# What does S&T Policy expect from Foresight ?

November 19, 2007

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# Outline

- S&T Policy in Japan
- Japan's Strategy for Innovation
- Efforts in Priority Areas
- Future Issues
- Expectations for Future Forecast Surveys

# History of S&T Policy in Japan

- Science and Technology Basic Law (1995)
- Science and Technology Basic Plans
  - 1st Basic Plan (1996-2000)
  - 2nd Basic Plan (2001-2006)
  - **3rd Basic Plan (2006-2010)**

# 3rd Science and Technology Basic Plan: Policy Ideas and Goals

## <Idea 1> Create Human Wisdom

<Goal 1>

### Discovery and Creation of Knowledge for Quantum Jump

**Accumulation and creation of diverse forms of knowledge opening the path to the future**

(1) Discovery and elucidation on new principles and phenomena

(2) Creation of knowledge as a source of discontinuous technological innovation

<Goal 2>

### Breakthroughs in Advanced S&T

**Challenging and realizing the dreams of humanity**

(3) World's highest level projects as a driving force for S&T

## <Idea 2> Maximize National Potential

<Goal 3>

### Sustainable Development

**Realizing sustainable development which satisfies both environmental and economic needs**

(4) Solution of global warming and energy-related problems

(5) Realization of a recycling society in harmony with the environment

<Goal 4>

### Innovator Japan

**Realizing a strong, flexible economy and industry based on continuing innovation**

(6) Realization of a ubiquitous network society that attracts international interest

(7) Realization of world's No. 1 nation in manufacturing technology (*monozukuri* technology)

(8) Strengthening of international industrial competitiveness through S&T

## <Idea 3> Protect the Nation's Health and Security

<Goal 5>

### Lifetime Good Health

**Realizing a healthy nation from childhood to old age**

(9) Conquest of diseases afflicting the Japanese people

(10)Realization of a society where all citizens can lead healthy, active lives

<Goal 6>

### World's Safest Nation

**Making Japan the world's safest nation**

(11) Security of the nation and society

(12) Safety in everyday life

## Chapter 1 Basic Ideas

- Recent situation of S&T
- Basic stance in 3rd Basic Plan
- Fundamental ideas and policy goals of S&T policy
- ¥25 trillion investment in governmental R&D

## Chapter 2 Strategic Priority Setting in S&T

- Promotion of basic research
- Prioritization of policy-oriented R&D

Four priority areas: Life sciences, IT, environment, nanotechnology and materials

Four promotion areas: Energy, *monozukuri* (manufacturing technology), infrastructure, frontier (space/oceans)

- Establishment of promotion strategy by field

## Chapter 3 Reforming the S&T System

- Developing, securing, and activating human resources
- Progress of science and continuous creation of innovation
- Strengthening the infrastructure for promoting S&T
- Strategic promotion of international activities

## Chapter 4 S&T with Public Confidence and Engagement

- Responsible measures to resolve ethical, legal, and social issues (ESLI)
- Strengthening of accountability and information dissemination related to S&T
- Improving public awareness of S&T
- Proactive participation of the public in S&T

## Chapter 5 Role of the Council for Science and Technology Policy (CSTP)

- Effective, efficient promotion of governmental R&D
- Elimination of structural and operational obstacles to S&T
- Appropriate follow-up on S&T Basic Plan and promotion of progress in S&T, etc.

# Strategic Priority Setting in S&T (1)

## Basic Research

Steady promotion of basic research based on the original concepts of researcher with a certain investment of resources, while continuing to ensure diversity.

## Policy-oriented R&D

*Pursuing higher selectivity and concentration*

1 **Four priority areas** (life sciences, IT, environment, and nanotechnology & materials) and **Four promotion areas** (energy, monozukuri technology, infrastructure, and frontier)

2 **Prioritized investment within fields**

## Promotion Strategies for Prioritized Areas

- Understanding of current condition
- Setting of targets: Clarification of R&D targets & achievement targets and the responsible governmental entity
- Key R&D themes: Key issues for the government in the next 5 years
- Strategically-prioritized S&T: S&T particularly requiring concentrated investment in the next 5 years
- R&D promotion measures: Policies for smoothly promoting efforts and realizing "living strategy"

# Strategic Priority Setting in S&T (2)

**Life sciences**

**Translational research for practical application** of research outcomes in drug discovery and new therapeutic technologies
[Establishment of infrastructure for diagnosis and treatment of "lifestyle diseases," etc.]

***Bioinformatics***

**Information and communication technology (IT)**

S&T to win international competitive superiority in **next-generation super computers** (National Critical Technology) and the IT industry
[Realization of utilization of energy-saving IT by advanced electronics, etc.]

***Nanodevices/sensors***

**Environment**

S&T for achieving **international leadership** by Japan in the global warming problem
[Lead Asia with global observation technologies, etc.]

