Centers of Knowledge—
Approaches to the Development and Enhancement of Facilities at National University Corporations, which Bring a Bright Future for Japan
-Creation and Development of a Campus Environment that Generates New Values-
(Report)

August 2011

Committee of Research Partners Concerning the Future Development and Enhancement of National University Facilities
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Japan’s National University Corporations (NUCs; including Inter-University Research Institute Corporations and Institutes of National Colleges of Technology; the same shall apply hereinafter) have contributed to the development of society by responding to the development of higher education and academic research, and by meeting various social demands. Facilities of the NUCs form the basis for the fulfillment of NUCs’ missions, including the development of creative human resources and the promotion of unique, cutting-edge academic research. The development and improvement of such facilities are conducive to the growth and development of Japan toward a better future.

Toward this end, Japan’s Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been supporting prioritized and systematic improvement of facilities based on The Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc. (FY2001–FY2005), which was formulated in response to the 2nd Science and Technology Basic Plan (Cabinet Decision in March 2001) and The 2nd Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc. (FY2006–FY2010; hereinafter referred to as “the 2nd Five-Year Program”), which was formulated in response to the 3rd Science and Technology Basic Plan (Cabinet Decision in March 2006).

The 2nd Five-Year Program is achieving certain results, including the ensuring of a safe and secure educational and research environment through prioritized implementation of measures for improvement of basic facilities for education and research (improvement of dilapidated facilities and improvement to eliminate overcrowding), as well as the improvement of university hospitals. In addition, individual corporations have actively promoted system reforms, including facility management, which has begun to produce significant effects on the progress of education and research.

However, NUCs have various problems. The great number of dilapidated facilities, such as those with insufficient earthquake resistance, and the overcrowding caused by new educational/research needs require urgent attention, while the medical environment at university hospitals needs to be enhanced promptly. Individual corporations are now required to promote further individualization and diversification, so they need to increase their value by improving the quality of their facilities; however, they are not yet adequately prepared.

The Great East Japan Earthquake occurred on March 11, 2011, causing extensive and serious damage to NUCs in the Tohoku and Kanto regions. Educational and research activities were badly affected due to damaged facilities and equipment, lifeline services were interrupted, and the power supply capacity was diminished, which made us re-acknowledge the importance of ensuring the continuity of educational, research and medical activities through comprehensive enhancement of disaster prevention measures.

The Committee has provided recommendations for the development and improvement of facilities of NUCs in various ways and called on the national government, NUCs and others at appropriate times to implement necessary measures. However, because FY2010 was the last year of the 2nd Five-Year Program, based on the examination of the efforts taken during the program period, the
Committee studied the current situation surrounding the facilities of NUCs, related problems, ideal facility development, and medium-to-long term future measures. The results of the study were reported as “Interim Summary” in August 2009. Then, in August 2010, the Committee further continued studies, including the examination of the progress of the 2nd Five-Year Program through questionnaire and other surveys, a survey of the situation in foreign countries, and the creation of the “Guide to the Creation of a Strategic Campus Master Plan.” The Committee presented a specific direction of prioritized and systematic improvement of facilities, which is to start from FY2011, the contents of which were reported as “Second Interim Summary.”

Later, the Committee gathered public opinions on “Second Interim Summary,” studied new problems in light of the damage caused by the Great East Japan Earthquake, and compiled priority facility improvement goals for five years from FY2011, which are reported below.

This report intends to show the direction of future facility development based on the 4th Science and Technology Basic Plan (Cabinet Decision on August 19, 2011) while helping the national government and NUCs to promote integrated efforts for the development and improvement of their facilities.

We expect that the government will faithfully implement the measures that are set forth in this report toward this end and that NUCs will make independent efforts in accordance with the measures.

Above all, we earnestly hope that various stakeholders, including NUCs, understand the need for facility improvement, while a national debate will be sparked toward facility development, leading to the development and improvement of the facilities of NUCs so that they can fulfill their mission adequately.

A campus is the face of a university—
An attractive campus environment full of character appeals to excellent researchers and students.
Chapter 1 Roles Played by National University Corporations’ Facilities

1. Mission and Roles of National University Corporations

   Situations around the world are quickly changing, as exemplified by the growing concern over global environmental problems and the intensifying international competition accompanying globalization. In addition, Japan is saddled with a mountain of various problems, including restoration and reconstruction after the Great East Japan Earthquake, and changes in the social system associated with the progress of the falling birthrate and the aging and falling population.

   As a nation poor in natural resources, the cornerstone for Japan’s continued growth and contribution to the international community is human resource development, in other words education. The sustainable development of Japan is impossible without the development of education.

   In addition, it is essential for the sustainable growth and development of Japan to powerfully advance the development of science and technology, which are conducive to innovation, while robustly cultivating international competitiveness based on science and technology. It is also critical to the realization of the 4th Science and Technology Basic Plan that universities promote the cultivation of creative human resources as well as original and cutting-edge research. Furthermore, social contribution through regional contribution, industry-university-government collaboration, international cooperation and other efforts are indispensable for the country to continue vigorous development.

   Supporting the basis of higher education and academic research in Japan, universities are expected to play the role of a knowledge base demonstrating international attractiveness in order to contribute to establishing the foundation of the future development of society.

   Among universities, National University Corporations (NUCs) have played central roles in higher education and academic research in Japan by contributing to the cultivation of creative human resources while promoting original and cutting-edge research. Distributed across the country, they have played important roles, such as supporting the foundation of regional education, culture and industries, and providing students with opportunities to learn regardless of their economic status, while contributing to the realization of a life-long learning society and the revitalization of local communities.

   After the Great East Japan Earthquake, universities provided emergency shelter to students, teaching staff, victims and commuters who had difficulty returning home, and extended other wide-ranging support while at the same time playing the central role in emergency critical care for victims, which made us reaffirm the importance of their role in the community. Each university is expected to continue participating in initiatives aimed at post-disaster reconstruction and the restoration of a dynamic Japan, by exploiting their own distinctive features.

   There is no change in the mission of NUCs today after the start of the Second Medium-Term Objectives period; the further enhancement of functions is expected, taking advantage of incorporation.

2. Role of the Facilities of National University Corporations

   Because the facilities of National University Corporations form the basis for fulfilling NUCs missions described above, it is necessary to create a suitable environment for the transmission and revitalization of creative intellectual activities and soft assets as a place for nurturing human resources who will lead the future of the country and contribute to knowledge creation, transmission and development, and as a place for promoting original and cutting-edge academic research that creates
innovations.

Being the places where diverse people gather and promote exchange, campuses of NUCs also need to have a flexible and comfortable environment giving consideration to human nature and cultures. In addition, when a disaster strikes they will be used for protection of the lives of local residents and patients as well as students and teaching staff, which means that the appropriate securing of necessary functions for such purpose is required.

In this way, the facilities of NUCs not only play critical roles in developing more sophisticated and diversified educational and research activities but also form the basis for the facilitation of industry-academia-government collaboration and research exchange, the promotion of internationalization, the realization of a life-long-learning society, social contribution and other efforts. In order to develop sophisticated human resources who will play central roles in society and to attract excellent students and researchers from home and abroad, it is necessary to establish a more attractive educational and research environment in the future.

It is indispensable for the country’s growth and development to steadily and continuously develop and improve facilities to ensure and further sophisticate a safe, well-equipped and high-quality educational and research environment.
Chapter 2 Current Status and Challenges for the Facilities of National University Corporations

I. Verification of the 2nd Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc.

Based on the 3rd Science and Technology Basic Plan, MEXT formulated the 2nd Five-Year Program, identifying facilities that require urgent improvement (approx. 5.40 million m²) during five years from FY2005 from among the total improvement demand of approx. 10 million m², and has supported prioritized and systematic improvement.

The specific implementation status is described below (Chart 1):

(1) Status of Prioritized Improvement

The 2nd Five-Year Program identified the urgent renovation and building of approx. 5.40 million m² of facilities, consisting of i) the improvement of fundamental facilities for education and research, including a) the improvement of dilapidated facilities (approx. 4 million m²), b) improvement to eliminate overcrowding (approx. 800 thousand m²), and ii) the improvement of university hospitals (approx. 600 thousand m²).

It is estimated that approx. 4.88 million m² or about 90% of the approx. 5.40 million m² that is the target would have been completed at the end of FY2010, which shows that the facilities have been improved through individual corporations’ own self-reliant efforts utilizing diverse sources of finance in addition to the improvement at the national expense, including the facility improvement subsidy (Chart 2).

(i) Improvement of fundamental facilities for education and research

a) Improvement of dilapidated facilities:

To ensure the development and improvement of fundamental facilities for education and research, a target is set at the improvement of approx. 4.00 million m² (including the 2.80 million m² improvement of dilapidated facilities with an Is value 1 below 0.4 2), placing the first priority on the improvement of dilapidated facilities and focusing on those with very poor seismic capacity and those promising better educational and research results through the improvement of their significant functional problems.

Toward this target, approx. 3.39 million m² (85%) of the dilapidated facilities have been improved, including the fundamental facilities focusing on the function to develop human resources (approx. 3.13 million m²) and Centers of Excellence (approx. 0.26 million m²).

Specifically, efforts were made to ensure a safe and secure educational and research environment including earthquake resistance alongside functional improvement, such as creating space in response

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1 Is value: seismic index of structure, calculated based on the basic seismic capacity, shape, age and other factors of a building (Is = Eo × SD × T, where Eo is the basic seismic capacity index, SD is the structural irregularity index, and T is the time deterioration index). The “Basic Policy to Promote Diagnosis of Earthquake Resistance Levels and Earthquake Retrofit of Buildings” (Public Notice of the Ministry of Land, Infrastructure and Transport, No. 184 on January 25, 2006), based on the provision of Article 4 of the Act on Promotion of Seismic Retrofitting of Buildings (Act No. 123 of 1995) requires the ensuring of an Is value not less than 0.6 (it is deemed that there is a high risk of collapse due to a large earthquake, etc. when Is is less than 0.3; there is a risk of collapse due to a large earthquake, etc. when 0.3 ≤ Is < 0.6) for general facilities to prevent them from collapsing when a large earthquake occurs. For school facilities, the minimum Is value is increased to 0.7 considering their particularity as educational facilities in accordance with these laws and guidelines, as well as “Survey and Research on the Earthquake Resistance Capacity of School Facilities (Report)” compiled by the Seismic Capacity Subcommittee, School Facilities Committee, Architectural Institute of Japan in 1996.

2 “Standards for the Seismic Diagnosis on Reinforced Concrete Buildings and the Interpretation” (Japan Architectural Disaster Prevention Association) reports that “most of the school buildings with an Is value not more than 0.4 at the secondary diagnosis collapsed or were wrecked during the 1995 Kobe Earthquake.” “Center of Knowledge – Future of the Facilities Development of National University Corporations, etc.” compiled by the Committee in March 2006 suggests the need for urgent improvement of facilities with very poor earthquake resistance (with an Is value of 0.4 or lower) as the most important issue.
to changes in utilization form and space for new educational and research projects, as well as replacement with energy-saving equipment when improving deteriorated essential equipment.

