AIST REPORT

2013 Social and Environmental 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 the society.

Editorial Policy

The National Institute of Advanced Industrial Science and Technology (AIST) published the first environmental report in the fiscal year (FY) 2004. Since FY 2010, it has published the "AIST Report" that integrates the corporate social responsibility (CSR) and the environmental activity reports.

The "AIST Report 2013: Social and Environmental Report" was edited to promote the understanding of various stakeholders by explaining in familiar terms the open innovation that utilizes the "people" and "place" of AIST, in addition to the CSR activities at AIST. Ultimately, we aim to build a trusting relationship with society through AIST's community involvement. We also introduce the activities of AIST within society, particularly focusing on nanotechnology research base and renewable energy activities.

The detailed data for each research base pertaining to the environmental report are available on the website.

AIST Official Website http://www.aist.go.jp/index_en.html

(Translation from AIST Report published in Sept. 2013)

◆ Scope of this report

The subject of this report includes the activities at all AIST research bases.

◆ Period covered by this report

April 2012 to March 2013.

◆ Areas covered in this report

This report covers primarily organizational governance, human rights, labor practices, fair operating practices, community involvement, environmental activities, occupational safety and health activities, and open innovation activities at AIST.

◆ Treatment of fractions

The numbers are rounded off to the specified digits.

◆ Guidelines used as references

- *Environmental Reporting Guideline, 2012 Edition*, Ministry of the Environment (in Japanese)
- *Law Concerning the Promotion of Business Activities with Environmental Consideration by Specified Corporations, etc, by Facilitating Access to Environmental Information, and Other Measures* (in Japanese)
- *Guideline on Matters to Be Covered in the Environmental Report, Second Edition*, Ministry of the Environment (in Japanese)
- *ISO 26000:2010 Guidance of Social Responsibility, Japanese Edition,* Japanese Standards Association (in Japanese)

◆ Next issue

September 2014 (Japanese edition)

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President's Message

President
National Institute of Advanced Industrial Science and Technology (AIST)

Ryoji Chubachi

Toward a Sustainable Society

Although not blessed with mineral and energy resources, Japan has managed to develop as a nation and build a modern society through science and technology. However, we now face a situation in which, because of intense international competition, it is hard for private businesses to secure sufficient budgets for research and development for investment in the future. In this context, expectations for AIST in its role as a promoter of the scientific and technological innovation required for future growth are continuously rising.

Our mission is to strengthen our open innovation hub, making use of people and places so that business, academia and government can work together to drive forward the research and development that leads to innovations. As a part of this, in 2009 we cooperated with partner institutions to set up the Tsukuba Innovation Arena (TIA-nano), and in April 2012 we founded the Tsukuba Power Electronics Constellation (TPEC) as a private sector cooperative research body. This year we opened a new TIA Collaboration Center. It is equipped with facilities including a state-of-the-art clean room, a multi-purpose hall in which we can host events such as seminars to develop the next generation of leaders and workspaces where experts from different fields can effectively communicate and work together. We anticipate that this new facility will be used for many new projects.

In support of the reconstruction after the Great East Japan Earthquake, we are progressing with the construction of the Fukushima Renewable Energy Institute, to be opened in 2014 in the city of Koriyama in Fukushima Prefecture; it will be used for research and development for the effective use of next-generation solar power, geothermal energy/ground source heat, improvements in wind power generation, and demonstrations of technologies for the storage of energy from these sources and energy networks. It will be a global base for research into renewable energy and will promote leading-edge research, development and demonstration tests in collaboration with businesses in the region and organizations outside the region in Japan and abroad.

Since its founding, AIST has conducted research and development for the achievement of a sustainable society in accordance with the motto “in society, for society.” In this report we will outline the progress we as a public research body are making in our corporate social responsibility (CSR) activities, our organizational structure (though this is difficult to describe in a small booklet), the employment of people with special needs and disabilities, environmental safety management, and other endeavors.

Interview with Toshihiko Kanayama [AIST Vice-President and Directer-General, Tsukuba Innovation Arena Headquarters]

Transforming TIA-nano into a global innovation hub for nanotechnology

The Tsukuba Innovation Arena for Nanotechnology (TIA-nano) marks its fourth anniversary this year and is steadily making progress in building an organizational structure and setting up facilities as evidenced by the establishment of the AIST Tsukuba Innovation Arena (TIA) Headquarters and completion of the TIA Collaboration Center. We interviewed Vice-President Toshihiko Kanayama about his enthusiasm and prospects.

Creating a forum for people, technology and industry

"Since its establishment in 2009, approximately 130 companies have participated in projects utilizing TIA-nano, while the number of external researchers from companies has exceeded 800. Many research findings have already been announced and among these are findings based on multi-disciplinary approaches that are so characteristic of TIA-nano," says Kanayama as he explains the response to this effort to create a global hub.

Nanotechnology is coming under the spotlight as a core technology for a wide range of applications. As the technology covers a broad scope and is becoming more complex, it is becoming difficult to visualize exactly what technology to use for what objective. In this situation, TIA-nano is aiming to create a mechanism to deliver technology to society. The key point is to invite participation by diverse researchers from industry, academia and the public sector from the interim stages of research in order to "foster innovation" rather than merely "utilize findings" and thereby create opportunities for encounters for people, technology and industry.

"In Europe and North America, industry, academia and the public sector adopt a common pace, the government injects a large budget, and efforts are carried out in a focused manner. The only place in Japan where this can be emulated is Tsukuba Science City, where a wealth of scientific and technical expertise has come to be concentrated. Among many public institutes in Tsukuba, AIST boasts an abundance of ingredients for innovation. Our mission is to create new industries, raise the competitiveness of Japan, and contribute to the creation of a safe and prosperous society."

Targeting commercialization through vertical links

Looking back at the structure of industry in Japan, there was an era in which a large manufacturer covered all aspects from upstream through to downstream in what

was essentially a vertically linked model. However, this structure has collapsed accompanying technological advances and diversification. In contrast, in a fragmented situation in which separate companies manufacture materials, devices and systems, each company needs to search for the next in the chain to pass the baton to create a new product. For this reason, Kanayama emphasizes the necessity for a hub for people to come together that transcends industry types and boundaries.

"By bringing together companies with TIA-nano at the core, we want to eventually create a number of virtual vertical collaborations. Nanotechnology research and development starts with the desired performance and seeks to create a material from scratch to meet performance needs. This point is a decisive difference compared with research and development in the traditional production model that utilizes existing materials.

Nanotechnology is useless as a standalone technology. It must be melded with technologies from different layers. Companies participating in TIA-nano find that links are born through research based on their respective aims and this opens up channels to commercialization. The more companies participate, the more potential there surely is."

One issue for further expanding opportunities for unexpected encounters and new vertical collaborations is increasing the number of participating foreign companies

and researchers. TIA-nano will endeavor to reinforce its open innovation hub function open to foreign entities

Broadening the scope for entry into the nanotech field

An important role for TIA-nano is to broaden scope in order that even more companies participate in the field of nanotechnology. Equipment for the nanotechnology field is very expensive and requires users with advanced knowledge and skills. On these accounts, it is not easy to enter the field independently.

In this respect, AIST possesses a global top class super clean room that houses equipment capable of mass production. The super clean room can be used 24 hours a day. Furthermore, if for example there is a company that has an idea to deploy nanotechnology but lacks the expert technology for trial manufacture, AIST is planning to provide a system that will make it easy for users to utilize the facilities by preparing a so-called 'fixed menu' with various options.

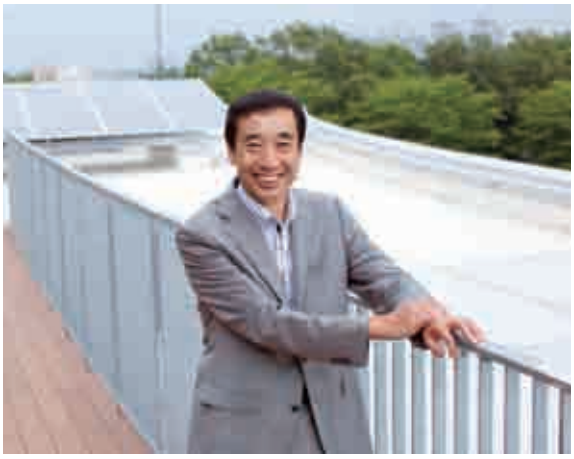
"We would very much like small companies and venture companies that want to try out their ideas to participate. The next innovations will not be born without taking up challenges. The facilities and equipment that we have will go to waste without people with dreams coming forward," says Kanayama frankly. He then expounded on the advantages of sharing the super clean room.

"The number of companies furnishing 'common property' to TIA-nano in the form of delicate process conditions or in other word recipes is on the increase. The next person that comes can use these. There seems to be broadening awareness that this will benefit everyone in the future and I am thankful for this."

TIA Collaboration Center as a base for human resources development

The TIA Collaboration Center was completed within the AIST site in March 2013. The building incorporates a clean room, multi-purpose hall, information corner, and meeting lounge and it is connected with the super clean room building via a connecting passageway. This facility is utilized as a base for human resources development, which is an important pillar for TIA-nano, as well as needless to say a place for R&D and personal exchanges.

"Tsukuba University is the core for human resources development and it has already started organizing summer schools and symposiums in this new building.



Moving forward, we plan to use this facility not only for training of students, but also young technicians and researchers from the private sector."

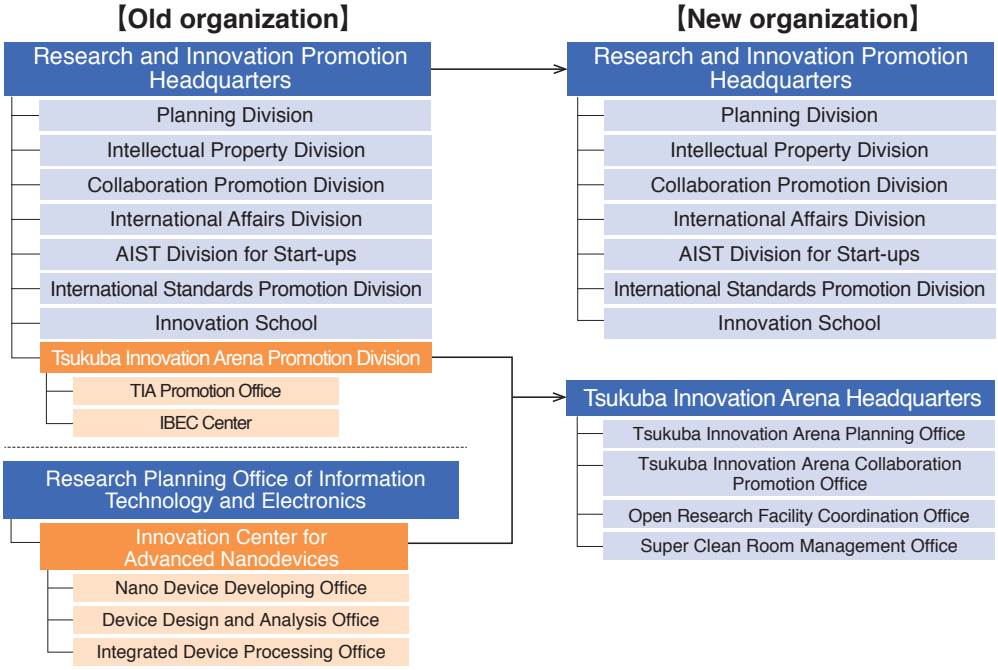
In addition, the TIA Headquarters in AIST was established in April 2013, thereby centralizing management of operations and creating a structure that is also easy to understand from outside. "We cannot apply the same rules across the board because companies participating in TIA-nano hail from a diversity of industry types and also possess diverse technology portfolios. On this account, we plan to prioritize a flexible approach."

"Moving forward, we must extend the utmost care in the management of data security. We aim to prepare a trustworthy environment to undertake R&D and personnel exchanges and grow TIA-nano into an organization with global attractiveness. I sincerely hope that we can bring together as many companies and researchers as possible and that they move into new fields."

TIA nano
Tsukuba Innovation Arena

Establishment of the TIA Headquarters

The Tsukuba Innovation Arena Headquarters (TIA Headquarters) was set up in April 2013 in order to strengthen management and promotion of the Tsukuba Innovation Arena for Nanotechnology (TIA-nano) projects. The TIA Headquarters is an entity directly under the President of AIST that defines the chain of command and responsibility system, speeds up decision-making, beefs up planning functions, and simplifies the user interface. In particular, the office strengthens the management structure of the Super Clean Room (SCR) and executes special measures so that this facility can be utilized 24 hours a day, augments planning and support for projects that utilize TIA facilities, and supports a wide range of R&D in the semiconductor industry.



TIA Collaboration Center

The TIA Collaboration Center opened within the AIST Tsukuba West site in June 2013 as a core facility for the activities of TIA-nano. The building incorporates the TIA-nano Hall that can be utilized for lectures, various nanotech seminars, and meetings of the TIA Networking School of Nanotechnology and it functions as a base for development of next-generation leaders. In addition, it has been outfitted with an open workspace to facilitate discussions between researchers and technicians from various fields as part of its role as an R&D base where open innovation can take place in an efficient manner. Furthermore, a clean room (approximately 1,000m^2) and five laboratories are housed in the wing and coupled with the global leading class super clean-room housed in the adjacent SCR building; integrated processes spanning preparation of samples through to evaluation can be executed.


TIA Collaboration Center


Open workspace

Tsukuba Power Electronics Constellations (TPEC)

AIST established the Tsukuba Power-Electronics Constellations (TPEC) on April 27, 2012 in cooperation with industry as a private sector-type joint research entity utilizing TIA-nano resources. Power electronics is a field in which Japanese industry continues to be highly competitive in global markets. The majority of the budget for the R&D in TPEC is founded by Japanese industrial members. It is a joint private sector-type research entity that administers an open innovation base both autonomously and sustainably. TPEC's aims are open innovation and simultaneous development of superior human resources for the power electronics field.

Twenty nine private sector companies had approved of these objectives as of the end of June 2013 and TPEC is taking up the challenge to realize Japan's first full-fledged open innovation center. AIST is responsible for the management of TPEC as the core organization. In addition, human resource development is promoted with the support of Japanese universities and public research organizations (academic members) that are preeminent in the power electronics field, with University of Tsukuba at the core of these efforts.

TPEC participants

Tsukuba Nanotechnology Human Resource Development Program Summer Schools

Organized by the Tsukuba Innovation Arena for Nanotechnology (TIA-nano), the 1st TIA Summer School for Power Electronics was held at AIST Tsukuba Central for four days from August 27 through 30, 2012. The event was convened with the objective of developing young Japanese human resources to carry the next generation and was attended by 62 graduate students and 53 company employees. Fourteen lecturers delivered an intensive three-day course covering fundamentals through to application, while an exchange meeting for research themes of participants and a facility tour were also carried out. Of particular note was the third day when all the events were conducted entirely in English in anticipation of globalization including lectures by two professors, considered to be authorities in their fields who were invited from overseas, and a panel discussion. In addition, attendance by students from across Japan was facilitated by TPEC subsidizing their travel expenses.

The 2nd Summer School for Power Electronics and the 1st Summer School for Nano-electronics were held in August in the newly built TIA Collaboration Center (AIST Tsukuba West site) as part of the fiscal 2013 TIA-nano Summer Open Festival.

The 1st TIA Summer School for Power Electronics

Completion ceremony of the 1st TIA Summer School for Power Electronics

About AIST

AIST's Research Strategy

AIST aims to solve 21st century problems and to strengthen its functions as an open innovation hub in line with the basic principle "achieving a sustainable society." In our third term (FY 2010 to FY 2014), we have been working on the following four research promotion strategies, in order to contribute to the achievement of the strategic goals set forth in the New Growth Strategy.

I Strategy to promote green innovation

— The challenges of environmental, resource and energy constraints —

Humanity has achieved rapid developments in science and technology, but it now faces critical environmental issues including climate change, as well as resource and energy issues including rare metals and oil. To provide answers to these global issues and achieve a sustainable society, we aim to "promote green innovation," with our main focuses on renewable energy technologies and energy conservation technologies.

- Renewable energy technologies
- Energy conservation technologies
- Technologies for securing and efficiently using natural resources
- Basic material and equipment technologies
- Technologies for reducing the environmental load of industry
- Technologies for evaluating and managing green innovation

II Strategy to promote life innovation

— Working toward healthy and active living —

Japanese people are among the healthiest and longest lived in the world; Japanese peoplel's expectations for high-quality medical services and active lives are continuously rising. At the same time, the aging society means that the burden of elderly care is becoming a serious problem. To meet the expectations of the people and deal with the emerging problems, we aim to promote life innovation across a range of technological fields including biotechnology, the development of medical equipment and nursing care robots.

- Health preservation technologies
- Technologies enabling healthy lifestyles
- Health and safety technologies

III Strategy to promote the development of cutting-edge technologies

— Supporting science and technology in Japan and international competitiveness —

Research and development in cutting-edge technologies is vital for supporting a nation built on science and technology and for improving the international competitiveness of Japanese industry. We aim to be a source for new innovations, creating new technologies and new industries in telecommunications, device technologies, system technologies, technologies for producing innovative materials and systems, and support technologies for service industries.

- Telecommunications device and system technologies
- Technologies for producing innovative materials and systems
- Support technologies for service industries

IV Strategy to develop and promote the intellectual infrastructure

— Contributing to innovation and to safety and security —

Our intellectual infrastructure underpins economic activity in Japan and is the systematization of patents and copyrights, specifications and standards, and the outcomes of research and development. Strengthening our intellectual infrastructure is particularly important for a country that is poor in natural resources. AIST's responsibilities include representing Japan in international activities relating to measurement standards, legal metrology and geological surveys. By the consolidation and refinement of such standards, we will strengthen the industrial infrastructure of Japan.

- Measurement and evaluation infrastructure
- Measurement standards
- Geological surveys

Toward the Opening of the Fukushima Renewable Energy Institute

In response to the government's "Basic Policy for Reconstruction from the Great East Japan Earthquake," AIST is setting up the Fukushima Renewable Energy Institute (FREA). This will be a new base for promoting renewable energy research and development that will be open to the world. The facility is being constructed in the Koriyama Seibu Industrial Park (2 Machiike-dai, Koriyama, Fukushima), which was launched in October 2013. FREA is scheduled to open in April 2014.

FREA will have a Main Research Building, an Annex Experimental Building and a Demonstration Field on a site of approximately 55,000m^2. The Main Research Building is a four-story building with a seismic isolation construction (total floor space 6,900m^2), with rooms including 46 laboratories and six meeting rooms. It is specified to high environmental standards, making use of natural lighting, natural ventilation, and an air-conditioning system that uses a ground source heat pump. The Annex Experimental Building is a single-story building (total floor space 4,600m^2), divided into three specialized experimental areas, and is equipped with large-scale equipment such as a solar cell module production line. The demonstration field will include power generation equipment such as a solar array (about 500kW), wind turbines (about 300kW) and a hydrogen cogeneration unit (about 100kW); energy storage equipment such as hydrogen carriers (about 100kW×300hours) and battery storage (about 100kW×4hours); and heat utilization equipment for sources such as ground source heat and solar heat. The demonstration field will advance experimental research into energy management and is intended to supply around half of the electric power consumed by the Institute.

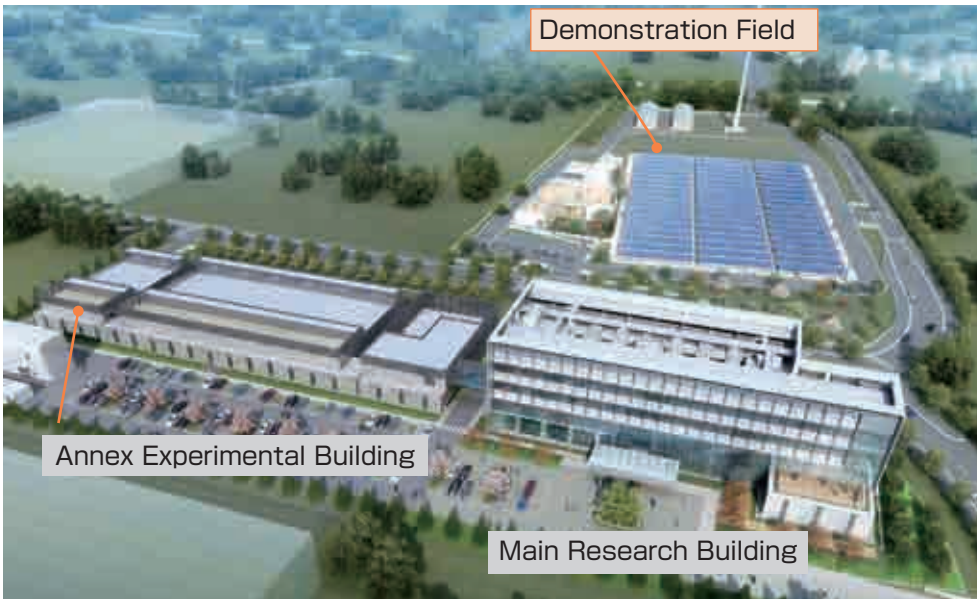
With the objective of large-scale deployment of renewable energy, we hope to solve various technical problems and have set the following basic goals for FREA:

(1) To develop integrated system technologies for driving power electronics from different forms of energy storage such as hydrogen and storage batteries, and to demonstrate a model energy system using a high proportion of temporally varying renewable energy.

(2) To conduct research and development into innovative technologies such as cheap and lightweight photovoltaic modules, and to achieve large reductions in costs.