**Nanotechnology & materials**

Research **responding to social and industrial needs with breakthroughs** by dramatic progress in the nano region and novel materials
[Realization of medical technologies with high therapeutic impact by early diagnosis of very small cancers, etc.]

**Energy**

S&T for achieving **freedom from petroleum dependence** in the transportation sector
[Establishment of core technologies for electrical vehicles for the next generation, etc.]

***Energy-saving monozukuri technologies***

*※ Numerous other types of interdisciplinary S&T also exist.*

***Monozukuri*** **(manufacturing) technologies**

Technologies which further **strengthen Japan's unique monozukuri technologies**
[Scientific elucidation of basic processing technologies/know-how of medium- and small companies, and transmission to the next generation, etc.]

**Infrastructure**

Technologies to substantially reduce damage, prioritizing **disaster mitigation**
[Quick rescue of persons at disaster sites, prevention of the spread of disaster, etc.]

**Frontier**

S&T which pioneers frontiers utilizing space/oceans and **space transportation systems** (National Critical Technology)
[Improvement of the reliability of Japan's mainstay rockets, etc.]

Etc.

# Innovation Strategies in Other Countries

**The only key to sustained growth is "innovation"**

→ **The world's leading countries have constructed respective innovation strategies.**


| | |
|---|---|
| **USA** | "American Competitiveness Initiative" (2006)<br>Stimulating innovation as a national which will win in the global economy. |
| **EU** | "New Lisbon Strategy / Competitiveness and Innovation Framework Program (CIP)" (2005/2007)<br>Designates practical application of the research and innovation processes.<br>Innovation support program for small and medium-sized enterprises (SME). |
| **UK** | "Science and Innovation Investment Framework 2004-2014" (2004)<br>Prioritizes investment in new technologies and innovation, including business. |
| **China** | "National Medium- and Long-term Plans for Science and Technology Development" (2006)<br>*Long-term vision to the year 2020.<br>Targets independent innovation (creation (innovation) based nation) and China as an S&T power. |
| **OECD** | "OECD Innovation Strategy" (2007)<br>Creation of a collection of examples of successful innovation support measures. |

· Expansion of R&D investment

· Global competition for human resources

→ **Era of "intensive knowledge competition"**

# Japan's Innovation Strategy

**Council for Science and Technology Policy (Cabinet Office)**

**3rd Science and Technology Basic Plan (2006-2011)**
**Comprehensive strategy for innovation creation: (2006)**

**Strategic Council on Intellectual Property (Cabinet Office)**

**Intellectual Property Strategic Program 2007 (May 2007)**

**Innovation Strategy Council (Cabinet Office)**

**Long-Term Strategic Guidelines: "Innovation 25" (June 2007)**

# Innovation is the Key

**Era of intensive knowledge competition at the global level**

**Without innovation, sustainable development cannot be achieved.**

## Innovation

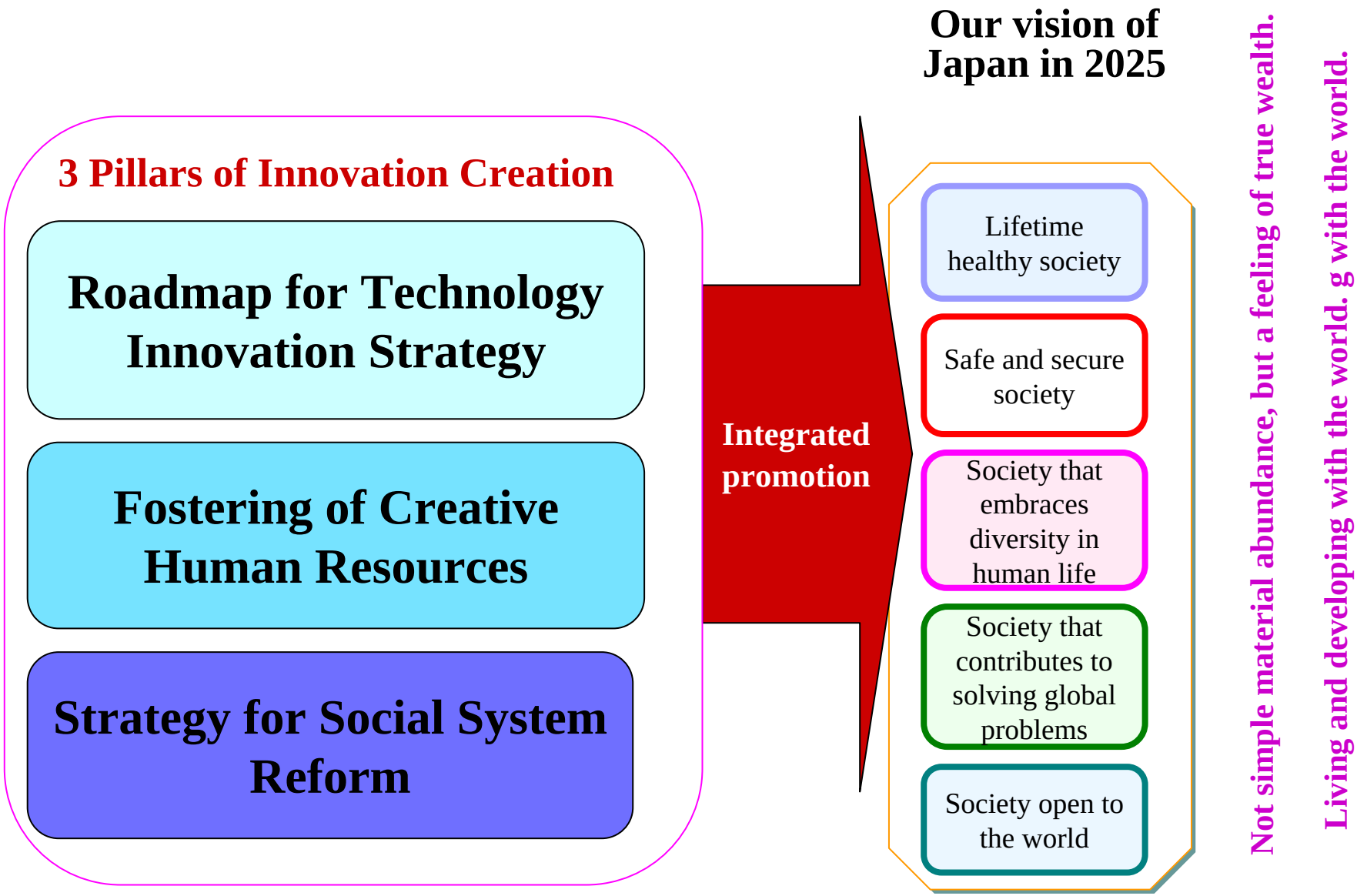
**Creation of new wealth and value by injecting novelty into existing products,technologies, systems, etc.**