Earthquake resistance, in particular, was given the top priority and earthquake-resistance retrofitting was conducted for approx. 3.08 million m², focusing on the facilities with very poor seismic capacity. As a result, the rate of earthquake resistant facilities was improved from approx. 65% in 2006, when the 2nd Five-Year Program was formulated, to approx. 88% (estimation for the end of FY2010). However, there are still approx. 290,000 m² of facilities with an Is value of 0.4 or lower without earthquake-resistance retrofitting. (All the facilities with an Is value less than 0.3 that are at high risk of collapse due to a large earthquake, etc. and can be retrofitted have been reinforced against earthquakes.)(Chart 3)

b) Improvement to eliminate overcrowding

For cases where it is difficult to respond through facility management to new educational and research needs, including the need for space for newly established graduate schools and young researchers, and there is no other means, approx. 0.80 million m² of new construction and extension were planned and facilities of approx. 0.81 million m² (101%) have been developed to eliminate overcrowding.

Specifically, the improvement consists of approx. 0.35 million m² of facilities for cutting-edge research, such as world-leading research centers, facilities for conducting joint or funded research under industry-university-government collaboration and at Centers of Excellence; and approx. 0.46 million m² of fundamental facilities focusing on the human resources development function, including space for newly established graduate school and young researchers.

ii) Improvement of university hospitals

University hospitals are promoting systematic redevelopment, etc. in order to play a pioneering role in state-of-the-art medical care. Approx. 0.60 million m² was set for the target of such redevelopment and developed approx. 0.68 million m² (114% of the target).

Specifically, development was made to maintain and improve medical services, including by eliminating overcrowding caused by the specialization and sophistication of medical practice resulting by the progress of medicine and the diversification of needs in recent years, as well as by resolving functional deterioration due to aging.

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3 The rate of earthquake resistant facilities as of the end of FY2010 was calculated by adding approx. 3.30 million m² of facilities that were found to be earthquake resistant in seismic diagnosis and new constructions/extensions, as well as the redevelopment of university hospitals to approx. 3.08 million m² of facilities with strengthened earthquake resistance.
Chart 1: Outline of the 2nd Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc. (FY2006–2010)
(2) Status of the System Reform

The 2nd Five-Year Program sets the concrete policy of further promoting system reform including improvements through facility management and those using diverse sources of finance by NUCs, whose specific efforts are described below:

i) Efforts of facility management

a) Effective Utilization of Existing Facilities

Individual NUCs are actively working on the effective utilization of existing facilities, including the inspection and evaluation of facilities, the ensuring of space for flexible use, and the reallocation of space. (Chart 4)

- Almost all corporations have established rules for effective utilization of existing facilities, which shows they have advanced their efforts for effective utilization (from 97% in 2005 to 99% in 2008).
- The utilization rate of lecture rooms is higher compared with the level of FY2006 but there are still lecture rooms with a low utilization rate.

- Space was reallocated4 based on the results of inspection and evaluation of existing facilities. Of the reallocated area, 62% is space for joint use and 16% is used for research offices and laboratories. The total area for joint use of NUCs has increased from 1.33 million m² (2006) to 1.69 million m² (2010).

- Individual corporations are advancing the formulation of rules, etc. to ensure space for young researchers (from 13% in 2005 to 63% in 2008).

- An increasing number of corporations have introduced a system to charge fees for use of space5 (from 60% in 2005 to 76% in 2008). Some corporations use the collected fees for maintenance management.

b) Maintenance management of facilities

Maintenance management is important for ensuring the safety of students, teaching staff and others, and preventing the deterioration of facility functions, but it is also essential for providing a good campus environment, so it is important to create and implement annual plans for mid- and long-term refurbishment and repair works giving consideration to the service life of facilities and equipment, cost and other factors. Almost all corporations have a mid- to long-term repair plan in place. Approx. 30% of the plans do not specify necessary expenses involving repair and other work, and some of them specify necessary expenses only for a part of the facilities. (Chart 5)

In order to ensure appropriate cost for facility maintenance management, efforts to reduce costs are made by utilization of scale merit through central order placement for services of the same type and through changing to multiple year contracts, and by shifting to general competitive bidding, for example.

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4 Reallocation of space: effort to change the purpose of facilities with the aim of effective utilization of existing facilities

5 Charging fees for use of space: collected from users of research and other facilities.
c) Energy conservation measures

All NUCs have established their basic policy for energy conservation measures and set concrete numerical targets. Some corporations are independently making active efforts, such as initiatives to raise staff awareness about energy conservation and the introduction of an environmental charge system.\(^6\)

\(^6\) Environmental charge system: a system to collect a charge for consumption of electricity, gas and water from users and to use the revenue for energy conservation measures
Through these efforts, approx. 70% of the campuses improved their energy consumption \(^7\) by more than 1% from the previous year in FY2008. However, energy consumption increased at approx. 20% of the campuses, which shows that further promotion of energy conservation measures is required. (Chart 6)

### ii) Improvements using development techniques that utilize diverse sources of finance

NUCs have been actively making independent efforts on facility improvement using development techniques that utilize diverse sources of finance, including those using long-term borrowings, independent revenue such as donations, and improvement in cooperation with local governments, government agencies and private enterprises, in addition to improvements at the national expense, such as the facility improvement subsidy.

Specifically, approx. 990,000 m\(^2\) of facilities were developed during the period from FY2006 to FY2010 using development techniques that utilize diverse sources of finance. Such techniques include the development of educational and research facilities, industry-academia-government collaboration facilities, welfare facilities, and facilities for extra-curricular activities and accommodations. (Chart 7)

### iii) Efforts for cost reduction and proper execution

Efforts for cost reduction have been made since FY1997 and most of the goals of previous programs have been accomplished. Since FY2008 the focus has been shifted from cost reduction to both cost and quality, giving consideration to life-cycle cost and other factors under “MEXT Public Works Cost Structure Improvement Program.” The program aims to accomplish a 15% total cost reduction in five years from the level of FY2007 and calls for the promotion of initiatives toward the accomplishment of the target.

Each corporation is responsible to ensure fair bidding and contracts based on the Act for Promoting Proper Tendering and Contracting for Public Works and other laws.

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\(^7\) Energy consumption: obtained by dividing the energy usage of a building by values closely related to energy use (ex. total floor area, hour of use)
### Chart 7 Improvement Using Development Methods that Utilize Diverse Sources of Finance

<table>
<thead>
<tr>
<th>Development Method</th>
<th>Developed Area</th>
<th>Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development using individual and company donations</td>
<td>Approx. 136,000m² (approx. 39.7 billion yen)</td>
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<tr>
<td>Tokyo University Interfaculty Initiative in Information Studies/Fukutake Hall</td>
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<tr>
<td>Kyushu University, Inamori Foundation Memorial Hall</td>
<td></td>
<td></td>
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<tr>
<td>Fukuoka University of Education, multi-purpose ground</td>
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<tr>
<td>Kyoto University Hospital Sekitei Building</td>
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<tr>
<td>Development utilizing subsidies of other offices/ministries</td>
<td>Approx. 151,000m² (approx. 27.1 billion yen)</td>
<td></td>
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<tr>
<td>Hokkaido University Platform for Research on Biofunctional Molecules</td>
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<tr>
<td>Shinshu University Fiber Innovation Incubator</td>
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<tr>
<td>Development in cooperation with local governments</td>
<td>Donations, etc.: Approx. 12,000m² (approx. 3.2 billion yen) Own initiative: Approx. 20,000m² (approx. 5.8 billion yen) Loan: Approx. 47,000m² (approx. 10.7 billion yen)</td>
<td></td>
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<tr>
<td>Gunma University Ota Campus</td>
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<td>Tokyo University of the Arts, Senju Campus</td>
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<tr>
<td>Development using other independent funds</td>
<td>Approx. 55,000m² (approx. 13.4 billion yen)</td>
<td></td>
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<tr>
<td>Tenenting facilities of private business</td>
<td>Approx. 23,000m² (approx. 5.2 billion yen)</td>
<td></td>
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<tr>
<td>Development using long-term borrowings</td>
<td>Approx. 60,000m² (approx. 9.1 billion yen)</td>
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<tr>
<td>Oita University Student dormitory</td>
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<td></td>
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<tr>
<td>Tokyo University of Agriculture and Technology veterinary hospital</td>
<td></td>
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<tr>
<td>Development using long-term borrowings</td>
<td>Approx. 22,000m² (approx. 5.3 billion yen)</td>
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<tr>
<td>Tokyo University IPMU</td>
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<tr>
<td>Development using overheads, etc.</td>
<td>Approx. 356,000m² (approx. 77.1 billion yen)</td>
<td></td>
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<tr>
<td>Osaka University Integrated Life Science Bld.</td>
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<tr>
<td>Akita University Student support Bld.</td>
<td></td>
<td></td>
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<tr>
<td>Development using appropriated surplus</td>
<td>Approx. 73,000m² (approx. 20.6 billion yen)</td>
<td></td>
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<tr>
<td>Development using income from land selling</td>
<td>Approx. 55,000m² (approx. 13.4 billion yen)</td>
<td></td>
</tr>
<tr>
<td>Tenanting facilities of private business</td>
<td>Approx. 23,000m² (approx. 5.2 billion yen)</td>
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</table>

**Developed area: Approx. 990,000m²: Project cost: approx. 227.3 billion yen**

*FY 2010 results of two universities and three technical colleges in the disaster area of the Great East Japan Earthquake were not investigated. (Survey by MEXT)
(3) Effects of Facility Improvements on Education and Research

i) Effects of facility improvements made in the 2nd Five-Year Program on education and research

A questionnaire survey on effects of facility improvements in the 2nd Five-Year Program on education and research was conducted for presidents, teaching staff, etc. of NUCs. In the survey, more than 80% of respondents answered that the improvements were “effective” for ensuring a safe and secure educational and research environment, motivating researchers, students and others, which indicates certain effects on education and research. (Chart 8) Many respondents answered that ensuring a new space and enhancing and improving the information/room environment were effective. It will be useful to effectively combine various types of improvement according to the purpose. (Chart 9)

<table>
<thead>
<tr>
<th>Results of a questionnaire survey for presidents of NUCs</th>
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</thead>
<tbody>
<tr>
<td><strong>Improvement of fundamental facilities focusing on the human resources development function</strong></td>
</tr>
<tr>
<td>1. Enhancing the function to develop future human resources and world-class human resources</td>
</tr>
<tr>
<td>2. Responding to the improvement of educational content and methods, including the development of cross-disciplinary courses</td>
</tr>
<tr>
<td>3. Developing educational content and methods with unique characteristics</td>
</tr>
<tr>
<td>4. Ensuring an environment for young researchers to conduct independent researches</td>
</tr>
<tr>
<td>5. Ensuring a living environment, including accommodation and welfare facilities</td>
</tr>
<tr>
<td><strong>Development of Centers of Excellence</strong></td>
</tr>
<tr>
<td>1. Developing original and cutting-edge academic research centers with excellent educational and research functions</td>
</tr>
<tr>
<td>2. Ensuring a research environment that attracts excellent researchers and students from home and abroad</td>
</tr>
<tr>
<td>3. Ensuring a research environment to promote cooperation with society, including joint research with local government and private companies</td>
</tr>
<tr>
<td>4. Ensuring a research environment to promote cooperation, including joint research with other universities and public research institutions in response to national/social issues</td>
</tr>
<tr>
<td><strong>Improvement of university hospitals</strong></td>
</tr>
<tr>
<td>1. Education and training of medical human resources</td>
</tr>
<tr>
<td>2. Contributing to the development of clinical medicine and raising the level of medical technology skills</td>
</tr>
<tr>
<td>3. Enhancing the function as a medical center of the region</td>
</tr>
</tbody>
</table>

*Excluding “no applicable project”*
ii) Specific examples of effects on education, research, etc.

