Technological Research and Development in Relation to the Road in Japan - Their Trend, Recent Changes and Official Assistance to the Research -

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Situations surrounding technology research and development (1)

Changing social trends

- Internationalization
- Fewer children and an aging society
- Declining expendable funds for investment
- Expanding informaiton Society
- Increasing leisure time
- Increasing resident Participation

Changing needs for roads

(1) A high-standard road traffic service ensuring punctuality, safety and comfort.

(2) The formation of road space considering townscape, landscape and the environment.

(3) High-quality road structures requiring fewer maintenance expenses and considering life-cycle cost and durability.

(4) Method of accounting for people in a comprehensible manner.

Situations surrounding technology research and development (2)

Rising interest in science & technology policies

1. Promotion of the “Nation built on scientific and technological creativity” policy as a national strategy (since 1996)

2. Formulation of a science and technology basic plan (since 1996)

   At Present, being under the third term (2006-2010)

3. Formulation of a long-term strategy “Innovation 25” (in 2007)

   Technology development plan to realize a desirable society vision for 2025.

Road technology research and development in Japan (1)

Government-level R&D organizations

1921: Founded as the Road Material Test Institute of the Civil Engineering Bureau of the Ministry of Interior

2001: Separated into two research institutes in the central government reform.

1. National institute for Land and Infrastructure Management (NILIM)

Research into traffic management, ITS, traffic safety, road disaster and road environments.

2. Public Works Research Institute (PWRI)

Research into the design, construction and maintenance technologies relating to road structures (bridges, pavement, tunnels, earthwork, etc.), asset management and risk management.

Road technology research and development in Japan (2)

Priority research areas (10 policy domains)

◯ **In the past (1993-2003)**

Five year plans for technology development were formulated and promoted for two terms.

◯ **Presently (2004-)**

10 policy domains were defined in 2004 to promote efficient research programs conforming to governmental policies.

	Targeted area in the domain
Reform	① Creation of a new administrative system
Vigor	② The development and utilization of road networks invigorating the economy and life
	③ The creation of new information services
	④ Cost structure reform. The effective formation of road assets
Life	⑤ The creation of beautiful landscape and comfortable, quality road space
Safety	⑥ The prevention of traffic accidents
	⑦ Risk management in disasters
	⑧ Asset management
Environment	⑨ Improvement of environments along roads. The creation of preferable living environments
	⑩ The conservation of the natural environment and the global environment

Yellow: undertaken by PWRI

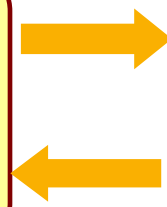
White: undertaken by NILIM

Road technology research and development in Japan (3)

New R&D schemes promoted in cooperation with private businesses or universities

"New road technology conference" (formed by the Road Bureau of the Ministry of Land, Infrastructure and Transport)

1. To discuss present states and the basic direction of road policies and research themes
2. To invite research partners from the public and examine applications' proposal
3. To evaluate research achievements precisely



University
Private businesses

To determine a research scheme for each research theme and implement a road technology R&D project.

Road technology research and development in Japan (4)

Type of invitation

Type	Outlines	Annual maximum budget
I . Policy embodying type	Research helping solve the current key road administration issues	20 million yen
II . Technological break-through type	Research aiming to provide innovative solutions to technical issues	50 million yen
III . New policy domain creation type	Research proposing a new policy domain for road administration from a trans-policy-domain perspective	100 million yen

Examples of adopted themes

Year	Number of research themes		Major research projects	Research expenses
2005	Type I	4 themes	Development of degraded ASR structure safety evaluation methods	131 million yen
	Type II	2 themes	Method to reinforce the embankment against earthquake	
	Type III	2 themes	Mobility management	
	Total	8 themes		
2006	Type I	1 theme	Road pricing technique for traffic demand management	176 million yen
	Type II	1 theme	Development of a next generation slope disaster control system	
	Type III	1 theme	Mechanism of beneficiary liability	
	Total	3 themes		

