

Innovative Combustion Technology

【Objective】

Realize innovative combustion technology for maximum thermal efficiency of more than 50% to contribute to energy saving and CO₂ emission reduction, while developing world-leading researchers and building sustainable industry-academia collaboration in the field of combustion technology.

【Duration】 Five years 【Budget】 ¥ 2.0 Billion (for FY 2017)

■ Contents:

1. The combustion technology which leads to high thermal efficiency

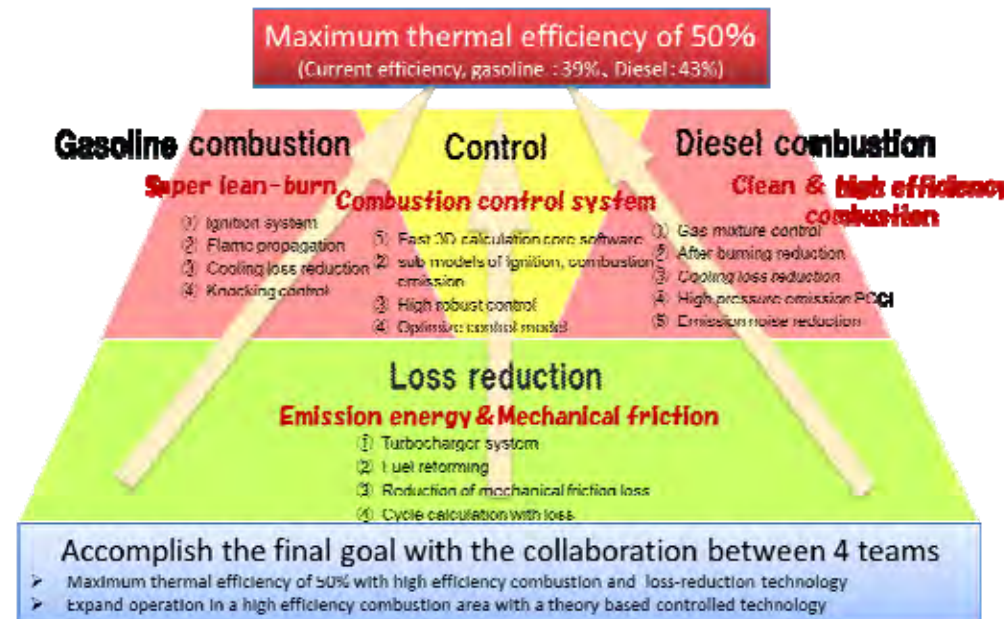
- ✓ Gasoline Engine: Super lean burn, High boosted combustion, The combustion under large amount of EGR
- ✓ Diesel Engine: Fast silent combustion, Clean low temperature combustion

2. The technology which controls the combustion of internal combustion engine freely

3. The technology which reduces losses

■ Program Director(PD):

Masanori SUGIYAMA (Toyota Motor Corp.)



Next-Generation Power Electronics

【Objective】 Dramatically cutting power loss for more energy-efficient and downsized power electronics systems by developing capable next-generation power devices until 2020.

【Duration】 Five years

【Budget】 ¥2.40 Billion (for FY2017)

■ Targets:

Integrating next-generation semiconductors into highly efficient and downsized power electronics systems through comprehensive development from materials to systems.

■ Contents:

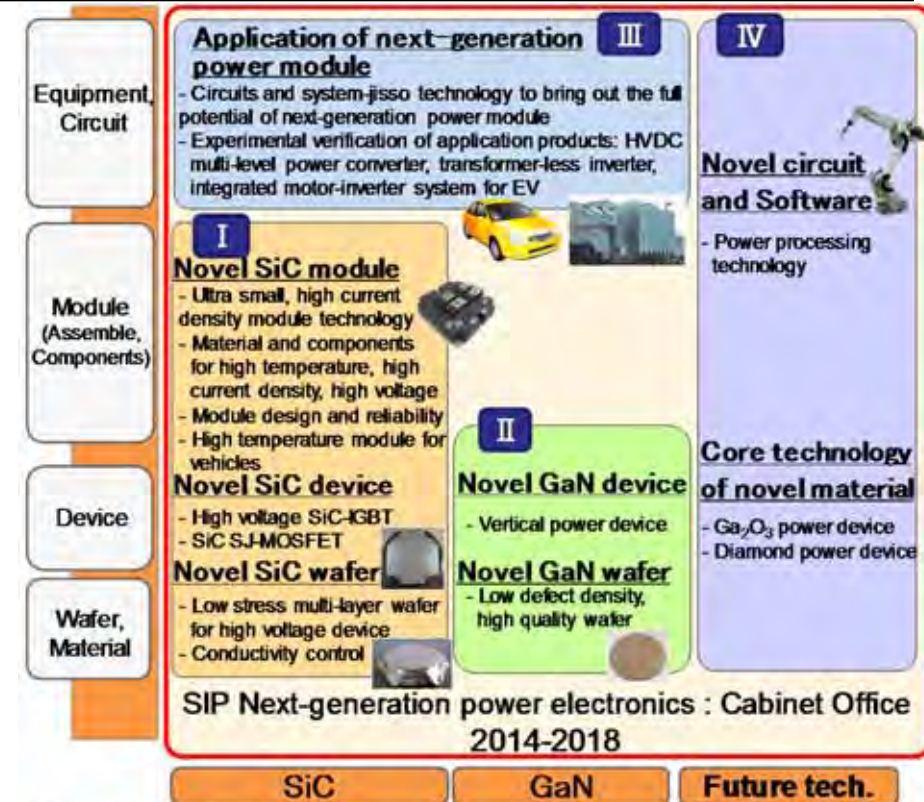
- I. Development of fundamental basic technologies regarding SiC
(higher voltage ratings, downsize, smaller loss and higher reliability)
- II. Development of common fundamental technologies regarding GaN
(improvement of wafer and development of vertical power devices)
- III. Basic research and development regarding applications of next-generation power modules (circuit, control ...)
- IV. Basic research and development for the future power electronics
(new materials and structures)

■ Strategies

- Consider and formulate a strategy for activities toward creating an ideal society in 2030
- Prove performance using prototypes to demonstrate successful development of technologies that meet requirements
- Conduct standardization and other activities to promote the adoption of program results

■ Program Director(PD) :

Tatsuo OOMORI (Mitsubishi Electric Corp.)



Structural Materials for Innovation (SM⁴I)

【Objective】 Development and application of advanced heat-resistant structural materials for yielding innovation in energy technology, esp. making airplanes and power plants highly energy-effective, through encouraging Japanese industry.

【Duration】 Five years

【Budget】 ¥4.000 Billion (For FY2017)