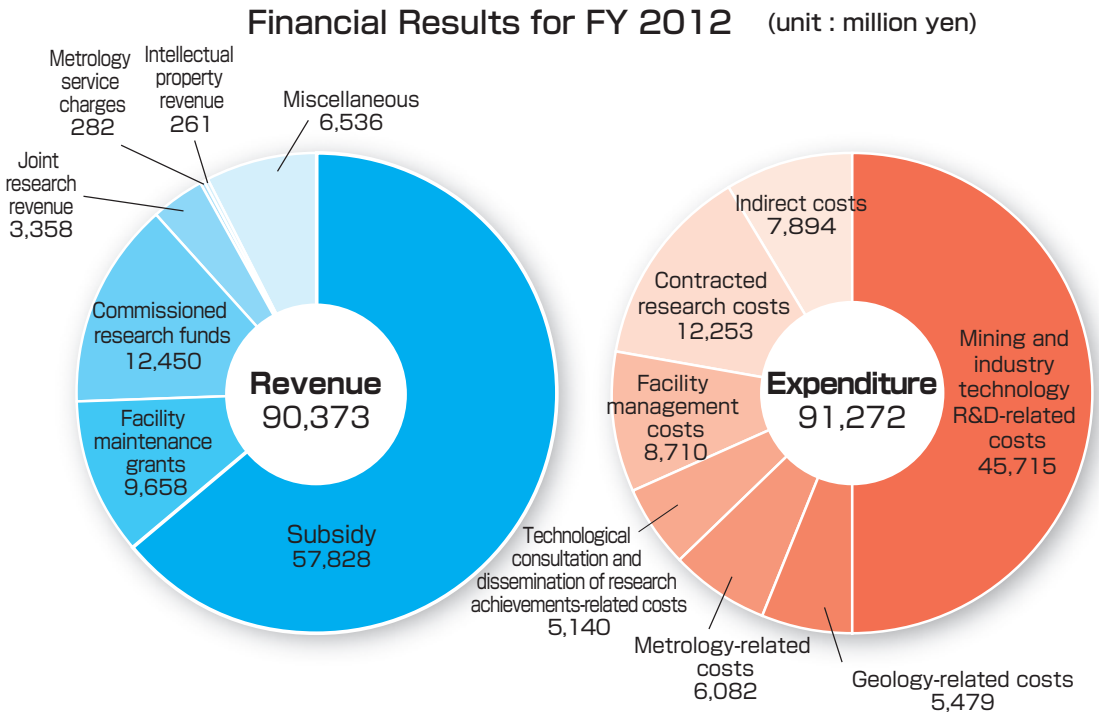
(3) To construct and provide access to a database of renewable energies, including geothermal energy and ground source heat, in order to support the wider use of reliable technologies and social acceptance.

In the lead-up to the opening, we held a symposium, "New Fukushima Research Base: Renewable Energy Symposium," in Koriyama city in March 2013. More than 300 participants attended, strengthening the relationships between local people and many of the people involved in the institute. In the future, we hope to take advantage of various opportunities to spread knowledge of FREA, to strengthen collaboration with research institutions and universities inside and outside Japan, including the Fukushima Technology Centre and the four universities in the prefecture (Fukushima University, Nihon University, the University of Aizu, and Iwaki Meisei University), and with local businesses and other related businesses, and to make it a base for research and development at the global cutting edge of renewable energy.

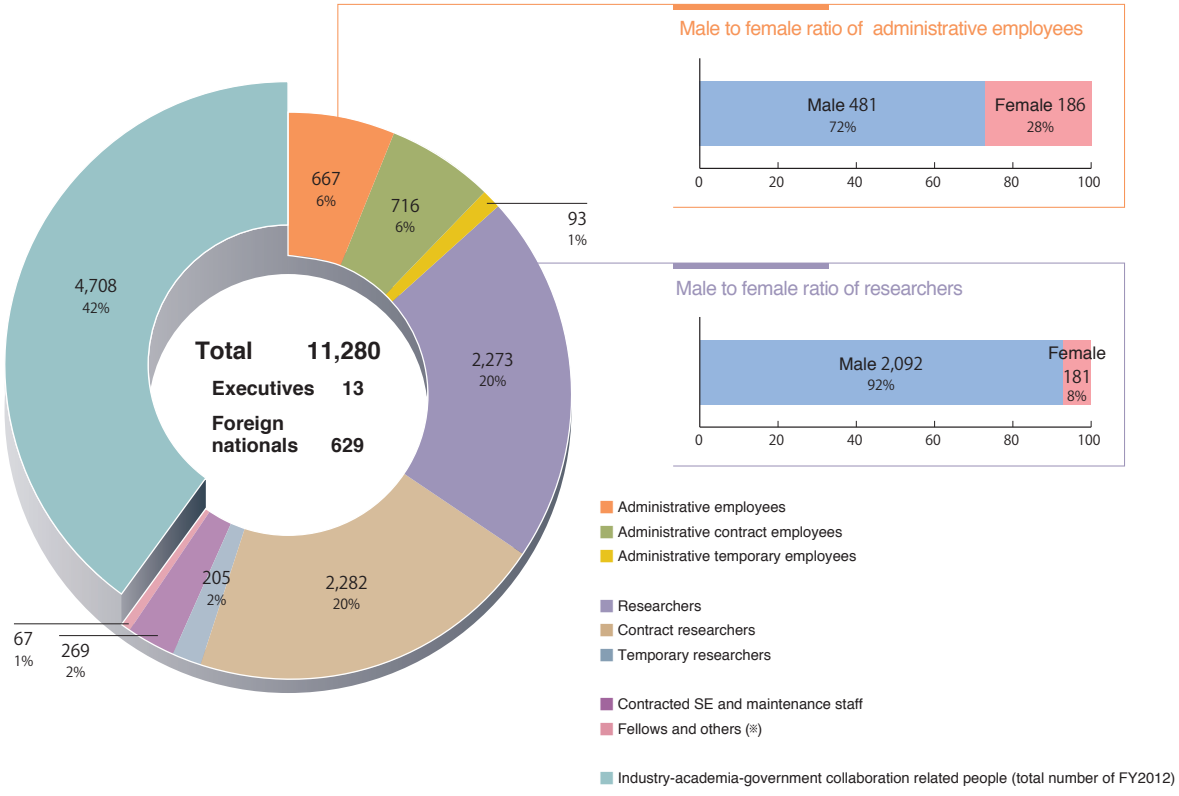


Organization Chart (April 1, 2013)

Revenue and Expenditure



Staff (as of March 1, 2013)



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

Promotion of Compliance

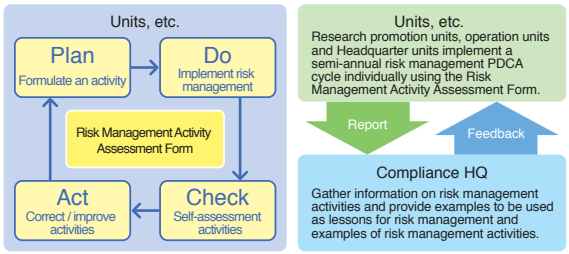
The Compliance Headquarters supports the activities that promote compliance of the units and employees of AIST. We believe that it is important to raise consciousness for compliance on an individual basis, and measures are taken to encourage, rather than force, voluntary compliance by the employees.

In FY 2012, the "compliance training sessions" were conducted to provide the basic knowledge of compliance to the new employees and contract employees.

To increase the individual's consciousness for compliance and to reinforce the basic thinking, the "compliance self-check" was conducted once a year (undergone by a total of 5,645 people). As part of the compliance promotion activities and to deepen the understanding of compliance using familiar cases, four "Compliance Newsletters" were issued and delivered to the employees.

As a risk management activity, risk management planning was done at each unit and self-evaluations were conducted twice a year (every half year) to thoroughly implement the PDCA cycle of risk management. To share information and to nurture consciousness for risk management, the "Case Studies of Risk Management Activities" and "Instructive Cases of Risk Management" were released on the intranet as reminders of this issue.

PDCA cycle of Risk management



Disclosure of Information and Protection of Personal Information

Disclosure of information

Based on the "Act on Access to Information Held by Incorporated Administrative Agencies, etc." (effective since October 1, 2002), AIST actively discloses information through its website and others to ensure the accountability for the various activities conducted at the research institute.

In FY 2012, the layout of the official website showing the items disclosed based on the Act was revised and some links were added, to make the site user friendly.

Protection of personal information

Based on the "Act on the Protection of Personal Information Held by Incorporated Administrative Agencies, etc." (effective since April 1, 2005), AIST established the "Privacy Policy" and the "Rules on Protection of Personal Information of AIST," to protect the rights and interests of the individual while ensuring the appropriate and smooth operation of the research institute.

Every year, the "Personal Information Protection and Information Security Self-Check" is conducted to execute appropriate management of information including personal information and to raise the consciousness for compliance to information security.

Information disclosure desk and personal information protection desk

The requests for disclosure based on the "Act on Access to Information" and the "Act on the Protection of Personal Information" are received through the desks and the website of AIST Tsukuba and other regional bases (only the request for information disclosure is accepted through the website). Each desk also provides help on the procedures for disclosure and personal information protection.

Number of requests for disclosure of information and personal information

FY	Information disclosure	Personal information
2010	10 Cases	11 Cases
2011	3 Cases	0 Cases
2012	6 Cases	3 Cases

Evaluation of Research and Research-related Activities

AIST evaluates its research units (research institutes, research centers and research laboratories, which comprise the main part of AIST). Administrative departments are also evaluated for their services, as well as for their efficiency and execution of their affairs.

The evaluation is aimed at the following: ① the promotion of R&D of research units and research-related activities, ② the improvement of decision making, ③ the attainment of transparency and fostering of public understanding through the publication of the evaluation results.

The evaluation committee consists of specialists and experts from within and outside of AIST. The results of the evaluations including comments and ratings are reported to the President of AIST and the final reports are released to the public.

●Evaluation of research units

AIST lays weight on evaluation of "outcome" leading to innovation. Research units are evaluated every two years, and the year without the above evaluation, research units exchange views with the evaluation committee to obtain advice for their activities.

The evaluation committee for each research unit is composed of 5 to 7 external specialists and 2 principal reviewers from AIST. The external specialists are requested to evaluate from the viewpoints of: ① technology and science, ② business management, and ③ society.

In fiscal2012, evaluations were submitted for 21 research institutes and 9 research centers, 11 research centers exchanged views with their respective evaluation committee in order to obtain advice for their activities, and 1 new research center was evaluated for its research and management plans. The total number of external specialists who participated in the evaluations was 245.

The rating scale is as follows: "A": Superior (4 points), "B": By and large appropriate (3 points), "C": Improvement required (2 points), "D": Inappropriate (1 points), and only for highly evaluated cases, "AA": Particularly superior (5 points).

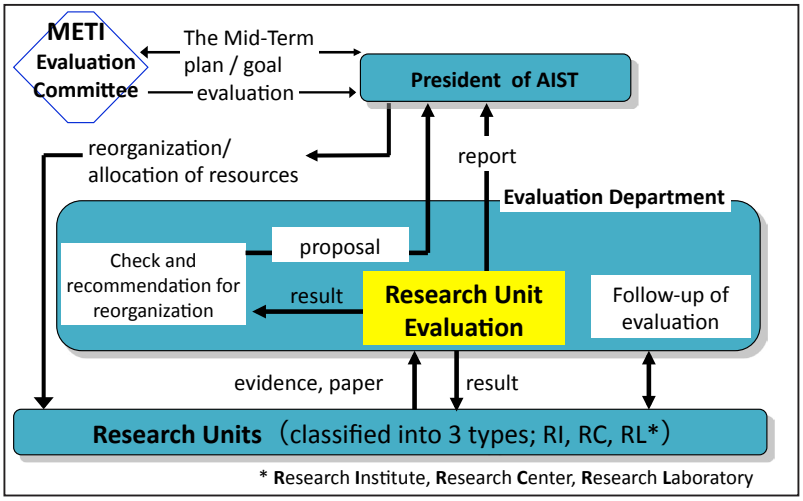
The average rating was 3.8 points for the research units as a whole, 3.8 points for research institutes, and 3.9 points for research centers. These results were almost the same as last year.

●Evaluation of research-support and administrative departments

During the Third Mid-term period of AIST, the activities of the headquarters and branches are evaluated on "vitalization of regions," "promotion of innovation," and "development of human resources for industry" The evaluation aims to upgrade activities by clarifying status of achievements, results, and issues of closely linked individual activities as well as the activities as a whole. This leads to continuous efforts in solving issues.

In fiscal 2012, 8 regional research bases of AIST were evaluated for their local activities. They were evaluated on "efforts and accomplishments leading to the vitalization of regions and AIST," and "technical support and personnel training for small- and medium-sized enterprises."

In addition, Research and Innovation Promotion Headquarters exchanged views with the evaluation committee in order to obtain advice for their activities related to the promotion of innovation and the development of human resources for industry.



Extending Lifetimes and Evaluating Reliability of Photovoltaic Modules

Japan has excellent solar power generation technology but has fallen behind in international competitiveness. At AIST Kyushu, to address this problem, we have set up a cooperative research body in the form of a consortium spanning the divides between manufacturers. We have delivered a range of results that have attracted attention in Japan and abroad.

Outdoor exposure test facility for modules

Full size module test production and evaluation line

Module components as the key to international competitiveness

Japan's solar power industry has fallen from a previous 50% share of the world market to less than 10%. Improving our international competitiveness is an urgent problem. There are three requirements for improvement: improving conversion efficiencies, reducing production costs, and improving module reliability and service life. Considering the last of these, the key to extending service life is frame components rather than the cells themselves. Photovoltaic cell performance cannot be maintained over long periods unless module components and module production processes are improved to assure encapsulation.

Therefore, in order to drive research and development together with industry, we set up the "Collaborative Module-Reliability Research Team" at AIST Kyushu in October 2010. We are test producing and evaluating high added-value modules and evaluating power outputs and long-term reliability outdoors.

According to Atsushi Masuda, Leader of the Collaborative-Research Team, "Research and development through collaboration among different fields is necessary for the development of the solar power industry. AIST, in its role as an open innovation hub, aims to raise the technological level of the whole country. In the first phase, which lasted two years, we concentrated on providing a site for testing and demonstration of modules. In the second phase, which started in 2011, we have made a shift to more fundamental research. We have strengthened our collaboration with both component manufacturers and solar cell manufacturers. The result is a structure that has been established for the whole of Japan.

Reducing the costs of power generation by technological innovation

The members of the consortium study are linked by a strong sense of mission, understanding that "unstinting efforts to lower the costs of generation through technological innovation are necessary for solar power to become a serious energy source." AIST Kyushu is the only academic or research institution in Japan to have a full-size module test production/ evaluation line and a long-term outdoor exposure facility. Use of these facilities is enabling the consortium to deliver a range of research results.

One example of these results is the discovery that the cause of degradation of solar cells is not water but acid. Previously it was believed that suppressing the permeation of water vapor through the backsheet was the key to extending lifetime, but we have established that the proximate cause of degradation is moisture reacting with sealing materials and producing acid. Accordingly, we have presented new guidelines for component design.

Another result attracting attention is the anti-PID (potential-induced degradation) technology that Senior Researcher Kohjiro Hara has been working on: "PID is a phenomenon that greatly reduces the output of solar panels in megasolar arrays. To suppress PID, we developed a technology in which a glass substrate is coated with a thin film of a composite metal compound based on titanium oxide. We will continue the research and try to identify the mechanism behind the PID phenomenon. If we can make low cost, long-life modules with high efficiencies by following this line of research, solar power generation will become more widely used without relying on government support, and the related industries can be invigorated. That's what I am seeking to achieve."

Local industries and technologies in Saga Prefecture, which has a strong ceramics industry, are playing an active role in the research into PID.

International standards for measuring reliability

There is still another problem. However excellent the solar cell modules we develop through technological innovation may be, they cannot be marketed to the world without being credibly evaluated. However, there is currently no measure for evaluating long-term reliability, and definitions of service life are inconsistent. To overcome this situation,

Senior Researcher Takuya Doi is working on the development of new reliability testing procedures.

Temperature and humidity test apparatus for developing reliability testing methods.

"Japanese solar cells have good quality, but with the current IEC (International Electrotechnical Commission) standards, it is not possible to differentiate the quality. Therefore, I am working to create a testing procedure that can identify the good ones as good and the poor ones as poor. I'm also creating a testing procedure to reproduce the problems that become apparent outdoors."

In the "Asia Standards and Conformity Assessment Promoting Project" we have investigated the increasing burden of IEC standards testing (longer testing time, increase in testing cycle, combination of different tests) in cooperation with the Photovoltaic Power Generation Technology Research Association, Japan Electrical Safety & Environment Technology Laboratories, and Saga Prefecture. We are establishing a consortium to develop testing methods that reproduce degradation in outdoor environments, including tests that address multiple degradation factors and tests that shorten testing times. Collaborative-Research Team Leader Masuda has set a goal of "creating test procedures that can identify long-term reliability, with the aim of proposing them for future international standards."

Our mission to develop personnel and contribute to the region

The consortium study at AIST Kyushu has a number of other goals; the aim is to achieve a wide range of contributions.

First, there are contributions from the release of results and the development of human resources. Collaborative-Research Team Leader Masuda says "We want the knowledge obtained by the consortium study to be useful to the whole of Japan's solar power industry," so the outcomes of the research are being released. He also takes the view that "Presenting the fruits of the research to the outside world contributes to the education of young researchers. Personnel development underpins the sustainable growth of industry, so this is an important objective."

Second, there are contributions to academia. The tendency in Japan has previously been to focus on the development of photovoltaic cells. Now, however, the activities of the consortium study are attracting attention and academic societies are becoming active in the field of modules. We anticipate that many more researchers will be getting involved in the future.

Third, we are making contributions to the region. There is a cluster of solar cell module component manufacturers and related businesses in Kyushu, and solar generation is becoming more widely used in private homes. AIST is strengthening collaboration with public testing and research institutions in Kyushu, as well as the Saga Prefectural government, with whom we have concluded a comprehensive agreement. AIST is working to return the fruits of research to local enterprises. Recently, we have been undertaking research into the particular characteristics of the region; for example, we have been investigating the effects of volcanic ash on solar cell modules in Kagoshima Prefecture.

In these ways, AIST Kyushu is building up the potential of Japan's solar power technology and is bringing new strength to related industries in Japan.

Leader
Collaborative Module-Reliability Research Team
Research Center for Photovoltaic Technologies, AIST
Atsushi Masuda

Senior Researcher
Collaborative Module-Reliability Research Team
Research Center for Photovoltaic Technologies, AIST
Takuya Doi

Senior Researcher
Collaborative Module-Reliability Research Team
Research Center for Photovoltaic Technologies, AIST
Kohjiro Hara

A Gift from the Earth: Making Use of Geothermal Power and Ground Source Heat Energy

All eyes are on geothermal power and ground source heat energy as a trump card for beating energy problems and environmental problems. Japan has both the resources and the technologies, but development has been sluggish so far. Now, however, a long-awaited shift to serious development and wider use is starting to take place.

Renewed attention to heat resources in the Earth

There has recently been interest in geothermal power generation and air conditioning that uses ground source heat. Geothermal power utilizes high temperature heat resources in the deep underground, while ground source heat utilizes temperature differences between the shallow underground and the ground surface. Both have great benefits, such as being highly effective at reducing carbon emissions, using purely domestic resources, and being steadily available regardless of the weather.

The reasons geothermal energy is still not used at a larger scale are intimately connected with energy policy. Specifically, the development of geothermal power has tended to advance for a while after the oil crisis in the 1970s but then new developments came to a halt when oil supplies were eased. Now geothermal energy is in the spotlight again because, in the context of global environmental problems and the effects of the Great East Japan Earthquake, interest in renewable energy has risen in the last few years. A series of supportive measures have appeared, such as a system of subsidies for the installation of geothermal energy and a system of purchasing electricity generated from renewable sources at fixed prices. This is an excellent opportunity for development and scaling up.

Research group leader Keiichi Sakaguchi, who has been studying geothermal power for thirty years, is enthusiastic: "This is a critical time, a fresh start for research. If we can successfully develop geothermal power, it will be a useful resource for society forever. I hope it doesn't end up as a short-lived fad but becomes firmly established as one of the sources of the energy that Japan's future will depend on."

High-reliability evaluations of potential

So, what thermal resources are there under the ground, and where are they? Answering this as accurately as possible is fundamental to the wider use of geothermal energy. Therefore, AIST has been proceeding with the creation of geothermal resource maps and ground source heat potential maps using accumulated data on geology and groundwater throughout Japan for over 120 years, and developing new survey and evaluation methods.

Keiichi Sakaguchi is working on modeling research of geothermal systems based on geological surveys of volcanic regions, and on evaluations of geothermal resource levels based on data in geothermal resource maps published by AIST. The results will be useful as reference resources for energy policy and geothermal energy development.

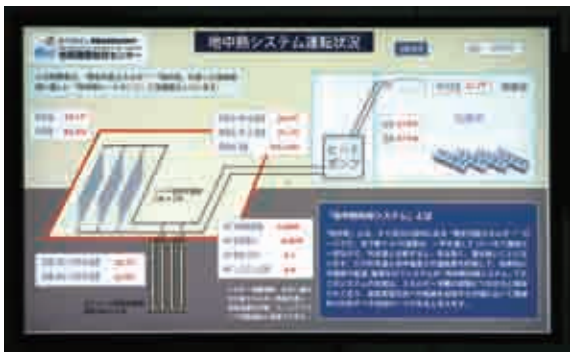
Research group leader Kasumi Yasukawa is evaluating geothermal resources by geophysical methods especially by self-potential. Three factors are essential for geothermal development: heat supply, water supply and reservoir extent. Among these factors, reservoir extent and water flows can be estimated by self-potential (electric potential) mapping on the ground surface so that the possibility of long term power generation can be evaluated.

In addition, because geothermal fluid is dynamically moving under the surface, monitoring technologies after development are important to observe subsurface changes during plant operations. The self-potential method can be applied also for such monitoring.

Meanwhile, senior researcher Youhei Uchida of the Groundwater Research Group is working to develop evaluation methods for ground source heat exchange potential that combine field surveys with numerical analyses, in order to prepare potential maps for ground source heat exchange. Considering ground source heat exchange from a hydrological perspective is a characteristic feature: Groundwater flow systems over large areas can be investigated by using subterranean temperature distributions as a tracer. Subterranean information and data have been continuously collected and managed to promote the installation of ground source heat pumps.

Multi-stage applications and fostering geothermal power generation

Japan, with its many volcanoes, is the third richest country in the world in geothermal resources. About 80% of these resources are within national parks, so exploitation is restricted. However, with a relaxation of the restrictions in March 2012, the possibilities for development have opened up, subject to certain conditions. As to how geothermal resources are used, Kasumi Yasukawa focuses on cascade use of thermal heat: "The ideal way to use thermal energy is cascade use from high temperature to low temperature applications. For example, after heat energy from original hot fluid is used for binary power generation, the temperature of the fluid is lower than the original, but still high enough to be used for food



Geothermal heat pump system installed in the Geological Museum in July 2013

processing or bathing. Even after being used for food processing or bathing, it can be used for greenhouses and/or fish culturing, snow melting and so forth."