Cooperation with private businesses at PWRI (1)

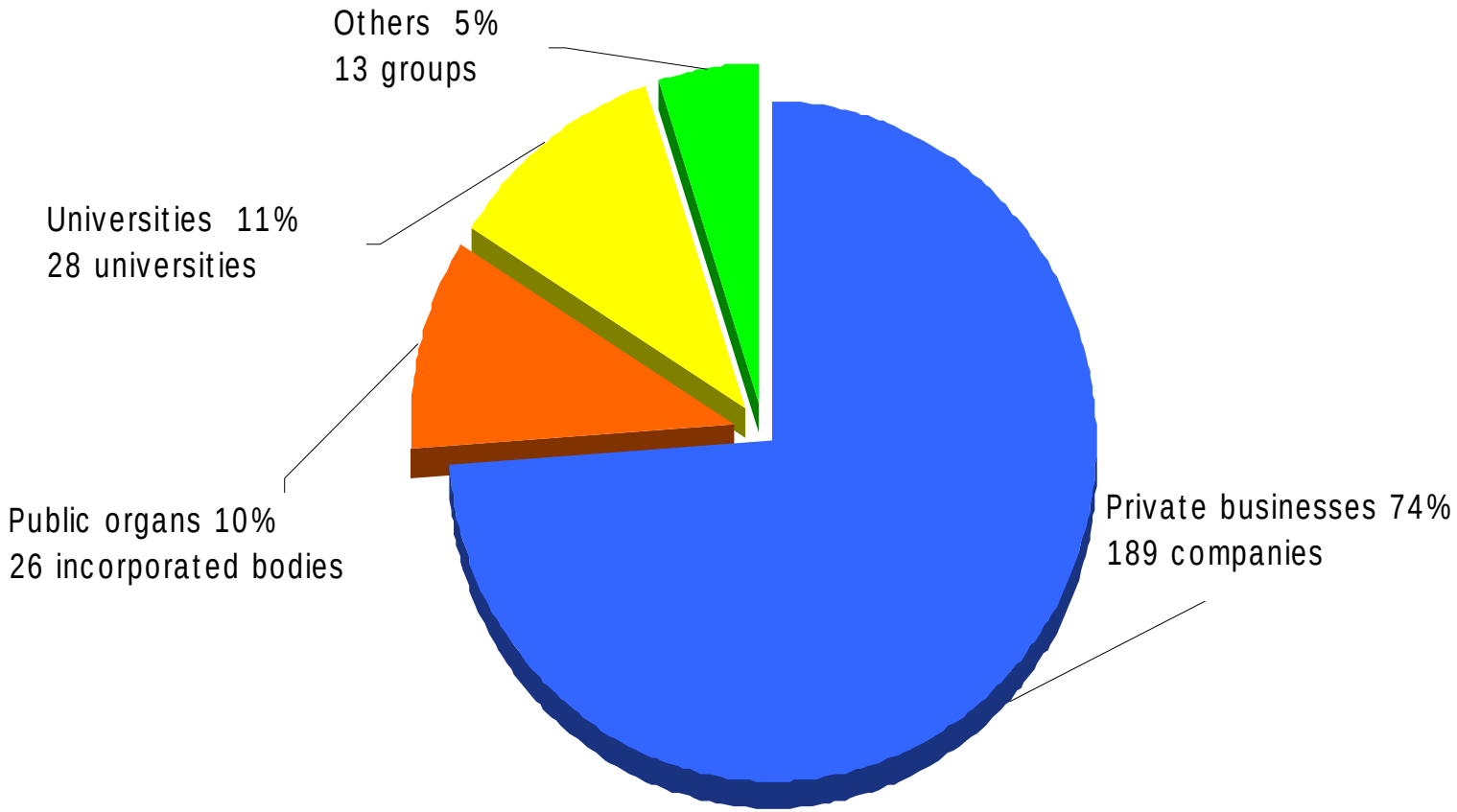
Joint research schemes with private businesses

In addition to PWRI's own research projects, joint research schemes with private businesses are also enhanced.

