar and promote balanced nutrition. By applying Heat Moisture Treatment (HMT) techniques to stabilize starch structure, researchers developed noodles with lower glycemic indices suitable for diabetes management. This project combines agricultural innovation with public-health relevance, advancing both SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being)

through the creation of affordable, nutritious foods.

Sustainable Mycoculture for Diversified Protein Sources

Another strand of research focuses on Lion's Mane mushrooms (Hericium erinaceus), a high-value functional food with medicinal potential. Studies on substrate composition, temperature, and humidity optimization have yielded best-practice guidelines for mushroom cultivation, encouraging smallholder participation in sustainable protein production. This work provides rural communities with an alternative, nutrient-dense food source that complements plant- and animal-based diets while generating economic opportunities.

Advancing Health Innovation and Community Well-Being in North Sumatra

Health is not merely the absence of disease, but the foundation for a productive and meaningful life for everyone

3 GOOD HEALTH AND WELL-BEING

Universitas Sumatera Utara demonstrates its commitment to SDG 3: Good Health and Well-Being by integrating research, innovation, and community programs to improve health for people of all ages. Through advances in medicine, pharmacy, psychology, and public health, USU enhances access to healthcare, promotes disease prevention, and encourages healthy lifestyles. By translating scientific knowledge into practical solutions, from laboratories to local communities, the university strengthens community resilience, supports productive and thriving populations, and ensures that everyone has the opportunity to live healthily, reflecting the essence of sustainable development.

USU Teaching Hospital: Clinical Excellence Powering Community Health

The Universitas Sumatera Utara Teaching Hospital (RS USU) has significantly contributed to public health through its comprehensive medical services and educational mission. As a relatively new academic medical center (opened in 2016), it provides broad healthcare access for the community via multiple specialist clinics and inpatient facilities. The hospital currently operates 17 specialist polyclinics (covering fields such as pediatrics, surgery, obstetrics/gynecology, internal medicine, cardiology, psychiatry, and others) and has over 100 operational beds, serving as a fully accredited Class C hospital. This capacity allows RS USU to treat a high volume of patients – on the order of tens of thousands of visits annually (around 75,000 patient visits per year in recent data). Striving to meet the health needs of North Sumatra's population, RS USU continually expands and upgrades its services. For example, it has introduced new treatment units such as a chemotherapy service and is investing in minimally invasive surgical techniques (laparoscopic surgery) by procuring advanced equipment.

Beyond routine clinical services, RS USU actively engages in community health programs and medical service innovations. The hospital has implemented special outreach initiatives to improve public health, including free medical treatments and preventive screenings. Notably, RS USU has organized gratis surgical and screening events – for example, it offered free cataract removal operations for dozens of patients and free cardiac examinations (electrocardiogram screening), coupled with a public seminar on proper antibiotic use, as part of a university community service program. Such efforts reflect its commitment to broaden healthcare access, especially for underserved groups.

Sustainable Agro-Technology for Food Security

Health Promotion and Disease Prevention Universitas Sumatera Utara has adopted a proactive stance in health promotion and disease prevention as essential pillars of SDG 3. A community outreach initiative titled “Healthy Lifestyle Education” was conducted in Desa Bulu Cina (Deli Serdang) through collaboration between the Faculties of Medicine and Public Health. Residents received counselling on diet, exercise, smoking cessation, and routine health monitoring; in addition, basic screenings (blood glucose, cholesterol) were offered, enabling early risk identification for non-communicable diseases (NCDs). Parallel to this, the Faculty of Medicine conducted **training for school teachers and pesantren staff** on early detection and prevention of cardiovascular and adolescent health conditions, thereby embedding health awareness within the educational sector and contributing to SDG 3.4 (NCD reduction).

Women’s Health and Reproductive Care

USU deepened its commitment to women’s health by offering **cervical-cancer screening programmes** (Pap test) in community clinics and

through partnership-based outreach in rural areas. Educational sessions on reproductive health, menopause and early detection of women's cancers were integrated into community engagement, aligning with SDG 3. These efforts not only increased screening uptake but also fostered informed decision-making among women in underserved areas.

Maternal, Infant and Child Health & Nutrition

Maternal and early-childhood health were advanced by the Faculty of Nursing through **breastfeeding preparation classes**, offered at health centres (Puskesmas) for expectant mothers and families, and through a **"1000 HPK" (first 1000 days of life)** mentoring programme employing both in-person training and social-media campaigns. In addition, community-based food processing workshops empowered mothers and health cadres to develop local supplementary foods (cassava-based), thereby strengthening nutritional resilience and supporting child survival and related nutrition targets.

Maternal, Infant and Child Health & Nutrition

USU extended its impact to younger generations through school-based hygiene campaigns. The Faculty of Public Health's **Clean and Healthy Living Behaviour (PHBS)** initiative at primary schools introduced hand-washing protocols and food hygiene education, contributing to infectious-disease reduction. Concurrently, the Faculty of Dentistry implemented oral-health programmes such as **"Little Dentist" training** and **teledentistry services** during National Dental Health Month (BKGN), offering free check-ups and preventive education to children and community members. These interventions promote oral wellness as a component of general health and equitable access to

Maternal, Infant and Child Health & Nutrition

Accessing underserved populations, the Faculty of Pharmacy implemented **free health-screening services** and health education at the Tanjung Gusta Juvenile Detention Centre (LPKA) and deployed a thematic **PKM Skema Perintis** outreach in Medan Sunggal, offering check-ups, nutrition counselling and pharmacy services. The Faculty of Medicine integrated mobile medical outreach into regional deployment during anniversary events, conducting screenings and basic treatment in rural locales (e.g., Samosir). These activities uphold the SDG's principle of leaving no one behind.

Maternal, Infant and Child Health & Nutrition

USU addresses health determinants beyond clinical settings. The Faculty of Public Health led a project constructing a **bore-hole well in Pantai Labu (Deli Serdang)** to improve access to clean water and reduce water-borne illness, reinforcing clean water alongside. Training for pesticide-spraying farmers improved their occupational health practices and mitigated risks from agrochemical exposure. Disaster-resilience programmes co-led by Public Health and Nursing faculties established **Disaster-Resilient Villages (Destana)** in high-risk areas, with first-aid training and early-warning education, advancing emergency-response capacity and resilient communities.

Integrated Research and Service Through Synergistic Collaboration

The synergy between research and community service is central to USU's strategy. Systems for screening, education, and outreach are underpinned by ongoing investigations into health behaviours, technologies, and delivery models. The cross-faculty structure and institutional alignment ensure that innovations are locally adapted and scaled. The 2024 programmes reflect USU's holistic approach: combining preventive medicine, maternal and child health, youth education, equitable access, and environmental health.

Through each sub-component, USU sustains its mission to transform scientific knowledge into actionable, sustained community impact , thereby advancing Good Health and Well-Being within North Sumatra and contributing to national SDG progress.

Natural-Based Medical Innovations for Human Health

Universitas Sumatera Utara continues to expand its global contribution to Sustainable Development Goal 3 (Good Health and Well-Being) through research that integrates science, technology, and local biodiversity.

Among its most remarkable achievements is the creation of kombucha from soursop leaves and honey, a natural beverage with proven antioxidant and antimicrobial properties that supports immune system resilience. Complementing this, USU researchers developed an innovative membrane derived from the grass jelly plant that accelerates wound healing while minimizing infection risk, an affordable and eco-friendly alternative for clinical care.

Further studies revealed the potential of African leaf extracts in treating pancreatic cancer and the use of sweet melon fruit compounds as a natural defense against sepsis, one of the world's leading causes of hospital mortality. In radiation

medicine, the Aloe vera and Daikon gel formulation has demonstrated significant results in protecting patients from radiation dermatitis, marking another milestone in the development of plant-based therapeutic solutions.

Accessible and Equitable Dental Health Care Services For Students and Community

USU's Faculty of Dentistry (FKG USU), through the IKGA Community Service Program, has consistently provided free dental examinations, treatment, and health education for children in underserved areas. These outreach efforts directly enhance oral health literacy and reduce preventable dental diseases among vulnerable populations.

Additionally, research on cochlear measurement for implant surgery improves the success rate of hearing restoration procedures, emphasizing USU's role in advancing inclusive and precision healthcare for all.

Through its extensive portfolio of medical research, technological innovation, and community engagement, Universitas Sumatera Utara demonstrates how academic institutions can play a transformative role in improving global health.

From herbal therapeutics and regenerative medicine to digital innovation and public health campaigns, USU continues to embody its vision of "knowledge for humanity." These collective efforts not only contribute to the achievement of SDG 3 (Good Health and Well-Being) but also strengthen Indonesia's position as a center of health innovation, scientific excellence, and social compassion.

Inclusive and Innovative Education to Achieve Quality and Equity in Learning

Education must not only enlighten minds but also empower communities to adapt, innovate, and thrive in an ever-changing world

Universitas Sumatera Utara recognizes education as the cornerstone of sustainable development and social transformation. In alignment with Sustainable Development Goal 4 (Quality Education), the university is committed to ensuring that learning is not only accessible but also inclusive, innovative, and transformative, preparing individuals and communities to thrive in a rapidly changing world. Guided by the belief that "education must not only enlighten minds but also empower communities to adapt, innovate, and thrive in an ever-changing world," USU integrates academic excellence with social equity to build an education ecosystem that benefits all.

Opening Doors, Changing Lives: USU Expands Access for Low-Income Students

Universitas Sumatera Utara (USU) is widening pathways to higher education for underserved communities while safeguarding quality. In 2024, USU enrolled 41,570 students (up from 41,084 in 2023), with 86.6% in undergraduate programs and an improved student-faculty ratio of 1:24 (from 1:25 in 2023; 1:27 in 2022; 1:30 in 2021). Drawn from all 34 provinces, 65% of students originate from North Sumatra, 20% from other Sumatran provinces, 10% from Java and Kalimantan, and 5% from Eastern Indonesia, reflecting inclusive national admissions via SNBP, SNBT, and Mandiri.

This geographic spread underscores USU's role as a higher-education hub for Western Indonesia and a driver of social mobility for rural and underdeveloped regions.

To remove financial barriers, USU deploys a comprehensive aid architecture that combines public, private, and university funds. In 2024, 6,636 students received KIP Kuliah (plus 119 via the community-proposed KIP mechanism),

complemented by USU's Bantuan Belajar Mahasiswa (BBM), Baznas scholarships, and support from partners such as Bank Indonesia, PT Martabe, BCA, the Labura local government, as well as ADik and BRIN Barista schemes. In total, approximately 7,500 students, around 18% of all enrolments, benefited from financial assistance, with 8,250 awards disbursed across programs. The Directorate of Student Affairs and Ditmawalumni monitor academic progress, provide counseling, and offer emergency relief, ensuring students persist to graduation. Together, these measures translate vulnerability into opportunity, advancing SDG 1 (No Poverty) and SDG 4 (Quality Education).

USU Scales Student Start-Ups with Entrepreneurship Education and Rp 1.7 Billion in Grants

Universitas Sumatera Utara (USU) is accelerating student entrepreneurship through structured education, incubation, and seed funding. In 2024, institutional programs supported 137 student-led start-ups and 40+ community enterprises via P2MW, the USU Pitching Competition, and Kewirausahaan Merdeka, complemented by over Rp 1.7 billion in grants and technical mentorship from partners including Bank Indonesia, BRIN, PT Inalum, and the Ministry of Cooperatives and SMEs. USU's enterprise culture is reinforced by the BPRI-managed USU Enterprise, a hub for incubation and product commercialization, whose facilities and showcases connect student innovations to industry and investors.

BPRI (USU Enterprise) expands entrepreneurship education through hands-on training and national collaborations. Its Entrepreneurship Training for USU Students develops ideation, business planning, and venture execution skills; BPRI also hosted a Startup & Incubator Institution Selection Socialization under the Ministry's Startup Go Global program and co-ran a Demo Day with Kemenkop UKM featuring bootcamps, coaching clinics, and investor pitching. Together, these initiatives translate classroom learning into market-ready ventures and strengthen founder capabilities.

Ecosystem events knit learning with real markets. The USU Career Expo & Car Boot Sale integrated recruitment with student business showcases, 27 companies, 40 cars, and ~120 student businesses, positioning the campus as a launchpad for jobs and new ventures, while ongoing BPRI programs in career and entrepreneurship services provide year-round mentoring and commercialization pathways. With parallel support to community MSMEs, including village funding and green/digital venture focus, USU is building an inclusive, sustainable innovation pipeline for North Sumatra.