The city of Yuzawa in Akita Prefecture provides an example of promoting both thermal power generation and direct utilization of heat. Keiichi Sakaguchi has high hopes: "Yuzawa Geopark is running a project using geothermal resources throughout the area and helping to promote the area. Geothermal energy is one of the region's treasures; geothermal energy development and application there is very impressive."

In 2012, NISTEP Award was given to Kasumi Yasukawa by the National Institute of Science and Technology Policy, for her achievements in spreading understanding of geothermal power among the wider public. To further expand installation of geothermal power, she makes the following suggestion with a friendly face: "The most efficient way of geothermal power development is to begin with a small scale and grow it substantially with time. What I mean is that a power production can be put in operation with a small unit with only a single production well or a few wells at most, and then the scale may be enlarged after the reservoir characteristic is well evaluated after a few years of operation. Its image may be better expressed by a botanical plant rather than an industrial plant: putting roots into the ground and gradually growing the surface parts with growth of roots. That is more environment-friendly, too. We can also make environment-friendly designs of geothermal power plants."

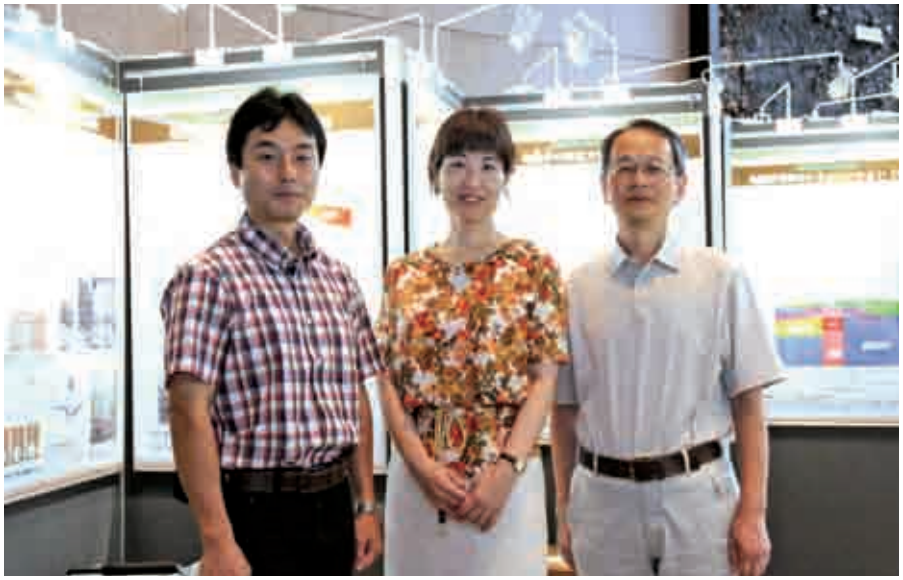
Developing ground source heat systems specific to Japan

Initially, the use of ground source heat was most widespread in the regions of Hokkaido and Tohoku. Recently, however, installations have been proceeding in various places, such as in the vicinity of the Tokyo Skytree tower and the international terminal of Tokyo's Haneda Airport. Future possibilities are enthusiastically described by Youhei Uchida.

"My objective is to make an effective use of data on regional geologies and groundwater flow systems, and to propose ground source heat exchange systems that are specific to Japan. For example, there are two kinds of ground source heat pumps, one in which large amount of groundwater is directly drawn up and used, and one in which groundwater is not extracted, instead, a heat exchanger is used which can be installed anywhere. It is also possible to recover and use the heat of spring water. In areas of high housing density, it will be efficient to install a single heat exchange well for a number of houses and share the ground source heat energy.

"Another point is that, from agricultural research, we have found that productivity rises when the roots of crops in hothouse cultivation are cooled in the summer. Only heating has been applied in usual hothouses but it is also possible to use ground source heat for cooling. Therefore, the field of agriculture is also starting to make use of ground source heat energy."

Clean ground source energy is steadily spreading its roots throughout Japanese society, from private homes to large commercial buildings and public facilities, and even into industries.



From left:

Leader, Team
Shallow Geothermal and Hydrogeology Team
Renewable Energy Research Center, AIST
Youhei Uchida

Principal Research Manager
Renewable Energy Research Center, AIST
Kasumi Yasukawa

Innovation Coordinator
Fukushima Collaboration Office
Fukushima Renewable Energy Institute, AIST
Keiichi Sakaguchi

World-Leading Technologies Transforming Windows and Wood

Two technologies developed at AIST Chubu in Nagoya City are currently attracting huge interest: light-modulating mirror glass and flow-molding of timber. Both are good for the environment, and are world-leading revolutionary technologies that are being steadily brought closer to commercial application by collaborative research.

Reducing air conditioning loads in summer with switchable mirror glass

Leader
Energy Control Thin Film Group
Materials Research Institute for Sustainable Development, AIST
Kazuki Yoshimura

We have developed a switchable mirror glass, transparent glass that can instantaneously become a mirror and just as quickly become transparent again. This switchable mirror glass can be readily switched any number of times.

Research group leader Kazuki Yoshimura enthusiastically explains: “The energy conservation performance of a window depends on thermal insulation and shading performance. Our aim is to raise shading performance of the window above any previous glass and to reduce summertime air conditioning loads. AIST is the only institution in the world that is conducting commercialization research on switchable mirror windows.” Since this research began in 2001, we have made remarkable improvements in visible light transmittance in the transparent state, durability, switching speed and other characteristics. In particular, by using a magnesium–yttrium alloy thin film, we realized a switching durability beyond 10,000 cycles in September 2012. Then, in January 2013, we achieved a revolutionary development in the switching system.

“In previous switching systems using gas, a gas containing hydrogen or oxygen that is produced by electrolyzing water flowed into a gap of about 5 mm between two panes of glass. In the new system, the two panes of glass are placed very close together, leaving a gap of around 0.1 mm into which the gas can flow. In this system, water vapor in the air is used so there is no need for water for electrolysis. Therefore, the amount of hydrogen produced is tiny and can immediately be absorbed into the switchable mirror thin film, and this improves safety. Moreover, even conventional glass can be used simply by taping the switchable mirror sheet to the glass, and the limitation of the system only being usable in pair glass no longer applies. Because this is a sheet, it can be produced as a thin film in a roll, unlike glass plate, so productivity is good and costs can be greatly reduced.”

Prospects for wide-ranging application in buildings and vehicles

A succession of businesses have contacted us to say that they would like to commercialize this switchable mirror glass, and our collaborative research is making excellent progress. We anticipate applications including windows in buildings, automobiles, trains and airplanes. In particular, glass-walled buildings have become more common in recent years, and great effects on energy conservation can be expected from using the switchable mirror glass in these buildings. Car companies are also interested, because a car’s windows can be shaded with a single switch when the car is parked on a hot summer day. Kazuki Yoshimura is clearly pleased: “We are developing all sorts of applications through collaborative research with businesses, and we really want to see this technology being commercialized. This is a critical time.” The market is full of possibilities for this technology to spread throughout the world.

Even now, we have already commercialized a

Testing the energy conservation capabilities of switchable mirror glass that can be installed in buildings

hydrogen-visualizing sheet, which uses the property of the optical characteristics changing when in contact with hydrogen and applies the technology to a completely different application, as a simple hydrogen detector. We are currently making progress in the development of a hydrogen sensor that can more specifically measure hydrogen concentrations.

In 2010, the members of Kazuki Yoshimura's Energy Control Thin Film Group were awarded the Tanahashi Technical Development Award by The Electrochemical Society of Japan for their research into switchable mirror glass. The group has continued to present useful results, renewing interest in light-modulating materials and invigorating research into switchable mirror materials in Japan.

Flowing wood cells to create shapes

Wood can be easily changed in shape, like a viscous material, and can be stretched out thin, like a metal. Flow-molding of wood is a world-leading technology for transforming the concept of wood. There has been a flood of interest in this from many businesses, and we are currently proceeding with twenty collaborative studies.

Group leader Kozo Kanazawa, who is working on this research, was originally a specialist in metal processing. When he first started dealing with wood, he was ambivalent about it: "I wouldn't even say the word 'wood'. I used to talk about 'porous materials'!"

The research first started with forming logs into square shapes by compaction molding, which was followed by the discovery of a phenomenon of intercellular layers becoming slippery in repeated tests of powder molding. This progressed to a technology for freely molding wood without cutting it.

"If you compare the structure of wood with reinforced concrete, the cellulose is like the steel and the lignin is like the concrete. The key to molding is softening the lignin. When there is a high water content, it tends to become slippery, but if some additive other than water is added, the lignin becomes much softer. It is important to investigate which additives provide which characteristics. This is similar to alloy design, creating alloys to meet particular needs, so I call it wood alloy design."

Another important topic is the development of tools. The material characteristics of a mold and surface treatments must be changed in accordance with what is being molded, so we are researching in collaboration with experienced molding engineers and we are clearly building up our capabilities.

Materials to replace plastics and metals.

Kozo Kanayama's goal is industrial production of products that are currently made of plastic or metal, such as automobile parts, household electronic products and building materials, by flow-molding of wood. Wood is a renewable resource, which is good for the environment, and levels of carbon dioxide fixing can be increased by appropriate planting and felling. Flow-molding can be used for all different kinds and forms of wood, including wood from forest thinning and bamboo, which grows fast and can be harvested regularly.

Prototypes (cups, speakers with wooden cones, etc. produced using fused pine, bamboo and plum wood)

One practical application for which we have high hopes is window sashes. "Wood can be comfortably touched with bare hands from –20 °C to 100 °C, because its thermal effusivity is excellent. Wooden sashes do not become so hot as to cause burns in midsummer nor so cold as to freeze up in midwinter, and are free of condensation. If there is a fire, they will not melt or warp, and they can block the spread of fire. What's more, if used as frames for light-modulating mirror glass, they provide a synergy and energy conservation effects are improved. Even though the surface area of the frame itself is small, this is a valuable effect."

The technology can also be applied to composite materials of plastic and wooden materials. A Japanese Industrial Standard covering these composite materials is currently being prepared.

We are still making further advances with this flow-molding technology. Wood alloy design, mold development and research into practical applications are progressing together, and in the future we may see it being used for completely unforeseen applications and as yet unimaginable products.

Leader
Advanced Wood-based Material Technology Group
Materials Research Institute for Sustainable Development, AIST
Kozo Kanayama

Open Innovation

Reinforcing functions of an open innovation hub

For the Japanese industry to recover its dynamism and to grow, industrial re-creation based on industrial technologies is essential. Leading the world in the creation of businesses of innovative technologies, in other words, the enhancement of industrial competitiveness through continuous creation of innovations is required.

On the other hand, shifting production overseas is inevitable for Japanese enterprises due to market reduction in Japan and rapid growth of market size in emergent countries. Moreover, it is getting more and more difficult for private companies to do basic research and development independently. Under these circumstances it is necessary for a governmental research institute to try to establish hubs for R&D, standardizations and human resource developments, for example, which promote innovations inside the country in order to maintain domestic employment both in quality and in quantity.

Being one of the largest public research institutions in Japan, AIST plays a central role as the open innovation hub for government-industry-academia collaboration by utilizing its human resources in various research fields, leading-edge infrastructures, accumulated research findings, systems for technology fusions and personnel training, and regional research bases and their networks.

On this account, AIST promotes appealing research projects for industry by gathering a variety of personnel, organizations and institutes, and an effective utilization of international networks.

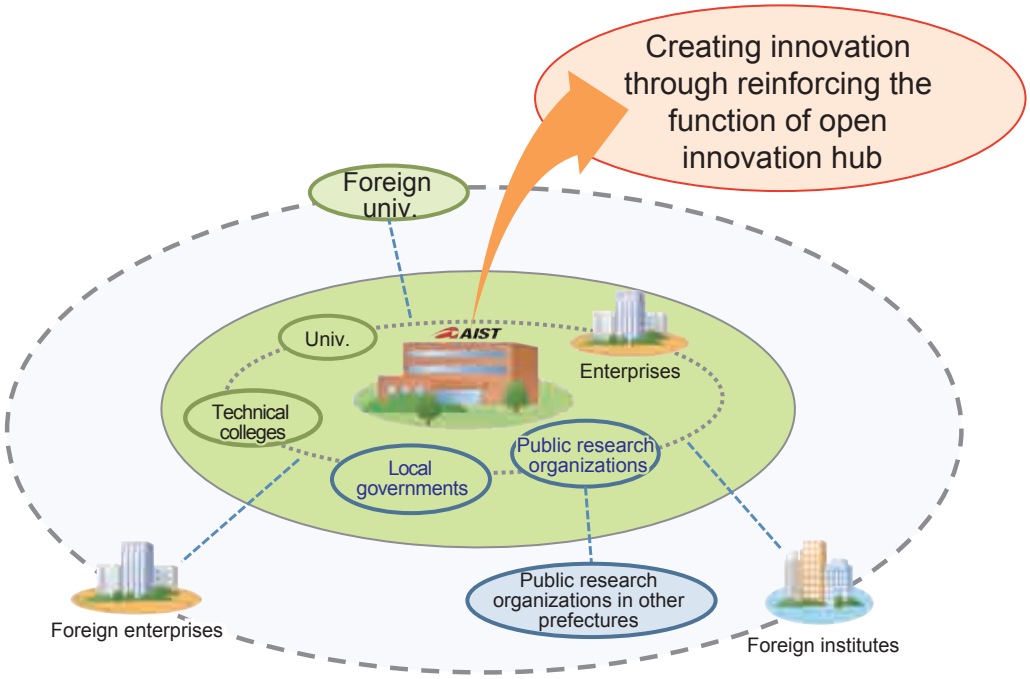
Furthermore, AIST continuously promotes the accumulation of research findings, upgrading of leading-edge infrastructures, and training of personnel, and enhances the support system for research development and industrialization from mid-and long-term perspectives.

In concrete terms, we try to deliver on our strategy in 3 stages for reinforcing functions of an open innovation hub, and promote green innovation, life science-based innovation etc.

Stage 1: creating promising seeds
- Development of function of utilizing research achievements
- Gathering and development of talents

Stage 2: developing outstanding technology
- Enhancement of collaboration with industry
- Promotion of open innovation in regions
- Reinforcement of hub function by internationalization

Stage 3: establishing paths to the market
- Preparation of strongholds
- Enhancement of networks with industry



AIST Open Lab (AIST Tsukuba)

The AIST Open Lab held on October 25 and 26, 2012 at AIST Tsukuba was the fifth of such an event. A total of 4,761 people visited the venue. This event was held with the objectives of presenting the research results and showing the research resources such as the laboratory equipment and shared facilities, to the corporate managers, researchers and engineers, and the people of universities and public research institutions, to seek opportunities for expanding and strengthening cooperative relationships with AIST. Panel displays of about 420 research topics were presented by the research bases throughout Japan. About 100 laboratories in Tsukuba were opened to visitors. In addition to the lectures on hot topics in various research fields, there were talks about innovations and responses to globalization by the corporate leaders. Afternoon Café and Evening Café were held, and there, the researchers offered easy-to-understand explanations about their research and background to the visitors through direct communication.


Lecture


Lab tour


Panel display


Evening Café

The Vitalization Council for Industrial Technology of Japan

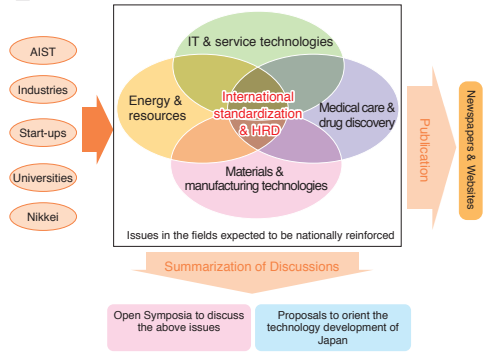
The Nikkei Inc. and AIST share a common awareness that the re-creation of industry based on the internationally competitive industrial technology is essential for Japan to reemerge as a powerful economic nation after the Great East Japan Earthquake. Unless the foundation of innovation is set firmly now, Japan may lose the propulsion of growth for its future, as the competition to become an industrial state is becoming fierce among other nations. Therefore, "the Vitalization Council for Industrial Technology of Japan" was established on October 1, 2011.

With the participation and cooperation of major Japanese companies and universities, "the Vitalization Council for Industrial Technology of Japan" organizes symposiums in the four fields: 1) energy and resources, 2) innovative medical care and drug discovery, 3) IT and service technologies, and 4) state-of-the-art materials and manufacturing technologies. At the symposiums, the direction of the technological development and the issues that must be solved were discussed, as well as the trans-disciplinary topics such as human resource development and international standardization. "Revitalize Japan by Creating Products, Values, and People," a proposal to break the stagnation of the Japanese economy, was released in December 2012. The proposal will be followed up, and new topics will be discussed in the future.

Website for "the Vitalization Council for Industrial Technology of Japan": http://www.aist-renkeisensya.jp/ind_tech_council/


Lecture


Pamphlet



Outline

Participation in Technology Research Associations

AIST supports the research association activities by becoming a member of the Technological Research Association (hereinafter, TRA) where the members share the researchers, research funds, and facilities to develop various individual technologies. AIST contributes to the TRA activities from the planning and implementation of research all the way to the utilization of results. AIST functions as the place where diverse organizations, people, and their knowledge interact, by providing its "people" and "place" to the TRA projects in hopes of promoting open innovations.

The "people" of AIST participate in TRA as researchers, project leaders, or administrators. The AIST facilities and equipment are provided as the "place" where the industrial and university researchers of TRA may concentrate on their researches.

Participation to TRA (FY 2012)

- AIST joined 20 TRAs (total number of TRA members excluding AIST: 308 companies, 27 organizations, 11 universities)
- Conducted intensive research at AIST (A in Table, 17 TRAs)
- AIST researchers acted as project leaders in charge of entire project management (B in Table, 7 TRAs)
- AIST staff assigned as directors (C in Table, 15 TRAs)
- AIST provided technical guidance, support, and know-how of equipment use

List of TRAs in which AIST participates (as of March 31, 2013)

	Name of TRA	
1	Photovoltaic Power Generation Technology Research Association (PVTEC)	A B C
2	Bio Electro-mechanical Autonomous Nano Systems Laboratory TRA (BEANS)	A
3	Lithium Ion Battery Technology and Evaluation Center (LIBTEC)	A C
4	Fuel Cell Cutting-Edge Center Technology Research Association (FC-Cubic)	A C
5	Advanced Laser and Process Technology Research Association (ALPROT)	A C
6	R&D Partnership for Future Power Electronics Technology (FUPET)	A B C
7	Technology Research Association for Single Wall Carbon Nanotubes (TASC)	A B C
8	Epigenomics Technology Research Association (EPiRA)	
9	International Standard Innovation Technology Research Association (IS-INOTEK)	
10	Stem Cell Evaluation Technology Research Association (SCETRA)	C
11	Photonics Electronics Technology Research Association (PETRA)	A C
12	Chemical Materials Evaluation and Research Base (CEREBA)	A C
13	Advanced Printed Electronics Technology Research Association (JAPERA)	A C
14	Technology Research Association for Next-generation Natural Products Chemistry	A B C
15	NMEMS Technology Research Organization Technology Research Association (NMEMS)	A B C
16	Control System Security Center (CSSC)	A C
17	Fine Ceramics Research Association (FCRA)	A
18	Minimal Fab Development Association	A B C
19	Technology Research Association of Highly Efficient Gene Design (TRAHED)	A
20	Technology Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM)	A B C

An example of a technology research association

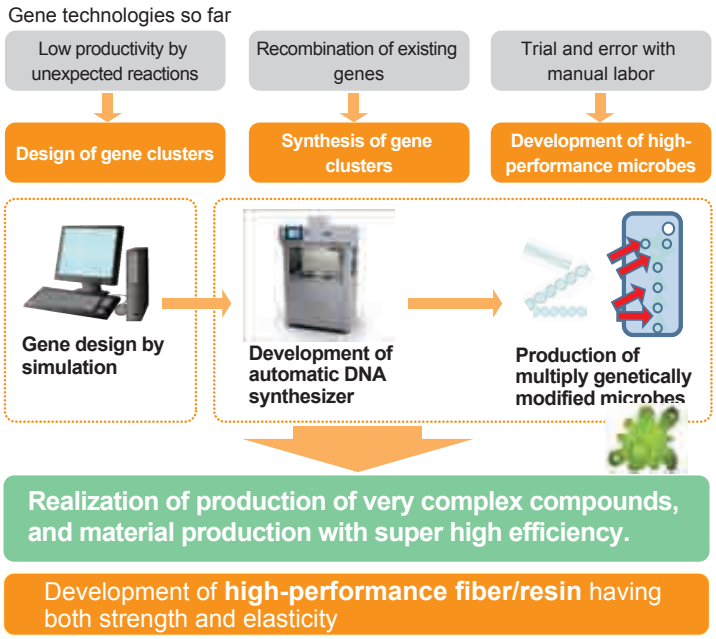
Technology Research Association of Highly Efficient Gene Design

［Establishment］ September 2012

［Members］ Ajinomoto Co., Inc., Astellas Pharma Inc., in silico biology, Inc., Kaneka Corporation, Kumiai Chemical Industry Co., Ltd., KNC Laboratories Co., Ltd., Kojima Press Industry Co., Ltd., Spiber Inc., Precision System Science Co., Ltd., Mitsubishi Chemical Corporation, Kobe University, Technology Research Association for Next-Generation Natural Product Chemistry, Japan Bioindustry Association, AIST
（10 companies, 1 university, 3 organizations）

【Outline of R&D】 We will design gene clusters for material production including a control system of gene expression, then will synthesize long chain DNA according to the design. We aim at the development of effective production technology for innovative biomaterials, such as high-performance fiber/resin which has both strength and elasticity, an anticancer agent with few side effects, a non-natural amino acid, and a pesticide without antibacterial activity, through producing a high-performance genetically-modified microbe with high productivity.