Joint research project type	Outlines	No. of Projects implemented (2006)	PWRI's budget allocation (yen for 2006)
PWRI initiative type	Invite proposals from private businesses for a specific technology theme determined by PWRI.	56 projects	305,059,000
Private business initiative type	PWRI specifies a research area only and invites a wide range of technology proposals from private businesses.	49 projects	202,616,000
Total		105 projects	507,675,000 (14.8% of total budget)

Cooperation with private businesses at PWRI (2)

Breakdown of joint research partners



Total: 256 organs

※Numbers of joint research partners include duplications

Cooperation with overseas organs at PWRI

Bilateral research cooperation agreement

E.g.: Workshop on advanced construction technologies under the Japan-France science and technology cooperation agreement.

Multilateral research cooperation agreement

E.g.: Joint research project for soft and weak ground countermeasures promoted with three countries, i.e. Indonesia, Thailand and Laos

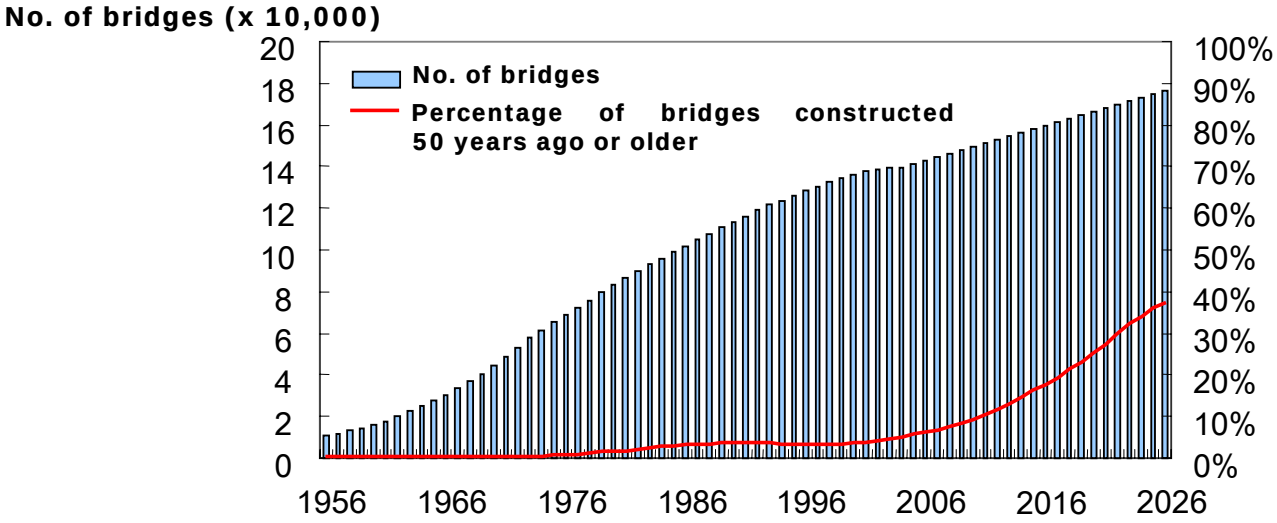
Construction executed in a field test

Actual case example of technology research and development: Asset management (1)

Background to the project

1. Many bridges were built in Japan during the period of rapid economic growth, spanning from 1960 to 1980.
   (49% of Japan's 140,000 bridges were built during this period)
2. Aging road structures, consisting mostly of these bridges, will approach the end of their lifespan in the near future.