Realizing Lifelong Learning through Digital Transformation

USU's UNIC-USU Moodle platform serves as a cornerstone for lifelong and technology-enabled education. The system offers open-access digital courses that support flexible learning for students, alumni, and the broader community. By integrating multimedia content, discussion forums, and real-time assessments, the platform encourages self-paced and inclusive learning that transcends traditional classroom boundaries.

This initiative ensures that education remains accessible to all, regardless of time, location, or background, directly supporting SDG 4.3 (equal access to affordable and quality tertiary education) and SDG 4.4 (enhancing relevant skills for employment and entrepreneurship). Through its innovative conferences, scholarship programs, institutional collaborations, and digital platforms, Universitas Sumatera Utara embodies the spirit of SDG 4 (Quality Education). These efforts promote inclusive access to learning, foster technological literacy, and prepare future generations for global challenges.

By merging academic excellence with community empowerment, USU ensures that education remains a catalyst for sustainable development, nurturing not only skilled graduates but also resilient, ethical, and globally minded citizens dedicated to shaping a better future.

Advancing Innovation and Global Resilience through Education

The ELTICOM 2024 (Electrical, Telecommunication, and Computer Conference) marked a milestone in USU's commitment to advancing science and education for sustainable development. Organized by the Faculty of Computer Science and Information Technology, the event brought together academics, students, and industry professionals from multiple countries to explore the role of digital technology and artificial intelligence in supporting organizational resilience and global competitiveness.

Through its scientific sessions and technology showcases, ELTICOM strengthened interdisciplinary collaboration and inspired young researchers to contribute to innovation-driven learning ecosystems, aligning with SDG 4 targets on improving technical and vocational education.

Expanding Equal Access through the English Access Scholarship Program

In collaboration with the Indonesia International Education Foundation (IIEF) and supported by the U.S. Embassy, USU launched the English Access Scholarship Program Medan 2024–2026. The program provides English language training,

cross-cultural learning, and leadership development for underprivileged high school students across Medan and surrounding regions.

By empowering economically disadvantaged youth with linguistic and soft skills, this initiative widens access to global education and employment opportunities. It represents USU's strong dedication to inclusive education and social mobility, core principles of SDG 4.5 (Eliminate disparities in education) which aims to eliminate disparities in education access.

Student Development through Collaboration with LPS

USU's partnership with the Indonesia Deposit Insurance Corporation (LPS) demonstrates how higher education can connect learning with practical skill-building. Through joint programs on student development, financial literacy, and career readiness, the collaboration equips students with the knowledge and values needed to thrive in professional and civic life.

The initiative also includes leadership training and ethical awareness components, encouraging students to become responsible citizens who contribute positively to national and global development. This reflects SDG 4.7 (Education for sustainable development & global citizenship), which emphasizes education that promotes sustainable lifestyles, human rights, and global citizenship.

Empowering Women and Building Gender Equality through Education, Legal Protection, and Economic Independence

Gender equality is not only a fundamental human right, but the foundation for a peaceful, prosperous and sustainable world

5 GENDER EQUALITY

Achieving Sustainable Development Goal 5 (Gender Equality) requires collective commitment to ensuring that women and girls everywhere have equal opportunities to thrive , in education, health, employment, and participation in public life. Universitas Sumatera Utara has taken concrete steps to translate this global vision into local realities by integrating gender equality into its community service, research, and education programs.

Through initiatives such as legal education on preventing sexual violence, empowering rural women through the Batik Prima Jaya home industry, and community programs to improve maternal and child health, USU demonstrates that gender equality can only be realized through a comprehensive approach, combining protection, empowerment, and capacity-building. These programs reflect the belief that empowering women is not just about inclusion, but about transforming systems and mindsets that sustain inequality.

Advancing Gender Equality for Students and Alumni at USU

Universitas Sumatera Utara (USU) strengthens gender equality by expanding women's access to quality higher education and ensuring they thrive through to graduation and early careers. In 2024, USU admitted 10,390 new students, 54% of whom were women, reflecting inclusive national admissions (SNBP, SNBT, and Independent Selection) and targeted financial support. Of 6,636 scholarship recipients, the majority were women, helping first-generation and rural students overcome economic barriers.

Women formed 65–80% of entrants in Nursing, Public Health, Cultural Studies, Psychology, Pharmacy, and Social & Political Sciences, while their participation continues to rise in Engineering, Agriculture, and Computer Science.
Women's academic success is equally visible in professional outcomes. In 2024, USU produced 1,540 female graduates in health professions, 66% of 2,344 graduates in this sector, with women comprising 70–85% of graduates in Nursing, Public Health, and Pharmacy. In Medicine, women were 58% of 952 graduates, and in Dentistry, 73% of 386 graduates. Clinical placements at RS USU (Teaching Hospital), RSGM USU (Dental and Oral Hospital), and community health centers (Puskesmas) ensured equitable training pathways, while many women led outreach on stunting prevention and maternal-child health, signaling a robust pipeline of female leaders in health services and research.

USU's Directorate of Student and Alumni Affairs and the Center for Independent Learning provide mentoring, leadership training, reproductive-health education, and entrepreneurship development that support women from enrollment through alumni transition. Academic progress monitoring and counseling secure persistence and completion, while skills programs position women for advancement in diverse fields. Together, these measures embed gender equity across access, attainment, and career readiness, advancing SDG 4 (Quality Education) and SDG 5 (Gender Equality) by empowering women students and alumni to contribute as professionals, innovators, and community leaders.

Gender Equity in Academia: Strengthening USU's Faculty and Staff

Universitas Sumatera Utara (USU) advances gender equality by expanding women's representation across academic ranks and leadership roles. In 2024, the university recorded 1,480 senior academic staff, with 610 women (41%) among professors and associate professors, evidence of a strengthened pipeline to seniority. The number of full professors rose from 207 (2023) to 256 (2024), a 23.7% increase enabled by merit-based promotion, publication and research incentives, international collaboration, and structured mentorship. Women's leadership is particularly prominent in Medicine, Public Health, Nursing, and Pharmacy, and is also strong in Cultural Sciences, Law, and Social and Political Sciences, broadening perspectives in research, supervision, and academic governance.

USU's whole-workforce development consolidates these gains. The university reported 2,263 academic staff in 2024, 256 professors, 343 associate professors, 631 lecturers, 215 assistant lecturers, and 248 instructors, with 44% holding doctoral and 56% master's degrees, and an improved student–faculty ratio of 1:24. Transparent recruitment and promotion processes are paired with targeted schemes such as the Women in Academia Mentorship Scheme and the Leadership

for Women Researchers Initiative, which support grant-writing, international mobility, and readiness for academic leadership. Together, these measures embed parity, strengthen supervision capacity, and elevate research productivity.

Promoting Legal Awareness and Protection through the Prevention of Sexual Violence Program

The study "Lesson Learn of Community Services Concerning the Prevention of Sexual Violence for Teenagers" highlights USU's proactive stance in combating gender-based violence. Led by the Faculty of Law and Faculty of Psychology, this community service engaged with the Indonesian Mosque Youth Communication Board (BKPRMI) to educate adolescents about sexual violence prevention within religious and public spaces.

The program used participatory methods such as surveys, discussions, and role-play sessions ("Let's Practice Being a Trainer/Facilitator on Sexual Violence Prevention for Adolescents in Medan City") to strengthen youth understanding and intervention skills. The results showed significant improvement in knowledge, attitudes, and awareness among 167 participants (56.9% female and 43.1% male). The initiative also encouraged community-based supervision models for houses of worship and public institutions, fostering safe environments for women and youth.

This initiative supports SDG 5.2 (eliminate violence against women and girls) and SDG 5.5 (ensure women's full participation in public life). By empowering young people with legal and emotional literacy, USU contributes to the creation of gender-sensitive institutions that uphold justice and equality.

Empowering Rural Women through the Batik Prima Jaya Home Industry

The program "Empowering Village Women Through Home Industry Batik Prima Jaya to Create Local Economic Independence" demonstrates how women's economic empowerment contributes directly to gender equality and sustainable community development. Conducted in Tanjung Kasau, Batu Bara Regency, the initiative trained rural women , mostly housewives with limited formal education , to master batik-making skills and manage small-scale enterprises.

The training involved a series of Focus Group Discussions (FGDs), seven days of hands-on workshops, and follow-up

mentoring. Participants learned not only technical skills (such as molani, chanting, coloring, and finishing) but also financial literacy and entrepreneurship. The results were transformative: several women began producing batik products independently, generating household income and promoting cultural heritage preservation.

This project advances SDG 5.a (equal rights to economic resources) and SDG 5.b (enhance the use of technology to promote empowerment). It redefines women's roles in rural economies , from passive dependents to active entrepreneurs , and promotes self-reliance, creativity, and leadership in traditionally male-dominated spaces.

Improving Maternal Knowledge and Family Health to Prevent Stunting

The research "The Influence of Housewives' Behavior in Child Care on Stunting Incidents in Medan City" addresses one of Indonesia's persistent gender-linked health challenges , the disproportionate burden on women in childcare and nutrition. Conducted by USU's Faculty of Public Health, this study found that limited education, socio-cultural beliefs, and lack of awareness significantly affected child health outcomes.

By introducing structured health education interventions, including counseling and focus group discussions, researchers improved mothers' knowledge and attitudes toward nutrition and early childhood care. The findings revealed a measurable impact: after the intervention, 77.2% of mothers showed increased knowledge and 93.6% demonstrated positive attitudes toward stunting prevention.

This initiative promotes SDG 5.6 (ensure access to reproductive health and rights) and SDG 3 (Good Health and Well-Being). It acknowledges women as central agents in family and community health and underscores the importance of empowering them through education, support networks, and local health systems.

Strengthening Women's Agency through Sustainable Entrepreneurship and Coastal Empowerment

The community project "Developing Mussel-Based Shredded Products in Pematang Cengal Village" provides an example of gender-responsive innovation in coastal areas. The program trained fishermen's wives to process fur mussels into high-value food products (abon kerang), allowing them to diversify family

income and create local microenterprises.
By transforming an undervalued resource into a durable and marketable commodity, the project fostered economic participation and independence among women who were previously limited to domestic roles. Participants also learned hygiene, packaging, and marketing skills, enabling them to commercialize their products through social media and local cooperatives.

This initiative supports SDG 5.5 (women's participation in economic life) and SDG 12 (responsible production). It strengthens women's confidence, builds community resilience, and demonstrates that gender equality can be achieved through inclusive local innovation.

The various initiatives led by Universitas Sumatera Utara under Sustainable Development Goal 5 (Gender Equality) exemplify a multidimensional approach to achieving gender justice, combining education, economic empowerment, and legal protection. From empowering rural women artisans and strengthening maternal knowledge to preventing gender-based violence and promoting entrepreneurial innovation, USU transforms gender equality from a principle into a lived reality.

These programs illustrate that true empowerment arises when women gain both agency and opportunity , when they can make informed choices, contribute economically, and live free from violence and discrimination. By fostering collaboration across academia, government, and civil society, USU continues to lead the way in building an inclusive society where gender equality is not only a goal, but the foundation for sustainable development and shared prosperity.

Innovating for Clean Water, Healthy Ecosystems, and Sustainable Communities

Clean water is not merely a resource, it is the foundation of life, resilience, and sustainable development

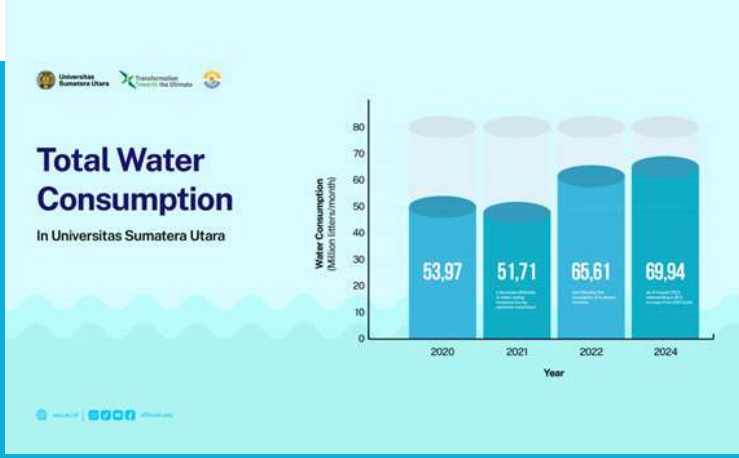
6 CLEAN WATER AND SANITATION

Water is the essence of life and a cornerstone of sustainable development. Recognizing its fundamental role in human health, environmental stability, and economic resilience, Universitas Sumatera Utara has placed Sustainable Development Goal 6 (Clean Water and Sanitation) at the heart of its research and community innovation agenda. Guided by the principle that "clean water is not merely a resource, it is the foundation of life, resilience, and sustainable development," USU strives to create science-based solutions that ensure the sustainable use, protection, and equitable distribution of water resources for present and future generations.

