Advanced Industrial Science and Technology Report

2015 AIST REPORT

Social and Environmental Report

AIST Report





AIST NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST)

National Institute of Advanced Industrial Science and Technology
AIST

CHARTER

Full Research in Society, for Society

National Institute of Advanced Industrial Science and Technology (AIST),
An Independent Administrative Institution

The common goal of humankind is to realize a society in which every person can enjoy a comfortable life. Science and technology can lead the way to such a society. The mission entrusted to AIST and its staff, as members of the scientific community, is to develop science and technology that complements society and the environment.

We, the staff members of AIST, recognize our mission and responsibility to society. We work towards the realization of such a society through research and development in industrial science and technology.

■ Accurate Assessment of Social Trends

We endeavor to ascertain social trends and needs at every level of society from local communities to the international stage, to identify key issues promptly, and to propose scientific and technological solutions in collaboration with other organizations.

■ Creation of Knowledge and Technology

We value each person's autonomy and creativity and display our collective strength through collaboration and synergy, creating new knowledge and innovative technology based on advanced research efforts.

■ Application of Research Findings

We contribute to Japan's industrial development by applying our research findings to academic pursuits, intellectual infrastructure development, technology transfer, and policy proposals. We endeavor to enhance and disseminate science and technology through human resources development and the open sharing of information.

■ Responsible Conduct

We are actively involved in improving our own abilities and our working environment in order to perform our duties more effectively. We respect both the letter and the spirit of the law and maintain a strict sense of ethics in all our affairs.

Charter of the Environmental Safety

- We strive to promote research activities that contribute to the global environmental protection and the security of mankind and pursue our work to realize a safe and reliable society of high quality of life harmonious with the environment.
- In compliance with the applicable laws and regulations related to environmental protection, we establish the autonomous standards of the institute such as Safety Guideline, etc. and with this in mind, we shall endeavor to conserve environment and promote health and safety at all times.
- We promote the dissemination of information related to the environmental protection and make every effort to be in harmony with and coexist with the local community. Naturally, in case of disasters or emergencies, we take prompt and proper measures to deal with the situation.

  Furthermore, in conformity with the ‘principles of disclosure,’ we shall endeavor to return the knowledge acquired and accumulated to society.

Editorial Policy

The National Institute of Advanced Industrial Science and Technology (AIST) first published an Environmental Report in the fiscal year (FY) 2004. Since FY2010, AIST has published the AIST Report, which is the Environmental Report combined with a report on corporate social responsibility (CSR) activities.

In editing AIST's 2015 Social and Environmental Report, our aim has been to have a variety of stakeholders understand both AIST's CSR activities and the bridge building activities by which it effectively links its science and technology research outcomes and businesses, thus building a deeper relationship of trust through harmonious coexistence between AIST and society. Especially on bridge building research, this report presents AIST's social activities focusing on research that represents AIST and is leading the world.

Detailed data on Environmental Report–related activities at each research base are available on AIST's website.

AIST's official website: http://www.aist.go.jp/

◆ Activities covered by the report

Research activities at all AIST research bases

◆ Period covered by the report

April 2014 to March 2015

◆ Areas covered by the report

Key areas covered include organizational governance, human rights, labor practice, fair operating practice, community involvement, environmental report, and promotion of research activities.

◆ Rounding of numbers

Numbers are rounded off to the specified whole number.

◆ Referenced Guidelines and other sources

- 2012 Environmental Report Guidelines, Ministry of the Environment
- Law Concerning the Promotion of Business Activities with Environmental Consideration by Specified Corporations, etc., by Facilitating Access to Environmental Information, and Other Measures
- Guidance on Information to be Provided in the Environmental Report (2nd Edition), Ministry of the Environment
- ISO 26000:2010 Guidance on Social Responsibility, Japanese Version, Japanese Standards Association

◆ Scheduled date of the next edition

September 2016 (Japanese edition)

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Aiming to be the core of a national innovation system

–Contributing to society and industry in Japan by generating innovation–

The National Institute of Advanced Industrial Science and Technology (AIST) entered the five-year period of its Fourth Medium- to Long-Term Plan in April 2015. At the same time, AIST changed its legal status from an incorporated administrative institution to a national research institution, whose purpose is to make it clearer that our role as an institution is to maximize the outcomes of our research and development (R&D) activities.
At present, about 10,000 people now work at AIST, roughly 3000 full-time employees together with contract employees and visiting researchers.

Japanese society is currently facing a wide range of problems, including concerns about energy supplies, low birth rate and aging population, declining local economies, dangers of natural disasters such as earthquakes, and deteriorating social infrastructure. In the industrial sector, the number of companies, which have strong competitiveness in the global market, have been gradually decreasing. With the exception of some industries, such as automobiles, the profile of Japanese companies in the market continues to dim.
I believe that science and technology can play a major role in solving these social and economic problems; the generation of innovation can be seen

as the most powerful driving force for revitalizing the Japanese economy and continuing Japan's growth.

By integrating research all the way from basic research to applications, mainly focusing on green technologies and life technologies, AIST is conducting research activities that offer solutions to the problems affecting Japanese society and industry and that chart new directions at which to aim. As of this year and after, the strengthening of our bridge-building function, linking R&D outcomes with practical applications and commercialization, is being prioritized as the most important issue for our management.

To start, our research organization has been reorganized from the previous six research fields to seven research domains. The objectives of this reorganization are to improve the efficiency of our research activities, make it easier for outsiders to understand what AIST is researching and who is responsible for what in the organization, and encourage businesses to make use of the fruits of our research.

We are promoting open innovation, bringing researchers together to create new value and, at facilities such as the Tsukuba Innovation Arena for Nanotechnology (TIA-nano), the Fukushima Renewable Energy Institute, and the AIST Tokyo Waterfront Bio-IT research facility, offering a superb research environment in which researchers from outside AIST can engage in R&D in collaboration with AIST.

To energize and develop researchers, we have adopted a cross-appointment system in which researchers are brought in as AIST employees while remaining employed by the universities, businesses and such that they come from. Through these human exchanges, we are working to integrate the seeds of technology generated by universities and businesses with AIST's technologies.

At the AIST Innovation School, young researchers can experience work in research activities at AIST and in the engineering field in industry, and through this school we are nurturing research personnel who can immediately contribute to R&D activities in businesses and other research venues. We are also supporting the development of young research personnel by providing a research assistant system in which graduate students are employed by AIST and take part in R&D projects.

AIST has seven regional research bases in locations throughout Japan. Each of these regional research bases is focused on R&D that corresponds to the characteristics and needs of its region and is engaged in activities to return its research outcomes to local businesses. AIST will continue to work in close collaboration with universities and public institutes in each region, with a focus on making use of each region's resources to generate innovation in the region and invigorate the regional economy.

Japan must build a national system that will continuously produce the seeds of innovative technologies, bring those technologies to commercialization, and keep on generating innovation.

AIST has resolved to play a central role in this national system for innovation and thereby contribute to the development of Japan and the construction of a sustainable society. To do this, we must earn the trust of society, both by making our research activities and their outcomes useful to society and by performing social responsibility as a public research body in all of our operations.

This report describes our efforts in systems such as AIST's governance and welfare programs; staff training initiatives; support for a proper work-life balance; the promotion of diversity in aspects such as female participation and the employment of people with disabilities; improvements in compliance; environmental safety management; and the establishment of fair business practices such as proper treatment of suppliers. The report also outlines some of our major research activities.

We look forward to receiving your continued understanding and support in our work.

Director, Advanced Power Electronics Research Center Hajime Okumura

Guiding the Commercialization of Power Electronics

Power electronics has an immense influence on the efficiency of electric power and is a key technology behind the practical development of next-generation smart grids. AIST has established the necessary underlying technologies for power semiconductors at a world-leading level and, in partnership with Japanese business, has laid a path to commercialization. Research that has been built up over 35 years gives an excellent example of the route to success in "bridge-building" for technologies.

It started with basic research into semiconductor materials

Power electronics includes technologies for using semiconductors to freely convert and control voltages, currents, frequencies, etc. There are high hopes for the use of wide-gap semiconductors in place of conventional silicon (Si) semiconductors in power electronics, to reduce conversion losses in a wide range of fields such as household electric goods, IT equipment, automobiles, and railways.

AIST's involvement in wide-gap semiconductor research began in the late 1970s, at what was then the Agency of Industrial Science and Technology's Electrotechnical Laboratory. There were great expectations then for wide-gap semiconductors with a larger band gap than mainstream silicon semiconductors; so, we started research into materials such as silicon carbide (SiC), gallium nitride (GaN) and diamond. A particular focus was SiC semiconductors, which combined excellent features such as higher breakdown voltages than Si semiconductors, lower losses, faster operation, and better operation at high temperatures; SiC was expected to be useful for a wide range of applications.

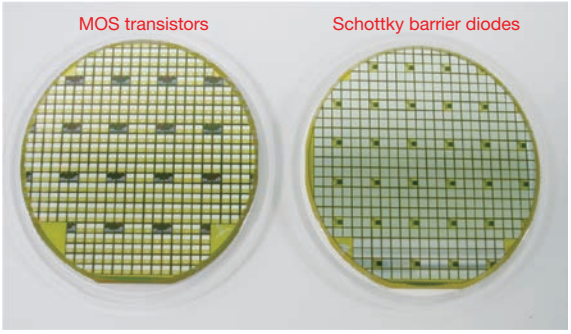
Hajime Okumura, Director of the Advanced Power Electronics Research Center, describes the progress from then to now: "The prospective applications of wide bandgap semiconductors were initially to short-wavelength optical devices, and then to environmentally tolerant devices resistant to high temperature and radiation. The application to electric power conversion devices as power electronics equipment started to attract attention in the mid-1990s. Since then, there have been two key junctures. One was a national project named “R&D of ultralow-loss electric power devices,” which ran from 1998 to 2002. In that project, basic technologies related to the SiC semiconductor were successfully developed. The other was that several national projects related to SiC power electronics started being carried out simultaneously from around 2008. Concurrently, our research infrastructure oriented to practical development was being improved rapidly."

The Industrial Transformation Research Initiative and TIA

In 2001, as the national project for ultralow-loss electronic components was proceeding, the Agency of Industrial Science and Technology and other

bodies were unified and AIST was launched as an incorporated administrative agency. Commercial exploitation of the fruits of research was set as a policy for AIST.

Okumura says, "Though we were required to carry out industrialization using the results of national projects, in reality, we would just give up at the beginning. In national projects, outstanding data or world records are frequently aimed at. Even though research results with excellent data were being achieved at the time, they could not be industrially utilized immediately. What was sought with the launch of AIST was technology that could actually be utilized rather than outstanding data. Under these circumstances, “SiC device mass fabrication research” started in 2009 as one theme of the Industrial Innovation Research Initiative, which was a new research scheme of AIST for collaboration between industry, academia and government. Through this activity, we have been able to establish manufacturing technologies that consider yields, reliability and so on at a mass fabrication level, that are practically available for industrialization in the real sense of the word."



SiC components from mass production trials (3-inch wafers fabricated in 2011)

Also in 2009, the Tsukuba Innovation Arena (TIA) was launched as a research base for R&D. Power electronics was specified as one of its core research areas.

In 2010, a dedicated clean room (approximately 1500 m2 in area) for production trials of SiC devices was completed. The clean room facility has been used by AIST with its basic SiC technologies; Fuji Electric Co., Ltd., with its strong production expertise as a device manufacturer; and ULVAC, Inc., the equipment manufacturer, to conduct collaborative research; the three succeeded in developing mass production technologies for SiC device chips.

Setting up the private sector collaborative research body TPEC

In the context of the establishment of this research system, the movement toward bridge-building for technologies was accelerating. AIST took advantage of the accumulated results of numerous national projects and the dedicated clean room to expand its collaborative research with business to a larger scale, setting up the Tsukuba Power Electronics Constellations (TPEC) in 2012. About 30 companies are participating in TPEC now.

"If we simply present the results of our national projects to companies, they would not be of any use to them. Moreover, due to the current business environment, it has been quite difficult for companies to provide sufficient budget and manpower for product development. What's more, as technology becomes more complicated, it is difficult to produce a new competitive product from only a single specific technology.

Therefore, AIST has decided to establish an open

innovation research platform in the hope that it would be used by industry and academia. TPEC is really leading the way of 'bridge-building' that AIST advocates and can be called the embodiment of bridge-building at the TIA platform. We have drawn up a strategy for the future in which the best possible performances are pursued in national projects, then are transferred to TPEC and completed as manufacturing technologies, leading to business creation through mass production by industry."

High breakdown voltage inverters, increasing our contribution to society

Our roadmap for power electronics research using wide-gap semiconductors includes a development trend with a first generation of medium breakdown voltages (the 1 kV class), a second generation of high breakdown voltages (the 5 kV class), and a third generation of ultrahigh breakdown voltages (the 10 kV class). But in what fields are these actually proceeding toward commercialization?

The first generation, the 1 kV range, is the high-volume zone, covering most segments of markets such as household electric goods, lighting, and IT equipment. In recent years, power electronics technology has been incorporated in a range of products such as inverters for household electric goods, power supplies for IT equipment, and power conditioners for solar power generation.

The second generation, the 5 kV range, is used in infrastructure such as railways and industrial machinery. Our inverters for railway vehicles have been installed in trains on the Tokyo Metro Ginza Line since 2012, the Odakyu Line and the JR Yamanote Line since 2014 and, the JR Tokai Shinkansen since 2015. We are advancing the development of inverters for automobiles with the aim of widespread adoption around 2020.

"The epoch-making case in railways was the Tokyo Metro Ginza Line. In general, even if there are large power loss reductions at the power semiconductor device chip level, loss reductions become smaller at the inverter and the whole system levels. In the case of the Ginza Line, however, a final power loss reduction of as much as 30% for the whole car system was achieved. This was possible because, by installing semiconductor devices with high breakdown voltages and fast switching capabilities, a car could fully exploit electricity produced by a regeneration braking system. In other words, excellent electronics components can innovatively reform even the whole system design for the trains."

The third generation, the 10 kV range, is expected to find commercial use in electric power networks, but there are still many underlying technologies to be developed. "If intelligent semiconductor components are used for circuit breakers in power transmission/distribution systems, they can be operated remotely and great benefits will be obtained in the effective operation of power networks. Even if there is a break accident in a backbone transmission line, it need not result in a large power outage. In our vision for the future, we are aiming to develop technologies that can be used in next-generation smart grids."

The importance of accumulating basic research

In regard to overcoming the "valley of death" between R&D and successful commercial exploitation, two major points have been apparent since basic research at the old Agency of Industrial Science and Technology.

The first is the importance of accumulating basic research. "It is not possible to adopt standardized role sharing in which universities conduct fundamental research and AIST acts as a bridge between fundamental research and industry. In fact, the accumulation of fundamental materials research during the Agency of Industrial Science and Technology era is being utilized very effectively in the R&D of wide bandgap semiconductors and their power electronics applications we have conducted for over nearly 40 years. It is because of this that we can earn the respect of industry. If we did not have this accumulation of fundamental research, we would not be able to find paths to industrialization."

Okumura talks of sowing the seeds of basic research in parallel with commercialization: "One example is the fundamental research feeding into wafer mass production technology. When wafers are made from SiC powder, SiC boule crystals are grown by a sublimation method under high temperature environment at present. We are investigating whether a solution method (the Czochralski method) can be used, as is used for silicon. The solution method has high potential for cost reduction and other advantages, such as ease of doping and very few crystal defects, which leads us to have high hopes."

Accumulating technologies that link upstream and downstream stages

The second point in overcoming the valley of death is to be able to build up technologies developed in Japan from upstream stages to downstream stages. Power electronics research has to incorporate many stages, from materials to wafer creation, thin film growth on wafer surfaces, device finishing, circuit

module formation, deployment in machinery, and so forth. Unless SiC wafers can reliably be supplied from upstream, there can be no progress in the subsequent stages of component development and system development.

"In the early 2000s, SiC wafers with thin films were imported from US for device development because there were no commercial suppliers performing SiC thin film growth in Japan. To remedy this situation, we developed excellent technology for SiC epitaxial growth that deposits single crystalline films on a bare wafer to improve the crystal quality. We made use of a new “limited liability partnership (LLP)” system to set up a venture organization providing SiC epitaxial growth services. In 2007, we transferred this technology to Showa Denko K.K., one of the partners of LLP; this was the origin of Showa Denko's current SiC epitaxial growth business."

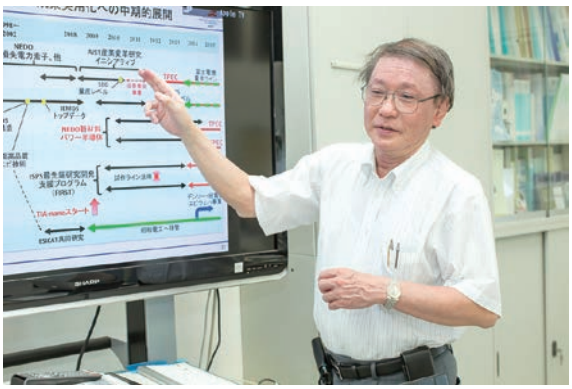
This epitaxial growth technology is an original AIST technology. It made a large contribution to the development in 2006 of power devices with the lowest resistance values in the world and led on to further significant successes.

Bringing vitality from personnel development

In the future, it is likely that AIST will continue to spur the commercialization of power electronics technologies, with the power electronics domain of TIA functioning as an open innovation research base. Personnel development will be one of the most important factors in this. As university courses in the field of power electronics continue to disappear, power electronics courses have been given at Tsukuba University as part of the activities of TIA, in the form of courses endowed by businesses and cooperative courses with AIST. Technologies in areas such as wafers, devices, circuits, modules, and machinery applications fall into different territories at universities, such as materials engineering, electronic engineering, electrical engineering, and systems engineering. "It is difficult to straddle neighboring research fields in universities. Making these connections is a role for a public research institute such as AIST. Personnel development brings vitality to the research platform and vitality to the university."

An open innovation research base

To raise the attractiveness of TIA's power electronics domain as a research base, we are accumulating recipes (prescriptions) for technologies that can be



shared between participating businesses. Hence, the participating businesses can utilize the technologies that are the basis for sharing as R&D tools and each business can get results more quickly than it would from development by itself.

"The concept of open innovation is that resources, time, manpower, etc. can be saved by conducting research and development together. After bringing the achievements back from TIA, the participating companies can finalize their products and go on to challenge in the market.

Because power electronics is a technology that combines various kinds of technological components, a final product may not be improved just by a single component being improved. There are cases in which a number of companies must bring the technologies they are best at to the table and collaborate to develop a final product. TPEC, a collaborative research body, can be a meeting place to coordinate an alliance for such cases; it holds the potential to produce unforeseen matches. In the future, it is likely that intellectual property will be exploited on the basis of open innovation between participating companies, through measures such as unused intellectual property by one company being used by another company."

Looking overseas, since the creation of the TIA power electronics research base and TPEC, we have been hearing that similar development structures for power electronics are being set up in Europe and North America. "This is because the realization that power electronics technology has matured and has huge effects on energy control has infiltrated among the people. The energy problem is a common and urgent issue affecting the entire world. It is perhaps inevitable that the necessary activities for solving this problem are accelerated all over the world."

There will continue to be many challenges in the exploitation of power electronics technologies: in how far power losses in new, high-performance devices can be reduced; in how far energy efficiency can be raised; in how systems can be built; and in how new fields of application can be opened up.

Research and Development in the 4th Period at AIST

Introduction

AIST strives to help address 21st century issues, including global warning and Japan's aging population and declining birth rate, to build a sustainable society. To address these issues, it is essential to promote green innovation with a focus on renewable energy and energy-saving technology, as well as life innovation with a focus on biotechnology, nursing-care robots, and drug discovery. We have been conducting research and development in two main areas of focus: "green technology to build a prosperous and environmentally friendly society" and "life technology to make it possible to live healthy and safe lives."

Strategy in the 4th Period

This is the first year of AIST's 4th medium- and long-term goal period. AIST will work on 4th period projects based on the following strategies in accordance with the image of an ideal research institute: "a research institute trusted by society that plays a central role in innovation and helps achieve a sustainable society by conducting the highest level of research in the world to meet the needs of society and industry and by serving as a bridge for the transfer of research results."

●Strategically selecting research topics to meet the needs of society and industry

We will accurately identify the needs of society and industry through technology marketing activities; strategically select research topics; and quickly form and develop a research implementation structure.

●Promoting regional innovation

Each regional research base selects priority research topics (missions), taking into account the characteristics of industrial clusters in the region; conducts the highest level of research and development; identifies the needs of small-to-medium-sized companies and leading medium-sized companies in the region in collaboration with public research institutions; serves as a bridge to transfer AIST's technology; and thus contributes to the development of local industry.

●Becoming a research organization highly trusted by the public

We will continue to promote research activities that gain trust from corporations and society; enhance safety management and operational management procedures to ensure the reliability of our research results and the transparency of our activities; identify risk factors and prevent problems from occurring; and improve governance in performing our work.

●Leading open innovation based on the collective wisdom of Japan and other countries

We will actively incorporate into AIST diverse and excellent technology seeds and human resources from universities in Japan and overseas and from local public research institutions and corporations; increase our research potential; and thus act as a hub for Japan's innovation system.

●Developing and passing on human resources to create innovation

We will develop and pass on human resources to create innovation by putting in place a personnel management system that allows people of all occupations and ages to work for AIST; we will also set up a framework to allow contributions to our organization to be evaluated in a fair manner.

Changing our Research Implementation Structure by Setting Up Seven Domains

In changing AIST's research implementation structure, we have grouped our research into seven domains (five areas and two general centers) in an easy-to-understand manner to enhance our technological strength (core competence) and to allow as many industries as possible to use our technology for practical applications. We will enhance our research effort to build a sustainable society by creating new fields by combining informatics and human factors; materials science and chemistry; and electronics and manufacturing, and by making full use of our collective strength.

① Department of Energy and Environment

In order to promote green innovations toward solutions to energy and environmental issues growing on a global scale, the Department of Energy and Environment pursues the following development: 1) Technology to accelerate introduction of new energy, including renewable energy, to enable reduced greenhouse gas emissions, 2) Technology to store energy in high density, 3) Technology to convert and exploit energy efficiently and achieve an energy-conserving society, 4) Technology to use new energy resources such as methane hydrate effectively, and 5) Technology to evaluate and reduce environmental risks in order to achieve a society where industry and environment coexist.

② Department of Life Science and Biotechnology

Department of Life Science and Biotechnology implements advanced research that contributes to Life Innovation and Green Innovation for healthy longevity in society through a healthy and secure daily life, and for a sustainable society that minimizes the burden to the environment. Specific efforts include the following: 1) Fundamental drug discovery technology that enables rapid, highly successful and cost effective ways; 2) Technology to readily measure health conditions, and health care technology for highly bio-compatible medical materials and medical equipment; and 3) Bioproduction to efficiently produce useful substances like starting materials for pharmaceuticals by enhancing substance productivity of microorganisms and plants with transgenic technology.

③ Department of Information Technology and Human Factors

In the Department of Information Technology and Human Factors, R&D concentrates on interactions between information science and ergonomics, and aims for enhanced industrial competitiveness and a plentiful and comfortable society. Development efforts include the following: 1) Artificial intelligence technology that creates value from big data, 2) Cloud technology that creates new value from people, things, and services and security technology for safe Internet use, 3) Measurement and evaluation technology of human activities, like driving an automobile, that elucidates human factors such as physiological, cognitive, and physical functions, and 4) Practical implementation technology for robots used in various fields such as caregiving, daily-life assistance, and manufacturing lines, and fundamental technology for autonomous work of robots that withstand environmental changes.

④ Department of Materials and Chemistry

In the Department of Materials and Chemistry, we aim to provide technology to create innovative components and primary materials, keys to product competitiveness, by synergy of materials and chemistry research fields. We promote green sustainable chemistry and chemical process innovation, and we develop nano-materials such as nano-carbon materials as well as their application technologies. The development of inorganic functional materials is also our focus to drive manufacturing technology and advanced structural materials contributing to establishment of energy-conserving technology. The efforts provide opportunities to create new added value for the materials and chemical industries.