Transition of the number of bridges (National Highway, regional roads)



Actual case example of technology research and development: Asset management (2)

R&D themes toward asset management implementation

Issues		Research themes
Integration and rationalization of maintenance system	• Development of a scientific road asset management system based on data	・ System development and improvement ・ Provision of administrator support tools
	• Realization of reasonable management based on forecasting	・ Establishment of a deterioration forecasting method
Establishment of existing structure performance evaluation	• Acquisition of the data required for diagnosis in an adequate, reasonable manner.	・ Acquisition of the necessary information (from 'observing' to 'examining') ・ Rationalizing, improving the efficiency of, and advancing the integration of data acquisition
	• Establishment of technology to evaluate the condition (safety) of existing structures accurately	・ Soundness evaluation technology ・ (Present condition evaluation and safety assurance, determination of needs for repair / reinforcement)
Establishment of repair / reinforcement technologies and their integration	• Reduction of LCC with efficient repair / reinforcement methods	・ Development of new technologies / construction methods ・ Repair / reinforcement design standards

Next slide:
Technology development example 1

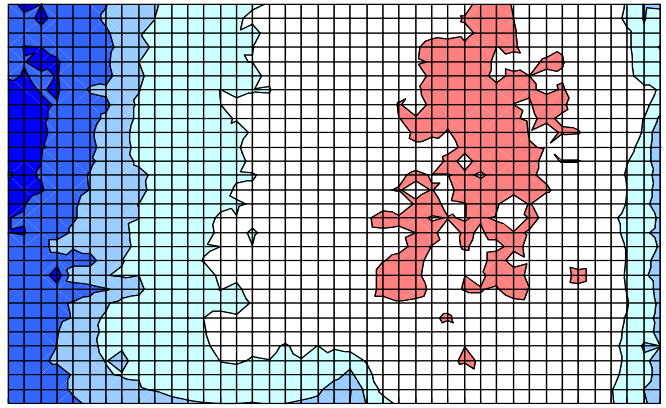
Next slide, but one:
Technology development example 2

Actual case example of technology research and development: Asset management (3)

Technology development example 1

Preventive soundness diagnosis technology for concrete structures

Potentiometer and electrode probe



- Wet for 30 min. by sprinkling water over a concrete surface
- Press the electrode probe directly onto the surface to measure

Legend Degree of corrosion: greater → Degree of corrosion: less

- The non-destructive estimation of the degree of corrosion of reinforcing bars

Actual case example of technology research and development: Asset management (4)

Technology development example 2

Paint coating film removal technology to extend the useful life of a steel bridge

It is a technology to remove and recover the existing paint coating films safely and efficiently, with due consideration paid to the environment, to recover a bridge with a long-life paint.

Existing paint coating

Recover

More durable paint coating

(1)Cost is reduced to a half that of a conventional method using a special stripping agent
(2)Reduced environmental impacts, improved work efficiency and coating film recovery rate
(3)Can be applied to steel bridges located over 50,000 sites in Japan

