No.	University/College	Faculty	Researcher	Research theme	URL	Research overview
1	Tokyo Metropolitan College of Industrial Technology		YOSHIDA Kenichi	Solid Oxide Fuel Cell		From a carbon-neutral perspective, I am conducting research into solid oxide fuel cells that use hydrogen, which does not emit CO2, as fuel. From a nature-positive perspective, I am conducting research into solid oxide fuel cells that use methane gas generated from sewage treatment plants, food waste and so on,as fuel.
2	Tokyo Metropolitan College of Industrial Technology		YAMAMOTO Shoji	Promotion of educational DX through knowledge acquisition	https://www.houjin-tmu.ac.jp/topics/topics13002/#kiji04	This study utilizes user models based on individual traits such as personality and values to enable personalized learning and skill transfer support through machine learning. By promoting educational digital transformation (DX), it aims to enhance the efficiency of human resource development and knowledge acquisition, thereby contributing to the resolution of social issues and the advancement of sustainable human activities.
3	Tokyo Metropolitan College of Industrial Technology		KUDO Masaki	Research on cellulose nanofiber composite materials with high functionality	https://www.metro-cit.ac.jp/contents/000009110.pdf	This research focuses on enhancing the functionality of cellulose nanofiber (CNF) composites derived from plants by imparting high thermal conductivity and improving water resistance. The added value of CNF composites is expected to accelerate their adoption, thereby contributing to environmental impact reduction and decarbonization. One example is the development of CNF filaments with thermal conductivity comparable to that of stainless steel.
4	Tokyo Metropolitan College of Industrial Technology		FUKANO Azusa	Research on nuclear fusion as a new energy source to replace petroleum and coal	https://www.nifs.ac.jp	This research aims to enhance the performance of negative ion sources in fusion reactors by analyzing the electron energy loss width in cusp magnetic fields, with the goal of establishing highly efficient heating and acceleration technologies. By addressing both fundamental and applied aspects of plasma physics, the study contributes to the realization of fusion energy and the development of sustainable next-generation energy sources as alternatives to fossil fuels such as oil and coal.
5	Tokyo Metropolitan College of Industrial Technology		KOIDE Teruaki	Study on a wind turbine with valuable blade pitch	https://www.metro-cit.ac.jp/contents/000011997.pdf	This research aims to improve energy conversion efficiency by implementing variable pitch control of blades in vertical-axis wind turbines, optimizing aerodynamic forces in response to changes in wind speed. Through numerical analysis and experimental validation, the study demonstrates performance surpassing conventional models and seeks to establish this approach as a novel energy-saving technology.
6	Tokyo Metropolitan College of Industrial Technology		SUZUKI Tatsuo	The study of a revolutionary water-splitting photocatalyst ”the monolayer of boron phosphide” in order to produce green hydrogen by direct use of solar energy	https://www2.metro-cit.ac.jp/~tatsuo/	This study theoretically proposes a monolayer film of boron phosphide as an innovative photocatalyst that directly utilizes solar energy to decompose water and generate green hydrogen. It aims to contribute to a decarbonized society through the development of a highly efficient and low-cost hydrogen production technology.

7	Tokyo Metropolitan College of Industrial Technology	SAITO Hiroshi	Development of Phase Change Self-Excited Oscillating Heat Transport Devices with Low Environmental Impact Refrigerants	https://www.mmlab.mech.tuat.ac.jp/mmlab/research/research-ht-j.shtml	This study develops a self-excited oscillating heat transport device that utilizes the phase change of a refrigerant (evaporation and condensation) to establish a high-performance heat transport technology for cooling electronic and power devices with high heat flux. Using refrigerants with a low environmental impact, we will apply machine learning to analyze their flow and heat transport characteristics to advance our understanding of the underlying phenomena. Through this research, this research aims to establish a sustainable thermal management technology.
8	Tokyo Metropolitan College of Industrial Technology	HASEGAWA Osamu	Press forming of the material for weight reduction of automobile		Basic study on bending technology when replacing structural materials such as automobile bumpers and seat frames with aluminum alloys and magnesium alloys, and when replacing copper stranded wire with aluminum strips for bus bars.