**Does not mean the narrow concept of simple "technological innovation"; means causing major social changes by wide-ranging creation of new value, including social systems.**

**The "innovation-based nation" which is Japan's goal . . .**

**A vigorous society where individual capabilities are demonstrated to the fullest extent.**

# Long-Term Strategic Guidelines: “Innovation 25”



# Measures for Realizing "Innovation 25"

**Global competition in innovation is a competition of . . .**

- **How quickly and efficiently the seeds of innovation can be cultivated and applied to society (ex. S&T outcomes).**
- **How to establish a social framework for easier fruition of the seeds of innovation.**

## Strategies for social system reform

**1. Urgent issues (146 items) . . . Improvement and strengthening of next-generation investment, reform of universities**

**2. Mid- to long-term issues (28 items)**

## Roadmap for technology innovation strategies

**1. Projects that accelerate social return**

**2. Promotion of field-specific strategic R&D**

**3. Promotion of aggressive and challenging basic research as an incubator for innovation**

**4. Strengthening of the R&D system propelling innovation... Independent Administrative Institutions for Research and Development (IAIs for R&D)**

**Change of policy from "field-specific industrial promotion type" and "government-led type" to "infrastructure creation type."**

# Future Development of Intellectual Property Strategy

## Creation of Innovation and Global Dissemination of Information

**Creation of innovation that will spur new activity in Japanese society**

Establishment of long-term strategic guidelines envisioning as far as the year 2025

**Incorporating activity worldwide, esp. Asia**

**Enhancing the appeal/strength of Japan, and publicizing the virtues/unique qualities of Japan worldwide (animation, music, food culture, etc.)**