High-performance gene design technology



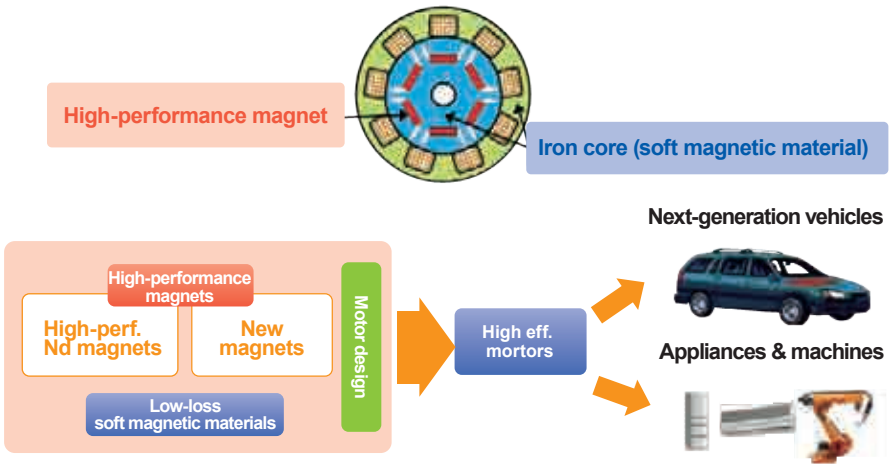
An example of a technology research association

Technology Research Association of Magnetic Materials for High-Efficiency Motors (MagHEM)

［Establishment］ September 2012

［Members］ T&T Innovations Inc., Aichi Steel Corp., Intermetallics Co. Ltd., NEC Tokin Corp., JFE Steel Corp., Daikin Industries Ltd., Denso Corp., Toyota Motor Corp., Mitsubishi Electric Corp., Japan Research and Development Center for Metals, AIST（9 Companies and 2 Organizations）

【Outline of R&D】 Collaborative R&D on magnetic materials for high-efficiency motors and motor design using these materials, and other projects to improve technical potential of members and to promote commercialization



Structure of high-efficiency motors (example)

Providing a Place for Industry-Academia-Government Collaboration and Promoting Researcher Interchange

AIST interchanges researchers through joint research, participation in TRA, and invitation of visiting researchers. AIST also supports R&D or product development at companies by commissioned research, conducts technical training, technical consultations, commissioned tests, and material transfers.

Active acceptance of external researchers

Acceptance of external researchers in joint research

Number of researchers accepted in FY 2012: 2,034.

We accept researchers from joint research partners, to use advanced facilities and equipment at AIST in order to conduct research effectively.

Joint research with transfer of human resources

Number of human resources transfer in FY 2012: 4 (5 researchers transferred to AIST).

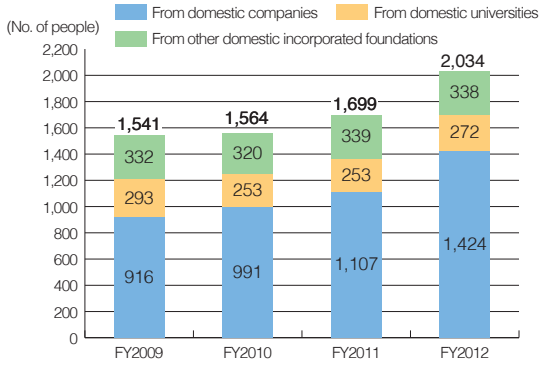
A researcher may move from a joint research partner to AIST (the partner bears labor costs provided as research funds), and use AIST research infrastructure and human resources altogether to deepen joint research and accelerate R&D mutually.

Accomplishments by external researchers

AIST researchers work with external researchers in various research projects.

- R&D from material through final product for next-generation crystalline silicon solar cells that may achieve both a major reduction in manufacturing cost and the maximal conversion efficiency.
- Research for the realization of ultra high-voltage SiC power semiconductors to achieve a low carbon society.

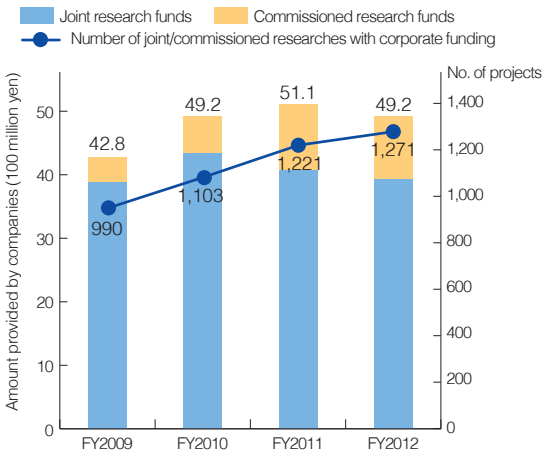
Number of accepted external researchers in joint research



Number of joint and subcontracted researches

Joint research is R&D between AIST and partners: company, university or public research institution with common objectives and goals, for creation of novel results that cannot be achieved solely. Commissioned research is a R&D project where AIST is commissioned by a company or other organization. These collaborations may allow our partners to complement their aims with AIST's research potentials.

Number of joint/commissioned research projects with companies



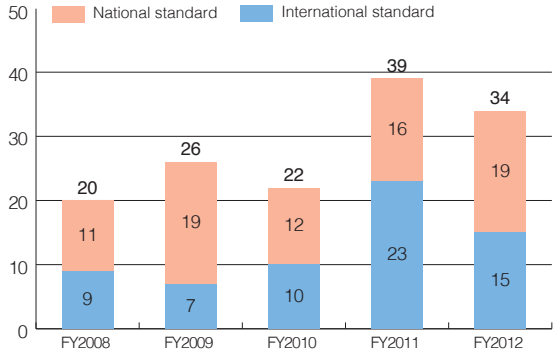
Promotion of International Standardization

AIST is promoting standardization activities utilizing our R&D results. We proposed 34 national and international standards in total in FY 2012, such as for “quality evaluation of dimethyl ether for bio-fuel.” We are also cooperating with the national standardization strategy. The technical committee for fine bubble technology was newly established as ISO/TC281 in Feb. 2013, under the Top Standard Scheme, which is established by the Ministry of Economy, Trade and Industry (METI) to promote standardization expeditiously.

We held a symposium on international standardization promotion strategy in July, 2013 to disseminate the importance of standardization and certification issues among industry, academia and governmen.

Symposium of International Standardization Promotion Strategy on July 3, 2013

Number of proposed standards



Collaboration with Overseas Research Institutions and Support for Overseas Corporate Development

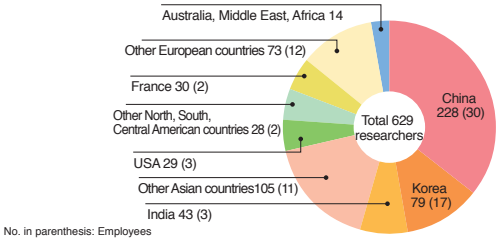
AIST has concluded Memoranda of Understanding with 35 research institutes around the world, and has been promoting organizational human resource interaction and international research cooperation. The network formed as a result of these activities has been used to support the expansion of Japanese companies overseas. In particular, joint researches have been conducted in Asian countries experiencing rapid growth, with Japanese companies participating in collaborative research activities between AIST and overseas public research institutes. In October 2012, the “AIST Innovation Workshop in Thailand” was held in Bangkok to encourage interaction and to seek future research collaboration opportunities between AIST, Thai public research institutes, and Japanese companies operating in Thailand. Around 200 persons attended the workshop, which was the first of its kind to be organized solely by AIST outside of Japan. The lectures by AIST and other institutes introduced case studies of technical support for measurement standardization, and of joint research between Japan and Thailand in green innovation.

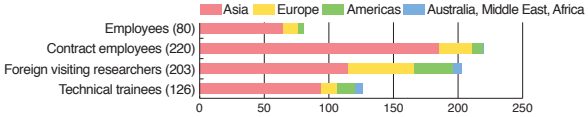
AIST Innovation Workshop in Thailand on October 30, 2012

Acceptance of Foreign Researchers

To become a base for an international network of excellent researchers by strengthening ties with overseas research institutes, AIST actively accepts foreign researchers from universities and research institutes around the world. There were a total of 629 foreign researchers who were accepted at AIST in FY 2012. Of these, around 70% were from Asian countries. AIST will continue to promote close relations with the research institutes of Asian countries in order to play a leading role in the region.

Number of researchers by countries and regions in FY 2012 (as of March 1, 2013)

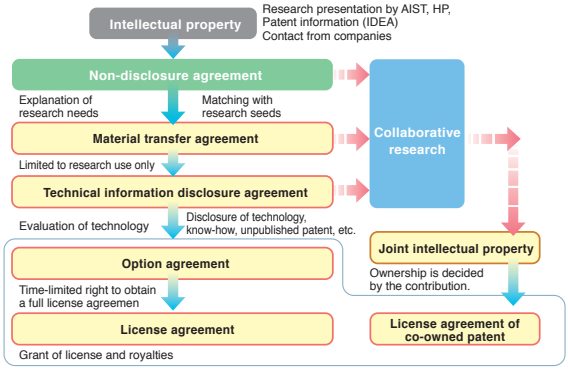




Technology Transfer Activities

It is our key mission to disseminate our research results in society and contribute to economic and industrial development. To achieve the mission, we acquire intellectual property rights, and maintain and manage them in an appropriate manner to achieve technology transfer, and strongly promote technology transfer based on intellectual property.

Technology licensing process at AIST



Technical Consultation

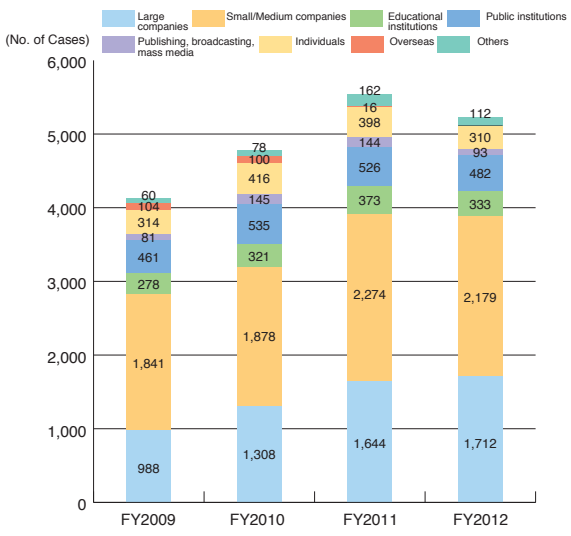
AIST gives advice to companies, universities, and public research institutes based on our technological potential we accumulated over the years. The industrial technology instructor works with innovation coordinators and our researchers to find a solution.

Case study

Request: Client wanted to know the mechanism of stress and how abrasion occurs in the chain and bearing of an escalator under conditions of actual use.

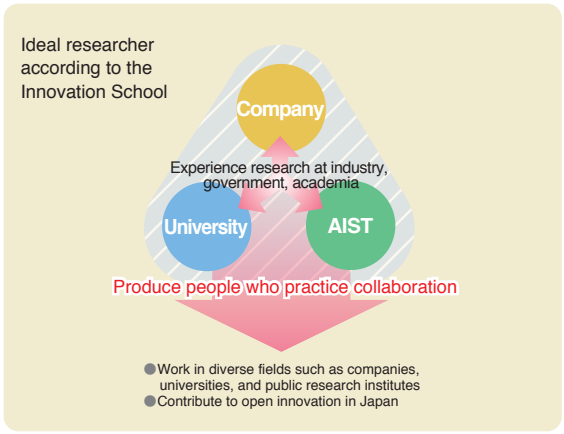
What we did: Based on the photograph provided by the client, discussions with our researchers made the problems clear and the technique to measure the abrasion was instructed.

Number of technical consultations



Innovation School

To train human resource who can immediately engage in innovative activities, the Innovation School offers a unique and characteristic curriculum that may expand the visions and raise the consciousness of the young researchers.
To solve complicated social problems and to bring forth change in society, it is necessary to create innovative technology by combining the ideas and technologies from inside and outside the company. People who can act as the hub of collaboration are wanted. Therefore, postdoctoral researchers and PhD students are invited to AIST, to be trained as human resources with vast vision, communication ability, cooperative attitude, and ability to work with specialists of different fields, as well as with the scientific and technical knowledge of a specialized field.
In FY 2012, 22 postdoctoral researchers were employed, and 11 PhD students were accepted as technological trainees.



Curriculum of the Innovation School

1) Lecture and exercise at AIST

- Lectures on principles, management, and activities by AIST researchers and corporate managers.
- Lectures and exercises on standardization and research, intellectual property and research, natural disaster research, risk assessment, career development, and others.
- Article reviews by students on “synthesiology” (a research method where a research scenario is established and the elemental technologies are integrated and synthesized).
- Exercise to give research presentations that allow understanding by people from different fields.

2) Research at AIST

- Practice research topics at assigned research sites.
- Experience *Full Research* (research that continues from basic to product realization).

3) On-the-job training at companies (on average for 3 months)

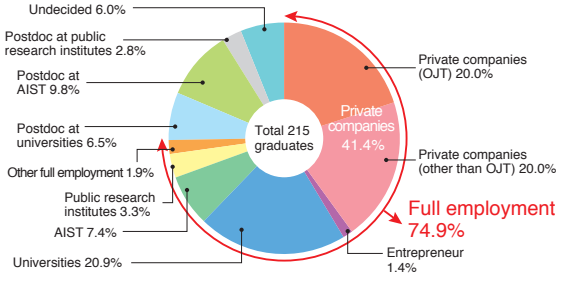
- Learn corporate philosophy, emphasis on demand, speed, and cost consciousness.
- Experience teamwork and collaboration with different units.

Lecture by the President

Expanding the vision and providing opportunities to young researchers

The students of the Innovation School were able to experience that the work of doctoral researchers could be diverse, as exemplified by the comment, “My research method was usable in a corporate setting,” or “It gave me confidence that I was able to work effectively in corporate training.” They were able to change their mindset, as stated in, “The most important point is to realize that we function as an organization,” and “It is necessary to have a common language that can be understood by people of various fields and specialties.” Also, the companies that accepted the students highly regarded their research abilities and the work attitude, as in, “We were able to gain valuable technological knowledge,” and “The employees of the same age were stimulated in a good way.”
There have been 215 students that completed the Innovation School since it started in FY2008. They discovered their new potentials, and are now working in various fields at companies, universities, and public research institutes.

Employment of students who completed the Innovation School
(215 people) (as of April 1, 2013)



Metrology Training Center

The Metrology Training Center provides opportunities to acquire new knowledge and technologies for legal measurements. The center is located in the "Sakura-kan" building, which is located in the woods at one corner of AIST Tsukuba.

The primary aim of the center is to improve technical abilities of people working in metrology-related administration in prefectures and designated cities, and also to provide training to candidates for certified general measurers and certified environmental measurers. Under the Measurement Act of Japan, the center provides various training courses on metrology and other subjects necessary for metrological services, such as the Measurement Act, measurement standards, domestic and/or overseas legal metrology systems, accreditation systems for testing laboratories, and the development and evaluation of quality systems.

Training for environmental measurement (noise and vibration)

Targeted people are those working for legal metrology services in the public sectors, including the Ministry of Economy, Trade and Industry (METI), various organizations of prefectures and local cities, and designated laboratories for testing, inspection, verification and calibration, as well as those in the private sectors who want to be certified measurement experts.

Training for checking electrical balances

The Metrology Training Center also offers different kinds of training courses in cooperation with other organizations. One such example is a training course for registered quality system inspectors and technical experts under the Japan Calibration Service System promoted by NMIJ. It also organizes trainings for overseas technical experts who are involved in international cooperation. Training courses for measurement experts vary in content, from the fundamentals to applications. They are designed to provide as many practice sessions as possible, i.e. dealing with specific aspects of metrology, as well as for those in managing positions.

Earthquake and Tsunami Education Program for Local Government Staff

Cooperation between researchers and local government staff is necessary to apply earthquake research results to actual disaster prevention and reduction. With the cooperation of the Institute of Geology and Geoinformation and the Geological Museum, the Active Fault and Earthquake Research Center (AFERC) has been carrying out an earthquake and tsunami education program for local government staff since 2009. In 2012, the program was carried out from November 5 to 9 with six participants from five prefectures (Shizuoka, Aichi, Mie, Kagawa and Fukushima). The participants in 2012 hoped that the next program would be shorter and held earlier in the year. Therefore, the 2013 program was carried out from July 1 to 4 and there were seven participants from six prefectures (Shizuoka, Aichi, Mie, Kagawa, Fukui and Chiba).

The main feature of the 2012-2013 program was lectures on giant earthquakes along the Nankai Trough. According to questionnaires returned by the participants, the lectures on giant earthquakes along the Nankai Trough, the 2011 Tohoku earthquake, tsunami deposits, historical earthquakes and databases made by the Geological Survey of Japan were highly evaluated. A visit to the Geological Museum and a field trip to Iwaki City in Fukushima Prefecture were also well evaluated. The participants also said that frank discussions and communication with the researchers during the education program were useful.

The earthquake and tsunami education program has helped establish important connections between local government staff and researchers and it will be continually held.

Field trip participants observing an outcrop of the fault of the April 2011 Fukushima earthquake

Technical Training

AIST accepts researchers, engineers and students from companies, universities and public research institutions for a certain period, to make them obtain certain techniques under the instruction of AIST researchers. In FY 2012, we accepted 1,469 people in this program.

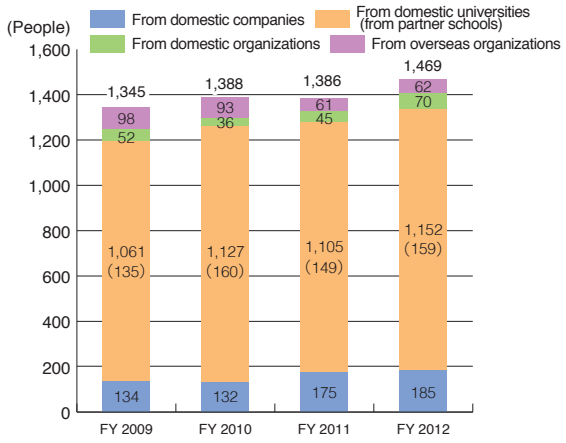
Combination with the partner graduate school system

AIST researchers as guest professors of partner graduate schools instruct graduate students for their research. Also AIST directly or indirectly supports education of partner graduate schools using the research potentials of AIST, such as holding lectures by AIST researchers.

Internship program

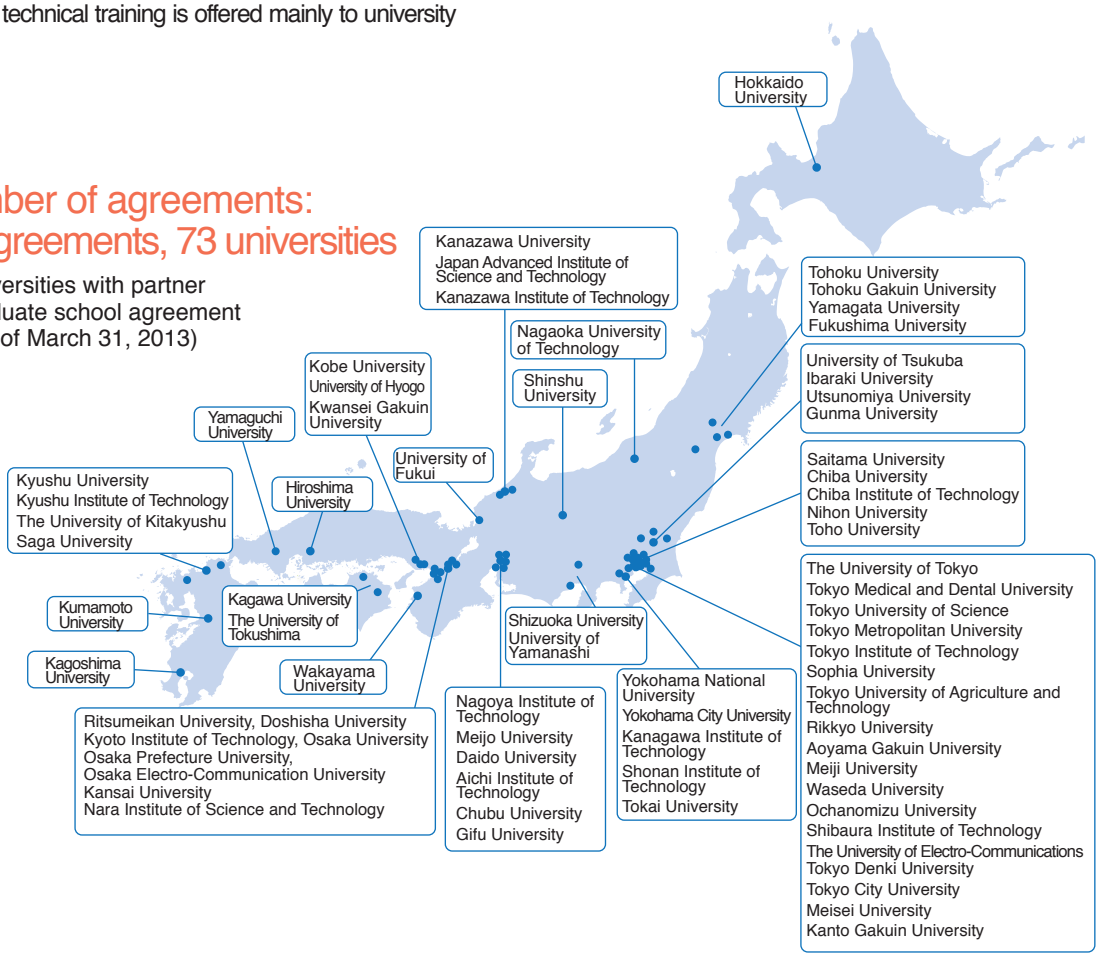
Short-term technical training is offered mainly to university students.

Number of people in technology training



Number of agreements: 81 agreements, 73 universities

Universities with partner graduate school agreement (as of March 31, 2013)



Voices of the trainees

“I learned from the attitude of AIST researchers involved in cutting-edge technology by working with them.” (from corporation)

“It was a worthwhile experience to be in contact with the professionalism of AIST researchers. Not only about technological matters but about attitudes toward research and profession, we learned a lot.” (from university)

“AIST researcher gave me advice to solve the problem through discussions.” (from public research institution)

Labor Practices

Occupational Safety and Health

Our priority is the safety and health of our employees

AIST established the Environmental Safety Charter "Improvement of Occupational Safety and Health," to place priority on building a workplace environment where all employees of AIST can be safe and healthy.

Health and Safety Committee and site meetings

The Health and Safety Committee to which the manager and labor representatives participate is held every month at each site, to discuss the matters of occupational safety and health.

