Kanazawa University
Carbon Neutrality Initiative Plan 2023

(3rd revised edition)

～ Kanazawa E^4-CAMPUS for Carbon Neutrality ～

Kanazawa University

Good Campus

～ Kanazawa E^4-CAMPUS for Carbon Neutrality ～

（Kanazawa University's Mission and Aspirations Toward Achieving Carbon Neutrality）

E4-CAMPUS[*1] embodies the mission and aspirations that the university should fulfill. As a hub of knowledge in East Asia, the university aims to achieve carbon neutrality and the SDGs through universal education, research, medical care, and social contribution in the fields of environment, energy, and ecosystems.

「E^4」: Environment

Energy

Ecology

Education and research

「C」: Cooperation

Working with all members, the university will advance education, research, and outreach toward carbon neutrality.

「A」: Achievement

The university will achieve carbon neutrality by 2050.

「M」: Medical

By advancing and disseminating cutting-edge medical care, the university will support the health and well-being of all people.

「P」: Pioneer

As a knowledge hub in Hokuriku and East Asia, the university will lead carbon neutrality efforts.

「U」: Universality

Through education and research, the university will build a sustainable society where no one is left behind.

「S」: Social Contribution

In partnership with industry, government, academia, and local communities, the university will promote education and research for a sustainable society.

＊1…Refer to the glossary of terms in the reference materials.

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1． Message from the President

■Toward Achieving Carbon Neutrality by 2050

Climate change driven by greenhouse gas emissions is increasing weather and natural disasters, posing a global risk. In response, Japan has declared its goal of achieving net-zero greenhouse gas emissions by 2050.

Kanazawa University established a Carbon Neutrality Promotion Council and launched its action plan, “Kanazawa E^4-CAMPUS for Carbon Neutrality,” in March 2022, revised in June 2024. The university is implementing this plan as a model for society, contributing to the SDGs.

The Future Vision “Aspiration” Version UP 2024 aims to contribute to society through “Future Knowledge” with an all-university approach. “Future Knowledge” means the wisdom to address challenges and create future value and society. Aligned with this vision, the university promotes carbon neutrality through “Future Knowledge.”

In education, it strengthens interdisciplinary liberal arts and STEAM to develop future leaders. It also advances ESD and SDGs education to foster leaders in the environmental field.

In research, it promotes collaboration across industry, government, academia, and finance to accelerate global research and social implementation, including new innovation centers. In research, the university promotes industry–government–academia–finance collaboration to build global research hubs and accelerate the social implementation of research results. Efforts include facilities such as the Biomass-Green Innovation Center (completed in 2022) and the M I R A I C H I Research Center (completed in 2025). Furthermore, by leveraging its expansive campus, the university is advancing both the social implementation of research results and the carbon neutrality of campus facilities in an integrated manner.

Through continuous implementation, evaluation, and improvement, it aims to achieve a carbon-neutral campus. As a frontrunner, the university will advance talent development and R&D for carbon neutrality and contribute to society.

Kanazawa University President 和田隆志
Wada Takashi

2. Basic Policy for Achieving Carbon Neutrality

<Background to the Formulation of the Plan>

In October 2020, in the policy speech at the 203rd extraordinary session of the Diet, then Prime Minister Yoshihide Suga declared that "Japan will aim to realize carbon neutrality by 2050, that is, to reduce greenhouse gas emissions to net zero overall and achieve a decarbonized society," and this policy has been carried on by the current Kishida administration.

Furthermore, in order to achieve carbon neutrality by 2050, while pursuing both significant reductions in greenhouse gas emissions and economic growth and contributing to adaptation measures to the impacts of climate change, various strategies have been established, including the "Long-Term Strategy as a Growth Strategy Under the Paris Agreement" (approved by the Cabinet in June 2019), the "Innovative Environmental Innovation Strategy" (decided by the Integrated Innovation Strategy Promotion Council in January 2020), and the "Green Growth Strategy Through Achieving Carbon Neutrality by 2050" (compiled by the Ministry of Economy, Trade and Industry in June 2021).

In October 2021, the "Plan for Global Warming Countermeasures" was approved by the Cabinet, setting a guideline for universities to achieve a 51% reduction in emissions by fiscal year 2030 compared to fiscal year 2013. Subsequently, in February 2025, the plan was revised, and "Japan submitted a new Nationally Determined Contribution (NDC)" to the United Nations Framework Convention on Climate Change (UNFCCC), setting ambitious targets consistent with the global 1.5°C goal and a linear pathway toward net-zero by 2050, aiming to reduce greenhouse gas emissions by 60% in fiscal year 2035 and 73% in fiscal year 2040 compared to fiscal year 2013. In the "business and other sector," to which universities belong, a new guideline was indicated to reduce emissions by 79–83% by fiscal year 2040 compared to fiscal year 2013.

Based on these developments, national universities are required to address both institution-wide initiatives—including research and human resource development—and efforts related to individual facility development that take into account regional characteristics and specific facility requirements.

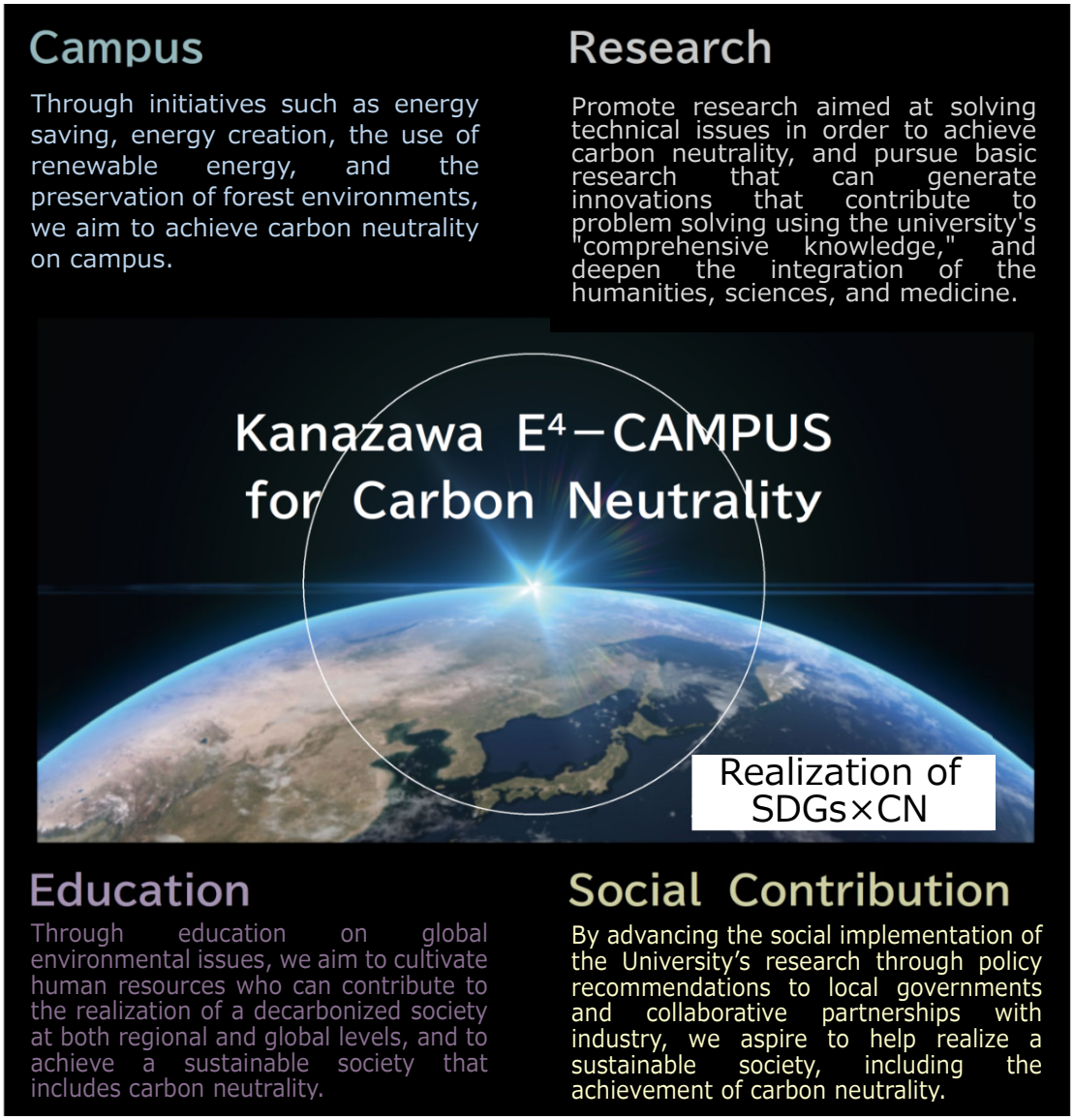
In response, Kanazawa University has formulated the "Kanazawa University Carbon Neutrality Action Plan" (hereinafter referred to as the "Action Plan") and will proactively promote initiatives that serve as leading models for society in areas such as Campus, Education, Research, and Social Contribution, thereby contributing to the achievement of the "Sustainable Development Goals (SDGs)[*2]", including those related to clean energy and climate action.

<Basic Policy for Initiatives>

2 – 1 University-wide Policy

In March 2022, Kanazawa University formulated the "Kanazawa E4-CAMPUS for Carbon Neutrality" initiative, which is based on the pillars of “Research”, “Social Contribution”, “Education”, and achieving carbon neutrality for “Campus” facilities, and published a revised version in June 2026.

Kanazawa University's Future Vision "Aspiration" Version UP 2024 sets out the goal of "All Kanazawa University contributing to society through 'future intelligence'" and, in line with the initiative plan toward carbon neutrality, aims to achieve carbon neutrality through "future intelligence." As "All Kanazawa University," the university will not only achieve carbon neutrality on its campus, but will also contribute to society by serving as a leader in promoting human resource development and research and development that can contribute to the realization of carbon neutrality.

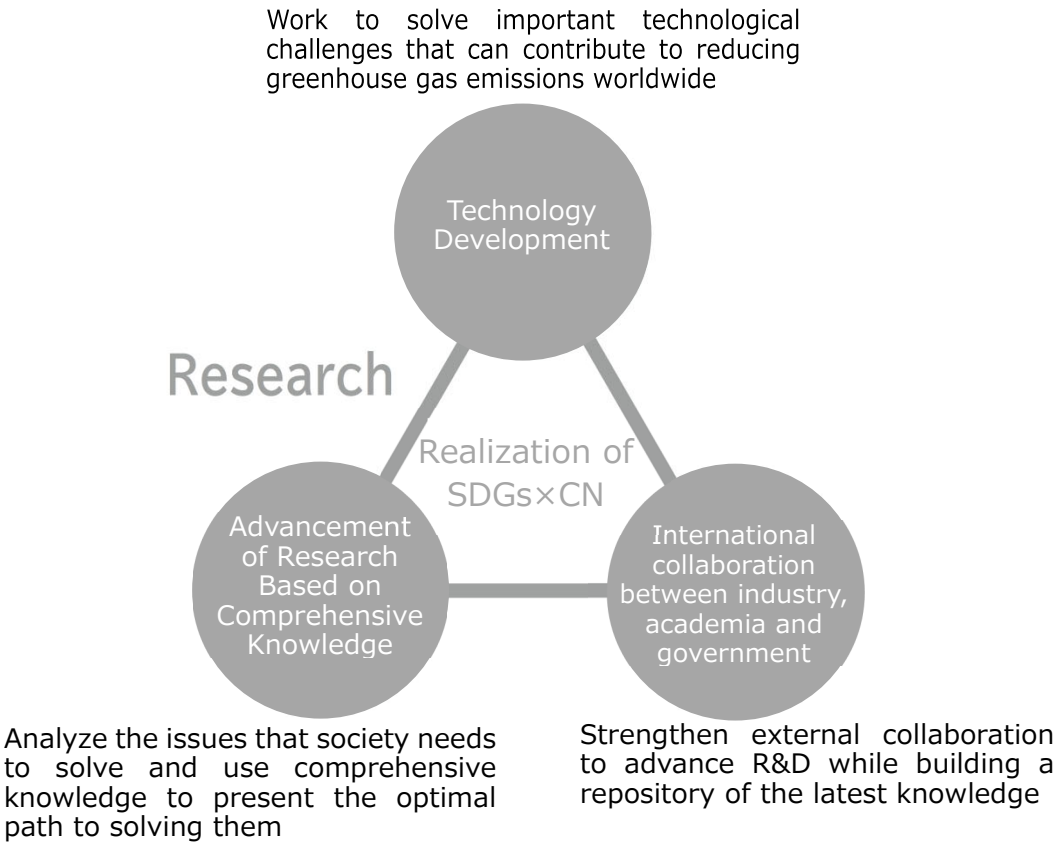


<Specific Policy for Initiatives>

2 – 2 – 1　Basic Policy on Research Contributing to Carbon Neutrality

In its "Innovative Environmental Innovation Strategy," the government has organized the important areas that should be addressed in order to contribute to reducing greenhouse gas emissions worldwide through the creation of innovative innovations into five categories: 1) non-fossil energy, 2) energy networks, 3) hydrogen, 4) carbon recycling, and 5) zero emissions in the agriculture, forestry, and fisheries industries. It has also selected technological challenges and set themes in which Japan can make a significant contribution using its technological capabilities.