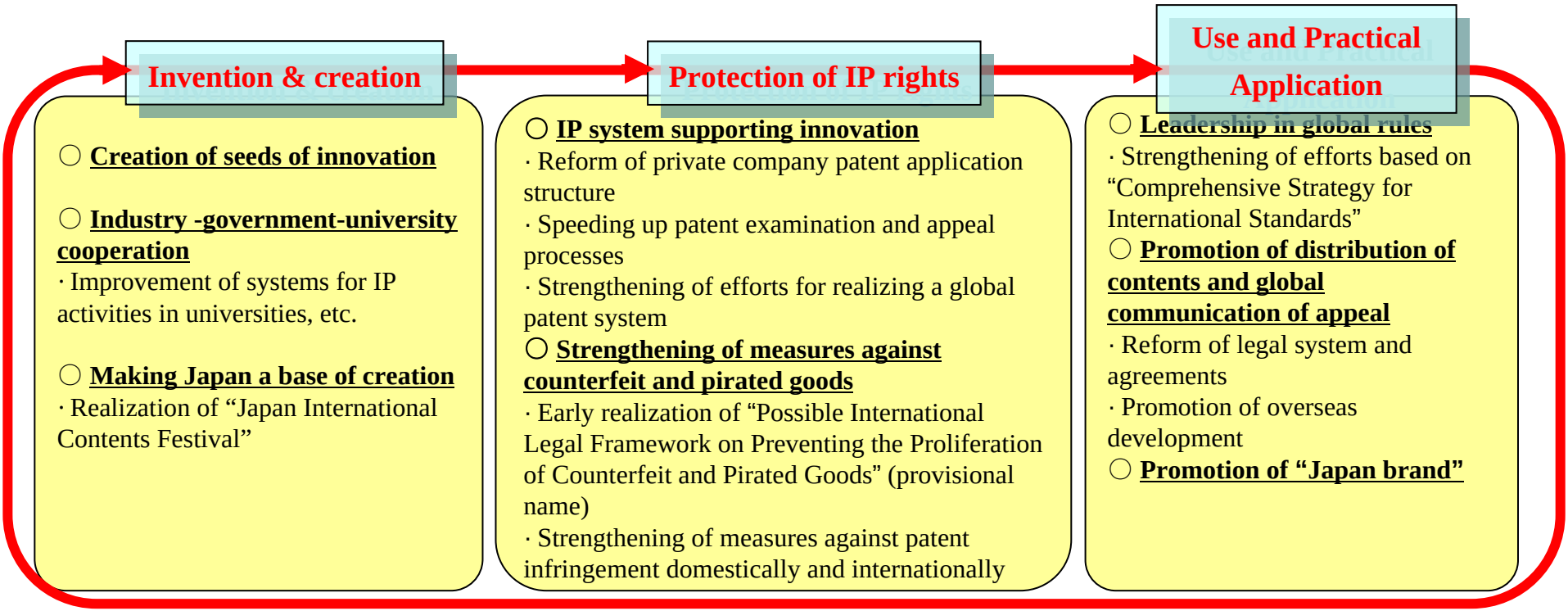
Intellectual property as a source of growth and vitality

Promotion of intellectual property strategy

# Knowledge Creation Cycle

**1) Intellectual property (IP) policy contributing to creation of innovation**

**2) IP policy contributing to inducing global activity and information dissemination**




- ○ **Promotion of corporate IP management**
- ○ **Regional promotion utilizing IP**
- ○ **Support for medium and small-sized enterprises and ventures**
- ○ **Development of human resources for IP**

# Intellectual Property (IP) Strategy

## Efforts toward an "Intellectual Property-based Nation" and Future Plans

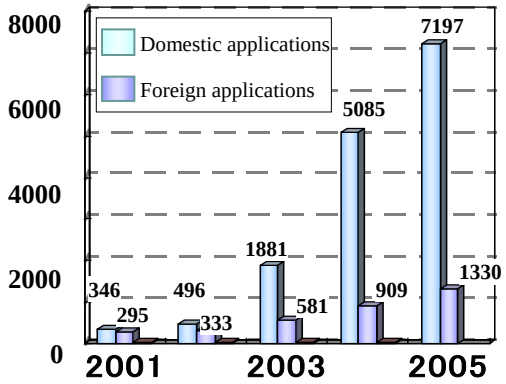
2003 | 2004 | 2006 | 2007 | 2008 | 2009 | 2010 | ・・

### Phase 1: Improvement of University IP Headquarters

■**Examples of measures for vitalizing knowledge creation**

1. Expansion of competitive funding (2007: ¥476.6 billion)
2. University IP Headquarters Improvement Project (2007: ¥3 billion)
   → Number of universities with IP headquarters: 43
3. Expansion of support for TLO (2007: ¥600 million)
   Number of TLO: 44

2003-2005: Increase of approx. 3.5 times



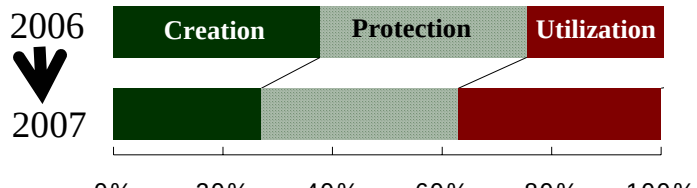

[Trend in number of patent applications by universities, etc. (Source: MEXT survey) ]