⑤ Department of Electronics and Manufacturing

In the Department of Electronics and Manufacturing, AIST engages in development of devices that possess world-class performance for enabling both considerable energy-saving and high performance in IT equipment, and targets development of innovative manufacturing technology to achieve industrial activities that save energy, resources and money. Eyeing the arrival of the Internet of Things (IoT) connecting appliances other than information devices to the Internet, we develop super-efficient manufacturing systems and contribute to reinforcement of Japan's industrial competitiveness by tying advanced sensing technology to acquire information from "things" together with innovative manufacturing technology.

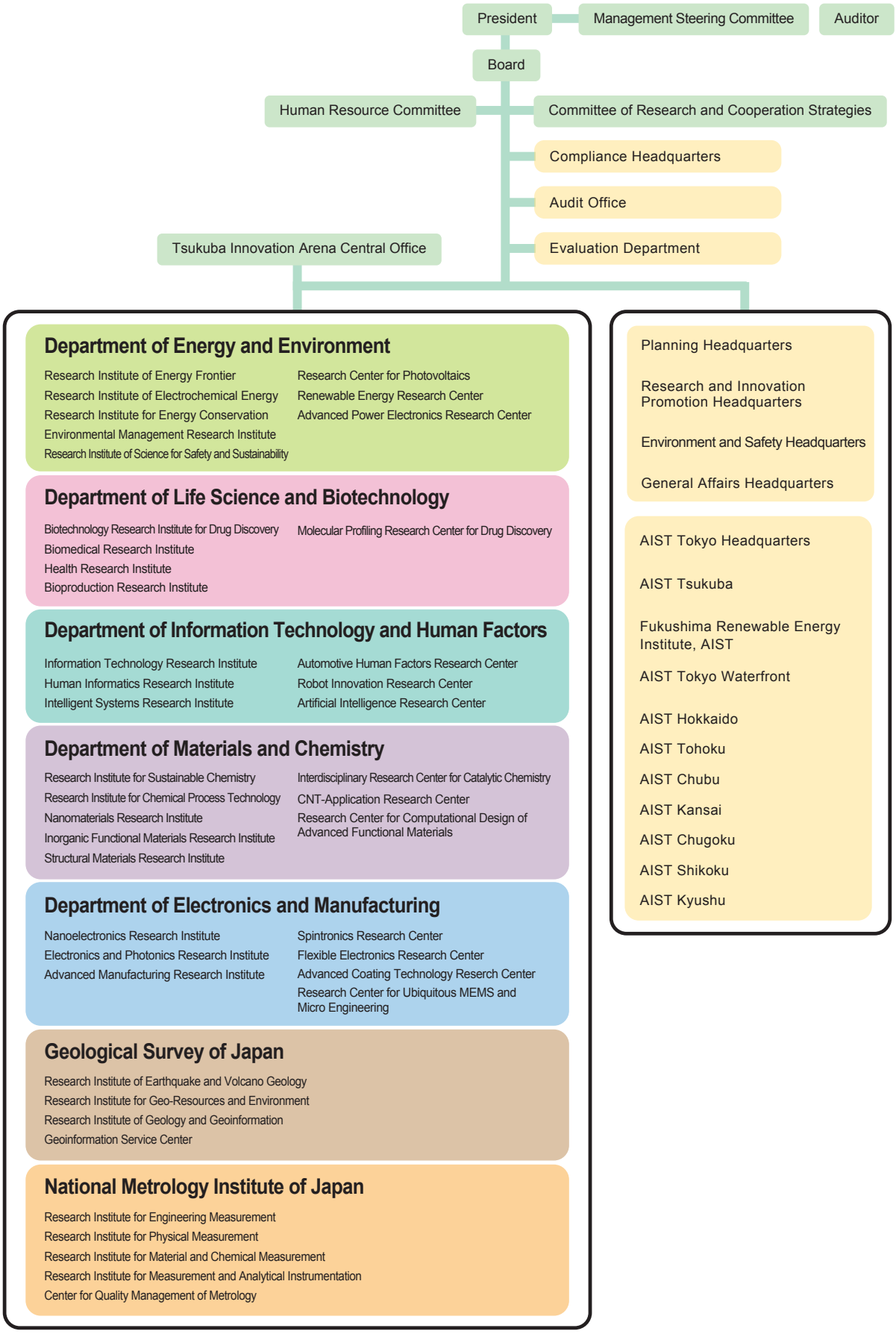
⑥ Geological Survey of Japan

Geological knowledge is considered to be "information with a time axis," crucial in predicting the future of the earth by understanding its history. It is fundamental knowledge for building a safe and secure society particularly in Japan, which sits on a tectonically active belt. With an abundance of knowledge in geology, the Geological Survey of Japan (GSJ) pursues technology development to solve various issues related to mitigation of geological disaster, environmental protection and others. In addition, through resource potential assessment and the studies and surveys on the usage and maintenance of geo-environment to facilitate resource and energy policy planning and sustainable industrial development, we contribute to the advancement of a geo-friendly and sustainable society that uses resources and energy effectively.

⑦ National Metrology Institute of Japan

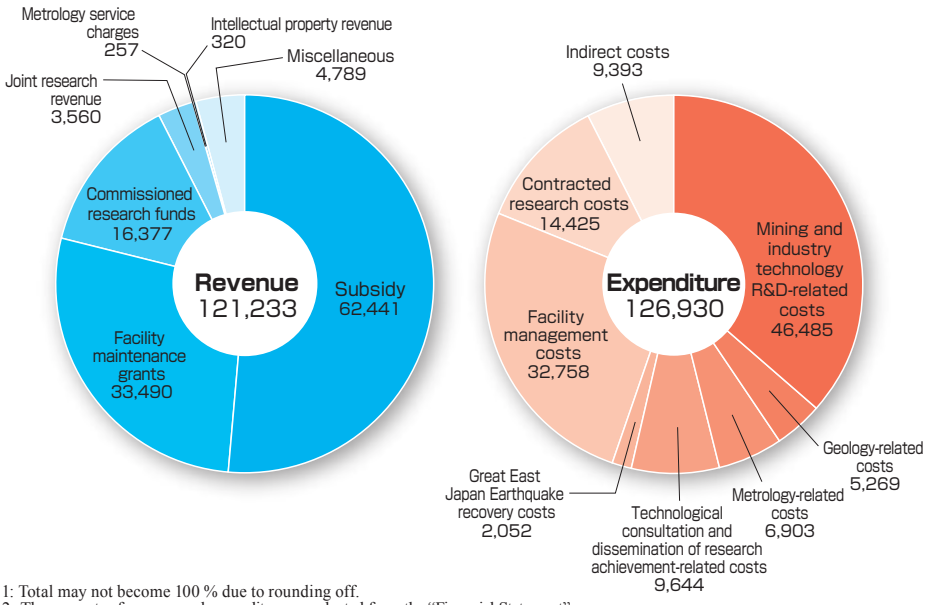
Development of the measurement standards such as length, time, and mass is a vital mission of AIST. The National Metrology Institute of Japan (NMIJ) develops and maintains measurement standards of physical quantities for seven base units and numerous combinations of those base units, and disseminate these standards to society. NMIJ advances the development of measurement technologies associated with the measurement standards, and undertakes the development of infrastructure underpinning cutting-edge manufacturing as well as the safety and security of our society. Four Research Institutes and the Center for Quality Management of Metrology are organically connected and cooperate closely to disseminate measurement standards, conduct legal metrology services, and enhance personnel training.

Organization Chart (November 1, 2015)



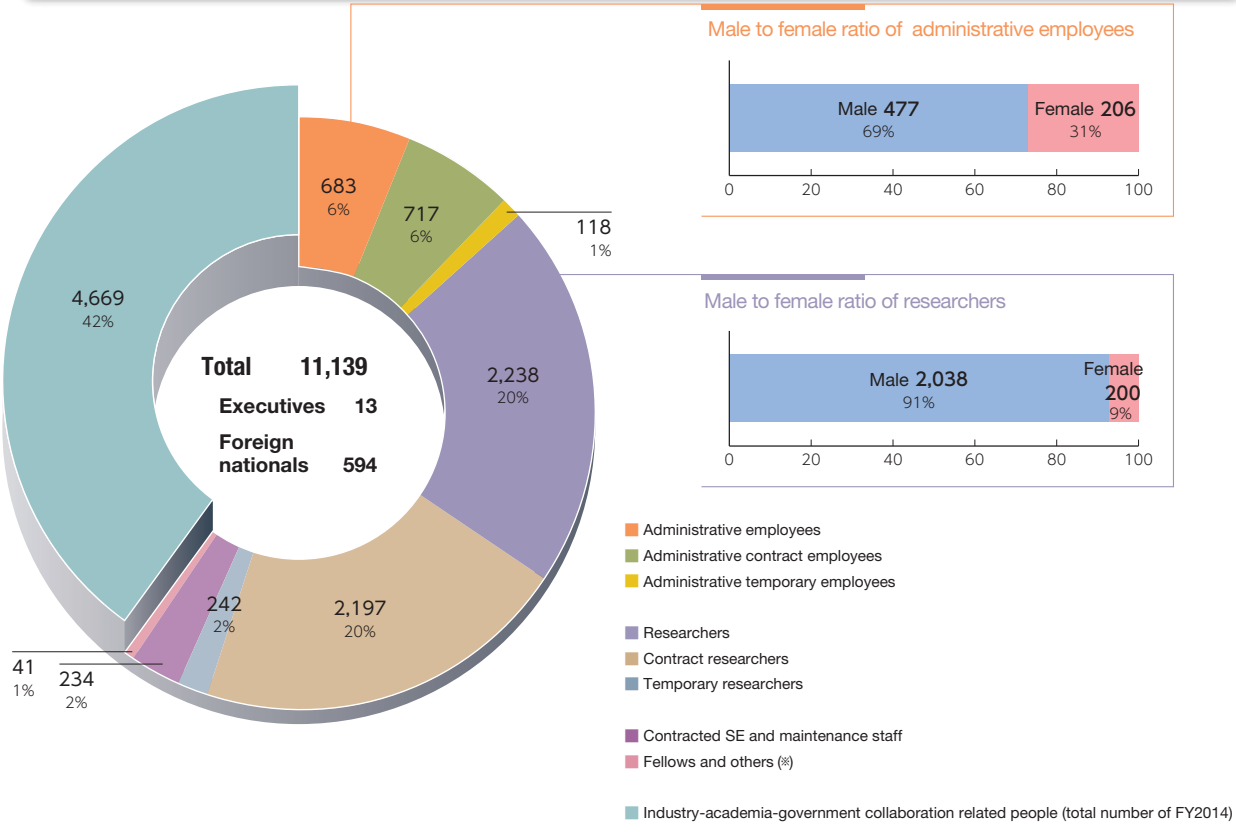
Revenue and Expenditure

Financial Results for FY 2014 (unit : million yen)



Notes 1: Total may not become 100 % due to rounding off.
Notes 2: The amounts of revenue and expenditure are adapted from the "Financial Statement" prescribed in Article 38 of the Act on General Rules for Incorporated Administrative Agencies. The expenditure outreaches the revenue as we carried forward the balance of previous years.

Staff (as of March 1, 2015)



※Honorary AIST Fellow、Special AIST Fellow、Grand Emeritus Advisor、Special Emeritus Advisor、Research Emeritus Advisor、Research Emeritus Counselor

Compliance Improvement

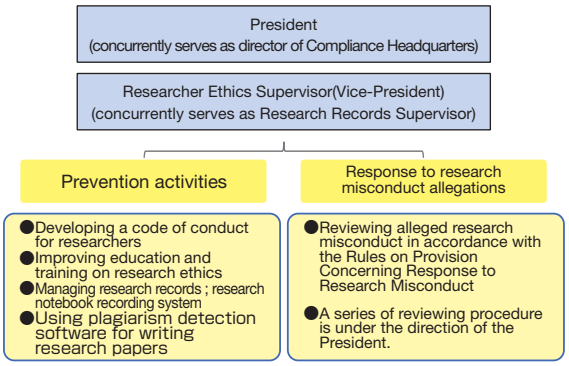
The Compliance headquarters is responsible for compliance improvement at AIST.

We accomplished the following, mainly focusing on management of research misconduct:

- Provided basic training programs on ethics and compliance for new employees and contract employees.
- Provided training programs for research group leaders aiming at enhancing their knowledge and raising their awareness on compliance as middle managers.
- Issued five in-house newsletters based on familiar examples of compliance risks.
- Revised a code of conduct for researchers and added the responsibilities of co-authors.
- Established new rules on research records. Examination of research notebooks by research supervisors is required on a regular basis.
- Improved e-learning program on research ethics.
- Introduced plagiarism detection software for research papers and offered it to researchers.

Despite these efforts, if we find that research misconduct occurred, AIST will take strict action in accordance with the research misconduct rules.

Management of research misconduct at AIST



Disclosure of Information and Protection of Personal Information

Disclosure of information

To increase the transparency of AIST's activities and fulfill its accountability requirements, AIST proactively discloses information on its website and by other means in accordance with the Act on Access to Information Held by Independent Administrative Agencies (implemented on October 1, 2002).

Protection of personal information

In accordance with the Act on the Protection of Personal Information Held by Independent Administrative Agencies, etc. (implemented on April 1, 2005), AIST established the Privacy Policy and the AIST Rules for the Protection of Personal Information to protect the individual's rights and interests while ensuring that research and related activities at AIST are conducted properly and smoothly.

Each year, each manager and employee conducts a self-check for personal information protection and information security to raise awareness of the proper management of information, including personal information, and of information security compliance.

Information disclosure desk and personal information protection desk

A request for information disclosure in accordance with the Act on Access to Information Held by Independent Administrative Agencies and the Act on the Protection of Personal Information Held by Independent Administrative Agencies, etc. can be made through the desks and the website of AIST Tsukuba and other regional research bases. Each desk also provides help on the procedures for disclosure and personal information protection. Only requests for information disclosure can be made on the website.

Year-to-year numbers of requests for disclosure of information and personal information

FY	Information disclosure	Personal information
2011	3 Cases	0 Cases
2012	6 Cases	3 Cases
2013	6 Cases	0 Cases
2014	9 Cases	2 Cases

Research Notebooks

Guidelines for addressing misconduct in research were developed by the Ministry of Education, Culture, Sports, Science, and Technology and the Ministry of Economy, Trade, and Industry and have been established since August 2014. To prevent fabrication, falsification, and plagiarism of research papers and protect the rights of researchers, it is particularly important for researchers to keep records of their research and for the organization to manage the records, instead of leaving it to individual researchers. AIST requires researchers to take research notebooks to protect intellectual property rights, ensure the traceability of the investigations, and prevent research misconduct. AIST has decided to make the following changes to make this requirement more effective: (1) a research notebook is AIST's important information asset and should be retained as an institutional document for a long period of time; (2) the research information should be recorded either in paper medium or electromagnetic medium (in PDF format); and (3) the records of research should be examined on a regular basis by the group leader and others. A ledger of all research notebooks will be managed by AIST. As has been done in the past, primary research information that cannot be included in a research notebook will be managed by individual research units or researchers.

A discussion was held to establish rules providing for the duties of researchers and for keeping, managing, retaining and disclosing records of research. Rules on Management of Research Records were established in April 2015.

Research notebooks used at AIST

Internal Audit

At AIST, in collaboration with the auditor and the accounting auditor, the Audit Office, which is defined as an independent organization under the direct control of the president, monitors whether work is properly and efficiently performed and recommends improvements in work practice on the basis of the results of the monitoring. Its aim is to: (1) improve the effectiveness and efficiency of work; (2) comply with laws relating to research and related activities; (3) protect assets; and (4) ensure the reliability of financial reports. The purpose of an internal audit is not to identify work-related problems and bring up issues (i.e. problem-identifying) but to advise on the most effective improvements based on mutual understanding through a thorough discussion of any identified problems (i.e. problem-solving) and thus to support the audited departments.

In FY 2014, AIST auditors talked with the audited departments about a specific theme with a high need for an audit, namely obstructive factors affecting the research environment. As a result of these talks, AIST provided information that will help with organizational management.

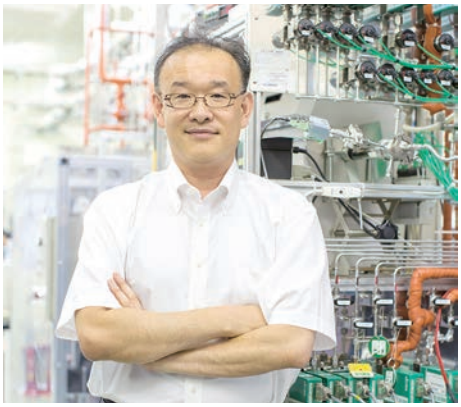
AIST performed a comprehensive audit of the activities of each research unit in general and confirmed that, overall, these activities were being properly conducted. AIST made suggestions and advised the audited departments to make improvements as soon as possible to the issues identified in terms of the compliance, effectiveness, and efficiency of activities. In addition, AIST conducted a follow-up audit of the status of the improvements suggested in the previous year's internal audit. Improvements are being made as appropriate.

Collaboration in audit

	Internal audit	Collaboration	Auditor audit	Collaboration	Accounting auditor Audit
Scope of audit	○ Operational audit ○ Accounting audit		○ Operational audit ○ Accounting audit		○ Accounting audit
Points of audit	○ Activities as a whole ○ Appropriateness of risk management and development and operation of an internal control system ○ Improvement of work process efficiency		○ Appropriateness of operations ○ Appropriateness of financial statements		○ Appropriateness of financial statements

Creating New Industries based on Single-Walled Carbon Nanotubes

Carbon nanotubes (CNTs) combine many excellent physical characteristics such as lightness, strength, flexibility, corrosion resistance, heat resistance and thermal conductivity. CNTs are new materials that are expected to have a wide range of applications. At AIST we have developed a revolutionary growth technique for single-walled CNTs, the super-growth method. In collaboration with Zeon Corporation, we have successfully applied the super-growth method at an industrial scale and we hope to create a CNT industry started in Japan.



Director, CNT-Application Research Center
Kenji Hata

A thousand times the synthesis efficiency: the challenge of mass production

Previously there were high hopes for the application of single-walled CNTs in a wide range of fields but practical application could not be achieved because of problems such as synthesis efficiency, impurities and cost. The answer to all of these problems was the super-growth method.

The development leader, Kenji Hata, had developed CNT synthesis skills with chemical vapor deposition (CVD) to a world expert level in his post-doctoral years at Harvard University. In 2004, the year after he joined AIST, he promptly succeeded in improving the CVD process to develop the super-growth method, raising the synthesis efficiency of single-walled CNTs by a factor of a thousand in one step.

He explains, "The key point of this synthesis method is the addition of tiny amounts of water. The synthesis efficiency of single-walled CNTs was poor because the catalyst was getting covered with carbon and becoming unable to work. Therefore, I thought we could maintain catalyst activity by adding an oxygen source (water) to remove the trapping carbon, separately from the carbon source (ethylene). The basic idea is very simple."

The super-growth method was published in the American scientific journal *Science*. Hata says that he decided to work toward mass production the month after publication: "One of my motives was the expectation that if we could make the super-growth method continuous and scale it up, then we could make more in a single synthesis apparatus than the total amount then being produced in the world. Another was that the single-walled CNTs produced by the super-growth method have three characteristics that stand out above any other current material: great length, large relative surface area and extremely high purity. Practical application was unlikely to happen without these characteristics."

Success in both mass production and application development

How was the way to practical application proceeded? First, a carbon nanotube capacitor development project (NEDO, 2006 to 2011) was set up with the assistance of Hata's superior at the time, prime senior researcher Motoo Yumura. The project provided funds for developing mass production synthesis technology.

In 2006, Hata embarked on collaborative research with Zeon Corporation. They had to build up the necessary technological elements for a mass production system from scratch: large-area synthesis, continuous synthesis, catalyst application, re-use of substrates and so forth. In particular, the most important aspect of moving toward practical application was reducing costs. The outcome of this collaborative research is that Zeon will finish setting up a factory in December 2015 and mass production will at last begin. Even now, Hata's attitude is, "This last 10 years has just been a warm-up. The completion of the factory is like coming up to the starting line of a marathon." They will continue to work on research for further improvements in performance and cost reduction.

The other face of the project was the development of supercapacitors. "We did not know it at the time, but it turns out that single-walled CNTs from the super-growth method make ideal capacitor electrodes. Nippon Chemi-Con Corporation is planning to launch and market supercapacitor products in 2016.

This national project has been a valuable example of achieving both mass production and a practical application at the same time.

The power of companies leading to success in application

Talking about finding a way across the "valley of death" to successful application, Hata reflects, "We were lucky in every respect. I just added water (the addition of water during the development of the super-growth method) and didn't have to do anything else." These words express expectations for companies that can take on responsibility for application research.

"For companies, practical application to turn new technologies into finished products is a very tough challenge. I think that it is many times more difficult than developing a single technology. Decisions cannot be made without a combination of very effective leadership and the ability to deliver; as well as being one of the managers in charge. Kohei Arakawa (special commissioning manager) of Zeon, our partner in the project, has had a lot of experience in starting up large enterprises and possesses the ability to deliver success in practical application.

"The fact is that Zeon had had no experience in dealing with CNTs before. Maybe the businesses that had dealt with CNTs before lacked the boldness to put aside the technologies they had accumulated and make the leap to the super-growth method. There is a term that is often heard in America—'NIH', not invented here—but if companies persist with their own technologies, the result may be that they cannot see the value of new technologies."

A research base for creating a CNT industry

The CNT-Application Research Center was opened in April 2015. Hata himself named it, the first unit in the history of AIST to include the word "application" in its name. "The focus is on R&D into a common foundation for application development: dispersion, forming, coating, fiber-making, and precision machining technologies; safety evaluation technologies; and technologies for evaluating CNTs in finished products. AIST's role will be 'support,' in the form of this research center that will provide services to all companies and researchers."

We are making steady progress in the creation of a new research base. One part of this is the Nanocarbon Application Forum, which started its activities two years ago. This is the only forum in Japan where companies that are developing applications of CNTs come together.

Another part is creating a site where CNT researchers within AIST can gather, crossing the boundaries between the different research centers, to regularly discuss the latest research developments. "Researchers in all sorts of fields, such as materials development, application development, evaluation technology and safety technology, are working together under AIST. When they gather together, everyone's research is invigorated. There is value in meeting."

Building on these two foundations, we aim to create a CNT industry originated in Japan.

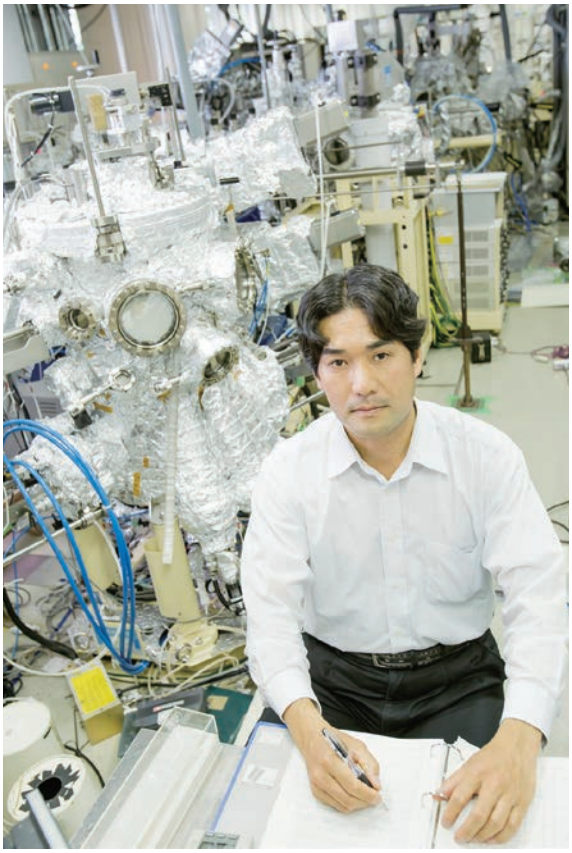
New Spintronic Devices Amaze the World

AIST is a leader in the field of spintronics; we have delivered results that have amazed the world. We have developed a new type of tunnel magnetoresistance (TMR) device and, by applying it in the magnetic heads of hard disk drives (HDDs), have achieved remarkable increases in the capacity and energy efficiency of hard disks. As well as improving the performance of next-generation IT equipment, this is raising hopes for the dream of zero power consumption in equipment on standby.