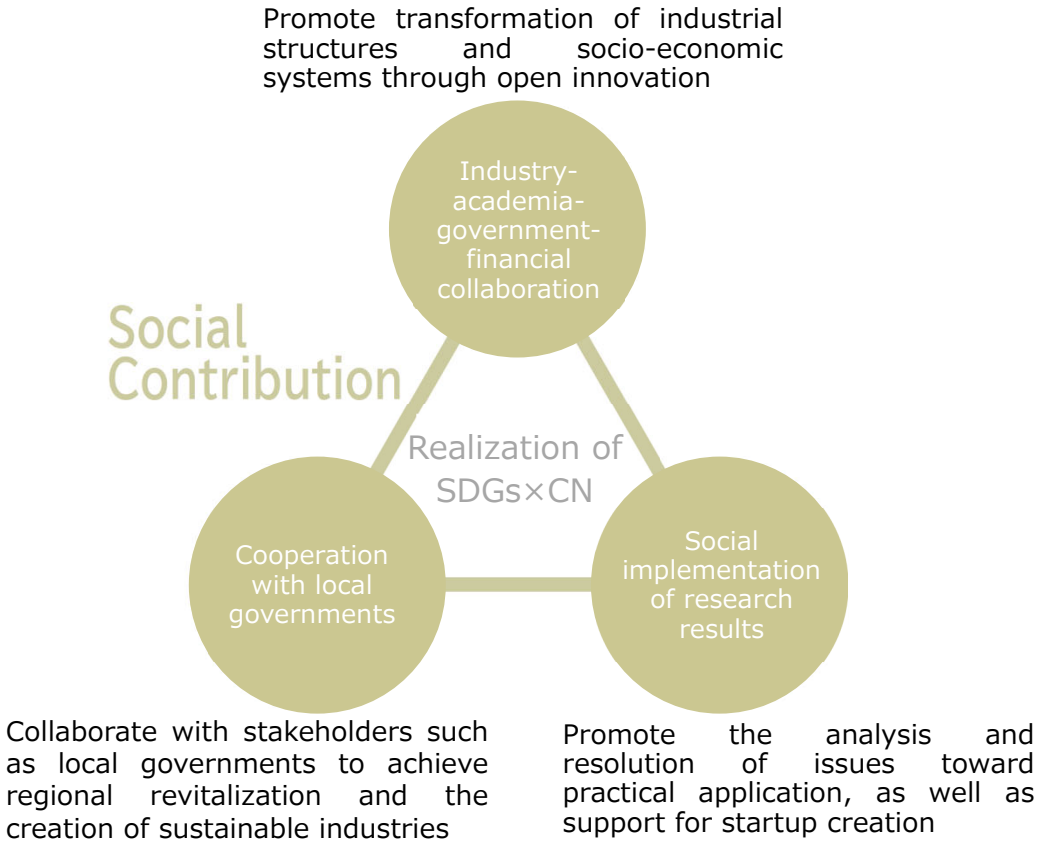
Our university aims to be a "world-class" university that offers outstanding education and research on a global level, and will promote research and development aimed at resolving technical issues in order to achieve carbon neutrality on a global scale. Furthermore, through collaboration with industry, academia, government, and international partners, we will constantly analyze the latest social and technological trends, and without being limited to existing themes, we will utilize the strengths of our university to pursue basic research that can create innovations that contribute to problem-solving through "comprehensive knowledge," and to deepen the integration of the humanities, sciences, and medicine.



2－2－2　Basic Policy on Social Co-creation Contributing to Carbon Neutrality

In its "Green Growth Strategy for Carbon Neutrality by 2050," the government states that in addition to establishing innovative technologies to address the issues outlined in the "Innovative Environmental Innovation Strategy," a further challenge is social implementation and cost reduction through investment. For each priority area, the government has formulated an "action plan" that includes: 1) goals with clear time frames, 2) research and development/demonstration, 3) system development such as regulatory reform and standardization, and 4) international collaboration.

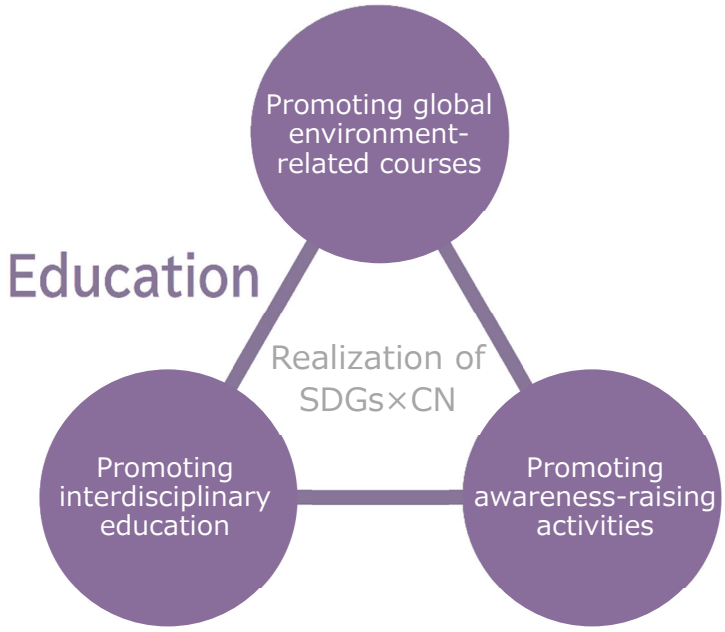
This strategy (a virtuous cycle between the economy and the environment) posits that responding to global warming will bring about changes in industrial structure and socio-economy, leading to growth. It calls for the implementation of this strategy not only by the industrial sector, which is the main driver of social implementation, but also by government, academia, finance, and all other sectors in a unified manner. In order to promote the return of our university's research results to society, we will work with industry, academia, government, and financial institutions, as well as local governments, to propose policies based on comprehensive knowledge, promote open innovation, and support startup businesses, thereby working to co-create a carbon-neutral society.



2－2－3 Basic Policy on Education Contributing to Carbon Neutrality

In order to realize a sustainable society, including carbon neutrality, our university has adopted the basic policy of education that contributes to carbon neutrality as "cultivating human resources who can contribute to the realization of a carbon-neutral society in the local and global regions through education on global environmental issues." We will promote the expansion of courses related to global environmental issues and the SDGs, and actively carry out awareness-raising activities regarding global environmental issues. We will also widely disseminate information about carbon neutrality among students and strive to develop talent with comprehensive knowledge across multiple fields.

Expand course offerings related to the global environment and the SDGs, widely promote them to students, and foster human resources who can contribute to the building of a sustainable society



Widely disseminate initiatives related to carbon neutrality education to students and foster human resources equipped with comprehensive, interdisciplinary knowledge

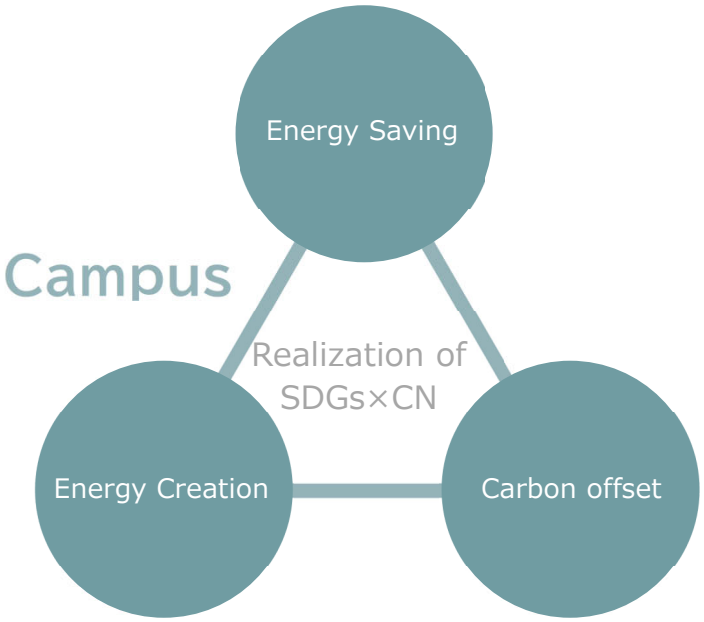
Actively conduct awareness-raising activities on global environmental issues for students across all faculties and graduate schools

2－2－4 Basic Policy for Achieving Carbon Neutrality in Campus Facilities

Kanazawa University emits approximately 37,600 t-CO2 of greenhouse gases per year. This is equivalent to the carbon neutrality of approximately 14,900 average households (approximately 6.9% of Kanazawa city). Although it will not be easy to achieve carbon neutrality for the campus facilities, we will promote initiatives that will serve as a leading model for realizing a sustainable society.

Kanazawa University aims to achieve carbon neutrality for campus facilities by simultaneously implementing energy conservation measures, energy creation measures, utilization of renewable energy, preservation of the forest environment, and demonstrating the use of research results.

