

Application Examples of Intellectual Infrastructure

Intellectual infrastructure (soft infrastructure)



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Measurement and Intellectual Infrastructure Division,
Industrial Science and Technology Policy and Environment Bureau

Ministry of Economy, Trade and Industry

1. The public wealth and soft infrastructure: Intellectual infrastructure

As a public wealth, "intellectual infrastructure" such as measurement standards, microorganism genetic resources and geological information has been widely supporting people's lives and socio-economic activities to maintain and reinforce international competitiveness of our country, to promote innovation, to improve reliability of corporate activities, and to assure the core technology of manufacturing in small and medium-sized enterprises and safety and security of people's lives.

"Intellectual infrastructure" is a soft infrastructure which should be developed and made available to the public along with development of the social capital (hard infrastructure) as the responsibility of the government. In contrast to social capital such as roads and sewage systems whose development is easily seen and which are directly used by the people, the outcomes and advantages of intellectual infrastructure are less noticed by most people or enterprises. Because of that situation, it is not well known, and the importance and necessity of intellectual infrastructure have not been widely understood by people except for those who participate in it.

Based on the Second Science and Technology Basic Plan (cabinet decision made on March 30, 2001), a goal was set to bring up the development and availability level of our country's intellectual infrastructure to the world's highest level by 2010, and it has been achieved, bringing the level up to the levels of Europe and America. "Intellectual infrastructure" made available to the public and provided by the National Institute of Advanced Industrial Science and Technology, National Institute of Technology and Evaluation, etc. is realized through continuation of persistent works.

For example, 20 years were needed to reach the development level of measurement standards equal to that of Europe and America, and even longer years, 53 years were needed to create a geological map in the scale of 1/200,000.

2. Request for intellectual infrastructure for a new era

Until now, construction of intellectual infrastructure has been led by its developer, however, along with diversification of people's lives, complication of socio-economic activities and rapid development of information-oriented society, the way of creating and making intellectual infrastructure available to the public will be requested to change to realize the one that is more easily understandable and easier to use for the users to participate actively.

From now on, formulation of a new plan to make intellectual infrastructure available to the public will be requested based on the Fourth Science and Technology Basic Plan (cabinet decision made on August 19, 2011) which focuses on enrichment of not only the quantity but also the quality to fulfill various needs of the users.

3. Discussing the role of new intellectual infrastructure

In accordance with the Fourth Science and Technology Basic Plan, starting from April 2012, the Ministry of Economy, Trade and Industry has been holding the Special Committee on Measurement Standards and Intellectual Infrastructure (the chairperson: Koichi Kitazawa, advisor, Japan Science and Technology Agency), a joint session of the Industrial Structure Council and the Japanese Industrial Standards Committee, on the topic of "the way of using new intellectual infrastructure which is easy to understand and easy to use based on the user's point of view", and discussed the future policy and specific measures to promote making intellectual infrastructure available to the public and using it.

From August 2011, prior to the discussion at the Special Committee on Measurement Standards and Intellectual Infrastructure, great efforts and cooperation have been offered from related organizations which currently serve for development, provision or use of intellectual infrastructure, such as conducting interviews with 100 individuals/ companies on intellectual infrastructure with the developers, users, experts, etc., field investigation of small and medium-sized enterprises for actual use, follow-up survey on research and development project for creating and using intellectual infrastructure implemented by the New Energy and Industrial Technology Development Organization, and provision of information for "Application Examples of Intellectual Infrastructure". (230 organizations, 500 people in total)

On August 7, 2012, the Special Committee on Measurement Standards and Intellectual Infrastructure prepared an interim report on new policy and detail measures to promote making intellectual infrastructure available to the public and using it related to measurement standards, microorganism genetic resources, geological information, measures against computerization, etc.

The interim report is a guide for the next decade which shows mid-long term measures to promote making intellectual infrastructure available to the public and using it, which is to be reflected to the new plan to make intellectual infrastructure available to the public based on the Science and Technology Basic Plan, and also to be used as the core technology of manufacturing and a guide for measures to be taken in Asia. It systematically arranges details on implementation of the measures as a promotion program to make intellectual infrastructure available to public and use it so that the national government, development organization, users, etc., participate in activities to promote making intellectual infrastructure available to the public, using, and improving it through PDCA cycles.