Director, Spintronics Research Center
Shinji Yuasa

The challenge of developing next-generation devices

Spintronics is a relatively new field, fusing electronics with magnetics. Electronics gives us semiconductor technology and magnetic engineering gives us magnetic recording, which are important technologies underpinning IT. Spintronics fuses these two fields of engineering and is considered a key technology that is essential in the development of the advanced information society.
By using this new technology, next-generation devices can be created that make use of both electric charge and electron spin (magnetism). The important factor is the technology called magnetoresistance effect that uses spin to control electricity. The higher the level of magnetoresistance (the MR ratio), the higher the performance and energy efficiency of the devices that can be created. In 1988, Albert Fert of France and Peter Grünberg of Germany discovered the giant magnetoresistance (GMR) effect, suddenly raising the MR ratio by a factor of ten (and winning the Nobel Prize in Physics in 2007). In 1995, Terunobu Miyazaki of Tohoku University demonstrated tunnel magnetoresistance at room temperature, raising the MR ratio several times again. Shinji Yuasa, Director of AIST's Spintronics Research Center, aimed to raise potential values by another factor of ten.
Yuasa says, "It would be completely impossible to raise performance by an order of magnitude just through small technological improvements; new technologies must be found. To unlock progress, I pursued research with magnesium oxide (MgO) replacing aluminum oxide (AlO) as the insulator (tunnel barrier) material in the TMR devices."



The experimental apparatus that first produced thin films of MgO in 2003

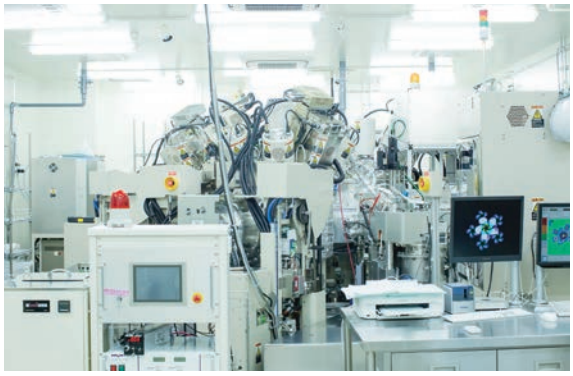
Achieving world-beating performance with single-crystal MgO

Yuasa explains that developing a thin film deposition apparatus led to a breakthrough in basic research.
"The theory that a large TMR effect could be produced using MgO as an insulator had been published and researchers around the world had conducted experiments but they had not been successful. The turning point for my success was in 2002, when I applied to the Japan Science and Technology Agency (JST) under the "Sakigake" program that supports basic research and won a

research grant. I spent the first year building the thin film deposition apparatus; so, I had no results to show. That time was very tough but I was on a mission and I worked without rest. I completed the apparatus at the end of 2003. Then, all of a sudden, I was producing the world's highest MR ratios."
By using the apparatus with a higher level of vacuum, he was able to deposit single-crystal MgO and achieve a breakthrough. The MR ratio went up by an order of magnitude, as he had hoped, bringing it up to a range close to current theoretical limits.
In 2004, he published a paper in the British scientific journal Nature Materials. Simultaneously, in the same issue, Stuart Parkin of IBM published a paper with roughly the same content. The outcomes of their basic research had arrived at just the same moment. Yuasa has since been pushing ahead with research into practical applications.

Collaboration with equipment makers and a leap to mass production

"I was resigned to spending five or ten years in the 'valley of death' before we could develop mass production technology for HDD magnetic heads utilizing this new TMR, but actually it only took half a year. This was because of successful collaborative research with the equipment maker Canon Anelva Corporation and a lot of good luck with technology leading to another breakthrough. First, when searching for an alloy magnetic material to be combined with MgO, we happened to test a material that had been put in our apparatus and unexpectedly found success with it. Because the material was cheap and could be produced efficiently, it also cleared the cost hurdle. Then, because the material could be produced using equipment HDD manufacturers already had in their factories with only minor adjustments, we were suddenly able to realize mass production."
When magnetic heads using the technology were launched, the world's HDD manufacturers took them up. Now the technology can boast a global share of 100 %, both in components (low-power consumption HDD magnetic heads) and in manufacturing equipment. At the same time, this research, which started from the findings of basic research, has made a great contribution to the fields of development and practical application of spintronics technology.



Equipment for mass production of TMR thin films

Aiming for environment-friendly IT equipment

Now, collaborative research (in a NEDO project with Toshiba Corporation) is making progress toward mass production of nonvolatile memory (MRAM), which does not lose its contents even if the power supply is turned off.
"As the development of mass production technology reaches a stage close to the factory, our role is coming to an end. We are gradually changing direction to searching for new solutions. We are widening our scope to memories, data communication, radar applications and so forth."
Because spintronics is a new field, there is great freedom in research and it is easy to find new materials and new device concepts; so, there are plenty of starting points for research. The future goal is to realize environment-friendly IT equipment that can be used over long periods without being charged. "One of our dreams is to create a mobile IT device that needs to be charged, for example, only once a month. Not only would this be convenient and energy efficient; it would mean that information could be reliably accessed even if power was cut off in a major disaster. To this end, we are radically reconsidering the technology. We are aiming to develop memories that consume very little electricity."
Yuasa explains what will be important to bring about second and third successes: "It is important to keep on producing breakthroughs in basic research at AIST. Simply taking the fruits of basic research from other institutions such as universities and bridge-building will not be rewarding. It is because we have findings that we ourselves discovered that we are highly motivated to work on bridging the valley of death."
He offers the following advice to all young researchers: "When you produce results from good basic research, you must not toss them away but keep going until you can transfer them to the world of industry. If you do that, your original discoveries will eventually be five or ten times higher in value."

A Revolutionary Technology that Creates Ceramic Films at Room Temperature

Ceramic films that protect precision components from damage, dirt, heat, electric currents and the like underpin our daily lives and industry in places that we do not see. AIST has developed an aerosol deposition (AD) process, the world's first technology capable of coating with ceramics at room temperature. This has gone on to commercial exploitation with semiconductor equipment components and has made a great contribution to the development of the world's semiconductor industries.

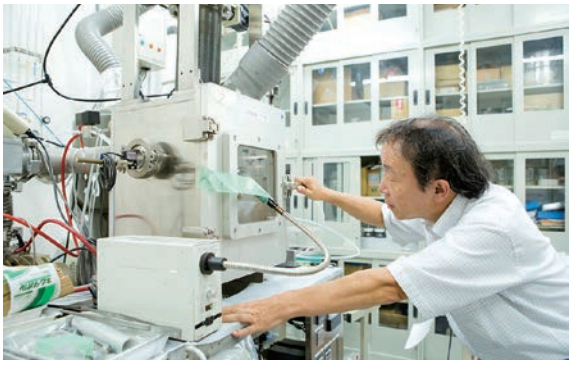
Director, Advanced Coating Technology Research Center
Jun Akedo

Just spray it: film formation that defies common sense

In general, ceramic materials are applied by being sintered at 1000°C or more. This method has disadvantages in that there may be shrinkage during sintering and ceramics cannot be combined with materials that have low melting points such as metals, glasses and plastics. By overcoming these problems, the AD process overturns the previous conventional wisdom. Jun Akedo, Director of the Advanced Coating Technology Research Center, developed the process, starting his research on it more than 20 years ago.

"The method is similar to thermal spraying processes that create a film by spraying heated powder. I was conducting experiments sintering powders on a substrate. One day, I noticed that although the film at a heated area peeled off easily, a staining residue in an unheated area around the heated area did not peel off even when scraped. This was the key to discovering the 'room temperature impact-consolidation (RTIC) effect' that could produce a film just by ceramic particles being sprayed at room temperature and impacting against a substrate. I was successful in applying this effect as a coating technology. "

"The breakthrough point came when I wondered if the mechanical fracture characteristics of the particles were being changed rather than if there was a temperature rise caused by the impact. When I investigated this, I found that some of the particles in the ceramic had the characteristic that they could be clushed and deformed at room temperature, like a metal. A chemical reaction occurred at the moment of crushing and caused secure bonding. Creating particles with characteristics suitable for the AD process was the key."



The AD process, supporting semiconductor fabrication around the world

Akedo discovered the room temperature impact-hardening effect in 1994 and started presenting it to academic associations and the like from around 1997. The first reactions came from the world of industry rather than the world of science. He started collaborative research with TOTO, Ltd. in 1999. A major national project on "Nano Structured Coating for Advanced Ceramic Integration Technology" was launched in 2002. The project was centered on AIST and involved six companies and four universities. After a series of challenges, a great result emerged in 2007.

"TOTO found success in incorporating components coated using the AD process into semiconductor fabrication equipment. As IT terminals have decreased in size and increased in functionality, line widths in semiconductor integrated circuits have become narrower. Microscopic contaminants that are produced during processing, which were not previously a problem, can form obstacles that interfere with the formation of wiring patterns. If interior walls of semiconductor fabrication equipment can be given a dense ceramic coating at room temperature by the AD process, contaminants will not be produced from surfaces inside the equipment even if they are struck by plasma. Now, TOTO has a large global share of

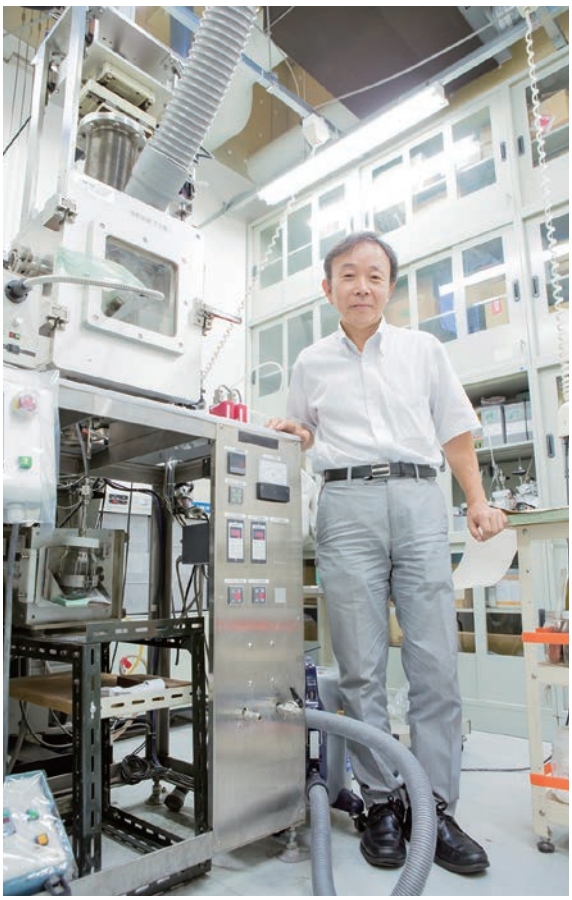
such components for semiconductor fabrication equipment. If components could not be coated with ceramics by the AD method, the global supply of semiconductors would be severely hindered."
The AD process meets the needs of today. Akedo sees the technology continuing to increase its global share in the future.

The development of applications extends to unexpected fields

Subsequently, there were increasing approaches to AIST from business. Companies in a range of fields of industry embarked on the development of applications of coating technologies based on the AD process. There were two factors behind this situation. One was the advancing understanding of the mechanism of the room temperature impact-consolidation effect, which facilitated R&D directed toward mass production. The other was advances in AD process technologies, such as the formation of transparent ceramic films and fabrication by the roll-to-roll method.
"Because coating is one of the basic process steps of manufacturing, the AD process has been taken up in many different fields. When ceramics can be processed at room temperature, the range of materials that can be used for coating widens and the usefulness of the final products can be improved. Accordingly, companies in a wide range of fields have come to us and development is being actively pursued for applications that we did not initially imagine."
To be specific, the scope of application development has extended to energy fields such as all-solid lithium-ion batteries (collaborative research with Toyota Motor Corporation), film-type dye-sensitized solar cells (collaborative research with Sekisui Chemical Co., Ltd.) and fuel cells; the power electronics field; manufacturing fields such as electronic components, magnetic devices and industrial rollers; optical fields; automotive fields; and medical fields such as dentures and implants.
"The dream is that, if we can reduce costs, we will be able to do something similar for painting. There could be many benefits apparent to everyone, such as automobiles that are not damaged when scratched by small stones."

Building bridges between science, engineering and business

There are a number of schemes proceeding forward to use the AD process on a commercial scale in industry. Collaborative research is proceeding that will hopefully provide successes to follow the success of TOTO.
"There is a wide gap between science and engineering. Engineering, the commercial side, develops products, then has to provide support and services and help users to use the products appropriately. The introduction of a new technology comes with risks, including the risk of success or failure in business. That is where we find the 'valley of death'. We cannot bridge the valley unless science and engineering move closer to one another.
In the case of TOTO, they were a good partner for AIST. I think they had their doubts about the possibilities of the technology when we first met, but eventually they came to believe in the technology and they invested people and money over ten years. A firm relationship of mutual trust is absolutely necessary for successful bridge-building."
In 2015, AIST set up the Advanced Coating Technology Research Center with the mission of building bridges for new coating technologies into the business world. In order to build bridges that will not just commercialize a technology but contribute to the resulting products producing consistent profits for companies, improving competitiveness and expanding employment, we are working to create an environment that facilitates cooperation with business.



An AD apparatus that forms films of Li-ion battery material at room temperature

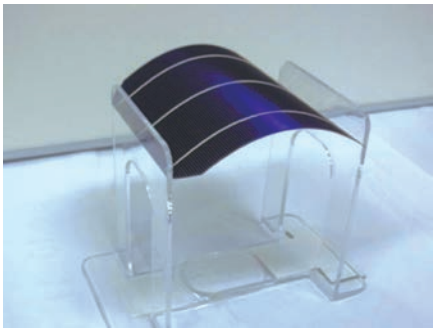
Progress of research at the Fukushima Renewable Energy Institute

Since its establishment in April 2014 in the city of Koriyama, Fukushima Prefecture, Fukushima Renewable Energy Institute, AIST (FREA) has been working on renewable energy research and development to help reconstruct the region through the world's most advanced research and the formation of industrial clusters. The number of the staff has increased to more than 300, from AIST as well as from partner companies, universities, and research institutes, both in Japan and overseas.

The Renewable Energy Research Center (RENRC) responsible for research and development at FREA consists of six research teams: Photovoltaic Power Team, Wind Power Team, Hydrogen Energy Carrier Team, Geothermal Energy Team, Shallow Geothermal and Hydrogeology Team, and Energy Network Team. We are working to develop core component technologies for the extensive use of renewable energy. We are also working on the research to integrate these component technologies.

The following are notable results of our research in FY 2014. In the area of thin-wafer based crystalline silicon solar cell module production technology, a FREA standard cell fabrication process was established (see photo); in the area of hydrogen carrier production/utilization technology, the fraction of hydrogen in the fuel for a next-generation cogeneration engine using methylcyclohexane (MCH) was increased to 60% (see Figure 1); in the area of energy networks, system-integration technology to make the most of renewable energy by using energy storage in batteries and as hydrogen, as well as power electronics and ICT technology, was developed (see Fig. 2); in the area of geothermal technology, a simulator of high-pressure water injection into a geothermal well was developed; in the area of ground-source heat technology, the development of a ground-source heat-potential map of the Tohoku region was started; and in the area of wind-power technology, the possibility of improving the operation efficiency by using a nacelle-mounted LIDAR was confirmed, and the assessment technology was improved by using satellite remote sensing.

As a global hub for renewable energy innovation located in Fukushima, FREA will continue to develop innovative renewable energy technologies and to help reconstruct the region through the cooperation with research institutes in Japan and overseas.



Thin-wafer based crystalline silicon solar cell (0.1 mm thick)

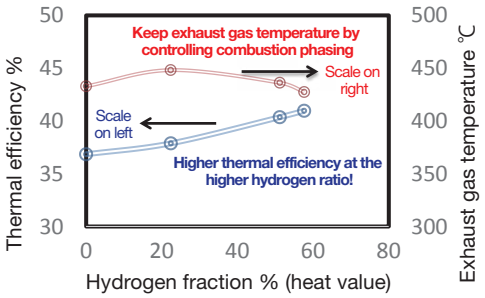
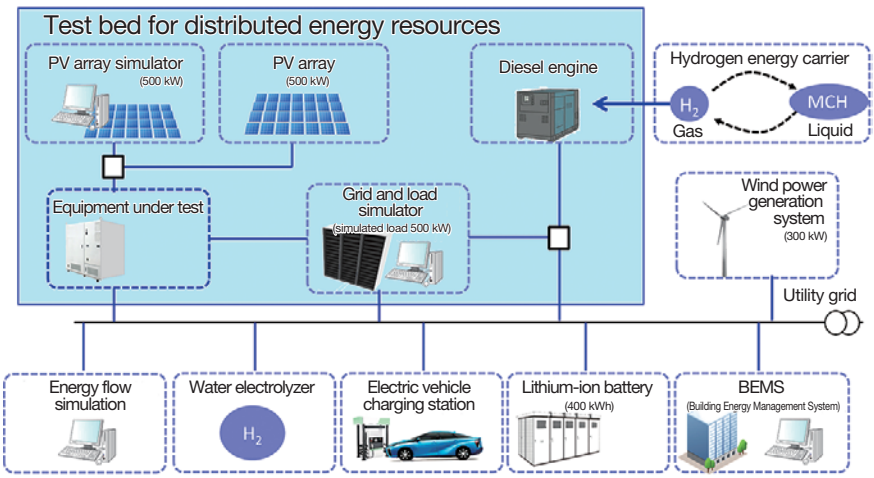


Fig. 1 Thermal efficiency and exhaust gas temperature as a function of the hydrogen ratio of the next-generation cogeneration engine

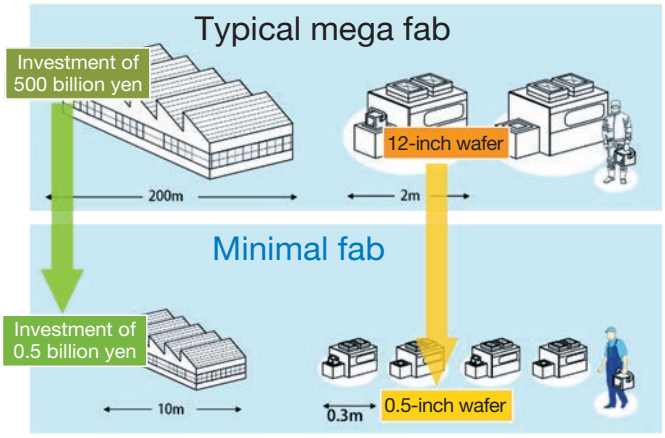


DER-demonstration platform

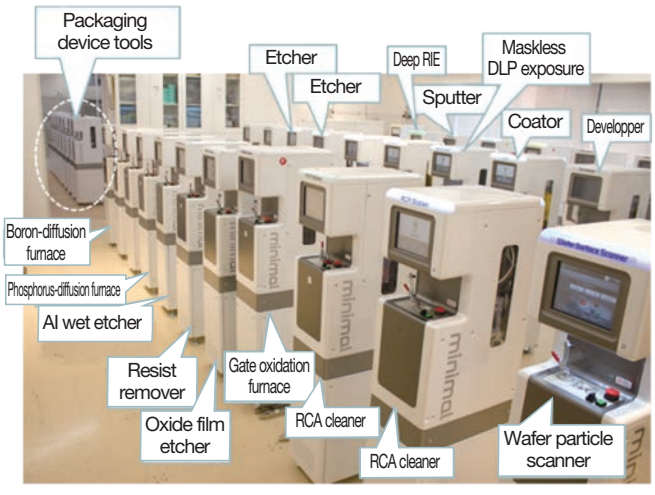
Minimal Fab

Mass production predominates in the device market. In recent years, as the scale of production has become ever larger, mass production has become unsuitable for production in small quantities and devices produced in small runs have become very expensive. Small production in quantities of less than a few hundreds of thousands accounts for a major part of the total market (50%; 15 trillion yen). AIST has proposed a minimal fab model—a new semiconductor system concept—that requires much less capital investment than large-scale factory production (mega-fab) for the manufacture of semiconductor circuits and accommodates small production in quantities of less than a few hundreds of thousands. This system allows for both research and development and production. An investment in one production line in this practical production system of the future, which is set to appear as a premier new industry, will be a few thousandths of that for mega-fab, or about 500 million yen. This system is characterized by three features: (1) a half-inch wafer; (2) a system width of 30 cm; and (3) removal of the need for a clean room by using a localized cleaning production system. The cost of the electricity used in each transistor-production process to produce a 300-mm-diameter wafer is 3600 yen (5.2 yen/cm2) for mega-fab and only one yen for minimal fab owing to its ultra-small size. The AIST Fab System Research Consortium was formed in January 2010 as a comprehensive organization to develop this new production system. It is currently working with 100 companies, 9 universities, 3 patent offices, and 5 public organizations.

A minimal system with the above basic specifications has been developed and is ready for transistor prototyping without a clean room.



Comparison between mega fab and minimal fab



AIST's minimal device equipment

Participation in Technology Research Associations

AIST has become a member of Technology Research Associations, the members of which provide researchers, research funds, and equipment and perform joint research and development of technologies used in industry. AIST contributes to the projects of these Associations, including by developing research plans, performing research, and using research outcomes.
Particularly by providing our people and place to the Associations, we aim to serve as a place for collaboration and creation where different organizations and people can meet and exchange knowledge through the Associations' projects. We thus aim to help promote open innovation.
AIST's "people" participate in the Associations' projects as researchers, project leaders or board members. We also provide our facilities and equipment as "place" for use by researchers from industries and universities participating in the Associations to intensively carry out their research.

Participation in FY 2014 in Technology Research Associations

- AIST participated in 25 Associations
- Intensive research projects were performed at AIST(16 Associations marked with the letter "A" in the table).
- AIST's researchers served as project leaders and managed whole projects (9 Associations marked with the letter "B" in the table).
- AIST's managers served as directors(19 Associations marked with the letter "C" in the table).
- AIST provided technical guidance and support, as well as know-how of equipment use.

Technology Research Associations of which AIST is a member (as of March 31, 2014)

	Technology Research Association			
1	Photovoltaic Power Generation Technology Research Association (PVTEC)	A	B	C
2	Consortium for Lithium Ion Battery Technology and Evaluation Center (LIBTEC)	A		C
3	Fuel Cell Cutting-Edge Research Center Technology Research Association (FC-Cubic)	A		C
4	Advanced Laser and Process Technology Research Association (ALPROT)	A		C
5	R&D Partnership for Future Power Electronics Technology (FUPET)	A	B	C
6	Technology Research Association for Single Wall Carbon Nanotubes (TASC)	A	B	C
7	Epigenomics Technology Research Association (EPiRA)			
8	International Standard Innovation Technology Research Association (IS-INOTEK)			C
9	Stem Cell Evaluation Technology Research Association (SCA)			C
10	Photonics Electronics Technology Research Association (PETRA)	A		C
11	Chemical Materials Evaluation and Research Base (CEREBA)	A		C
12	Japan Advanced Printed Electronics Technology Research Association (JAPERA)	A		C
13	Technology Research Association for Next Generation Natural Products Chemistry	A		C
14	NMEMS Technology Research Organization Technology Research Association (NMEMS)	A	B	C
15	Control System Security Center (CSSC)	A		C
16	Fine Ceramics Research Association (FCRA)	A	B	
17	Minimal Fab Development Association	A	B	C
18	Technology Research Association of Highly Efficient Gene Design (TRAHED)	A		
19	Technology Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM)	A	B	C
20	International Research Institute for Nuclear Decommissioning (IRID)			C
21	Manufacturing Technology Research Association of Biologics (MAB)			
22	Thermal Management Materials and Technology Research Association (TherMAT)		B	C
23	Innovative Structural Materials Association (ISMA)			
24	The Research Association of Automotive Internal Combustion Engines (AICE)			
25	Technology Research Association for Future Additive Manufacturing (TRAFAM)		B	C

Providing Opportunities for Industry-Academia-Government Collaboration and Accepting Researchers

AIST proactively accepts researchers to conduct joint research, participates in technical research associations, and invites visiting researchers. In addition, AIST supports R&D and product development of private companies by conducting commissioned research and verification services, and by providing technical training, technical advice services and material samples for research.