9	Tokyo Metropolitan College of Industrial Technology	SAGARA Takuya	①Synthesis of hydrogen storage alloy-filled CNTs and TiO2-filled CNTs by solid-liquid interfacial arc discharge method ②Development of conductive TPU finger bending sensors for XR application		①We are attempting to synthesize CNTs filling FeTi alloys. We will experimentally verify whether it is possible to solidify hydrogen gas under high pressure (GPa) within the nanocavities of CNTs. If this is difficult, we will consider whether it is possible to reduce the hydrogen embrittlement of the alloy. On the other hand, we believe that CNTs filling TiO2 can be used as a reusable water purification agent due to the improved photocatalytic effect of one-dimensional TiO2.②General sensors that detect the bending angle of each finger are expensive, and it is difficult to prepare sensors that are tailored to the size of each individual's finger. In addition, optical detection of finger bending angles; for example, motion capture, has limitations such as being blocked by objects or angles that cannot be seen. Therefore, in this study, we aim to create a finger bending sensor that can be designed to suit the user, and to provide a sensor that can detect the bending angle of a human finger in a VR or AR space using a microcontroller and computer.
10	Tokyo Metropolitan College of Industrial Technology	CAO Meifen	①High Efficient Electric Drive for E-Mobility ②Development of a Hexacopter with Variable-Angle Rotors	https://ieeexplore.ieee.org/abstract/document/5157705	①Development of high-efficient drive technology for electric mobility to contribute to sustainable energy use. ②Development of a hexadrone which can dynamically adjust the angle of each rotor to stabilize and increase the efficiency of cargo transportation.
11	Tokyo Metropolitan College of Industrial Technology	ISHIBASHI Masaki	Study on High frequency Inverter for NOx Reduction System Using Dielectric Barrier Discharge		This research aims not only to reduce NOx through dielectric barrier discharge but also to develop a power supply that reduces the electrical energy required for the discharge. This approach seeks to lower environmental impact while achieving efficient energy utilization.
12	Tokyo Metropolitan College of Industrial Technology	ISHIBASHI Masaki	Research on Practical Application of Magnetic Pulse Welding		The seam welding method, which joins metals in a linear fashion, is a fusion welding technique that requires a large amount of electrical energy. In contrast, magnetic pulse welding is a new joining method that is dramatically more energy-efficient and can instantaneously achieve seam-like connections compared to seam welding. This research focuses on advancing the practical application of magnetic pulse welding.

13	Tokyo Metropolitan College of Industrial Technology	KAWASAKI Norihiro	Study on Demand and Supply Control System using Hydrogen Storage with a Large Penetration of Photovoltaic Generation		This study proposes a power supply-demand balancing system that stores surplus electricity—generated during daytime due to large-scale solar power deployment—and converts it into hydrogen for stable power supply operations. By optimizing operational strategies, the research also explores minimizing the size of hydrogen storage tanks and improving overall system efficiency.
14	Tokyo Metropolitan College of Industrial Technology	IKEDA Hiroshi	Development of novel environmentally conscious cleaning method with microbubble and ultrasonic vibration	https://www.metro-cit.ac.jp/contents/000010997.pdf	My research is Development of novel environmentally conscious cleaning method of some machine parts with microbubble and ultrasonic vibration and this research is that the new cleaning technology that can compensate for the shortcomings of ultrasonic and microbubble cleaning by combining the effectiveness of microbubbles in an ultrasonic acoustic field was reported.
15	Tokyo Metropolitan College of Industrial Technology	SUGIMOTO Seiichi	Development of recycled structural materials using HHP method for recycling the wastes and study of their material properties	https://www.houjin-tmu.ac.jp/topics/topics16025/#kiji02	This study aims to develop a high-strength and highly recyclable regenerated structural material from solid wood using the hydrothermal hot press (HHP) method. Compared to conventional materials such as medium-density fiberboard (MDF), the proposed material exhibits superior bending strength and can be repeatedly regenerated. By clarifying the relationship between the characteristics of cellulose fibers and the material properties, the study contributes to the effective utilization of wood waste and the promotion of sustainable resource circulation.