### Phase 2: More Strategic IP Activities

■**Examples of measures for vitalizing knowledge creation**

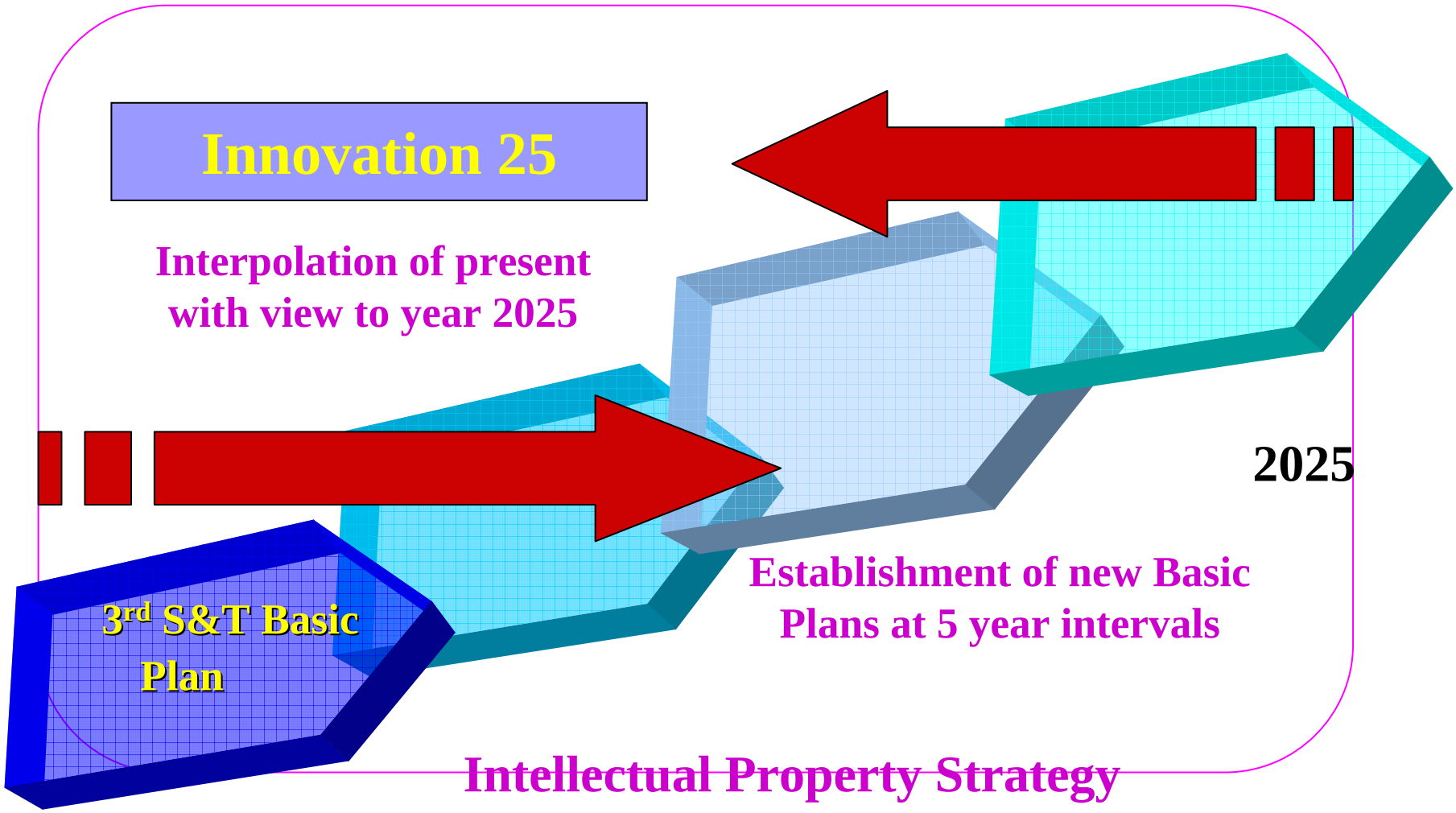
1. **Compilation of "On Intellectual Property Strategy"**
   Summarizes more effective strategies for realizing an "IP-based nation."
2. **Establishment of field-specific IP strategies**
   Establishment of strategies for creation, protection, and utilization of IP corresponding to the characteristics of individual fields
3. **Construction of research tool database**
   In particular, the measures aims at promotion of R&D and strengthening of international competitiveness in the life sciences field.

**Proportions of "creation, protection, and utilization"** proposed in "On Intellectual Property Strategy"




In Phase 2, the emphasis shifts from **creation** of the S&T outcomes based on infrastructure improvement in Phase 1 to **utilization**, and Phase 2 includes strategic IP activities contributing to innovation creation.

# Framework of Innovation Strategy



# Efforts on Key Themes

- Priority efforts in FY2008
  - **Investment in human resources**
  - **Project to Accelerate Transfer to Society**
  - **Strengthening of S&T diplomacy**
- Ongoing efforts to be promoted on a priority basis
  - Creation of universities with international competitiveness and openness to the world
  - Expansion of competitive funding
  - Creation of world's top level research centers, strengthening of international IP strategy, and promotion of international standardization

Council for Science and Technology Policy (68th) Resources Allocation Guidelines (June 2007)

# Developing, Securing, and Activating Human Resources

Creation of an environment in which individuals thrive and integrated human resources development

→ **Securing both quality and quantity in human resources for S&T**

**Promoting the activities of female researchers**

Promoting the activities of foreign researchers
Utilizing the abilities of talented senior researchers