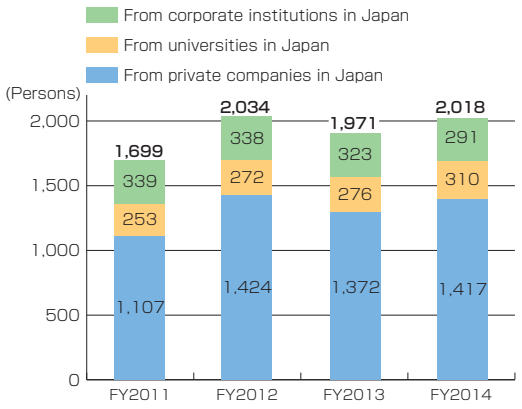
Acceptance of external researchers

Acceptance of external researchers for joint research

2,018 researchers were accepted in FY 2014.

AIST accepts researchers from joint research partners to conduct joint research effectively by utilizing the state-of-the-art research facilities at AIST.

Acceptance of external researchers for joint research



Joint research with transfer of human resources

4 researchers were transferred to AIST in FY 2014.

Researchers from joint research partners are transferred to AIST. (The partner bears the cost of research equivalent to the personnel expenses.) The researchers of both the partners and AIST deepen research collaboration and thus R&D is accelerated, taking full advantage of AIST's research infrastructure and human resources.

Activity examples conducted by external researchers

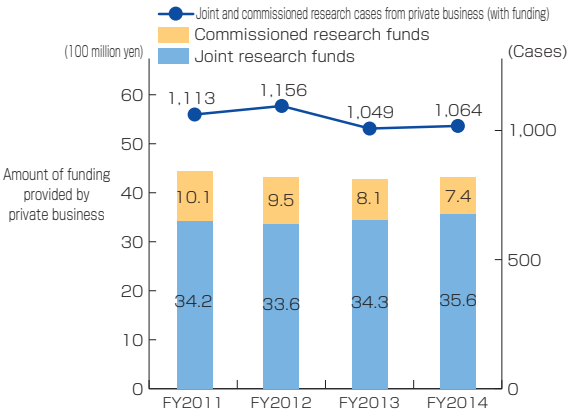
AIST researchers work together with external researchers on various research projects.

- In cooperation with researchers from French research institutes, the AIST-CNRS Joint Robotics Laboratory conducts research to increase the autonomy and interactivity of robots.
- AIST conducts joint research to support private companies based in Fukushima Pref., Miyagi Pref., and Iwate Pref., which suffer from substantial damage caused by the Great East Japan Earthquake, to support the commercialization of technology seeds for their renewable energy technology.

Joint and commissioned research conducted in past years

Joint research is an R&D project between AIST and cooperative partners: companies, universities, or public research institutions with common objectives and goals, in order to generate innovative results that cannot be achieved by independent research. Commissioned research is an R&D project that AIST conducts on contract by a company or other organization. Even in the case that they need external technology, they can complement their aims with AIST's research potential.

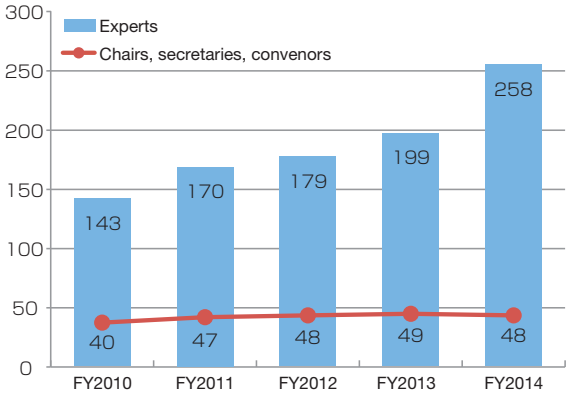
Joint and commissioned research with companies and other organizations



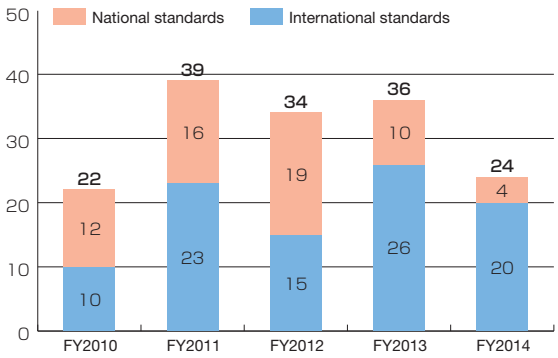
Promotion of International Standardization

AIST promotes standardization activities utilizing our R&D achievements. Staff of AIST has been playing a key role in committees of international standards developing organizations such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC): 48 employees have served as chairs, secretaries and convenors, and 258 employees have participated as experts.
We proposed 24 national/international standards in FY 2014, including "Specification, calibration and expression of uncertainty of calibration results of capacitance diaphragm vacuum gauge with electrical output."
Since 2011, AIST has held the Symposium on Strategies for International Standardization every year to enhance standardization efforts by sharing the importance and issues of standardization and certification with involved parties in the industry, academia and government sectors. In FY 2014, in conjunction with the IEC Conference in Tokyo, we held a symposium titled “International standardization: key for opening new market with innovation.”

Contribution of AIST staff to international standardization activities



Number of proposed standards



Increase in Global Presence

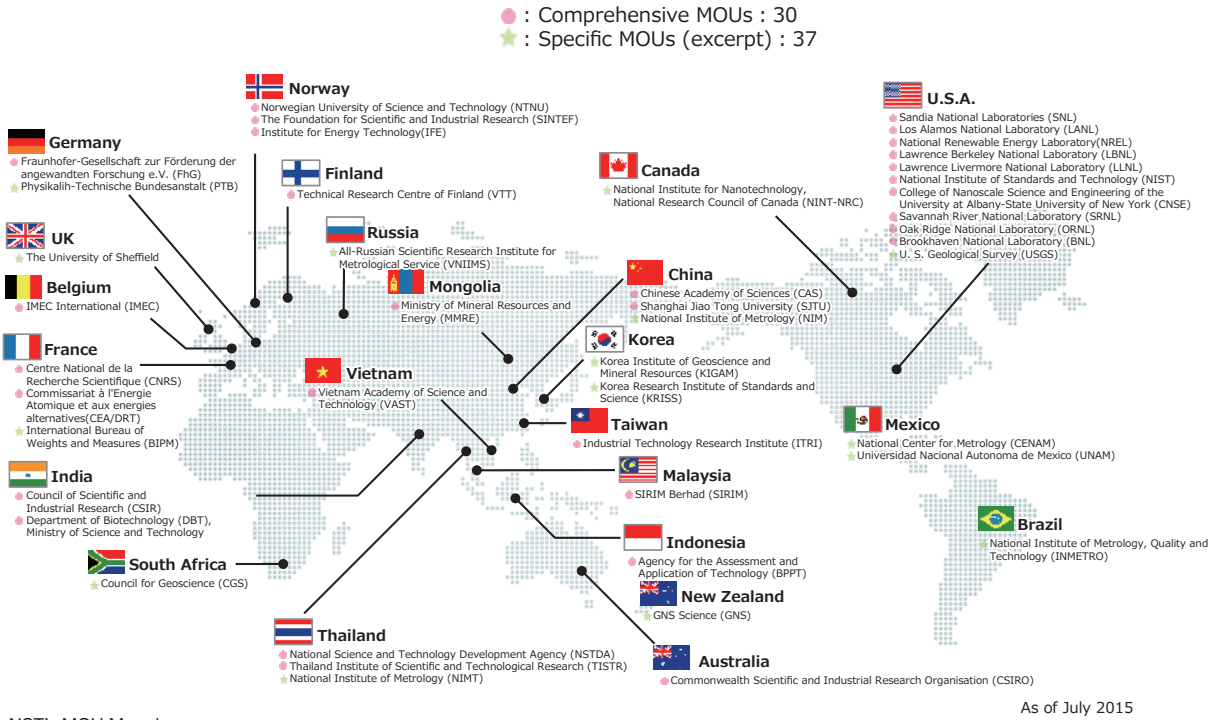
AIST has increased its global presence through enhanced cooperation with overseas research institutions and inter-organizational exchange of personnel. As part of the enhancement of cooperation with overseas research institutions, in October 2014, AIST and RIKEN jointly hosted the 3rd Global Summit of Research Institute Leaders. The purpose of this summit is to provide an opportunity for leaders from research institutions to meet and discuss the future of science and technology, the role of each research institution, and collaboration among research institutions. Representatives from 15 research institutions in 12 countries gathered at the Summit and enthusiastically discussed “Development of Research Human Resources and Inter-Organizational Cooperation.” From AIST, President Ryoji Chubachi attended this summit.

Third Global Summit of Research Institute Leaders (October, 2014)

Building International Research Networks to Address Global Issues

AIST has memoranda of understanding (MOU) on comprehensive research collaboration with 30 research institutions worldwide and is engaged in the development of international research networks. On the basis of the memoranda of understanding, we aim to address global issues through joint research and personnel exchange with overseas research institutions. In April 2015, we held a joint workshop with the Thailand Institute of Scientific and Technological Research (TISTR) and the National Science and Technology Development Agency (NSTDA,Thailand). At this workshop, research presentations were made and views were exchanged with the aim of enhancing ongoing cooperation in areas such as energy and developing cooperation in new areas of research such as biotechnology and environmental risk assessment. In June 2015, we held the 5th Joint AIST-ITRI (Industrial Technology Research Institute, Taiwan) Symposium. At this symposium, AIST and ITRI shared the view that steady progress has been made in research areas such as thermoelectric conversion materials and photovoltaics. We also discussed cooperation in other areas such as advanced manufacturing.

Joint AIST-NSTDA-TISTR Workshop (April 2015)



AIST's MOU Mapping

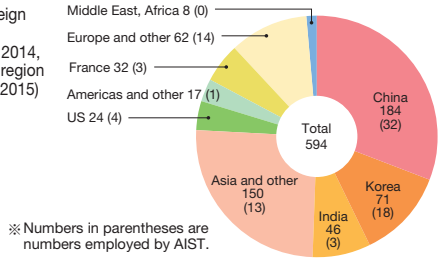
As of July 2015

Accepting Foreign Researchers

To enhance cooperation with overseas research institutions and to develop an international network of researchers, we actively accept researchers from universities and research institutions in other countries. In FY 2014, a total of 594 foreign researchers were engaged in research at AIST.

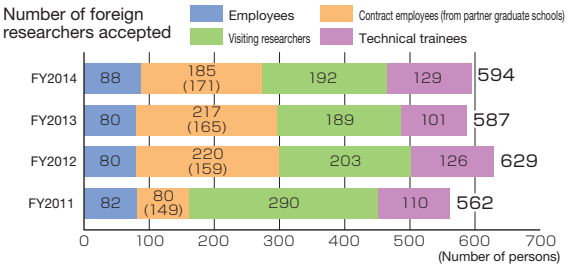
In terms of regional statistics, 70% were from Asian countries, with those from Europe making up the second largest percentage of accepted researchers. We will continue to develop close collaboration with overseas research institutions through personnel exchange.

Numbers of foreign researchers accepted in FY 2014, by country and region (as of March 1, 2015)



※Numbers in parentheses are numbers employed by AIST.

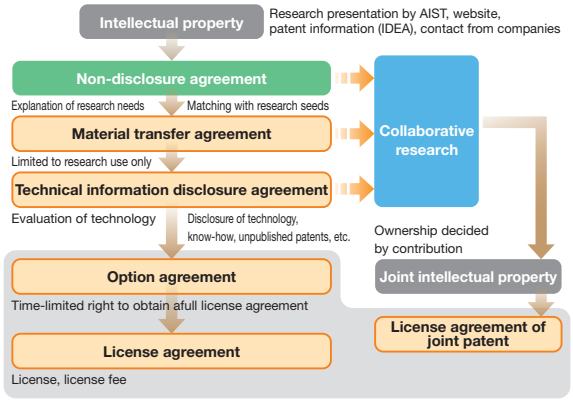
Number of foreign researchers accepted



Technology Transfer Activities

It is AIST's mission to contribute to the development of the economy and industry by disseminating its research achievements in society. To achieve this mission, AIST develops a strategic approach to obtain intellectual property (IP) rights, and appropriately maintain and manage such IP rights so that the research achievements lead to technology transfer. In addition, AIST is strongly and powerfully promoting technology transfer centering on intellectual property.

Technology transfer process at AIST



Technical Advice Service

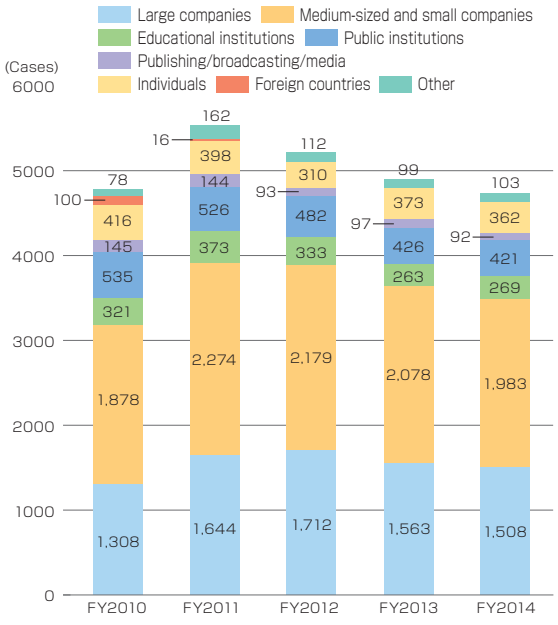
AIST welcomes technical questions and requests of joint research not only from companies but also from academia, media, and others. The general advice desk provides answers to received questions and requests by consulting appropriate scientists at AIST, such as technical advisers, innovation coordinators, and researchers.

Example

Consultation request How durable is the switchable mirror developed by AIST? What are its uses?

Actions taken and answers given A switchable mirror is a glass mirror that can switch between a light-reflecting state and a transparent state. It eventually degrades (mainly because of the switching between the two states) but can switch more than 10,000 times. The mirror can be designed in a compact configuration, using a dry battery as the power supply. We are developing applications of the mirror in residential and vehicle windows.

Number of technical consultations



Innovation School

AIST's Innovation School is working to broaden the horizons of young researchers and to raise their awareness in order to train them, by using a specially developed curriculum, to be ready to contribute to innovation.

To address increasingly complicated social issues, we need to develop innovative technologies by combining the ideas and technologies of AIST and external organizations. For this we need personnel who can play central roles in collaboration. AIST actively accepts young researchers with PhDs (i.e. postdoctoral researchers) and PhD students and trains them so that they have scientific and technological knowledge in specific areas of expertise, along with the communications and cooperation skills they need to work with experts in different fields from a broader perspective.

In FY 2014, we accepted 20 postdoctoral researchers, 9 PhD students, and 3 lecture course students as Innovation School trainees and provided them with lectures and practice.

This year, in FY 2015, we intend to develop the Innovation School Program from a pilot project to a full human resource development project. This will further enhance AIST's bridging role. To achieve this, we will attempt new activities inside and outside AIST, and the Researcher Development Working Group will develop a medium-to-long term vision for the Program.

Curriculum of the Innovation School

1) Lectures and exercise at AIST

- Lectures on philosophy and management and on the activities of researchers in industry, academia, and government and of corporate executives
- Lectures and exercises on topics such as standardization and research, intellectual property and research, design thinking, risk assessment, and career development
- Paper reviews by students on synthesiology (a research approach to integrating and configuring component technologies on the basis of research scenarios)
- Exercise to improve skills in presenting research in ways that can be understood by people from different fields

2) Research at AIST

- Working on research topics in laboratories
- Experiencing research covering the process from basic research to product development in a seamless way

3) On-the-job training with companies (about 3 months on average)

Students of the school are sent by AIST to companies to learn the following by experience:

- Importance of the procedures used to conduct research, the speed of technology development, and cost awareness
- Importance of teamwork and collaboration with other departments.

Expanding the vision and providing opportunities to young researchers

Students of the school say such things as "My research approach works in the company better than I thought it would" or "My successful completion of the corporate training program gave me a lot of confidence." They realize from experience that there are a variety of opportunities to work as researchers; to develop such insights as "The most important thing is the awareness that I work in an organization" or "You need to share a language with those with expertise in each area;" and to broaden their horizons. Companies that have accepted trainees say that "We gained valuable technological knowledge from the students" or "The students inspired those of our employees who were from the same generation." The companies rate the trainees' research capabilities and work attitudes highly.

Since the school started, 245 students have completed the program and have discovered their new potential. They are working in a variety of areas in companies, universities, and public research institutions.

AIST Research Assistant Program

To develop human resources with world-class, high level expertise and practical research ability that produce results leading to innovation, AIST provides the AIST Research Assistant Program, to hire graduate students with high levels of ability. This program allows talented graduate students to focus on research for their degrees without financial difficulties. By participating in AIST's R&D activities, which meet social needs, they can develop the ability to plan and conduct advanced research which is crucial for R&D activities. In FY 2014, 8 graduate students in doctoral programs and 38 graduate students in master's programs were engaged in R&D at AIST.

Employment requirements for AIST Research Assistants (as of July 2015)

Candidate	Graduate students in PhD programs	Graduate students in master's programs
Requirements	Superb R&D and paper-writing abilities which highly contribute to promotion of AIST R&D projects, and year-round execution of duties independently under staff guidance.	R&D and paper-writing abilities which contribute to promotion of AIST R&D projects, and year-round execution of duties independently under staff guidance.
Days of employment	14 days/month	Avg. 7 days/month
Salary	1,900 yen/hour (approx. 200,000 yen/month for 14 working days)	1,500 yen/hour (approx. 80,000 yen/month for 7 working days)
Number of employed graduate students in FY 2014	8	38

Voices of graduate students and their supervisors

"I had the opportunity to engage in R&D activities, which I could not have experienced at university. It was a great experience." (graduate student)

"By supervising the student, I was able to review my own research approach and identify issues to focus on. I was greatly inspired by his motivated attitude." (supervisor)

Development of Human Resources in Bioinformatics

Bioinformatics, which is a combination of biotechnology and information technology, has become essential in various areas of molecular bioscience, including drug discovery. AIST offers a "Program for High Performance Computing Infrastructure (HPCI) Human Resource Development" to train people with an understanding of both technology and theory in this field. More than 200 people participate in this program each year. The following lectures and seminars are provided in the program. Most of them are available for e-learning.

Bioinformatics training course

We provide mainly corporate researchers with instructions on topics from the basic theory of handling biological information to the practical analysis of biological information. In this way, we train them so that they can use supercomputers for NGS (next-generation sequencing) data analysis.

Drug-discovery informatics training course

We offer a practical curriculum on cheminformatics and bioinformatics, with a focus on molecular modeling and virtual screening to increase the efficiency of the initial search stage of drug discovery research.

HPCI seminar series

Twelve times a year, we hold graduate school–level seminars to present a variety of cutting-edge computer-based research activities in biotechnology and other areas such as big data analysis.

- In addition, we offer tutorials and seminars jointly with the Japan Science and Technology Agency's National Bioscience Database Center (NBDC), the University of Tokyo, and the Japanese Society of Bioinformatics.

Technical Training

AIST accepts researchers, engineers and students from companies, universities and public testing and research institutions for defined periods. Such a technical training program enables trainees to absorb leading technology under the instruction of AIST researchers. During FY 2014, we accepted 1,449 people into this program.

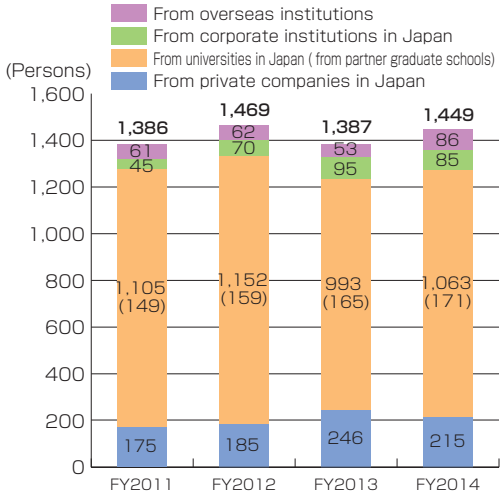
Partner graduate school program

Making use of the knowledge and experience they have gained at AIST, AIST researchers teach as guest professors at graduate schools that have cooperation agreements with AIST. AIST provides technical training to graduate students and AIST researchers advise them on their research.

Internship program

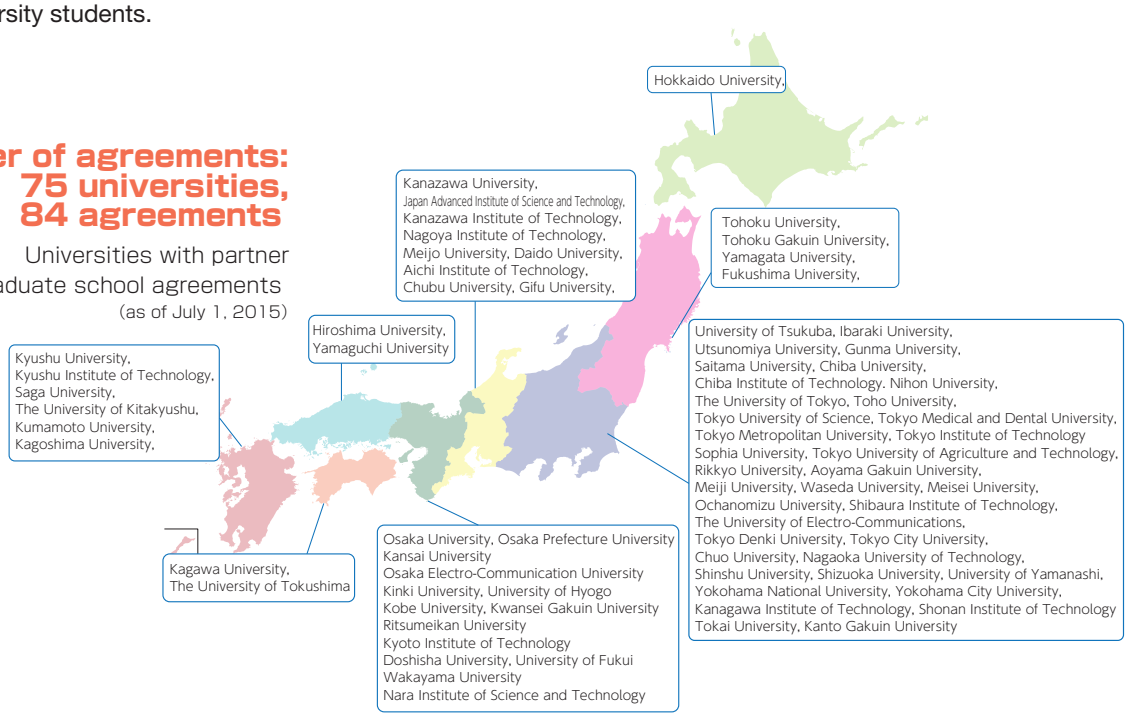
AIST provides short-term technical training mainly to university students.

Number of trainees for technical training



Number of agreements: 75 universities, 84 agreements

Universities with partner graduate school agreements
(as of July 1, 2015)



Voices of the trainees

“It was a beneficial experience to conduct research by special observation, analysis techniques and expertise.” (trainee from a company)

“I learned from failures during the training program how to conduct research to complete the project.” (trainee from a university)

“I learned principles and theories during the training program, which helped me improve the quality and broaden the range of my work.” (trainee from a public research institution)

Labor Practices

Occupational Safety and Health

Our priority is the safety and health of our employees.

AIST has an Environmental Safety Charter in place to create a work environment in which all people working here can do so in a safe and healthy manner. AIST is also working to improve the health and safety of its employees as a top priority.

Health and Safety Committee meetings and site meetings of AIST bases

A Health and Safety Committee meeting, which is attended by labor and management representatives, is held at each AIST base every month to discuss health and safety issues.
At the monthly meetings of the AIST bases, representatives from each AIST base discuss the results of the discussions at the Health and Safety Committee meetings, along with other safety and health issues. The results of the meeting of AIST bases are communicated to all employees through department meetings.