■ R&D Targets

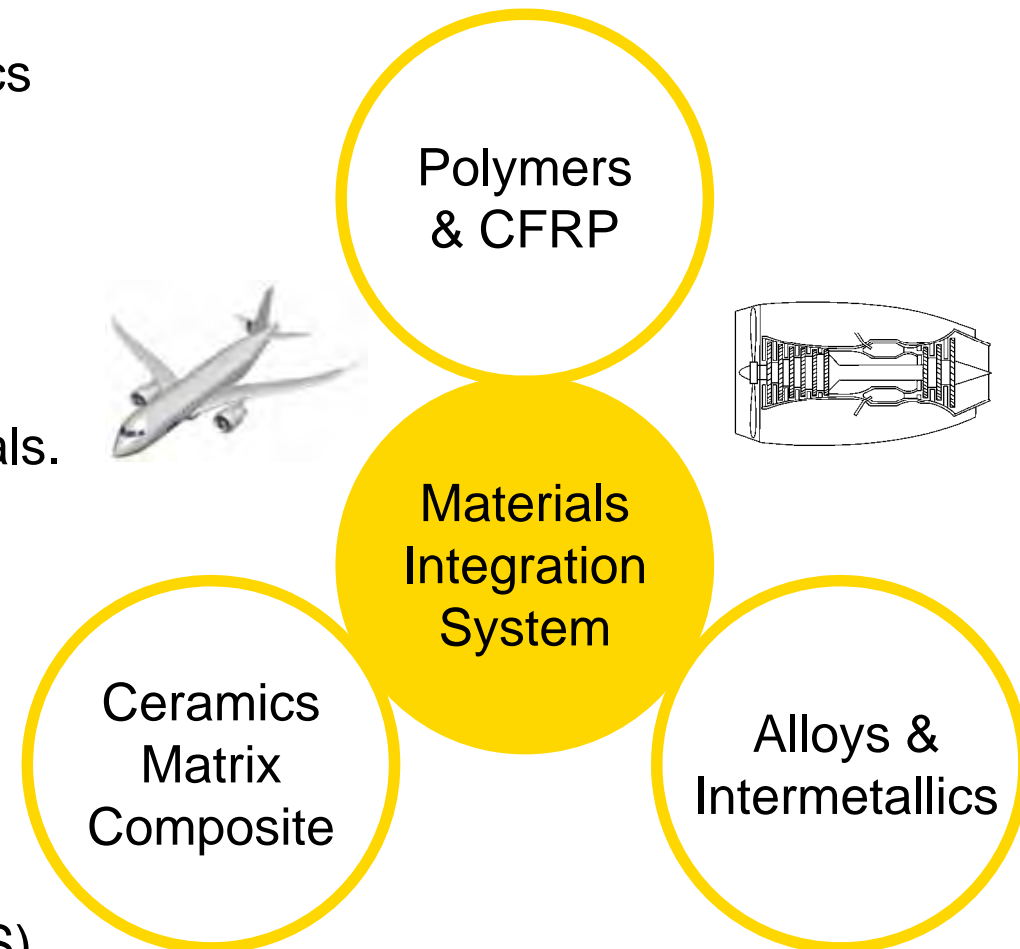
- a. Polymers and Carbon Fiber Reinforced Plastics
- b. Heat-resistant Alloys and Intermetallics
- c. Ceramics Matrix Composite
- d. “Materials Integration System”, tools to accelerate R&D process with a technique of computational materials science. Innovative Measurement & Analysis for Structural Materials.

■ R&D System Reform

- Organize an R&D center for each target
- Build a network of researchers for structural materials

■ Program Director

Prof. Teruo KISHI (ISMA, Univ. of Tokyo, NIMS)



Energy Carriers

【Objective】 Building a new energy world for contributing to a low-carbon society with hydrogen based on renewable energy, and disseminating the technologies