4. Application Examples of Intellectual Infrastructure

This collection of application examples, created as a PR material comprising application examples of intellectual infrastructure in various scenes, is aimed to make known the importance and necessity of developing and making intellectual infrastructure available to the public to a wide range of users such as the people, business operators, universities and municipalities who use intellectual infrastructure.

What is intellectual infrastructure?

Reference

Create/promote
innovation
(R&D activities)

Improve reliability for
industrial activities

Assure safety and
security of
people's lives

Contribute to international
collaboration
(Environmental and energy issues)

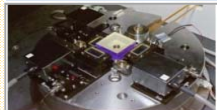
Important and indispensable infrastructure which supports people's lives and socio-economic activities

Intellectual infrastructure (soft infrastructure)

Social infrastructure

National land
management
and
maintenance
Traffic/
transport
system
Universal
design
Information
security
Disaster
prevention
system

Measurement standards



(AIST: Development/provision of standards)

Geological maps



(AIST: Provision of geological information)

Test/evaluation methods



(International standard, Japanese Industrial Standard)

Microorganism genetic resources



(NITE: Preservation/provision of microorganisms)

Reference material



(AIST: Development/provision of standards)

Database



(NITE Product accident information provision DB)

Advanced measurement techniques



(JST: Research and development)

Chemical material management



(NITE: Atmosphere concentration map)

Intellectual property is systematized or organized to be widely used and applied as national basic information (public wealth).

Definition of intellectual infrastructure

◆ The Fourth Science and Technology Basic Plan (Cabinet decision made on August 19, 2011)

4. Forming research environment and infrastructure at the international level (2) Developing intellectual infrastructure

To promote research and development activities effectively and efficiently, **intellectual infrastructure**^(Note) needs to be developed to systematize intellectual properties such as research results and research materials, and provided to be widely used by researchers.

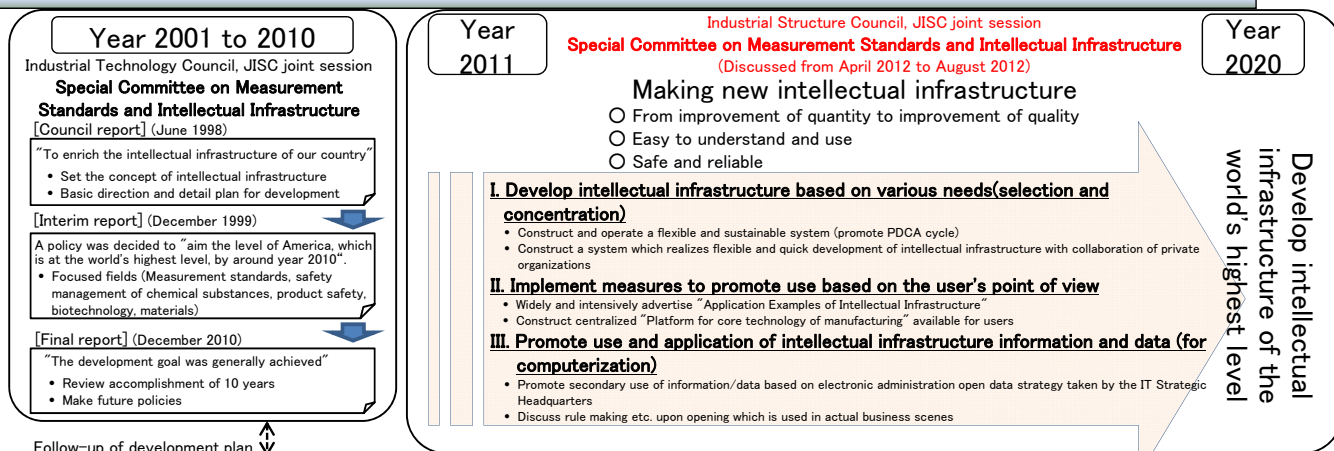
^(Note) **Intellectual infrastructure: Research materials, measurement standards, measurement/analysis/test/evaluation methods and related advanced machines, related database, etc.**

◆ Research and Development Enhancement Act (Act No. 63 of June 11, 2011)

(Act related to activities including enhancement of research and development by promoting reformation etc. of the research and development system and effective promotion of research and development, etc.)