Establishing the safety guidelines

AIST has safety guidelines in place that set forth a code of conduct to ensure safety in handling hazardous chemicals, high-pressure gas containers, and in performing experiments.
The guidelines provide the basis for employee safety education and for laboratory work and are revised once every year. Changes have been made to the guidelines: in November 2014, specified chemical substances that were added in the revised Ordinance on Prevention of Dangers Due to Specified Chemical Substances (which became effective in November 2014) were incorporated into the appendix table in the guidelines. Moreover, a list of applicable equipment was added to the Confirmation Form for Safety Management at the Time of Selection and Reception to prevent failure to submit a notification of installation of equipment requiring approval and notification under law.

Emergency response management

We run disaster and fire-fighting drills so that we can take prompt action to minimize damage in the event of emergencies such as disasters or accidents.
To ensure a means of communication with the regional research bases in the event of a disaster, we also conduct communication drills by using a radiotelephone system for disaster management; this system is installed in all research bases of AIST.
In FY 2014, using the Earthquake Early Warning reception system, all bases participated in an Earthquake Early Warning drill conducted by the Meteorological Agency on Tsunami Disaster Prevention Day, November 5, 2014. On the same day, a disaster drill was conducted at AIST Tsukuba with the participation of all AIST sites.
To prepare for disasters such as earthquakes, we have a stockpile of food and emergency items and rescue supplies; we check, review, and replace them on a regular basis.

Scene from a fire-fighting drill

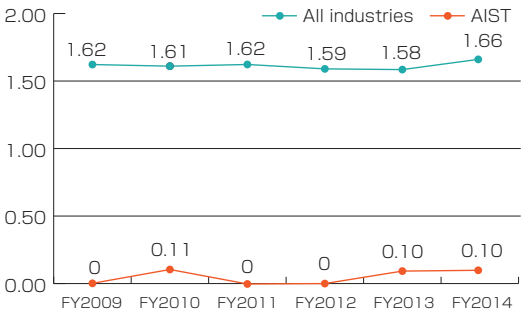
Prevention of accidents and their recurrence

In the event of a work-related accident, investigations and analyses are conducted to determine the cause of the accident. The relevant work is put on hold until recurrence-prevention measures are taken, and information on the accident is communicated to all employees, etc. to prevent similar accidents.

AIST holds a Safety Management Report meeting every morning. At this meeting, AIST connects 13 research bases across the country through the teleconferencing system to exchange information on accidents at the regional research bases, AIST Tsukuba, and other sites, including near-miss incidents and health issues; the aim is to share details of recurrence-prevention measures and thus improve employee health and safety.

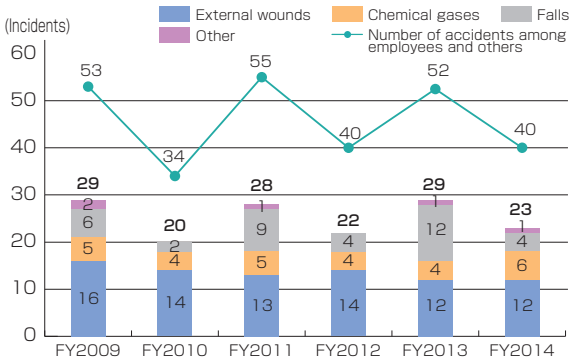
We kept the total number of accidents in FY 2014 in AIST, as well as the number of accidents resulting in injury associated with laboratory work, at low levels. The number of falls not associated with laboratory work decreased from FY 2013 to FY 2014; this indicated the effectiveness of the recurrence-prevention measures put in place in FY 2013, including the installation of night lights along on- and off-site sidewalks and the elimination of height differences between the sidewalk and the road.

Incidence of accidents resulting in absences from work



Incidence of accidents resulting in absence from work
Indicates accident incidence expressed as the number of casualties from industrial accidents per one million cumulative work hours.
Incidence of accidents resulting in absence from work = number of casualties from industrial accidents / number of cumulative work hours × 1,000,000

Year-to-year changes in the number of accidents and injuries among employees and others



Safety education and support for license acquisition

AIST provides a variety of safety education programs and workshops for accident prevention to all levels of employees, including new employees and those accepted to work at AIST.

Safety education provided when employees are hired and when there is a change in work content is managed by an internal safety education management system, allowing participation history and program contents to be checked. To broaden learning opportunities, an e-learning system is used in part of safety education and training for life science experiments.

In FY 2014, AIST made it compulsory for a general safety workshop on instructions for the use of hazardous chemicals and high-pressure gases to be held and for all users of hazardous chemicals and high-pressure gases to attend the workshop every 3 years. Moreover, those responsible for hazardous chemicals in quantities exceeding a given amount, and any other relevant persons, must obtain a hazardous materials handlers' license. In this way, we are committed to improving safety management in our laboratories.

Also, we actively support employees in acquiring licenses. For example, we hold a course on skills required for a Health Officer's License and a course on skills required for a Chief Technician's License for Using Organic Solvents.

Main education and training programs and workshops held in FY 2014

Program	No. of sessions held	No. of participants
Course on skills required for a Health Officer's License	2	49
Course on skills required for a Chief Technician's License for Using Organic Solvents	2	96
Course on skills required for a Chief Technician's License for Using Specified Chemical Substances	2	82
Course on the safe use of chemicals and high-pressure gases	10	666
General safety workshop (for all those responsible for hazardous chemicals and high-pressure gases, and other relevant persons)	4	1,126
Education and training for recombinant DNA experiments (e-learning participants)	1	989
Education and training for animal experiments (e-learning participants)	1	414
Education and training on human ethics	1	490
Course on safe driving	16	1,884
Joint radiation education and training [for radiation workers]	3	315
X-Ray education and training [for new users of X-ray-equipment]	72	227
Course on compliance with laws and regulations on radioactive materials [for managers]	1	44

Hiring Fixed-term Regional Employees by Open Recruitment at AIST

The work conducted by AIST's headquarters and operational organizations includes routine work, such as purchasing, asset management, and employee benefit management, which can be done more effectively if highly experienced employees are responsibly engaged in the work for an extended period of time.

Skilled contractors and temporary employees who have been with AIST for a certain period of time are recruited and hired by AIST as fixed-term regional employees (i.e. administrative staff who are not transferred from one region to another). AIST hired 19 of them in total between 2012 and 2015. These employees are working in the head office and operational organizations of AIST Tsukuba.

Fixed-term regional employees can work for up to 3 years. However, their work performance is comprehensively evaluated during their employment and they have the chance to be hired as non-fixed-term employees. This year, two of those who were hired in FY 2012 were rehired as non-fixed-term employees.

AIST will continue to hire fixed-term regional employees as staff to support our research and development and other activities.

Number of persons newly employed each year

Year	Number of persons employed
2012	2
2013	5
2014	5
2015	7

Support for Work–life Balance

Combining work with nursing care and child-raising

AIST is working to develop a work environment that makes it possible to manage work and childcare or nursing-care responsibilities. We have a number of support programs in place. The tables below show the numbers of employees who used the leave programs and child daycare services.

As a measure to support childcare, child daycare facilities where those who work in AIST can temporarily leave their child are available at three research bases (AIST Tsukuba, Chubu, and Kansai). Private childcare and babysitting services that are under contract with AIST are available for those who work at research bases with no child care facilities.

In supporting nursing-care, we hold work–life balance seminars to provide information on managing work and nursing-care responsibilities and reducing anxiety about any nursing-care responsibilities that may arise. In FY 2014, we held seminars in which external experts delivered information on remote nursing-care and AIST researchers gave details of nursing-care support technology. Many employees participated in the seminars. A questionnaire survey of the seminar participants showed that fewer than 60% of them had been aware of nursing-care leave, indicating that there is still room for raising awareness of this type of leave. Awareness of the leave program still

Seminar on work life balance

Numbers of people who used various leave programs

	FY2012		FY2013		FY2014	
	Male	Female	Male	Female	Male	Female
Sick Child Care Leave	90	159	86	167	101	178
Special Child-care Leave	28	16	27	11	28	13
Extended Child-care Leave*	0	25	0	35	1	26
Nursing Care Leave	44	9	34	17	39	25
Extended Nursing Care Leave*	0	1	1	0	0	0

* Number of employees who started their leave within the fiscal year

Numbers of employees who used child daycare services (totals)

	FY2012		FY2013		FY2014	
	Permanent employees	Contract employees	Permanent employees	Contract employees	Permanent employees	Contract employees
AIST Tsukuba	795	876	1,018	678	1,276	971
AIST Chubu	11	68	37	66	26	88
AIST Kansai	283	45	175	87	248	115
Private child daycare facilities and babysitters	12	3	20	3	32	0

needs to be raised among employees.
Information on childcare and nursing-care services is available on the Intranet sites “Childcare Square” and “Nursing-Care Square,” which provide information on the relevant programs.
AIST has a flex-time system and a discretionary-work system in place to allow flexible work arrangements; 35% of employees use the flex-time system and 50% of them use the discretionary-work system. These work systems are applied to many employees and support work–life balance, regardless of whether staff have childcare or nursing-care responsibilities.

Action Plan to Support the Development of Next-Generation Human Resources

As part of the 3rd Action Plan to Support the Development of Next-Generation Human Resources (plan period: June 26, 2014 to March 31, 2017), we set three goals for activities to raise awareness of the work–life balance support programs that have been put in place.
As a result of the 1st and 2nd Action Plans, AIST was recognized as a “Childcare Support Organization” by the Minister of Health, Labour, and Welfare and was awarded the next-generation support certification logo Kurumin. We have started using the symbol mark Tomonin, the purpose of which is to promote the development of a work environment that makes it possible to manage work and nursing-care responsibilities. The use of this mark is promoted by the Ministry of Health, Labour, and Welfare.

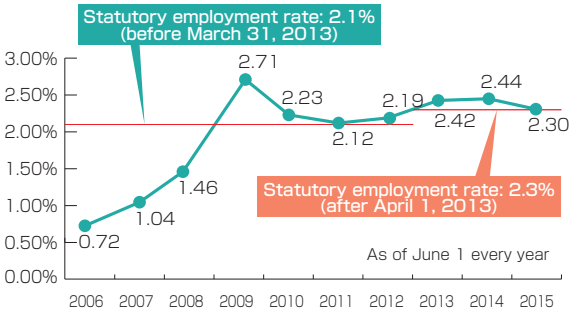
We support childcare: 2014 recognized organization: *Kurumin*

Supporting the management of work and nursing-care responsibilities: *Tomonin*

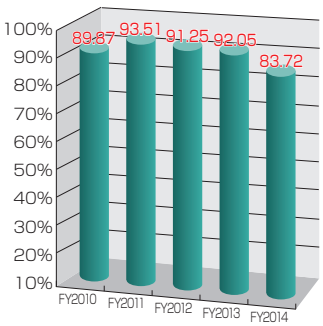
Efforts to Hire People with Disabilities

AIST actively hires people with disabilities. In April 2013, the statutory employment rate for people with disabilities was increased to 2.3%. We hired people with disabilities at every opportunity and achieved the statutory employment rate. (The disability employment rate as of June 1, 2015 was 2.3%.)
We create a work environment that helps the physically challenged work with ease and provides support for them in cooperation with each region’s Support Center for People with Disabilities. Thus, we aim to increase the percentage of physically challenged people who are taken on as employees and remain at work. (This percentage was 83.72% in FY 2014.)

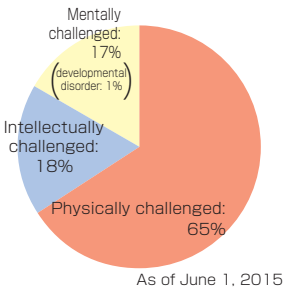
Change in employment rates for people with disabilities



Percentage of people with disabilities remaining at work



Employment rates by disability type



As of June 1, 2015

Activities of intellectually or developmentally challenged teams

AIST Tsukuba

The AIST Tsukuba Challenged Team consists of 10 members and assists with clerical work and development of the work environment.

In response to an organizational change, the team helped move equipment and furniture and shredded discarded documents at the request of offices and laboratories at the center.

Team members are doing well with their regular recycling and cleaning work and are helping to create a comfortable work environment.

AIST Chubu

The AIST Chubu Challenged Team consists of three members and one instructor and performs tasks such as weeding the site, cleaning meeting rooms, setting up meeting rooms, and collecting and sorting waste generated at the center.

In addition, they have started making envelopes using recycled maps—an activity that is already being done by the AIST Tsukuba Challenged Team. The envelopes are used at the center and were handed out to the public at our open day.

AIST Kansai

The AIST Kansai Challenged Team consists of three members and works to improve the landscape at the center's site. They perform mainly outdoor work such as cutting grass and collecting fallen leaves.

On rainy days and extremely hot days they are assigned tasks such as indoor cleaning. Starting in FY 2015, they have begun working in a planned way; this planning, for example, allows them to clean the carpet in a meeting room and a building entrance in turn with a high-pressure water cleaner.

Health management and mental health

General and special medical examinations are performed in spring and autumn every year. We strive to increase the percentage of employees who undergo medical examinations by raising awareness that they are required to take these examinations, including health screening. As follow-up care after medical examinations, an industrial physician and health care staff provide health advice. We provide support to improve the performance of individual employees and AIST as a whole by detecting and preventing employees' health disorders and illnesses in their early stages.

To address mental health issues, we have developed a unified Mental Fitness Program in accordance with the directives and guidelines of the Ministry of Health, Labour, and Welfare. Four programs based on the Mental Fitness Program are implemented in a continuous and planned way. They focus on (1) self-care; (2) line care through implementation of education and training and seminars; (3) care by workplace industrial health staff and others through face-to-face counseling with an industrial physician and health care staff and support in returning to work; and (4) care by external resources through the use of external mental health organizations.

Numbers and percentages of permanent and contract employees who underwent periodic medical examinations (including health screening), 2010–2014

Top: percentage of examinees. Bottom: no. of examinees/ total no. of eligible employees

Year	2010	2011	2012	2013	2014
① Employees (excluding ②) ※1	97.5%	98.1%	98.4%	99.9%	99.9%
	2940／3016	2934／2990	2937／2986	2990／2993	2965／2966
② Contract employees ※2	88.1%	88.3%	88.8%	99.9%	100.0%
	2095／2379	2081／2357	2072／2330	2136／2139	2252／2252

※1 : Excluding those on extended childcare leave and sick leave and those on long leave due to overseas relocation
※2 : Medical insurance policyholders only

Numbers of permanent and contract employees (including temporary employees) who underwent special medical examinations in FY 2013–2014

Top: no. of examinees/ total no. of applicable employees in spring. Bottom: no. of examinees/ total no. of applicable employees in autumn

Special medical examination		2013 Permanent employee	2013 Contract employee	2013 Total	2014 Permanent employee	2014 Contract employee	2014 Total
Medical examination for organic solvent poisoning prevention	Spring	709／709	614／614	1323／1323	704／704	680／680	1384／1384
	Autumn	737／737	694／694	1431／1431	714／714	731／731	1445／1445
Medical examination for specified-chemical poisoning	Spring	318／318	164／164	482／482	321／321	237／237	558／558
	Autumn	335／335	202／202	537／537	325／325	262／262	587／587
Medical examination for ionizing radiation exposure	Spring	341／341	115／115	456／456	311／311	115／115	426／426
	Autumn	343／343	110／110	453／453	314／314	120／120	434／434
Medical examination for lead poisoning	Spring	10／10	4／4	14／14	8／8	8／8	16／16
	Autumn	10／10	5／5	15／15	7／7	6／6	13／13
Medical examination for laser injury	Spring	159／159	51／51	210／210	179／179	68／68	247／247
	Autumn	67／67	32／32	99／99	49／49	18／18	67／67
Medical examination for pneumoconiosis	Spring	18／18	13／13	31／31	6／6	13／13	19／19
	Autumn	15／15	14／14	29／29	1／1	0／0	1／1
Medical examination for asbestos exposure	Spring	6／6	2／2	8／8	5／5	3／3	8／8
	Autumn	6／6	3／3	9／9	6／6	3／3	9／9

Numbers of employees with significant findings1 from AIST's medical examinations, and numbers of employees who received face-to-face counseling

① Number of employees with significant findings, and their percentages of the total

Year		2010	2011	2012	2013		2014
With significant findings(Rated C)	No. of employees	780	753	816	785	With significant findings(D-diagnosed)	423
	Percentage of employees	18.1%	17.8%	18.5%	15.3%		8.1%
With significant findings(Rated D)	No. of employees	391	356	481	483	With significant findings(E-diagnosed)	598
	Percentage of employees	9.1%	8.4%	10.9%	9.4%		11.5%

※1Numbers of C- and D-rated persons cover the period 2010–2013. Numbers of D- and E-diagnosed persons cover FY 2014 only.

② Numbers of employees who received counseling, and their percentages to employees with significant findings

Year		2010	2011	2012	2013		2014
With significant findings(Rated C)	No. of employees who received counseling	664	660	775	712	With significant findings(D-diagnosed)	350
	Percentage of employees who received counseling	85.1%	87.6%	95.0%	90.7%		82.7%
With significant findings(Rated D)	No. of employees who received counseling	317	309	473	470	With significant findings(E-diagnosed)	569
	Percentage of employees who received counseling	81.1%	86.8%	98.3%	97.3%		95.2%

Definition of criteria:
- FY 2010–2013
  A: within normal range; B: follow-up examination required; C: detailed examination required; D: treatment required
- In FY 2014
  A: no anomalies; B:more than minor findings but no interference with daily life; C: follow-up examination required; D: health advice required; E: treatment required; F: counseling required (applicable only to special medical examinations)

Face-to-face counseling with an industrial physician, and health consultation

FY 2014

		Tsukuba	Hokkaido	Tohoku	Chubu	Kansai	Shikoku	Chugoku	Kyushu	Tokyo	Tokyo Waterfront	Fukushima
Industrial physician	Body	1223	289	52	96	153	48	17	12	84	42	52
	Mental	483	5	21	69	86	1	3	13	0	78	11
Industrial health staff		724	833	29	525	841	80	65	198	78	98	143
Total		2430	1127	132	690	1080	129	85	223	162	218	206

Flu shots (at AIST)

Year		2010	2011	2012	2013	2014
AIST Tsukuba/ Tokyo	Permanent employees		706	947	994	1025
	Contract employees		534	759	788	812
	Total	968	1240	1706	1782	1837
Regional research bases	Permanent employees		246	273	271	288
	Contract employees		252	229	261	267
	Total	432	498	502	532	555
Grand total	Permanent employees		952	1220	1265	1313
	Contract employees		786	988	1049	1079
	Total	1400	1738	2208	2314	2392

Other activities

Year	2010	2011	2012	2013	2014
Refreshing exercise	461	281	167	291	304
Emergency first-aid workshop	115	141	148	145	175
Seminar	0	82	10	93	64
Workshop (training)	187	242	179	252	162

Fair Operating Practices

Conflict-of-interest Management

An important mission of AIST is to promote industry-academia-government collaboration and disseminate the results of that collaboration. If an executive or staff derives personal gain from industry-academia-government collaboration, he or she needs to properly manage any situation in which there is a conflict of interest between his/her personal gain and the research duties and responsibilities required by his/her role as an executive or staff of AIST as a public research institution.

AIST has formulated rules to implement conflict-of-interest management and applies this management to such cases.

In FY 2014, AIST conducted a Periodic Conflict-of-Interest Self-Report Survey of executives or staff and the like twice (in August in the first half of the fiscal year and in March in the second half). All of those surveyed (3057 in the first half and 3080 in the second half) reported conflicts of interest. Eight of them were considered to have possible conflicts of interest and were interviewed by an external conflict-of-interest counselor.

Information Security

AIST provides information security training to all users of our information network on a continuous basis, so that they can improve their understanding of the rules on information security of AIST, procedure for implementation information security of AIST, and the guide to the implementation of information securityand can use the information network properly with awareness of their responsibilities.

Information security training

AIST requires all the employees to take information security training every year, to implement and improve information security awareness. We also require new employees to take the training before they start using the network.

Implementation status of self-inspection

Self-inspections are as important as training to ensure AIST's information security. We implement self-inspection for information security and for the protection of personal information in a unified manner. In FY 2014, through the electronic information administrator, we had all eligible employees conduct a self-inspection within a specified time period to further increase their awareness of information security, including the handling of personal information.

Implementation of an information security audit

AIST conducts an information security audit of research units to objectively evaluate whether information and the information security system are properly used, managed, and operated. In FY 2014, in order to enhance the information security of AIST as a whole, we conducted information security audits of 18 research units and information security follow-up audits of 17 research units. The follow-up audits ensure improvements to the issues identified in the previous year. We plan to continue the information security audits and information security follow-up audits.

Numbers of units audited

Year	2011	2012	2013	2014
Units subjected to audit	31	24	24	18
Units subjected to follow-up audit	3	20	9	17

Implementation of Security Export Control

The security export control is an important effort in maintaining peace and security in the international community. In Japan, in addition to the regulations on weapons trade itself, the export of goods and transfer of technologies that may be used for the development and manufacture of weapons are regulated according to the “Foreign Exchange and Foreign Trade Act” to prevent the proliferation of weapons of mass destruction and excessive accumulation of conventional weapons. Therefore, companies and institutions that may develop relationships with overseas companies and institutions must have tight export control.

In FY 2004, AIST formulated Rules for the Security Export Control and gave notification of them under the title “Internal Compliance Program” to the Ministry of Economy, Trade and Industry. In accordance with these rules we have tight security export controls in place. Security Export Control activities include: (1) communicating the latest information on export control within AIST; (2) export control training for AIST staff; (3) export control instruction to individual staff members; (4) classification and transaction screening; and (5) conducting internal audits.

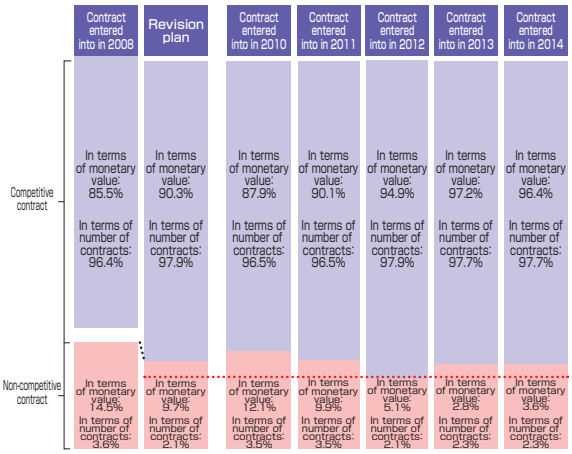
In recent years, with the increase in collaborative research with overseas research institutes and universities, there has been an increase in the importance of raising awareness of security export control among employees. As a result, security export control is in place and individual employees are now fully aware of security export control.

AIST will continue to promote further implementation of security export control in the future to maintain peace and safety as a member of the international community.

Training in export control within AIST

Proper Implementation of Procurement Processes

AIST enters into contracts based on general competitive bids, competitive proposals, or public tenders, except in the case of truly unavoidable negotiated contracts. In April 2008, as part of a review of negotiated contracts in accordance with the Plans for Streamlining Independent Administrative Institutions, we changed our base amount for maximum negotiated contract–based procurements to make it the same as the government's. In April 2010, we formulated a new Plan for the Revision of Negotiated Contracts based on this 2008 amount. As a result, in FY 2014, non-competitive negotiated contracts exceeding the base amount accounted for 3.6% of all contracts entered into in terms of monetary value and 2.3% in terms of the number of contracts. The projected target in the Plan for the Revision of Negotiated Contracts was achieved in terms of monetary value but exceeded in terms of the number of contracts. One of the reasons for this is the fact that, in FY 2014, radioisotope waste was generated and this waste was required by law to be disposed of at a waste disposal facility.



※ The Plan for the Revision of Negotiated Contract was checked and reviewed in relation to contracts entered into in 2008. It was made public in April 2010.

Test for Procuring Services from the Market

In accordance with the Cabinet Decision on the "Principle of Public Service Reform, etc." (July 15, 2011), the Consortium for Facility Maintenance and Other Services at AIST Tsukuba provided eight services, including facility maintenance, which were to be provided at AIST for the 3 years from FY 2012 to FY 2014.