16	Tokyo Metropolitan College of Industrial Technology	HASEGAWA Osamu	Press forming of the material for weight reduction of automobile		Basic study on bending technology when replacing structural materials such as automobile bumper reinforcement and seat frames with aluminum alloys or magnesium alloys, and when replacing copper stranded wire with aluminum strips for bus bars.
17	Advanced Institute of Industrial Technology	MURAKOSHI Hideki	Light transmittance algae density analyser and particle size analyser - Towards the construction of an optimal culture environment for microalgae -	https://www.houjin-tmu.ac.jp/sustainability_files/environmental_report_2022/?pNo=30	This study aims to achieve stable and efficient cultivation of the microalga Nannochloropsis, which contains omega-3 fatty acids and other valuable compounds, by developing a light-transmission-based algal density measurement device and an aggregation particle measurement system. Utilizing IoT technologies for environmental sensing and data analysis, the research seeks to establish optimal cultivation conditions. These advancements are expected to contribute to applications in biofuel production and CO2 reduction.
18	Advanced Institute of Industrial Technology	TAKASHIMA Shinji	Future Mobility and Infrastructure design as Systems		Considering historically changes in the purpose of movement, focuses on the ”Qualitative value” of movement. Envisioning the future 10 years from now, we propose the realization of ”Mobility that allows you to encounter various things you never knew” as a new mobility value.

19	Advanced Institute of Industrial Technology		ITAKURA Hiroaki	Sustainable Regionable Management	www.italabo.com	Based on the concept of regional value chains, this study aims to maximize the value of local resources and build sustainable communities. By applying data science, artificial intelligence (AI), and machine learning, it conducts an integrated analysis of regional well-being, economic viability, and environmental sustainability. Through diverse initiatives such as the utilization of vacant houses, tourism promotion, and migration support, the research seeks to establish a model for autonomous regional development.
20	Tokyo Metropolitan University	Economics and Business Administration/Management	UCHIYAMA Tomonori	Economic function of sustainable investing	https://www.saa.or.jp/learning/journal/prize/35.html https://www.saa.or.jp/english/professional/journalprizes.html https://orsj.org/?p=7874	This study examines the economic functions of sustainable investment and the construction of optimal portfolios from both theoretical and empirical perspectives, aiming to clarify the role of investors and their impact on environmental and social issues.
21	Tokyo Metropolitan University	Science	MIZUGUCHI Yoshikazu	Development of new thermal management materials using superconductors	https://www.tmu.ac.jp/news/topics/36531.html	This research aims to develop a ”non-volatile magneto-thermal switching” technology that utilizes materials exhibiting both superconducting and magnetic properties to control thermal conductivity through the application of an external magnetic field. Experiments using Sn-Pb solder demonstrated the potential of new materials capable of maintaining high thermal conductivity at low temperatures by transitioning from a superconducting to a magnetic state. Future applications are anticipated to involve high-temperature superconductors.
22	Tokyo Metropolitan University	Science	SHIMOJO Masahiko	Invasion phenomenon of reaction-diffusion equations related to extinction of biological species considering climate change such as global warming	https://kaken.nii.ac.jp/ja/grant/KAKENHI-PROJECT-24K06817/	This study aims to mathematically elucidate invasion and propagation phenomena in predator-prey type reaction-diffusion systems using the entropy method. It analyzes the stability and asymptotic behavior of traveling and expanding wave fronts under temporally varying environmental conditions, with the goal of theoretically clarifying the mechanisms underlying species range expansion and extinction.
23	Tokyo Metropolitan University	Science	OKAMOTO Takashi	Production of CO2 fixing hybrids by in vitro fertilization system	https://www.f-rei.go.jp/assets/contents/240401_Energy_02.pdf	This research aims to realize the practical application of negative emission technologies by selecting and improving plant species with high CO2 fixation capacity through advanced techniques such as microinjection. Enhancing photosynthetic activity and developing improved cultivars contribute to sustainable resource circulation and the achievement of a carbon-neutral society.