Securing Water for a Sustainable Campus: USU's SDG 6 Actions on Supply, Efficiency, and Safety

Universitas Sumatera Utara operates an integrated water system anchored by municipal water supply and campus-wide metering, ensuring accurate monthly and annual accounting. Complementary sources include rainwater harvesting (e.g., Engineering, Information Study Centre, Mini Stadium) and recycled wastewater at the Digital Learning Center for flushing and landscape irrigation. Water infrastructure, retention ponds, infiltration wells, biopores, and reservoirs at Kuala Bekala and Tambunan A, reduces runoff and supports groundwater recharge, while leak repair and sensor-based devices drive conservation. UI GreenMetric reporting evidences active monitoring: average consumption moved from 53.97 to 51.71 million L/month (2020–2021), rose with campus re-opening to 65.61 million (mid-2022), and reached 69.94 million (Aug 2024), about +35% versus 2021.

USU prevents pollution through distributed wastewater treatment compliant with



national standards (Ministerial Regulation P.68/2016) and verified by third-party audits (SUCOFINDO, provincial environmental agency). Key assets include the STP at the Digital Learning Center; a 150 m^3/day extended-aeration WWTP at the Teaching Hospital (pretreatment, aeration, sedimentation, chlorination, post-treatment/fishpond, sludge handling); a dedicated laboratory WWTP at the Faculty of Pharmacy; bio-technology STP at the Dental and Oral Hospital; and a compact Johkasou system at Environmental Engineering (via JICA). Routine inspections of pH, ammonia, COD, BOD, TSS, and coliform, together with retention ponds and infiltration wells, provide layered safeguards, even under incident scenarios.

To ensure equitable access and cut plastic waste, USU provides free drinking-water refills and bans single-use bottled water under Rector's Regulation No. 3/2019 (Green Campus Movement). Refill stations across faculties enable students, staff, and visitors to use personal tumblers, lowering both costs and environmental footprint. These measures, supply diversification, rigorous treatment and compliance, demand-side efficiency, and plastic-free hydration, demonstrate USU's structured delivery of SDG 6, coupling operational reliability with environmental stewardship and public health protection.

Solar Still: Turning Seawater into Freshwater

The Solar Still project reflects USU's leadership in developing renewable and nature-based solutions to address the freshwater scarcity crisis. In many coastal regions of Indonesia, rising sea levels and saltwater intrusion have made groundwater unsuitable for consumption. USU researchers designed a solar-powered distillation unit that transforms seawater into clean drinking water using the natural process of evaporation and condensation powered by sunlight.

This technology requires no electricity or chemicals, making it cost-efficient, environmentally friendly, and accessible to remote coastal and island communities. It can be constructed using locally available materials, such as glass panels, aluminum sheets, and insulated containers, making it a scalable solution adaptable to various climates.

The Solar Still technology ensures clean and safe drinking water for households affected by drought, climate shocks, or poor infrastructure. It reduces reliance on bottled water, lowers household expenses, and provides a sustainable water source during disaster emergencies. For coastal farmers, this technology also supports small-scale irrigation and livestock hydration, helping stabilize food production even in saline-prone regions. Beyond immediate benefits, Solar Still enhances community independence in water management, fostering local innovation and resilience against the growing threat of water scarcity and climate change.

Developing a Specific Water Quality Index for Tropical Coastal Lakes

In an era where water ecosystems face increasing stress from pollution, urbanization, and climate change, Universitas Sumatera Utara has pioneered a new standard in environmental monitoring through the development of the Specific Water Quality Index (SWQI) for tropical coastal lakes. Unlike conventional indices that are often designed for temperate regions, SWQI introduces parameters that are adapted to tropical environments, such as higher temperatures, seasonal rainfall variation, sedimentation rates, and nutrient loads specific to coastal hydrology.

This scientific tool integrates biological, chemical, and physical indicators, including dissolved oxygen, pH, chlorophyll content, and organic pollution levels, to offer a holistic assessment of lake health. By employing regionally calibrated thresholds, the SWQI helps detect early signs of ecosystem degradation, enabling timely interventions for conservation and management.

The SWQI plays a vital role in sustaining aquatic biodiversity and community livelihoods. Many fishing villages and agricultural sectors in Indonesia depend on these lakes for freshwater and food production. By monitoring water quality with precision, local authorities can protect fish stocks, irrigation networks, and human health. Additionally, the data supports environmental education, empowering communities to participate in conservation initiatives. This innovation directly strengthens evidence-based policy for integrated water resource management and contributes to climate resilience in coastal ecosystems, ensuring the continuity of life and livelihoods that depend on clean and balanced water systems.

Responding to Micropollutant Emergencies: Hazards and Mitigation Strategies

As industrialization and urban expansion continue, micropollutants, tiny yet toxic contaminants like microplastics, pharmaceuticals, heavy metals, and industrial residues, have emerged as a critical threat to freshwater safety. Through the research titled “Micropollutant Emergency: Hazards and Response Measures,” USU scientists identified contamination patterns across rivers, lakes, and groundwater systems in tropical settings. The study provides both an early warning framework and scientifically validated mitigation measures for policymakers and water management authorities.

Researchers evaluated pollutant concentrations, pathways, and potential biological effects, proposing solutions such as biofiltration systems, adsorption technologies, and stricter waste management protocols. These innovations not only enhance environmental

protection but also contribute to long-term public health security.

This initiative protects millions of people who rely on surface and groundwater sources for daily consumption. By identifying and mitigating micropollutant risks, the project helps prevent chronic illnesses, endocrine disruptions, and ecological imbalances. Communities benefit from cleaner water, safer food chains, and improved environmental quality. Furthermore, the research fosters public awareness campaigns, educating citizens on responsible waste disposal and the dangers of chemical pollution, thereby promoting a culture of preventive action and sustainability.

Exploring Waste Potential: Revolutionizing Fecal Waste Treatment

In collaboration with partner institutions in Malaysia, USU researchers are revolutionizing the way human waste is managed through the project "Exploring Waste Potential." This initiative applies circular economy principles to transform fecal sludge into valuable resources such as organic fertilizer, compost, and biogas. Using advanced treatment techniques like anaerobic digestion, drying beds, and microbial bioconversion, the project redefines waste as a renewable source of energy and soil nutrients.

This breakthrough directly enhances sanitation infrastructure in urban and peri-urban areas, reducing pollution of rivers and groundwater caused by untreated sewage. By turning waste into resources, communities not only achieve cleaner environments but also generate economic value through local fertilizer production and renewable energy for households. The initiative mitigates the spread of waterborne diseases, such as cholera and diarrhea, and improves hygiene standards for marginalized communities.

It also supports gender-inclusive benefits, as women, often the most affected by poor sanitation, gain safer facilities and healthier living environments. The project showcases how technology and international collaboration can turn one of humanity's oldest challenges into a source of sustainable growth and dignity.

Oil Palm Shell Powder: A Green Solution for Seawater Purification

Indonesia's palm oil industry generates tons of waste annually, much of which remains unused. USU researchers have innovatively transformed this waste into an eco-friendly water purification material through the development of Oil Palm Shell Powder (OPSP). The material acts as a natural bio-adsorbent, capable of filtering out salt, heavy metals, and suspended solids from seawater, making it a sustainable and affordable solution for water purification.

Laboratory trials demonstrated that OPSP can reduce turbidity and contamination levels to meet World Health Organization (WHO) drinking water standards. Because it is biodegradable and easy to reproduce, OPSP offers a long-term alternative to synthetic filtration materials that often end up polluting the environment after use.

This innovation bridges the gap between agricultural waste management and clean water access. For rural and coastal communities, it ensures safe water for household use, aquaculture, and irrigation, while creating new livelihood opportunities through small-scale filter production. Environmentally, OPSP reduces the carbon footprint of palm oil waste and prevents landfill accumulation. Economically, it stimulates local green industries, supporting Indonesia's circular economy and sustainable resource use. In the long term, OPSP contributes to environmental stewardship and community empowerment, showing how waste can be transformed into life-sustaining innovation.

Science and Innovation for Water Security and Human Well-Being

Through these multidisciplinary innovations, Universitas Sumatera Utara stands at the forefront of scientific contributions to Sustainable Development Goal 6 (Clean Water and Sanitation). From the SWQI that enhances data-driven lake management, to the Solar Still ensuring freshwater for coastal communities, to micropollutant mitigation, fecal waste valorization, and eco-material purification, each initiative demonstrates how academic research can address real-world water and sanitation challenges.

Collectively, these projects deliver measurable benefits: cleaner and safer water, healthier ecosystems, improved sanitation, and stronger local economies. They also empower communities to adopt sustainable water practices while fostering a generation of researchers dedicated to environmental justice and social well-being. By turning science into service and innovation into impact, USU reaffirms its role as a leader in sustainable water management research, championing the belief that access to clean water is not just a development goal but a fundamental human right and a shared responsibility toward a sustainable future.

Renewable Energy Innovations to Promote Affordable and Clean Energy for All

The energy transition must empower communities to innovate locally, use resources sustainably, and build a cleaner future for all

7 AFFORDABLE AND CLEAN ENERGY

Energy access is a foundation for sustainable development, influencing every aspect of human well-being, economic productivity, and environmental balance. In line with Sustainable Development Goal 7 (Affordable and Clean Energy), Universitas Sumatera Utara is committed to expanding access to reliable, sustainable, and modern energy through research, innovation, and community empowerment. The university's initiatives under this goal focus on developing renewable energy technologies, low-emission fuels, and waste-to-energy solutions that support both environmental preservation and energy equity.

Beyond technological advancement, these projects empower local communities to build energy independence and new sources of livelihood. They promote the principles of circular economy, ensuring that energy development goes hand in hand with environmental protection and social inclusion. By integrating research excellence with practical application, USU proves that clean energy is not only a scientific pursuit but a pathway to climate resilience, economic empowerment, and sustainable growth.

Transforming Mangrove Branches into Renewable Energy through Wood Briquettes

Researchers from Universitas Sumatera Utara have pioneered a sustainable energy innovation by converting mangrove branches and wood residues into high-efficiency wood briquettes. This initiative addresses two key issues at once, renewable energy generation and sustainable mangrove management. By

collecting naturally pruned or fallen mangrove wood, the project ensures environmental protection while utilizing waste materials as valuable bioenergy resources.

The resulting briquettes have a high calorific value, low smoke emission, and longer burning duration, providing a cleaner and more sustainable alternative to charcoal and kerosene. The production process also emphasizes community involvement, training local residents in briquette manufacturing, packaging, and small-scale distribution.

This project empowers coastal communities with new sources of income while promoting energy self-sufficiency in remote areas. It helps reduce the dependence on non-renewable fuels, limits deforestation, and cuts carbon emissions. Additionally, the sustainable use of mangrove biomass strengthens coastal ecosystem protection and contributes to climate resilience in rural Indonesia.

Glycerol Innovation for a Cleaner Fuel Industry

Another breakthrough led by USU researchers focuses on glycerol, a by-product of biodiesel production often regarded as waste. Through chemical conversion and catalytic processes, the team successfully transformed glycerol into a renewable, clean-burning alternative fuel. This innovation exemplifies the potential of waste-to-energy technology, aligning industrial sustainability with the global energy transition.

The glycerol-based fuel demonstrates higher combustion efficiency and lower emissions than traditional fossil fuels. Its scalability also opens opportunities for small-scale biofuel industries, especially in regions rich in agricultural and industrial by-products.

The use of glycerol as fuel reduces industrial waste accumulation, lowers greenhouse gas emissions, and supports Indonesia's renewable energy targets. The technology promotes circular economy principles, turning waste into value while enhancing local energy security. Communities benefit from cleaner energy alternatives, economic opportunities in the green energy sector, and a healthier environment.

Turning Coffee Dregs into Biodiesel Energy

In another creative sustainability effort, USU researchers have harnessed used coffee grounds, a common household and industrial waste, into a promising source of biodiesel energy. The process involves oil extraction followed by transesterification, producing clean-burning biofuel suitable for vehicle engines and small power generators.
This research redefines waste as a renewable energy asset and showcases how simple, locally available materials can contribute to urban sustainability. It reflects USU's interdisciplinary approach that combines chemical engineering, environmental science, and entrepreneurship.

By turning coffee waste into biodiesel, this innovation helps reduce organic waste pollution while generating sustainable energy for households and small enterprises. The project creates new economic opportunities for coffee-producing regions, café owners, and micro-industries, encouraging local

participation in renewable energy production. The biodiesel emits fewer pollutants than fossil diesel, contributing to cleaner air quality and mitigating urban carbon emissions.