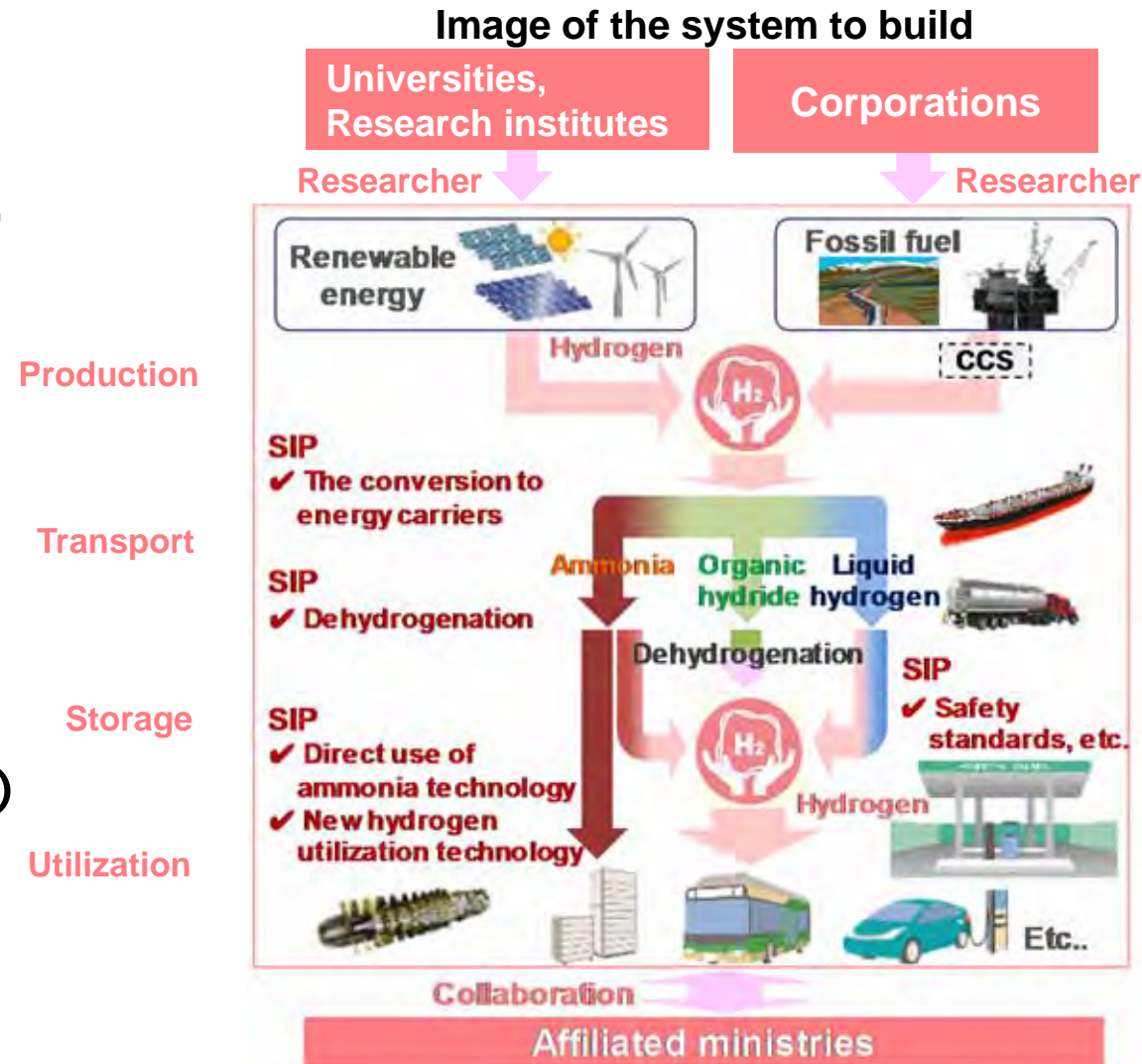
【Duration】 Five years

【Budget】 ¥3.66 Billion (for FY 2017)

■ Contents:

1. Energy carrier technology of high efficiency and low cost using ammonia, organic hydride
2. The technologies required handling of liquid hydrogen
3. Hydrogen engine technology
4. Safety assessment of energy carriers and future scenario development

■ Program Director (PD) :
Shigeru MURAKI (Tokyo Gas Co., Ltd.)



Next-generation Technology for Ocean Resources Exploration

【Objective】 To develop ocean resource exploration industry, build the world's most advanced and effective exploration technologies for ocean resources .

【Duration】 Five years

【Budget】 ¥4.56 Billion (for FY 2017)

■ Contents:

- ① Scientific research on genesis of ocean minerals and resources
- ② Development of exploration technologies for ocean resources
- ③ Ecosystem survey and development of long-term monitoring technologies
- ④ Development of “Integrated Ocean Resource Surveying System”