**Supporting the independence of young researchers**

· System enabling independent activity
· Increase in allocation of research funds

**Improving the quality of university education (enhancing human resources function in universities)**

· 5-Year Plan
· Financial aid for doctoral course students

**Expanding the horizons and scope of human resources who will build future S&T**

· Developing children with exuberant intellectual curiosity
· Developing individuality and abilities of gifted children

**Elementary school**

**Middle school**

**High school**

**University**

**Graduate school**

**Developing human resources that meet the needs of society**

**Researchers**

**World's top class researchers**

**…**

**…**

**…**

**Skilled workers**

**Engineers**

**IP human resources Technology managers**

**S&T communicators**


· Human resources development by industry-university partnership, such as long-term internships, etc.
· Development of technology managers, S&T communicators, etc.

# Urgent Issues

## For creation/promotion of further innovation by universities

### Improvement and strengthening of next-generation investment

◆**Research-funding reform such as bold investment in young researchers and ambitious and challenging research**

- Improvement and strengthening of funding for young researchers
- Expansion and review of competitive funding
- Promotion of development and sharing of research facilities
- Smooth funding to promote research with outstanding results

◆**Creation of research centers gathering the world's most talented scientists**

- Creation of world's top level research centers

◆**Acceptance of diversity and development of unique, outstanding individuals**

- Improvement of youth exchange programs
- Development of human resources with entrepreneurship
- Development of human resources with the ability to manage technology
- Improvement of support for those who have motivation and ability to learn

# Urgent Issues

## For creation/promotion of further innovation by universities

### University reform

◆**Strengthening the research capacity and educational capacity of universities**

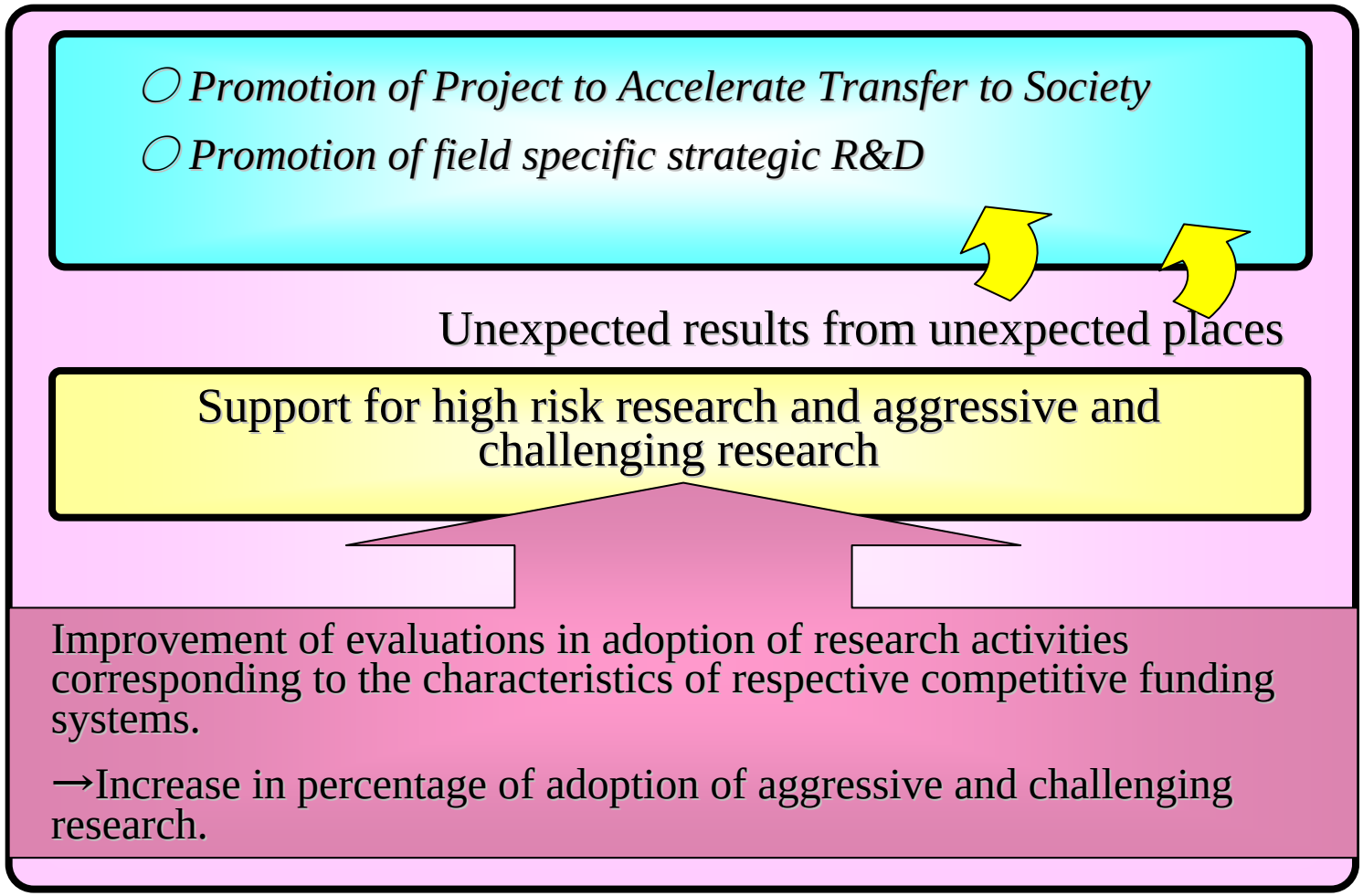
- Improving international competitiveness both of research and education at universities
- Filling the gap between humanities and science
- Improvement of university admission process to select students with high motivation and ability