To introduce competition in FY 2015 and into the future, these eight services, which had been integrated into one group, were reviewed and reintegrated into a few groups. A service contract in which the services will be provided over a 3-year period from FY 2015 to FY 2017 was entered into by the end of March 2015. The main results of the services in the latest 3-year period are as follows:

Maintenance and improvement of the quality of services, and cost cuts

Improvement of service quality
- Clarification of instructions and orders centered on general management work
- Understanding each other's work (holding a work report meeting and providing periodic group training)

Cost cuts
- A reduction of 168,889,000 yen on average over 3 years of implementation (excluding additional work such as general management work)

Maintenance of service quality
- A comfortable facility environment was still maintained.

Average satisfaction rates in a questionnaire survey of facility users:

Operation and management of the Research Collaboration Center (Sakura Kan)
96% (recommended minimum approval rate 90%)

Operation and management of the Research Collaboration Center (Keyaki Kan)
98% (recommended minimum approval rate 85%)

Maintenance of Science Square Tsukuba
95% (recommended minimum approval rate 90%)

Operation and management of the Geological Museum
96% (recommended minimum approval rate 90%)

Community Involvement

Science Square Tsukuba (City of Tsukuba, Ibaraki Prefecture)

After being renovated, the permanent exhibits were reopened to the public in spring 2015. The results of extensive research and development are on display. The Innovation Zone, which is the core exhibit zone, is divided into three subzones: Life technology, Green technology, and Manufacturing. The exhibits in each subzone are displayed in an easy-to-understand manner to show how various fields of science and technology serve our society. Video and touch-panel presentations and infrared-based audio guidance are available.
The Square had 32,721 visitors in FY 2014.

- Closed: Monday (or the following day if Monday is a holiday) and year-end and New Year holidays (Dec./28 to Jan./4)
- Hours: 9:30 a.m. to 5:00 p.m.
- Inquiries should be directed to the Public Relations Office, Planning Headquarters.
  TEL: 029-862-6215
  FAX: 029-862-6212
  Mail: sst-ml@aist.go.jp
  http://www.aist.go.jp/sst/en/



Geological Museum (City of Tsukuba, Ibaraki Prefecture)

This is a globally unique museum that is dedicated to earth science. A number of geological samples, as well as the history of Earth and the mechanisms of Earth's movements and their relationship to humans, are displayed in an easy-to-understand manner. Special exhibitions on the latest geological research are displayed and participatory events are held. The museum had 36,969 visitors in FY 2014.

- Closed: Monday (or the following weekday if Monday is a holiday) and year-end and New Year holidays (Dec./28 to Jan./4)
- Hours: 9:30 a.m. to 4:30 p.m.
- Inquiries should be directed to the Administrative Office, Geological Museum.
  TEL: 029-861-3750
  FAX: 029-861-3746
  http://www.gsj.jp/Muse/




AIST Chubu Open Lab

AIST Chubu held an Open Lab (research presentations, a poster session, and a lab tour) on June 23 and 24, 2015, with a total of 326 participants.

In the morning on both days, research presentations and a poster session were given to present the latest results of research at AIST Chubu. In the afternoon, a lab tour was conducted to give the participants—most of whom were from companies, universities, and public institutions—an opportunity to visit the laboratories and talk to researchers. 139 people attended the tour and learned about research developments.

Voices of participants

"The explanations were clear and easy to understand."

"The event gave me a good opportunity to see demonstrations and to visit laboratories."

Lab tour

Research presentation

Poster session

Club activities at AIST

Arts circle "Jazz Players Club"

The Jazz Players Club was formed in 2005. The big jazz band has about 20 members, including saxophone, trumpet, trombone, drum, and piano players; there's also a combo and a small ensemble. The club itself has about 30 members, including AIST staff and others who have ties to AIST. Members with different backgrounds, including those who have just started to play an instrument, those who have picked up an instrument again after many years, and those who actively play an instrument, enjoy playing music in a friendly atmosphere.

Club members perform on stage mainly at the open house at AIST Tsukuba and at AIST's Cultural Fest. They also perform at various events, such as barbecues, farewell parties for retiring AIST employees, and neighborhood summer festivals, and they perform at the request of the Ibaraki Prefectural Office and Tsukuba City Hall.

Voices of people attending the public open day

"I had lots of fun. Most of all, the jazz performance by AIST employees was fantastic."

Jazz at the open house at AIST Tsukuba

Neighborhood summer festival performance

Human Rights

Respect for Basic Human Rights

A wide variety of people work at AIST, including executives, permanent employees, contract employees, temporary employees, visiting researchers, technical trainees, contractors, visitors participating in industry–academia–government collaborative programs, and visitors participating in international collaborative programs. We work with the awareness that it is important to have an attitude of respect for each other, regardless of title or position.

From the "Compliance Guideline"

Paragraph 1: Respect for human rights
– We respect human rights. We do not say or act in any way that ignores human rights.
1. We respect basic human rights. We do not discriminate against people on the basis of race, nationality, age, sex, religion, belief, or social status.
2. We do not say or act in any way that ignores human rights, including by harassment.

Respect for Human Rights in Research Activities

Research involving human subjects and ergonomic experiments, such as measurement of human characteristics, is conducted at AIST
32 new research projects and 172 ongoing research projects were conducted in FY 2014.
Before an experiment, the Ergonomic Experiment Committee, which includes 6 external members, reviews and approves experimental protocols in accordance with the Declaration of Helsinki to ensure the safety and scientific validity of experiments. Thus, experiments are conducted in an appropriate manner.
In practice, an oral and written explanation of the details of the experiment and of the right to revoke consent is given to the experimental participants. In this way their human rights and dignity are respected.

Harassment Prevention

Harassment hurts the dignity of the person being harassed and causes emotional distress and disadvantage. Conversely, if a person who conducted an act of harassment with no intention to do so is held responsible for that act, he/she may suffer from adverse health effects. The presence of harassment may lead to deterioration in the work environment, reduced motivation to work, and adverse effects on the results of research. AIST has internal rules in place and provides training to make the workplace free of harassment.

Harassment prevention measures

- AIST has in place rules for handling workplace harassment (excluding sexual harassment) and sexual harassment and has defined procedures for the prevention of harassment.

- AIST provides employees and managers, and counselors placed in the sites, with training on how to prevent harassment and provide counseling for harassment victims.

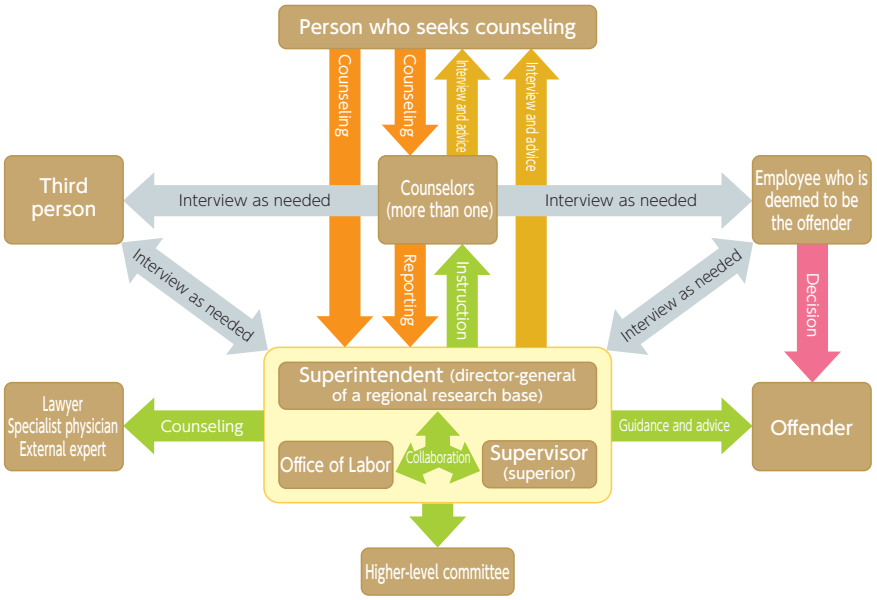
Counseling system

Each site has workplace harassment counselors and sexual harassment counselors; half of all the counselors are women. The counselors work to counsel, investigate, and mediate so that harassment victims are not distressed as a result of their experience. If the line of management or a counselor cannot address a harassment issue, a higher-level committee reviews the issue and recommends the appropriate actions, which are then taken.

In addition, we create an environment that helps harassment victims to seek counseling. We also provide email and telephone counseling by industrial physicians or external organizations to protect people's privacy.

Training programs provided on harassment in FY 2014

Training program	Trainees	Objectives	Number of trainees in FY2014
New Employee Training	New AIST employees	As part of training in the attitudes, basic knowledge, and skills required to perform their work, participants learn the basics of harassment issues and harassment prevention.	94
e-learning training	Permanent employees, contract employees	As part of their learning of the basic organizational ethics and rules of AIST, participants learn the basics of harassment issues and harassment prevention.	5,388
Basic Training for Foreign and Contract Employees	Foreign and contract employees who do not understand the Japanese language	Provision in English of training in the basics of harassment issues and harassment prevention.	43
Young Researchers' Training in Skills for Conducting Research	Young researchers in fixed-term employment who have been with AIST for 5 years, and young researchers who have passed an employment examination and have been with AIST for 8 years	As part of the training of young researchers transitioning to become mid-career researchers, participants learn skills in advanced research, along with the basics of harassment issues and harassment prevention. This deepens their understanding of how to interact with everyone at AIST.	57
Group Leader Training	Newly appointed group leaders (including group leaders who have not taken this training)	As part of their training in basic management knowledge and skills, newly appointed group leaders learn the basics of harassment issues and harassment prevention.	42
Manager/acting manager training	Newly appointed managers, acting managers, senior planning managers, and the like (including managers and the like who are yet to take this training)	As part of their learning of basic management knowledge and skills, newly appointed managers and the like learn the basics of harassment issues and harassment prevention.	28
Harassment Counselor and Sexual Harassment Counselor Training	Harassment counselors and sexual harassment counselors	Participants learn the harassment prevention knowledge and skills required by counselors. These include face-to-face counseling techniques based on lectures and role-play sessions.	37



Flow of the counseling process

- Those who seek counseling can include people other than the employees involved (i.e. they can be the employee who is deemed to be the offender, the employee who is deemed to be the victim, or someone else, such as a colleague or supervisor).
- Counseling can be sought by means of a face-to-face meeting, telephone, email, writing (a letter), or fax.
- Seeking counseling causes no disadvantage.
- Adequate consideration is given to the protection of privacy, and any information acquired in the course of counseling is kept strictly confidential.

Diversity Promotion Education and Activities

Diversity is essential for creative research activities. Aiming to create a work environment that makes the most of the values and ideas associated with the diverse attributes of employees, such as gender, age, and nationality, AIST has set the following six action plans and has been taking various measures to implement them: 1. providing education to increase diversity awareness and disseminate that awareness; 2. proactively hiring female and foreign researchers and making the most of their abilities; 3. taking measures to ensure gender equality in career development support; 4. supporting work–life balance; 5. collaborating with the government, municipalities, and other research and educational institutions; and 6. promoting diversity in an integrated manner.

With the goal of increasing the percentage of female researchers employed in the 3rd medium-term target period (FY 2010 to FY 2014) to more than 15%, AIST ran a recruiting campaign through job expos and job placement magazines to increase the number of applicants and thus strove to discover and hire talented researchers. As a result, the percentage of female researchers hired between FY 2010 and FY 2014 reached 16.7% (as of the end of March 2015). We are striving to increase the percentage of female employees in management positions to 5%; the value was 2.8% as of April 2014.

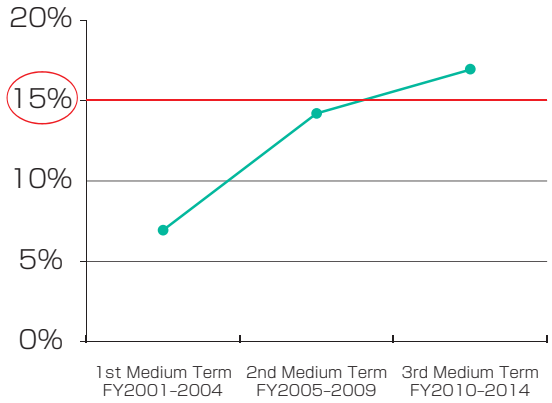
At the 29th Annual Academic Conference of the Japan Society for Research Policy and Innovation Management, in October 2014, we gave a presentation on our activities, support programs, and other issues, titled “AIST’s Support for Work–Life Balance in the 3rd Period.”

We conduct employee seminars and training sessions to raise and disseminate awareness of diversity. On February 10, 2015, at AIST Tsukuba, we held a presentation by Michiko Fukuda, Director of AIST’s Glycoscience and Glycotechnology Research Center, titled “Discussion with a Role Model: Michiko Fukuda, Director of the Glycomedicine Technology Research Center, in Light of Experience in the US.” Female researchers in different fields were invited to participate in a discussion held after the presentation. The invited researchers sat around the presenter, and she answered their questions and told them about her own experience.

Activities to “Promote Diversity in AIST” were featured in the March 2015 issue of “AIST TODAY.”

To enhance cooperation with Japan’s educational institutions and further promote diversity, as part of the administrative function of the Diversity Support Office (DSO), AIST holds information-exchange meetings and issues a newsletter. In FY 2014, the DSO became a network organization based on equal partnership. AIST serves as the chair organization.

Percentage of female researchers hired in each medium-term (as of March 31, 2015)



Supporting Foreign Researchers

As part of the development of a work environment for foreign researchers at AIST, we created English versions of the evacuation map and the employment contract for foreign employees. We revised the English versions of the AIST Administrative Procedures for Employment, the Safe Driving Workshop Handouts, and the Compliance Self-check List.

With the goal of supporting talented foreign researchers in their research, in FY 2014 we tentatively started providing administrative staff to the foreign leaders of research groups and teams who needed support, with the aim of reducing their language-related managerial workloads. This support program is valued highly by the foreign research group leaders and by individuals in the research units within the groups.

Opening of AIST's International Center after changing its location

AIST International Center (AIC) was relocated from Sakura-kan in the westernmost part of AIST Tsukuba to the central part. In this easily accessible central region it will be possible to integrate foreign researcher support activities toward the 4th period, address the needs of these researchers, and increase the convenience of accessing AIC.

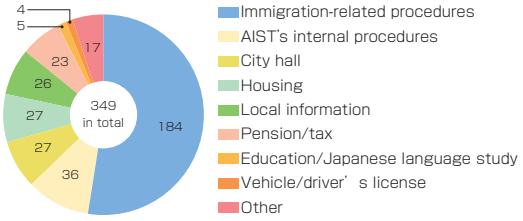
AIC provides foreign researchers with guidance, consultation, and help, in English, in relation to living and staying in Japan. AIC staff members, who are qualified as immigration application agents, file applications on behalf of foreign researchers to the Mito Branch Office of the Tokyo Regional Immigration Bureau. This is the most requested service. In FY 2014, we filed 52 applications for extension of period of stay and for change of status of residence.

The AIC Japanese language course is the second most popular service. In FY 2014, a total of 44 researchers took the class. Busy foreign researchers can go back to their work in the laboratory after taking a Japanese class within AIST; this is very beneficial to them.

In addition, in the new AIC office, there is a meeting space where foreigners can read the *Japan Times* and share information. This allows us to provide integrated support, from support within living and staying in Japan to support in learning the language.

Meeting space in the new AIC office

Breakdown of consultations in FY 2014



A word from one foreign researcher

Congratulations on AIC's relocation! More than anything else, foreign researchers, who have little knowledge of, or information on, Japan, need the basics of secure living so that they can adapt to life at AIST as soon as possible. Particularly, those who start life in an unfamiliar country with their families have to collect information on everything from housing and living essentials to the educational environment for their children. Making use of my experience in working as a postdoctoral researcher in a foreign country before coming to Japan, before I arrived I first researched where AIST's International Center was located and what support was available. Although I have lived in Japan for 10 years now, I still ask AIC to help me with the procedures required to live here, such as visa renewal. When I came to Japan, AIC was some distance away from the central area of AIST Tsukuba. I had absolutely no knowledge of the Japanese language, but now I am able to read, write, and speak Japanese because I learned the language in AIC's Japanese language classes. Many books and DVDs about Japan are available at AIC. After my family arrived here, we borrowed books from AIC to learn about Japanese culture. It was a little inconvenient that AIC was not easily accessible. In FY 2014, AIC was relocated to the central area of AIST Tsukuba, with a cafeteria and a convenience store, making it readily accessible. It was more than just a move to an easy-to-reach location: the move was made out of consideration for AIST's foreign researchers. As a foreign researcher I'm very grateful for this heartfelt consideration.

Environmental Report

Environmental Policy

AIST promotes environment-friendly activities under the Charter of Environment and Safety.

To build a sustainable society, AIST has a Charter of Environment and Safety in place. Its aim is to bring the results of research and development to society, as well as to incorporate environmental considerations into the research and development process. Under the Charter of Environment and Safety, we have set an Environment and Safety Policy to proactively work with a keen awareness of the importance of ensuring global and local environmental conservation, and the health and safety of everyone working at AIST.

Charter of Environment and Safety

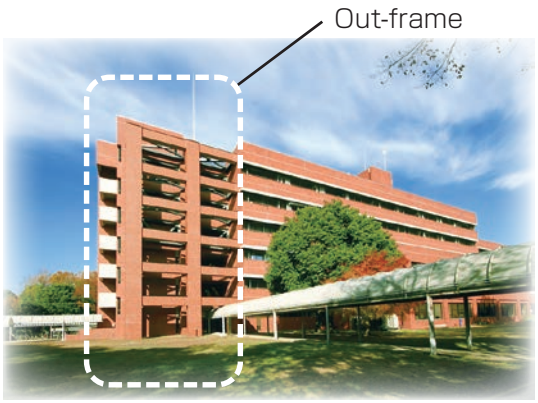
- We promote research that helps to conserve the global environment and human safety; we aim to realize a safe, secure, and high quality life and a society in harmony with the environment.
- We comply with laws and regulations on environment and safety, set our own standards such as guidelines, and seek to increase efforts in environmental conservation and promotion of health and safety on a daily basis.
- We actively disseminate information on environment and safety and seek to achieve harmony and integration with the local community. We take prompt and appropriate actions in the event of an accident or disaster and seek to pass on the lessons learned to society under the principle of disclosure.

Environment and Safety Policy

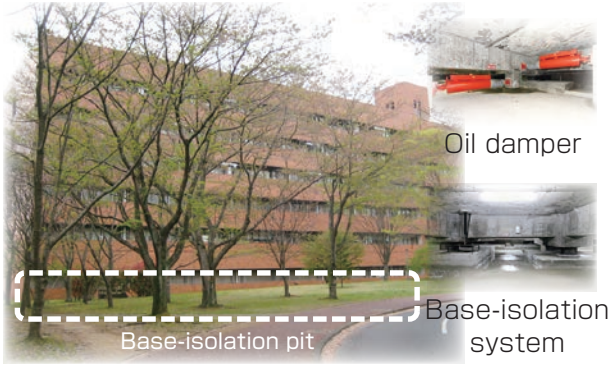
1. We proactively conduct research that contributes to conservation of the environment and the development of a healthy and safe society.
2. We comply with laws, regulations, ordinances, and agreements on the environment, health and safety, set our own management standards, and seek to further improve environmental conservation, health and safety.
3. We seek to reduce the consumption of energy and resources and the generation of waste, and thus aim to reduce loads on the environment.
4. We seek to prevent pollution and work-related accidents, to take prompt and appropriate actions in the event of an emergency, and to prevent the spread of damage.
5. We are developing a management system for effectively and efficiently conducting activities to ensure environmental conservation, health and safety with the participation of all members of AIST; we seek continuous improvement.
6. We actively disclose environmental, health and safety information by publishing environmental reports and disclosing information to promote communication with society.

Seismic retrofit to provide a safe environment

Because there are a number of buildings at AIST where hazardous and toxic contaminants are used, we need to ensure the safety and security of employees and minimize secondary hazards in the event of an earthquake. Based on testing of our buildings for seismic safety, AIST developed Seismic Retrofit Master Plan in FY 2008. Buildings at risk of collapse or a fall were retrofitted to improve seismic performance in accordance with the plan. We completed seismic retrofits of the main buildings at each site at the end of FY 2014.
Consideration was given to continuing research activities during the retrofit work, as well as to preserving the research environment and ensuring user convenience and harmony with the surrounding environment. To reduce environmental loads, consideration was also given to using eco-friendly building materials and extending building life.
To minimize environmental loads during the retrofit work, design and construction considerations for the temporary buildings included reducing, sorting and collecting, and recycling construction byproducts.

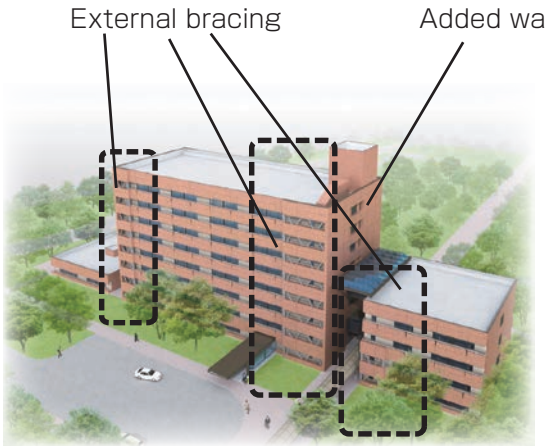


Out-frame construction method
(AIST Tsukuba West Building 1)



Base-isolation retrofit method
(AIST Tsukuba Central Building 5-1)

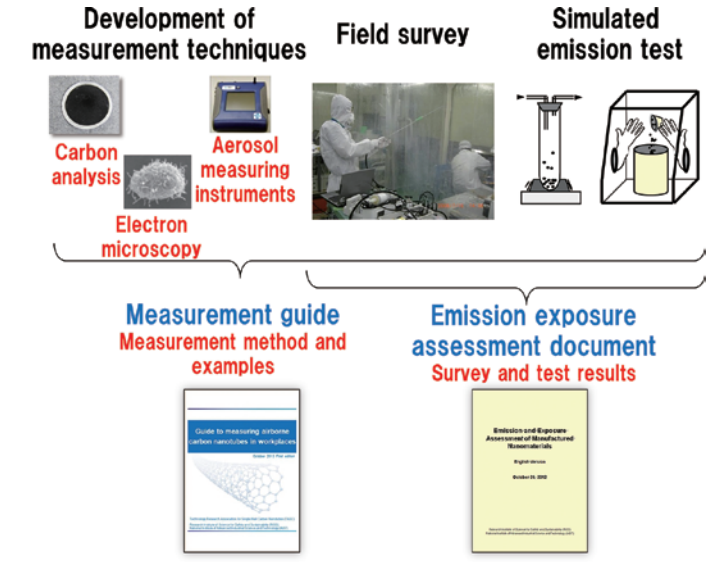
Toggle brace damper method
(AIST Tsukuba Central Building 5-2)



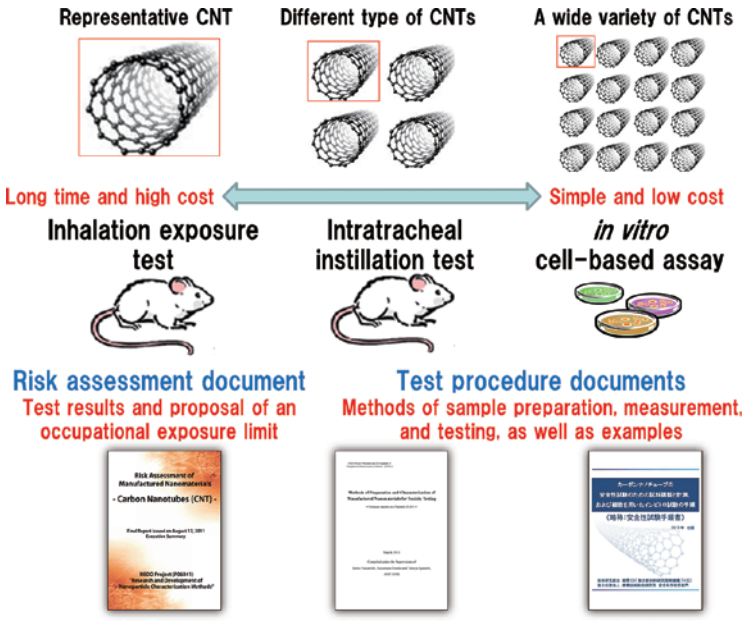
External bracing method
(AIST Tsukuba East Building 1)

Developing methods for assessing exposure and hazards of carbon nanotubes (CNTs)

Since CNTs are novel materials, their safety assessment and proper management are required. Research Institute of Science for Safety and Sustainability are engaged in developing methods for assessing the exposure and hazards of CNTs in projects commissioned by the New Energy and Industrial Technology Development Organization, focusing on the effects of CNT inhalation. For the exposure assessment of CNTs, we conduct field surveys and simulated emission tests, and develop techniques to measure released CNTs. For the hazard assessment of CNTs, we developed a framework of hazard tests: inhalation exposure tests, in which experimental animals are exposed to CNTs through inhalation, intratracheal instillation tests, in which CNTs dispersed in a liquid are directly administered into the experimental animal's trachea using a syringe etc., and in vitro cell-based assay. Based on the obtained results, a measurement guide, an emission and exposure assessment document, a risk assessment document, and test procedure documents have been published. We are providing information and technical consultations to support safety management by businesses.