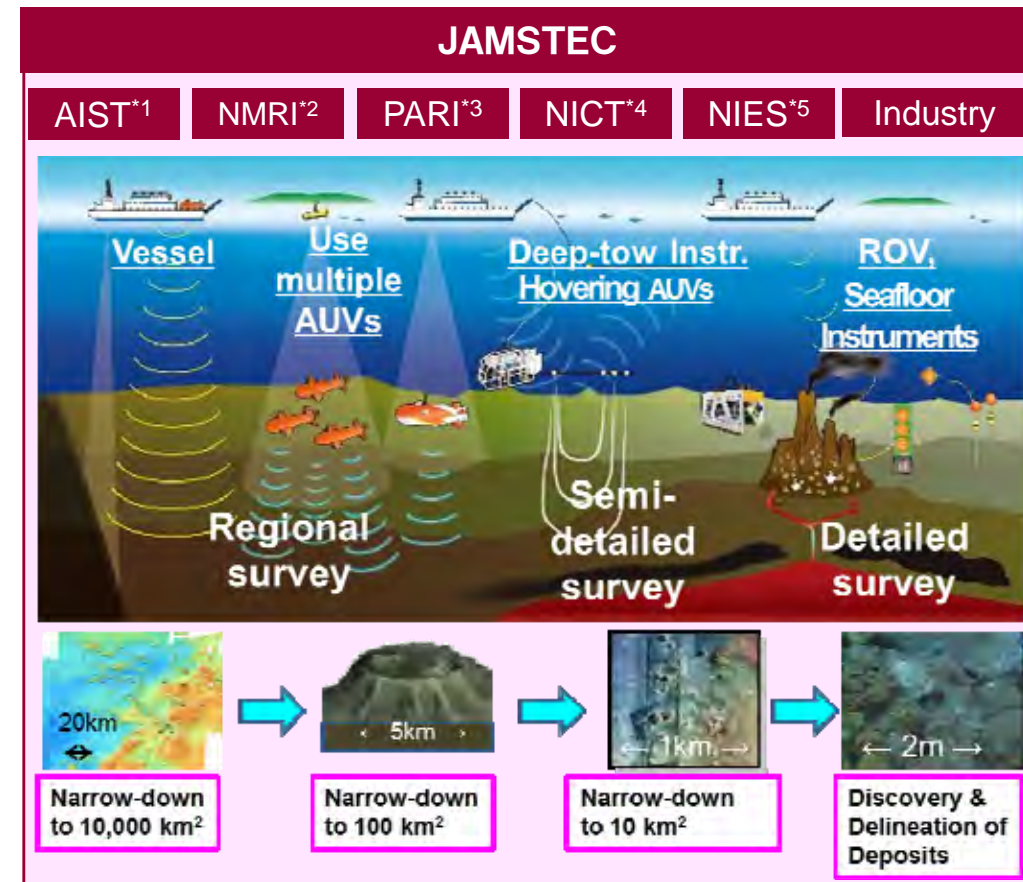
■ Strategies:

- Develop competitive exploration technologies for ocean minerals and resources through an industry-government-academia partnership
- Transfer technologies and know-how to private sectors to develop ocean exploration industry for ocean minerals and resources
- Accelerate overseas deployment by establishing global standard technologies for ocean exploration

■ Program Director(PD):

Dr. Tetsuro Urabe

(Univ. of Tokyo, Japan Mining Engineering & Training Center)



Development of ocean exploration industry for ocean minerals and resources
And its overseas deployment

*1 Advanced Industrial Science and Technology 2 National Maritime Research Institute 3 Port and Airport Research Institute
4 National Institute of Information and Communications Technology 5 National Institute for Environment Studies
6 Japan Oil, Gas and Metals National Corporation

Automated Driving System

【Description】 Developing new transportation systems including technologies for avoiding accidents and alleviating congestion.

【Duration】 Five years

【Budget】 ¥3.32 Billion (for FY 2017)

■ Goal & Exit Strategy

① Social aspects

Ensuring safety and traffic jam reduction on the road.

② Technical aspects

To Achieve a high-end Level 2 automated driving system by 2020 as a step towards Level 3.

Advance R&D in cooperative fields necessary to commercialize Level 3 automated driving systems by around 2020 and Level 4 (full automation) systems by around 2025.