Empowering Inclusive Growth and Decent Work through Innovation and Collaboration

Sustainable economic growth begins where knowledge meets opportunity, when education, innovation, and community empowerment converge to create meaningful work for all

Inclusive and sustainable economic growth lies at the heart of Sustainable Development Goal 8 (Decent Work and Economic Growth). Universitas Sumatera Utara advances this goal by integrating education, research, and community engagement to generate equitable opportunities and strengthen local resilience. Through innovation-driven projects, international collaborations, and capacity-building programs, the university connects academic excellence with real-world impact, creating jobs, supporting entrepreneurship, and promoting sustainable development across North Sumatra and beyond.

USU's initiatives, ranging from job fairs and entrepreneurship training to digital economy studies and sustainable tourism research, demonstrate how higher education can serve as a catalyst for inclusive prosperity. These initiatives embody a holistic model in which universities act as drivers of human capital development, innovation ecosystems, and community-based economic empowerment.

Expanding Employment Opportunities through Career Days

The USU Career Days 2024 Job Fair underscores the university's strong commitment to improving employability and workforce inclusion. The event connected students, alumni, and job seekers with national and regional employers across multiple sectors. In addition to providing job opportunities, the fair featured workshops and consultations on career readiness, digital competence, and workplace ethics.

This initiative expands employment access for young graduates and marginalized groups, addressing unemployment while aligning university programs with market needs. It fosters industry–academia collaboration and prepares participants with the skills necessary for sustainable, dignified work, supporting SDG 8.5, which promotes productive employment and equal pay for all.

Building Rural Economic Independence through an Accounting System

The project "Penetrating Boundaries, Building Rural Economic Independence through an Accounting System" focuses on empowering small rural enterprises by introducing a simple and practical digital accounting framework. This tool helps local entrepreneurs manage finances, improve transparency, and access microcredit opportunities. USU's team conducted training sessions for cooperatives and village-owned enterprises to ensure local adoption.

This innovation strengthens small and medium-sized enterprises (SMEs), enhances financial literacy, and increases community resilience. By enabling better business decisions and sustainable profit management, it contributes to SDG 8.3, promoting productive activities and entrepreneurship as pathways to inclusive rural development.

Fostering a Sustainable Digital Economy in Indonesia and Malaysia

The comparative study on Sustainable Digital Economy in Indonesia and Malaysia highlights the transformative power of technology when coupled with sustainability and inclusivity. The research examines digital ecosystems, ranging from e-commerce to financial technology, identifying policy opportunities for reducing inequalities and ensuring environmentally responsible growth. This study strengthens policy dialogue between nations and provides a blueprint for building inclusive, low-carbon digital economies. It promotes digital innovation that balances economic efficiency with social responsibility, expanding opportunities for youth and entrepreneurs in the emerging digital sector.

Developing a Muslim-Friendly Tourism Model for Sustainable Growth

USU researchers developed a Muslim-Friendly Tourism Model for North Sumatra, inspired by successful examples from Penang (Malaysia) and West Sumatra (Indonesia). The model integrates sustainability with cultural and religious values, offering practical guidelines for tourism governance and destination management.

The approach enhances regional tourism competitiveness while promoting community-based enterprises and protecting local heritage. By combining inclusivity and environmental responsibility, the model aligns with SDG 8.9, which encourages sustainable tourism

as a driver of local job creation and cultural preservation.

Universitas Sumatera Utara's initiatives under SDG 8 (Decent Work and Economic Growth) reflect a comprehensive commitment to inclusive prosperity and sustainable innovation. The university's research and community programs bridge academic knowledge with social and economic transformation, proving that education can be a catalyst for both opportunity and equity.

Each initiative, whether fostering employability, empowering entrepreneurs, or promoting sustainable industries, demonstrates a shared goal: building an economy that values people as much as productivity. By nurturing human capital, supporting innovation, and strengthening community-based enterprises, USU reinforces the foundation of a resilient, fair, and future-ready economy that leaves no one behind.

Innovating for a Sustainable Future through Science and Industrial Advancement

Innovation is the bridge between knowledge and progress, it transforms research into solutions that build resilient industries and a sustainable future

Sustainable industrial innovation stands at the heart of Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure). As industries confront the dual challenge of economic growth and environmental responsibility, Universitas Sumatera Utara continues to lead with pioneering research that links technological innovation to sustainability. The university's scientists and engineers transform natural resources, agricultural residues, and industrial materials into eco-efficient technologies, ensuring that industrial progress aligns with environmental protection and social benefit.

USU's research portfolio under SDG 9 spans multiple domains, biomaterial development, nanotechnology, green energy, and advanced manufacturing systems. Each initiative exemplifies how universities can serve as drivers of industrial transformation by fostering innovation ecosystems, supporting local industries, and producing research that contributes to national competitiveness while reducing environmental footprints.

From Palm Trees to Sustainable Innovation

The palm oil industry, often criticized for its environmental impact, becomes a source of sustainability through USU's "From Palm Trees to Sustainable Innovation" project. Researchers explore how palm waste, such as empty fruit bunches, shells, and fibers, can be transformed into value-added materials for bioenergy, biodegradable composites, and sustainable construction.
This initiative demonstrates the principles of circular economy by turning agricultural

by-products into renewable resources, reducing industrial waste, and generating new opportunities for small enterprises in rural communities. The research strengthens Indonesia's bio-based industry, promoting greener manufacturing practices and reducing reliance on non-renewable materials.

Revealing the Secret of Supersonic Flutter in Layered Conical Shells

At the frontier of mechanical and aerospace engineering, USU researchers have unveiled new insights into supersonic flutter behavior in layered conical shells. By developing mathematical models and conducting structural simulations, the research contributes to safer and more efficient aircraft and spacecraft designs.

This study enhances understanding of high-speed aerodynamics, ensuring structural integrity and energy efficiency in future aerospace systems. The outcomes have implications for defense, aviation, and renewable energy sectors (such as wind turbine blade design), demonstrating how fundamental science can translate into technological innovation and sustainable industrial advancement.

Rice Husk's Journey to Silica Nanoparticles: A Valuable Material of the Future

In the project "Rice Husk's Journey to Silica Nanoparticles," USU scientists transform one of Indonesia's most abundant agricultural wastes into high-value nanomaterials. Through controlled chemical and thermal processes, rice husks are converted into silica nanoparticles, a key ingredient in electronic components, construction materials, and medical technologies.

This innovation addresses two sustainability priorities: waste reduction and material innovation. It supports clean production systems by turning waste into industrial-grade materials while providing a cost-effective alternative to imported silica. The research strengthens the domestic manufacturing base and opens opportunities for small-scale industries to engage in nanotechnology-driven production, aligning with Indonesia's roadmap for industrial modernization.

Turning Rubber into Gold: The Secret of Magic Fertilizer

The project "Turning Rubber into Gold" introduces a remarkable advancement in agricultural chemistry. Researchers at USU have developed a biodegradable fertilizer derived from rubber plant compounds,

enhancing nutrient absorption efficiency and soil health. The so-called “magic fertilizer” increases crop yield while minimizing chemical runoff, promoting sustainable agriculture practices.

This innovation addresses two sustainability priorities: waste reduction and material innovation. It supports clean production systems by turning waste into industrial-grade materials while providing a cost-effective alternative to imported silica. The research strengthens the domestic manufacturing base and opens opportunities for small-scale industries to engage in nanotechnology-driven production, aligning with Indonesia’s roadmap for industrial modernization.

Optimizing Plastic Strength with a Magic Touch of Compatibilizer

Through the research “Optimizing Plastic Strength with a Magic Touch of Compatibilizer,” USU scientists address one of the major challenges in polymer science, enhancing plastic durability while maintaining recyclability. By incorporating compatibilizers at the molecular level, they improve interfacial bonding within polymer blends, creating stronger yet more eco-friendly plastic materials.

This research contributes to the development of sustainable materials that extend product life cycles and support the reduction of plastic waste. The innovation benefits manufacturing sectors such as packaging, automotive, and consumer goods, positioning Indonesia as a regional leader in sustainable polymer technology.

Air Conditioning Innovation in the Green Energy Revolution

Recognizing the environmental impact of conventional cooling systems, USU engineers developed an energy-efficient air conditioning technology that reduces electricity consumption and greenhouse gas emissions. This innovation employs smart thermodynamic control and eco-refrigerants, ensuring effective cooling with minimal environmental footprint.

The breakthrough supports energy conservation and contributes to climate change mitigation, addressing one of the most pressing challenges in urban development. By reducing operational energy use, the technology also lowers household and industrial costs, advancing both economic efficiency and environmental sustainability.

Universitas Sumatera Utara’s contributions to Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure) highlight how academic research can drive sustainable industrial progress. Each project, from transforming agricultural

residues into advanced materials to pioneering clean technologies, demonstrates the university's role as a catalyst for innovation, circular economy, and green industrial growth.

These scientific breakthroughs not only strengthen national competitiveness but also ensure that industrial advancement remains aligned with social equity and environmental integrity. By integrating research, education, and collaboration, USU exemplifies the power of innovation for inclusive and sustainable industrialization, proving that the future of progress lies in sustainability-driven science and technology.

Promoting Equality and Inclusion through Education, Empowerment, and Advocacy

True equality is achieved when every individual, regardless of gender, ability, or background, can participate fully and safely in shaping their future

10 REDUCED INEQUALITIES

Reducing inequality within and among societies is one of the core pillars of sustainable development. In alignment with Sustainable Development Goal 10 (Reduced Inequalities), Universitas Sumatera Utara has undertaken numerous initiatives that address social disparity, gender-based violence, disability inclusion, and rural empowerment. Through a combination of education, advocacy, and community engagement, USU demonstrates that academic institutions have a moral and strategic role in promoting equality and ensuring that no one is left behind.

These initiatives are designed to create safe learning environments, empower marginalized groups, and uphold the rights of vulnerable populations. By integrating research, outreach, and policy advocacy, USU strengthens both institutional and community-level resilience, contributing to a more inclusive and equitable society.

Creating a Safe and Inclusive Campus Environment

The Socialization of Sexual Violence Prevention Program reflects USU's strong institutional commitment to ensuring safety and equality across its campus community. This initiative is implemented under the framework of the USU Task Force for the Prevention and Handling of Sexual Violence (Satgas PPKS), established by the Rector's Decree.

The program promotes awareness among students and staff regarding the

prevention, reporting, and handling of sexual harassment cases. It includes workshops, public discussions, and social campaigns to foster a culture of mutual respect, gender sensitivity, and zero tolerance for violence.

This effort not only ensures a safe and comfortable academic environment but also supports the broader goal of gender equality and protection of human rights. By institutionalizing preventive measures and empowering victims to speak up, the program directly contributes to SDG 10.2, which emphasizes the social, economic, and political inclusion of all individuals regardless of gender or circumstance.

Empowering Rural Women through the Batik Prima Jaya Home Industry

In rural North Sumatra, USU's researchers collaborated with local communities to empower women through the Batik Prima Jaya Home Industry. The initiative provides training in batik design, production, and entrepreneurship, transforming traditional skills into viable sources of income and local identity.

By integrating creative industries with local culture, this program elevates women's economic participation and enhances their leadership roles within the community. It also promotes environmentally friendly production methods using natural dyes and sustainable materials.

The project improves economic independence among rural women and reduces gender-based income inequality. It aligns with SDG 10.1 by promoting income growth for the bottom 40% of the population and strengthening rural entrepreneurship. Moreover, it reinforces women's social position as agents of change in local development.

Upholding the Rights of Children with Disabilities

The project "Fulfilling the Civil Rights of Children with Disabilities in Sunggal Subdistrict, Deli Serdang Regency" addresses the barriers faced by children with disabilities in accessing education, healthcare, and public services. Through collaboration with local schools, parents, and social organizations, USU academics advocate for inclusive education policies and provide community-based training for caregivers and teachers.

This initiative ensures that children with disabilities enjoy equal rights and opportunities, contributing to the creation of inclusive education systems. It aligns with SDG 10.3, which promotes the elimination of discriminatory practices and the equitable access to services. In addition, it fosters empathy and social awareness among the broader community toward the importance of inclusion and accessibility.

Enhancing Political Accessibility for Persons with Disabilities

In preparation for the 2024 general elections, USU researchers led the initiative “Strengthening Accessibility for Persons with Disabilities through Political Education in Medan City.” The program focuses on educating persons with disabilities about their voting rights and political participation, while also working with electoral commissions to improve physical and procedural accessibility at polling stations.

Workshops and advocacy meetings were held to ensure that electoral processes are more inclusive, transparent, and representative of all citizens.