24	Tokyo Metropolitan University	Science	OKA Daichi	Development of low-cost thin-film synthesis techniques for photoenergy conversion applications	https://sspc.cpark.tmu.ac.jp/sspc/ja/index.html	This research focuses on the development of low-temperature, cost-effective synthesis techniques for thin films of oxides and sulfides, which are promising materials for photoenergy conversion. By controlling crystal growth and electrical and optical properties, the study aims to enable applications in next-generation energy devices.

25	Tokyo Metropolitan University	Science	EHIRA Shigeki	Production of useful substances from atmospheric carbon dioxide and nitrogen gases using photosynthetic organisms.	https://sites.google.com/site/o3ehira/research	This research develops a technology that utilizes the metabolic functions of photosynthetic microorganisms to produce valuable compounds such as amino acids and lipids from atmospheric CO2 and N2. The goal is to establish a bioprocess that contributes to sustainable resource circulation and the reduction of greenhouse gas emissions.
26	Tokyo Metropolitan University	Science	YAMAZOE Seiji	Developments of Direct Air Capture system and CO2 conversion catalysts	https://yamazoelab.cpark.tmu.ac.jp/yamazoelab/ja/index.html	This study promotes the development of innovative Direct Air Capture (DAC) technologies for efficiently recovering atmospheric CO2, along with catalysts that convert the captured CO2 into valuable substances. With potential applications in facilities such as plant factories, the research aims to realize low-energy, low-cost resource circulation and contribute to the construction of a carbon-circulating society.
27	Tokyo Metropolitan University	Science	TAMURA Koichiro	Development of methods with green computing for molecular phylogenetic analysis	https://biol.fpark.tmu.ac.jp/member/tamura/ja/	This study aims to reduce the computational and environmental burdens associated with molecular phylogenetic analysis, which have increased due to advances in next-generation sequencing technologies. It promotes the theoretical development of green computing techniques. To analyze differences in evolutionary rates and traces of natural selection, the research integrates mathematical modeling, simulation, and empirical data analysis, with the goal of establishing a foundation for sustainable molecular evolution research.
28	Tokyo Metropolitan University	Science	YAMASHITA Aichi	Development of superconductor and thermoelectrc materials		Development of new superconductors which are aiming to the practical use as high-performance magnet for nuclear fusion reactor and MRI. Development of thermoelectric materials for high-performance module, which can directly convert the waste heat into the electricity.
29	Tokyo Metropolitan University	Science	KIKKAWA So-ichi	Absorption and catalytic conversion of carbon dioxide using inorganic functional materials	https://yamazoelab.cpark.tmu.ac.jp/yamazoelab/ja/index.html https://www.tmu.ac.jp/stafflist/data/ka/30337.html	This study aims to develop technologies for CO2 absorption, fixation, and catalytic conversion using inorganic functional materials such as metal oxide clusters. Focusing on the unique functions derived from their distinctive structures, the research explores applications as basic and photocatalysts to establish environmentally friendly reaction systems. By utilizing advanced analytical techniques such as synchrotron radiation spectroscopy, the study seeks to elucidate the dynamic behavior of structural and electronic states during reactions, ultimately providing design guidelines for next-generation materials.
30	Tokyo Metropolitan University	Science	KATO Hidetoshi	The collection and accumulation of biodiversity information in Tokyo		A project utilizing DX to collect and accumulate wildlife information in Tokyo through public-private-academic collaboration

31	Tokyo Metropolitan University	Science	NOMURA Kotohiro	Development of Bio-Based Advanced Polymers and their Depolymerization, Chemical Recycle	https://www.jst.go.jp/kisoken/crest/project/1111113/1111113_2021.html or http://biobase.tmu-orgchem-lab.com/	This project aims to develop functional polymeric materials that can be chemically recyclable derived from naturally abundant inedible plant resources. The project aims to develop the methodology for synthesis of fine chemicals by efficient chemical conversion through selective bond activation, scission, cleavage and formation. The goal of this project is to establish a circular economy from plant resources to polymer synthesis, chemical recycling, and upcycling through innovative catalyst technologies.