Article 35 The national government, to promote sharing of facilities and equipment for research and development (Hereinafter referred to as "R&D facilities" in this article.) and sharing of **research materials, standards for measurement, information on science and technology, and other components of intellectual infrastructure to promote research and development** (Hereinafter referred to as "**intellectual infrastructure**" in this article.), shall provide users including researchers with information of R&D facilities and intellectual infrastructure owned by the nation, research and development corporations, or national university corporations and such necessary to use, and take measures necessary to widely make other R&D facilities and intellectual infrastructure available to researchers, etc.

Discussing development and application of new intellectual infrastructure



Promote development of intellectual infrastructure in the "Science and Technology Basic Plan" based on the Basic Act on Science and Technology (established in November 1995)

The First Science and Technology Basic Plan (Cabinet decision made in July 1996) It is important to develop intellectual infrastructure to stably and effectively promote R&D activities, etc. • Majorly expand measurement standards types • Establish methods for various tests and evaluations • Develop data related to biological genetic resources and chemical substances	The Second Science and Technology Basic Plan (Cabinet decision made in March 2001) Promote strategic and systematic development of intellectual infrastructure. • Aims to reach the world's highest level by the target year of 2010 • Improve convenience for users • Effectively store and develop research results • Develop basic rules including intellectual properties right • Evaluate future activities of researchers and engineers	The Third Science and Technology Basic Plan (Cabinet decision made in March 2006) Review the intellectual infrastructure development plan to conduct development which sets the index based on not only quantitative ideas but also qualitative ideas such as fulfilling the needs of users and frequency of use while facilitating selection and concentration, and promote focused development which aims to reach the world's highest level in 2010.	The Fourth Science and Technology Basic Plan (Cabinet decision made in August 2011) To fulfill various needs of users in the future, promote development of intellectual infrastructure on the idea of quality enrichment. • The government has established a new development plan • Enrich and sophisticate intellectual infrastructure • Construct system to act in an emergency • Development, popularization and utilization of advanced measurement analysis technology and equipment by the national government • Train and secure human resources
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Special Committee on Measurement Standards and Intellectual Infrastructure: Summary of interim report – Program to promote development and use of intellectual infrastructure –