Framework of exposure assessment



Framework of hazard tests

Environmental Targets and Results

AIST sets and reviews its targets for environmental sustainability and improves them for the following fiscal years.

Activity	FY 2013 results	FY 2014			FY 2015 target	Reference page
		Target	Results	Self-evaluation		
Reduction of CO_2 emissions	Average 4% reduction compared to FY2009 over 3 years from FY2012 to FY2014	Average 4% reduction compared to FY2009 over 3 years from FY2012 to FY2014	Average 3.8% reduction compared to FY2009 over 3 years from FY2012 to FY2014	△	Average 4% reduction compared to FY2014 over 3 years from FY2017 to FY2019	P52
Asbestos removal	Removed 12,898 m^2	Complete removal of remaining asbestos by FY2014	Removed 4,713 m^2 ; Plan completed	○	Remove asbestos in accordance with building closures and other plans	P55
Effective use of resources	Reused in 588 cases	Reuse of properties no longer in use: more than 600 cases (during Third Medium-Term Plan period)	Reused in 704 cases	◎	Reuse of properties no longer in use: more than 600 cases (during Third Medium-Term Plan period)	P57
Promotion of green procurement	100% procurement rate for 231 out of 232 items available	100% procurement rate for special procurement items	100% procurement rate for 234 out of 236 items available	○	100% procurement rate for designated procurement items	P50
Expansion of green contract	Signed contract for power supply with environmental threshold at AIST Hokkaido, Karima Site, AIST Chugoku, and AIST Shikoku	IIntroduce contract for industrial waste disposal with environmental threshold in 2014 or later	Signed contract for industrial waste disposal with environmental threshold at AIST Hokkaido, AIST Tsukuba, AIST Waterfront and AIST Kyushu	○	Sign contract for power supply and waste disposal with environmental threshold	P51

Self-evaluation:
◎ Target exceeded
○ Target achieved
△ Target almost achieved
× Target not achieved

Overview of Environmental Loads

AIST assesses environmental loads caused by its business to reduce those loads and to pay due care to the effect of its activities on the environment. The table below shows the amounts of energy, chemical substances, water used and released through AIST's business.

Environmental loads

Energies	Unit	FY2012	FY2013	FY2014
	TJ	2,422	2,372	2,267
Electricity purchased	1,000 kWh	217,356	217,914	212,126
Utility gas	1,000 m³	5,657	5,823	4,901
Propane gas	kg	4,091	3,703	2,855
Liquid fuel	kL	803	370	106
Purchased energy	TJ	21	21	18
Solar power	1,000 kWh	1,319	1,257	1,794

Substances	Unit	FY2012	FY2013	FY2014
Chemical substances (PRTR substance)	t	123	109	92
Equipment and materials for research and development (laboratory equipment, paper, etc.)	-	-	-	-

Water	Unit	FY2012	FY2013	FY2014
	1,000 m³	2,535	2,267	2,091
Water received	1,000 m³	1,116	1,042	994
•Potable water	1,000 m³	1,082	1,004	964
•Groundwater	1,000 m³	34	38	30
•Industrial water	1,000 m³	0	0	0
Recycled water	1,000 m³	1,419	1,225	1,138

input → AIST → output

Atmospheric emission	Unit	FY2012	FY2013	FY2014
Greenhouse gas emissions	1,000 tCO_2	115	127	124
•Purchased electricity	1,000 tCO_2	99	112	111
•Fossil fuels	1,000 tCO_2	15	14	12
•Purchased energy	1,000 tCO_2	1	1	1
NOx emissions	kg	11,495	3,302	3,530
SOx emissions	kg	1,853	2,244	640
Soot dust emissions	kg	371	299	242

Wastes	Unit	FY2012	FY2013	FY2014
Waste generated	t	2,453	2,741	2,173
•General waste	t	611	585	544
•Industrial waste	t	1,842	2,155	1,629
Final disposal wastes	t	300	258	248
Recycling of used paper	t	202	230	276

Effluent	Unit	FY2012	FY2013	FY2014
Amounts of water discharged	1,000 m³	1,171	908	997
•To sewer	1,000 m³	1,169	879	982
•To public waters	1,000 m³	2	29	15
Amounts of pollutants discharged	kg	1,426	928	2,389
•BOD	kg	590	353	554
•Nitrogen	kg	154	56	1,257
•Phosphorus	kg	11	8	159
•Suspended solids	kg	671	511	419

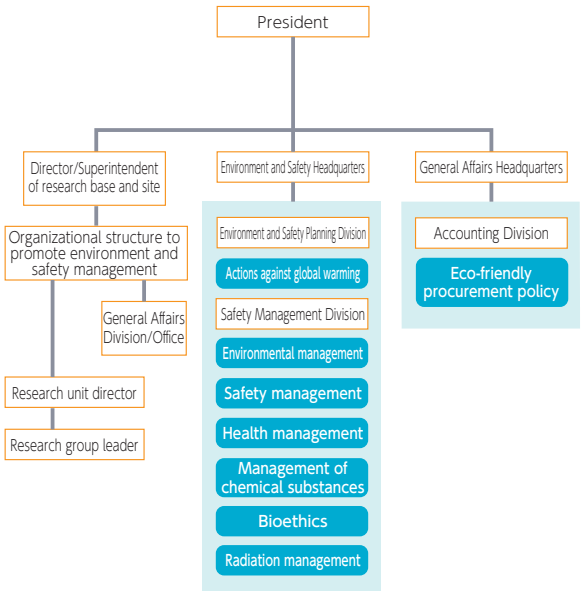
Organizational Structure To implement environmental policies and actions

AIST's headquarters organizations (Environment and Safety Headquarters, General Affairs Headquarters) and business organizations (regional research bases and sites) firmly work together to implement our environmental policies and actions.

The Environment and Safety Headquarters determines policy for the reduction of greenhouse gas emissions, which is an ongoing issue, and the General Affairs Headquarters develops and monitors AIST's policy for green procurement.

These policies are embodied in implementation plans of each regional research base and site under the leadership of the director-general and the superintendent.

Structure for environment and safety

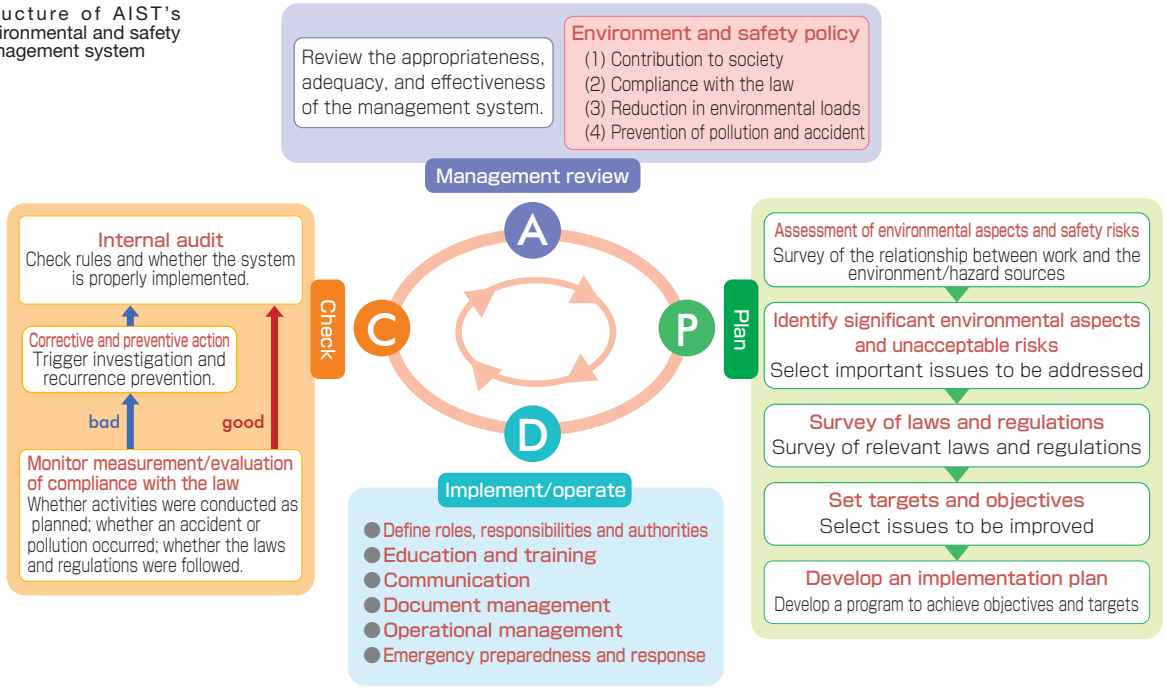


Environmental and Safety Management System

AIST has its own environmental and safety management system (ESMS) in place. It combines two systems: an environmental management system to reduce environmental impacts of its business and preserve the natural environment, and an occupational health and safety management system to reduce potential risks in the workplace and improve health and safety.

In FY 2014, we conducted an internal audit for environment and safety of each research base and site, and checked the implementation status of the management program. With the aim of improving the skills of health and safety managers who serve as administrators of the ESMS at each regional research base and site, all AIST meeting of health and safety managers was held to exchange views on ESMS activities at every regional research base and site.

Structure of AIST's environmental and safety management system



Environmental Education

To enhance environmental education

AIST provides environmental education to new employees and those who have joined AIST under the industry–academia–government exchange program, the international exchange program, and dispatched workers on issues with significant environmental impacts, such as how to treat liquid wastes and vent gases from research and how to sort and remove wastes.

We are continuing to enhance environmental education and training.

Green Procurement and Green Contract

Green procurement activities *1

When purchasing products, parts, or materials that are necessary for conducting R&D and when subcontracting external services for processing and prototype manufacturing, AIST considers not only quality and price but also environmental loads, and engages in green procurement that gives priority to products and services with little environmental load.

To promote green procurement, every year AIST publicizes the procurement policy that sets the procurement goal for eco-friendly goods, based on the "Act on Promotion of Procurement of Eco-friendly Goods and Services by the State and Other Entities (Green Purchasing Act)" and the "Basic Policy for Promotion of Procurement of Eco-friendly Goods and Services."

Status of procurement of eco-friendly goods

In FY 2014, AIST purchased 236 items in 18 categories among the 267 items in 19 categories designated in the Green Purchasing Act (types of eco-friendly goods and services to be preferentially purchased by the government and other organizations). Excluding two items (media storage cases and vehicles, excluding official vehicles) because of their required functions and performance, AIST achieved 100% procurement rate for each designated procurement item (i.e. those that met the criteria established by the government for items that reduce environmental loads). The environmental loads are also considered in purchasing eco-friendly products (such as trash bags) that are not designated procurement items.

Number of hybrid vehicles owned by AIST

As of April 2015, of the 80 AIST-owned vehicles for business (including research), 8 are hybrid vehicles, 1 is a plug-in hybrid vehicle, and 2 are electric vehicles. In replacing the automobiles, preference will be given to hybrid and low-emission vehicles.

＊1 For details on green procurement, please refer to the following page:
http://www.aist.go.jp/aist_j/procure/kouhoyou/green/

Green contract activities

When signing contracts with contractors and suppliers, AIST promotes a green contract that takes into consideration reduction of greenhouse gases on the basis of the “Act on Promotion of Contracts of National Governments and Other Entities Involving Due Care for Reduction of Greenhouse Gas Emission (Green Contract Act).” In FY 2014, we signed the following green contracts.

Number of green contracts

Type of green contract	Number
Automobile purchase	2 Cases
Contract for power supply	6 Cases
Industrial waste	22 Cases

For automobile purchases, we evaluated the price and environmental performance (fuel economy) of two vehicles for purchase and five vehicles for lease in a comprehensive evaluation bidding system in which the bidder with the highest rating entered into the contracts.

For contracts for power supply, we adopted the environmental threshold system[*2] at AIST Hokkaido, AIST Tsukuba North, AIST Waterfront, AIST Chubu, AIST Kansai Amagasaki Branch, and AIST Shikoku.

The system was also adopted for 22 industrial waste contracts for collection, transport, and disposal.

＊2 Environmental threshold system
This is a bidding system with screening by the sum of score points of carbon dioxide emission coefficient, unutilized energy usage, new energy usage, and planned amount of green power certificate to be transferred to the purchaser. The bidder that has a certain total score that surpasses the threshold and presents the lowest price has the right to enter into the contract.

Purchase results of major designated procurement items

Area	Item		Target	Total quantity purchased	Purchase of specified purchase items	Target attainment
Paper	Photocopier paper		100%	108,438.1379kg	108,438.1379kg	100%
	Forms		100%	850.2kg	850.2kg	100%
	Coated paper for inkjet color printers		100%	98kg	98kg	100%
	Toilet rolls		100%	14,404.6kg	14,404.6kg	100%
	Tissue paper		100%	4,227.18kg	4,227.18kg	100%
Stationery	Mechanical pencils		100%	580	580	100%
	Mechanical pencil leads		100%	2,215	2,215	100%
	Ballpoint pens		100%	10,199	10,199	100%
	Marker pens		100%	9,914	9,914	100%
	Pencils		100%	7,074	7,074	100%
	Media case		100%	1,130	905	80%
	Glue (solid)		100%	1,718	1,718	100%
	Files		100%	39,502	39,502	100%
Office furniture, etc.	Chairs		100%	1,315	1,315	100%
	Desks		100%	569	569	100%
OA equipment	Photocopiers, etc.[*3]	Purchased	100%	28	28	100%
		Leased/rented (new)		35	35	
		Leased/rented (extension)		206	206	
	Scanners	Purchased	100%	156	156	100%
		Leased/rented (new)		0	0	
		Leased/rented (extension)		0	0	
	Paper shredders	Purchased	100%	45	45	100%
		Leased/rented (new)		0	0	
		Leased/rented (extension)		0	0	
	Recording media		100%	6,239	6,239	100%
	Toner cartridges		100%	6,470	6,470	100%
	Ink cartridge		100%	3,510	3,510	100%
Vehicles, etc.	Non-general official vehicles	Purchased	100%	3	1	33%
		Leased/rented (new)		0	0	
		Leased/rented (extension)		1	1	
Fire extinguishers	Fire extinguishers		100%	11	11	100%
Services	Passenger transportation		100%	2,507	2,507	100%

＊3 Photocopiers, combination units, digital photocopiers with expandable functions

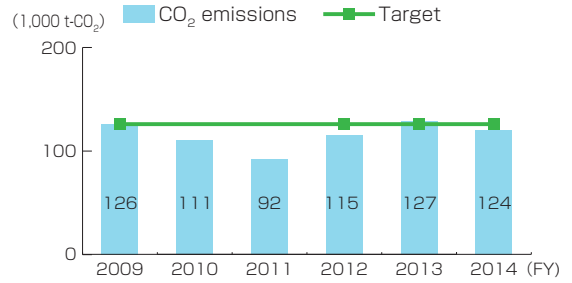
Actions against Global Warming

AIST sets a target and implementation plan for reducing greenhouse gas emissions as part of the effort to reduce environmental load substances generated from our business. In FY 2014, AIST promoted research facility integration and efficient use of laboratory space for its research activities to achieve the target of reducing greenhouse gas emissions by 4% from the FY 2009 level (on average) for the 3 years from FY 2012 through FY 2014.

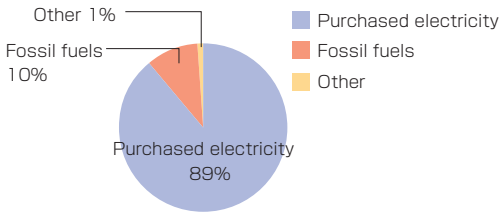
As a result, AIST achieved a 3.8% reduction in greenhouse gas emissions. During the period of implementation of the plan, a new research base was established and AIST's energy usage was increased including other factors thus the reduction target was not achieved. However, AIST's greenhouse gas emissions decreased from the FY 2013 level.

Our greenhouse gas emissions are expected to increase because of an increase in research and development activities promoted by open innovation. Nonetheless, from FY 2015, we will continue to act on reducing greenhouse gas emissions toward the target of reducing them by 4% from the FY 2014 level (on average) for the 3 years from FY 2017 through FY 2019.

Change in CO_2 emissions



Breakdown of sources of CO_2 emissions



Introduction of Renewable Energy Sources

To reduce CO_2 emissions

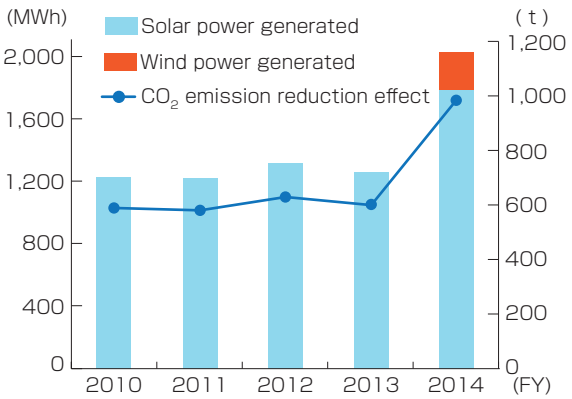
AIST introduced solar power generation facilities to AIST Tsukuba, and also to AIST Tohoku, AIST Tokyo Waterfront, AIST Chubu, AIST Kansai, AIST Chugoku, AIST Shikoku, and AIST Kyushu. Whereas our existing solar power systems are being used effectively, solar and other renewable energy systems have been installed in new buildings.

The amount of solar power generated in FY 2014 was 1,794 MWh. This is equivalent to the annual power use of 498 households, and this helped reduce the CO_2 emissions by 870 t/year.

A wind-power generator was installed in the Fukushima Renewable Energy Institute, a new research base. In FY 2014, 236 MWh of wind power was generated. This contributed to a CO_2 emission reduction of 124 t/year.

Wind-power generator and solar panels at the Fukushima Renewable Energy Institute

Progress in renewable power generation and CO_2 emission reduction



Power-saving during Summer

AIST put in place the following energy-saving measures:

(1)Large facilities and equipment (clean rooms, constant temperature/humidity room, large-scale computers, HVAC systems, etc.) were operated in turn to balance the operating load.

(2)Infrastructures that consume large amounts of power such as wastewater treatment facility were operated in turn, and were also shifted to holidays and nights.

(3)Visualization of electrical power usage by introducing the total power monitoring system.

(4)Employees at AIST Tsukuba and regional research bases took holidays in turn depending on their regional research base or site.

(5)AIST requested the cooperation of technology research associations in cutting peak electricity consumption during summer.

These measures helped to reduce peak power consumption by 12% at AIST Tsukuba and by 4% to 18% in the regional research bases, compared with FY 2010 levels.

Green Curtain Activities at AIST Tsukuba West

At AIST Tsukuba West, a green curtain was installed to cover 30 m2 of window area on the south side of the offices on the first floor of the Main Research Building. Bitter melon, morning glory, and hop plants were selected for use in the green curtain, taking into account their effectiveness, visual appeal, insect-repelling nature, and ease of planting, as observed over the past few years. Flowers were planted in front of the green curtain to bring green and other colors into the workplace. Fringed pink (pink), marigold (yellow), and globe amaranth (red) were planted to make the site look bright and colorful.

The green curtain is very effective as a heat shield. The temperature of the window surfaces of the rooms was measured. There was a temperature difference of 7 to 9 °C between windows with and without the green curtain. Thus, the green curtain helps to reduce the cooling load.

Many employees worked together to plant the green curtain. People from different departments encouraged each other to harvest the bitter melons and shared them while enjoying a chat. The green curtain certainly contributed to the creation of an environment conducive to work.

More than 200 bitter melons were harvested. The melons were cooked at an employee party, helping to further expand the circle of friendship. Red seeds were collected from the orange-colored ripe bitter melons. They will be stored for use next year to bring the green curtain into homes. (Information supplied by the Green Curtain Project Management Office.)

Appropriate Management of Chemical Substances

AIST seeks to reduce environmental risks and ensure safety through appropriate management of chemical substances.

AIST's research covers a wide variety of areas and involves the use of a wide variety of chemicals usually in small quantities. Chemicals are properly used and stored to prevent fuming, flaming, and leaking and are properly treated for disposal.

[Treatment of liquid waste and vent gas after the use of a chemical]
Liquid waste: At AIST Tsukuba, inorganic liquid waste is rendered harmless in the treatment facility on the premises and is then discharged into the public sewerage system. AIST Tsukuba decided to outsource the disposal of all organic liquid waste to an industrial waste-treatment service provider, starting in FY 2013. Regional research bases outsource the disposal of their organic and inorganic liquid wastes to industrial waste-disposal service providers.
Effluent gas: Toxic vapor-producing chemicals are used in fume hoods, and the toxic vapors are discharged through effluent gas detoxification systems. By using the integrated chemical management system described below, AIST provides each researcher with information on the chemicals that may be used only in a fume hood and must be discharged only after being rendered harmless.

Chemical Substances Integrated Management System

A wide variety of chemicals used in research are registered in the Chemical Substances Integrated Management System at the time of delivery. Via AIST's intranet, the Chemical Substances Integrated Management System allows all researchers to view, at a glance, information on the laws and regulations applicable to the chemicals being used and on the properties and handling of the chemicals. Also, the system gives a quick view of the amounts of hazardous materials (under the Fire Service Act) and high-pressure gases that may be stored in each room. The system is used to collect information on chemicals that are subject to the PRTR (Pollutant Releases and Transfer Register) below and should be reported to government agencies.

Collecting Information on Released Chemical Substances

AIST reports on the releases and transfers of chemicals subject to the PRTR Act* and applicable municipal ordinances. At AIST, the following chemicals are used in large quantities: organic solvents to dissolve or extract various organic compounds; hydrogen fluoride to clean semiconductors; and ferric chloride to treat hydrogen fluoride liquid waste. The use of these chemicals must be reported every year. In FY 2013, the organic liquid waste spray incinerator was removed. As a result, there is now no facility subject to the reporting of dioxin emissions.

Amounts of chemicals reported under the Chemical Control Program
Releases and transfers of chemicals subject to the PRTR Act (chemicals used in quantities of more than 1 ton)

Research site	Substance	Amount used	Amount released	Amount transferred	
			Air	Sewer	Waste
AIST Tsukuba Central 5	Chloroform (kg)	1,200	270	0	890
	Dichloromethane (kg)	2,500	240	0	2,200
	Hexane (kg)	1,000	270	0	780
AIST Tsukuba West	Ferric chloride (kg)	71,000	0	0	0
	N,N-dimethylacetamide (kg)	1,500	0	0	100
	Hydrogen fluoride and its water-soluble salt (kg)	5,500	0	220	0

After use, all of the ferric chloride changes to insoluble ferric fluoride and ferric hydroxide. There are no releases and transfers.

[Tokyo Metropolitan Government]
Releases and transfers of chemicals subject to the Ordinance on an Environment to Ensure the Health and Safety of the Residents of Tokyo (chemicals used in quantities of more than 100 kg)

Research site	Substance	Amount used	Amount released	Amount transferred	
			Air	Sewer	Waste
AIST Tokyo Waterfront	Acetone (kg)	310	30	0	280
	Chloroform (kg)	200	12	0	180
	Ethyl acetate (kg)	110	10	0	99
	Methanol (kg)	950	100	0	850

[Osaka Prefectural Government]
Ordinance on the Preservation of the Living Environment of Osaka Prefecture (chemicals used in quantities of more than 1 ton)

Research site	Substance	Amount used	Amount released	Amount transferred	
			Air	Sewer	Waste
AIST Kansai	VOCs (kg)	2,500	2,000	0	500

* PRTR Act
The official name of the PRTR Act is "The Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof". Facilities that use any of the 462 designated Type 1 chemicals in quantities of more than 1 ton/year (more than 0.5 tons in the case of some chemicals) must report the amount released to the environment and the amount transferred to other facilities (the amount sold and the amount disposed of by waste-disposal service providers).