32	Tokyo Metropolitan University	Urban Environmental Sciences	ISHIDA Tamao	Transformation of CO2 into valuable compounds by heterogeneous metal catalysts		Development of hetergeneous metal catalysts for conversion of CO2 into valuable compounds aiming at carbon neutral.
33	Tokyo Metropolitan University	Urban Environmental Sciences	SHUDO Toshio	Research on environmentally friendly energy utilization and vehicle power systems using alternative fuels such as hydrogen and ethanol.	https://shudo.fpark.tmu.ac.jp/	This study aims to enhance efficiency and reduce environmental impact across the production, conversion, and utilization stages of next-generation energy sources, including hydrogen, methanol, and biofuels.
34	Tokyo Metropolitan University	Urban Environmental Sciences	YAMATO Masafumi	Research on Direct Air Capture		We aim to develop ultra-high gas permeability membranes for a gas separation membrane-based Direct Air Capture (DAC) system, with the goal of achieving direct CO2 removal from the atmosphere at low energy costs.
35	Tokyo Metropolitan University	Urban Environmental Sciences	KAJIHARA Koichi	Development of inorganic-based functional materials (e.g. efficient phosphors, solid electrolytes, cathode materials for rechargeable magnesium batteries, etc.)	https://kajiharalab.fpark.tmu.ac.jp/	This research aims to develop photoelectronic functional materials based on inorganic solid-state compounds to support sustainable urban environments and a low-carbon society. Focusing on high-efficiency luminescent materials, solid electrolytes, and cathode materials for magnesium secondary batteries, the study encompasses a wide range of investigations from fundamental to applied research, including low-environmental-impact synthesis methods, structural and property analyses, and the exploration of novel materials.
36	Tokyo Metropolitan University	Urban Environmental Sciences	KATO Shungo	Measurement of atmospheric hydrogen in urban and suburban area	https://hydrogen.fpark.tmu.ac.jp/research.html	To advance the realization of a hydrogen-based society, this study aims to assess the actual concentrations of atmospheric hydrogen through observations conducted in both urban and remote areas. By employing high-precision measurement instruments, it seeks to analyze the sources and diffusion behavior of hydrogen, thereby contributing to environmental impact assessments and the assurance of safety in hydrogen energy utilization.

37	Tokyo Metropolitan University	Urban Environmental Sciences	IMAMURA Yoshiyuki	Flood risk management	https://suimon.fpark.tmu.ac.jp/	To address the increasing flood risks associated with climate change and urbanization, this research develops flood prediction and assessment methods utilizing AI and satellite data. Through integrated watershed management and international collaboration, the study aims to establish a sustainable framework for disaster prevention and mitigation.
38	Tokyo Metropolitan University	Urban Environmental Sciences	TAKAHASHI Hideo	Urban climatic environments, Urban heat island phenomenon, Short duration intense rainfall in cities, Climate change	https://www.ues.tmu.ac.jp/geog/guide/studies/index.html#studies02	This study conducts a multifaceted analysis of the mechanisms behind urban heat island phenomena and short-duration heavy rainfall associated with urbanization and climate change, using observations, statistical methods, and simulations. By understanding changes in urban climate conditions, the research aims to provide scientific insights that support the development of sustainable cities.
39	Tokyo Metropolitan University	Urban Environmental Sciences	UENO Atsushi	Study on Carbon Pool Concrete	https://carbon-pool.com/	This study focuses on the development of a novel type of CO2-fixing concrete, referred to as “carbon pool concrete,” which aims to reduce emissions during concrete production by actively sequestering carbon dioxide. By applying CO2 to by-products such as recycled aggregates and sludge powder, the research seeks to enhance material properties while minimizing environmental impact. With a view toward practical application as a paving material, the study also aims to standardize evaluation methods and promote international standardization.
40	Tokyo Metropolitan University	Urban Environmental Sciences	OKU Mami	Legal policy and multi-media approach to combat environmental issues, Environmental law and policy at local government level, Law and policy on urban development	https://www.tmu.ac.jp/stafflist/data/a/356.html	This study examines legal and policy frameworks that combine environmental management systems with regulatory and informational approaches to address issues such as climate change and environmental pollution. Through institutional design related to the roles of local governments and urban development, the research aims to build a sustainable society. It also involves comparative analysis of legal systems in Japan and abroad, as well as practical studies on intermunicipal collaboration.