◆**Opening universities to the world**

- Promotion of credit compatibility with partner universities/graduate schools abroad
- Support for forming an international consortium through university partnership, and expansion of a double-degree system
- Improvement of mobility of professors and associate professors
- Support for attracting excellent human resources from abroad
- Granting fellowship to excellent students regardless of nationality

◆**Establishment of life-long learning system that leads to new challenges, utilizing local universities**

# Promotion of Diverse Basic Research as Seeds for Innovation



# Project for Accelerating Transfer to Society

## Purpose

**Creation of a pioneering model project in which the national government takes the initiative, integrating several element technologies which are expected to reach the verification stage. By this project, accelerate the transfer of S&T outcomes to society through verification research.**

→ **Realization of the vision of Japan in 2025 targeted in "Innovation 25."**

## Outline of Policy

*Present (2007)* — 2025

**Promotion of "Project for Accelerating Transfer to Society," enabling a real feeling of innovation.**

From 2008 **"Project for Accelerating Transfer to Society"**
- Disaster information communication system
- Comprehensive utilization of biomass resources, etc.

**Transfer of new technologies to society**

From 201X / From 20XX

New **"Project for Accelerating Transfer to Society"**

**Verification accompanying systemic reforms**

**Field-specific promotion strategy based on 3rd S&T Basic Plan (including National Critical Technologies)**

→ Technologies reaching verification stage → **Transfer of new technologies to society**

→ **Fundamental/basic technologies** (continuing promotion on priority basis)

Research by universities, etc — **Germinal technologies**

**Vision of Japan in 2025**

- **Lifetime healthy society**
- **Safe and secure society**
- **Society with diversified lifestyles**
- **Society contributing to solution of global problems**
- **Society open to the world**

# Strengthening S&T Diplomacy

## Definition (Purpose)

○ Introduction of Japan's proposal, "Beautiful Planet 50," by former Prime Minister Abe at the G8 Heiligendamm Summit. (= Reduce total global GHG emissions by half by the year 2050)

○ By actively addressing various global issues, making maximum use of Japan's scientific and technical capabilities, strengthen "S&T Diplomacy," which links research cooperation and technical cooperation with foreign diplomacy, and enhance Japan's "soft" power.

## Outline of Policies

1. Strengthening of science and technology cooperation with developing countries
2. Strengthening of transmission and demonstration of Japan's excellent science and technology to the world
3. Development of world environmental leaders
4. Strengthening of international cooperation in advanced science and technology

# Strengthening S&T Diplomacy

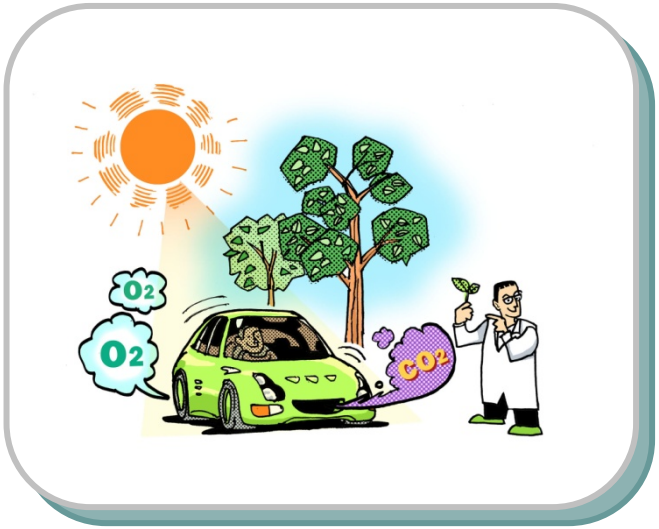
## Concrete Examples


Strengthening science and technology cooperation with developing countries

Strengthening of S&T cooperation with developing countries in the form of support for improvement of higher education, research institutes, research facilities/equipment as local bases, study of a system for dispatching Japanese researchers to perform joint research and training of human resources in the counterpart country, etc.

Development of world environmental leaders

Implementation of a program for development of environmental leaders who can play an active role on the world level by education, in Japan, of young people from around the world in environmental technologies and policies in order to solve the environmental and energy-related problems confronting each nation through international cooperation.