Asbestos Removal

Removal of spray materials containing asbestos

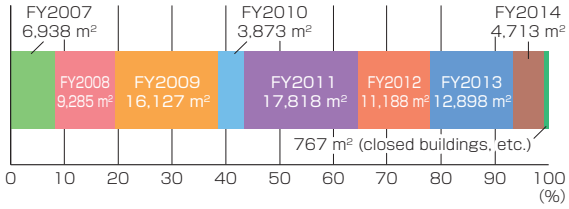
The planned removal of sprayed asbestos materials was completed.

Since FY 2007, AIST has been inspecting sprayed asbestos coatings for deterioration; we have taken environmental measurements and have been carrying out the removal of an intended total of 83,607 m^2 of sprayed asbestos coatings in a planned manner.

In FY 2014, we removed 4,713 m^2 of sprayed asbestos coatings. We have now removed a total of 82,840 m^2 of sprayed asbestos coatings, as planned.

In the case of facilities in buildings that have been closed, asbestos will be removed when the facilities are dismantled.

Gross removed surface area of spray materials containing asbestos



Storage of PCB Waste Materials

AIST stores and monitors PCB waste on an ongoing basis.

At each research base and site, PCB capacitor and transformer waste is stored as specially controlled industrial waste in accordance with statutory guidelines. At each research base and site, a Specially Controlled Industrial Waste Manager inspects the stored PCB waste once a month to make sure it is properly stored.

In FY 2014, we contracted out the disposal of highly concentrated PCB waste (capacitors, ballasts, etc.) to the Japan Environmental Storage & Safety Corporation (JESCO). We contracted out the disposal of low-concentration PCB waste (transformers, etc.) to a licensed detoxification service provider. We will continue to dispose of PCB waste until completion of the disposal within the period specified by law.

Disposal and storage of PCB waste

Waste type	Quantity disposed of in FY 2014	Quantity stored at the end of FY 2014
Capacitors	217	352
Ballasts	36	4,691
Transformers	65	30

A transformer being disassembled

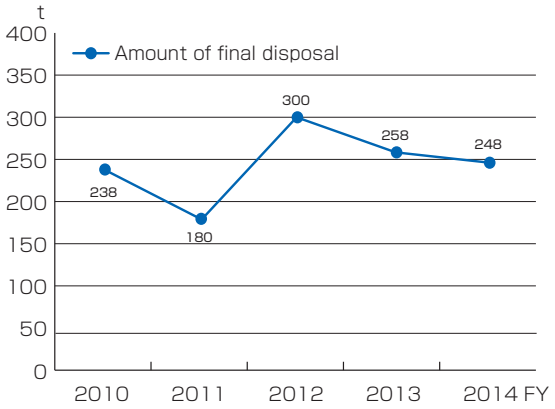
Reduction in Waste Generation

AIST seeks to reduce waste and thus to reduce environmental loads.

AIST seeks to reduce waste by applying 3R (Reduce, Reuse, and Recycle) principles and thus to reduce environmental loads. We are focusing particularly on the reuse of research equipment, because this reuse can also contribute to cost savings (see “Effective Use of Resources” below). As part of our responsibility as a waste generator, every year we conduct an on-site inspection of waste treatment facilities on a voluntary basis to make sure the waste is appropriately treated and disposed of. In FY 2014, we conducted on-site inspections of 27 intermediate waste treatment and landfill facilities.

Changes in the amount of disposed waste

Changes in amounts of final disposal



Breakdown of waste generated (FY2014)

Waste type	Amount disposed (t)	Amount landfilled (t)	Percentage of waste landfilled (%)
General waste	544	83	15
Industrial waste	1,073	145	13
Plastic waste	177	40	23
Metal scrap	204	2	1
Sludge	214	34	16
Wood waste	15	3	23
Glass, concrete/ceramic waste	57	24	41
Mixtures	15	3	20
Composite materials	250	30	12
Slag	38	0	0
Other	102	9	9
Specially controlled industrial waste	556	20	4
Flammable waste oil	88	4	5
Strong acids	231	3	1
Infectious waste	15	11	77
Waste oil (hazardous)	203	0	0
Sludge (hazardous)	9	0	1
Acid waste (hazardous)	1	0	6
Other	9	0	4
Total	2,173	248	11

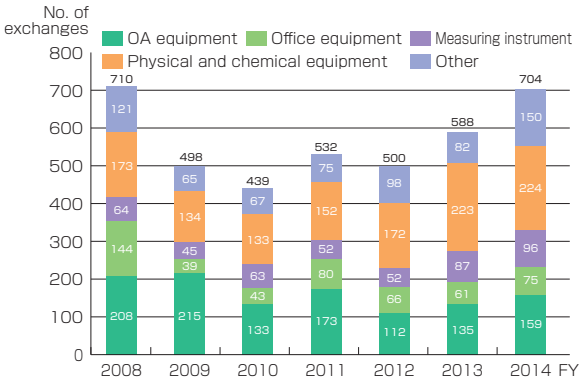
Effective Use of Resources

AIST promotes the reuse of equipment that is no longer used.

Since 2005, an intranet-based Article Recycling System has been in place to exchange information on necessary and unnecessary items, including research equipment, OA equipment, furniture, and consumables, and to promote recycling within AIST.

We also give away items no longer used at AIST to external organizations. In these ways we facilitate the reduction and reuse of waste.

Number of exchanges of items for recycling



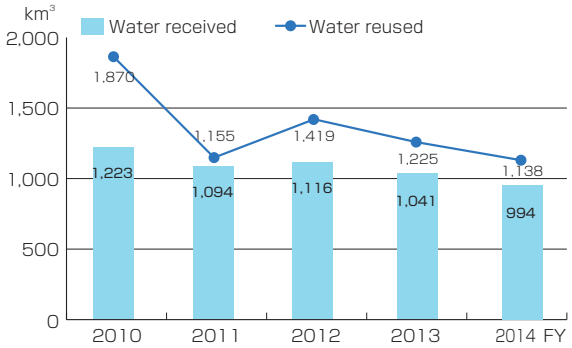
Conservation of Water Resources

AIST seeks to effectively use water resources through reuse.

At AIST Tsukuba and AIST Chubu, research wastewater is neutralized, reduced, and reused for use as water for cooling laboratory equipment and flushing toilets.

In FY 2014, the amount of water received decreased by 5% from the previous year and the amount recycled decreased by 7%. As a result of a change in the cooling system for the helium liquefier, the use of recycled water decreased. We are continuing to seek to effectively use water resources.

Changes in the amounts of water received and reused



Wastewater treatment plant at AIST Tsukuba

Compliance with the Convention on Biological Diversity and the Cartagena Act

In 1992, the cooperation of many countries, including Japan, led to the adoption of the Convention on Biological Diversity to allow comprehensive conservation of biodiversity and sustainable use of biological resources. The Cartagena Protocol was created to protect biodiversity by the safe transport, handling, and use of living modified organisms that may have adverse effects on the conservation and sustainable use of biodiversity. In Japan, the Act on the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms (the Cartagena Act) came into effect in 2004.

To comply with the Cartagena Act, AIST holds committee meetings attended by external experts to conduct preliminary reviews of experiments involving living modified organisms and the handling of living modified organisms. AIST requires researchers and research assistants who conduct experiments involving living modified organisms to undergo education and training on a regular basis. There were 187 such experiments in FY 2014. We conduct on-site inspections of laboratories that use living modified organisms to ensure that the organisms are labeled as specified in the Act, that they are stored correctly, and that containment measures are taken to prevent dispersal of the organisms. We have a system in place in each research site to provide support and guidance in this regard and thus seek to conserve biodiversity.

We aim to promote AIST's compliance with laws and regulations, social norms, internal codes of conduct for researchers, and internal rules, and to turn AIST's Charter, "Full Research in Society, for Society" into a reality.

We take the following environmental protection actions to help conserve the global environment and create a sustainable society.

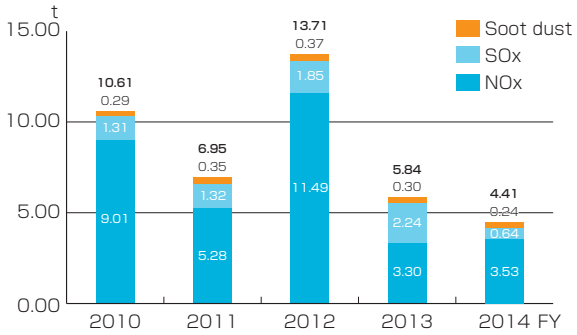
1.We comply with international environmental regulations and the environmental laws and regulations of the government and municipalities, and we work to prevent pollution and conserve the natural environment.

2.We promote research that helps to conserve the global environment and human safety, and we proactively work to improve energy efficiency, save natural resources, and promote recycling.

Prevention of Air Pollution

The major sources of air pollutants in AIST are the boilers for cold heat source in air conditioning. To reduce sulfur oxide (SOx) emissions we use mainly city gas and kerosene as fuel for the boilers.
In FY 2014, the air-conditioning boiler at AIST Kyushu was removed, and SOx emissions decreased significantly.

Changes in atmospheric environmental loads



Prevention of Water Pollution

At AIST, the fourth and subsequent washing waters from laboratories are sent as research wastewaters to the wastewater treatment plant. The wastewater undergoes processes such as pH adjustment, coagulation and sedimentation, filtration, and activated charcoal absorption to meet municipal effluent standards. It is then discharged into the public sewerage system.

Monitoring of groundwater

Arsenic exceeding the limit was detected in the groundwater in a groundwater survey conducted in April 2012 at AIST Kansai. The water quality of seven groundwater observation wells is measured on a regular basis under the guidance of the government of the City of Ikeda, where AIST Kansai is located. In the water quality measurements taken in FY 2014, arsenic and its compounds exceeding the limits (the highest concentration was 0.017 mg/L, compared with the reference level of 0.01 mg/L), and boron and its compounds (the highest concentration was 1.2 mg/L, compared with the reference level of 1 mg/L) were detected in the water in two observation wells. We will continue the monitoring.
Fluorine and its compounds exceeding the limits were detected in the soil in a survey conducted in June 2012 at AIST Chubu. One groundwater observation well was drilled. Under the guidance of the government of the City of Nagoya, where AIST Chubu is located, the quality of the groundwater is measured once a year to prevent spread of contamination. In the measurements of water quality taken in FY 2014, no particular issues were identified. We will continue the monitoring.

Water quality preservation activities

In FY 2014, to comply with the amended Water Pollution Control Act, a bund was provided around rooftop exhaust cleaning equipment and a liquid waste storage tank for that equipment to prevent leakage of water containing hazardous materials. Equipment was installed to collect oil contained in wastewater from the cafeteria kitchen to improve the quality of wastewater from non-laboratory activities.

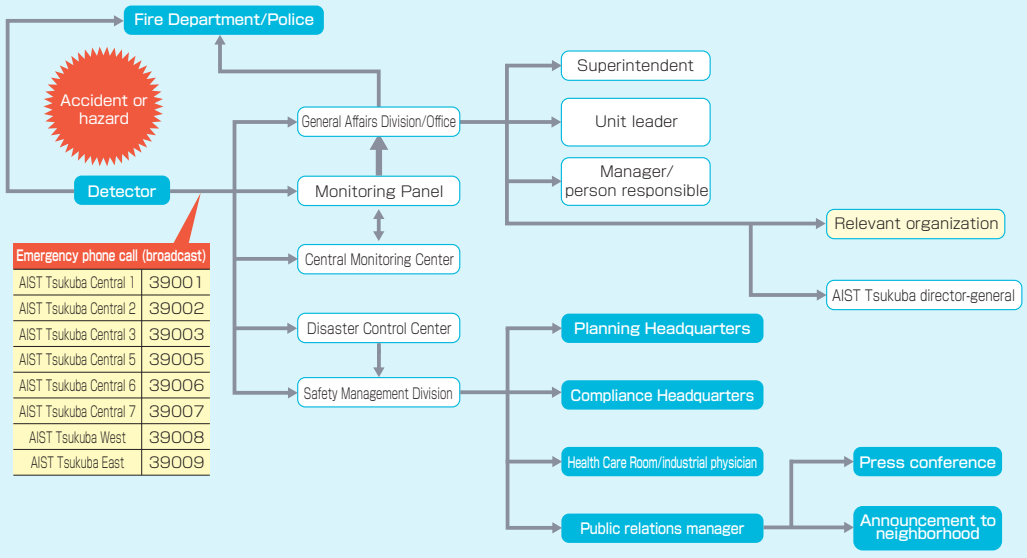
Containment bund placed around a liquid waste storage tank for exhaust cleaning equipment

Oil-collection device connected to the grease trap

Accidents Affecting the Environment

To ensure compliance with environmental laws and regulations, AIST has an ESMS (Environmental and Safety Management System) in place and implements the PDCA (plan–do–check–act) cycle. Also, we have a system to minimize damage in the event of an accident.

AIST Tsukuba Emergency Contact System



Emergency phone call (broadcast)	
AIST Tsukuba Central 1	39001
AIST Tsukuba Central 2	39002
AIST Tsukuba Central 3	39003
AIST Tsukuba Central 5	39005
AIST Tsukuba Central 6	39006
AIST Tsukuba Central 7	39007
AIST Tsukuba West	39008
AIST Tsukuba East	39009

Drills to prepare for environmental accidents

AIST conducts contact, communication, and emergency action drills to minimize damage in the event of an environmental accident such as leakage of oils and chemicals. In FY 2014, we conducted accident drills at 10 research bases on such events as leakage of hazardous materials from rooftop exhaust cleaning equipment and leakage of research wastewater during transport. We will continue to conduct drills for various environmental accidents on a regular basis.

Scene of an environmental accident drill

Reports on accidents that occurred in 2014

Regulatory limits for sewage at AIST Tsukuba

At AIST Tsukuba, wastewater exceeding the regulatory limits for sewage was discharged into the sewerage system three times. The n-hexane-extract content exceeded the limit in all cases. To prevent a recurrence of this discharge, we and the cafeteria operator together improved the kitchen work and changed the frequency of cleaning of the grease trap.

Drain Overflow from AIST Kansai into the Hachioji River

On September 10, 2014, torrential rain fell in the area where AIST Kansai is located. A large amount of rainwater flowed into the storage tank pit in the research wastewater facility and overflowed from the wastewater treatment plant into the Hachioji River, which runs through the site. To prevent a recurrence of the overflow, under the guidance of the government of the City of Ikeda, where AIST Kansai is located, we made improvements, such as raising the tank pit wall and installing a selector valve to discharge rainwater.

Pipe damage found in periodic inspection of underground research wastewater pipes

Periodic inspection of underground research wastewater pipes in accordance with the Water Pollution Prevention Act was conducted. Pipe damage was found at AIST Chubu and AIST Chugoku and was reported to the respective municipal governments. At both regional research bases, the soil under the damaged pipe was analyzed and found not to be contaminated.

AIST Tsukuba received a complaint of noise from a resident in the neighborhood and, from another resident, a request to fix the problems caused by fallen leaves scattered from the site. To address these problems, we repaired the equipment that had produced the noise; we also cut down the trees and took other measures.

Tank pit with a raised wall

Third Party Views

The AIST Report 2015: Social and Environmental Report

Director, Workers Club for Eco-harmonic Renewable Society (NPO) Tamio Yamaguchi

As reiterated in the fourth edition of the GRI guidelines, which are the international standard for social responsibility (SR) reports, an SR report must include content that addresses changes in the conditions of society and associated expectations from society. Therefore, it is important for an organization publishing an SR report to always pay attention to domestic and international society and strive for continuous improvement, and to address topics of interest in each year. With regard to the former, AIST is striving for continuous improvement by feeding back my comments on the draft report and readers' expectations to the organization and seeking responses.

With regard to the latter, specific topics should be properly identified each year and raised in the Message from the President and the articles. This year, it seems that the specified topics are an impending crisis that "In the industrial sector, progressively fewer companies are internationally competitive ... the profile of Japanese companies in the global market continues to decline" (from the Message from the President) and "bridge-building" as in the basic policies of the Fourth Medium- to Long-term Plan that started this year. This report discusses the "valley of death" in which, even when there is success in basic research, technologies disappear if they do not ultimately lead to market products. With the recent decline in the profile of Japanese companies, the importance of bridging the valley of death is becoming an even more important and pressing issue. The report discusses this matter in detail both in the Message from the President and in examples of success in the Lead-off article (page 4) and the Research reports (page 14). The circumstances of these successes are concretely described, a success for the editorial policy of providing explanations that are easy to understand and engage with and that will be understood by all of AIST's various stakeholders.

The basic framework of the "cross-appointment system" was established in December 2014 by the Ministry of Economy, Trade and Industry and the Ministry of Education, Culture, Sports, Science and Technology. This is a system in which an employee has multiple employment contract relationships with bodies such as universities, public research institutes and private companies and performs work for each body without any disadvantage in social insurance or the like. There are examples in Europe and North America that show this framework being effective for bridge-building to link basic research with commercialization. It is reported that the new system has started to be actively used at AIST, too. However, although this system is mentioned in the Message from the President, it is disappointing that the report does not offer more examples of its use in relation to bridge-building or more detail about its future development. I hope that there will be more description of the effectiveness of the system, plans for its use, and its outcomes next year.

Readers of this report are still affected by the shock of the STAP cell scandal at RIKEN; there is great concern about how public institutes deal with research misconduct. On this question, last year's report only touched on the matter of conducting "training on standards in research activities" and did not have sufficient content to address the concerns of readers. In contrast, this year's report meets the concerns of readers by presenting the gist of improvements at AIST to conform to the new ministerial "Guidelines for Responding to Misconduct in Research," which came into effect in April 2015, and AIST's "Code of Conduct for Researchers," which was amended in the same month. A survey on implementation of these guidelines is to be carried out and published later. I hope that the next edition of the report will describe whether or not the described amendments have been effectively implemented.

The conditions that apply to an SR report are laid out in ISO26000. They include "achieving a balance," meaning that negative information about the effects of an organization's activities should not be omitted. This report describes incidents that have affected the environment and meet the condition to some extent. However, I hope that AIST will strive to collect and describe a wider range of information from more perspectives.

Lastly, my hope for future activities and reporting are as follows. Even if excellent products result from "bridge-building," there is no guarantee that they will not fail in the global market. There are all sorts of international rules, which often affect the terms of competition and impede the development of markets. It has been observed that while leading overseas businesses proactively participate in rule-making, Japanese businesses are more passive. AIST has proactively participated in the promotion of international standards for some time and now there are strong demands for the way businesses deal with rules to switch from adapting to rules to making the rules. I hope to see efforts for various new rules to be made through cooperation with government and business.

Workers Club for Eco-harmonic Renewable Society (Junkan Workers Club): A citizens group that investigates, with a global perspective, the form of a society in harmony with the natural ecosystems that will be passed on to the next generation. The goal of the club is to study, support and put into practice measures leading to a sustainable mode of society for regional citizens, businesses and governments. At CSR workshops within the club, the group studies and proposes appropriate forms of CSR. URL：http://junkanken.com/

Afterword

On the publication of the AIST Report 2015

Hiroki Yotsumoto,
Deputy Director-General
Planning Headquarters

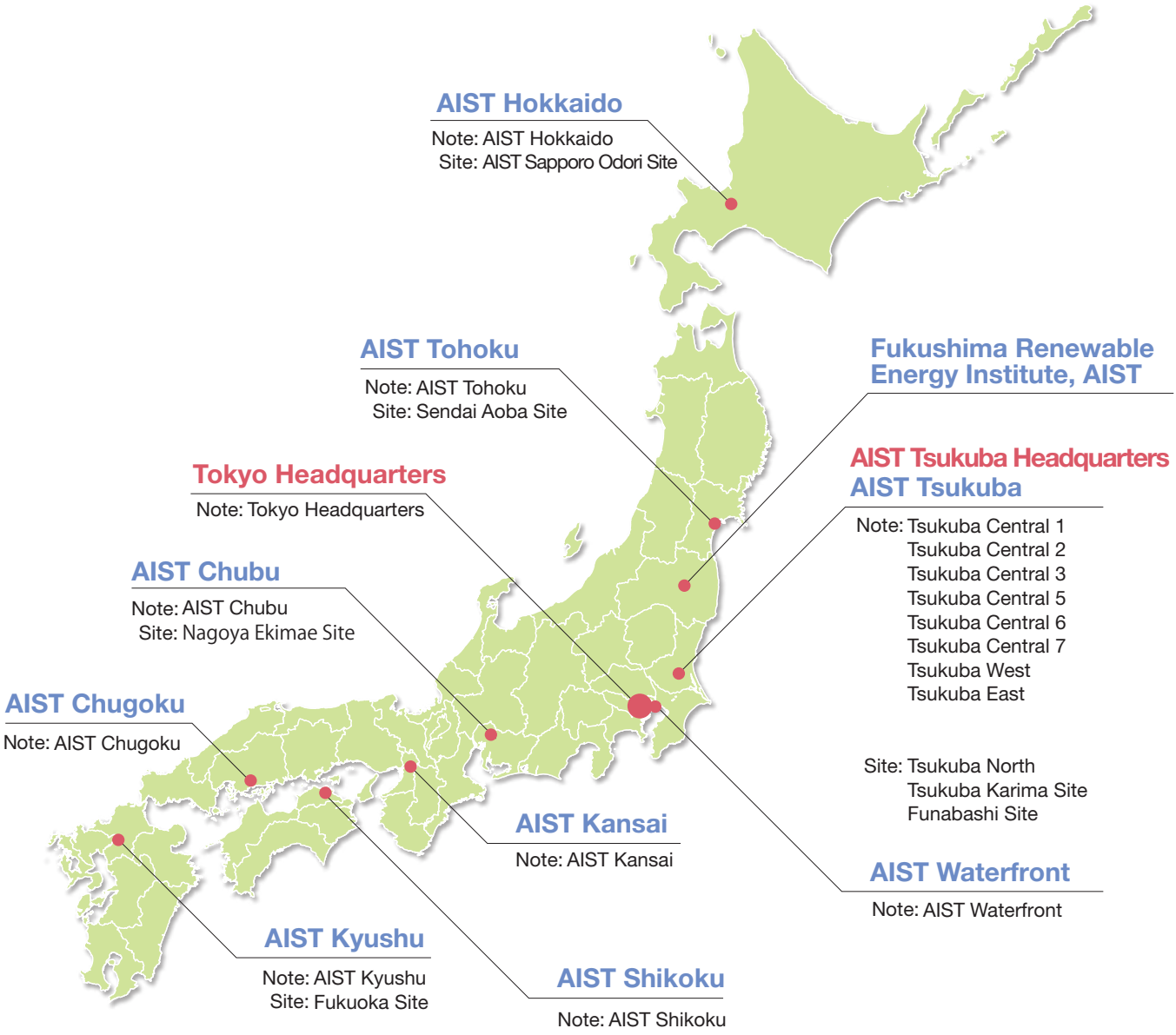
AIST has been publishing environmental reports since 2004. Since 2010, the AIST Report: Social and Environmental Report has been compiled and published in accordance with ISO 26000, widening the scope of the report to cover regional research bases across the country as well as AIST's Tsukuba Center and adding reports on initiatives relating to the environment, workplace health and safety, and corporate social responsibility.

This year's report discusses efforts to improve "bridging" innovative technological seeds and commercialization, identified as AIST's most important mission for the five-year period of the Fourth Medium- to Long-term Plan that started in April 2015.

The Lead-off article outlines research for the application of power electronics and the Research reports outline research for the application of carbon nanotubes, spintronics devices and ceramic films. There are also reports on the open innovation initiatives and personnel development initiatives helping to drive this bridging work.

For AIST, with the motto "full research in society, for society," it is our duty and our mission to present AIST's activities to the many stakeholders who want to hear about them in a form that is easy to understand. In this report, we are striving to make connections to build relationships of deeper trust with society.

Research Bases



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