At the site meeting held every month, the representatives from the site convene to discuss the results of the Committee and other health and safety issues. The result of the meeting is communicated to all employees through unit meetings.

Establishing the safety guideline

Based on the Environmental Safety Charter, AIST established a safety guideline that sets out the safety conduct for handling hazardous chemicals, high-pressure gas containers, and others.

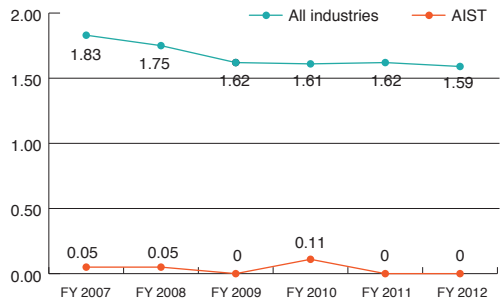
This guideline is the basis of the safety education of the employees and for carrying out various experiments. It is regularly reviewed and revised once a year. In the revision of FY 2012, patrol of the workplace by research group leaders, storage of water-reactive substances, and handling of biologically derived reagents were added.

Prevention of accidents and their recurrence

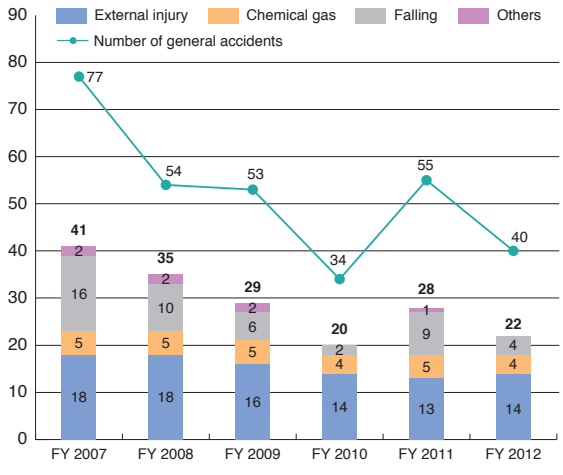
In a case where an occupational accident occurs, the cause is surveyed and analyzed, and the work will be stopped until measures against recurrence are put into effect. The information on the accident is released to all employees to prevent occurrence of any similar accidents.

The "safety management reporting" is held at all research bases throughout Japan through the teleconferencing system. Information about the accidents, hiyari-hatto (close calls and near misses) report, and health matter at each base and site from the previous day to morning are exchanged. The horizontal deployment of anti-recurrence measures for similar accidents is expected to enhance the safety and health. In FY 2012, the total cases of accidents and the number of injuries during experiments decreased compared to the previous year. In FY 2012, a fire broke out in AIST Kansai, and a thorough anti-recurrence measure was implemented. Most of the injuries that occurred during experiments were external injuries such as injuring oneself while handling glass equipment and chemical exposure caused by improper use of safety equipment.

Frequency rate of disabling injury



Number of general accidents and accidents involving injury



Emergency response

Drills for emergency response for accidents and fire are conducted to prevent the expansion of accidents into serious damage.

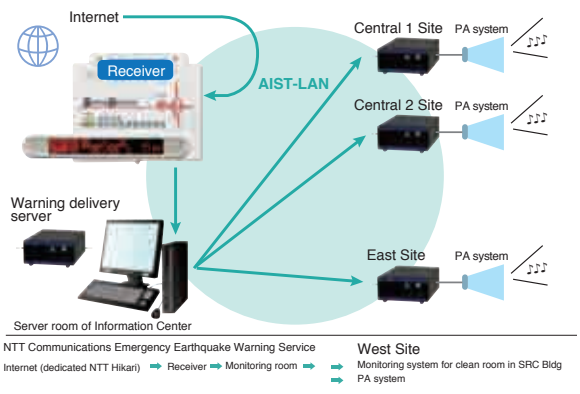
To maintain contact with the regional bases during disaster, the wireless telephone systems were installed at the research bases throughout Japan. Drills were conducted using this telephone system.

As measures against disasters such as earthquakes, food and rescue equipment are stored as reserves. The reserves are inspected, reviewed, and organized regularly.

Following AIST Tsukuba, AIST Chubu, and Tsukuba West, the Emergency Earthquake Warning System was introduced to Tsukuba Central, Tsukuba East, and AIST Tokyo Waterfront and AIST Kansai in FY 2012. PA systems were constructed for broadcasting the warnings in all buildings of the facilities when the signals are received from the Japan Metrological Agency. Serious disaster may be prevented by taking actions against earthquakes such as quickly stopping the experiment before the main quake hits.

Firefighting drill

Emergency Earthquake Warning System at AIST Tsukuba



Safety education and support for obtaining certifications

To prevent accidents beforehand, various safety education programs and workshops are offered to the new employees, visiting researchers, and employees at various levels.

The safety education at the time of employment and at the change in appointment is managed by the “Safety Education Management System” on the intranet system, and one can review the content and check the courses taken. Part of the safety education for life science experiments is available on the e-learning system that was implemented to enhance the learning opportunity in FY 2010.

To actively support the obtainment of licenses and certificates, workshops and courses for obtaining the licenses for health officer of industrial hygiene, operation chief handling organic solvent, and crane operator are offered at AIST.

Main education and training programs and workshops (FY 2012)

Program	No. of sessions	No. of participants
Course for health officer’s license on industrial hygiene engineering	2	65
Course for operation chief for handling organic solvents	1	32
Course for operation chief for handling specified chemical substances	1	23
Education/training for recombinant DNA experiment	1	260(426)
Education/training for animal experiment	1	123(185)
Education/training for life science experiment involving human ethics	1	116
Safe driving course	4	1,062
Joint radiation education/training [for personnel handling radiation]	4	445
X-ray education/training [for personnel handling x-ray]	97	311
Explanation of compliance with laws/regulations for radioactive materials [for managers and personnel using nuclear fuel material]	1	66

Figures in the parentheses indicates the number of e-learning participants.

Employment of Limited Term Employees by Open Recruitment within AIST

Among the work done by the headquarters and operations of AIST, there is a lot of regular work that can be efficiently accomplished if people with abundant experience and responsibility take charge over a long period.

The “regional term-appointed employees (office workers without transfer to other regions)” are excellent human resources with experience in procurement, asset management, welfare, and operations, appointed as term-appointed employees by recruitment within AIST. This appointment program was introduced on April 1, 2012.

Two people were employed in FY 2012 and five in FY 2013. They are working in the headquarters and operations of AIST Tsukuba.

The term of the “regional term-appointed employee” is three years, but the personnel may be employed as regular employees upon comprehensively considering his/her work performance during the term.

The “regional term-appointed employees” will be continually employed in the future, as they are personnel who back up the R&D at AIST.

Work-Life Balance Support

Childcare and nursing care

AIST has programs for childcare and nursing care, to allow the employees to achieve work life balance. Flexible working styles including a flex-time system, a discretionary work system, a short-time work system for parents with preschool children, and various leave and absence programs are available.

A list of information for AIST’s support programs is available in both Japanese and English in the “Childcare Plaza” and “Nursing Care Plaza” of the AIST intranet website. A site for exchanging information is also available on the bulletin board for the employees.

Three research bases have daycare facilities where the employees can leave their children during work time. At bases without such facilities, sudden demands can be met by providing private child day care or babysitting services.

As support for work life balance, the “Seminar on Nursing Care” started in 2007. The situation of nursing care and the interests of the employees are surveyed, and the “Work Life Balance Seminar: Nursing Care” that reflects the survey results is held sequentially.

Campaign to take annual paid leave

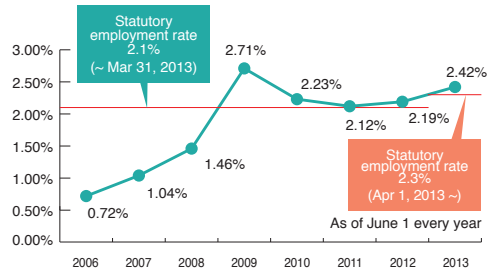
AIST encourages the employees to take annual paid leaves and a campaign was started in July 2011. An employee can take: 1) one-day leave every month, 2) one-week continuous leave during periods of light work load, or 3) leaves in conjunction with holidays, summer vacation, and year end and new year. For this campaign, posters are placed in many places in AIST to promote planned leaves, to announce statistical data, and to build an atmosphere in which the employees can readily take leaves.

Work Life Balance Seminar: Nursing Care

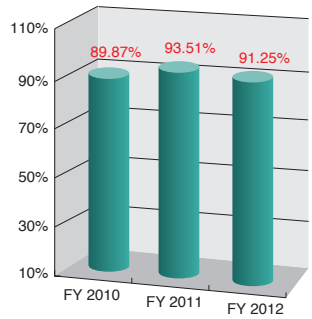
Employment of Challenged People

AIST actively employs people with mental and physical challenges. The statutory employment rate was raised to 2.3% in April 2013. People were newly employed last year and the statutory rate was cleared (actual employment 2.42% as of June 1, 2013). Efforts were made to create an environment where challenged people can work comfortably, and high retention rate was maintained (retention rate 91.25% in FY 2012).

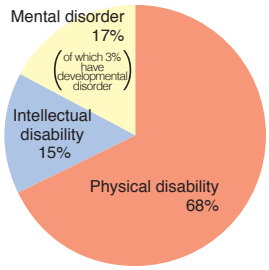
Change in employment rate of challenged people



Retention rate for challenged people



Employment of challenged people (by type of challenge)



Letters from the family of the Challenged Team

☆ Thank you very much for your instructions every day. Thank you for the cherry blossom viewing. My son was really looking forward to it. He reported, “It was a wonderful location and the cherry blossoms were beautiful.” I am glad to see him go off to work cheerfully every day. I am grateful that he has a place to go to work every day.

☆ My son was looking forward to the cherry blossom viewing, and he came home very happy. We, the parents, took time off from work to join him. It was the entrance ceremony day of the elementary school, and the new first-graders with their brand new book bags were there. My son and I were reminded of the time when he was a first-grader, when he could not speak well and felt insecure and hopeless about the future. We spoke about how it’s like a dream that he is working at AIST.

Cherry blossom viewing during lunch break

Activities of Challenged Team

There are 11 challenged people with intellectual disability or developmental disorder at AIST Tsukuba, 3 people at AIST Chubu, and 2 people at AIST Kansai, working in the Challenged Team (as of June 1, 2013).

Challenged Team at AIST Tsukuba

The team works as clerical aids, in custodial service, and for preparing publication handouts at events.

Preparation of handout sets that will be distributed at open house

Challenged Team at AIST Chubu

The team works on weeding the lawn, setting up the conference room for various meetings, and collecting old newspapers.

Weeding the lawn

Collecting and sorting the old newspapers

Challenged Team at AIST Kansai

The team helps the eco-woodworking class held during the open house. They make the parts for the exhibits when lawn mowing cannot be done due to rain.

Making parts for exhibits

Eco-woodworking class during the open house

Health Maintenance

The following mental and physical supports are provided to enable the individual employees to exert their full capacity and to experience a healthy professional life. Early prevention, detection, and improvement of sickness and diseases are emphasized.

- Increase the health checkup rate by conducting appropriate general and special health checkup, as well as raising the consciousness for obligatory health checkups.
- As the follow-up for general and special health checkup as well as complete medical checkup, thorough interviews are provided by the industrial physicians and the industrial health staff to those with positive findings, to encourage early discovery and treatment of disease.
- From the perspective of preventing health problems due to excessive work, AIST established a standard (see separate table*) to conduct interviews and counseling by industrial physicians based on the Industrial Safety and Health Act.
- Efforts are made to maintain and enhance employee health through first-aid classes, health support seminars, and quit-smoking consultations.

Standard for subjects who require interviews

	Conditions requiring interviews	Request made	Obligation of the management	Conditions and measures at AIST
1	Over 100 overtime working hours (owh)/month	Request	Obligation (Article 55, Section 8, Item 1)	If over 100 owh/month, obligation to provide counseling by industrial physician (researcher, clerical worker)
2	Over 80 owh/ month (excl. those corresponding to 1)	Request	Obligation to make effort	If over 80 owh/month, obligation to provide counseling by industrial physician (employees dispatched to other places (researcher, clerical worker))
3	Over 100 owh/ month (excl. those corresponding to 1) or those of 2 or average for 6 months is over 80 ow hours	No request	Obligation to make effort	If over 80 owh/month continues for 3 months, obligation to provide counseling by industrial physician (researcher) If over 80 owh/month continues for 2 months, obligation to provide counseling by industrial physician (clerical worker)
4	Over 45 owh/month and those deemed necessary for sake of health	No request	Recommended	If over 45 owh/month continues for 3 months, obligation to provide counseling by industrial physician (researcher, clerical worker (those belonging to HQ or operations)) If over 45 owh/month and applicable conditions, obligation to provide counseling by industrial physician

Health activities in FY 2012

Main activity	No. of sessions	No. of people
Interview with industrial physician (physical)	All year round	1,037
Interview with industrial health staff	All year round	743
Consultation to quit smoking	All year round	40
Diet consultation	at all AIST bases	7
Influenza vaccination	at all AIST bases	2,208
First-aid class	5 times	148
Health support seminar “Refresh Exercise”	8 times	167

Mental Health Care

AIST established an integrated “Mental Health Plan” that follows the guideline issued by the Ministry of Health, Labour and Welfare. The measures to promote mental health are executed continuously according to plan, focusing on the following four cares.

- **Self care**
  Various classes and seminars are held to enable the employees to understand about stress and mental health, and to learn ways to prevent, reduce, or cope with stress.
- **Line care**
  Educational seminars and information provision are done to enable managers who encounter the employees daily to catch the signs of problems from the employees’ behavior, to understand and improve the workplace environment, and to learn skills to discuss this matter with the employees.
- **Care by industrial health staff of the workplace**
  The interview with the industrial physician, counseling with health staff (with counseling qualification), and support for returning to workplace such as reduced work time and temporary work programs are offered.
- **Care by methods outside of workplace**
  Consultation by mail and telephone, interviews, e-learning (mental support program) of the external mental health institutions can also be used.

From April 2012, to further strengthen the support plan and the programs based on the “Improvement of Support and Programs for Sick Leave and Temporary Retirement due to Sickness” (decided by the Board in March 22, 2012), new programs were started to further support illness prevention, early discovery, and recovery time, as well as support for returning to work.

Activities for mental health

Main activity	No. of sessions	FY 2010 No. of participants	FY 2011 No. of participants	FY 2012 No. of participants
Interview with industrial physician (mental)	All year round	755	797	760
Counseling	All year round	227	188	160
Telephone counseling	All year round	16	11	7
EAP (counseling by external institutions through telephone, email, interview)	at all AIST bases, all year round	75	61	49
Health support seminar “Response to QFT test for follow-up of tuberculosis outbreak” (2012)	Once	-	82	10
Health support seminar “Self care – Dealing with extreme stress” (2012)	at all AIST bases, once	187	242	179
First joint session for new employees FY 2012 “Mental health” (organized by Human Resource Development Planning Office)	Once	84	80	75
Second seminar for group leaders FY 2012 “Mental health management” (organized by Human Resource Development Planning Office)	Once	35 (Twice)	481 (14 times)	29

Fair Operation Practices

Implementation of Conflict of Interest Management

The important mission of AIST is to promote the industry-academia-government activities and to widely diffuse the results to society. On the other hand, when an AIST staff member has a personal interest in the partner company while conducting the industry-academia-government activities, it is necessary to appropriately manage the conflict of interest, when the personal interests collide with the research duties and obligations as a staff of AIST that is a public research institute.

Therefore, AIST established "Rules on Managing Conflicts of Interest of the National Institute of Advanced Industrial Science and Technology."

For FY 2012, reports titled "Regular Self-Reporting on Conflict of Interest," were collected twice a year (first semester in August; second semester in February). There were reports from 3,165 people in the first semester, and 3,175 people in the second semester. Seven staff members were interviewed by external counselors to resolve the possible conflict of interest.

Information Security

The information security trainings are conducted so all users of the AIST network may deepen the understanding of information security policy and engage in appropriate practice with awareness and responsibility.

Information security lectures

Through compulsory participation at least once a year to the information security training as well as obligatory participation by new staff members, the consciousness for information security is maintained and increased. In FY 2012, the percentage of attendance to the web training was calculated and publicized at AIST.

Implementation of self-checks

To maintain the information security at AIST, self-checks are important as well as the training sessions. Therefore, the information security measures and self-checks for personal information protection are conducted concurrently. In FY 2012, a self-check period was set, and the electronic information managers asked all people involved to conduct self-checks. The implementation rate of self-checks reached 92.49%, and the consciousness for information security including the handling of personal information was enhanced.

Implementation of information security inspections

Information security inspections are done at AIST on whether appropriate operation and management are conducted at the research units, according to the security policy for the information system. In FY 2012, the security inspections were done at 24 AIST units, and confirmation inspections were done in 20 units to check the improvements of items that were brought to attention in the previous year. The information security of the entire AIST was strengthened utilizing the PDCA cycle. The security inspections and security confirmation inspections will be done according to the plan for the following year.

Number of units under inspection

	FY 2011	FY 2012	Planned for FY 2013	Planned for FY 2014
Number of units subjected to inspection	31	24	24	12
Number of units subjected to confirmation	3	20	9	24

Number of participants of information security training sessions

	FY 2009	FY 2010	FY 2011	FY 2012
Group training	1,178 (22 times)	1,857 (22 times)	329 (3 times)	78 (Once)
Web training	344	4,432	5,745	6,209
CD-ROM training	37	-	-	-
Face-to-face training for units	50	112	85	154
Total participants	1,609	6,401	6,159	6,441

Implementation of Security Export Control

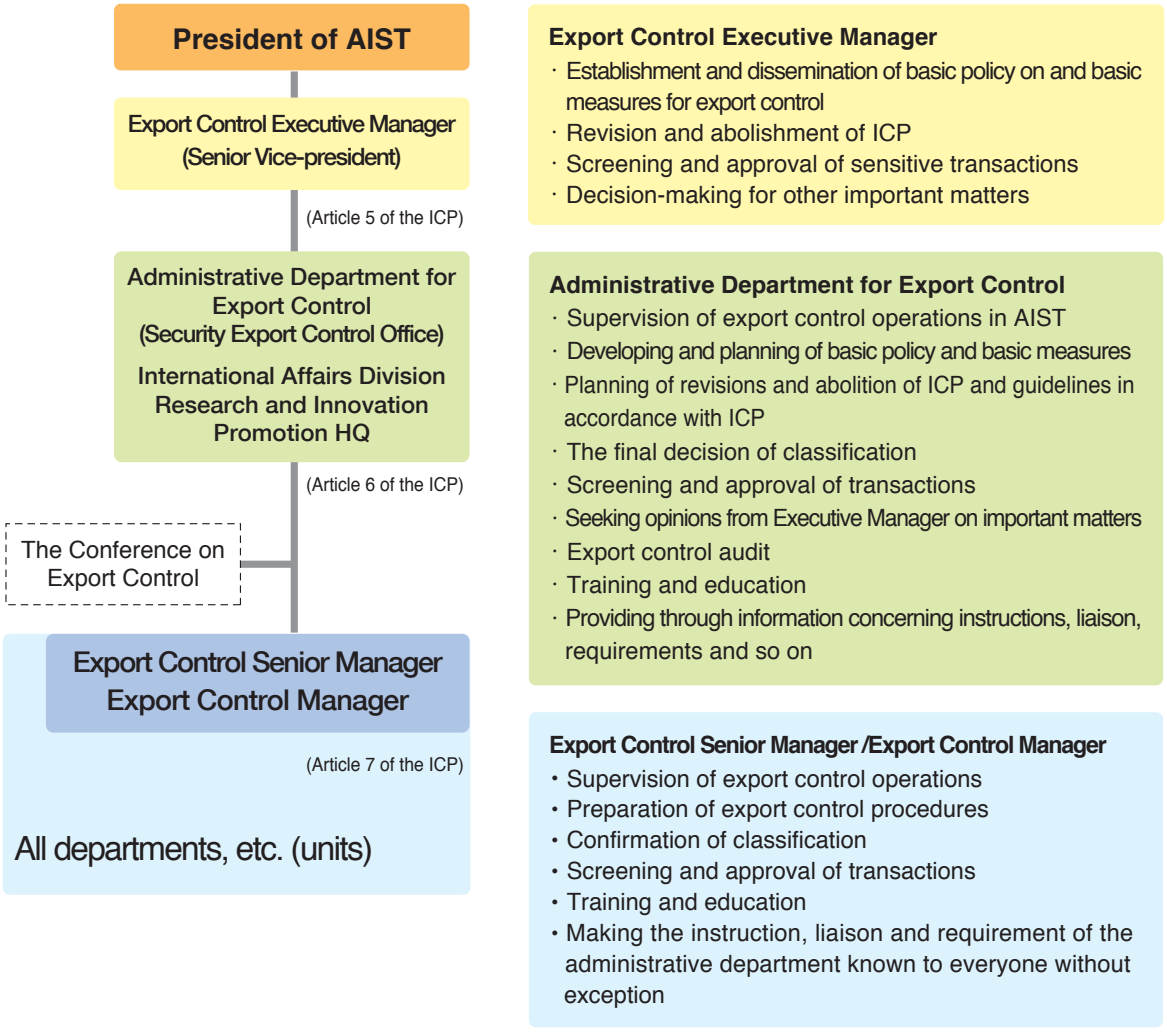
The security export control is an important effort in maintaining the peace and security in the international community. In Japan, in addition to the regulation on weapon trade itself, the export of goods and transfer of technologies that may be used for the development and manufacture of weapons are 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, the companies and institutions that may engage in business with overseas companies and institutions must implement strict control.

AIST established the "Rules on Security Export Control" in 2004. The draft of the "Internal Compliance Program (ICP)" was submitted to the Ministry of Economy, Trade and Industry. AIST conducts strict security export control according to this Rule. Examples of the implementations include: 1) communication of the latest information on export control within AIST, 2) export control training for AIST staff, 3) export control instruction to individual staff member, 4) classification and transaction screening, and 5) internal audit.

Recently, with the increased joint researches with overseas research institutes and universities, there is higher importance of raising the staff's consciousness about security export control. We now have an established security export control procedure, and the consciousness for security export control has risen among individual staff members.