Facility development under the 2nd Five-Year Program has had effects on education, research, etc. as shown in the following examples. (Chart 10)

- Installation of a learning room for the improvement of an outdated library enabled the gathering and putting together of academic information using computers, which raised learning efficiency. The installation of rooms for group learning enabled small-group discussion, which enhanced learning. (Gunma University)

- Elimination of the shortage of research space and the ensuring of a safe research environment enabled new research development and joint research with research institutions at home and abroad, which stimulated research activities. (Hiroshima University)

Chart 10 Specific examples of effects of facility improvement on education, research, etc.
• Improvement of the outdated and overcrowded university hospital enhanced its function as a regional referral medical institution and ensured a safe and secure hospital environment for patients by enabling the provision of highly-advanced medical treatment and the protection of patients’ privacy as well as increasing the number of operations (Okayama University).

iii) Satisfaction with the Current State of Facilities

The questionnaire survey described above included questions on satisfaction with the university facilities that had not been developed or improved during the period of the 2nd Five-Year Program. The level of satisfaction with the area size (quantity) and function (quality) of the facilities is low in all the questions among NUC presidents and teaching staff alike; the satisfaction level is especially low with regard to “facilities to promote international exchange in education and research,” "facilities that serve as a center of world-class academic research” and “accommodation for foreign students,” for which about 80% of respondents answered “dissatisfied” or “somewhat dissatisfied.” (Chart 11)
2. Current Situations and Issues of the Facilities of NUCs

The development and improvement of the facilities of NUCs have been promoted as prioritized development and system reform based on the 2nd Five-Year Program.

However, various issues still remain concerning the facilities of NUCs; specifically, the following problems are presented:

(1) Situation of Aging Deterioration

The need for improvement is expected to grow due to the aging of facilities after the prioritized improvement under the 2nd Five-Year Program in addition to the dilapidated facilities that were not included in the prioritized improvement and those that were included but not yet improved.

Facilities more than 25 years old and owned by NUCs make up approx. 15.60 million m² (a little under 60% of all facilities owned), of which approx. 10.04 million m² (approx. 38%) require improvement, of which approx. 6.62 million m² (approx. 25%) are not yet refurbished and approx. 3.42 million m² (approx. 13%) have been only partially refurbished. These dilapidated facilities require prompt improvement, including the securement of safety and functions. (Chart 12)

i) Safety issues

Most of the dilapidated facilities of NUCs were designed in accordance with the old earthquake-resistance standards. Many of them are beset by structural problems, including those of earthquake resistance, which are obstacles to ensuring the safety of students, teaching staff and others, maintaining the function as an emergency evacuation center for the community, and safeguarding accumulated intellectual property.

Regarding earthquake resistance, there are still facilities with a high risk of collapsing due to a massive earthquake; clearly, a safe educational and research environment has not been fully ensured. Amid the concern about a possible occurrence of a massive earthquake anywhere in Japan, the basic policies based on the Act on Promotion of Seismic Retrofitting of Buildings sets the target of improving the rate of earthquake resistant facilities to at least 90% by 2015. Earthquake resistance remains a challenge to be addressed by the entire government.

8 Partially refurbished: facilities where either exterior, interior or earthquake-resistance work is not yet completed or interior/exterior renovation was conducted more than 25 years ago
9 Old earthquake-resistance standard: the earthquake-resistance standard was revised in 1981 following the fundamental review after the 1978 Miyagi Earthquake. The earthquake-resistance standard before the revision is called the old earthquake-resistance standard.
Furthermore, there are dilapidated facilities with safety problems due to aging, including the risk of falling nonstructural members\(^\text{10}\), such as outer walls and eaves, and weakened structures due to the corrosion of steel or deterioration of concrete. There are also cases where the improvement of structural strength through retrofitting is difficult, including the cases of buildings more than 50 years old with poor concrete strength, which suggests that there may be an increase in rebuilding (refurbishment) demand in the future.

The rate of the infrastructure (lifeline)\(^\text{11}\) that is past its legal durable years is also high. The functional degradation of receiving/transforming facilities and of outdoor gas and other piping, in particular, not only has an adverse impact on educational, research and medical activities, but also could cause fatal accidents. (Chart 13)

\(^{10}\) Nonstructural members: refers to such members as ceiling materials, armoring materials and lighting equipment that are not major structures. In a narrow sense, “nonstructural members” refers to architectural nonstructural members, such as ceiling materials, but may also include equipment and furniture, in a broader sense. (Protecting Children from Falling and Tumbling Objects due to an Earthquake—Guidebook for Earthquake Protection for Nonstructural Members of School Facilities— March 2010, Ministry of Education, Culture, Sports, Science and Technology [http://www.nier.go.jp/shisetsu/pdf/e-hikouzou.pdf])

\(^{11}\) Infrastructure (lifelines): Major/core parts of the facilities necessary to maintain functions, such as power/gas supply, information communication, water supply and drainage, and air conditioning, that are essential for educational and research activities of universities and other institutions.
ii) Functional problems

Today, as the sophistication/diversification of education and research, the review of organizations and the progress of project studies are calling for changes in how and for what purpose rooms are used, such as research rooms and laboratories, many facilities lack the flexibility in the layout of their rooms that would enable functional and efficient use.

In some cases, an inadequate room environment for experiments and research (in terms of sound proof, vibration isolation, electromagnetic shield, adequate temperature, humidity and lighting) and poor water quality due to corrosion of the piping cause a negative impact on the accuracy of experiments.

There are also cases where an inadequate or low capacity of power or water supply/drainage equipment prevents both the response to changes in experimental studies and the expansion of laboratory equipment, and cases where inadequate information communication equipment prevents the implementation of multifunctional and sophisticated education.

In this way, there are many outdated facilities where the quality necessary for adequate educational and research activities is not ensured.
iii) Problems concerning asset value

Because the functionality of a building deteriorates day by day due to aging, dilapidated facilities emerge every year. Without adequate investment in consideration of the durable years of the building and accessory equipment, the number of buildings that are past their durable years will increase, which will generally come to surface as a decrease in depreciation cost.

Regarding the depreciation costs involved in NUC facilities, depreciation costs of infrastructure necessary for education and research have been greatly decreasing since FY2005. Without equipment investment at least exceeding the amount of the depreciation cost, the asset value of a building will go down. (Chart 14)

![Chart 14 Changes in the Depreciation Cost for Facilities of NUCs](image)

(2) Situation of Overcrowding

Facilities of NUCs are grossly cramped due to the increase of various research equipments, expansion of graduate schools, and progress of industry-academia-government collaborations.
accompanying the development of education and research in recent years.

Because The Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc. and other initiatives promoted urgent improvement, identifying the elimination of overcrowding as one of the priority issues, the area of facilities is increasing in accordance with demand, but the area of the existing facilities is still only approx. 90% of the area necessary for educational and research activities (necessary area), which indicates that the support is not enough for increasingly sophisticated and diversified education and research. (Chart 15)

Specific examples include very poor educational/research conditions, such as researchers working at desks in a laboratory where chemicals, etc. are used. Such an environment not only has a significant adverse effect on education and research but also hinders the safety of experiments.

Recently, especially in some universities where some universities acquired external funds for project research, overcrowding is worsening due to an increasing number of researchers, such as Post Doctoral Fellows,12 who are not taken into consideration when calculating the necessary area above. Approx. 63% of the NUCs answered that they don’t have a separate research space for young researchers such as newly employed Post-Doctors, which indicates that an environment is not in place for the young researchers to devote themselves to independent research. (Chart 16)

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12Post Doctoral Fellow: Abbreviation of Post-Doctoral Fellow. Persons who are employed under fixed term contracts after obtaining a doctoral degree and (i) are engaging in research at a research institution, such as a university, but who are not in a position of professor, associate professor, assistant professor or research associate, and (ii) persons who engage in research at a research institution, such as an independent administrative corporation, and who are not in a position such as a leader or senior research fellow (including those who were in doctoral course for the standard course term or longer and completed a PhD program without being awarded a Ph.D. degree)
Changes in the number of post-doctoral fellows, etc.

Source: “Survey on Postdoctoral Fellows and Research Assistants” April 2010, MEXT National Institute of Science and Technology Policy

Space for post-doctoral fellows, etc.

Chart 16 Conditions Related to Overcrowding of Facilities of National University Corporations

Source: created based on “Research on Science and Technology Human Resources,” March 2009, National Institute of Science and Technology Policy
(3) Status of Improvement of University Hospitals

University hospitals have important roles, including educating and training medical professionals (education/training function), contributing to the development of clinical medicine and the raising of the level of medical skills (research and development function), and providing high-quality medical services as medical centers of their regions (medical service function).

In order to fulfill these roles, it is critical that university hospitals underlying facilities accommodate the increasing sophistication of medical care and the demand for enhancement of regional medical care functions. However, outdated facilities make it difficult to introduce state-of-the-art medical equipment, lead to poor service quality due to a deteriorated hospital environment for patients, as well as cause the deterioration of working environment for medical professionals, inefficient hospital management, and other problems.

University hospitals have many old facilities that are not only deteriorated but also inadequate for the provision of cutting-edge medical services. Improvements are gradually being made, but 26 of the 42 university hospitals are still following the improvement process while improvement work is yet to start in six hospitals; such situation interferes with the implementation of adequate educational, research, medical and other activities in these hospitals.

(4) Response to Global Environmental Problems

Environmental problems are a pressing and monumental challenge for the continued existence and prosperity of all humanity. In terms of the scale and seriousness of the potential effects, global warming is a particularly urgent challenge of a worldwide scale and one of the most serious problems threatening the very foundations of human survival.

In this context, more efforts are required toward the realization of a low-carbon society in addition to the efforts to accomplish the goals of the first commitment period of the Kyoto Protocol.\(^\text{13}\)

In Japan, the Act on the Rational Use of Energy\(^\text{14}\) and the Act on Promotion of Global Warming Countermeasures\(^\text{15}\) were revised as the legal framework requiring necessary measures from business operators, including universities.

On the other hand, the majority of CO\(_2\) emissions attributable to school facilities nationwide are emitted from university facilities. A study has shown that CO\(_2\) emissions from school facilities would increase by about 10% in 2050 compared to the base year (1990), even with the implementation of the current standard energy-saving measures, which indicates that school facilities need more measures to control greenhouse gas emissions. However, approx. 30% of NUCs are yet to formulate a plan regarding global warming countermeasures\(^\text{16}\) and approx. 6.62 million m\(^2\) of outdated facilities with significantly inferior energy-saving performance remain without refurbishment. The world today focuses on global environmental measures, so rather than lagging behind, NUCs in Japan should take proactive measures.

\(^{13}\) In February 2005 the Kyoto Protocol based on the United Nations Framework Convention on Climate Change came into effect. In the Protocol, Japan made a legally-binding commitment to reduce average greenhouse gas emissions to a level 6% below the 1990 level from 2008 to 2012.

\(^{14}\) Revisions on May 30, 2008. Major related revisions include the introduction of energy management by business operators (changed from management by workplace) and the expansion of the subjects of the obligation to report energy-saving measures concerning buildings to include smaller buildings (from over 2,000m\(^2\) to over 300m\(^2\)).

\(^{15}\) Revised on June 13, 2008. Major related revisions include the introduction of calculation and reporting of greenhouse gas emissions by business operators (changed from individual workplace to business operators); decision of guidelines for control of greenhouse gasses (presenting measures necessary for control of greenhouse gas emitted in conjunction with business activities).

\(^{16}\) The “Action Plan for Greenhouse Gas Emission Reduction in Government Operations” (Cabinet Decision on March 30, 2007) expects initiatives on the basis of the spirit of the plan from government-affiliated agencies and organizations.
(5) Response to National Policies and Social Needs

As situations around the world undergo major changes, the situation surrounding NUCs is also changing, which raises new issues and urges them to play major roles in society.