41	Tokyo Metropolitan University	Urban Environmental Sciences	OSAWA Takeshi	Ecosystem-based disaster risk reduction, Evaluation of any ecosystem functions as Green Infrastructure	https://www.tmu.ac.jp/news/topics/35212.html	This study evaluates the flood mitigation functions of ecosystems such as farmland and rice paddies in response to the increasing risk of water-related disasters caused by climate change. Through statistical analysis and simulation across entire river basins, the research demonstrates that agricultural lands located away from urban areas can contribute to reducing flood damage in cities. These findings highlight the importance of land-use planning that utilizes ecosystems as green infrastructure.
42	Tokyo Metropolitan University	Urban Environmental Sciences	NUMATA Shinya	A study on sustainable use of nature resources	https://nmt.fpark.tmu.ac.jp/	This study investigates the multifaceted relationship between humans and nature through nature-based tourism and the management of protected areas, focusing on ecosystems in Japan and Southeast Asia. It explores the potential of tourism activities that do not involve resource exploitation, aiming to balance ecosystem conservation with regional development. Utilizing methods such as GIS and questionnaire surveys, the research seeks sustainable approaches to natural resource use.

43	Tokyo Metropolitan University	Urban Environmental Sciences	HIHARA Katsuya	Research of sustainable tourism market		Achieving a sustainable society is critically important on a global scale from the perspectives of climate crisis mitigation and biodiversity conservation. However, it is also expected to incur substantial additional costs—for example, approximately 4 trillion USD in the international aviation sector (UN estimate)—which must be appropriately shared among users, investors, operators, municipalities, and national governments. In the tourism sector, which faces challenges such as overtourism, it is essential to understand the factors and structures influencing travelers' willingness to pay for sustainability measures, and to estimate the amount they are willing to contribute. Moreover, studies such as Braje et al. (2022) suggest that these factors have shifted due to the COVID-19 pandemic, potentially increasing the complexity of related issues. Coupled with the rapid recovery of tourism in the post-COVID era, there is currently a notable lack of scientific knowledge regarding the structure of sustainable tourism demand. This joint research project aims to actively contribute to the realization of a sustainable society by forming an international research hub through collaboration between researchers at this university and those in Spain, where advanced tourism market analysis has been accumulated. The project will conduct intensive analysis of post-COVID tourism market demand structures using a combination of experimental economics, psychostatistics, machine learning, and other advanced methodologies. Future expansion of collaboration to Southeast Asia is also envisioned.
44	Tokyo Metropolitan University	Urban Environmental Sciences	SHISHIDO Tetsuya	Selectoive conversion of CO2 to value-added chemicals		Development of catalysts to CO2 conversion into useful chemicals such as CH4, CO, and lower alcohols
45	Tokyo Metropolitan University	Urban Environmental Sciences	KAWAHIGASHI Masayuki	Analyses on ecological functions of soils in green infrastructures		Artificially constructed greenery spaces in urban areas can be called as green infrastructures which is expected to be available to compensate artificially reclaimed area. Although the primary productivity of the green infrastructure is relatively high, soils as planting bases are poorly developed. The relationship between the plant growth and soil development is still not clear. Spatial and temporal change in soil properties of the plant basement is mainly focused to know the relationship between soil development and the plant growth.
46	Tokyo Metropolitan University	Urban Environmental Sciences	KAWAKAMI Hiroyoshi	Fuel cells, all-solid-state secondary batteries, Direct air capture	URL: http://www.comp.tmu.ac.jp/kawakami-labn/	To enhance the performance of fuel cells and all-solid-state lithium-ion batteries, this study focuses on developing high-performance electrolyte membranes using nanofibers. In addition, the research aims to create ultra-high gas permeability materials for direct air capture (DAC), a promising technology for CO2 separation and recovery, by leveraging the interfacial structures between polymer membranes and nanoparticles. These technologies seek to achieve both energy efficiency and reduced environmental impact.