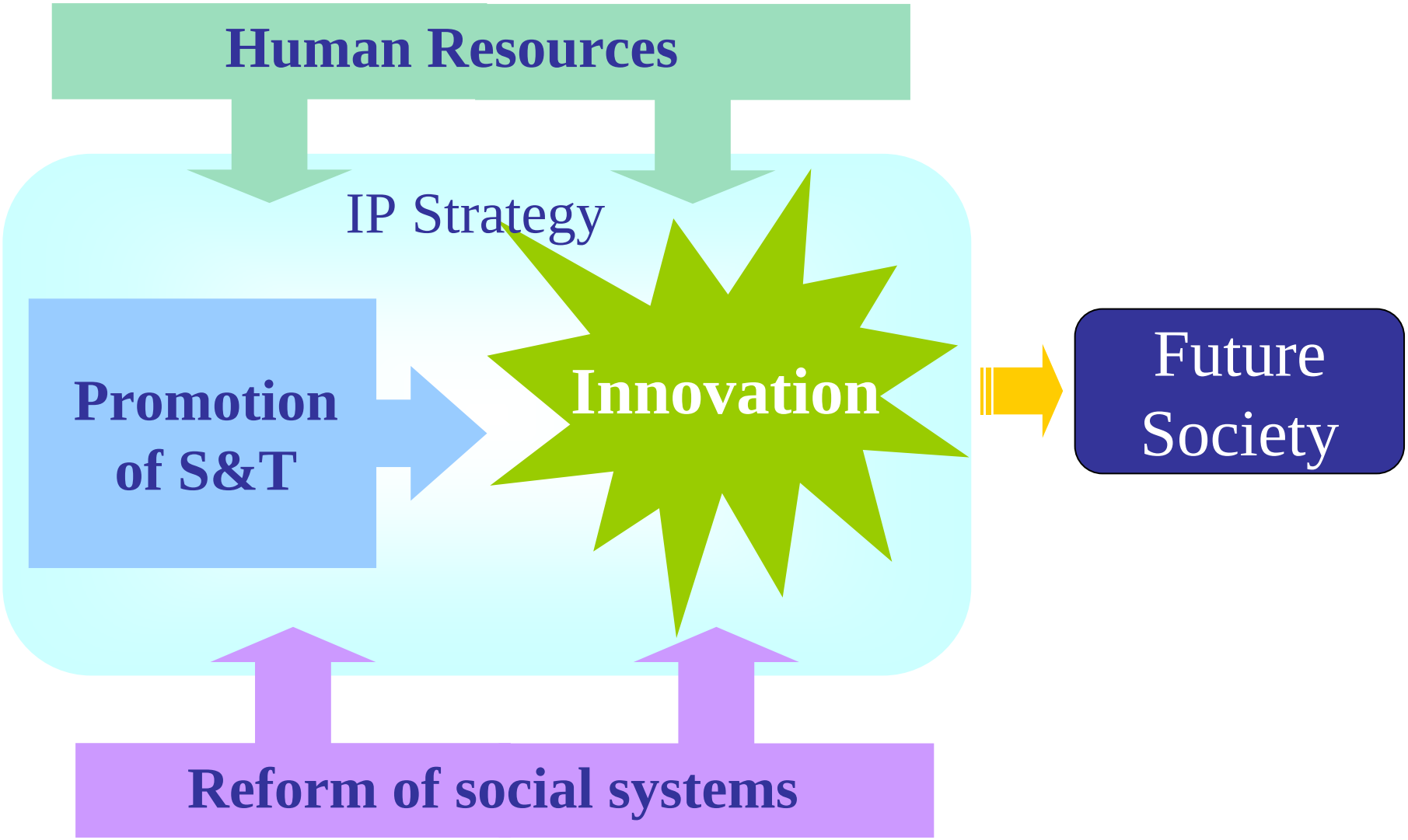

## Future Plans

**Study of concrete cooperation measures, looking ahead to the 2008 Lake Toya Summit in Hokkaido, Japan and Tokyo International Conference on African Development Process (TICAD IV) in the near future.**

# Future Issues

- Evaluation of current S&T Basic Plan
  - Innovation indexes
  - Evaluation of transfer of research institutes to IAI* status (*IAI: Independent Administrative Institute)
- Further promotion of innovation
  - Combination of S&T, systemic reform, human resources, and IP strategies

# Future Promotion of Innovation



# Expectations in Future Foresight

- What kind of innovations may possibly occur in the future based on S&T outcomes?
- How will innovation occur in the future as a result of S&T outcomes?
- Evaluation of the achievements of past and present S&T Basic Plans.

  → What is the contribution of S&T Basic Plans to the establishment of S&T policy?
- Suggestion of recommended changes in Japan's S&T policy in preparation for the future.