While facing various national policies, including responding to the globalization of higher education as shown by the increase of foreign students, for example, the promotion of a “leading graduate school” vision, the strengthening of basic science to lead the world and the generation of future technological innovations, a solution to the severe doctor shortage and provision of regional medical care including perinatal care, NUCs are expected to fulfill their social responsibilities, such as consideration to the global environment, including the global warming countermeasures described above, efforts for social and international contributions, and the promotion of gender equality in education and research.

With rapid changes in conditions in Japan and abroad, we are entering a phase of major change in the entire social structure, which requires a review of the entire university education. In this context, the Central Council for Education is studying “medium- to long-term approaches to university education,” including the big picture of Japanese universities in a depopulating period. There is a need to explore approaches to future facility development and medium- to long-term countermeasures in light of such studies.

(6) Financial Issues

NUCs’ facility improvement subsidies are tending to decrease in the current severe fiscal situation facing Japan. Although pressing improvement needs are covered by supplementary budgets, facility improvement budgets are not at all large enough to meet demand, making it difficult to ensure systematic and sufficient facility improvement (Chart 17). Furthermore, because improvements of hospital facilities are mostly made using long-term loans, their redemption remains a heavy burden in spite of the expected increase of medical treatment income at hospitals based on the revision of medical treatment fees in FY2010, which calls for further financial support by the government.

Moreover, the current severe economic situation and other factors have made improvement in cooperation with industry and other partners difficult, which may make independent facility improvement harder for individual corporations.

17 It is estimated that renovations and reconstructions just to maintain the facilities of NUCs require more than 220 billion yen every year.
(7) Strategic University Facility Improvement in Other Countries

Government spending for higher education in Japan’s expressed as a percentage of Gross Domestic Product (GDP) is 0.5%, which is half of the OECD average (1.0%) and among the lowest level in OECD Member countries. (Chart 18)

Chart 18 Comparison of Government Spending for Higher Education as percentage of GDP among OECD Countries

The governments of developed countries are actively promoting strategic investment in higher education, science and technology policy and many of them ensure prioritized investment in university campuses, which are fundamental for that purpose.
In the U.S.A, for example, improvement of higher education institutions’ facilities is left to the discretion of the individual states, whereas the federal government has no involvement in principle. However, President Obama established strategic investments in his basic policy, which includes investment in the improvement of university facilities to promote the American Recovery and Reinvestment Plan,\(^\text{18}\) which aims to jumpstart job creation and long-term growth; and he secured a budget for this purpose.

In the United Kingdom, in response to the deterioration of the quality of higher education as a result of continued restraint on expenditure for higher education institutions, the Dearing Report\(^\text{19}\) recommended the expansion of higher education and the improvement of higher education finance in 1997. It also identified the “renovation of buildings and renewal of obsolete equipment” as requiring substantial additional resources for the development of higher education in 20 years time. Following this report, national expenditure for higher education has increased and funds are provided for full-scale facility and equipment improvement under strategic planning.

In France, it was pointed out that university facilities had deteriorated and were neither adequate for modern education and research nor attractive for students. In 2008, supported by the strong will of President Sarkozy, the “Operation Campus” project was initiated with the aim of revitalizing universities by attracting excellent human resources from home and abroad through the renovation of university campuses while upgrading French universities to the highest level of the world through excellent education and research. A total of 5.0 billion Euros (approx. 615.0 billion yen\(^\text{20}\)) in financial support will be provided.

In Germany, higher education used to be a joint task (Gemeinshaftsaufgabe) of the federal and state governments, but was placed under the control of states by the federal system reform in 2005. While the federal government provides compensation and support to large research facilities, etc. through transition measures, individual states are also making prioritized investments, including 5 billion Euros (approx. 615.0 billion yen) in total made by the state of Nordrhein-Westfalen for higher education facility improvement from 2009 to 2015.

In addition to developed countries, Asian countries, including Korea, China, Thailand, Malaysia, Singapore and India, are promoting prioritized investment in higher education and the improvement of its underlying facilities to increase international competitiveness. Especially in China, the government leads various projects and has been implementing a priority policy to build world-class universities. (Chart 19)

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\(^{18}\) American Recovery and Reinvestment Plan, January 2009

\(^{19}\) “Dearing Report” is a popular name for “Higher education in the learning society,” National Committee of Inquiry into Higher Education, July 1997

\(^{20}\) Converted at 1 Euro=123 yen
Chart 19 Efforts for University Facility Improvement by Governments of Other Countries
3. Damage to Buildings, etc. Caused by the Great East Japan Earthquake, and Challenges

(1) Overview of the Damage

Total damage to the facilities of 76 NUCs of 30 corporations caused by the Great East Japan Earthquake was valued as high as 42.1 billion yen (the total of the amounts estimated by each corporation as of July 2011).

Regarding damage to buildings, the posts and other structural members in facilities built before the enforcement of the new earthquake-resistance standards (1981) and for which seismic strengthening had not been made, were severely damaged. Facilities built after the new earthquake-resistance standards and facilities with seismic strengthening generally suffered slight or no damage (there are exceptional cases of major damage, but they are believed to be caused by sympathetic vibration between the ground and the building or the accumulation of damage to buildings caused by previous repeated earthquakes).

However, even in cases where structural members were not majorly damaged, damage was seen in interior materials, such as ceiling materials, outer walls and other nonstructural members, experiment study equipment inside buildings, and infrastructure (lifelines) that had become fragile due to aging. Precious frozen research materials, etc. were also damaged due to the loss of external power supply just after the earthquake.

Some university facilities located in coastal areas suffered catastrophic damage, such as buildings being washed away by the tsunami.

Moreover, because an accident occurred at Tokyo Electric Power Company’s Fukushima No. 1 nuclear power plant and other factors caused a tight power supply, universities and other heavy consumers in the service areas of Tohoku Electric Power Company and Tokyo Electric Power Company were required to reduce their peak power demand by 15% in the summer of 2011 based on Article 27 of the Electricity Business Act. Reducing power was requested in other regions as well.

(2) Challenges

In light of the damage described above, the following challenges were identified:

i) Seismic reinforcement of buildings

Given the extensive damage to the structural members, such as posts of the facilities mainly built before the enforcement of the new earthquake-resistance standards (1981), there is a need to continue efforts for prompt seismic reinforcement of buildings.

ii) Enhancement of seismic reinforcement measures for nonstructural members

In light of the cases of major damage to nonstructural members, there is a need for prompt efforts toward seismic reinforcement of nonstructural members in conjunction with the improvement of dilapidated facilities.

iii) Enhancement of disaster-prevention measures for experiment research equipment

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21 Act No. 170 of July 11, 1964, Article 27, “When it seems that if no adjustment is made to the supply and demand of electricity, a shortage of electricity supply will adversely affect the national economy, standard of living or public interest, the Minister of Economy, Trade and Industry may, to the extent necessary for resolving such a situation and pursuant to the provision of a Cabinet Order, restrict the use of electricity supplied by a General Electricity Utility, Specified Electricity Utility or Specified-Scale Electricity Utility by limiting the power usage or peak load or specifying the purpose of use or the date and time when power usage should be stopped, or restrict the receiving of electricity from a General Electricity Utility, Specified Electricity Utility or Specified-Scale Electricity Utility by limiting the capacity of receiving electricity.”
Regarding some of the experiment research equipment that fell or suffered similar damage, basic measures, such as fastening to the building, had not been taken. In light of this, it is necessary to promptly enhance disaster-prevention measures, including the systematic implementation of these basic safety measures.

iv) Promotion of infrastructure (lifelines) improvement

Infrastructure (lifelines) that had become fragile due to aging suffered heavy damage, paralyzed educational and research activities. In light of this, there is a need to promptly improve deteriorated infrastructure through measures including seismic strengthening.

v) Creating an environment to ensure requisite minimum power in case of power outage

For a possible case of disrupted power and other supplies from outside, it is necessary to take measures, such as ensuring the minimum power necessary for continuing university hospitals’ service and preserving intellectual property, including research materials.

vi) Efforts for mitigation of tsunami damage

For university facilities located in coastal areas, there is a need to take effective measures from the perspective of disaster mitigation, including the development of evacuation routes to limit tsunami damage.

vii) Further promotion of resource and energy conservation

Today when power saving efforts are widely requested, further promotion of resource and energy conservation efforts is necessary to ensure stable and continuous educational and research activities. There is a need to consider prompt improvement of equipment that have become less efficient due to aging as well as the introduction of renewable energy.

In addressing the challenges listed above, it is important for individual NUCs to ensure comprehensive disaster prevention measures combining software and hardware approaches, such as developing disaster prevention and contingency plans to continue educational, research and medical activities in times of emergency when a disaster strikes.
**Chart 20 Damage to the Facilities of National University Corporations Caused by the Great East Japan Earthquake**

**Damage to structural members**

The building did not collapse but its structural members suffered heavy damage (aftershocks, etc. could cause it to collapse.)

- Tohoku University (broken post)
- Tohoku University (broken outer wall of a tower)

**Damage to nonstructural members**

Nonstructural members with inadequate earthquake protection were broken (ex. ceiling, lighting, inner wall)

- Tohoku University (ex. broken labware)
- Ibaraki University (fallen ceiling material)

**Damage to infrastructure**

Deteriorated infrastructure (ex. gas, water supply/waste pipe, electric equipment) suffered damage, disrupting the supply of power, water and gas.

- University of Tsukuba (broken waste pipe)
- High Energy Accelerator Research Organization (broken water receiving tank)

**Damage to building, etc. caused by tsunami**

Damage to buildings; outdoor facilities washed away by the tsunami; damage to interior due to flooding.

- Tohoku University (washed-away building)
- Tokyo University (damage to building, etc. caused by tsunami)
Chapter 3 Approach to National University Corporation Facility Improvement in the Future

I. Objective for Facilities of National University Corporations

With situations at home and abroad rapidly changing and the entire social structure entering a phase of major change, expectations and demands toward National University Corporations (NUCs) are enormous and diverse. For NUCs to accomplish their missions and roles and fully exhibit their unique characteristics, it is necessary for each corporation to present a clear and concrete vision for the future.

According to the vision, individual corporations are required to develop their facilities so that they can adequately accommodate increasingly sophisticated and diversified educational, research and other activities.

In doing this, NUCs need to improve their facilities considering the functions listed below according to the unique characteristics of each university.

Furthermore, considering that the Subdivision on Universities, Central Council for Education is discussing the promotion of specialization according to the function of universities and the construction of inter-university networks, it is necessary to further study the approach to facilities improvement, taking them into consideration.

(1) Developing Educational Functions

In order to cultivate capable personnel who will support and develop society and lead the international community, and personnel who can contribute to the creation of knowledge, universities need to enhance and develop their education functions. In addition they are required to enhance and sophisticate more practical knowledge and skills to train practical and creative high-level engineers. For this purpose, there is a need for facilities that can accommodate future upgrading and individualization of education while respecting students’ points of view.

i) Responding to diverse education and research needs by making good use of the unique characteristics of each university

- Each university is required to ensure a flexible learning environment that can respond to the upgrading and individualization of educational content and methods in an agile manner while making the most of its unique characteristics, which may include lectures, small-group instruction and unique education across the boundaries of departments and faculties.
- It is required to enhance information infrastructure to accommodate interactive lectures using multimedia teaching materials or information communication systems such as the Internet and lectures using an information system.

ii) Responding to sophisticated and specialist education and research needs

- It is required to develop a facility environment suited to sophisticated and specialist education and research activities, including the development of an experiment and training environment in which to learn practical and creative techniques.

iii) Responding to the formation of world-class educational centers

- It is required to develop facilities suited to educational centers that cultivate world leaders in growth fields.
### iv) Ensuring an enriched educational environment (enhancing the student support environment)

- In order to enrich the campus environment from students’ points of view, it is required to improve the student support environment, including by ensuring a space for diverse communication activities that stimulate intellectual creation while enhancing library functions and places for self-study.
- Attention must be paid to forming a comfortable and enriched campus amenity where students and teaching staff gather and feel secure, and where rich intelligence and sensibility are cultivated.