Implement energy reduction initiatives such as updating existing facilities to high-efficiency equipment, converting buildings to ZEBs, implementing ESCO projects, and implementing daily energy conservation measures



Implementing energy creation initiatives such as developing renewable energy power generation facilities, utilizing 100% renewable energy electricity, and demonstrating the use of research results

Promote greenhouse gas absorption by maintaining and improving the forest environment unique to our university

2 – 3 Greenhouse Gas（GHG） Reduction Targets

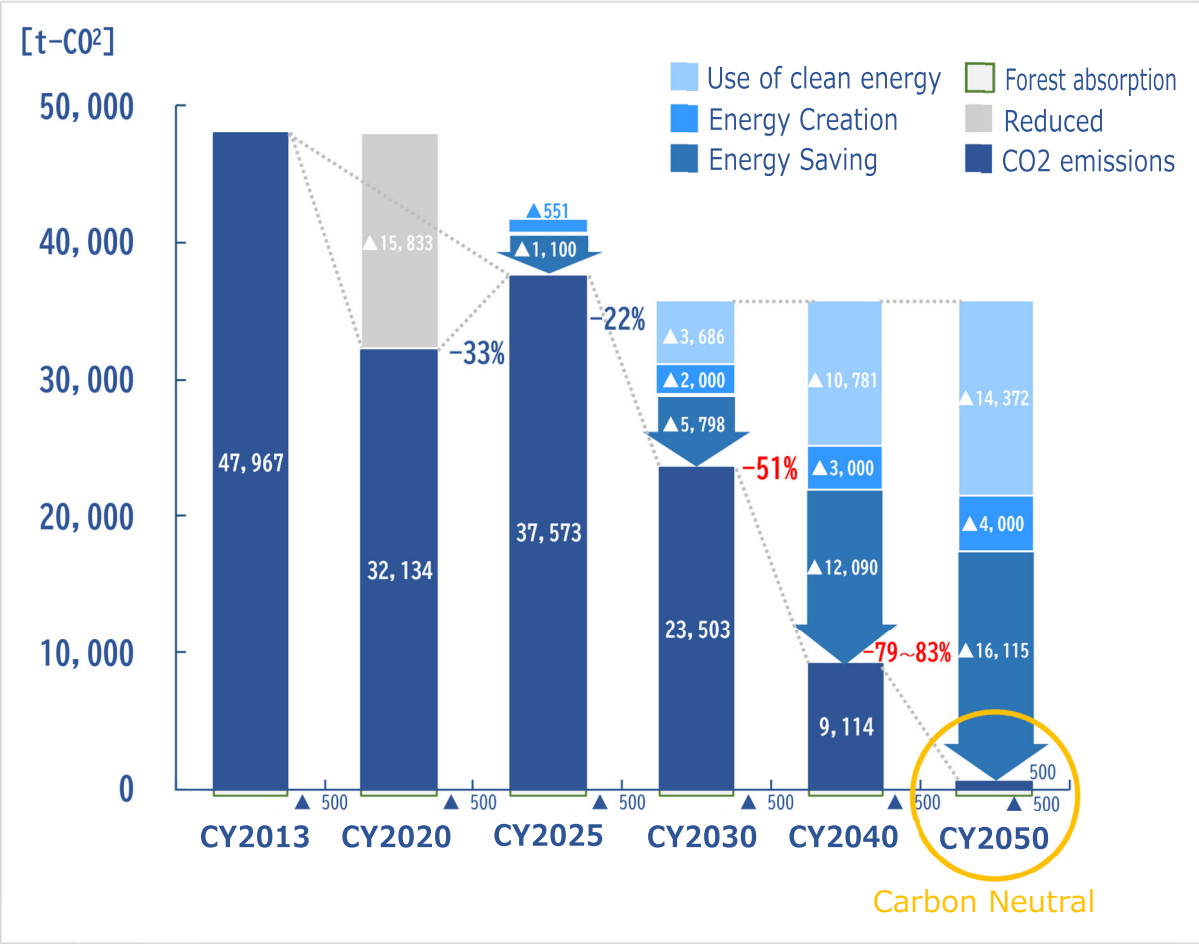
Through daily energy-saving efforts, our university's greenhouse gas emissions will be 37,573 t-CO2 in 2025, a reduction of approximately 22 % compared to 2013.

However, an increase in greenhouse gas emissions is expected due to the construction of new buildings (such as the Natural Science Lecture Hall 2 and the Usui Hall) and increased air conditioning load due to the effects of global warming. In addition, taking into account their age, the renovation of the university's main buildings to become ZEB[*3]-compatible is expected to take place after 2030.

Taking these factors into consideration, we will set reduction targets and timelines for achieving them based on the "Plan for Global Warming Countermeasures" and promote efforts to achieve carbon neutrality by 2050.

Mid-term target : By 2030,compared to 2013 Aiming for a reduction of 51 % or more

Long-term target : Aiming to achieve Carbon Neutral by 2050



3. Specific Initiatives for Achieving Carbon Neutrality

3 – 1 Roadmap for Achieving Carbon Neutrality (through 2050)

Kanazawa University has outlined a roadmap to achieve carbon neutrality by 2050, including initiatives and greenhouse gas reduction targets. It will promote R&D through industry–academia–government collaboration, enhance environmental education, and advance emission reductions in campus facilities. Through these efforts, it aims to achieve its medium-term target (at least 51% reduction by 2030 vs. 2013) and long-term target (carbon neutrality by 2050). The university will also continue efforts to address Scope 3[*4] supply chain emissions and reduce leakage of high–global-warming-potential[*5] fluorocarbons.

Item	Details of the initiative	CY2020 ▶	CY2030 ▶	CY2040 ▶	CY2050
Research, Social Contribution initiatives	Green Energy	Expanding the use of organic solar cell modules (for agriculture, etc.) and scaling them up		Establishment of a circulation system for solar cell resources by introducing recycling technology	
		Development of next-generation electricity storage and energy storage technologies and construction and implementation of power grids to make renewable energy the main power source			
	Material Creation	Breaking away from dependence on fossil fuels Utilization of biomass and development of advanced resource circulation technology			
	Resource circulation	Development of highly efficient carbon and metal recycling technology			
	Social Systems	Social implementation of autonomous driving technology in urban areas		Multi-regional deployment of autonomous driving technology	
	Social Contribution	Demonstration experiments of cutting-edge environmental technologies on campus through the MIRAICHI Research Center		Introduction of environmental policies and systems in the Hokuriku region and social implementation of cutting-edge environmental technologies	
Educational initiatives	Education that contributes to CN	Enhancing CN-related subjects			
		Visualization of CN-related subjects in the syllabus			
		Development of high school-university collaboration and reskilling education			
		Enhancing CN-related international student programs			
		Establishment and development of new minors and degree programs			
Initiatives Toward Carbon Neutrality on Campus	Energy Saving	Planned equipment upgrades			
	Energy Creation	Installation of renewable energy facilities			
	ZEB building	Achieving Nearly ZEB or better when newly built and ZEB Ready or better when renovated			
	Use of clean energy	Procurement of electricity from renewable energy sources			
	Securing forest absorption capacity	Planned maintenance and preservation			
	Operational Initiatives	Daily energy saving, introduction of BEMS, etc.			
	Experimental equipment updates	Planned equipment upgrades			

3 – 2 Roadmap for Achieving Carbon Neutrality (Through 2030, Detailed Ver.)

Item	Details of the initiative	CY 2024 ▶	CY 2025 ▶	CY 2026 ▶	CY 2027 ▶	CY 2030 ▶
Research, Social Contribution initiatives	Green Energy	Organic Solar Cells: Performance, Cost Reduction, and Module Feasibility				
		Next-Gen Energy Storage Development for Renewable Energy Expansion				
	Material Creation	Biomass Utilization and Advanced Resource Circulation				
	Resource circulation	High-Efficiency Carbon & Metal Recycling Technologies				
		<①CO_2 Capture> Core CO_2 Capture Technologies			CO_2 Capture Process Feasibility	
		<②CO_2 Utilization> Core CO_2 Utilization Technologies			CO_2 Utilization Systems	
		<③Metal Recycling Technologies> Metal Recycling Processes			Practical Metal Recycling Systems	
	Social Systems	Safety Evaluation of Autonomous Driving		Urban Deployment of Autonomous Driving		
		Next-Gen LiDAR Recognition				
		Evaluation Scenario Collection	DX Promotion in Autonomous Driving Development			
	Social Contribution	Campus Demonstration of Advanced Environmental Technologies Open Energy Data & Educational Use Business Impact of Energy Investment				
Educational initiatives	Education that contributes to CN	Enhancement of CN-related Courses				
		Visualization of CN-related Courses in Syllabi				
		Expansion to HS Collaboration & Reskilling				
		Enhancement of CN-related Programs for International Students				
		Establishment and Development of New Minors and Degree Programs				
Initiatives Toward Carbon Neutrality on Campus	Energy Saving	Planned Equipment Renewal				
	Energy Creation	Installation of Renewable Energy Facilities				
	ZEB building	Achievement of Nearly ZEB (new buildings) and ZEB Ready (renovations)				
	Use of clean energy	Procurement of Renewable Energy–Derived Electricity				
	Securing forest absorption capacity	Planned Maintenance and Upkeep				
	Operational Initiatives	Daily Energy Saving and Introduction of BEMS				
	Experimental equipment updates	Planned Equipment Upgrades				

3 – 3 Supplementary Roadmap for Research, Social Contribution

Details of Initiatives in Research, Social Contribution

① Green Energy	Next-Gen Solar Cells & Energy-Efficient Manufacturing / Stable Renewable Power Supply Technologies
② Material Creation	Eco-Friendly Materials via Advanced Technologies
③ Resource circulation	CO_2 Utilization & Carbon Neutral/Negative Emissions / Waste-Heat-Driven CO_2 Capture Systems
④ Social System	Deployment of Autonomous Driving
⑤ Social Contribution	On-Campus Demonstrations & Deepened Social Collaboration

At our university, through research and educational activities based on the future vision “Aspiration”, we aim to achieve carbon neutrality by 2050 through “Future Knowledge,” with the collective efforts of the entire Kanazawa University. The foundation of interdisciplinary research integrating the humanities, sciences, and medicine—promoted university-wide—accelerates the creation of new value and contributes to society by leading the resolution of increasingly diverse and complex challenges in the future society through the social implementation of research achievement.

To date, the university has advanced research and development contributing to carbon neutrality, including renewable energy technologies, carbon cycle technologies, energy and environmental materials, and biomass utilization. However, carbon neutrality cannot be achieved solely by extending existing measures or incremental progress in R&D; the creation of entirely new values and social systems is essential.

This roadmap translates these research results into five concrete initiatives for societal return: Green Energy, Materials Creation, Resource Circulation, Social Systems, and Social Contribution. Achieving carbon neutrality requires the defossilization of the energy and materials industries, as well as circular economy processes that enable CO_2 capture and conversion into valuable materials.

Through the initiatives of Green Energy, Materials Creation, and Resource Circulation, future knowledge related to energy generation, energy efficiency, and decarbonization will accelerate the creation of new energy industries and carbon recycling industries. In addition, realizing a green growth strategy requires the simultaneous development of regional social systems and policies. This roadmap

places particular emphasis on the transportation sector, which accounts for approximately 20% of greenhouse gas emissions in Japan. Under the initiatives of Social Systems and Social Contribution, the social implementation of autonomous driving technologies and the introduction of environmental policy frameworks, using the Hokuriku region as a field, will promote EV-based energy efficiency, smoother traffic flow, and the development of public transportation networks in regional areas, thereby reducing greenhouse gas emissions across the entire road transportation system.

Furthermore, as a mechanism to promote the social implementation of university-originated research achievement, the Future Knowledge Demonstration Center was established in April 2023. Through programs such as startup ecosystem co-creation initiatives, this center accelerates the creation of university spin-offs and other ventures working to commercialize innovative environmental technologies. By rapidly implementing results from the university's broad research domains into society, we will strongly promote the dissemination of renewable energy and societal decarbonization, generating significant ripple effects toward the reduction of global greenhouse gas emissions.

Through the social implementation of these research outcomes, the estimated greenhouse gas reduction effect is expected to reach hundreds of millions of tons per year, far exceeding the greenhouse gas emissions from our university campus (approximately 37,600 tons, FY2025 results). The resulting ripple effects are anticipated to extend beyond Japan to the global scale.

Achieving carbon neutrality by 2050 is an ambitious challenge. All members of Kanazawa University, together with a wide range of organizations, must transcend institutional and organizational boundaries while strengthening collaboration with diverse external stakeholders to jointly create world-leading innovations. As the urgency grows to enhance the efficiency, speed, and sophistication of research and development contributing to carbon neutrality and its social implementation—essential for the survival of humanity—Kanazawa University, as a top runner under the banner of "All Kanazawa University," will contribute to society by realizing carbon-neutral social contribution through integrated collaboration among academia, industry, government, and civil society.

Below, the five initiatives are further elaborated in detail.