Chapter 1 New direction in promoting development and use of intellectual infrastructure	Chapter 2 Focused and detail policy of development for each field	Chapter 3 Overall policy and detail measures for promoting development and use
■ Importance of intellectual infrastructure <ul style="list-style-type: none"> ➢ Application Examples of Intellectual Infrastructure (145 examples) ➢ Negative influence brought by undeveloped infrastructure 	■ Measurement standards <ul style="list-style-type: none"> ➢ Measures for implementation of development <ul style="list-style-type: none"> • Develop measurement standards, optimize supply system (Clarify core control center, expand standard supply with collaboration of private organizations) • Measurement standards, reference material, measuring instruments, evaluation methods for tests, comprehensive development of related data, etc. ➢ Policy to promote use <ul style="list-style-type: none"> • Popularize and educate small and medium-sized enterprises, improve convenience by providing technological information 	● Measures against computerization <ul style="list-style-type: none"> ➢ Secondary use of opened public data ➢ Easy-to-understand portal website for intellectual infrastructure ➢ Construct a platform for core technology of manufacturing ➢ Dealing with informational technology of each field to be developed
■ Political positioning of intellectual infrastructure development <ul style="list-style-type: none"> ➢ Political positioning in METI ➢ Positioning in major national policies, etc. ➢ Develop intellectual infrastructure based on the legal system ➢ Political positioning in Western countries 	■ Microorganism genetic resource information <ul style="list-style-type: none"> ➢ Measures for implementation of development <ul style="list-style-type: none"> • Start development of information infrastructure related to risk evaluation of microorganisms • Add genome information etc. to microorganism genetic resources ➢ Policy to promote use <ul style="list-style-type: none"> • Develop a database which enables search by functions • Popularize, educate, give technical support to small and medium-sized enterprises through public research institutes, etc. 	● Overall policy and detail measures to promote development and use <ul style="list-style-type: none"> ■ Construct flexible and sustainable system (Strengthen system and function to promote development and use) <ul style="list-style-type: none"> ➢ Clarified positioning in national strategy, etc. ➢ Secure resources (budget, human), coordination of organizations ➢ Clarify the function of core organizations etc. as the headquarter ➢ Maintain and update developed intellectual infrastructure ➢ Evaluate and review development based on the PDCA cycle ■ Dealing with small and medium-sized enterprises <ul style="list-style-type: none"> ➢ Popularize and evoke public awareness of intellectual infrastructure ➢ Technical consultation by regional public research institutes, etc.
■ New direction in promoting development and use of intellectual infrastructure <ul style="list-style-type: none"> ➢ Analyze and utilize various needs of users ➢ Focused development (selection and concentration) ➢ Thinking how to implement development ➢ Promote use of intellectual infrastructure which is easy to understand and use 	■ Geological information <ul style="list-style-type: none"> ➢ Measures for implementation of development <ul style="list-style-type: none"> • Integrate boring data and prepare geological and subground maps of urban areas • Focusing on preparing geological information of regions critical for preventing disasters, such as urban areas/coastal zones ➢ Policy to promote use <ul style="list-style-type: none"> • Provide geological information that is easy to understand and use • Promote secondary use by clarifying rules, distributing in a standardized format, etc. 	■ Internationalization (for Asia) <ul style="list-style-type: none"> ➢ Construct win-win relation between individual countries and local subsidiaries ➢ Environmental support for local subsidiaries
		■ New approach to promote development and use <ul style="list-style-type: none"> ➢ Comprehensive development of intellectual infrastructure ➢ Joint research with other organizations, development of measurement standards

Supplementary volume "Application Examples of Intellectual Infrastructure" (145 examples)

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How to read the application examples

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7. 質量標準の活用事例

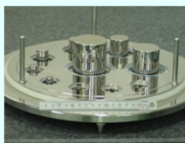
■ 質量とは

質量は、物体の動きにくさ・止まりにくさ(慣性質量)と地球など他の物体に万有引力により引き付けられる強さ(重力質量)という物体の二つの性質を指す。
質量の単位“キログラム (kg)”は、国際単位系(SI)では基本単位の一つになっている。

■ 質量標準の開発・整備・供給



日本国キログラム原器



1 mg～5000 kg
の標準分銅

1 kg(キログラム原器)を起点として、1 mgから5000 kgまでの標準分銅を産総研内で校正し、質量の標準器として設定・維持している。そして、これらの標準分銅を参照して、法規制のための基準分銅や校正事業者が使う参照分銅を校正することにより、標準を供給している。

産業界のニーズ

- 現在標準を供給している1ミリグラムより更に小さい微小な質量の範囲で、質量計測の信頼性向上が求められている。
- 既存の1 mgから5000 kgの範囲においても、質量計測の一般ユーザから、より高精度な標準供給のニーズがある。

医薬品開発や環境分析に不可欠な正確な質量計測

- ◆ 医薬品の開発や製造においては、試料の調製などのために、ミリグラムあるいはそれ以下の小さい質量を高精度に計測することが不可欠である。
- ◆ 環境分析においても、分析装置の校正・点検用の標準ガスなどの標準試料を調製するために、質量標準にトレーサブルでかつ高精度な質量計測が不可欠である。
- ◆ このほか、法規制に用いられる基準分銅を検査するため、並びに圧力・密度・力・トルク・液体流量など産業上重要な量の標準を設定・維持するためにも必要とされている。



薬品の開発・製造過程における試料の質量測定
(イメージ)



力標準機(力の国家計量標準)の重錘の質量調整と校正



環境分析装置のための標準ガスの調製
(写真: 産総研NMIJ 有機分析科 ガス標準研究室)

1

Title

2

Definition of intellectual infrastructure

3

Overview of the development process

4

Point of description

5

Details of the application example