### v) Promoting inter-university collaboration

- It is required to enhance functions necessary to provide high-quality education by forming “joint-use centers for educational purposes” that reinforce collaboration with other universities, and by accommodating the joint operation of bachelor programs and the curriculum of graduate schools.

### (2) Developing Research Functions

Universities have an important role as academic research centers and institutions to cultivate human resources who create innovation. The development of research functions requires an adequate and flexible response to the increase of project research and the integration of research fields. When introducing large research equipment, it is necessary to consider developing the facilities and the research equipment in an integrated manner.

### i) Forming an outstanding research center, responding to the need for creation of innovation

- Outstanding world-class academic research and large scale projects to form a center require an environment that can accommodate a large number of excellent researchers from home and abroad as well as cutting-edge research equipment.

### ii) Responding to project studies, etc.

- It is necessary to create an environment where postdoctoral fellows and project research fellows engaging in various projects can focus on their research in an independent manner as well as to accommodate large research equipment.
- It is necessary to ensure the safety of experiment facilities and establish an operation system in addition to ensuring a space for flexible use and joint use of research facilities on campus.

### iii) Response to the promotion of joint use and research

- It is necessary to respond to the promotion of joint use and research by enhancing necessary functions and ensuring space for exchange by researchers so that researchers across the country can jointly use large research equipment, and large quantities of materials and data beyond the bounds of individual corporations.

### (3) Reinforcing Collaboration between Industry, Academia and Government

As knowledge bases to create innovation, universities are expected to strategically develop collaboration between industry, academia and government. It is necessary to develop facilities in
diverse forms so that universities and companies can further deepen their collaboration to respond to the increasing amount of joint research.

i) **Collaboration and cooperation with local government and private companies, and initiatives aimed at securing a variety of spaces**
- It is necessary to strengthen collaboration and cooperation with local government and private companies in their industry-university-government collaboration; it is required to develop facilities containing research space for flexible joint use to accommodate project-based research activities. For this purpose, it is necessary to promote development using diverse methods according to the situation, including facility development conducted by the local government or companies on campus, construction incorporating a donated building, and ensuring space outside the campus.

ii) **Giving consideration to the nature of collaboration between industry, academia and government**
- In addition to the enhancement of security functions, such as strict control of classified information when conducting collaboration between industry, academia and government, it is required to ensure space for flexible use, such as a rental laboratory, to deal appropriately with joint research in various forms.

(4) **Promoting Efforts to Contribute to the Local Community**
As intellectual and cultural centers of their local communities, universities are required to employ various human resources from the local community while at the same time opening the results of educational and research activities to the public so as to contribute to local revitalization. After the Great East Japan Earthquake, universities served as emergency evacuation and medical care centers, which reminds us of the importance of the role played by universities for disaster prevention in local communities.

Individual universities are expected to further deepen their collaboration with local communities by exploiting their unique characteristics and contributing to the community through their facilities as well.

i) **Harmonious co-existence with the local community and society**
- Because a university campus is a core facility of the local community, campus development needs to consider the harmony with the surrounding environment, including ensuring a green space and harmony with a local cityscape.
- A perspective of promoting town development with a university at its center in concert with regional development initiatives by the local government, NPO and other players is needed.

ii) **Enhancing lifelong learning functions**
- It is required to enhance facility functions to support the contribution to the local community, including the development of facilities as a place for lifelong learning for diverse users, including local residents, working people and the elderly, while at the same time ensuring coordination with other public facilities for effective mutual utilization and information network building.
iii) Working on formation of regional medical care centers
   • Expected to play a central role in regional medicine, university hospitals are required to strengthen their functions and develop facilities with sophisticated and cutting-edge medical functions.
   • They are required to develop facilities that can serve as an emergency medical care center in times of disaster.

iv) Consideration of safety
   • To be universities open to the public and serve as the disaster prevention center of the local community, universities need to ensure a campus environment that is safe and accessible for local residents and other people. Their development should be based on the social responsibility of public facilities, which includes a barrier-free environment that gives consideration to use by local residents, and the strengthening of crime-, accident- and disaster-prevention functions.

v) Collaboration with local government
   • Collaboration and cooperation with disaster-prevention departments of local governments are important when working on comprehensive disaster prevention measures.

(5) Promoting Internationalization
   Universities are required to contribute to enhancing the international competitiveness of Japan by actively working for the internationalization of higher education. Their facilities need to fulfill functions necessary as centers for international education/research exchange, cultivation of world-class human resources and the promotion of accepting foreign students.

i) Internationalizing the campus
   • In order to attract excellent educators and researchers from around the world to enhance the educational and research functions of our universities, we need to build an educational and research environment open to the world and ensure an attractive campus environment on par with universities abroad.

ii) Responding to the needs of foreign students and researchers
   • In response to the increase of foreign students as a result of the Plan for 300,000 Exchange Students and other efforts, we need to develop universities that attract foreign students and a system for accepting them, which includes ensuring facilities to support student life, such as accommodation for foreign students in addition to spaces for education/research and international exchange. It is also required to give consideration to make life more convenient for foreign students by installing signs in foreign languages, for example.

(6) Contributing to the Resolution of Global Environmental Problems
   Today when concrete efforts are required for the creation of a low-carbon and recycling-oriented society in good harmony with nature, universities need to transform their campuses into those with a low impact on the environment, enabling sustainable development. They are required to make further contributions to resource and energy conservation, and to the reduction of environmental burden while contributing to local communities and international society through these efforts. Furthermore, as a tighter supply of power is anticipated, it is necessary to ensure energy for stable and continual
educational and research activities in addition to the realization of a low-carbon society.

i) Creating a campus that will serve as a model for countermeasures against global warming
   - Further efforts are required in facilities development giving consideration to the global environment, including measures to reduce environmental burden when improving outdated facilities with poor energy conservation performance or renewing infrastructure.
   - It is required to give consideration to enhancing green spaces in campus and developing a local landscape with a view to the preservation and formation of the global environment.
   - For developing a campus with a low impact on the environment enabling sustainable development, it is required to take environmental measures including efforts for introduction of renewable energy.

ii) Promoting energy conservation activities and integrated environmental measures
   - It is required to advance campus development giving consideration to the global environment in conjunction with proactive efforts in facility management concerning resource and energy conservation based on a long-term view.

(7) Forming Attractive Campuses
   A campus is the face of its university and represents the distinctive and regional characteristics, history and tradition of the faculty or the department. It is necessary to create an attractive campus environment in order to make the university a place with unique characteristics where students can live a fulfilling campus life with promise for the future.

(i) Creating a harmonious campus environment with unique characteristics
   - In order to create a harmonious campus environment suitable as a place of academic pursuit, it is required to develop stately facilities as the face of the university and symbol of the local community while developing history and culture and passing on traditions, which includes preservation and use of traditional/historic buildings.
   - It is required to improve the comfort and convenience of campuses, such as promoting campus beautification in addition to the development of the outdoor environment, such as adequate green space and open spaces.

(ii) Enhancing facilities that support campus life
   - In order to encourage student interaction and enhance support for education and research, it is required to enhance welfare facilities that support student life and facilities for joint use for job search, support for proceeding to higher education, extracurricular and other activities.
   - It is required to develop a campus plan giving consideration to a variety of users, such as people with disabilities, foreign researchers and students, and working adult students, as well as to gender equality by introducing universal design, preparing for night use and ensuring nursery rooms, for example.

2. Facility Development From a Long-Term Perspective
   Today NUCs have a large number of dilapidated facilities that require improvement, and more will continue to appear. In order to realize their future vision in this situation, individual corporations need to maintain and improve facility functions in an effective and efficient manner.
   For this purpose, NUCs need strategic management to create and improve a flexible and
comfortable campus environment equipped with functions suitable for their education and research contents.

In order to implement future facility development with more effective and efficient investments under the current fiscal pressure and to soundly fulfill their missions and roles, each corporation needs to create a development plan for the entire campus based on its future vision and long-term perspective (campus master plan)\(^\text{22}\) and undertake systematic development of the campus.

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**Creating a campus master plan**

NUCs need to create and improve their long-term and comprehensive campus master plans in accordance with their academic plans and management strategies as a university-wide effort under the leadership of the president.

The national government is required to encourage individual corporations to create and improve their campus master plan through such efforts as the dissemination of “Guide to the Creation of a Strategic Campus Master Plan,” which describes the necessity, role, etc. of a campus master plan.

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\(^{22}\) A campus master plan is a basic plan for the campus environment that is created with the following objectives: i) establishing a long-term vision for the overall image of the campus; ii) seeking to improve the quality of the campus environment; iii) stipulating the ideal campus and signaling the necessity for change; and iv) establishing the theory of the facility layout and design decisions.
3. Collaboration and Cooperation Between the National Government and National University Corporations

In the design of the system of National University Corporations (NUCs), their facility development is defined as, “The development of facilities for national universities creates a national asset, and basically relies on the revenues for facility expenses allocated each year, but to improve independence and autonomy, and to ensure the diversification of the resources and stable development of facilities, it shall also be possible to develop facilities by long-term borrowings, revenues from the disposal of land or other revenues of the university.”

For this purpose, the national government established a facility development policy for all NUCs and worked to ensure required financial resources while revising systems and providing information to encourage independent efforts by corporations through the expansion of the scope of long-term loans, the easing of treatment of donations to local governments, and other measures.

NUCs, on the other hand, have been making efforts for the individualization of facilities and campuses based on their own managerial judgment and developed their facilities autonomously and independently, utilizing diverse sources of finance in addition to the development using a facilities improvement subsidy based on the national planning of facilities development. They have also implemented system reform from a managerial perspective, including facility management under the top management led by the presidents.

The national government and NUCs have thus worked together to advance facility development with an adequate division of roles. In order to promote facility development soundly and more effectively and efficiently, the government and NUCs are required to further strengthen their collaboration and cooperation while advancing facility development and utilization according to the Mid-Term plan and objectives, each adequately fulfilling its role described below:

**i) Development based on the planning of facilities development**

Because the development of facilities of national universities creates a national asset, and because they require systematic and continual development, the national government needs to establish a facility development plan for all NUCs in accordance with the 2nd Five-Year Plan. It is also necessary to explore an effective system to promote facility development based on the campus master plans created by individual corporations; which may include reflecting whether or not individual projects for which corporations request a budget are clearly positioned in their campus master plans when evaluating the projects for allocation of annual facility improvement subsidy.

NUCs are required to create and improve their campus master plans as well as conduct systematic facility development based on the plans in order to advance a well-planned facility development in accordance with their academic plan and the management strategy.

**ii) Securing financial resources for smooth facility development**

It is estimated that renovations and reconstructions just to maintain the existing facilities of NUCs require more than 220 billion yen every year. It is essential to secure a sufficient facility improvement budget to ensure stable development.