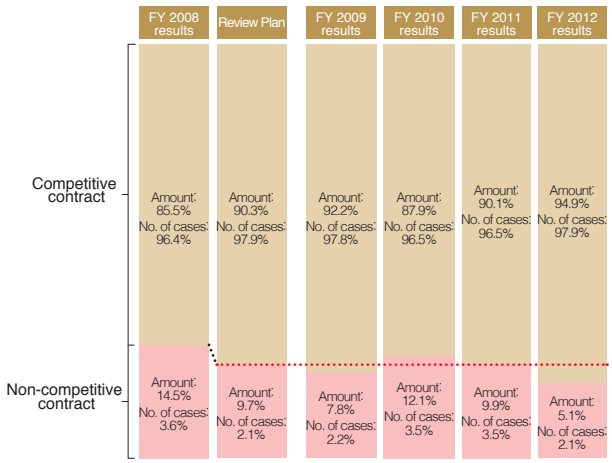
AIST will promote further implementation of security export control in the future to maintain peace and safety as a member of the international community.

Export control measure and role of AIST



Implementation of Appropriate Procurement

AIST concludes contract by general competitive bidding, competitions, and open application, except for negotiated contracts that are unavoidable. In the revision of negotiated contracts based on the "Consolidation and Rationalization Plan for Incorporated Administrative Agencies," the upper limit of price that can be set under the negotiated contract was changed to the amount set for the government. In April 2010, the new Negotiated Contract Review Plan was set based on the performance of FY 2008. As a result, the percentage of the negotiated contract without competition among the concluded contracts that surpassed the standard price in FY 2012 was 5.1% in monetary base and 2.1% in number of cases. Compared to the Negotiated Contract Review Plan set as a goal to be achieved in the future, the figures were almost achieved for the number of cases and decreased in monetary cases. This is because in FY 2012, there were no waste disposal case of polychlorobiphenyl (PCB) for which the disposal sites are strictly specified by law, and the number of negotiated contracts decreased temporarily as it was the transition period of the multi-year contract.



※ The Negotiated Contract Review Plan was released in April 2010 after inspecting and reviewing the FY 2008 performance.

Commercialization Test

Based on the Cabinet decision (July 15, 2011) pertaining to the "Basic Policy on the Revision of Public Services," the "Consortium of Facility Management Operations for AIST Tsukuba," a unified organization of eight operations involved in facility management at AIST Tsukuba, started in FY 2012. The result of the inspections conducted for FY 2012 for the services of Consortium is as follows.

Functions of the unified organization

- Clarify the chain-of-command centering on administrative management operation
- Create emergency response manual and build collaborative system
- Speed up grasping the overall status of the operation through information aggregation to the operation supervisor

※ Emergency response based on the manual for 4 seismic intensity earthquake in December 2012

Unified chain-of-command from Administrative Management Personnel

Patrol inspection, and quick recovery of facility and equipment (collaboration among security and maintenance personnel)

Improvement of service and quality

- Further strengthen the collaborative system of operation (create "Rules for Consortium Employees")
- Mutual understanding of operations (report meetings and regular joint training sessions)

※ Average satisfaction according to facility user questionnaire

Research Cooperation Center (Sakura) operation & management 96% (over 90% of index)

Research Cooperation Center (Keyaki) operation & management 99% (over 85% of index)

Geological Museum operation & management 99% (over 90% of index)

Science Square Tsukuba operation & management 94% (over 90% of index)

Community Involvement

Science class activities at AIST Kansai

AIST Kansai promotes the activities to communicate the fun and wonder of science based on the knowledge obtained through researches. Science classes which both children and adults can enjoy are held at various places, mainly in Kansai. In the science class “Micro Gravity,” the weightlessness can be experienced using available goods at home. In the science class “Earthquake and Tsunami,” in addition to the talk on earthquake-archaeology where the characteristics of big earthquakes are analyzed by studying the history of the earthquakes, the experiment of liquefaction, which is the key in earthquake-archaeology survey, can be experienced. The common goal of the science classes is to stimulate intellectual curiosity by looking at a phenomenon through experiments that one does not usually conduct. There were many requests from elementary schools and PTAs, and in FY 2012, a total 79 science classes were held and a total 6,508 people participated.


Scene from the science class

Science Café

AIST has been working on outreach activities, and the Science Cafés were held mainly at AIST Tsukuba as part of such activities. This year, the Science Café activities were expanded to regional research bases.

★ On March 21, 2013, a three-part session entitled “Museum of Microbes - Cause of glowing food, electricity-eating microbes, insect-saving microbes, and the wonderful world of microorganisms” was conducted at the Sapporo Odori site of AIST Hokkaido. Part 1 introduced the cases of changes (discoloration and decomposition) that actually occurred in food. Part 2 presented the creation of bacterial fuel cell using the recently found bacteria that release and absorb electrical energy. Part 3 explained the studies of the relationship of various insects and symbiotic microorganisms, their function inside the insect body, and use in pest control. The participants commented positively, “It was easy to understand because familiar cases were used. I was also able to learn about the recent findings about microorganism. These stimulated my intellectual curiosity throughout the session.”

★ On May 9, 2013, the session was conducted at the Tosu City Library as a joint activity of AIST Kyushu, Saga Prefecture, and Tosu City (this was the first session in Kyushu). Under the title “Capture Rare Earth – The forefront of rare natural resource exploration,” the characteristics of the rare earth elements and their use in industry were explained. The products in which rare earth is used were displayed, and the participants measured how much rare earth was in them using a special measuring device. Also, the exploration of rare earth materials and the research to solve the resource issues were presented. This helped the people who may not be familiar with AIST such as high school students, retirees, and housewives understand the activities conducted at AIST.


AIST Hokkaido


AIST Kyushu

"Speech Jammer" wins the Ig Nobel Prize

In September 2012, Dr. Kazutaka Kurihara of AIST and Dr. Koji Tsukada of Precursory Research for Embryonic Science and Technology (PRESTO) won the Ig Nobel Prize 2012 (Acoustics) for "Speech Jammer" that uses delayed auditory feedback to interrupt speech.

The Ig Nobel Prize is given to "research that first makes people laugh, and then makes them think," and was established in 1991 by a science magazine editor, Marc Abrahams.

It is known that normal speech can be interrupted by making the speaker hear his/her own voice with a delay of about several hundred milliseconds. This phenomenon has excellent properties: the speech can be interrupted without physical pain, the effect disappears when the speech is stopped, and there is no effect on the surrounding persons. Dr. Kurihara and Dr. Tsukada created the Speech Jammer by combining the directional microphone and speaker as a system to interrupt the speech from a remote place. This system has the potential for promoting conversational manners and rules and can also be used for presentation training.

Dr. Kurihara with "Speech Jammer"

The trophy and sub-prize

Work-Study Program at Geological Museum

At the Geological Museum, two eighth graders were accepted to the work-study experience program on July 18~19, 2012 at the request of the Teshirogi Junior High School, Tsukuba City.

On the first day, the students received a lecture about the routine work at the Geological Museum, and then were assigned to prepare the materials (paper crafts) that would be used in events. Although this was simple work, the two students understood its significance and worked seriously. In the afternoon, the outline of exhibit explanations was explained. They joined the visiting students of the Tochigi Prefectural Ashikaga High School and observed the staff of the Museum do the explanation. On the second day, the students were asked to provide junior high level explanation at the "Dinosaurs" and "Desmostylus" exhibits. The visiting group on that day consisted of the people of the life-long learning program organized by the Tsukuba City Community Center. The group was divided into two subgroups, and the staff of the Geological Museum provided the exhibit explanation in each room. The junior high students took over the explanation at their respective sections. Since the group was informed beforehand, the explanations by the students were received positively. Since 2005, the Geological Museum conducts one-day work-study experience at the request of the neighboring junior high schools. The two students who completed the work-study experience commented that it was a valuable opportunity to experience the difficulty of explaining the exhibits.

Scene of explaining the museum exhibits

Human Rights

Respect for Basic Human Rights

AIST is a workplace for many people including managers, staff members, contract employees, dispatch employees, visiting researchers, technical trainees, subcontract workers, visitors from industry-academia-university programs, visitors from international programs, and others. We are aware that we must respect and help each other regardless of the differences in status or position, in fulfilling our work duties.

From the "Compliance Guideline"

Item 1: Respect for human rights

— We respect the human rights, and shall not say or do things that may denigrate others. —

1. We respect the basic human rights, and shall not discriminate by race, nationality, age, gender, religion, belief, or social status.
2. We shall not say or do things that denigrate others, including harassment.

Respect for Human Rights in Research Activities

At AIST, research activities that use human subjects are conducted such as measurement of human characteristics.

The Human Engineering Experiment Committee that includes five external committee members is established to judge and approve the experimental plan from the perspectives of the rights of the subjects, guarantee of their dignity, maintenance of safety, and scientific justification for conducting the human engineering experiments.

In FY 2012, 49 new topics and 160 continuing researches were conducted.

Introduction of the Mentor Program

AIST implements a mentor program as part of its human resource training.

This is a program in which a new administrative employee (mentee) receives support about work and career building from a senior employee (mentor). The mentor listens to the concerns from the mentee about workplace and life, and supports the personal growth of the mentee as they build a trusting relationship.

In FY 2012, six mentors were selected by open application for eight mentees. Two groups each consisting of four mentees and three mentors were created, and the members of the groups engaged in voluntary activities including lunches and parties, as well as exchange between the two groups. Also, individual consultation and advice (mentoring) for the employees were done, and many mentees and mentors comment that these were useful in solving the problems.

In FY 2013, exchange activities will be organized by the secretariat to support the trust building between mentors and mentees.

Prevention of Harassment

Harassment violates the dignity of the person, causes mental pain, and even imparts disadvantage. Also, the person who unintentionally harasses another may become mentally ill. Occurrence of harassment degrades the workplace environment, lowers motivation, and may even have negative effect on the research result. AIST sets the rules and implements training sessions to create a harassment-free workplace.

Preventative measures

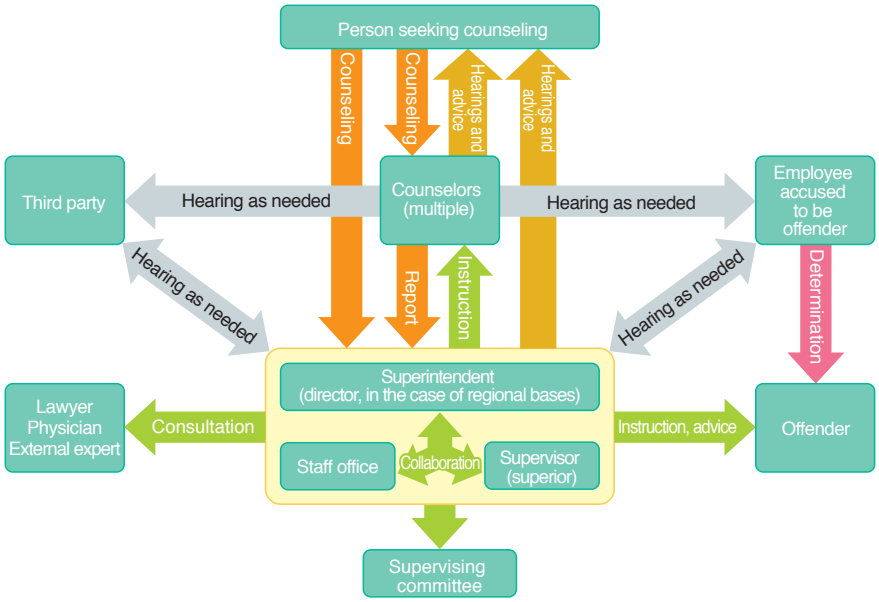
- The AIST rules for sexual harassment and other harassments have been created to clarify the procedures to prevent such harassments.
- Trainings for the staff, managers, and counselors are available at the sites to learn about the prevention of harassment and the handling of harassment consultations.

Counseling programs

The harassment counselors and sexual harassment counselors (half of them women) are placed at each site to consult, investigate, and mediate, so the harassment victims do not have to be alone. If the problems cannot be solved within the workplace or by counselors, a supervising committee will investigate the cases and provide appropriate advice or take necessary measures. Email and telephone consultations with industrial physicians and external institutions can be done from the perspective of privacy protection and to provide an environment where people can receive help readily.

Harassment training program conducted in FY 2012

Program	Subject	Objective	No. of participants
New employee training	New AIST employees	Learn the basic preventive measures of harassment, as part of training for principles, basic knowledge, and skills required to perform work duties.	80
Basic training for contract employees	Contract employees (new contract employees; those hired in previous FY but did not receive training)	Learn the basic preventive measures of harassment, as part of training for basic knowledge of AIST mission compliance needed to perform work duties.	379
Basic training for foreign employees and others	Foreign employees who do not speak Japanese	Basic training for contract employees is offered in English.	69
Training for young researchers	Limited term researchers (fifth year after joining AIST) Researchers employed by exams (eighth year after joining AIST)	Learn the basic preventive measures of harassment and understand the points for maintaining good relationship with all people who work at AIST, as part of a training for the researchers in the period of transition from junior to medium level, to learn the skills that may be needed to promote and develop their researches.	15
Group leader training	People who newly became group leader (including group leaders who have not yet received this training)	Learn the basic preventive measures of harassment, as part of training for those who newly became group leaders, to learn the basic knowledge and skills of management.	50
Harassment and sexual harassment counselor training	Harassment and sexual harassment counselors	Learn the knowledge about harassment prevention and interview skills that are required for a counselor.	59



Flowchart for counseling

- People seeking counseling include those who are not parties involved (victims or accused offenders).
- Counseling can be provided by interview, telephone, email, document (letter), or facsimile.
- There shall be no disadvantage for seeking counseling.
- Protection of privacy will be ensured in the consultations, and any confidential information obtained in the course of counseling will not be disclosed.

Activities to Raise Awareness of Diversity

AIST aims to create an environment where the values and ideas are generated from employee diversity (in gender, age, nationality, and others), with the common understanding that diversity is essential for creating innovation. Six action plans were set and various measures are planned and implemented to promote diversity.

To raise the awareness of diversity, seminars and trainings are conducted for the employees. In FY 2012, “Seminar on Childrearing” was held to raise the consciousness about the men’s involvement in childrearing.

The activities to support female researchers at AIST and the analysis data of work-life balance were reported at symposia. Also, the activities for diversity promotion are released inside and outside AIST through periodical publications.

AIST sets as a goal the employment of 15% or more female researchers in the period of Third Mid-Term Plan (FY 2010~2014). The job recruitment meetings and job information magazines are used to increase the number of applicants.

The recruitment staff shares the recruitment goal and policy and employment data to discover and to actively recruit excellent human resources. The total employment of women as of third year of Third Mid-Term (FY 2010~2012) reached 15.2%.

The Diversity Support Office (DSO) is organized to deepen the collaboration with the research and education institutions in Japan to promote diversity.

Support for Foreign Researchers

To employ excellent human resources around the world, the recruiting personnel and overseas applicants can now hold initial interviews through the Internet.

English emergency broadcasting that will be aired during emergencies such as earthquake and fire has been organized for employees who cannot understand Japanese. The English version of e-learning trainings were started so foreign employees can understand and learn the basic knowledge such as the missions and other topics of AIST, compliance, service and disciplinary rules, fundamentals of safety and health administration, and code of conduct for researchers. More English versions of guides and operation manuals will be created.

AIST International Forum is held annually to exchange information that may be useful in research.

AIST International Center (AIC)

The AIST International Center is located in AIST Tsukuba, to support the foreign researchers who work and stay at AIST.

- Consultation on living: There were 270 consultations in FY 2012, and 141 cases were about immigration procedures. Information supports were also provided for living accommodations and medical services.
- Help with applications to Immigration Bureaus: The staff members who have proxy qualifications regularly visit the Mito branch office, Tokyo Regional Immigration Bureau to submit applications such as extension of period of stay as requested by foreign employees (40 cases in FY2012). Such support is highly popular among foreign researchers.
- Handbook: The alien registration system was abolished in July 2012, and the new residence management system was started. Therefore, the procedures at the regional immigration bureaus and municipal offices changed. To handle the new residence management system, the previous handbook for foreign researchers was totally revised, and the new *Handbook for Living in Japan* (written in English and Japanese) was published in March 2013.
- Japanese language program: Three Japanese language courses are held twice a year (the first and the second term) by language instructors for foreign researchers staying at AIST Tsukuba. A total of 46 people took the courses in FY 2012, and the participants have commented that it was very useful for living in Japan.

Japanese class

Comment by a foreign researcher

Many foreign researchers including myself consider vacations a very important part of our work-life balance, as we often travel between Japan and our home countries. The Japanese government set the goal of paid leave taken by employees at 70% per year by 2020, and it is good to see that AIST is conducting campaigns to encourage the employees to take paid leave.

The paid leave program is very useful since it can be used for return trips to meet the family members who live outside Japan, as such trips take up long travel time. Other than paid leave, there are other leave programs such as summer vacation and bereavement leaves, and I have used them when there was sudden need to travel. These programs are satisfactory.

I also found useful the living information and tips to understand Japan provided by AIC. I think the Japanese classes and the flower arrangement sessions are useful for foreign researchers who do not know much about Japanese culture. Also, I am grateful of the agent service for doing procedures for the extension of stay.

Environmental Report

Environment-Friendly Policy

AIST promotes environment-friendly activities with the Charter of the Environmental Safety

AIST has stipulated the Charter of the Environmental Safety to promote environment-friendly activities in the research and development process, in addition to the production of research and development results toward a sustainable society. Under the principles of the Charter of the Environmental Safety, we have set an environmental and safety policy to take positive actions with a strong awareness that "protecting the global and local environment" and "ensuring the safety and health of all people working at AIST" are important issues.

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.

Environmental and Safety Policy

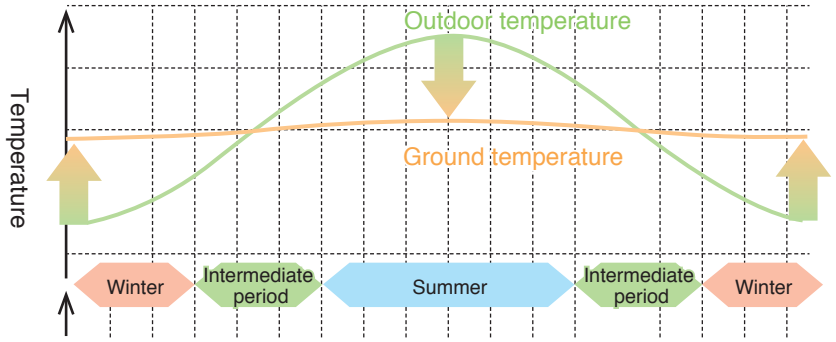
1. We will actively conduct research that contributes to the protection of the environment and the realization of a healthy and safe society.
2. We will comply with laws, regulations, ordinances, and agreements on the environment and occupational safety and health, and set self-imposed management standards to further improve environmental protection and occupational safety and health.
3. We will save energy and resources and reduce waste to decrease environmental load.
4. We will take actions to prevent environmental pollution and occupational accidents and take prompt and appropriate actions in the event of an emergency to prevent aggravation of damage.
5. We will establish a management system to effectively and efficiently promote environmental protection activities and occupational safety and health activities, perform the activities with the participation of all staff, and make continuous improvements.
6. We will actively disclose information on environment, safety and health through publication of environmental reports and information disclosure to promote communication with society.

Energy-Saving Measures for the Newly Established "TIA Collaboration Center"

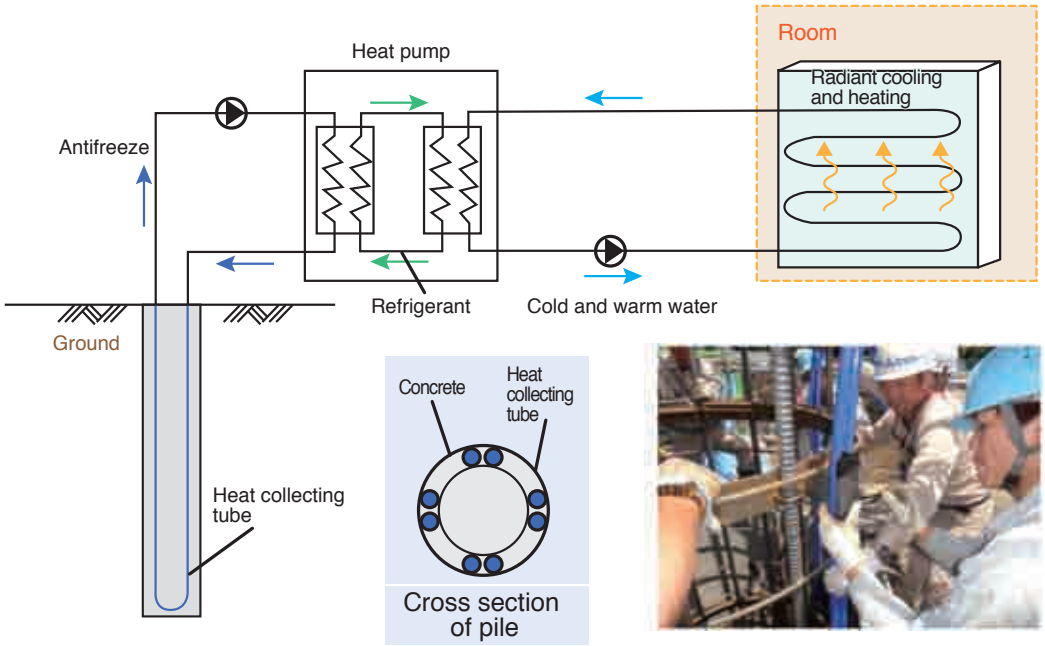
The heat pump air conditioning system using the ground-source was employed as the energy-saving measure at the “TIA Collaboration Center,” the core research facility of the Tsukuba Innovation Arena for Nanotechnology (TIA-nano).

This is a system where heat collection tubes are embedded inside the underground piles that support the building (maximum depth 40 m, 9 piles), and the heat and cold are collected through heat exchange between the ground and the water-cooled heat pump. The ground temperature is constant throughout the year, and it is lower than the outdoor temperature in summer and higher in winter. Therefore, by using the ground-source heat, efficient air conditioning operation is possible during both peaks of summer and winter. The air conditioning system includes the human-detecting sensors that are used for automatically controlling the air conditioning in areas without people, as well as manual operation of individual air conditioning. In addition, in time periods when air conditioners are not necessary, natural ventilation is used actively to increase the downtime for individual air conditioning. Much energy saving can be accomplished using this system.