① Green Energy	Development of Next-Generation Solar Cells and Energy-Efficient Manufacturing Processes

- Solar cells, which are expected to serve as a key new energy source, are currently made of silicon or other inorganic materials and have formed a market worth several trillion yen. However, solar cells based on inorganic materials are very heavy, making installation on rooftops and transportation labor-intensive. To address these challenges, this research promotes the practical application of next-generation solar cells based on organic materials. Examples of organic materials include agricultural products, food, paper, fibers, plastics, vinyl, and even everyday items such as PET bottles. These materials are lightweight, flexible, and can significantly reduce distribution costs, delivering multiple benefits simultaneously. Organic solar cells can be applied to a wide range of uses, including windows, greenhouses, factory roofs, and mobile devices.

- According to the Comprehensive Guidelines for Technology Development toward the Realization of a Sustainable Society reported by NEDO in 2020, estimates of CO_2 reduction potential based on International Energy Agency (IEA) scenarios suggest that the widespread adoption of innovative technologies could lead to the installation of 3,345 TWh of next-generation solar power generation. Based on CO_2 emission intensity, the CO_2 reduction potential in 2050 is estimated at approximately 2.2 billion tons. Furthermore, with technological innovations such as those pursued in this research, next-generation solar cells featuring ultra-lightweight design, ultra-high efficiency, and high aesthetic flexibility would eliminate installation constraints and significantly increase deployment. Estimates assuming replacement with next-generation systems indicate that by 2050, CO_2 reduction potentials from floating, building-integrated (wall-mounted), agricultural, and vehicle-mounted applications would reach approximately 4.8 billion tons, resulting in a total reduction of 7.0 billion tons. This corresponds to about 19% of global CO_2 emissions, estimated at 36.8 billion tons per year (2022 actual data).

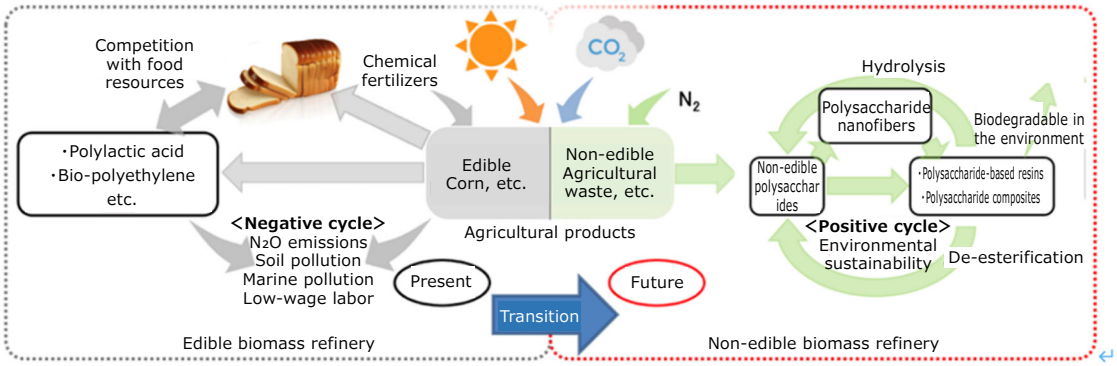
- In addition, energy-efficient manufacturing processes are being pursued. For organic perovskite solar cells fabricated using coating-based manufacturing methods, vacuum deposition processes requiring large vacuum pumps, as well as material heating for vapor deposition, are no longer necessary. Manufacturing can be completed using only short-duration motor operation. As a result, manufacturing costs and energy consumption can be reduced to approximately one-tenth to one-hundredth of conventional levels. Moreover, process simplification is expected to enable mass production and substantial reductions in manufacturing costs.

① Green Energy	Development of technologies that provide stable renewable energy output anytime and anywhere

- This research converts renewable electricity—whose output varies by season, time, and location—into easily transportable and storable materials, enabling stable energy supply at all times and places.
- This will allow renewable energy use even at night or on windless days, and enable energy transport without power lines, ensuring access in remote areas or during disasters. With potential similar to a hydrogen society but easier handling, energy can be produced, stored, and shared at household-to-community scales, significantly increasing renewable energy dependence.
- Realization requires integrating multiple component technologies, alongside improvements in performance, cost, and durability. Drawing on precedents in water electrolysis and fuel cell technologies, this research will advance through sustained investment and awareness-building efforts.

② Material Creation	Development of environmentally benign materials using cutting-edge technologies

- Since around 1960, over 8.3 billion tons of petroleum-based plastics have been produced globally, with 6.3 billion tons discarded. By 2050, more than 12 billion tons are expected to be incinerated, landfilled, or released into the environment.
- This research develops environmentally friendly materials from unused agricultural by-products and plant resources using cutting-edge technologies, while also promoting consumer behavior change and value innovation for social acceptance.
- This is a long-term challenge to create a prosperous future 10–20 years ahead by transforming people, universities, and society.



A biomass-plastics resource circulation society envisioned for 10–20 years from now

③ Resource Circulation	**Development of CO_2 Utilization Technologies and the Realization of Carbon Neutrality and Negative Emissions**

■ This research develops technologies to convert CO_2 into reusable carbon compounds, enabling carbon-neutral and negative-emission※ outcomes.

※Negative Emission Technologies (NETs) remove CO_2 from the atmosphere through capture, storage, or fixation, contributing to carbon dioxide removal (CDR).
https://www.meti.go.jp/shingikai/energy_environment/green_innovation/pdf/gi_008_04_00.pdf

■ The technology leverages reduction reactions driven by solvated electrons generated from the negative electron affinity of diamond, with potential for novel three-dimensional hybrid reaction fields. Further improvements in efficiency and the low-cost, large-scale production of diamond are essential for social implementation.

③ Resource Circulation	**Practical implementation of adsorption-based CO_2 separation and concentration systems utilizing waste heat**

■ To achieve carbon neutrality, this research targets CO_2-free incineration by adopting compact adsorption systems that require fewer auxiliary components than chemical absorption methods and are suitable for small- to medium-scale emission sources. Due to acidic components in incineration flue gas, adsorption methods offer advantages in stability. In Japan, waste incineration emits about 30 million tons※ of CO_2 annually.
※https://www.env.go.jp/council/03recycle/council/03recycle/y030-37-s1-1.pdf

■ If the outcomes of this research are applied to all incinerators and a 50% CO_2 capture rate is achieved, annual CO_2 reductions would reach 15 million tons, equivalent to about 1.4% of Japan's total annual CO_2 emissions (1.064 billion tons, FY2021 confirmed data).

■ As CO_2 capture concentration and recovery rate are in a trade-off relationship, this research applies academically grounded insights to optimize both and incorporate them into system and equipment design. At the same time, the importance of simplicity in equipment and operation for social deployment is strongly emphasized. Furthermore, since water vapor in flue gas significantly affects CO_2 separation performance, this research also focuses on developing adsorbents that maintain CO_2 adsorption capacity in humid conditions and selectively adsorb CO_2 without adsorbing water vapor.

④ Social Systems	Social implementation of autonomous driving technologies

- In Japan, road-sector CO_2 emissions—including vehicle use and infrastructure life cycles—totaled about 175 million tons in FY2021 (16% of national emissions)※. Decarbonizing this sector is a national priority, and autonomous driving is expected to reduce emissions through optimized vehicle control and the maintenance of regional public transportation.
  ※ https://www.mlit.go.jp/road/sisaku/utilization/datutannsoka/cn.pdf
- In collaboration with government, local communities, and industry, Kanazawa University advances autonomous driving technologies to enable safe, sustainable mobility and lower environmental impacts, aiming to create a future mobility society.
- Efforts focus on next-generation sensing, safety-enhancing autonomous and driver-assistance systems, demonstration tests to address infrastructure challenges, and real-time perception, decision-making, and control technologies.
- Building on its strengths in automotive autonomous driving, the university integrates technologies across multiple mobility modes to advance social implementation and create a future mobility society.

⑤ Social Contribution	Deployment of on-campus demonstration experiments and the creation and deepening of harmony with society

- Effective demonstration research requires sustained partnerships and stakeholder engagement to enable backcasting-oriented social implementation. As social challenges grow more complex, validation through demonstration studies and university-wide use of their data are essential. To coordinate these efforts, the MIRAICHI Research Center was established in April 2023.
- The center supports showcase selection, demonstration research, and shared research data infrastructure, while strengthening stakeholder networks and bridging research achievement to external organizations and local communities for social implementation.
  ※INNOVATION AIRPORT | MIRAICHI Research Center (kanazawa-u.ac.jp)
- Together with the university-wide Future Knowledge Demonstration Center, the MIRAICHI Research Center Building (tentative name), currently under construction as a symbolic facility for future social implementation, and the Biomass-Green Innovation Center as an open innovation hub, faculty members engaged in social implementation will work collectively to continuously connect research seeds with societal needs, aiming to achieve carbon neutrality.
  ※Biomass-Green Innovation Center | Kanazawa University (kanazawa-u.ac.jp)

3 – 4 Roadmap for Achieving Carbon Neutrality (Detailed Data Version)

Item	Details of the initiative	CY 2013▶	CY 2020▶	CY 2030▶	CY 2040▶	CY 2050
Specific Reduction Targets	CO_2 Emissions (t-CO_2)	47,967	32,134	23,503	16,452	500
	Forest Carbon Sink Absorption (t-CO_2)	▲500	▲500	▲500	▲500	▲500
	Reduction Amount (Compared to 2013)	–	▲15,833	▲24,464	▲35,515	▲47,467
	Reduction Rate (Compared to 2013)	–	▲33.0%	▲51.0%	▲65.7%	▲ 100%
	Fluorocarbon Leakage (t-CO_2)	–	338	100	100	0
Breakdown of CO_2 Emission Reductions by Initiative (t-CO_2)	Total Reduction Amount	–	▲15,833	▲24,464	▲31,515	▲47,467
	Energy Saving	–	–	▲3,058	▲3,281	▲3,555
	Energy Creation	–	–	▲2,000	▲2,600	▲4,000
	ZEB building	–	–	▲2,740	▲4,320	▲12,560
	Use of clean energy	–	–	▲3,033	▲7,680	▲13,719
	Reductions Already Achieved	–	–	▲15,833	▲15,833	▲15,833
	Increase Due to New Building Construction, etc.	–	–	2,200	2,200	2,200
Project Costs Required for Each Initiative (Million Yen) ※	Total Project Cost	–	–	15,578	10,497	44,549
	Energy Saving	–	–	1,959	2,383	3,440
	Energy Creation	–	–	6	17	23
	ZEB building	–	–	13,581	7,827	40,520
	Use of clean energy	–	–	33	269	567
Total Project Cost During the Planning Period (Million Yen)	Total Project Cost	–	–	70,624		
	Subsidies and Other Equivalent Amounts	–	–	61,928		
	Equivalent Amount from Diverse Funding Sources	–	–	8,696		

※Project costs are presented as aggregated values for each 10-year period. Figures shown for 2030 ▶ represent cumulative totals for the eight-year period from 2022 to 2030. Due to rounding, total project costs may not match exactly.

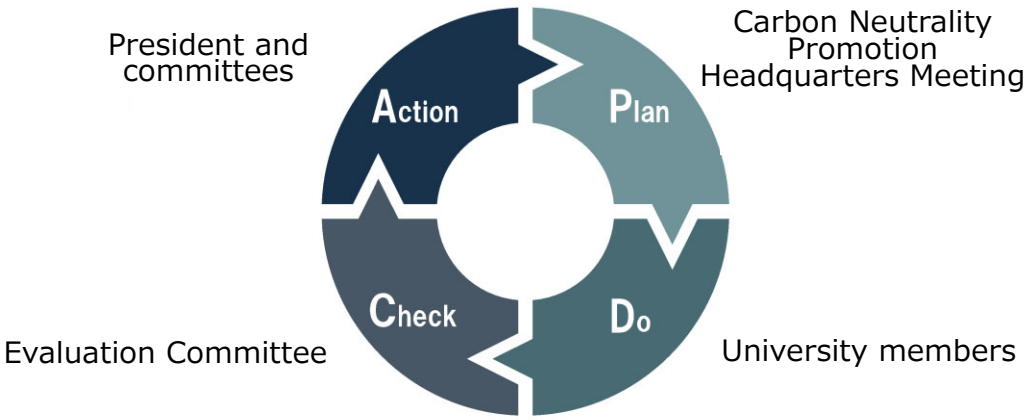
3 – 5 Promotion framework for implementing the roadmap

Establishment of a PDCA cycle centered on the Carbon Neutral Promotion Headquarters Meeting to continuously advance carbon neutrality initiatives.