■ Research and Development Topics

- [I] Develop/verify automated driving systems
- [II] Advance basic technologies to reduce traffic fatalities and congestion
- [III] Promote international cooperation
- [IV] Deploy next-generation urban transportation
- [V] Conduct large-scale field operation tests (FOT)

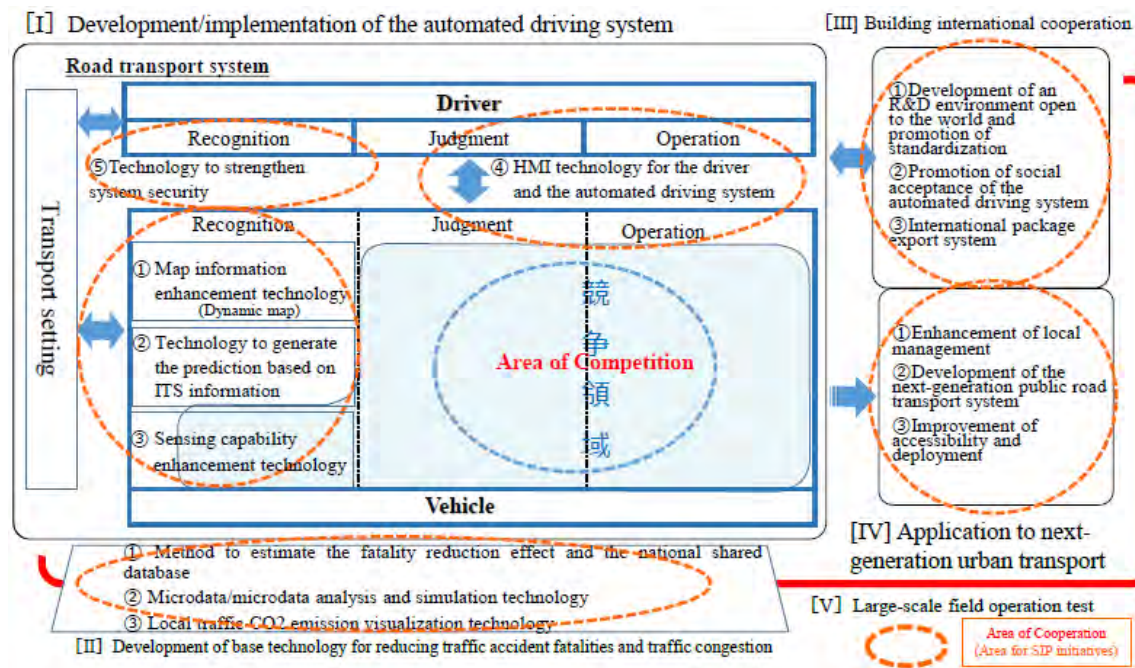
■ Exit Strategies

- ✓ Reduce traffic fatalities.
- ✓ Realize and diffuse automated driving systems
- ✓ Engage in collaborative development with Tokyo Metropolitan Government, setting the 2020 Tokyo Olympics/Paralympics as a milestone

■ Program Director(PD):

Seigo KUZUMAKI (Toyota Motor Corp.)

Scope of Research on Automated Driving



Infrastructure Maintenance, Renovation and Management

【Objective】 Realization of high quality infrastructure maintenance by cost-effective preventive measure, under the circumstances of serious accident risk increase and maintenance cost shortage because of aging. Creation of sustainable maintenance market, and promotion of expansion into overseas market.

【Duration】 Five years **【Budget】** ¥3.13 Billion (for FY 2017)

■ Goal:

Realization of preventive maintenance for 20 percent of important and deteriorated infrastructures until 2020, based on IC and robot technology.