This initiative promotes equal political participation for people with disabilities, reinforcing democratic inclusivity and representation. It advances SDG 10.2 by empowering marginalized groups to actively engage in decision-making processes and shaping public policy. It also builds institutional awareness of disability rights within electoral systems.

The initiatives undertaken by Universitas Sumatera Utara under the framework of SDG 10 (Reduced Inequalities) reflect a deep commitment to inclusivity, empowerment, and social justice. From creating safe campus spaces and empowering rural women to advocating for the rights of children and persons with disabilities, these programs embody the principles of equality in both action and impact.

Each initiative strengthens the social fabric of communities by dismantling barriers and promoting equitable access to opportunities. By integrating education, empowerment, and advocacy, USU demonstrates how universities can serve as engines of inclusion and transformation, ensuring that progress reaches even the most marginalized members of society.
In doing so, USU continues to advance a vision of sustainable development that is inclusive, participatory, and grounded in human dignity, a vision where equality is not only a goal but a lived reality for all.

Building Sustainable Cities through Innovation, Culture, and Responsible Tourism

Urban sustainability is not defined by infrastructure alone, but by how we harmonize innovation, heritage and human connection within the spaces we inhabit

The pursuit of sustainable cities and communities lies at the core of Sustainable Development Goal 11 (Sustainable Cities and Communities). As urban areas expand and environmental pressures intensify, the challenge of building inclusive, safe, resilient, and sustainable settlements grows ever more urgent. Universitas Sumatera Utara responds to this challenge through research and community initiatives that integrate environmental innovation, cultural preservation, and sustainable tourism development.

By fostering academic–industry–government collaboration, USU strengthens the link between urban planning, environmental stewardship, and socio-economic resilience. Its initiatives, spanning green building design, geopark tourism research, cultural tourism development, and destination sustainability, illustrate how universities can bridge scientific knowledge with real-world urban and community transformation.

Utilizing Green Building Concepts for a Sustainable Future

USU conducts a Webinar on Utilizing Green Building Concepts demonstrates USU's leadership in promoting environmentally responsible construction and urban design. Bringing together scholars, architects, and practitioners, the webinar explored energy-efficient building technologies, sustainable materials, and

passive design strategies that minimize carbon footprints.

USU's research centers emphasized the importance of integrated green architecture, where buildings contribute to ecological balance through renewable energy use, water recycling, and urban greening. The discussion also highlighted the role of policy and community awareness in accelerating Indonesia's transition toward low-carbon cities.
This initiative promotes sustainable urban infrastructure that reduces energy use, mitigates climate impacts, and enhances human well-being. It aligns with SDG 11.6, which seeks to reduce the environmental impact of cities, and SDG 13, on climate action through innovative design and planning.

Collaborative Research on Geopark Tourism Development

In partnership with Malaysian universities, USU conducted research on Geopark Tourism Development to strengthen sustainable destination management and cross-border learning. The project explores how geological heritage can be leveraged to stimulate local economies while maintaining ecological integrity and cultural authenticity.

Through case studies in North Sumatra and Malaysia, the research identifies community-based approaches that balance conservation and economic opportunity. It emphasizes geotourism education, local empowerment, and landscape preservation as key strategies for sustainable development.

This collaboration enhances regional cooperation in promoting sustainable natural heritage management and eco-tourism innovation. It supports SDG 11.4, which calls for strengthening efforts to protect and safeguard the world's cultural and natural heritage, while contributing to inclusive local economic growth.

Reusam Island: Aceh's Gateway to Sharia Tourism

The research and community engagement initiative on Reusam Island in Aceh represents an important step in advancing faith-based and culturally sensitive tourism. By developing a Sharia-compliant tourism model, the project integrates environmental stewardship, social ethics, and religious values into the tourism industry.

The study provides local stakeholders, government agencies, business owners, and community groups, with guidelines for implementing Sharia-based hospitality standards that uphold sustainability, cleanliness, and respect for local traditions.

This initiative fosters inclusive tourism practices that respect cultural diversity and enhance social cohesion. It contributes to SDG 11.3 by promoting participatory urban and community development, where local values and religious norms shape equitable tourism growth.

The Wave of Lake Toba Calls Tourists

USU's research on Lake Toba Tourism Development focuses on strengthening the sustainability and competitiveness of one of Indonesia's key tourism destinations. The study analyzes visitor behavior, environmental carrying capacity, and local business participation to ensure that tourism growth aligns with ecological preservation and community well-being. The project also supports the Lake Toba Geopark initiative by promoting eco-friendly tourism infrastructure, waste management systems, and cultural revitalization. Through public engagement and stakeholder collaboration, it encourages responsible tourism that benefits both residents and the environment.

This research contributes to sustainable destination governance, ensuring that Lake Toba's tourism development remains inclusive, culturally enriching, and environmentally sound. It supports SDG 11.2 by improving local access to sustainable infrastructure and SDG 8.9 through responsible tourism as a driver of inclusive economic growth.

Universitas Sumatera Utara's diverse initiatives under SDG 11 (Sustainable Cities and Communities) illustrate how academic research and community collaboration can shape the blueprint for sustainable urban and rural futures. Through its focus on green building design, sustainable tourism, cultural heritage preservation, and regional cooperation, USU demonstrates that innovation and inclusivity are essential for achieving resilient, livable communities.

These efforts highlight the university's ongoing commitment to integrating environmental responsibility with cultural and social progress. By empowering communities, fostering knowledge exchange, and advancing policy innovation, USU contributes to building cities and communities that are not only sustainable, but also humane, inclusive, and reflective of local identity, a vision where sustainability and culture thrive side by side.

Driving Responsible Consumption and Production through Innovation and Community Action

Sustainability begins not with technology alone, but with awareness, when communities learn to consume wisely, produce responsibly, and protect the environment together

The transition toward responsible consumption and production represents one of the most pressing global challenges addressed under Sustainable Development Goal 12 (SDG 12). Overconsumption, waste mismanagement, and inefficient production practices have placed enormous pressure on ecosystems and natural resources. In this context, Universitas Sumatera Utara has positioned itself as a key institutional actor in promoting sustainable transformation through research, education, and community engagement.

USU's sustainability agenda under SDG 12 focuses on cultivating behavioral change, improving production efficiency, and promoting a circular economy model that emphasizes reuse, recycling, and resource recovery. Through innovative campus programs, applied agricultural research, and civic initiatives, USU demonstrates that sustainability can be achieved not only through policy and technology but also through collective awareness and collaboration.

Socialization of Waste Management Towards a Zero Waste Campus

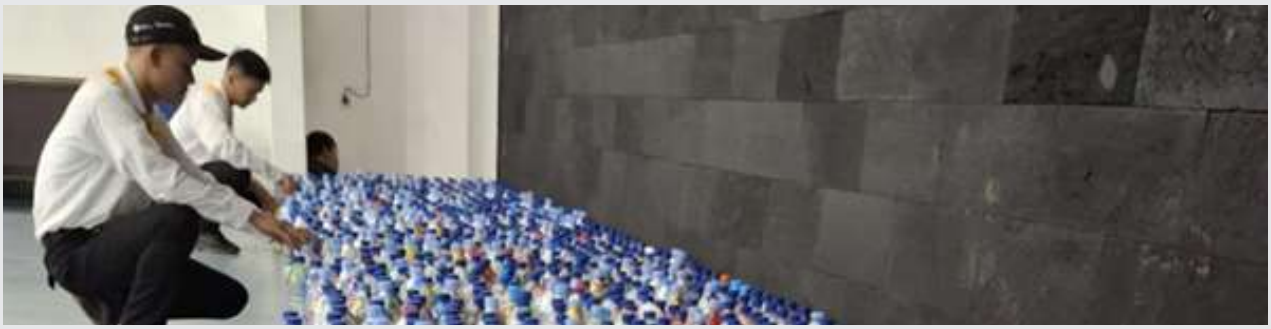
The Socialization of Waste Management Towards Zero Waste initiative embodies USU's commitment to embedding sustainability into the heart of academic life. This program is part of the university's long-term roadmap to achieve carbon neutrality by 2029, as mandated by the Rector's Circular Letter No. 1 of 2023. The initiative aims to establish a comprehensive waste management system that minimizes landfill dependency

by focusing on waste reduction, segregation, recycling, and composting.

Under this program, waste bins are color-coded for effective segregation of organic, inorganic, and hazardous materials. Composting facilities convert organic waste into fertilizer for campus green spaces, while partnerships with recycling companies ensure that plastics, glass, and paper are reprocessed responsibly. Educational workshops and public campaigns reinforce the behavioral aspect of waste management, encouraging students and staff to become active contributors to the zero waste movement.

This initiative serves as a model of institutional sustainability for universities across Indonesia. It creates a new generation of environmentally conscious graduates who integrate sustainable thinking into professional and personal decision-making. Beyond the campus, the initiative fosters a ripple effect as students and staff transfer these practices into their local communities, supporting the broader goal of SDG 12.5, reducing waste generation through prevention, reduction, recycling, and reuse.

Student Action through Ecobrick Creation



A compelling example of student-driven sustainability can be found in the Faculty of Engineering's Ecobrick Project, where first-year students produced over one thousand ecobricks from non-recyclable plastic waste. The project integrates sustainability education with hands-on innovation, teaching students how to repurpose everyday waste materials into durable building blocks used for public infrastructure and community projects.

Students collected single-use plastics, cleaned and compressed them into plastic bottles, and assembled them into modular units. These ecobricks were later used in community projects, such as constructing seating benches and garden partitions in nearby schools and neighborhoods. Beyond its tangible environmental impact, the project emphasizes creative problem-solving and sustainability leadership among young engineers.

The ecobrick initiative contributes to both waste reduction and community empowerment. It engages youth in environmental problem-solving and provides low-cost construction materials for community use. By transforming plastic waste into practical infrastructure, the project advances SDG 12.8, which promotes education and awareness for sustainable lifestyles. It also embodies experiential learning, equipping students with the mindset and skills to innovate sustainably in their future professions.

Collaboration to Clean Up Mountain Area Waste (PBL FAHUT)

The PBL FAHUT program (Field-Based Learning from the Faculty of Forestry) extends USU's sustainability principles beyond the campus into natural conservation zones. In collaboration with local residents and tourism managers, USU students and faculty conducted a mountain clean-up campaign in North Sumatra's highland regions, areas often impacted by tourism-related litter and agricultural

waste.
The program combined environmental education with direct community involvement. Students analyzed waste composition, implemented waste segregation systems, and trained villagers on eco-friendly waste management methods such as composting and eco-enzymes. The project also promoted "carry-in carry-out" principles among tourists, encouraging them to take responsibility for their waste.

This initiative promotes the sustainable management of natural landscapes, contributing to SDG 12.4, which calls for the environmentally sound management of chemicals and waste throughout their life cycle. It reduces pollution, safeguards biodiversity, and nurtures environmental stewardship among both local communities and visitors. Moreover, it strengthens experiential education by allowing students to apply theoretical knowledge in real-world sustainability contexts.

Sustainable Agriculture through Superior Soybeans and Persimmon Cultivation

In the agricultural domain, USU's research and outreach projects demonstrate how sustainable production systems can improve livelihoods and protect natural resources. Two notable examples include the Superior Soybeans with Three-way Cross initiative and the Persimmon Development Project in East Java.

The soybean research utilizes advanced genetic crossing techniques to produce high-yield, climate-resilient, and pest-resistant varieties. These new cultivars reduce the need for pesticides and fertilizers, minimizing environmental impact while increasing productivity and income for smallholder farmers. Meanwhile, the persimmon project trains farmers in post-harvest handling, product diversification, and marketing strategies to enhance competitiveness in domestic and export markets.

Both initiatives integrate sustainability principles, optimizing land use, conserving water, and promoting organic fertilization. Farmers are equipped with knowledge on sustainable agricultural practices, aligning productivity with environmental preservation.

These agricultural programs directly contribute to SDG 12.2, which emphasizes the sustainable management and efficient use of natural resources. They empower rural communities by improving food security, reducing production costs, and strengthening value chains. The initiatives also foster knowledge transfer between researchers and farmers, bridging the gap between academic science and practical agricultural innovation.

Waste Management for a Beautiful and Sustainable City

The research titled “Waste Management: Maintaining the Idea of a Beautiful Medan City” reflects USU’s contribution to urban sustainability and civic environmental governance. The study explores the design and implementation of urban waste management systems that combine infrastructure improvements with citizen engagement. It proposes models for optimizing waste collection routes, establishing neighborhood recycling stations, and implementing community-based monitoring mechanisms.

USU researchers worked alongside the Medan City Government and local NGOs to pilot these strategies in several districts. The findings highlight that effective waste management relies not only on technological solutions but also on the active participation of citizens in maintaining cleanliness and accountability.