Reinvestment of reduced utility costs from energy saving and energy creation into facility upgrades, further promoting energy efficiency and on-site energy production to reduce greenhouse gas emissions

<Promotion framework, etc.>

- Establishment of a PDCA-based operational framework linking the Carbon Neutral Promotion Headquarters Meeting with the Facilities & Environment Planning Committee, Research Planning Committee, Education Planning Committee, and related bodies
- Promotion of initiatives toward achieving targets while flexibly revising plans as needed
- Establishment of a circular energy-saving cycle funded by reduced utility costs
- Securing stable, long-term budget allocations



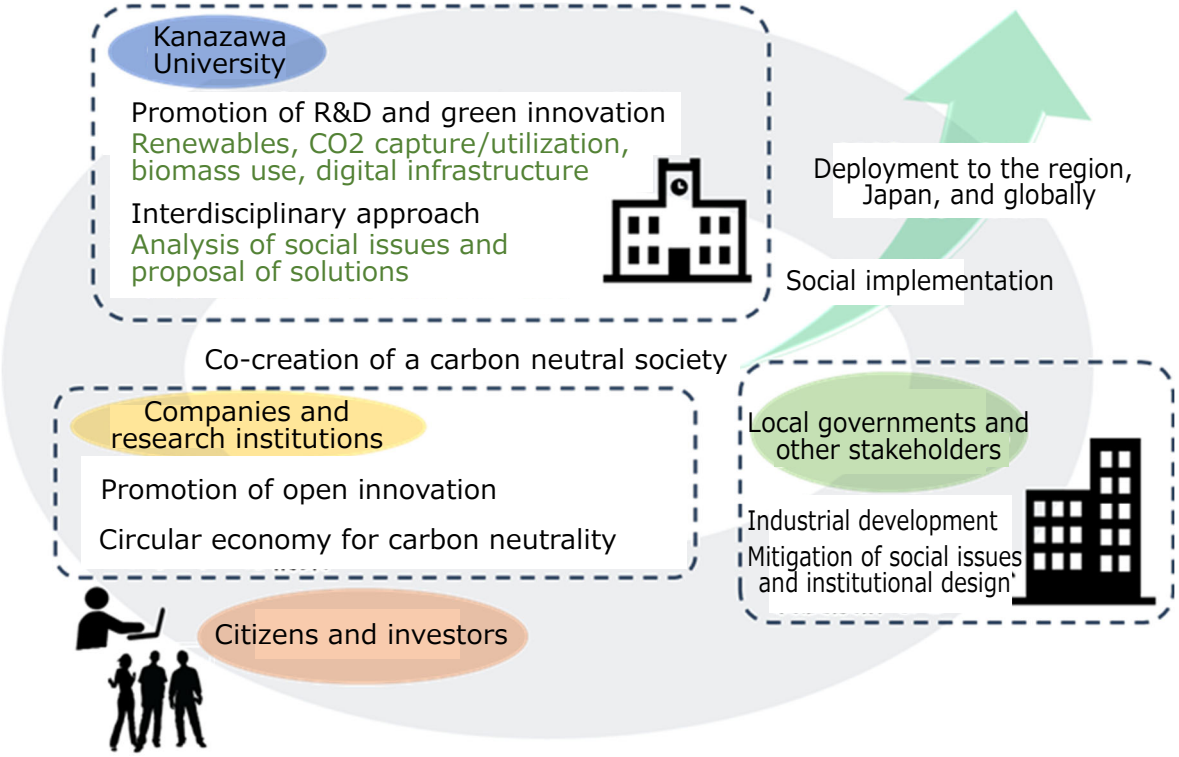
4． Research, Social Co-creation contributing to Carbon Neutrality

4－1 The role of university Research, Social Co-creation in achieving Carbon Neutrality

In July 2021, Japan's ministries and 188 universities established the "University Coalition for Contributing to Carbon Neutrality", highlighting that achieving carbon neutrality requires not only technological innovation but also transformation of socio-economic systems. Universities play a key role by creating and disseminating scientific knowledge that underpins policy and innovation at regional, national, and global levels.

Accordingly, Kanazawa University contributes through carbon-neutrality R&D and innovation, regional decarbonization and climate adaptation, circular economy projects with diverse stakeholders, value and behavior transformation through education and research, human resource development, and the promotion of zero-carbon campuses.

Carbon neutrality cannot be achieved through incremental measures alone; new values and social systems must be co-created across sectors. Kanazawa University will serve as a core hub for carbon neutrality social co-creation in collaboration among academia, industry, government, and civil society.



4 – 2 Research activities at the university contributing to carbon Neutrality

Kanazawa university established the Sustainable Energy Research Center in April 2011 and has proactively promoted research contributing to carbon neutrality, including renewable energy technologies, carbon cycle technologies, energy and environmental materials, and biomass utilization technologies. Since then, research in these fields has further expanded and advanced. Representative examples are categorized below in line with the technical challenges outlined in the “Innovative Environmental Innovation Strategy”.

■ Renewable energy

Energy generation using solar, wind, hydro, vibration, and related sources

■ Power networks

Development of high-efficiency, low-cost power electronics technologies using innovative semiconductors

■ Hydrogen supply chain

Development of green hydrogen production, liquefaction, and transportation technologies

■ CO_2 separation and capture as a foundation for carbon recycling

Development of low-cost CO_2 capture technologies from hard-to-abate sources such as waste incineration

■ Establishment of green mobility

Advancement of mobility technologies, including automobiles, and development of zero-emission technologies

■ Transition away from dependence on fossil resources

Utilization of biomass and development of advanced resource circulation technologies

■ Use of CO_2 as a feedstock

Development of electrochemical or photocatalytic CO_2 conversion technologies using innovative catalysts

■Big data, AI, and distributed management technologies

Acceleration of social implementation of technologies (realization of smart cities)

■Promotion of behavioral change

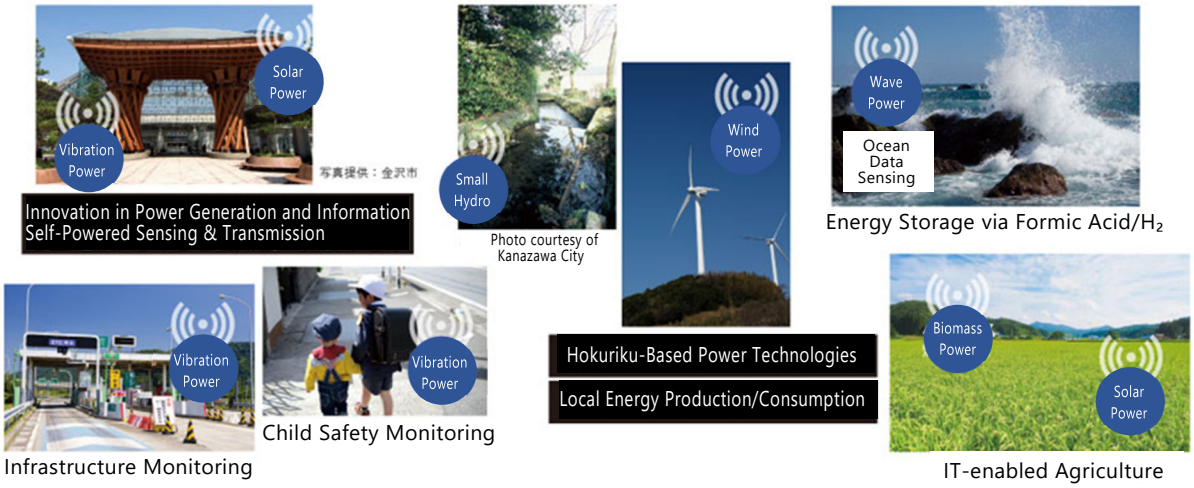
Analysis of human behavior desirable for a carbon-neutral society and research on methods to encourage such behavior

■CO_2 absorption and sequestration in farmland, forests, and oceans

Application of biotechnology such as genome editing, improved efficiency in forest management, and advancement of blue carbon

■Capture of atmospheric CO_2

Advancement of DAC (Direct Air Capture) technologies



https://infiniti.adm.kanazawa-u.ac.jp/core/mirai03.php

Addressing these technical challenges and implementing their outcomes in society require integrated approaches that combine not only natural sciences but also the humanities and social sciences. Based on the belief that solving global warming and related complex social challenges demands professionals who can work collaboratively with diverse stakeholders beyond specialized expertise, the university established the interdisciplinary School of Transdisciplinary Sciences in April 2021. This school emphasizes cross-disciplinary learning and collaboration alongside entrepreneurship education, and has begun cultivating leaders who drive innovation to solve present and future challenges.

As a comprehensive university pursuing a broad range of disciplines—including natural sciences, life sciences, humanities, and social sciences—and actively promoting practical interdisciplinary integration, the university advances research contributing to carbon neutrality, including the research themes outlined below.

■ Policy instruments

Examination of carbon pricing, emissions trading, feed-in tariffs for renewable electricity, and integrated environmental policies

■ Social decision-making

Research on environmental philosophy, environmental education, community governance, and assessment practices

■ Environmental business finance and corporate governance

Trend analysis of investments considering sustainability issues, emissions trading, and the Task Force on Climate-related Financial Disclosures (TCFD)

■ Pursuit of sustainability

Research on methodologies and impact evaluation for achieving the SDGs, and practical initiatives for well-being-oriented community development

4 – 3 Contribution to local communities

Within the framework of the Green Growth Strategy, the university's carbon-neutral research and development can serve as a driver of regional industrial revitalization. Innovations created with stakeholders are expected to benefit local communities through new industry creation and circular regional economies.

As a core regional university, the university supports decarbonization by integrating knowledge across disciplines, collaborating with communities, and enabling region-specific scenario development and evidence-based decision-making.

5． Education contributing to Carbon Neutrality

Basic policy on education

Foster human resources who contribute to decarbonization through environmental education for a sustainable society, including carbon neutrality

Initiatives for human resource development

Promotion of environmental courses	Raise awareness of courses on environment and SDGs to develop talent for sustainability
Promotion of interdisciplinary education	Promote carbon neutrality education to develop interdisciplinary talent
Promotion of awareness activities	Actively conduct environmental awareness activities across faculties and graduate schools

EXAMPLE

- Courses/Programs
  - ・General (intro): "University & Social Life"; GS: "Env. Studies & ESD"
  - ・Interdisciplinary / UG: "SDGs Basics", "SDGs Practice"
  - ・Grad (Nat. Sci., 5 div.): "Int'l Env. & Energy Tech Program"
  - ・Grad (all): "Sustainable Sci. & Eng." (Env./Energy)
  - ・Affiliated HS: "Integrated Studies"; JHS: "Creative Design"
- Curricular & extracurricular activities

Profile of target human resources

Individuals with high environmental literacy who recognize global and regional socio-economic changes, address environmental issues as personal challenges, take action to solve them, and contribute to a decarbonized society with interdisciplinary knowledge

5 – 1 The role of the university in education toward Carbon Neutrality

■ Promotion of courses related to global environmental issues

While expanding course offerings on global environmental issues and the SDGs, the university widely disseminates these opportunities to students and fosters human resources who contribute to building a sustainable society.