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23 A New Image of National University Corporations (quoted from the Study Team Concerning the Transformation of National Universities into Independent Administrative Corporations, March 2002)
24 System reforms mean proactive efforts by National University Corporations, including the promotion of facility management and development with techniques that utilize diverse sources of finance.
25 Facility management: initiatives to ensure efficient management and strategic utilization of facilities and a series of efforts for ensuring and utilizing facilities based on a comprehensive and long-term perspective concerning the entire campus.
Because the development of NUC facilities basically relies on the facility improvement subsidy allocated by the national government, the government should provide required resources for facility development necessary for the operation of individual NUCs. In order to ensure effective and efficient development of NUC facilities, the government needs to clarify the nature of its support while providing information to help smooth the implementation by individual corporations. Additionally, the loaning and granting of facility expenses that are currently conducted by the Center for National University Finance and Management are indispensable as financial resources for facility development as NUC facilities are aging and progressively deteriorating. It is necessary to continue to use the resources for smooth facility development.

When implementing development using the facilities improvement subsidy in accordance with the implementation policy of the national government, NUCs are required to promote “comprehensive cost structure improvement” focusing on the maximization of VFM\(^\text{26}\) based on “MEXT Public Works Cost Structure Improvement Program”\(^\text{27}\) in order to facilitate effective and efficient facilities development and maintenance.

NUCs are also required to take the initiative in the development based on their own managerial judgment using a range of sources of finance, including long-term loans and donations, partnerships with local governments/private companies, and effective and flexible utilization of indirect costs of competitive funds.

### iii) Facility development ensuring transparency and objectivity

When allocating the facility improvement subsidy, the national government is required to select projects based on proper evaluation and fulfill accountability for the public not only by explaining the necessity and urgency but also by ensuring the objectivity and transparency of the process. It is also necessary to actively facilitate public understanding of the necessity of NUC facility development to enhance public support.

NUCs need to fulfill accountability for the public by ensuring fair competition and transparency of facility development projects, including ensuring proper bidding and contract procedure. Furthermore, based on the full recognition that substantial public resources are invested in facilities development, they are required to promote public understanding of the development’s effects and results on education and research by actively providing information to the public.

### iv) Promoting facility management

The national government needs to provide necessary support to facilitate facility management initiatives by individual corporations.

NUCs need to use their facilities over the long term and maintain the entire campus in a good condition through proper maintenance. It is also necessary to advance efforts to use the existing facilities in a more effective and efficient manner. For this purpose, it is important to further promote facility management from a managerial perspective.

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\(^{26}\) VFM (Value for Money) indicates providing the service with highest value for the investment throughout the process from planning to maintenance management of public works while giving due consideration to economic efficiency.

\(^{27}\) “MEXT Public Works Cost Structure Improvement Program,” formulated in May 2008, states that it is necessary to develop and maintain good-quality social capital efficiently by radically improving public works in terms of cost and quality, and that it is important in facilities development to ensure the basic performances and quality expected from social capital, such as serviceability, convenience, fairness, safety, durability, environmental preservation, resource conservation, beauty, and cultural quality.
Chapter 4 Medium- to Long-term Measures for Prioritized Facility Development of National University Corporations in the Future

1. Promoting Systematic Prioritized Facility Development Based on a Long-Term Perspective

The facilities of National University Corporations (NUCs) form the basis for the development of creative human resources and the promotion of unique, cutting-edge academic research, for contribution to regional revitalization as a center of the community, and for the promotion of highly-advanced medical treatment, as well as the foundation for cultivating bearers of Japan’s future.

Amidst the tight fiscal situation, for NUCs to fulfill their expected roles to strengthen human resources who hold the key to the country’s economic growth and demonstrate the country’s technical capabilities, it is necessary to promote systematic and prioritized facility development in light of the current state and facility challenges described above, while actively working on system reform concerning facilities.

For this purpose, with the view to stable maintenance and renewal of existing facilities in the long term, it is important to adequately respond to increasingly sophisticated and diversified educational/research needs through effective and efficient improvement of the quality of facilities; and it is necessary to promote systematic and prioritized facility development from a medium- to long-term perspective in the next five years (FY2011 to FY2015).

Specifically, in order to enable NUCs to attract excellent human resources, to contribute to the strengthening of international competitiveness, and to promote industry-academia-government collaboration, regional contribution and internationalization by responding to increasingly sophisticated and diversified educational/research activities, the national government needs to establish a facility improvement plan. Such plans should identify the facilities that require priority development and incorporate items concerning targets and system reform efforts for facility development. The national government should also promote measures to make the plan a reality by securing the required budget for facility improvement expenditure, which is now definitely insufficient, so that it can support facility development by individual NUCs, while promoting their efforts to obtain resources, including facility management and facility development using diverse sources of finance.

2. Basic Concept to Systematic and Prioritized Facility Development

In the next Five-Year Program, with a view to more effective and efficient facility development, it is necessary to carry out systematic and prioritized facility development based on the basic policy expressed in the following 3S’s: i) Strategy—strategic development for qualitative improvement; ii) Sustainability—efforts to create an environment-friendly educational and research environment; and iii) Safety—a safe educational and research environment. (Chart 21)

(1) Strategy—Strategic Development for Qualitative Improvement

In order to revitalize increasingly sophisticated and diversified educational/research activities and develop unique characteristics and attractiveness of individual corporations, it is essential that the underlying educational and research environment has sufficient functions. With domestic and international situations rapidly changing and the entire social structure entering a phase of major change, expectations and demands of NUCs are enormous and diverse.

Against this background, individual corporations are required to display more originality, and their facility development needs to adequately respond to educational/research activities that will further
increase sophistication and diversification, bearing the following perspectives in mind:

(Perspective of strategic development for qualitative improvement)
◇ Forming outstanding education and research centers
Form centers that attract excellent human resources from Japan and abroad, cultivate world leaders and researchers, and generate world-class educational and research results with the aim of strengthening the international competitiveness of Japan.

◇ Creating an environment to nurture unique characteristics and stimulate education and research
Enhance the facility functions necessary for individual NUCs to fully develop their unique characteristics and stimulate education and research through activities such as the promotion of human resource development, academic research and social contribution activities (ex. regional contribution, industry-academia-government collaboration, international exchange).

◇ Systematic development of university hospitals providing state-of-the-art/regional medical services
Based on the basic recognition that university hospitals have education, research and medical-care functions, enhance their function as the center of attractive education programs integrating undergraduate and postgraduate education, cutting-edge medical service functions responding to the specialization and sophistication of medical care, and emergency medical services at the time of disaster, and functions necessary for promoting collaboration with the local community.

In order to carry out facility development based on the perspectives described above in the tight fiscal environment, it is necessary to promote efficient and strategic development, and maximize the unique characteristics and attractive points of the corporations by introducing the mechanisms described in the promotion measures below so that NUCs can compete in a friendly manner, taking advantage of their unique characteristics to facilitate their specialization according to function.

<Promotion measures>
○ Promoting strategic development in accordance with the unique characteristics of each NUC
In order to create an environment that responds to the sophistication and diversification of education and research, select categories based on the unique characteristics of each NUC and carry out development that prioritizes facilities with a greater effect on education and research.
(Category)
  a) Enhancing functions as an internationally outstanding education and research centers
  b) Enhancing functions to promote internationalization
  c) Enhancing functions for cultivation of people with high-level professional skills and education in specific specialist fields
  d) Enhancing diverse educational and research functions taking advantage of the university’s characteristics
  e) Enhancing the necessary functions based on the strategy of the university, such as student support and regional contribution
f) Enhancing university hospital functions

Give priority to development in the fields that require special focus in response to national policy concerns or social needs (ex. promotion of innovation and internationalization) and to the creation of an education and research environment to promote joint use of facilities in collaboration/cooperation among NUCs.

In addition, steadily improve basic conditions through such efforts as ensuring safety through earthquake-resistance retrofitting and improving outdated facilities, as well as reducing environmental burden.

○ Clarifying the nature of the support by the national government

It is necessary to clarify the nature of the support by the government giving consideration to the initiative of individual corporations and the perspective to promote facility development that utilizes diverse sources of finance.

(Basic policy concerning the nature of the support by the national government)

• Provide intensive support to the development of facilities where educational and research activities are conducted by NUCs

• Provide support to the development of student support, and athletic and administrative facilities after examining the possibilities of using development methods that utilize diverse sources of finance

• For facilities from which a certain amount of revenues, such as boarding fees and facility usage fees, is expected (ex. accommodation facilities, including student dormitories, and industry-academia-government collaboration facilities), promote development that utilizes diverse sources of finance, including long-term loans. However, if it is found difficult to use development methods that utilize diverse sources of finance after considering the situation of the region, provide support for a part of the cost of the development.

• Provide necessary support to university hospitals so that they can fulfill their mission of conducting education and research on advanced medical care and practice such care.

(2) Sustainability—Efforts to Create an Environment-Friendly Educational and Research Environment

Global warming is a pressing issue of a worldwide scale that requires NUCs to advance efforts to reduce greenhouse gas emissions. It is also important for NUCs to fulfill their role as “knowledge bases” for the realization of a low-carbon society.

Efforts for the global environment at NUCs are not limited to reducing greenhouse gas emissions of the corporations but are also expected to include significant contributions to creating a low-carbon society of the next generation as a place of education for students who carry the future as well as a place to put cutting-edge knowledge into practice together with society.

Therefore, the national government needs to take concrete promotion measures, including the three measures listed below. The efforts may include promoting the shift to a sustainable campus that has the least adverse impact on the environment so as to enable sustainable development, while making the consideration of the global environment a basic condition of facility development of NUCs in the future.
<Promotion measures>

○ Promoting eco-improvement of dilapidated facilities

With a view to reducing the environmental impact of the NUCs as a whole, the national government will promote necessary refurbishment/renovation of dilapidated facilities, and new construction and development of infrastructure (lifelines) on such conditions that environmental measures above a certain level (ex. introduction of high-efficiency apparatus/equipment) are taken, and that the project is in line with the medium- to long-term environmental and energy conservation plans established by the corporations. On the basis of the spirit of the Green Contract Act,28 the government will also promote the active introduction of the green proposal procedure29 to the ordering of design works by individual corporations.

○ Introducing renewable energy

The introduction of renewable energy for further promotion of resource and energy conservation will be promoted after carrying out the necessary testing on tangible effects.

○ Developing model facilities of cutting-edge environmental measures

With a view to playing a pioneering role as a testing site for society, the development of frontrunner facilities that take cutting-edge environmental measures will be promoted. For this purpose, the necessary development will be promoted on the following conditions: to provide follow-up initiatives, including the powerful dispatch of information to other corporations and society, education and research activities, and ripple effects on environmental and energy aspects, and to consider the introduction of development utilizing diverse sources of finance.

(3) Safety—A Safe Educational and Research Environment

Improvement of facilities and infrastructure (lifelines) that pose significant safety concerns, including facilities with earthquake resistance problems and other structural problems, continues to be a challenge demanding immediate attention, not only to ensure the safety of students, teaching staff and other people, but also to serve as an emergency evacuation center in the event of a disaster and as a core hospital of the local community.

Dilapidated facilities and infrastructure that cannot sufficiently accommodate increasingly sophisticated and diversified education/research activities also require prompt improvement. For this purpose it is necessary to take the concrete promotion measures listed below.

It is also necessary to make efforts for mitigation of possible tsunami damage considering that university facilities located in coastal areas have suffered catastrophic damage.