○ **Relationship between outdoor temperature and ground temperature throughout the year**



○ **Ground-source heat system**



Targets and Results for Environment-Friendly Activities

The targets are set for environment-friendly activities, the achievements are reviewed and evaluated, and the results are reflected in the activities for the next fiscal year.

Activity	FY 2011 results	FY 2012			FY 2013 target	Page
		Target	Results	Self-evaluation		
Reduction of CO_2 emissions	17.2% reduction compared to FY 2004	Average 4% reduction compared to FY 2009 over 3 years from FY 2012 to FY 2014	7% reduction compared to FY 2009	◎	Average 4% reduction compared to FY 2009 over 3 years from FY 2012 to FY 2014	P50
Asbestos removal	Removed 17,818m³	Complete removal of remaining asbestos by FY 2013	Removed 11,188m³	○	Complete removal of remaining asbestos by FY 2013	P53
Effective use of resources	532 cases	Reuse of properties no longer in use: more than 600 cases (During Third Mid-Term Plan period)	Reused in 500 cases	△	Reuse of properties no longer in use: more than 600 cases (During Third Mid-Term Plan period)	P55
Promotion of green procurement	100%	100% procurement rate for special procurement items	100% procurement rate for 231 out of 233 items	○	100% procurement rate for special procurement items	P48
Expansion of green contracts	Introduced environmental threshold to power supply contract at AIST Chugoku	Scheduled introduction of environmental threshold to power supply contract at AIST Tohoku and AIST Kyushu	Signed contract for power supply with environmental threshold at AIST Tsukuba and AIST Kansai	△	Scheduled to introduce environmental threshold to power supply contract at AIST Tohoku and AIST Kyushu	P49

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

Overview of Environmental Load

In order to conduct activities that take into consideration the environment as a whole and to reduce the environmental load, it is important to understand how much environmental load there is due to the operations at AIST. The following table shows the amount of energy, chemical substances, and water used and released by the AIST activities.

Overall picture of the environmental load

Energy	Unit	FY 2010	FY2011	FY2012
	TJ	2,668	2,172	2,422
Purchased electricity	1000kWh	233,146	195,868	217,356
Utility gas	1000㎥	7,841	5,611	5,657
Propane gas	kg	10,166	5,091	4,091
Liquid fuel	kL	968	639	803
Purchased energy	TJ	17	18	21
Solar power	1000kWh	1,233	1,220	1,319

Substance	Unit	FY2010	FY2011	FY2012
Chemical substance (PRTR substance)	t	112	104	123
R&D materials (experimental equipment, paper, etc.)	-	-	-	-

Water	Unit	FY2010	FY2011	FY2012
	1000㎥	3,093	2,249	2,535
Water received	1000㎥	1,223	1,094	1,116
●Potable water	1000㎥	1,185	1,059	1,082
●Groundwater	1000㎥	36	33	34
●Industrial water	1000㎥	3	2	0
Recycled water	1000㎥	1,870	1,155	1,419

input → AIST → output

Atmospheric emission	Unit	FY2010	FY2011	FY2012
Greenhouse gas emission	1000tCO_2	111	92	115
●Purchased electricity	1000tCO_2	90	77	99
●Fossil fuel	1000tCO_2	20	14	15
●Purchased energy	1000tCO_2	1	1	1
NOx emission	kg	9,007	5,283	11,495
SOx emission	kg	1,310	1,318	1,853
Soot dust emission	kg	295	346	371

Waste material	Unit	FY2010	FY2011	FY2012
Waste generated	t	2,253	2,320	2,453
●General waste	t	583	567	611
●Industrial waste	t	1,670	1,753	1,842
Landfilled waste	t	238	180	300
Recycled paper	t	274	250	202

Effluent	Unit	FY2010	FY2011	FY2012
Amount discharged	1000㎥	760	981	1,171
●To sewer	1000㎥	758	979	1,169
●To public water bodies	1000㎥	2	2	2
Contaminants discharged	kg	1,605	1,114	1,426
●BOD	kg	905	470	590
●Nitrogen	kg	128	118	154
●Phosphorus	kg	9	10	11
●Suspended solids	kg	563	516	671

Organization

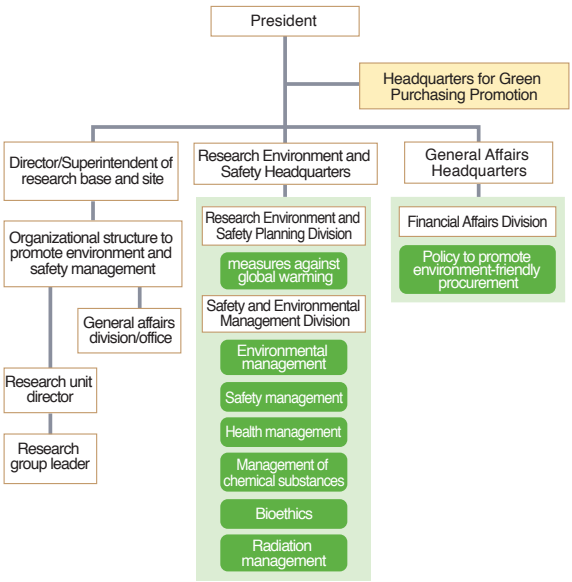
Established to ensure steady implementation of the measures based on the environmental

AIST promotes various environment-friendly activities through close collaboration between the headquarters (Research Environment and Safety Headquarters, General Affairs Headquarters, etc.) and the operational organization (research bases and sites).

The Research Environment and Safety Headquarters set the policy for the control of greenhouse gas emissions that is an ongoing issue. The Headquarters for Green Purchasing Promotion was established to develop and monitor the AIST policy for promoting the procurement of environment-friendly goods and services.

The directors and superintendents of the research bases and sites will take lead to plan and carry out specific measures based on these policies.

Organization for environment and safety

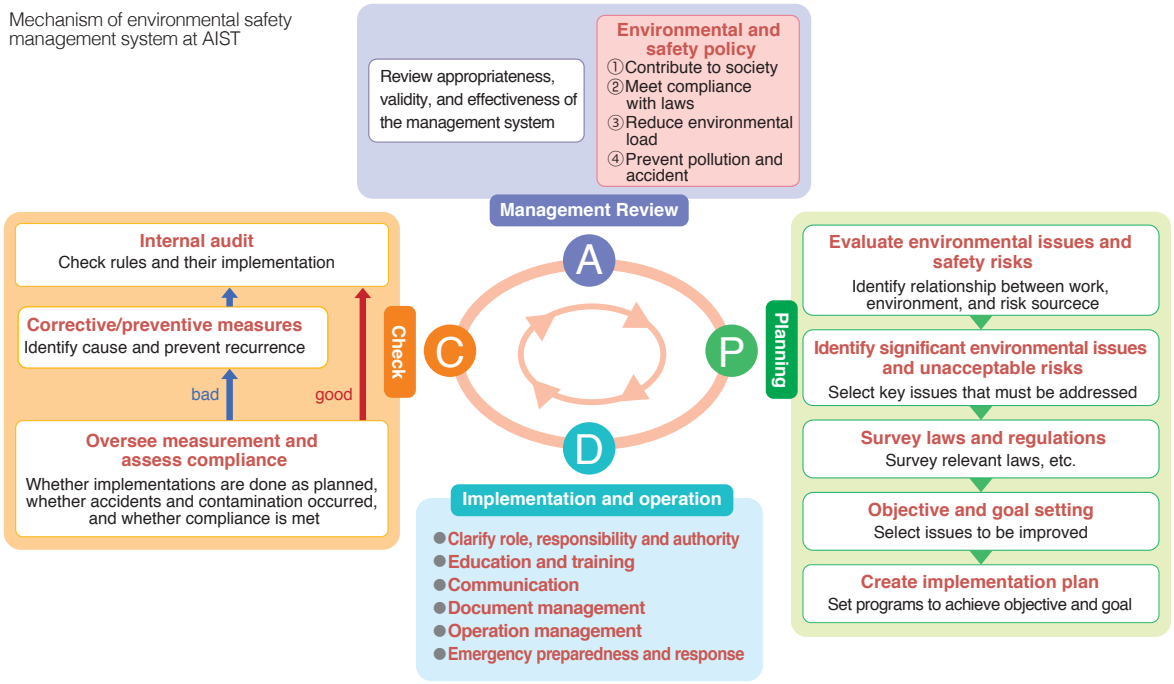


Environmental Management System

AIST has created and is operating a unique environmental safety management system (ESMS). This system integrates the environmental management system that aims to reduce the environmental impact of the operations to protect the natural environment, and the occupational safety and health management system to reduce the potential dangers and to improve the safety and health at the workplace.

In FY 2012, the internal audit (internal audit for environmental safety) was conducted at each unit to inspect the status of implementation of the management program, and revisions were done for improvements. Also, the ESMS activities were explained and exchange of opinions and information was done to improve and evaluate the issues at the National Meeting of Safety and Health Managers, to raise the skill of the safety and health managers who play a central role in the implementation of ESMS at each unit and regional base.

Mechanism of environmental safety management system at AIST



Environmental Education

We shall enhance environmental education

AIST provides education to new employees as well as people who are visiting AIST under the industry-academia-government interchange programs, international exchange programs, and dispatch programs, on issues that may have major environmental load, such as the treatment of wastewater and exhaust gas generated by research, and the sorting of waste materials, before they start work at AIST. We plan to enhance the environmental education and training in the future.

Green Purchasing and Green Contract

Green purchasing activities[*1]

When purchasing products, parts, or materials that are necessary for conducting R&D and when subcontracting external services for processing and prototype building, AIST considers the environment as well as quality and price, and engages in green procurement that give 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 environment-friendly goods, based on the "Law Concerning the Promotion of Procurement of Eco-friendly Goods and Services by the State and Other Entities (Green Purchasing Law)" and the "Basic Policy for the Promotion of Procurement of Eco-Friendly Goods and Services."

Status of procurement of environment-friendly goods

In FY 2012, AIST purchased 235 items in 18 categories among the 261 items in 19 categories specified in the Green Purchasing Law (types of environment-friendly goods and services to be preferentially purchased by the Government and other organizations). Excluding two items (media case and automobile [other than general official vehicle]) that failed to fulfill the standard due to the required function and performance, the 100% procurement rate for the FY goal was achieved for the specified procurement goods (those that meet the criteria for goods that reduce environmental load specified by the government). The environmental load is also considered in purchasing environment-friendly products (such as trash bags) that are not specified procurement goods.

Number of hybrid vehicles owned by AIST

As of March 2013, there are eight hybrid cars among a total of 86 vehicles (including research vehicles) owned by AIST. In updating the automobile that will be used for operations, 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/green/**

Green contract activities

AIST promotes the green contract that takes into consideration the reduction of greenhouse gases when signing contracts with the subcontractors, based on the "Law concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities (Green Contract Law)." In 2012, there were seven green contracts including the contract to change the power supply method.

Number of green contracts

Type of green contract	Number
Automobile purchase	1Cases
Contract for power supply	6Cases

For automobiles, three automobiles were purchased and two were leased. General competitive bidding, in which the price and environmental performance (fuel efficiency) are comprehensively considered and the contract is given to the service with best results, was conducted.

For the power supply contract, the environmental threshold system* was employed at the Tsukuba Central 1 (Energy Center, Pollution Management Facility), Tsukuba Central 6, Kita Site, Karima Site, AIST Kansai, and the Amagasaki Branch of AIST Kansai.

* Environmental threshold system
This is a system where the bidders are reviewed based on the score points for carbon dioxide emission coefficient, use of unused energy, use of new energy sources, and planned amount of green power certificate to be transferred to the purchaser. The bidder that has a total score that surpasses the standard and presents the lowest price is selected.

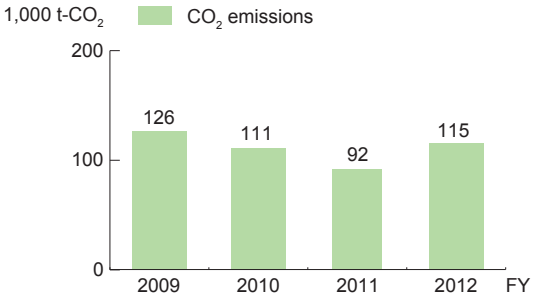
Measures against Global Warming

AIST created plans for reducing greenhouse gas emissions in April 2012, as part of the effort to reduce the environmental load materials that are produced by the operations at AIST. In three years from FY 2012 to 2014, AIST plans to reduce the greenhouse emissions by an average of 4% compared to FY 2009.

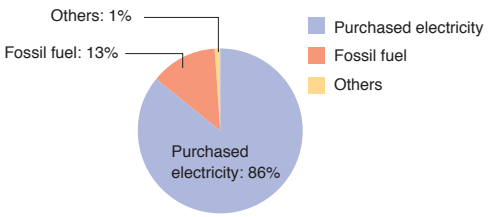
Following activities in FY 2011, in FY 2012, the research activities were restarted, as aggregation and space savings were promoted to achieve more efficient research facilities and organizations. Although the greenhouse gas emissions increased compared to FY 2011, it decreased about 7% compared to 2009, the benchmark year.

AIST will continue its efforts to reduce greenhouse gas emissions to meet the demands of society and the government, as the greenhouse gas emissions are expected to increase due to the operation boosts including the construction of new research bases and the promotion of open innovations.

Change in CO_2 emissions



Breakdown of the sources of CO_2 emissions



Introduction of New Energy Sources

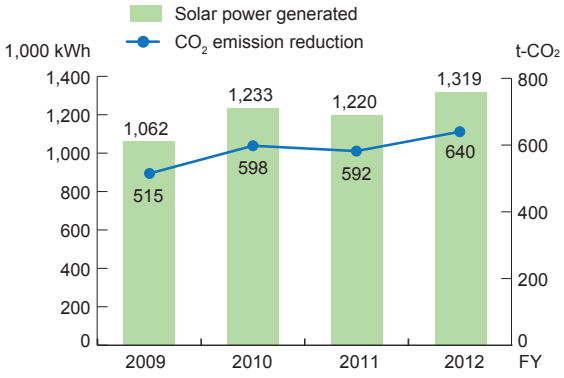
We have introduced new energy to reduce the CO_2 emissions

AIST introduced solar power generation facilities to AIST Tsukuba, as well as to its research bases such as, AIST Tohoku, AIST Tokyo Waterfront, AIST Chubu, AIST Kansai, AIST Chugoku, AIST Shikoku, and AIST Kyushu.

The amount of solar power generated in FY 2012 was 1,319,000 kWh. This is equivalent to the annual power use of 366 households, and this helped reduce the CO_2 emissions by 640 ton/year.

Mega solar town "Taiyo No Oka (Hill of the Sun)" at AIST Tsukuba

Changes in solar power generation and CO_2 emission reduction



Power Saving Measures during Summer

AIST conducted the following energy saving measures as requested by the government, with consideration on the effects such measures may have on the researches.

(1) Rotated operation schedule of large facilities (such as the clean room, constant temperature/humidity room, large-scale computer, air conditioning, etc.) to disperse the operation load
(2) Revised experiment schedule so experiments that use large facilities were conducted before and after the summer season
(3) Rotated operation schedule of infrastructures that consume large amount of power such as wastewater treatment and helium liquefaction facilities. Operations were also shifted to holidays and nights.
(4) Monitored power use by introducing the total power monitoring system
(5) Implemented rotated/scheduled vacations en masse at AIST Tsukuba and research bases

These measures and the rotated vacations at AIST Tsukuba allowed power reduction (peak cut) of 1,390～3,390 kW.

Appropriate Management of Chemical Substances

We shall reduce environmental risks and promote safety through appropriate management of chemical substances

Since there is a diversity of researches conducted at AIST, there are various chemical substances used in small quantities. In handling such substances, appropriate use and storage without accidents or leakages, as well as appropriate treatment of the disposed waste must be ensured.

【Treatment of waste liquid and exhaust gas after using chemical substances】

Liquid waste: AT AIST Tsukuba, the liquid wastes are detoxified at the treatment plant on the premises, and then are released to the public sewer system. In other regional bases, the disposal is subcontracted to the industrial waste treatment service.

Exhaust gas: The chemicals that produce harmful vapors are handled in the draft chamber, and the gases are released through the research exhaust detoxification facility. The decision on which chemicals should be handled in the draft chamber is communicated to the researchers using the Chemical Substance Management System described below.

Chemical Substance Management System

The “Chemical Substance Management System” was created and is operated to allow each researcher to manage the various chemical substances used in research, in accordance to the chemical property and the regulations. In the Chemical Substance Management System, the chemical substances are registered with the code of regulations that apply to them. These regulation codes enable monitoring of the information for the rooms in which the regulated chemical substances are used or stored.

Information on Released Chemical Substances

Based on the PRTR Law* and the related local government ordinances, AIST reports the amount of chemical substances that are released or transferred. The main chemical substances that must be reported are organic solvents that are used to dissolve and extract various organic compounds. Also, the amount of hydrogen fluoride used to cleanse semiconductors and dioxin from spray incinerators for organic liquid waste must be reported.

List of substances and amounts that must be reported according to the Chemical Substance Management System

Amount of PRTR substances released/transferred (1 ton or more handled)

Operation	Chemical substance	Handled	Released	Transferred	
			Air	Sewer	Waste
Tsukuba Central 1	Dioxin (mg-TEQ)		0.021		
Tsukuba Central 5	Chloroform (kg)	1,364	800		180
	Hexane (kg)	1,011	97		96
Tsukuba West	Hydrogen fluoride and its water-soluble salts (kg)	6,762		270	690
	Ferric chloride (kg)	106,570			

【Tokyo】

Amount of chemical substances subject to the Tokyo Metropolitan Environmental Ordinance to Ensure the Health and Safety of the People of Tokyo released/transferred (100 kg or more handled)

Operation	Chemical substance	Handled	Released	Transferred	
			Air	Sewer	Waste
AIST Tokyo Waterfront	Acetone (kg)	160	92		70
	Chloroform (kg)	320	38		280
	Methanol (kg)	1,300	790		470

【Osaka】

Osaka Prefectural Ordinance on the Preservation of Living Environment (1 ton or more handled)

Operation	Chemical substance	Handled	Released	Transferred	
			Air	Sewer	Waste
AIST Kansai	VOC(kg)	3,100	920		2,200

*PRTR Law: The official title of this law is the “Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management.” Business operations that handle 1 ton or more per year (0.5 ton or more for some substances) of any of the 462 PRTR chemical substances must report the release into the environment or the transfer to another business operation (due to sales or subcontract for disposal).

Asbestos Removal

Removal of spray materials containing asbestos

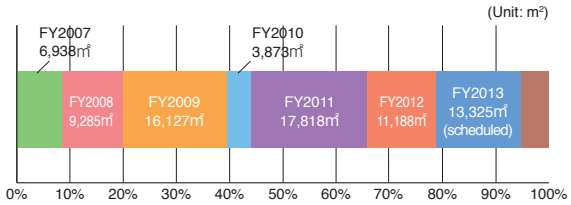
The spray materials containing asbestos are systematically removed

AIST is systematically removing 83,000m^2 of spray materials containing asbestos that were used on the AIST premises, based on the "Basic Policy for Planning the Removal of Asbestos-Containing Spray-on Materials" set in FY 2006. The plan has been ongoing since FY 2007, and the deterioration of the spray materials and the environmental measurements are monitored regularly.

In FY 2012, 11,188m^2 of spray materials containing asbestos were removed from the buildings. To present, a total of 65,229m^2 has been removed.

Excluding the parts of the building that will be closed down, the removal is scheduled to be completed in FY 2013. The environmental measurements will be taken once a year to check whether there are any airborne asbestos fibers from the remaining spray materials.

Change of the surface area of spray materials containing asbestos



Storage of PCB Waste Materials

Storage and monitoring of PCB wastes are done continuously

The transformers and capacitors that contain PCB are stored at each base.

The PCB wastes are stored as specially controlled industrial waste materials in designated warehouses at each unit and research base. The Specially Controlled Industrial Waste Manager inspects the storage conditions every month.

In FY 2012, the registration started for the treatment of PCB contaminated materials at the Hokkaido Branch of the Japan Environmental Safety Corporation (JESCO).

The ballast stored at AIST Hokkaido, and the pressure-sensitive copying paper and small electric appliances weighing 1 kg to less than 10 kg stored at AIST Tsukuba were registered.

Storage of PCB wastes

Category	Quantity
Capacitors	562
Transformers	45
Ballast	5,252

PCB-contaminated wastes packed in barrels for registration

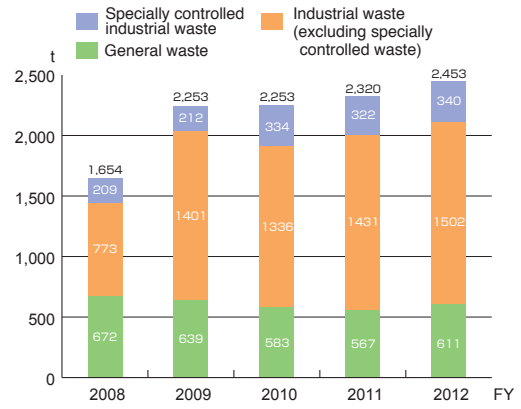
Reduction of Waste Production

Environmental load is reduced by decreasing the waste

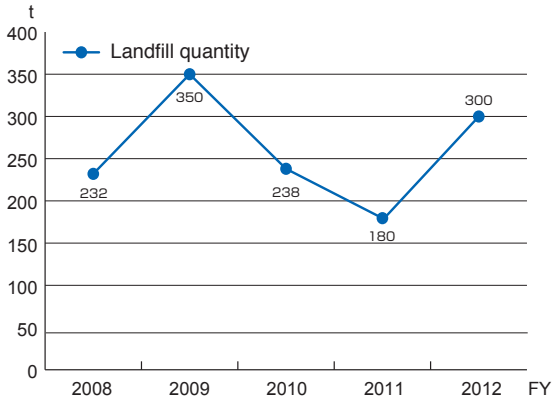
AIST attempts to reduce the environmental load through the 3R (reduce, reuse, and recycle) activities. Particularly, the reuse of research equipment is a focus area, since it also helps reduce expenditures (see Effective Use of Resources).

As a responsibility of an operator that produces waste, AIST voluntarily inspects the waste disposal sites every year. In FY2012, a total of 24 intermediate waste treatment facilities and landfill sites were inspected to ensure that the wastes were handled properly.