■ Promotion of interdisciplinary education

The university promotes carbon-neutral education initiatives across all departments and widely communicates them to students, fostering talent with interdisciplinary and comprehensive knowledge.

■ Promotion of awareness-raising activities

Awareness-raising activities on global environmental issues are actively conducted for students across all schools and graduate programs.

5 – 2 Initiatives for human resource development

■ Awareness-raising activities

Since FY2022, the *Student Handbook* has included the "Action Plan toward Carbon Neutrality" and the "Sustainable Development Goals (SDGs)," and has been used to raise awareness among undergraduate students (including transfer students), graduate students, and special-course students regarding the university's basic policy on education contributing to carbon neutrality and its educational role in achieving carbon neutrality.

Within this framework, the university positions education on global environmental issues as a core policy for fostering human resources who can contribute to decarbonization locally and globally, promoting the expansion of courses on environmental issues and the SDGs, actively conducting awareness activities, and widely disseminating carbon-neutral education to cultivate students with interdisciplinary and integrated knowledge.

In addition, from FY2023, the "Student Handbook" has been printed using carbon offsetting, with a butterfly mark and the amount of offset CO_2 emissions displayed, thereby communicating the university's initiatives related to SDG 12: "Responsible Consumption and Production".

■ Education on global environmental issues

As global environmental problems—such as climate change, ecosystem degradation, and pollution—intensify, countries worldwide are rapidly shifting from growth-first models to sustainable societies. This has increased the importance of citizens who understand socio-economic changes at global and local levels and can take action to solve environmental problems.

In response, the university promotes interdisciplinary environmental education to cultivate a broad range of individuals with high environmental literacy suited to future societal changes.

■ Examples of courses related to global environmental issues

- ✓ Introductory common education course: "*University and Social Life*"
- ✓ Common education GS (Global Standard) course: "Environmental Studies and ESD[*6]"
- ✓ Faculty of Transdisciplinary Sciences specialized courses: "SDGs Fundamentals" and "SDGs Practice"
- ✓ Graduate School of Natural Science and Technology (five departments)[※]: "International Course in Environment and Energy Technology"
- ✓ Graduate School of Natural Science and Technology (all departments): "Sustainable Science and Engineering Program – Environment and Energy Engineering Field"

5 – 3 Initiatives in the “Satoyama Zone” of the Kakuma Campus

■ Initiatives of the Kakuma Satoyama Office

<Establishment of the Kakuma Satoyama Office>

In August 2010, to create a “21st-century Satoyama Campus” utilizing the Satoyama Zone of the Kakuma Campus, the university established the Kakuma Satoyama Office, headed by the Vice President for Social Contribution and operated by relevant faculty members and senior administrative staff. In response to changes surrounding the Satoyama Zone, the functions and structure of the office were reviewed in FY2018, and since April 2019 it has operated under a new structure led by the Vice President for Core Curriculum Reform, with four subcommittees—Education Planning, Research Utilization, Collaborative Conservation, and Wildlife—engaged in various initiatives.

<Purpose of the Kakuma Satoyama Office>

The Kakuma Satoyama Office aims to promote education and research in the Satoyama Zone of the Kakuma Campus, a university that hosts Satoyama with cultural value unique to Japan, while sharing relevant information among stakeholders and experts on its management, operation, and use, and providing recommendations that contribute to solving challenges in Satoyama management, thereby advancing appropriate management and utilization of the university’s Satoyama Zone.

<Current status of the Kakuma Campus “Satoyama Zone”>

Satoyama represents a 21st-century model of coexistence between humans and nature and sustainable resource use, and “SATOYAMA” is recognized as an important concept in global frameworks such as the Convention on Biological Diversity (CBD), FAO’s Globally Important Agricultural Heritage Systems (GIAHS), and UNESCO’s Man and the Biosphere (MAB) Programme.

Undergrowth maintenance in the Kakuma Satoyama

About one-third (74 ha) of the 200-ha Kakuma Campus is designated as the Satoyama Zone, a unique environmental asset open to education, research, and local communities.

Public lectures held in the Satoyama Zone

<Various on-campus initiatives in the Satoyama Zone>

① Management, conservation, and utilization of the Satoyama Zone

- Forest management to enhance multiple forest functions and improvements to promote activities
- Satoyama revitalization through selective clear-cutting of aging and large trees, and thinning to promote seedling growth
- Removal of hazardous trees, maintenance of bamboo groves, and disposal of abandoned logs
- Planned tree planting and compost production using bamboo chips

②Education and research

- Lectures, field exercises, student club activities, and public programs using the Satoyama Zone
- Satoyama-based nature experience programs in early childhood education
- Bamboo forest thinning surveys and aquatic biodiversity studies in terraced rice fields
- Development of circular agriculture and forestry using Satoyama bamboo biomass
- Field training and ecological surveys of Satoyama flora and fauna

Satoyama nature-experience activities in early childhood education

③Community-based projects and events

- Use of “Kakuma-no-sato House,” the university’s 50th Anniversary Memorial Hall
- Kakuma Satoyama Festival organized by the NPO Kakuma Satoyama Mirai
- “Let’s Work with the President! Satoyama Undergrowth Cutting” event

<Challenges>

Due to the large area, volunteer efforts alone are insufficient, and issues such as forest aging, bamboo expansion, and wildlife appearances require improved management and conservation.

6. Carbon Neutrality of campus facilities

6 – 1 Policy for facility development planning

Kanazawa University greenhouse gas emissions were reduced from 47,967 t-CO_2 in 2013 to 37,573 t-CO_2 in FY2025 (−22%). Further reductions will focus on ZEB retrofits and renewable energy generation, implemented mainly in conjunction with major building renovations planned after 2030, in line with the Campus Master Plan and infrastructure longevity plans.

■ Mid-term targets through 2030

By 2030, the university will implement ZEB retrofits, ESCO[*7] projects at the affiliated hospital, equipment upgrades, and photovoltaic installations through PPA[*8] projects at the Kakuma Campus.

Through these measures and partial adoption of 100% renewable electricity, the university aims to achieve a 51% or greater CO_2 reduction by 2030 compared with 2013.

■ Long-term targets for 2031–2050

From 2031 onward, energy conservation and on-site generation will be continuously advanced, alongside expanded procurement of clean energy.

ZEB retrofits will be progressively implemented for aging buildings, targeting approximately 290,000 m² by 2050.

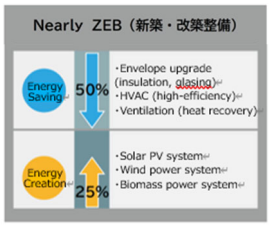
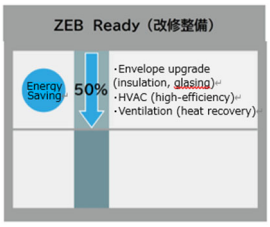
For energy creation, PPA projects will be introduced sequentially at the Heiwamachi, Takaramachi and Kakuma II campuses in conjunction with performance-maintenance renovations conducted every 20 years. The target is to install approximately 5,000 kW of capacity by 2050.

As achieving carbon neutrality through existing measures alone is challenging, newly developed technologies realized through demonstration research will be actively introduced into campus facilities, integrating education, research and development, and social co-creation efforts.

Through the integrated promotion of these initiatives, the university aims to achieve carbon neutrality by 2050.

6 – 2 Specific development measures

To achieve carbon neutrality of campus facilities, the university will steadily advance energy conservation, on-site energy generation, ZEB conversion, clean energy use, and forest management. The campus will be used as a living laboratory, applying research achievement to facilities while ensuring nature conservation and landscape preservation.

Energy Saving	■ **Upgrading existing facilities** EHP-based air conditioning and LED lighting ESCO projects and high-efficiency equipment upgrades ■ **Promotion of daily energy-saving practices** Efficient lighting and temperature control, heat recovery ventilation, and outdoor air cooling ■ **Adoption of advanced energy saving technologies** Geothermal energy, CO_2 concentration control, and BEMS*9
Energy Creation	■ **Renewable energy deployment** Solar PV and wind, hydro, and biomass power systems ■ **Power systems including BCP*10 measures** Energy transition from heavy oil to hydrogen
ZEB	■ **ZEB standards** New construction and reconstruction: "Nearly ZEB" or higher; Renovation: "ZEB Ready" or higher (including equivalent levels)  
Use of clean energy	■ **Optimization of the energy mix** Transition from gas and heavy oil to electricity ■ **Procurement of 100% renewable electricity**
Forest management	■ **Forest management** Proper maintenance of campus Satoyama areas, maximization of forest carbon sinks, and active use of thinned wood to fix CO_2 in long-lived timber ■ **Use of Satoyama as a site for environmental education** Active use as an environmental education field for students, faculty, staff, and local communities
Active use of new technologies	■ **Social implementation of new technologies** Hydrogen and vibration energy, organic thin-film solar cells, biomass fuels, DC power systems, digital technologies (AI, big data), CO_2 conversion, and promotion of behavioral change

6 – 3 Target performance levels for ZEB implementation

For new construction and major reconstruction, the goal is Nearly ZEB or higher through energy conservation and on-site energy generation. For renovations, energy-saving upgrades will be implemented at around 20 years, and ZEB Ready or higher will be achieved during major renovations at around 40 years.

■ZEB implementation

・New construction and reconstruction: Nearly ZEB or higher (≥75% reduction).

・Renovations: ZEB Ready or higher (≥50 % reduction).

※Including levels equivalent to Nearly ZEB and ZEB Ready

■Energy Saving measures

・Reduction of energy demand

Improved building envelope performance (walls, windows)

・Reduction of energy losses

Air-conditioning upgrades (GHP to EHP, high-efficiency systems)

Ventilation systems (total heat exchange, CO_2 concentration control)

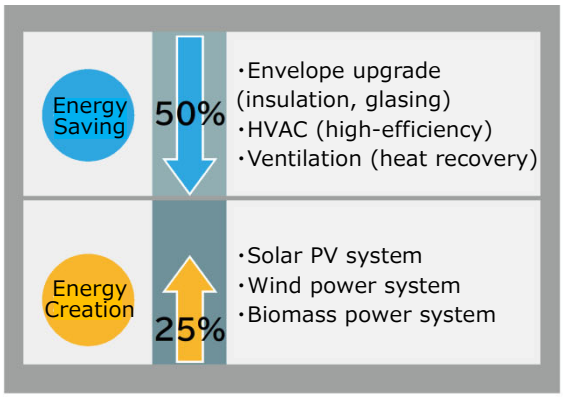
Lighting systems (LEDs, daylight and sensor controls)

■Energy Creation measures

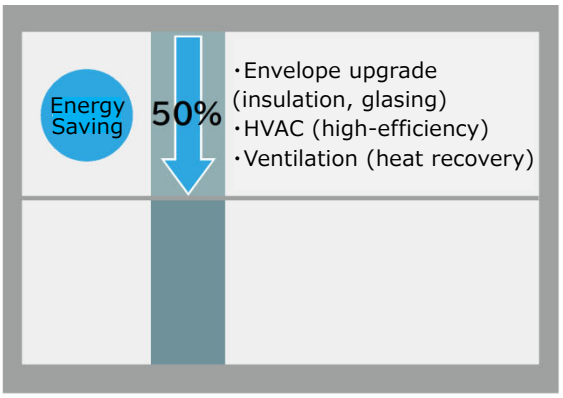
・Solar PV, wind power, and biomass power systems