This initiative strengthens the urban resilience and livability of Medan City, reducing pollution and enhancing public spaces. It supports both SDG 11.6 (reducing the environmental impact of cities) and SDG 12, by linking responsible consumption with sustainable urban governance. Furthermore, it builds public awareness that maintaining a clean city is a shared social responsibility that extends beyond government policies.

The diverse initiatives undertaken by Universitas Sumatera Utara under Sustainable Development Goal 12 (Responsible Consumption and Production) exemplify how higher education can serve as a hub for sustainability transformation. Through campus-wide zero waste programs, student innovations, environmental collaborations, sustainable agricultural research, and urban policy studies, USU integrates knowledge, practice, and community participation into a coherent sustainability framework.

These efforts not only minimize environmental footprints but also foster eco-conscious mindsets and social innovation. They demonstrate that sustainability is a shared responsibility, achieved through education, participation, and collective commitment. By empowering communities, advancing scientific research, and nurturing ethical leadership, USU continues to redefine what it means to produce and consume responsibly, paving the way for a more circular, equitable, and environmentally resilient future.

Strengthening Climate Action through Innovation, Ecosystem Research, and Community Engagement

Combating climate change requires collective intelligence, when science, community, and policy work hand in hand to protect the planet for future generations

Climate change stands as one of humanity's greatest global challenges, influencing every dimension of environmental stability, social equity, and economic resilience. In alignment with Sustainable Development Goal 13 (Climate Action), Universitas Sumatera Utara continues to take an active leadership role in mitigating climate impacts through scientific innovation, environmental stewardship, and community collaboration.

From cutting-edge research on carbon stock modeling and mangrove biodiversity to campus-based sustainability programs and public awareness campaigns, USU demonstrates how higher education can contribute to climate resilience. These initiatives not only reduce greenhouse gas emissions but also foster ecological literacy and social participation, essential pillars for achieving a low-carbon and climate-resilient society.

Promoting Inclusiveness and Eco-Friendliness in Every Activity

USU integrates climate awareness and sustainability principles across its academic and operational practices through the initiative "USU Promotes Inclusiveness and Eco-Friendliness in All Activities." This program ensures that all university events and operations incorporate environmentally friendly measures, such as minimizing single-use plastics, reducing paper consumption, and prioritizing low-emission logistics.

Beyond environmental aspects, the initiative promotes social inclusivity,

ensuring that sustainability efforts consider accessibility, gender equity, and community participation. Workshops, sustainability campaigns, and cross-sectoral partnerships have helped embed a culture of responsibility among students and staff, transforming USU into a model of an eco-conscious and socially inclusive campus.

This initiative strengthens community understanding of sustainability and climate-conscious behavior. It fosters a collective mindset where individuals recognize their roles in reducing carbon emissions and protecting ecosystems. In doing so, the university contributes directly to SDG 13.3, enhancing education and awareness on climate mitigation and adaptation.

Breaking Records through Ecoenzyme for Climate Mitigation

In a large-scale collaborative effort, the Faculty of Engineering (FT USU) participated in the MURI Record-breaking Ecoenzyme Pouring Event, demonstrating practical commitment to climate action. Ecoenzymes, natural liquid solutions produced from organic waste such as fruit peels, are known to improve soil health, reduce water pollution, and contribute to carbon sequestration by enhancing microbial activity in ecosystems.

By engaging students, academics, and communities in the mass ecoenzyme pouring, the program not only achieved a national record but also served as an environmental awareness campaign. The event emphasized waste-to-resource innovation, showing that small, scalable solutions can have measurable impacts on environmental restoration.

This initiative advances climate change mitigation at the grassroots level. It reduces organic waste, minimizes methane emissions, and improves environmental quality in urban and rural settings. It also promotes civic participation in sustainable practices, transforming environmental stewardship into a collective social movement aligned with SDG 13.2, integrating climate measures into policies and community actions.

eDNA Metabarcoding in Mangrove Biodiversity Assessment

Scientific innovation plays a central role in USU's contribution to climate action. The research project "Application of eDNA Metabarcoding in Faunal Biodiversity Assessment of Indo-Pacific Mangroves Vulnerable to Climate Change" exemplifies how advanced molecular techniques can support ecosystem monitoring and conservation planning.

Using environmental DNA (eDNA) technology, researchers can identify species composition and diversity in mangrove ecosystems without invasive sampling. This approach provides critical data on how climate change affects biodiversity patterns in coastal regions, particularly those threatened by sea-level rise and temperature shifts.

This research enhances adaptive ecosystem management by providing accurate, science-based insights into biodiversity loss and ecosystem vulnerability. It contributes to SDG 13.1, strengthening resilience and adaptive capacity to climate-related hazards. The findings inform policymakers and conservation practitioners, supporting the protection of mangroves, key carbon sinks vital for global climate regulation.

Predicting Forest Cover Change and Carbon Stock for Climate Planning

In another groundbreaking project, USU scientists conducted research on "Prediction of Forest Cover Change and Carbon Stock for the Next 5, 10, and 20 Years to Support Forest Planning and Sustainable Development Goals in North Sumatra." Utilizing remote sensing and predictive modeling, this study projects future trends in forest dynamics and carbon storage under different land-use and climate scenarios.

The research provides valuable tools for forest management and policy formulation, helping decision-makers balance economic development with conservation objectives. By mapping deforestation risks and estimating carbon sequestration potential, the study supports Indonesia's national strategy for reducing emissions from deforestation and forest degradation (REDD+).

This initiative strengthens the scientific foundation for climate-smart land-use planning. It helps governments and industries optimize reforestation efforts, enhance carbon sinks, and protect biodiversity. The research also contributes to global climate modeling databases, reinforcing Indonesia's position as an active contributor to international climate action.

The diverse initiatives of Universitas Sumatera Utara under Sustainable Development Goal 13 (Climate Action) exemplify the synergy between scientific research, education, and civic participation in addressing the climate crisis. By promoting eco-friendly practices, advancing molecular and remote sensing research, and engaging communities in waste-to-resource programs, USU transforms knowledge into measurable environmental impact.

These actions not only mitigate carbon emissions but also cultivate a culture of climate resilience and responsibility among students, researchers, and local communities. The university's integrated approach, linking innovation with inclusion, and policy with practice, demonstrates how higher education can serve as a powerful agent in the global effort to combat climate change. Ultimately, USU's climate action initiatives reaffirm that sustainability begins with informed action, where every experiment, outreach activity, and community partnership contributes to safeguarding the Earth for generations to come.

Protecting Life Below Water through Coastal Restoration, Marine Research, and Community Collaboration

The health of our oceans defines the health of our planet, protecting marine life is not a choice, but an obligation we share for the future of all living beings

Oceans and coastal ecosystems sustain life on Earth, regulating the climate, supporting biodiversity, and providing livelihoods for millions. However, increasing pollution, overexploitation, and climate-induced degradation threaten these vital ecosystems. In line with Sustainable Development Goal 14 (Life Below Water), Universitas Sumatera Utara has strengthened its scientific research, community outreach, and conservation initiatives to protect marine biodiversity and promote sustainable coastal management.

Through collaborative programs such as coastal reforestation, sanitation improvement, and biodiversity monitoring using environmental DNA (eDNA), USU actively contributes to marine ecosystem restoration in North Sumatra and the Indo-Pacific region. These efforts combine science, local participation, and education to ensure that marine resources are used responsibly and remain resilient against environmental change.

Green the Coast, Green the Nation with IKA-USU SUMUT

The initiative “Green the Coast, Green the Nation”, carried out in collaboration with the IKA-USU (North Sumatra Alumni Association), demonstrates how community engagement and alumni partnership can play a transformative role in coastal restoration. The program involved large-scale mangrove replanting and coastal rehabilitation along vulnerable shorelines affected by erosion and habitat loss.

Participants, including students, alumni, local residents, and environmental organizations, worked together to plant thousands of mangrove seedlings. Beyond restoration, the initiative also included environmental education sessions and awareness campaigns on the ecological and economic importance of mangrove forests.

This initiative contributes directly to SDG 14.2, which emphasizes the sustainable management and protection of marine and coastal ecosystems. The restored mangrove zones serve as natural barriers against storm surges and coastal erosion while providing nursery habitats for fish and other aquatic species. Socially, the program fosters community resilience and eco-based livelihoods, reinforcing the bond between environmental stewardship and local well-being.

Addressing Coastal Life and Sanitation Challenges

The study "Coastal Life and Sanitation Challenges" highlights USU's interdisciplinary approach to addressing environmental and social issues in coastal communities. Researchers assessed the impact of poor waste management, sanitation practices, and pollution on marine ecosystems and human health, particularly in fishing villages and small island settlements.

By integrating marine science, public health, and community development, the project proposed sustainable sanitation solutions, including community-based waste segregation, low-cost wastewater treatment, and environmental education for coastal residents. The research findings emphasize that protecting marine life requires addressing land-based sources of pollution, particularly those stemming from inadequate sanitation infrastructure.

This initiative aligns with SDG 14.1, which aims to reduce marine pollution from land-based activities. It enhances local awareness of the link between human behavior and ocean health, empowering communities to take collective action to improve sanitation and reduce waste discharge into coastal waters. The approach not only safeguards marine ecosystems but also enhances public health and the quality of life for coastal populations.

Application of eDNA Metabarcoding in Faunal Biodiversity Assessment of Indo-Pacific Mangroves

Scientific innovation lies at the core of USU's marine research agenda. The project "Application of eDNA Metabarcoding in Faunal Biodiversity Assessment of Indo-Pacific Mangroves Vulnerable to Climate Change" employs environmental DNA (eDNA) as a cutting-edge tool to monitor marine and coastal biodiversity. This method allows researchers to detect a wide range of species, from microscopic organisms to fish and crustaceans, through DNA traces left in water samples.

The research provides a non-invasive, highly efficient means of tracking biodiversity changes in mangrove ecosystems exposed to rising sea levels,

salinity fluctuations, and temperature anomalies. The collected data serve as critical inputs for conservation planning and for developing adaptive management strategies for coastal resilience under climate change scenarios.

This study supports SDG 14.5, which calls for the conservation of marine and coastal areas. By combining molecular biology and ecological analysis, it enhances our understanding of species diversity, ecosystem health, and climate vulnerability. The findings inform both policymakers and conservationists, guiding evidence-based marine resource management and strengthening regional collaborations for biodiversity protection.
The integrated initiatives of Universitas Sumatera Utara under Sustainable Development Goal 14 (Life Below Water) reflect a deep institutional commitment to protecting marine ecosystems through research, restoration, and community empowerment. Whether through mangrove reforestation with IKA-USU, the mitigation of coastal sanitation challenges, or advanced biodiversity monitoring using eDNA, USU unites science, policy, and social action to address the complex interconnections between land, sea, and society.

These efforts not only conserve marine life but also create adaptive coastal communities capable of thriving amid environmental change. By translating research into real-world solutions and fostering partnerships that span academia, government, and civil society, USU exemplifies how universities can act as drivers of ocean sustainability, protecting the seas today to secure a more balanced and resilient planet for tomorrow.

Protecting Life on Land through Research, Conservation, and Community Empowerment

Preserving nature means safeguarding life, balance and hope for future generations

Sustainable Development Goal 15 (Life on Land) calls for the protection, restoration, and sustainable use of terrestrial ecosystems, the responsible management of forests, and urgent action to halt biodiversity loss and land degradation. As one of Indonesia's leading research universities located in a region rich in tropical biodiversity, Universitas Sumatera Utara embraces this mission through integrated scientific research, conservation initiatives, and community engagement.

USU's contributions under SDG 15 span multiple fronts, from forest ecosystem management, biodiversity conservation, and climate-adaptive research, to rural empowerment and environmental education. Through interdisciplinary collaboration, partnerships with government and local communities, and the active involvement of students and researchers, USU demonstrates that science and community empowerment must go hand in hand to sustain the planet's natural heritage.

Conserving Biodiversity through Research and International Collaboration

The 9th Asian Primate Symposium hosted by USU reflects the university's international leadership in biodiversity conservation. The event gathered primatologists, conservationists, and policymakers from across Asia to discuss the preservation of endangered primate species, particularly the Sumatran orangutan, whose habitat is under increasing threat from deforestation.

This effort aligns closely with the research project “Exploring the Future of Orangutan Ecotourism on Sumatra Island”, which promotes sustainable tourism models that balance conservation with local economic benefit. By ensuring that ecotourism activities are environmentally responsible and community-centered, USU’s initiatives protect natural habitats while creating new livelihood opportunities for surrounding populations.