47	Tokyo Metropolitan University	Urban Environmental Sciences	TAKAHASHI Hiroshi	Physical Climatological Research on Climate Change	https://camo.fpark.tmu.ac.jp/pg129.html#research_j	This study aims to elucidate the mechanisms of climate change from a physical climatology perspective, focusing on meteorological and climatic phenomena such as the water and energy cycles at the Earth's surface, the Asian monsoon, typhoons, and land–atmosphere interactions. By utilizing satellite observations, ground-based measurements, reanalysis data, and climate model simulations, the research analyzes the causes of extreme weather events, including heavy rainfall and droughts, and contributes to improving the accuracy of future climate projections.

48	Tokyo Metropolitan University	Urban Environmental Sciences	TANAKA Manabu	Hydrogen Production by Water Electrolysis, Polymer Electrolyte Fuel Cell, Rechargeable Battery (Lithium Battery, Air Battery)	https://m-tanaka.fpark.tmu.ac.jp/	This study aims to address urban environmental and energy challenges through the development of advanced polymer materials. The research focuses on high-efficiency hydrogen production via water electrolysis, performance enhancement of proton exchange membrane fuel cells, and the practical implementation of next-generation batteries. It involves the design and evaluation of anion exchange membranes and nanofiber-based electrolyte membranes, with applications extending to emerging battery technologies such as lithium–air and zinc–air batteries. By integrating material design, prototyping, and performance evaluation, the study contributes to the realization of a sustainable energy society.
49	Tokyo Metropolitan University	Systems Design	KOBAYASHI Satoshi	Lower cost hydrogen storage containers		To reduce the cost of hydrogen tanks for fuel cell vehicles, we are developing a method to minimize the use of carbon fiber.
50	Tokyo Metropolitan University	Systems Design	OTA Ryousuke	Dynamic wireless power transfer for electric vehicles	https://pbs.twimg.com/media/FyJVmfeaIAAA9B_?format=jpg&name=4096x4096	This research aims to develop in-motion wireless power transfer technology for electric vehicles (EVs), eliminating the need for conventional charging and enabling extended driving range and optimized battery capacity. By integrating with road infrastructure, the study contributes to the realization of a next-generation mobility society.
51	Tokyo Metropolitan University	Systems Design	TAKESUE Naoyuki	Method of constructing industrial robots with lightweight materials aimed for energy conservation	https://www.robocip.or.jp/	This study aims to construct energy-efficient and highly safe industrial robots by utilizing lightweight materials and low-power actuators. By introducing wire-driven mechanisms and gravity compensation systems, the robot design achieves both portability and operational efficiency. The research also focuses on developing flexible control technologies that enable collaboration with humans and operation in specialized environments.
52	Tokyo Metropolitan University	Systems Design	WADA Keiji	Research for power electronics	https://sites.google.com/view/tmupel	This study explores the enhancement of performance and reliability in power electronics, focusing on the structure and implementation of power conversion circuits and noise suppression technologies. It promotes the development of technologies that improve energy efficiency and power quality, including harmonic suppression, EMC countermeasures, and the application of next-generation power devices.
53	Tokyo Metropolitan University	Systems Design	SHIMOMURA Yoshiki	Design Theory, Innovation Design, Product-Service System, Environmentally Conscious Design	https://smmlab.fpark.tmu.ac.jp/	This study aims to establish a creative design model based on knowledge manipulation by developing design support technologies that address the entire lifecycle of artificial products. From the perspectives of service engineering and Product-Service Systems (PSS), it promotes integrated design of products and services to contribute to the realization of an environmentally harmonious society. The research also involves the development of a design knowledge database utilizing web-based information and a general-purpose reasoning environment for design support, referred to in this study as UAS.

54	Tokyo Metropolitan University	Systems Design	SUZUKI Yukihisa	large-scale computer simulation, electromagnetic compatibility, wireless power transfer, application of generative AI	https://www.tmu.ac.jp/extra/download.html?d=assets/files/download/keisya/r3/e4_suzuki.pdf, https://steps-emf.net/, https://www.sd.tmu.ac.jp/research/data/sa/6279.html	This study aims to accelerate large-scale numerical simulations in electromagnetic and fluid analysis by developing computational methods that utilize GPUs and many-core processors. It also addresses safety evaluations of electromagnetic environments, such as wireless power transfer and 5G communications, as well as analyses of biological effects. Furthermore, by integrating mathematical models with AI, the research promotes advanced system design that contributes to solving societal challenges.