■ZEB performance levels

New construction and reconstruction:
"Nearly ZEB" or higher

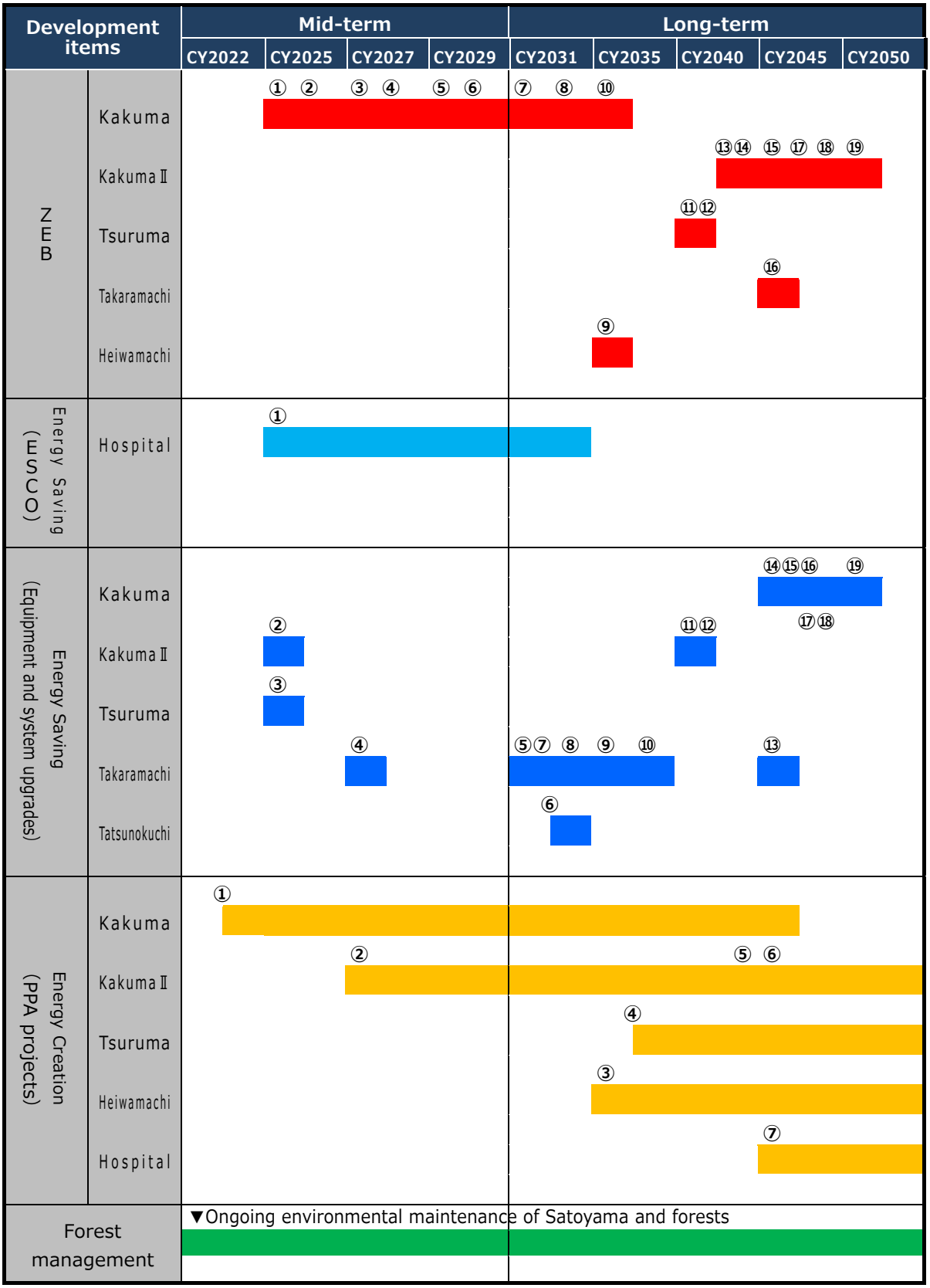


Renovation:
"ZEB Ready" or higher



※Including levels equivalent to Nearly ZEB and ZEB Ready

6 – 4 Annual Facility Development Plan (Overview)



■Details of the annual facility development plan

【ZEB】Under the following plan, ZEB conversion (ZEB Ready or higher) will be achieved when buildings undergo major renovations.

Year	Campus / site	Building name	Building size	Reduction
CY 2025	① Kakuma (North)	Human and Social Science Hall 1	R6-1・4,625 ㎡	200 t-CO_2
CY 2026	② Kakuma (North)	Human and Social Science Hall 2	R7・5,353 ㎡	230 t-CO_2
CY 2027	③ Kakuma (North)	Human and Social Science Lecture Hall 1	R4・3,549 ㎡	150 t-CO_2
		Human and Social Science Hall 3	R7・6,728 ㎡	290 t-CO_2
CY 2028	④ Kakuma (North)	Central Library, University Museum	R3・10,456 ㎡	450 t-CO_2
CY 2029	⑤ Kakuma (North)	Human and Social Science Hall 4	R3・3,690 ㎡	160 t-CO_2
		Human and Social Science Hall 5	R5-1・4,422 ㎡	190 t-CO_2
	Kakuma (Central)	Natural Science and Technology Hall 5A	SR7-1・12,236 ㎡	530 t-CO_2
CY 2030	⑥ Kakuma (North)	Human and Social Science Lecture Hall 2	R4-1・4,021 ㎡	170 t-CO_2
		General Education Hall 1	SR7・4,666 ㎡	200 t-CO_2
	Kakuma (Central)	Natural Science and Technology Hall 5B	R2・1,432 ㎡	60 t-CO_2
		Natural Science and Technology Hall 5C	R4・2,582 ㎡	110 t-CO_2
CY 2031	⑦ Kakuma (North)	General Education Hall 2	R5・5,070 ㎡	220 t-CO_2
		General Education Lecture Hall	R5・6,416 ㎡	280 t-CO_2
	Kakuma (Central)	RI Science and Engineering Research Facility	R2・782 ㎡	30 t-CO_2
CY 2034	⑧ Kakuma (Central)	Emerging Media Initiative	R2・2,300 ㎡	100 t-CO_2

Year	Campus/ site	Building name	Building size	Reduction
CY 2035	⑨ Heiwamachi	University-affiliated Kindergarten	R1・915 ㎡	40 t-CO_2
		University-affiliated Elementary School	R3・6,263 ㎡	270 t-CO_2
		University-affiliated Junior High School (General Classrooms)	R4・2,743 ㎡	120 t-CO_2
		University-affiliated Junior High School (Specialized Classrooms)	R4・2,332 ㎡	100 t-CO_2
	⑩ Kakuma (Central)	Joint Research Center	R3・1,130 ㎡	50 t-CO_2
		Innovation Research Building	S3・997 ㎡	40 t-CO_2
CY 2040	⑪ Tsuruma	School of Health Sciences Hall 3	R3・3,300 ㎡	140 t-CO_2
		School of Health Sciences Hall 4	R4・4,500 ㎡	190 t-CO_2
CY 2042	⑫ Tsuruma	School of Health Sciences Hall 5	R3・3,010 ㎡	130 t-CO_2
CY 2043	⑬ Kakuma Ⅱ	Natural Science and Technology Hall 1	SR7-1・27,657 ㎡	1,200 t-CO_2
CY 2044	⑭ Kakuma Ⅱ	Natural Science and Technology Main Hall Ⅳ	R5・7,259 ㎡	310 t-CO_2
		Natural Science and Technology Hall 2	SR7-2・28,194 ㎡	1,220 t-CO_2
		Natural Science and Technology Hall 3	SR7-1・18,201 ㎡	790 t-CO_2
		VBL, Hard Ware Laboratory 1	S5・2,501 ㎡	110 t-CO_2
CY 2045	⑮ Kakuma Ⅱ	Natural Science and Technology Main Hall Ⅴ	R3-1・5,335 ㎡	230 t-CO_2
		Technical Support Center	S2・1,305 ㎡	60 t-CO_2
		Natural Science and Technology Library, South Campus	R4-1・10,369 ㎡	450 t-CO_2

Year	Campus/ site	Building name	Building size	Reduction
CY 2045	⑯ Takaramachi (University Hospital)	West Ward, East Ward	SR10-1・38,780 ㎡	1,680 t-CO_2
		Central Consultations Building (1)	R4-2・18,093 ㎡	780 t-CO_2
		Outpatients and Consultations Building,	R4-1・20,541 ㎡	890 t-CO_2
CY 2047	⑰ Kakuma Ⅱ	Hard Ware Laboratory 2	S1・111 ㎡	5 t-CO_2
		Hard Ware Laboratory 3	S2・1,078 ㎡	50 t-CO_2
		Hard Ware Laboratory 4	S1・1,369 ㎡	60 t-CO_2
CY 2048	⑱ Kakuma Ⅱ	Natural Science Lecture Hal	S1・1,394 ㎡	60 t-CO_2
CY 2050	⑲ Kakuma Ⅱ	Cancer Research Institute	R7・5,036 ㎡	220 t-CO_2
			Cumulative reduction→	12,565 t-CO_2

【Energy Saving】Energy saving measures will be implemented under the following plan.

Year	Campus/ site	Building name	Building size	Reduction
CY 2025	① Takaramachi (University Hospital)	University Hospital	ESCO project (heat source retrofit; 10 years)	2,000 t-CO_2
CY 2025	② Kakuma Ⅱ	Natural Science and Technology Hall 1・2・3、Natural Science and Technology Main Hall Ⅳ・V	GHP replacement	800 t-CO_2
CY 2025	③ Tsuruma	School of Health Sciences Hall 3・4・5	Equipment renewal	77 t-CO_2
CY 2027	④ Takaramachi	School of Medicine Hall A・B・E・F・G、School of Medicine Educational Hall	Equipment renewal	181 t-CO_2
CY 2032	⑤ Takaramachi	Medical Library	Equipment renewal	23 t-CO_2

Year	Campus/ site	Building name	Building size	Reduction
CY 2033	⑥ Tatsunokuchi	Experimental Research Facility Building	Equipment renewal	8 t-CO_2
	⑦ Takaramachi	School of Medicine Hall C	Equipment renewal	81 t-CO_2
CY 2034	⑧ Takaramachi	School of Medicine Hall D、School of Medicine Welfare Facilities	Equipment renewal	36 t-CO_2
CY 2035	⑨Takaramachi	Central institute of Radioisotope Science、School of Medicine Memorial Hall	Equipment renewal	25 t-CO_2
CY 2039	⑩Takaramachi	School of Health Sciences Hall 1	Equipment renewal	50 t-CO_2
CY 2040	⑪KakumaⅡ	Nano Life Science Institute	Equipment renewal	49 t-CO_2
CY 2042	⑫KakumaⅡ	Biomass-Green Innovation Center	Equipment renewal	55 t-CO_2
CY 2045	⑬Takaramachi	Functional Enhancement Building	Equipment renewal	34 t-CO_2
	⑭Kakuma (North)	Human and Social Science Hall 1	Equipment renewal	10 t-CO_2
CY 2046	⑮Kakuma (North)	Human and Social Science Hall 2	Equipment renewal	11 t-CO_2
CY 2047	⑯Kakuma (North)	Human and Social Science Lecture Hall 1	Equipment renewal	8 t-CO_2
		Human and Social Science Hall 3	Equipment renewal	14 t-CO_2
CY 2048	⑰Kakuma (North)	Central Library, University Museum	Equipment renewal	22 t-CO_2

Year	Campus/ site	Building name	Building size	Reduction
CY 2049	⑱Kakuma (North)	Human and Social Science Hall 4	Equipment renewal	8 t-CO_2
		Human and Social Science Hall 5	Equipment renewal	9 t-CO_2
	Kakuma (Central)	Natural Science and Technology Hall 5A	Equipment renewal	26 t-CO_2
CY 2050	⑲Kakuma (North)	Human and Social Science Lecture Hall 2	Equipment renewal	9 t-CO_2
		General Education Hall 1	Equipment renewal	9 t-CO_2
	Kakuma (Central)	Natural Science and Technology Hall 5B	Equipment renewal	3 t-CO_2
		Natural Science and Technology Hall 5C	Equipment renewal	6 t-CO_2
			Cumulative reduction→	3,555 t-CO_2

【Energy Creation】Energy creation measures will be implemented under the following plan.