These initiatives advance SDG 15.1 and 15.5, which emphasize the conservation of terrestrial ecosystems and the halting of biodiversity loss. They showcase the role of academic research in supporting ecosystem-based livelihoods, promoting responsible tourism, and ensuring that human activities coexist harmoniously with wildlife.

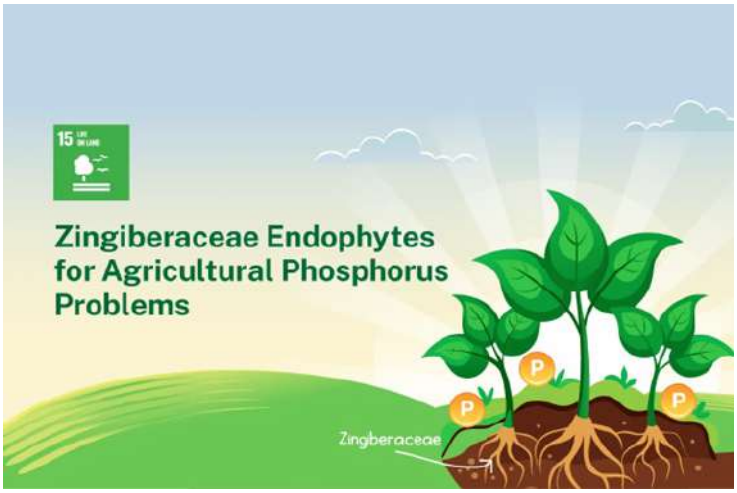
Agroforestry and Sustainable Land Use in Aek Nauli

The project “Agroforestry: The Amazing Nature Preservation of Aek Nauli” highlights the integration of forest conservation with community-based agricultural development. Through agroforestry systems, USU researchers and local farmers plant trees alongside crops, creating a balanced ecosystem that enhances soil fertility, reduces erosion, and restores degraded land.

This model provides long-term ecological and economic benefits by maintaining biodiversity and increasing forest cover while supporting sustainable agriculture. The research outcomes also inform national reforestation policies and strengthen local adaptive capacity to environmental change.

The Aek Nauli initiative directly contributes to SDG 15.3, combating land degradation and desertification. It builds local resilience against climate change, restores ecological integrity, and improves the livelihoods of rural communities by aligning conservation with productivity.

Scientific Innovation for Forest and Soil Conservation



USU’s scientific research extends into biotechnological innovation, as seen in the project “Endophytic Zingiberaceae Fungi for Agricultural Phosphorus Problems.” This study identifies beneficial fungi that enhance soil fertility by increasing phosphorus absorption in plants, thereby reducing dependence on chemical fertilizers.

Similarly, research on Keruing Identification and Conservation Efforts

provides valuable data on preserving Dipterocarpus spp., a critically important tropical timber species now threatened by overexploitation. The use of advanced molecular identification techniques supports accurate conservation planning and genetic diversity preservation.

These studies foster sustainable agriculture and forest management, advancing SDG 15.2 and SDG 15.5 by promoting responsible use of natural resources while reducing environmental degradation caused by unsustainable agricultural practices.

Mangrove and Coastal Forest Resilience Research

Through the project "Uncovering Mangrove Resilience: Salinity Conditions and Freshwater Recovery," USU researchers examine how mangroves adapt to changing salinity levels, providing insight into the ecosystem's resilience against climate-induced stress. The findings inform coastal conservation strategies and sustainable mangrove rehabilitation programs.

Complementing this effort, the USU Faculty of Forestry's community mangrove planting in Nipah Village engages students and local residents in restoring degraded coastal zones. These activities enhance natural defenses against erosion, sequester carbon, and support marine biodiversity.

These programs align with SDG 15.1 and SDG 15.4, integrating forest management with climate adaptation and community participation. They strengthen ecosystem services, mitigate coastal vulnerability, and create models for community-led conservation.

Education, Awareness, and Youth Engagement in Conservation

USU actively promotes environmental education through initiatives such as the PUI Mangrove Summer Course – "Exploring the World of Fungi and Peppers", where students engage in hands-on biodiversity observation and plant identification activities. Participants

explore forest laboratories, greenhouses, and arboretums with more than 80 tree species, deepening their understanding of biodiversity and sustainable management.

The Faculty of Forestry's 10th Anniversary and the Launching of the World Bamboo Collection Park further reinforces USU's role as a center for conservation and innovation. The park serves as a living laboratory for bamboo research and education, promoting sustainable materials and biodiversity conservation.

Similarly, the Youth Initiative – North Sumatra Young Leadership Accelerator (SOLA) 2024 empowers young leaders to advocate for terrestrial ecosystem protection through training, discussions, and conservation projects, such as the protection of the rare Lagan bras tree species.

These educational initiatives contribute to SDG 15.A, enhancing the capacity of young people and professionals in biodiversity management and environmental stewardship. They cultivate future generations of leaders committed to sustainable ecosystem conservation.

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Community Empowerment and Sustainable Livelihoods

The Grand Community Service Project in Pematang Kuala and Teluk Mengkudu and similar programs in Bagan Kuala Village exemplify USU's holistic approach to linking environmental protection with social empowerment. Communities are

trained to create plant-based pesticides, natural mosquito repellents, and ecoprint crafts, reducing dependence on harmful chemicals and promoting eco-friendly practices.

Moreover, the initiative titled "Empowering Communities, Preserving Ecosystems, Sustaining Traditions" integrates ecotourism development, appropriate waste management, and malaria eradication into sustainable rural development. Villagers are encouraged to adopt eco-friendly production methods, restore local biodiversity, and strengthen community-based conservation.

These programs align with SDG 15.9, integrating ecosystem and biodiversity values into local development. They empower communities to adopt sustainable practices while generating new livelihood opportunities, demonstrating that environmental conservation and economic progress can coexist harmoniously.

Innovation in Sustainable Materials and Waste Reduction

The PKM-K 2024 Team's "BCoWrap" project introduces an eco-friendly alternative to single-use plastic wrap made from cotton fabric, beeswax, pine resin, and virgin coconut oil. This reusable food packaging supports waste reduction, sustainable consumption, and the local creative economy.
Meanwhile, research on Malay Motif Woven Fabric with Extracts of Balakka and Sikkam Wood introduces natural dyeing methods that are antibacterial and fade-resistant, preserving traditional culture while reducing chemical pollution in textile production.

These projects advance SDG 15 and SDG 12, illustrating how innovation in materials and local craftsmanship can contribute to both cultural preservation and ecological protection. They reduce environmental pollution and encourage sustainable consumption patterns.

Regional and International Research Collaboration

USU also strengthens regional and international collaboration through the program "Developing Research Collaboration with UiTM, UM, and UPM – Building the 'Human Co-Existence with Wildlife' Scientific Cluster." This initiative establishes a joint research network among Southeast Asian universities, focusing on human–wildlife coexistence, forest ecology, and sustainable resource management.

The collaboration involves developing a Center of Excellence for Science and Technology in Human–Wildlife Coexistence, preparing 20 joint research publications, and advancing long-term conservation strategies for forest ecosystems.

This initiative supports SDG 15.B, mobilizing global partnerships and scientific cooperation for ecosystem conservation. It enhances research capacity, fosters knowledge exchange,

and contributes to regional solutions for biodiversity protection.

Through its comprehensive portfolio of research, education, and community engagement, Universitas Sumatera Utara demonstrates a profound commitment to Sustainable Development Goal 15 (Life on Land). From protecting tropical forests and conserving endangered species to promoting agroforestry, sustainable livelihoods, and youth-led environmental action, USU embodies the principle that human prosperity and environmental integrity are deeply interconnected.

Each initiative, whether rooted in scientific innovation, education, or grassroots collaboration, reinforces the importance of protecting terrestrial ecosystems as a foundation for sustainable life on Earth. By fostering interdisciplinary research, empowering local communities, and nurturing future conservation leaders, USU not only safeguards biodiversity but also builds a legacy of environmental responsibility.

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Advancing Peace, Justice, and Strong Institutions through Integrity, Innovation, and Civic Education

Strong institutions are not built by authority alone, but by transparency, accountability, and the collective will to serve the public good

The advancement of Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions) requires not only the establishment of effective governance systems but also the cultivation of a culture rooted in transparency, civic engagement, and respect for justice. In Indonesia, where democratic consolidation and social equity remain central to sustainable development, Universitas Sumatera Utara plays a key role in strengthening institutional integrity and promoting inclusive governance through education, research, and innovation.

Through initiatives such as award-winning transparency programs, digital governance studies, leadership training, and cultural heritage research, USU demonstrates that academia can be a catalyst for social transformation. The university's approach emphasizes evidence-based policy, ethical leadership, and public participation , ensuring that the principles of peace, justice, and accountability are embedded in both institutional practice and civic consciousness.

Recognizing Integrity and Innovation: USU Receives the 2024 Diktisaintek Award

The Diktisaintek Award 2024 represents national recognition of USU's commitment to governance excellence and academic transformation. The award honors institutions that have successfully integrated innovation and transparency into their management systems, aligning education and research with public accountability.

This achievement reflects USU's consistent implementation of good governance principles, including participatory decision-making, efficient

administrative processes, and a focus on performance-based outcomes. By leveraging digital technologies for data management and research integration, USU enhances institutional responsiveness and public trust.

This recognition strengthens institutional credibility and models effective governance for other higher education institutions. It contributes directly to SDG 16.6, which calls for the development of effective, accountable, and transparent institutions at all levels.

Transparency and Public Accountability: USU as an Informative Education Institution

For four consecutive years, USU has been honored by the Indonesian Central Information Commission (KIP) as an Informative Education Institution, reflecting its exemplary performance in ensuring transparency and open access to public information. Through the establishment of the Public Information and Documentation Management Office (PPID), USU guarantees the accessibility of institutional data, including research, finances, and public services, through digital platforms and open reporting mechanisms.

This commitment to transparency aligns with the university's broader effort to promote integrity, inclusivity, and good governance. By encouraging accountability across all administrative and academic units, USU fosters a campus culture that prioritizes ethical decision-making and public engagement.

This initiative advances SDG 16.10, ensuring public access to information and protecting fundamental freedoms. It also enhances citizen confidence in higher education governance, reinforcing the role of universities as transparent, socially responsible institutions.

Accelerating Urban Development through Online Government Services

The research "Accelerating Urban Development in Indonesia through Online Government Services" reflects USU's dedication to strengthening governance through digital transformation. The study explores how e-government initiatives can improve administrative efficiency, enhance public service delivery, and reduce bureaucratic corruption in Indonesian cities.

By analyzing case studies of local governments implementing digital platforms for licensing, documentation, and civic feedback, USU's researchers provide evidence-based recommendations for building responsive and citizen-centered urban institutions.

This study contributes to SDG 16.6 and 16.7, which emphasize responsive, inclusive, and participatory decision-making. It promotes innovation-driven governance, empowering local governments to become more transparent and accountable through technology.

Sarekat Islam and the Spirit of Independence from East Sumatra

Through the historical research "Sarekat Islam and the Spirit of Independence from East Sumatra," USU scholars examine how early social movements in Indonesia fostered political participation, solidarity, and civic consciousness. The study sheds light on the legacy of Sarekat Islam as a vehicle for grassroots empowerment and collective resistance against colonial injustice, inspiring modern understandings of democracy and social justice.

This research strengthens the appreciation of civic heritage and participatory governance, aligning with SDG 16.3, which promotes access to justice and the rule of law. By documenting the historical evolution of social movements, the study contributes to civic education and reinforces democratic values among contemporary generations.

Inspiring Ethical Leadership for Institutional Harmony

The article "An Inspiring Leadership for Worker Engagement" underscores the significance of transformational and ethical leadership within organizations. USU researchers analyze how empathy, integrity, and inclusive communication foster employee well-being and institutional cohesion. By cultivating leadership styles that prioritize human values, institutions can achieve productivity without compromising fairness and respect.

This research directly supports SDG 16.7, encouraging participatory and inclusive institutional management. It also promotes workplace justice and professional ethics as foundations for organizational harmony and long-term sustainability.

Understanding Political Dynamics and Democratic Resilience

In the study "Navigating Political Dynamics in Indonesia," USU academics explore the interplay between governance, policy formulation, and democratic resilience. The research highlights how political education and civic participation can safeguard democratic processes from polarization and misinformation.

This initiative advances SDG 16.3 and 16.7, fostering a politically literate society capable of engaging critically and

responsibly in governance. It contributes to the strengthening of democratic institutions by encouraging public participation and reinforcing the values of peace and pluralism.