■ Contents:

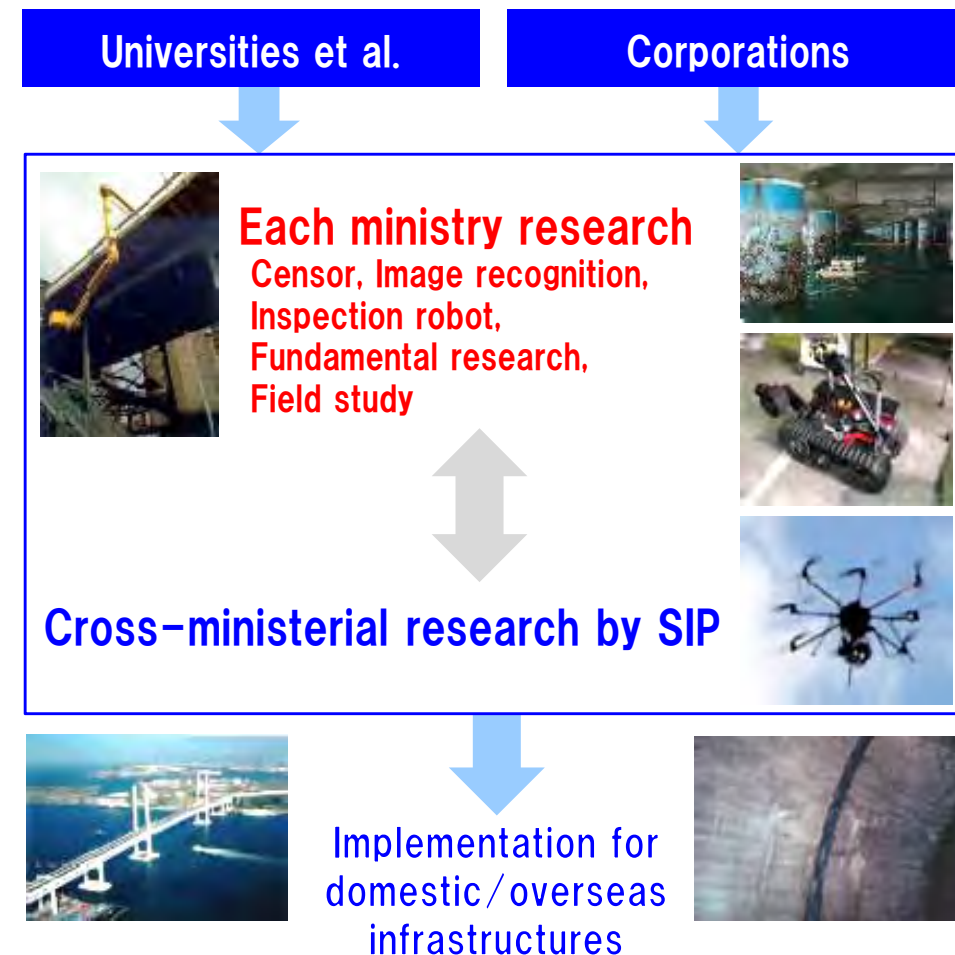
Inspection, Monitoring, Diagnosis
Structural material, Deterioration mechanism, Repair, Reinforcement
Information and communication
Robot for maintenance and post-disaster reconstruction
Asset management

■ Strategies:

Creation of infrastructure maintenance market, through utilization and evaluation of new technologies by the government, spreading them to the whole country.
Arrangement of regime to organize domestic use and evaluation and promote international standardization.

■ Program director(PD):

Distinguished Prof. Yozo FUJINO (Yokohama National Univ.)



Enhancement of Societal Resiliency against Natural Disasters

[Objective] To better protect our society against natural disasters such as large earthquakes and tsunamis, heavy rains and tornadoes, among others, focused are on the development of a mechanism to share disaster-related information in the real-time and between the public and private sectors, as well as the strengthening of capabilities to prevent the damage and enhance the post-disaster response.

[Duration] Five years

[Budget] ¥2.3 Billion (for FY 2017)

■ Goal:

- Develop a mechanism named “Resilience Information Network” to share disaster-related information in the real-time and between the public and private sectors and to estimate the damage immediately after the disaster.
- Contribute to more prompt and efficient post-disaster rescues and responses such as evacuation, emergent repair, etc. to be implemented by a variety of disaster-response agencies.