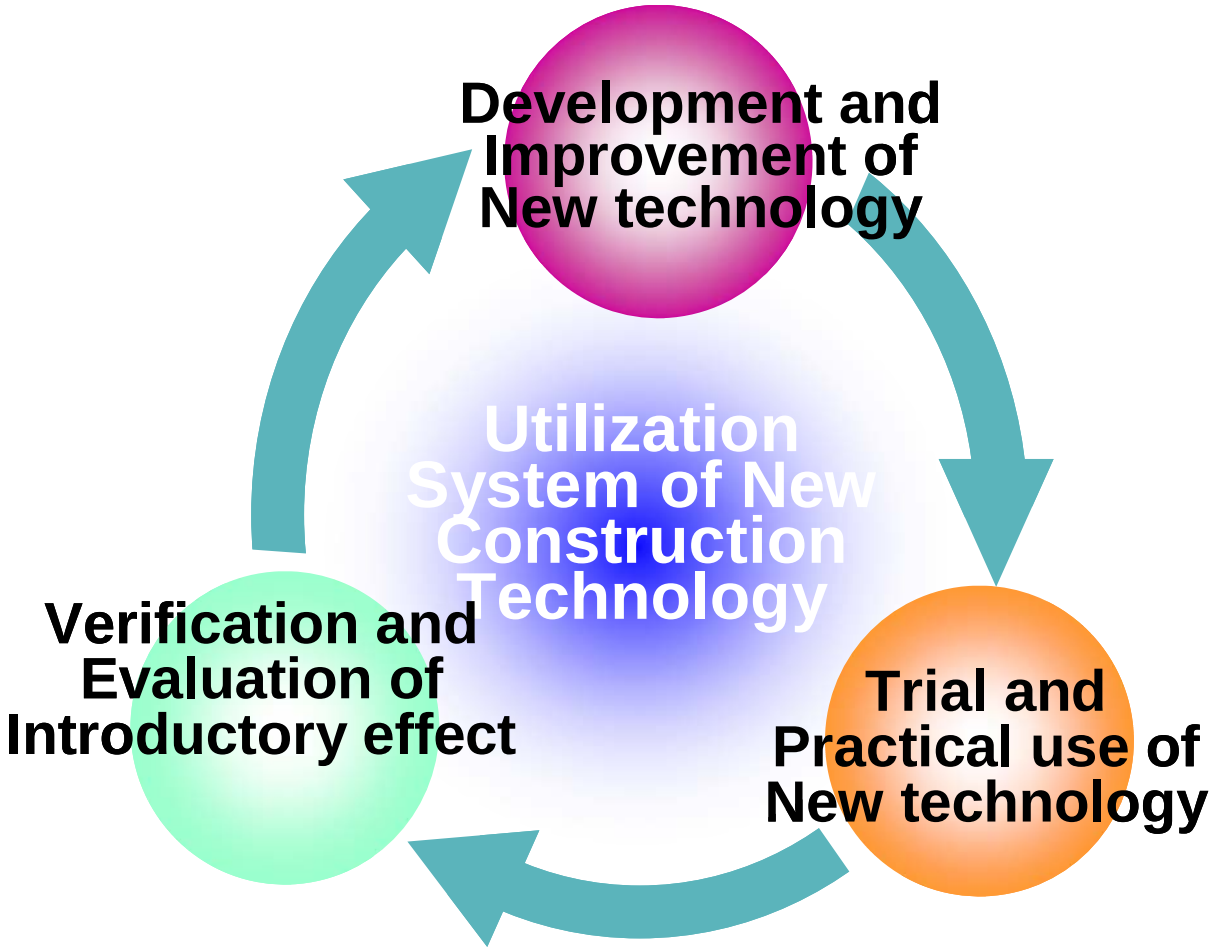
Conventional removal method (causing some scattering of paint coating film dust, noise and odors)

Newly developed removal method※ (causing no scattering paint coating film dust, noise or odors)

※It permits the efficient removal and recovery of paint coating film softened like a wet sheet.

Measures to find and utilize private sector-developed technologies (1)

Cycle for finding and utilizing technology



Measures to find and utilize private sector-developed technologies (2)