<Promotion measures>

○ Creating a road map for earthquake resistance

In order to ensure systematic development toward the completion of earthquake resistance

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28 Article 3 of the Law concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities (Act No. 56 of 2007) stipulates that: “The State and independent administrative institutions, etc. shall endeavor to ensure the appropriate and reasonable use of energy in order to reduce emissions of their greenhouse gases and others, and to award contracts in consideration of various factors other than cost, with preference given to contracts which contribute to the reduction of emissions of greenhouse gases and others by the State or relevant independent administrative institution and are also economically efficient.”

29 The green proposal procedure: When contracting for the design service pertaining to the construction or large-scale refurbishment of a building, it is essential to employ the procedure to select a party who has offered the most excellent technical proposal by evaluating comprehensively in light of the specified technical requisite standards, including features addressing the reduction of emissions of greenhouse gases and others in principle. Basic Policy concerning the Promotion of Contracts considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities (Cabinet Decision on February 5, 2010))
measures, create a roadmap to complete earthquake-resistance retrofitting of facilities with earthquake resistance problems in the next five years while giving consideration to effects on educational and research activities. For facilities with very poor earthquake resistance (an Is value of 0.4 or less) identify a specific time for implementation by setting a goal to complete earthquake-resistance retrofitting in the first two years in principle, for example.

**Promoting systematic improvement of dilapidated facilities and infrastructure**

Based on an accurate understanding of the current status of dilapidated facilities and infrastructure, promote systematic renewal and maintenance giving attention to safety and functionality, which includes the promotion of preferential renewal of facilities that require urgent improvement to ensure safety, including earthquake retrofitting of nonstructural members and renewal of old dilapidated infrastructure.

Promote also facility development to ensure necessary power and other supplies to minimize the impact of possible disaster on educational and research activities.

**Disaster prevention measures for experiment study facilities, etc.**

In order to protect experiment study equipment that is indispensable for educational and research activities, consider the introduction of measures to control the movement of buildings, such as seismic isolation, as needed, after taking basic disaster prevention measures, such as securing the equipment to the building.

When developing experiment study facilities that use objects that require special attention for handling hazardous substances, such as poisonous and deleterious substances, radioisotopes, and biological materials for experiments, enhance disaster prevention functions to ensure the safety of users not only at normal times but also in times of disaster, while preventing an impact on the surrounding environment.

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**Chart 21 Promotion of Focused facility Development**
3. **Content of Prioritized Facility Development**

When conducting facility development based on the basic concept provided in 2. above, it is necessary to promote priority development from the perspectives listed below, in order to ensure and further improve a high-quality and safe educational and research environment with sufficient functions while giving consideration to the current status of National University Corporations (NUCs) facilities.

**(1) Improvement of Dilapidated Facilities that Have Safety and Functional Problems**

It is important to create a safe and disaster-resilient educational and research environment by promptly improving facilities with earthquake resistance problems among the huge number of existing facilities while ensuring the safety of dilapidated facilities and infrastructure (lifelines) that have significant safety and functionality problems due to aging. In addition, it is necessary to improve the quality of obsolete facilities so that they will have sufficient functions for educational and research activities.

Approx. 15 years after the construction of a building it generally becomes necessary to renew some of the building’s equipment, such as electricity systems and air conditioning systems. After 20 to 30 years it becomes necessary to renew most of the building. In order to ensure the safety and functionality of NUC facilities and to keep them in adequate conditions, it is important to make efforts toward a steady state (where there is no facility that has not been improved for 30 years or longer) that enables steady maintenance and renewal by steadily improving facilities every year with these renewal times in mind. (Chart 22)
健全な状態の施設

老朽状態の施設

Dilapidated facilities

Facilities in a sound condition

Refurbished facilities

Facilities 30 years or more after construction or refurbishment

Facilities 25 to 30 years after construction or refurbishment

22.94 million m²

Estimation at the end of FY2010

改善を実施


*Excluding university hospitals
*Assuming that the total area will not change after 2010
Assuming that the facilities once improved will need improvement again after 25 years
*Dilapidated facilities include those with partial refurbishment

Chart 22 Long-term Improvement Plan for Dilapidated Facilities
<Concept of development target>
In order to bring existing facilities to a steady state that enables steady maintenance and renewal with a long-term perspective in mind, it is necessary to improve dilapidated facilities by approx. 0.8 million m² every year (approx. 4 million m² in the next five years) giving consideration to the roadmap for earthquake retrofitting, while at the same time enhancing functions of significantly deteriorated infrastructure so as to ensure safety and respond to the development of education and research.

(2) Ensuring Space that is Essential for Increasingly Sophisticated and Diversified Educational and Research Activities
Spaces to accommodate sophisticated and diversified educational and research activities have been developed but there is still not enough, posing the problem of overcrowding. In light of this situation, while the basic policy is to respond through facility management, including the effective utilization of existing facilities, it is necessary to ensure truly necessary space adequately through new construction or enlargement.

<Concept of development target>
Because there is a serious shortage of space to accommodate the following educational and research needs, it is necessary in the next five years to steadily implement facility development of approx. 0.8 million m², which is comparable with the level of the 2nd Five-Year Program.
- Improving the facilities that are significantly short of space for the revitalization of unique educational and research activities
- Ensuring the space essential to meet new educational and research needs in response to policy concerns and social needs (ex. forming outstanding education and research centers, in response to the increase of young researchers, such as postdoctoral fellows and foreign students)

(3) Improving University Hospitals to Provide Cutting-Edge and Regional Medical Services
Based on the basic recognition that university hospitals have the educational function to train medical professionals who carry the future of medical care, the research function to develop highly advanced medical care, and the medical service function playing a central role in regional medical care, it is necessary to promote the systematic development of the following: an environment for attractive education programs integrating undergraduate and postgraduate education; an environment for cutting-edge medical services responding to the specialization and sophistication of medical care; measures to enable university hospitals to fulfill their role of providing regional medical care, and; emergency medical care centers in preparation for emergency.

<Concept of development target>
Redevelopment of university hospitals has been promoted in a well-planned manner.
It is necessary to continue systematic development giving due consideration to the continuity of the project, including by continuing in the next five years the steady development of university hospitals that are now under the redevelopment process, through the implementation of approx. 0.70 million m² of facility development, which is comparable with the level of the 2nd Five-Year Program, while aiming to sequentially start developing the remaining university hospitals. It is also necessary to appropriately deal with the development of facilities that are essential for response to the latest medical needs and for ensuring safety.
4. Promoting System Reform

As the premise for the national government to promote facility development based on the basic concept provided in 2. above, it is necessary to further promote system reform.

When selecting projects for the facility improvement subsidy every fiscal year, the government is required to adopt projects giving consideration to the efforts for system reform made by NUCs, including efforts on facility management and development using diverse sources of finance.

(1) Promoting Facility Management

In order to make the most of NUC facilities and increase their value, it is important to further promote facility management efforts, including even more effective utilization of existing facilities by securing the space for joint use, the good maintenance and qualitative improvement of facilities based on a facilities repair plan,\(^{30}\) and energy management\(^ {31}\) efforts, such as the promotion of energy conservation. It is also necessary to systematically implement efforts to promote safety measures for experiment study equipment inside the buildings that suffered extensive damage due to the Great East Japan Earthquake.

For this purpose, it is necessary, after building a university-wide framework and accurately understanding the actual status of the existing facilities, to establish a PDCA (Plan, Do, Check and Action) cycle of setting targets, making efforts for effective utilization, and systematic and effective maintenance/improvement of facilities, evaluating the efforts properly and reflecting the results in the next efforts to ensure the continuing cycle of efforts.

Individual corporations are required to identify the facilities for prioritized development by determining the need and urgency based on the objective understanding and analysis of the current status of their existing facilities, and the understanding of the characteristics and problems of individual facilities, while exploring the best improvement measures to maximize the functions necessary for realization of the ideal state of the corporation.

(Future measures)

○Dissemination and enhancement of benchmarking

For adequate assessment of the existing facilities by individual corporations, it is important to provide a measure for objective assessment of the facilities’ conditions and their efforts. For this purpose, it is important that the government promotes dissemination of “Benchmarking Concerning Facility Management” that focuses on maintenance situations, while studying specific ways to improve benchmark indices to facilitate energy management and other efforts by individual corporations.

○Objective understanding of current conditions based on the performance evaluation of existing facilities

It is important that NUCs make comprehensive evaluation of their facilities’ conditions against the performance level expected from the facilities in terms of seismic capacity and deterioration level, including those of nonstructural members, the living environment, and low-carbon measures, and

\(^{30}\)Facilities repair plan: an annual plan for medium- to-long-term refurbishment and repair giving consideration to the useful life of the facilities and equipment, and the cost necessary for their improvement.

\(^{31}\)Energy management: implementing analysis and assessment of energy conservation performance throughout the facility lifecycle (planning, design, construction, operation and refurbishment) for energy conservation and CO₂ reduction (“Lifecycle Energy Management,” The Ministry of Land, Infrastructure and Transportation)
promote effective and efficient facility management and other efforts based on an objective understanding of their current conditions. For this purpose, the government should support efforts by individual corporations by disseminating and improving “Performance Evaluation Systems for University Facilities.”

(2) Promoting Facility Development that Utilizes Diverse Sources of Finance

Since their incorporation, NUCs have been conducting facility development and maintenance management that utilize diverse sources of finance, including PFI, donations, collaboration with local governments, government agencies and private enterprises, long-term loans, and revenue from charges for use of space. Further promotion of facility development utilizing diverse sources of finance is desirable for effective and efficient utilization of limited financial resources.

(Future measures)

NUCs need to examine the possibility of facility development and management/operation that utilize diverse sources of finance in a broad context. It is desirable for universities to share knowhow, including diverse development techniques. It is also important to ensure the effective utilization of their physical resources through their joint use by deepening collaboration and cooperation among them.

In order to facilitate facility development that utilizes diverse development techniques by NUCs, the government needs to support their efforts by actively providing information, including advanced development examples, and establishing guidelines. It is also necessary to consider a support mechanism to promote the joint use of facilities.

(3) Developing Human Resources Necessary for Strategic Facility Management

For further promotion of efforts for system reform, including strategic facility management, individual NUCs are required to accurately identify problems from a managerial perspective based on an understanding of the education and research trends at the universities, and present their solutions.

For this purpose, individual corporations need to cultivate human resources who have strategic facility management capabilities. This requires them to cultivate human resources with extensive knowledge and managerial capabilities, including knowledge of measures for ensuring safety and energy conservation, and knowledge pertaining to university management, in addition to specific expertise.

(Future measures)

NUCs are required to make independent efforts, such as strengthening collaboration among universities to form a consortium for sharing resources for advanced initiatives, broad people-to-people exchange, and practical training, for example, as part of their human resource development efforts, while at the same time further promoting efforts to facilitate and streamline their operations.

It is also effective to encourage active information sharing by setting up a portal site to share information pertaining to facilities.

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32 Report made in March 2010 by the Research and Study Committee on the Functional Level of National University Corporations Facilities” (Head: Yukio Komatsu, Professor, Faculty of Science and Engineering, Waseda University) set up in the National Institute for Educational Policy Research of Japan

33 PFI: The Private Finance Initiative is a new technique to utilize private funds, management and technical capabilities for construction, maintenance and operation of facilities, etc.
With a view to supporting individual corporations’ efforts for further facilitation and the streamlining of their operations, the national government needs to consider a mechanism that helps all NUCs’ human resource development in addition to proactive and broad-ranging information provision.
5. Follow up of the plan

In the two Five-Year Programs for Emergent Renovation and Building of Facilities of National Universities, etc., the government established facility development policies, identified the quantity of the facility development necessary during the planning period, examined the status of the achievement of the plan, and used the results for the promotion of facility development.