Change in the amount of disposed waste



Change of quantity sent to landfill



Particulars of disposed waste (FY 2012)

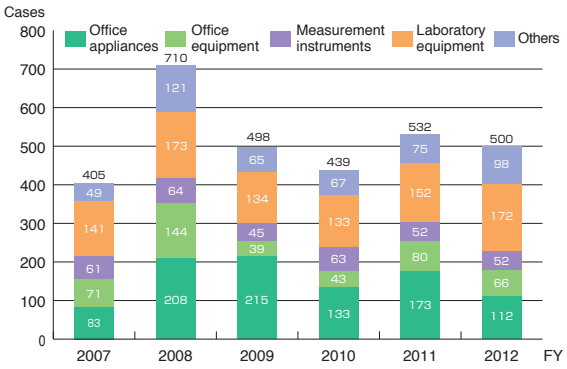
Category	Disposed (t)	Landfill (t)	Percentage landfill (%)
General waste	611	92	15
Industrial waste	1,502	196	13
Plastic waste	317	34	11
Scrap metal	581	1	0
Sludge	81	36	44
Scrap wood	35	24	69
Scrap glass, concrete, ceramics	60	9	15
Mixed waste	229	46	20
Waste oil	4	1	20
Composite material	0	0	0
Slag	20	0	0
Others	175	45	35
Specially controlled industrial waste	340	12	4
Flammable waste oil	47	2	3
Strong acid	255	3	1
Infectious waste	18	2	10
Waste oil (hazardous)	3	0	2
Sludge (hazardous)	14	5	40
Acid waste (hazardous)	1	0	9
Others	2	0	15
Total	2,453	300	12

Effective Use of Resourses

Reuse of equipment and facilities that are no longer used

Since 2005, AIST operates the “Goods Recycling System,” which uses the intranet to exchange information on necessary and unnecessary items such as research equipment, office appliances, furniture, consumables, and others, and thereby promoting recycling within AIST. Items that cannot be recycled within AIST are handed over (either free or sold) to external organizations. This promotes the reduction and reuse of waste materials.

Number of items recycled



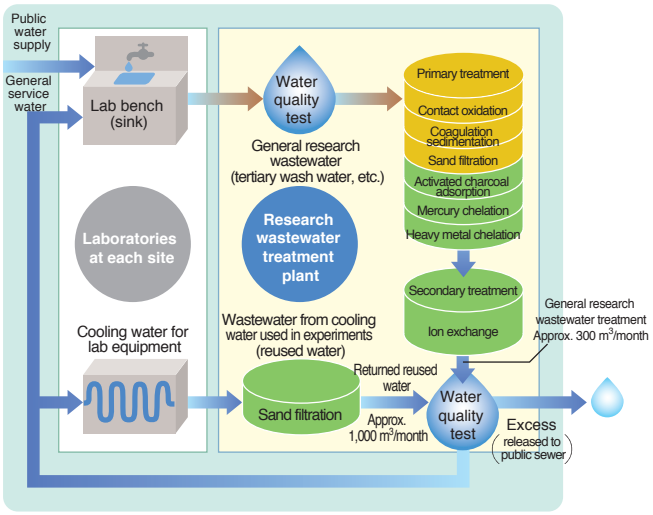
Conservation of Water Resources

The effective use of water resource is promoted through water reuse

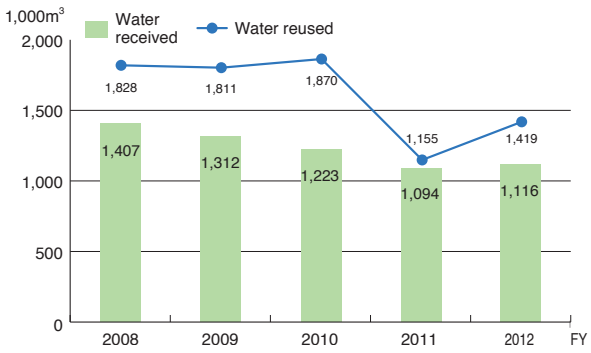
To promote the effective use of water resources, wastewater produced in research is reused after neutralization and reduction treatments at AIST Tsukuba and AIST Chubu.

The amount of water received in FY 2012 increased 2% compared to the previous year, and the amount of water reused increased 18% compared to the previous year. While the amount of water used in FY 2011 decreased due to the repair of the sewer pipes and suspension of experiments as the result of the Great East Japan Earthquake, in FY 2012, the level of water use recovered to the same level as before the Earthquake as the recovery efforts progressed.

Recycling of reused water at AIST Tsukuba



Change in the amount of water received and reused



Compliance with the Cartagena Protocol on Biosafety to the Convention on Biological Diversity

In 1992, the Convention of Biological Diversity (CBD) was adopted by many countries including Japan, to comprehensively conserve biodiversity and to utilize biological resources in a sustainable manner. Later, the Cartagena Protocol on Biosafety was drafted in order to ensure the safe transfer, handling, and use of genetically modified organisms that may have adverse effect on the biodiversity conservation and sustainable usage. In Japan, the "Act on the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms (Cartagena Act)" was established in 2004.

At AIST to comply with the Cartagena Act, a committee that includes external experts conducts the preliminary screening for the experiments using genetically modified organisms. Attendance to regular training sessions is compulsory for the researchers and assistants who conduct the experiments. Also, the laboratory, in which the genetically modified organisms are used, are inspected and support and instruction programs are offered at each site for conserving biodiversity.

Composting of lawn grass, tree branches, and leaves; dispersal of compost to forests (AIST Tsukuba)

AIST Tsukuba conducts greenery management (lawn mowing twice a year, pruning branches, etc.) within the premises. The mown grass and thin branches are not disposed, but are turned into compost through a one-year fermentation period (turned over once or twice by heavy machines) at the compost yard in the AIST grounds, without burdening the environment. The compost is returned to nature, as it is dispersed in the green areas and forests in the AIST grounds. The amount of compost produced is about 150m^3 per year.

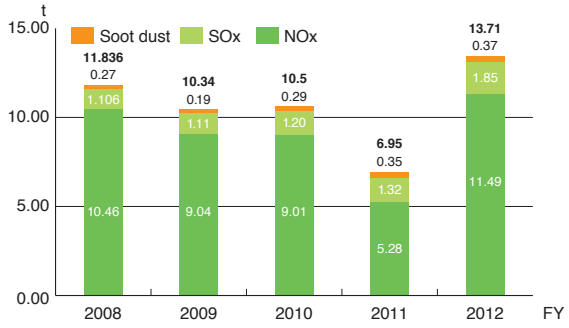
AIST strives to achieve "*Full Research* in society, for society" as stated in the AIST Charter by promoting compliance at the research facilities through the observation of laws, social code of conduct, researchers' code of conduct, and various rules.
For environmental protection, the following actions will be taken to protect the earth environment and to achieve a sustainable society.

1. **We shall observe the international environmental regulations and the environmental regulations of the government and local government to prevent pollution and to conserve the natural environment.**
2. **We shall promote researches that conserve the earth environment and ensure the safety of the humankind, and shall actively improve energy efficiency, save resources, and recycle materials.**

Prevention of Air Pollution

The main source of air pollutants is the boiler for a cold source in air conditioning. Utility gas and kerosene are used as boiler fuel to reduce the SOx emissions. In FY 2011, NOx emissions decreased because the operating hours of the boiler decreased at AIST Tsukuba due to the Great East Japan Earthquake. However in FY 2012, it increased to the level before the earthquake as the recovery progressed.

Changes in air environment load



Prevention of Water Pollution

The wastewater from research discharged from AIST is treated at the wastewater treatment plant located at each research base. It undergoes pH adjustment, coagulation sedimentation, filtration, and activated charcoal adsorption to meet the effluent standard of the local government, and then is released to the public sewer.

Inspection following the revision of the Water Pollution Control Law (prevention of groundwater contamination)

The inspection manuals and record forms were created, and the inspections were carried out properly as required by the revised Water Pollution Control Law that went into effect on June 1, 2012. Water leakages were found and repairs were made in some facilities, as a result of the inspections of specified facilities at AIST Tsukuba and the regional bases.

Damage of a pipeline was found at AIST Tsukuba during the inspection of outdoor buried drainpipes at research facilities. This case was reported to the local government, water quality analysis of the wastewater was conducted, and soil analysis was also done where deemed necessary. The situation is under control to prevent any effect on the surrounding environment.

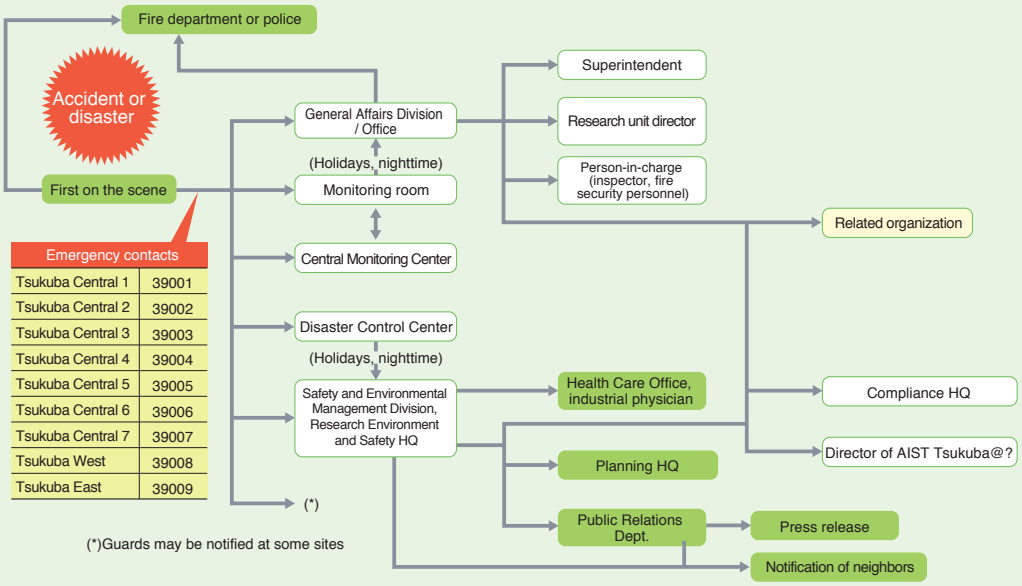

特定施設（水質汚濁防止法）点検表

Example of the inspection sheet

Environmental Accidents

AIST checks the status of compliance to the environmental laws using the PDCA cycle of the environmental management system. In case any accident occurs, a system to minimize the damage is prepared.

AIST Tsukuba Emergency Communication System



Drills to prepare for environmental accidents

AIST conducts drills for communication, reporting, and emergency response measures to minimize damages that may occur in case of environmental accidents such as leakage of oils or chemical substances.

In FY 2012, a drill that assumed the leakage of hazardous substances from the exhaust gas facility installed on the rooftop and grounds of AIST Tsukuba was conducted. The hazardous substances run into the public water system through the rain gutters if a leakage occurs on the rooftop and from the neighboring rain pit if it occurs on the ground. Therefore, the routes of rainwater drainpipes, the ways to stop the water flow at the rain pit, and communication and reporting methods at the time of emergency were checked.

Similar drills will be conducted regularly in the future, and the procedures will be revised as needed.

Drill for stopping the flow into the public water system

Drill for checking the flow route into the public water system

Reports of Accidents that Occurred in FY 2012

Fire at AIST Kansai

On June 18, 2012, a fire broke out and destroyed the second story area of the battery experiment building (three-storied) at AIST Kansai. The residents of the neighboring areas were temporarily evacuated, and we apologized for the great inconvenience and anxiety caused by this accident.

The on-site inspection was conducted by the fire department, police, forensics unit, crime lab, and the Labor Standards Supervision Office, but the cause of the fire could not be determined.

An accident investigation committee was established at AIST to conduct surveys of the cause of fire. Although the cause could not be specified, it was found that the fire developed into a serious accident due to the delay in initial fire extinguishing efforts and the lack of organization in the chain-of-command during emergency. Therefore, intensified fire drills, reduction of the amount of stored hazardous materials, thorough implementation of dangerous material management, and revision of fire and disaster prevention manuals were done as measures to prevent reoccurrence.

Improper handling of genetically modified organisms at AIST Shikoku

On October 26, 2012, it was found that some of the experimental apparatuses and the water used for washing were disposed without inactivation treatment. These wastes might have contained genetically modified organism (baculovirus) for which measures against proliferation must be taken according to the "Act on the Conservation and Sustainable Use of Biological Diversity through Regulations on the Use of Living Modified Organisms." This case was reported immediately to the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and inspections of the premises were conducted. Although there was no effect to human health or environment in this case, we received warning from the MEXT to thoroughly implement the measures to prevent recurrence.

Therefore, an investigation committee was set up at AIST to study the cause and to create preventative measures. The notifications were sent to all personnel, information of the inactivation treatment was communicated, manuals were revised, and re-education of the employees was conducted.

Omission of procedures for the distribution of research products at AIST Tsukuba Central 3

On February 27, 2013, it was found that sodium oxalate, a deleterious substance, was manufactured and sold as a standard substance, without the additional registration as an item handled by the manufacturer based on the "Poisonous and Deleterious Substances Control Act." The case was immediately reported to the Tsukuba Public Health Center. The standard substances were recalled, and inspections were done for the management of the poisonous and deleterious substances. An investigation committee was set up at AIST to study the cause and to create preventative measures.

The report including the measures to prevent recurrence was submitted to the Governor of Tsukuba Prefecture and the Tsukuba Public Health Center on April 30, 2013. As preventive measures, the notification and information of the management of poisonous and deleterious substances were communicated to all personnel, and the manuals were revised to make sure no omissions of the procedures might occur. Also, re-education and notification of the revised procedures were done to the employees.

Also in FY 2012, there were three cases of inquiries (complaints) from the neighboring residents concerning noise. Measures taken were limiting the construction work during holidays, fortifying the noise reduction facilities, and stopping the operation during nighttime.

Third Party Views

An Outsider's View of the AIST Report 2013 Social and Environmental Report

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

I think that one of the requirements for an excellent report is that an editorial policy reflecting social needs and concerns is established and permeates through the whole report. The main pillars of the editorial policy of this report are "promoting open innovation" and "building deeper relationships of trust."

I have examined the policy and the content of the report in this light. The former is guided by the interests of many people, including the government's identification of scientific and technological innovation as a pillar of its growth strategy. However, while innovation is crucial for creating new value for society and the importance of innovation is widely talked about when we look back to the past, it is not necessarily correct that it was innovation that led to the strengthening in the nation's industrial competitiveness. This is thought to be because our innovation has not had a base of excellent fundamental research to build from and because there are few examples of innovation resulting from collaboration by researchers in different fields.

In this report, from the President's message on, we can read about the AIST's "passion for innovation" and "real innovation" in the Lead-off Articles, the Open Innovation section, and Innovation School. It is noted in AIST that *Full Research* develops seamlessly from basic research to commercial research and it is often observed, such as by Vice-President Kanayama, that "there is a wealth of raw material for innovation." He says that he wants to gather personnel from various industries and regions and set up a large number of virtual vertical collaborations. Accordingly, there is an expectation of real innovation being realized and leading directly to stronger international competitiveness. In the early part of the year, the TIA Collaboration Center was completed and the Tsukuba Innovation Arena Headquarters was established. I look forward to reports of the kinds of innovation that result from the establishment of this innovation promotion system and venue.

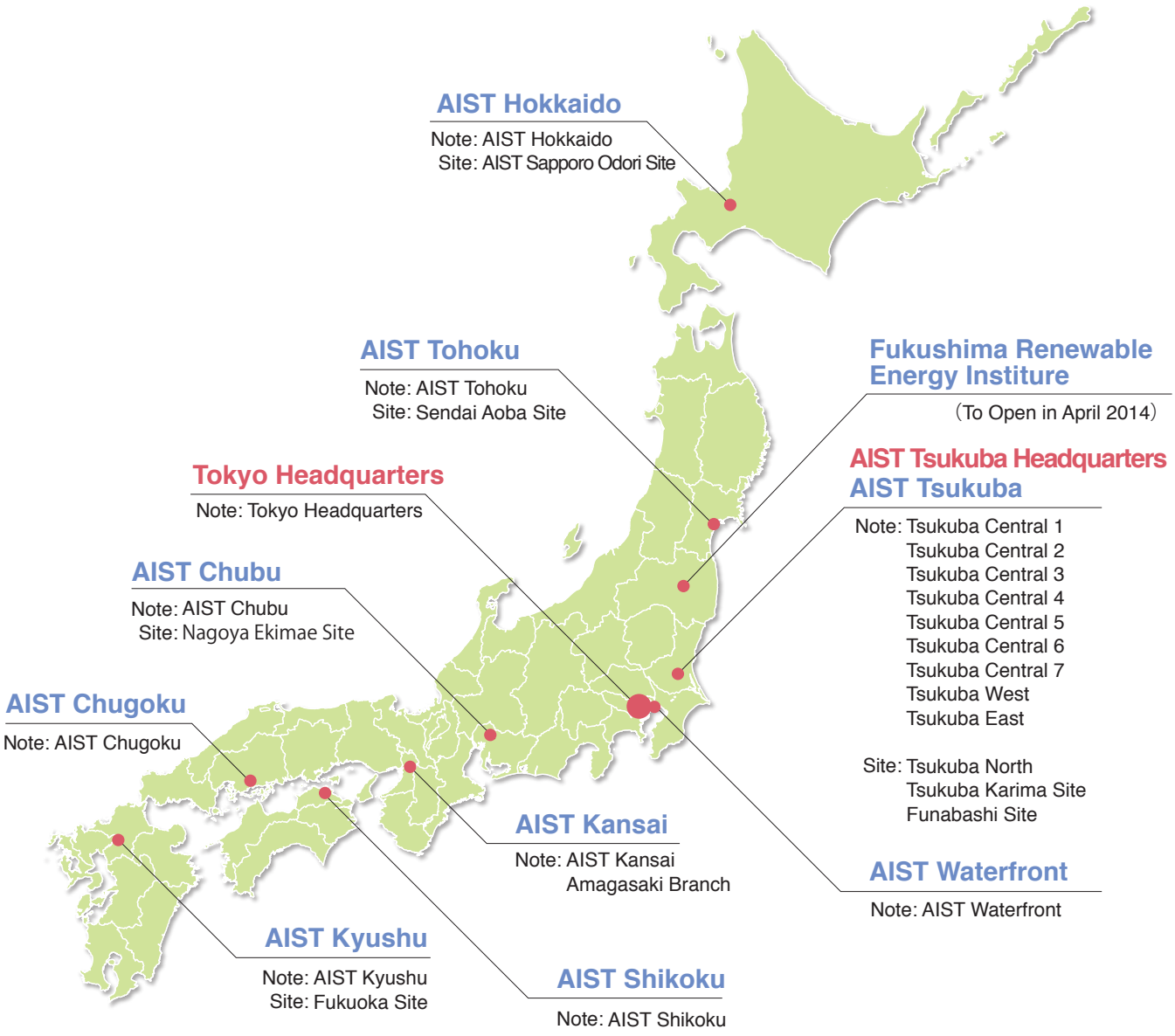
Considering now the content of the report, there is an awareness in AIST that "we are not really known" in society It seems to me that, through the course of previous reports and events, AIST has made great progress in promoting understanding and in creating its value as a part of society. Even so, the intention to further "build deeper relationships of trust" is clearly expressed in the report. "Evaluating research activities, etc.," which is mentioned for the first time, is symbolic of this. It seems likely that publishing the results of such evaluations, ensuring transparency, promoting public understanding, and practicing accountability will be necessary for building relationships of trust.

Another requirement is that sensitivity to social trends is reflected in the report. Looking through the report with this in mind, there is a discussion of the state of employment of people with disabilities (categorized by disability), showing that 17% of those employed have mental disabilities. A revision of the Physically Disabled Persons' Employment Promotion Law applying to businesses employing people with mental disabilities was approved by the cabinet in April 2013, so this presentation of the state of employment categorized by disability is very valuable. As yet, these disclosures are rare, and such descriptions require respectful sensitivity.

As I have discussed above, this report is highly comprehensive in its role as a social responsibility report for an independent administrative agency, but I would like to see more discussion of "building deeper relationships of trust." Firstly, the quantitative discussions of mental health and harassment that I mentioned last year are now included. Obviously space for these matters is limited, and while the state of current initiatives is described in detail, it is not clear whether these initiatives are producing results and leading to improvements. There are a number of precedents in which quantitative discussions have been conducted, factors analyzed, new policies developed and situations improved. Secondly, there is some reporting on the state of implementation and the verification of effectiveness of measures to prevent recurrences of misconduct. Every year the report describes misconduct honestly and I very much appreciate this, but review of the recurrence prevention measures is not reported. Review and reporting on recurrence prevention measures is in itself surely the highest form of recurrence prevention measure.

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. In its CSR workshops, the group runs activities studying and proposing appropriate forms for CSR.
(http://www.nord-ise.com/junkan/).

Research Baces



Afterword

On the publication of the AIST Report 2013

Masahiro Seto,
AIST Vice-President and Director-General,
Public Relations Department

AIST has been publishing environmental reports for ten years now, since the first one in 2004. The first reports were related to environmental initiatives and workplace health and safety initiatives at the Tsukuba Center. With the expansion of the subject matter to include research bases across the country, a report on activities relating to corporate social responsibility (CSR) for the organization was added. In recent years the AIST Report: Social and Environmental Report has been compiled and published in accordance with ISO 26000.

This report takes as its main theme the promotion of open innovation, pursued by AIST in order to improve Japan's industrial competitiveness. In the lead-off Articles, we report on the concept and activities of the TIA-nano research base, and on the Fukushima Renewable Energy Institute that will open in April 2014. In the research reports, we introduce research that is good for the environment—including research into solar cell modules and geothermal energy. There are also new reports on organizational governance in relation to systems and activities for evaluating important research activities and, in the environmental report, on systems and activities concerning energy conservation measures and biodiversity in relation to the construction of our new buildings.

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

http://www.aist.go.jp/index_en.html

Public Relations Department
AIST Tsukuba Central 2, 1-1-1 Umezono, Tsukuba, Ibaraki 305-8568, Japan
TEL.+81-29-862-6217 FAX.+81-29-862-6212
E-mail : aist-sr-ml@aist.go.jp

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