Cultural Wisdom and Biodiversity Protection: Ethnobotanical Inventory of the Haloban Community

The ethnographic study “Ethnobotanical Inventory as Local Wisdom of the Haloban Community in West Banyak Islands” exemplifies how cultural knowledge supports sustainable ecosystem management and social justice. By documenting the Haloban people’s traditional use of plants for medicine, rituals, and livelihoods, researchers reveal a profound interconnection between biodiversity conservation and cultural identity.

This anthropolinguistic approach underscores the importance of indigenous knowledge systems in protecting natural resources while promoting cultural rights and community autonomy.

This research aligns with SDG 16.7 and SDG 15, recognizing local communities as key actors in environmental governance. It promotes inclusivity in conservation decision-making and ensures that traditional wisdom contributes to sustainable resource management.

The initiatives undertaken by Universitas Sumatera Utara under Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions) exemplify a multidimensional approach to governance reform, transparency, ethical leadership, and civic empowerment. Through award-winning transparency programs, research on e-governance and political education, and the preservation of cultural wisdom, USU demonstrates how universities can drive institutional integrity and social transformation.

Each initiative reinforces the idea that peace and justice thrive when institutions are transparent, inclusive, and accountable. By merging technological innovation with ethical governance and cultural understanding, USU not only strengthens public trust but also nurtures a generation of informed citizens and principled leaders.

Ultimately, USU’s commitment to SDG 16 proves that the path to sustainable development begins with strong institutions , institutions that protect rights, uphold justice, and empower people to shape a peaceful and equitable society for all.

Weaving Global Partnerships into Local Impact for Sustainable Development

Empowered partnerships serve as the foundation for innovation, equity, and a sustainable future for all

17 PARTNERSHIPS FOR THE GOALS

Collaboration stands at the heart of global progress. In an era marked by interdependence, complex challenges such as climate change, poverty, and inequality demand joint responses that transcend institutional and national boundaries. In line with Sustainable Development Goal 17 (Partnerships for the Goals), Universitas Sumatera Utara has emerged as a hub of strategic cooperation, linking universities, industries, governments, and communities across the globe to generate solutions for sustainable development.

Through cross-sectoral partnerships, USU integrates research, education, and community engagement into a cohesive ecosystem of innovation. These initiatives not only facilitate knowledge transfer and capacity-building but also translate research outcomes into policies, technologies, and practices that address real-world needs. From academic collaborations in health, law, and agriculture to cross-border community programs and industrial linkages, USU's commitment to SDG 17 reflects a vision of sustainability rooted in inclusivity, solidarity, and shared responsibility.

Building Global Alliances for Academic Excellence and Innovation

USU's collaboration with global partners reflects its ambition to strengthen research ecosystems and enhance academic quality. The Focus Group Discussion (FGD) with Times Higher Education exemplifies this commitment by aligning university performance strategies with international standards, promoting data transparency, and enhancing

research visibility. This engagement helps USU strengthen its role as a globally recognized higher education institution that continuously benchmarks its practices against world-class criteria.

Similarly, USU's participation in Cultural Night 2024 in Bangkok and the hosting of honorary delegations from Singapore reinforce cultural diplomacy and international cooperation. These initiatives not only foster intercultural understanding but also create opportunities for academic and research partnerships, student exchanges, and dual-degree programs. By promoting mutual respect and global citizenship, USU ensures that internationalization serves as a channel for peace, inclusivity, and sustainable development.

These initiatives enhance global academic cooperation and provide platforms for cross-cultural dialogue and innovation exchange. They contribute directly to SDG 17.6 (enhancing international cooperation) and SDG 17.16 (multi-stakeholder partnerships), strengthening both institutional capacity and international solidarity.

Advancing Health and Education through International Collaboration

The collaboration between the Faculty of Medicine (FK USU) and the College of Korean Medicine, Kyung Hee University, demonstrates USU's proactive approach in advancing integrative medicine. This partnership fosters research on traditional and modern healing practices, academic exchanges, and capacity-building programs that enrich the scientific understanding of complementary medicine. The collaboration bridges cultural knowledge systems while promoting sustainable healthcare innovations that respect both tradition and evidence-based science.

In another major step, the Faculty of Law (FH USU) established a scholarship cooperation with Kyushu University, supported by the Japanese Consulate.

This initiative enhances academic mobility, encouraging young scholars to engage in comparative legal studies and international research collaborations. Through these partnerships, USU empowers its students and faculty to gain exposure to global perspectives and participate in international knowledge production networks.

These collaborations contribute to SDG 17.9 (enhancing capacity-building) and SDG 3 (Good Health and Well-Being) by advancing human resource development and health innovation. They nurture globally competent professionals capable of contributing to sustainable health systems and equitable access to education.

Mobilizing Student Engagement for Community Transformation

USU's KKN-T (Thematic Community Service Program) embodies the university's core mission to connect academic learning with real-world challenges. In 2024, USU deployed 522 students across various regions to implement community empowerment projects focused on environmental

conservation, entrepreneurship, public health, and education. This large-scale mobilization illustrates how academic institutions can bridge knowledge and practice, empowering students to become agents of sustainable change. Students worked with local governments, schools, and civil society organizations to identify local needs and co-design solutions, from waste recycling systems to agricultural innovation and digital literacy training. These experiences cultivate civic responsibility and social empathy, while simultaneously strengthening local institutions.

The KKN-T initiative contributes to SDG 17.17 (encouraging multi-stakeholder partnerships) by aligning university resources with community development agendas. It also builds intergenerational bridges, inspiring future leaders who are grounded in sustainability values and community service.

Building Disaster Resilience through Collaborative Research

The study “Resilience of Natural Disaster Survivors Based on Social Capital: A Study on the Survivors of the Eruption of

Mount Sinabung” exemplifies how partnerships and social networks drive community resilience. Conducted in Karo Regency, this research engaged multiple stakeholders, local governments, NGOs, and survivor communities, to identify the role of social capital in post-disaster recovery.

The research revealed that strong social bonds, trust, and cooperation enable communities to rebuild livelihoods, maintain mental well-being, and restore social structures after disasters. By disseminating its findings internationally through publications and conferences, the study reinforces how local knowledge can inform global resilience models.

This initiative contributes to SDG 17.16 and SDG 13 (Climate Action) by integrating research and partnership in disaster mitigation. It highlights the power of collective action and shared knowledge in enhancing the adaptive capacity of vulnerable populations.

ICONART 6: Building Global Research Networks for Sustainability

The 6th International Conference on Natural Resources and Technology (ICONART), hosted by USU's Center of Excellence for Mangrove Science and Technology, served as a major platform for global knowledge exchange. Featuring experts from Indonesia, Malaysia, Japan, and Germany, the conference discussed advancements in ecology, resource management, and sustainable innovation.

By involving academic, industrial, and government actors, ICONART strengthened international partnerships and encouraged joint research on biodiversity, green technology, and renewable resources. The participation of organizations such as the Nationwide University Network in Indonesia (NUNI) and the Malaysia Green Technology Society further exemplifies how cross-border collaboration accelerates the implementation of SDGs.

ICONART embodies SDG 17.6 and SDG 17.16, reinforcing networks that promote sustainable innovation, capacity-building, and policy integration. The conference's outcomes foster scientific diplomacy, facilitating cooperation that transcends borders and disciplines.

Strengthening Local Governance and Evidence-Based Policy in Dairi Regency

The study "Evaluation Model of Sustainable Development Planning in Dairi Regency" assesses the effectiveness of local governance structures in achieving sustainable outcomes. Researchers identified issues such as limited coordination, inconsistent budgeting, and weak stakeholder participation. To address these challenges, the study proposed an adaptive evaluation framework that integrates community engagement, data analytics, and institutional accountability.

The establishment of a Regional Development Evaluation Team (TEPD) ensures that local governments can systematically monitor progress and align planning with budget priorities. By linking research insights with policy implementation, this initiative promotes institutional learning and inter-agency synergy.

The study advances SDG 17.14 (policy coherence for sustainable development) and strengthens local–national coordination. It also provides a replicable model for other regions seeking to enhance governance transparency and effectiveness.

Partnerships for Legal Reform and Human Rights Protection

The research “Providing Restitution for Victims of Human Trafficking in the Perspective of Fulfilling the Principles of Justice” addresses the legal and institutional gaps in implementing restitution for trafficking victims. By collaborating with judicial authorities, law enforcement, and policy institutions, USU’s legal researchers advocate for stronger enforcement mechanisms that ensure victims’ rights to compensation.

The study’s recommendations have been disseminated through international journals and legal symposia, promoting global dialogue

on restorative justice and victim protection.

This initiative supports SDG 17.17 (multi-stakeholder partnerships) and SDG 16 (Peace, Justice, and Strong Institutions) by advancing collaborative policymaking and cross-sectoral legal reforms. It bridges research and advocacy to strengthen human rights and justice systems.

Cross-Border Economic Empowerment: Halal Market Collaboration

The program “Strengthening the Economy of Muslim Traders in Pasar KAMU Deli Serdang and Bangkok” builds cross-cultural cooperation to develop halal trade ecosystems. Through joint workshops and mentoring, partners from Indonesia and Thailand share strategies to improve market access, halal certification, and business literacy among small traders.

This partnership, supported by Thammasat University and the Bangkok Islamic Committee Office, enhances the competitiveness of micro, small, and medium enterprises (MSMEs) while respecting cultural values and promoting sustainable trade practices.

The program aligns with SDG 17.11 and SDG 8 (Decent Work and Economic Growth), strengthening international trade networks and inclusive economic participation. It also demonstrates how interfaith and intercultural partnerships can advance sustainable prosperity.

Youth Health Partnerships for a Smoke-Free Future

The collaborative project between USU and the International Islamic University Malaysia titled “Formation of Smoking Cessation Cadres” seeks to reduce smoking among adolescents in Medan. By conducting workshops, counseling, and mentorship programs, this partnership educates students on the dangers of tobacco and promotes healthy behaviors through peer-to-peer engagement. The program also builds institutional capacity for health promotion in schools, contributing to long-term public health resilience.

This initiative supports SDG 17.9 and SDG 3, showing how educational partnerships can improve community health outcomes and inspire behavioral change among youth.

Academia–Industry Collaboration and Graduate Employability

The USU and CICEEA Job Fair 2025 represents a milestone in bridging academia with global industries. Featuring 24 Chinese companies and a Leadership Forum on graduate competitiveness, the event connects students and alumni with international job opportunities. It

encourages dialogue between industry leaders, educators, and policymakers to ensure curriculum relevance and global employability.

Additionally, USU’s collaboration with PT Agrosindo International enhances research-to-market pipelines, supporting agricultural innovation and sustainable business growth through joint projects and technology transfer agreements. These partnerships contribute to SDG 17.3 (mobilizing financial resources) and SDG 4 (Quality Education), promoting youth employment, innovation diffusion, and economic inclusivity.

Building National Research Ecosystems and Academic Collaboration

USU’s role as host of the Indonesia Research Summit 2025 underscores its leadership in strengthening national research collaboration. Bringing together academia, government, and industry, the summit discussed how science can drive Indonesia’s Vision 2045, focusing on sustainable innovation and equitable growth.

Through the Indonesian Collaborative Research Program (RKI), USU and 20 other state universities form research

consortia to produce interdisciplinary studies and internationally recognized publications. These initiatives enhance national capacity for innovation and position Indonesia as a contributor to global scientific advancement.
These programs advance SDG 17.6 and SDG 17.16, reinforcing research networks and partnerships that generate long-term societal and economic benefits.

Green Campus Partnerships for Environmental Awareness

USU's Green Campus Program reflects the university's internalization of sustainability values through collaboration among faculty, students, and administrative units. Supported by the SDGs Center USU, this initiative includes waste reduction campaigns, tree planting, renewable energy use, and water-saving systems. Partnerships with local communities and government agencies further amplify the impact of environmental education programs.

The initiative aligns with SDG 17.17 and SDG 13, strengthening multi-stakeholder partnerships for environmental protection and promoting a culture of sustainability within and beyond the university.
The diverse partnerships led by Universitas Sumatera Utara under Sustainable Development Goal 17 (Partnerships for the Goals) reflect a deep institutional belief that collaboration is the cornerstone of sustainable progress. From disaster resilience and health partnerships to research networks and cultural diplomacy, USU's initiatives demonstrate how universities can act as catalysts of global cooperation.

By fostering alliances across academia, industry, government, and civil society, USU transforms collaboration into concrete action, bridging global knowledge with local impact. These joint efforts not only accelerate the implementation of the SDGs but also build collective capacity to address complex global challenges.

Ultimately, USU reaffirms that sustainable development can only be achieved through shared responsibility, trust, and collaboration, a vision where partnerships serve as pathways to innovation, inclusivity, and a better future for all.

Universitas
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