Year	Campus/ site	Building name	Building size	Reduction
CY 2024	① Kakuma	PPA project	Approx.500kW	400 t-CO_2
CY 2027	② Kakuma Ⅱ	PPA project	Approx.2,000kW	1,600 t-CO_2
CY 2035	③ Heiwamachi (University-affiliated school)	PPA project	Approx.500kW	400 t-CO_2
CY 2037	④ Tsuruma Gymnasium	PPA project	Approx.250kW	200 t-CO_2
CY 2044	⑤ Kakuma Ⅱ	PPA project	Approx.600kW	480 t-CO_2
CY 2045	⑥ Kakuma Ⅱ	PPA project	Approx.400kW	320 t-CO_2
CY 2045	⑦ Takaramachi (University Hospital)	PPA project	Approx.750kW	600 t-CO_2
			Cumulative reduction→	4,000 t-CO_2

Note: The project period for all of the above PPA projects is 20 years.

6 – 5 Plan details to achieve the mid-term target by 2030

■Scope of works by 2030

【ZEB】Achieve ZEB (ZEB Ready or higher) during major building renovations under the following plan. Standard retrofit menu as follows:

・Double glazing (improved envelope), enhanced wall insulation (improved envelope)
・HVAC (high-efficiency equipment), ventilation (heat recovery & CO_2 control)
・Lighting (LED, daylighting control, sensor control)

■Implementation year: CY2025 Project name: Major renovation (ZEB retrofit) of Human and Social Science Hall 1 Renovation scope: ZEB Ready or higher CO_2 reduction: 200 t-CO_2
■Implementation year: CY2026 Project name: Major renovation (ZEB retrofit) of Human and Social Science Hall 2 Renovation scope: ZEB Ready or higher CO_2 reduction: 230 t-CO_2
■Implementation year: CY2027 Project name: Major renovation (ZEB retrofit) of Human and Social Science Lecture Hall 1 Renovation scope: ZEB Ready or higher CO_2 reduction: 150 t-CO_2
■Implementation year: CY2027 Project name: Major renovation (ZEB retrofit) of Human and Social Science Hall 3 Renovation scope: ZEB Ready or higher CO_2 reduction: 290 t-CO_2
■Implementation year: CY2028 Project name: Major renovation (ZEB retrofit) of Central Library, University Museum Renovation scope: ZEB Ready or higher CO_2 reduction: 450 t-CO_2

■Implementation year: CY2029 Project name: Major renovation (ZEB retrofit) of Human and Social Science Hall 4 Renovation scope: ZEB Ready or higher CO_2 reduction: 160 t-CO_2
■Implementation year: CY2029 Project name: Major renovation (ZEB retrofit) of Human and Social Science Hall 5 Renovation scope: ZEB Ready or higher CO_2 reduction: 190 t-CO_2
■Implementation year: CY2029 Project name: Major renovation (ZEB retrofit) of Natural Science and Technology Hall 5A Renovation scope: ZEB Ready or higher CO_2 reduction: 530 t-CO_2
■Implementation year: CY2030 Project name: Major renovation (ZEB retrofit) of Human and Social Science Lecture Hall 2 Renovation scope: ZEB Ready or higher CO_2 reduction: 170 t-CO_2
■Implementation year: CY2030 Project name: Major renovation (ZEB retrofit) of General Education Hall 1 Renovation scope: ZEB Ready or higher CO_2 reduction: 200 t-CO_2
■Implementation year: CY2030 Project name: Major renovation (ZEB retrofit) of Natural Science and Technology Hall 5B Renovation scope: ZEB Ready or higher CO_2 reduction: 60 t-CO_2
■Implementation year: CY2030 Project name: Major renovation (ZEB retrofit) of Natural Science and Technology Hall 5C Renovation scope: ZEB Ready or higher CO_2 reduction: 110 t-CO_2
【ZEB】Total CO_2 reduction by 2030: 2,740 t-CO_2

【Energy Saving】Energy-saving measures implemented under the following plan.

■Implementation year: CY2025 Project name: University Hospital ESCO project Project period: 10 years Renovation scope: HVAC heat source conversion (from city gas to electricity) Steam absorption chillers (4 units) →Air-cooled heat pump chillers (3 units, high-efficiency) →Turbo chiller (1 unit, high-efficiency) CO_2 reduction: 2,000 t-CO_2
■Implementation year: CY2025 Project name: GHP replacement Renovation scope: HVAC heat source conversion (from city gas to electricity) GHP systems in Natural Science and Technology Hall 1・2・3, and Main Hall →EHP systems (high-efficiency) CO_2 reduction: 800 t-CO_2
■Implementation year: CY2025 Project name: Performance maintenance retrofit of School of Health Sciences Hall 3・4・5 Renovation scope: Equipment renewal GHP systems → EHP systems (high-efficiency) CO_2 reduction: 77 t-CO_2
■Implementation year: CY2027 Project name: Performance maintenance retrofit of School of Medicine Hall A・B・E・F・G、School of Medicine Educational Hall Renovation scope: Equipment renewal EHP systems (high-efficiency) CO_2 reduction: 181 t-CO_2
【Energy Saving】Total CO_2 reduction by 2030: 3,058 t-CO_2

【Energy Creation】Energy Creation measures implemented under the following plan.

■Implementation year: CY2024 Project name: Kakuma Campus (Parking Lot D) PPA project Project period: 20 years Implementation details: PV installation at Parking Lot D (500 kW) CO_2 reduction: 400t-CO_2
■Implementation year: CY2027 Project name: Kakuma II (temporary parking, etc.) PPA project Project period: 20 years Implementation details: PV installation at temporary parking areas, etc. (2,000 kW) CO_2 reduction: 1,600t-CO_2
【Energy Creation】Total CO_2 reduction by 2030: 2,000t-CO_2

6 – 6 Development using diverse funding sources

To implement the facility development plan (Section 6-4), ZEB upgrades during major renovations will be funded mainly by subsidies, while other measures (energy saving, energy creation, forestry, etc.) will utilize diverse funding sources such as PFI[*11] projects, donations, partnerships with local governments, long-term loans, and internal funds.

The roadmap in Section 3-1 estimates total investment for achieving carbon neutrality by 2050 at approx. JPY 70,624 million (JPY 61,928 million from subsidies, JPY 8,696 million from diverse sources), with about JPY 310 million per year required from diverse sources.

Utilization of diverse funding is essential for planned campus decarbonization, and appropriate funding schemes must be examined for each project.

For ESCO and PPA projects, securing government subsidies is also important, and projects should be implemented with these subsidy programs in mind.

7. Key perspectives for implementing the action plan

Successful implementation requires all university members (faculty, staff, and students) to proactively engage, with proper evaluation and periodic review systems in place.

（1）Awareness

・Share the plan internally and implement it collaboratively.

・Actively communicate the plan to the community and society.

（2）Establish evaluation and promotion framework

・Build a PDCA cycle centered on the Carbon Neutrality Promotion Headquarters.

・Advance initiatives toward targets with flexible plan revisions as needed.

（3）Evaluation of R&D and social co-creation

・Promote implementation of environmental and energy-related technologies.

・Disseminate research achievement to local communities.

（4）Evaluation of educational activities

・Promote student awareness and behavioral change through education.

（5）Assessment of GHG emissions and energy consumption

・Conduct regular emissions tracking and quantitative analysis of increase/decrease factors.

・Share GHG emissions and energy consumption data within the university.

Reference Materials

1. Glossary

*1: What is E^4-CAMPUS?

E^4-CAMPUS is the slogan of this plan, representing the university's mission toward carbon neutrality: Environment, Energy, Ecology, and Education & Research ("E"), combined with Cooperation, Achievement, Medical, Pioneer, Universality, and Social contribution within "CAMPUS," aiming to achieve carbon neutrality and the SDGs through education, research, healthcare, and societal contribution as a knowledge hub in East Asia.

【Meaning of CAMPUS components】

・Cooperation

Collaborate with all members to deliver education, research, and social contribution toward carbon neutrality

・Achievement

Achieve carbon neutrality by 2050

・Medical

Contribute to health and well-being through advanced medical development and dissemination

・Pioneer

Lead carbon neutrality as a knowledge hub in Hokuriku and East Asia

・Universality

Achieve a sustainable and inclusive society through universal education and research

・Social Contribution

Conduct education and research in collaboration with industry, government, academia, and local communities for sustainability

【Alignment with the 17 SDGs】

・Goals: 3 (Health), 4 (Education), 6 (Water & Sanitation), 7 (Energy), 9 (Infrastructure, Industry & Innovation), 11 (Sustainable Cities), 12 (Responsible Consumption & Production), 13 (Climate Action), 14 (Life Below Water), 15 (Life on Land)

*2: What are the Sustainable Development Goals (SDGs)?

SDGs (Sustainable Development Goals) are global goals aimed at achieving a sustainable and better society for all, leaving no one behind. They were adopted by all UN Member States in the 2015 "2030 Agenda for Sustainable Development," consisting of 17 goals and 169 targets to be achieved by 2030.

The university promotes campus-wide environmental management to minimize environmental impact, working continuously on GHG reduction and natural environment conservation to build a low-impact eco-campus toward carbon neutrality, while also developing a comfortable campus environment for global talent from a mid- to long-term SDG perspective.

【17 SDG icons】

*3: What is ZEB?

ZEB (Net Zero Energy Building) refers to a building designed to achieve net-zero annual primary energy consumption through energy efficiency and on-site generation while maintaining a comfortable indoor environment.

*4: What are Scopes 1–3?

Scopes 1–3 are GHG emission categories defined by the GHG Protocol, an international standard for measuring and reporting emissions across the entire supply chain, classified into three categories.

・Scope1 : Direct emissions from the operator
・Scope2 : Indirect emissions from the use of electricity supplied by other companies
・Scope3 : Other indirect emissions related to the operator's activities

*5: What is the Global Warming Potential (GWP)?

An index that measures how much a greenhouse gas contributes to global warming relative to CO_2.

・CO_2 : 1、R22 : 1,810、R32 : 675、R407C : 1,770、R410A : 2,090

*6: What is ESD?

ESD (Education for Sustainable Development) refers to learning and activities that empower individuals to address sustainability challenges, foster values and actions for solutions, and contribute to building a sustainable society.

*7: What is ESCO?

ESCO (Energy Service Company) is a business that provides comprehensive energy-saving services—including technology, equipment, human resources, and financing—with guaranteed results, where costs are repaid from achieved energy savings.

*8: What is PPA?

PPA (Power Purchase Agreement): A contract for purchasing electricity, where companies invest in power generation and procure solar power under long-term agreements; widely adopted in Europe and the U.S. since around 2015. In Japan, the "PPA model" refers to a localized renewable energy business model.

*9: What is BEMS?

BEMS (Building and Energy Management System): A system that monitors energy use in buildings ("visualization") and controls HVAC, lighting, and other equipment.

*10: What is BCP?

BCP (Business Continuity Plan): A plan to ensure critical operations continue at an acceptable level and recover within a set time after emergencies, including predefined priorities and alternative measures.

*11: What is PFI?

PFI (Private Finance Initiative): A concept in which private-sector funding and expertise are used for the design, construction, operation, and maintenance of public facilities to deliver efficient public services.

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～ Kanazawa E^4-CAMPUS for Carbon Neutrality ～

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Kanazawa University Research Planning Meeting

Kanazawa University Education Planning Meeting

Kanazawa University Facilities Department