In the next facility development plan, in addition to the perspectives above, it is important to check the progress of the plan on a timely basis and use the results for promotion of facility development by accurately understanding the effects as well as the completed quantity of the facility development in recognition that facilities of NUCs form the foundation for the promotion of human resource development and academic research.

For this purpose, it is important to establish certain indices for the 3S’s and system reform, and make follow-up efforts to ascertain NUCs progress.

It is also important to make full use of the indices to formulate policies concerning the subsequent specific facility development by setting goals for the indices wherever possible and grasping the achievement status of the goals as needed.

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IV. Enhancing Basic Research and Human Resource Development

1. Basic concept

In order for Japan to attract the world's top class human resources at home and abroad, and promote R&D in combination with the vitality of the world, it is necessary to advance the development of quality research facilities, equipment, and other environments. As such, the government will further promote the establishment of research environments and infrastructure based on international standards.

2. Drastic enhancement of basic research

(1) Enhancement of creative and diverse basic research

Basic research should be rooted in the intellectual curiosity and the spirit of inquiry of researchers and conducted based on their initiative and creativity. Findings of such research will lead to the creation of intellectual assets common to mankind and the accumulation of profound knowledge, and will further serve as a source of wealth and strength for Japan. The government will, therefore, strengthen efforts to promote such creative diversified research extensively and consistently.

<Promotional measures>
- The government will support basic research based on the free ideas of researchers, and increase basic expenses for university operation (operating subsidies and facility improvement subsidies for national university corporations, and aid to private schools) in order to enable academic diversity and consistency, and ensure seedbeds for intellectual activities.

4. Establishment of international-level research environment and infrastructure

(1) Improvement of R&D environments at universities and public research institutions

i) Development of facilities and equipment at universities

Universities should develop high-quality facilities and equipment with satisfactory functions in order to cope with more advanced and diversified education and research activities, attract quality human resources and enhance global competitiveness, and promote industry-university cooperation, local contributions, and internationalization. Development of facilities and equipment at universities is steadily progressing, but some of them have difficulties with systematic improvements or maintenance due to the severe financial circumstances. In addition, the recent earthquake caused serious damage to the facilities and equipment of universities in Tohoku and Kanto, and the ensuing power shortage forced a standstill of their education and research activities. In light of the above the government will promote efforts for developing / advancing such facilities and equipment, and ensuring stable operation.

<Promotional measures>
- The government will formulate a plan for aggressively developing facilities at all national university corporations (including the Inter-University Research Institute Corporation and technical colleges), strengthening support and ensuring stable and consistent development in order to ensure and further sophisticate a fully-featured, high-quality and safe education and research environment.
- The government will request national university corporations to formulate a campus development plan based on a long-term perspective, and further promote facility management. The government will also expect them to utilize various revenue sources, such as donations, self-income, long-term loans, and Private Finance Initiatives (PFI), for facility development. The government will promote efforts to support tax benefits including consideration of the way it should be. The government will also increase support for the improvement of facilities and equipment at private universities

* This is a tentative translation by Educational Facilities Research Center, National Institute for Educational Policy Research based on Japan’s Science and Technology Basic Policy Report
Chapter 1 Roles Played by National University Corporations’ Facilities

Foundation for accomplishing the mission of National University Corporations (NUCs) including human resource and academic research

- Japan is saddled with a mountain of problems, such as growing concern over global environmental problems, the intensifying international competition accompanying globalization, restoration following the Great East Japan Earthquake, and changes in the social system associated with the falling birthrate and aging population.

- For this nation that is poor in natural resources to continue growing and developing, it is essential to cultivate international competitiveness based on the promotion of science and technology. It is critical for universities to promote the development of creative human resources as well as original and cutting-edge academic research.

- Facilities of NCUs are places to cultivate people who can contribute to the creation of knowledge and promote academic research to create innovations. They form the essential foundation for educational and research activities.

- After the Great East Japan Earthquake, universities extended wide-ranging support, which made us reaffirm the importance of their role in the community.

Chapter 2 Current Status and Challenges for the Facilities of National University Corporations

Verification of the Second Five-Year Program for Emergent Renovation and Building of Facilities of National Universities, etc

A certain result was achieved with a 90% renovation rate but challenges remain, including earthquake resistance and satisfaction with the current status of facilities.

- Progress: approx. 4.88 million m$^2$, or about 90% of the 5.40 million m$^2$, which is the target of the Second Five-Year Program

- The rate of earthquake resistant facilities was approx. 65% in 2006, when the Second Five-Year Program was formulated, but has been improved to approx. 88%* (*estimation for the end of FY2010)

- Questionnaire survey for presidents and teaching staff of National University Corporations
  - Approx. 80% answered that facility development was “effective for enhancement of motivation for research and learning.”
  - The level of satisfaction with existing facilities is generally low: about 80% of respondents were “dissatisfied” with “facilities to promote international exchange in education and research,” and “facilities that serve as a center of world-class academic research” in particular.
Current Status and Challenges for the Facilities of National University Corporations

There are many problems, including dilapidation, that could significantly affect education and research activities

- **Dilapidation**
  
  There are approx. 10 million m² (approx. 38% of facilities owned) of dilapidated facilities with safety/functional problems that need improvement, which may hinder education/research activities in terms of safety and functions.

![Area of NUCs Facilities by Age Group](image)

- **Overcrowding**
  
  There are still facilities that cannot support education and research adequately due to significant overcrowding. Space for young researchers (post-doctoral fellows, etc) is especially in short supply.

- **Medical function**
  
  Insufficient development of the medical environment reduces services and causes insufficient adaptation to cutting-edge medical care

- **Global environmental issues**
  
  Problems such as a large number of facilities with significantly low energy-conservation performance call for proactive measures.

- **Policy challenges**
  
  Increasing policy challenges and social roles, including response to internationalization and the serious doctor shortage

- **Fiscal challenges**
  
  The facility development budget is completely insufficient, which makes systematic and sufficient facility development difficult

- **Lagging behind foreign countries**
  
  Not only developed countries but developing countries are making heavy investment in the development of higher education facilities

![Dilapidated facilities with significantly poor safety/energy-saving performance](image)
Damage to Buildings, etc. Caused by the Great East Japan Earthquake, and Challenges

-It is important to ensure comprehensive disaster prevention measures combining software and hardware approaches-

- Outline of damage
  - Enormous damage to nonstructural members, experiment study facilities, infrastructure (lifelines), etc.

- Challenges
  - Seismic strengthening of structural members
  - Enhancement of seismic strengthening measures for nonstructural members
  - Enhancement of disaster-prevention measures for experiment research equipment
  - Promotion of infrastructure (lifeline) improvement
  - Creating an environment to ensure requisite minimum power in case of power outage
  - Efforts for mitigation of tsunami damage
  - Further promotion of resource and energy conservation

Chapter 3 Approach to National University Corporation Facility Improvement in the Future

Objective for Facilities of National University Corporation (NUC)

-The objective is to develop facilities that have functions necessary for educational and research activities, and that represent unique characteristics of the university-

- Developing educational functions (Responding to diverse educational and research needs making good use of the unique characteristics of each university)
- Developing research functions (Forming an outstanding research center, accommodating the creation of innovation and project studies, etc.)
- Reinforcing collaboration between industry, academia and government (Collaboration and cooperation with local governments and private companies, and initiatives aimed at securing a variety of spaces)
- Making a contribution to the local community (Enhancing lifelong learning functions, working on formation of local medical centers, consideration of safety including barrier-free environment)
- Promoting internationalization (ex. Internationalizing the campuses, meeting the needs of foreign students and researchers)
- Contributing to the resolution of global environmental problems (ex. creating a campus that will serve as a model for countermeasures against global warming)
- Forming attractive campuses (ex. a harmonious campus environment with unique characteristics, enhancing facilities that support campus life)

Facility development from a long-term perspective

-Realizing the future vision of each NUC requires facility development based on a long-term perspective-

- Strategic facility management and functional maintenance/enhancement are necessary in order to deal with continually emerging dilapidated facilities.
- It is necessary to formulate a campus master plan for systematic facility development from a long-term perspective.

Collaboration and Cooperation Between the National Government and National University Corporations

-The government and NUCs need to fulfill their respective roles and further strengthen their collaboration and cooperation-

<Role of the government>
- Establish a facility development plan for all NUCs
- Secure the budget necessary for facility development
- Make the project evaluation/ adoption process transparent; explain the process to the public
- Provide support to facilitate facility management initiatives by individual corporations

<Role of NUCs>
- Create a campus plan based on a long-term perspective
- Implement facility development utilizing diverse sources of finance
- Ensure fair bidding and contracts as well as competitiveness of projects
- Promote facility management from a managerial perspective
Chapter 4 Medium- to Long-term Measures for Priority Facility Development of National University Corporations in the Future

Promoting systematic prioritized facility development based on a long-term perspective

- In order to advance effective and efficient facility development amidst the tight fiscal situation, the national government needs to establish a facility development program for the next five years (FY2011-FY2015), identifying the facilities that require prioritized development and incorporating the items concerning targets and system reform efforts for the development.

Basic concept to systematic and prioritized facility development (promotion of 3S)

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<tr>
<th>Strategy—Strategic development for qualitative improvement</th>
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<tr>
<td>- Including promotion of facility development by category giving priority to facilities that have more effects on education and research</td>
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<tr>
<td>- Enhancing functions of being an internationally outstanding education and research center</td>
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<tr>
<td>- Enhancing functions to promote internationalization</td>
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<td>- Enhancing functions for education of people with high-level professional skills and education in specific specialist fields</td>
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<tr>
<td>- Enhancing diverse educational and research functions taking advantage of the university’s characteristics</td>
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<td>- Enhancing the necessary functions based on the strategy of the university, such as student support and regional contribution</td>
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<th>Safety—A safe educational and research environment</th>
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<td>- Including creation of a roadmap for earthquake resistance and promotion of systematic improvement of dilapidated facilities and infrastructure (lifelines)</td>
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<th>Sustainability—Efforts for creation of an environment-friendly educational and research environment</th>
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<td>- Including eco-regeneration of dilapidated facilities and promotion of cutting-edge environmental measures</td>
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Promoting system reform

- Including promotion of facility management and facility development that utilizes diverse sources of finance as well as human resource development

Content of Prioritized Facility Development

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<th>Improvement of dilapidated facilities that have safety/ functional problems (approx. 4 million m²)</th>
<th>- Formulate a roadmap toward completion of earthquake retrofitting in the next five years.</th>
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<td>Ensuring space that is essential for the increasingly sophisticated and diversified educational and research activities (approx. 0.8 million m²)</td>
<td>- Ensure the space essential to meet new educational and research needs in response to policy concerns and social needs (ex. forming outstanding education and research centers, response to the increase of young researchers, such as postdoctoral fellows and foreign students)</td>
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<td>Improving university hospitals to provide cutting-edge and regional medical services (approx. 0.7 million m²)</td>
<td>- Improve and develop university hospitals continually in a well-planned manner, adequately respond to the latest medical needs, etc.</td>
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Promoting System Reform

- Promoting facility management
- Promoting facility development that utilizes diverse sources of finance
- Developing human resources necessary for strategic facility management

Following up of the plan (index examples)

- Check the progress of the plan on a timely basis and use the results for the promotion of facility development.
- For example, the status of ensuring space for young researchers, rate of the facilities with eco-improvement, rate of earthquake resistant facilities