History and features of the NETIS (NEw Technology Information System) system

2001 Development of NETIS (Technical information database)

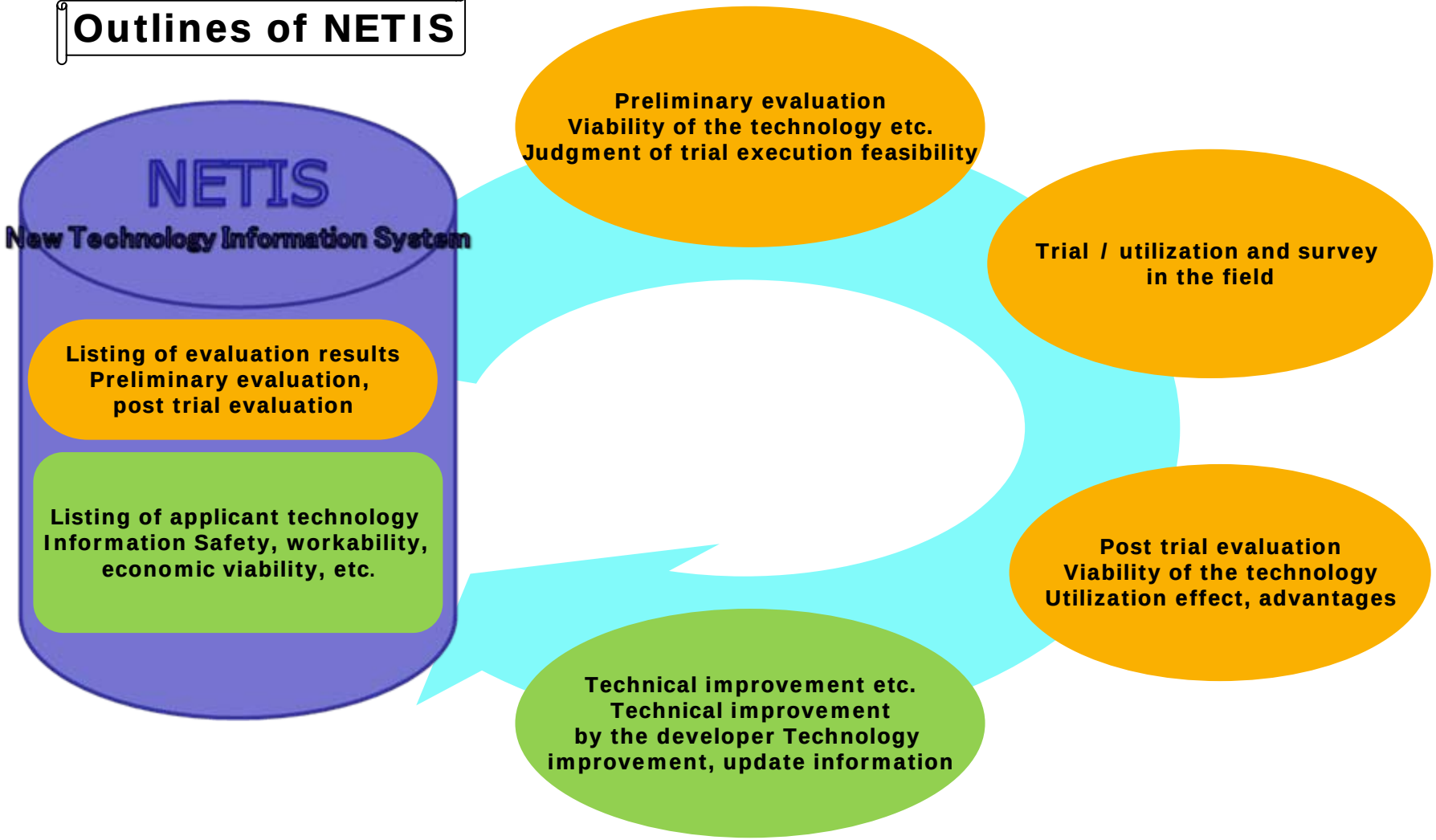
1. Registration of private sector's new technologies (Ministry of land, infrastructure and transport)
2. Information provision via the Internet

2005 Reorganization and enhancement of NETIS

1. Preliminary examination of technologies for NETIS registration (by PWRI)
2. Field trial
3. Post field trial evaluation and publication of evaluation results

Measures to find and utilize private sector-developed technologies (2)

Outlines of NETIS



Measures to find and utilize private sector-developed technologies (3)

Registration records, utilization records, etc.

(Total for 2001 - 2006)

Registration records:

No. of registered data: 3,355, evaluated cases: 180

Records of utilization in projects:

No. of projects ordered in which a new technology was utilized: 1,738
No. of new technologies utilized (gross): 2,537
(net): 1,504

Conclusion

It is considered important as an emerging contemporary need to advance / integrate civil engineering technology and seek its new application areas through information exchange and joint research efforts with other organs, including private businesses, those from different technology fields and overseas countries.