55	Tokyo Metropolitan University	Systems Design	SHIBATA Yasukuni	Development of lidar system for measuring greenhouse gas profile	https://lidar.fpark.tmu.ac.jp/labo/	This study develops a high-precision remote sensing system using laser-based LiDAR technology to measure the vertical distribution of trace gases such as CO2 and water vapor in the atmosphere. Through non-contact observations from the ground, the system captures the spatial distribution and temporal variation of greenhouse gases, contributing to climate change prediction and environmental monitoring. Collaborative applied research is also underway with domestic and international observation sites to promote practical implementation.
56	Tokyo Metropolitan University	Systems Design	TAKAHASHI Satoru	International Standardization of Test Methods for Integrity of Thermal Barrier Coatings in Carbon-Neutral Turbines		This study has been selected for the FY2024 project “Promotion of Certification for Advanced Energy Supply-Demand Structure Standards (International Standardization in Energy Efficiency)” by Japan’s Ministry of Economy, Trade and Industry. In collaboration among academia, industry, and government, the research focuses on developing a health assessment testing method for thermal barrier coatings—essential components in hydrogen and ammonia-fired gas turbines aimed at achieving carbon neutrality. The project also promotes the international standardization of this method.
57	Tokyo Metropolitan University	Systems Design	SUGAWARA Hiroharu	Feasibility Study on utilization of low-temperature excess waste heat	https://scrapbox.io/tmuMSEsugawaraLabPR/LowTempWasteHeat	This study aims to effectively utilize low-temperature surplus waste heat generated in industrial and public facilities by exploring the potential of small-scale power generation through thermoelectric conversion technologies. In temperature ranges where binary power generation is difficult, thermoelectric conversion—capable of operating without moving parts and with minimal heat input—is employed. Through demonstration experiments at facilities such as wastewater treatment plants, the research seeks to establish sustainable energy recovery technologies.
58	Tokyo Metropolitan University	Systems Design	ABO Makoto	Development of a differential absorption lidar for improving the accuracy of linear precipitation band forecasts		To improve the accuracy of forecasts for linear precipitation bands, which have been occurring more frequently due to global warming, this study aims to develop and implement a differential absorption lidar system for measuring lower-atmosphere water vapor.
59	Tokyo Metropolitan University	Systems Design	ABO Makoto	Estimation of CO2 fluxes from large-scale emission sources using differential absorption lidar observations		To achieve carbon neutrality, it is essential to reduce greenhouse gas emissions and evaluate the effectiveness of mitigation measures. In particular, improving the accuracy of CO2 flux estimates from major emission sources and urban areas is crucial. While systems for estimating CO2 emissions using satellite observation data are under development, this study focuses on developing a differential absorption lidar observation system to validate the accuracy of such satellite-based estimates.

60	Tokyo Metropolitan University	Systems Design	SHIMOMURA Yoshiki	Advocacy and Promotion of the Platonic Design	https://smmlab.fpark.tmu.ac.jp/	In modern society, the design of technology and artefacts is required not only to maximise functional and economic value, but also to contribute to the appropriate construction of interrelationships among diverse values, including environmental and social sustainability. Based on these perspectives, this research addresses the following questions: ① How is sustainable innovation positioned within the co-evolutionary relationship between artefacts and society? ② How do abductive thinking and empathy promote sustainable innovation? ③ What are the means for implementing empathy-based co-creation of value within society?
61	Tokyo Metropolitan University	Systems Design	OBARA Hiromichi	Environmental energy conversion by vibration-induced circulation(VIC) Flow		The establishment of environmentally friendly technologies for harvesting ocean energy, including tidal currents, is important. This research utilizes vibration-induced circulation (VIC) flow technology, which converts the vibrations of flexible tubes into circulating flow, to enable power generation and cultivation.