■ Outreach:

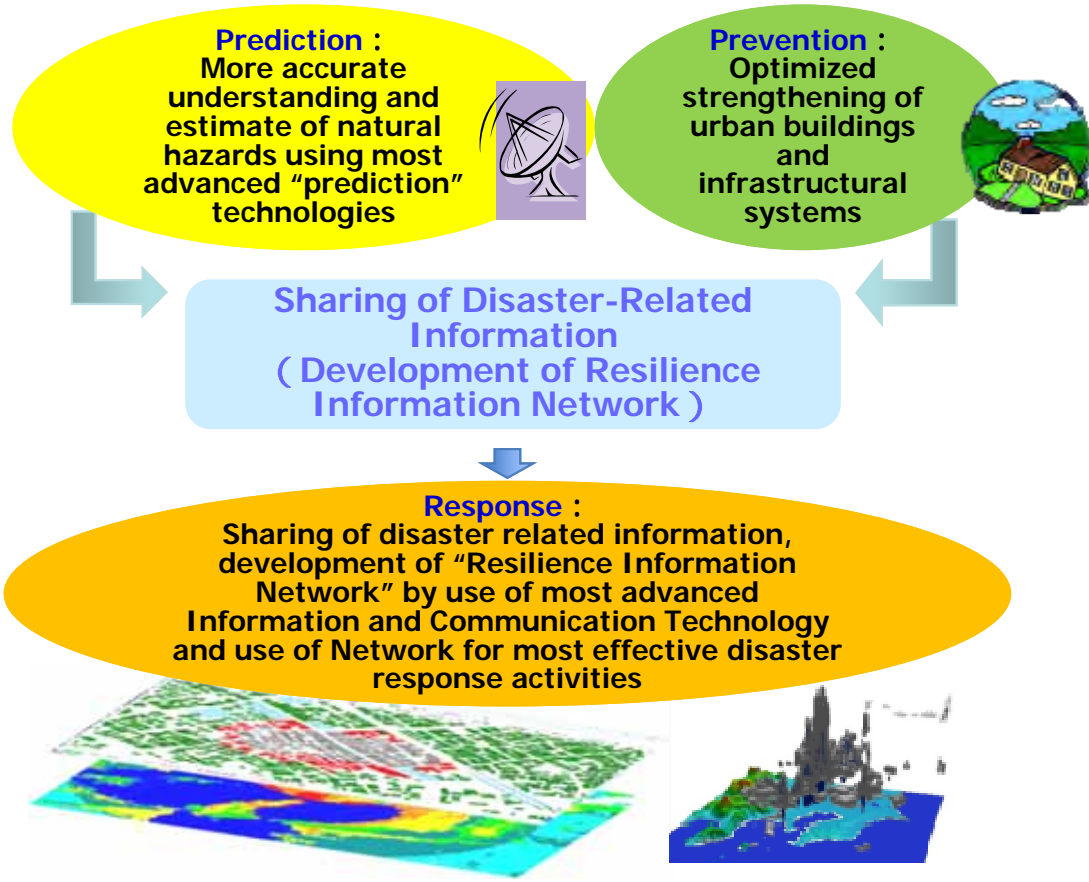
To instrument the developed mechanism to disaster response measures implemented by the national and local governments as well as by private industry.

■ Contribution to Innovation:

To reform fundamentals related to disaster measures such as sharing and mutual-use of disaster-related data and establishing basic rules for data exchange in emergency.

■ Program Director (PD) :

Prof. Muneo HORI
(Earthquake Research Institute, Tokyo Univ.)



Cybersecurity for Critical Infrastructures

【Objective】 Development of technologies that monitor, analyze, and defend control and communication system as well as confirm integrity and authenticity of system components to protect critical infrastructures against cyber threats.

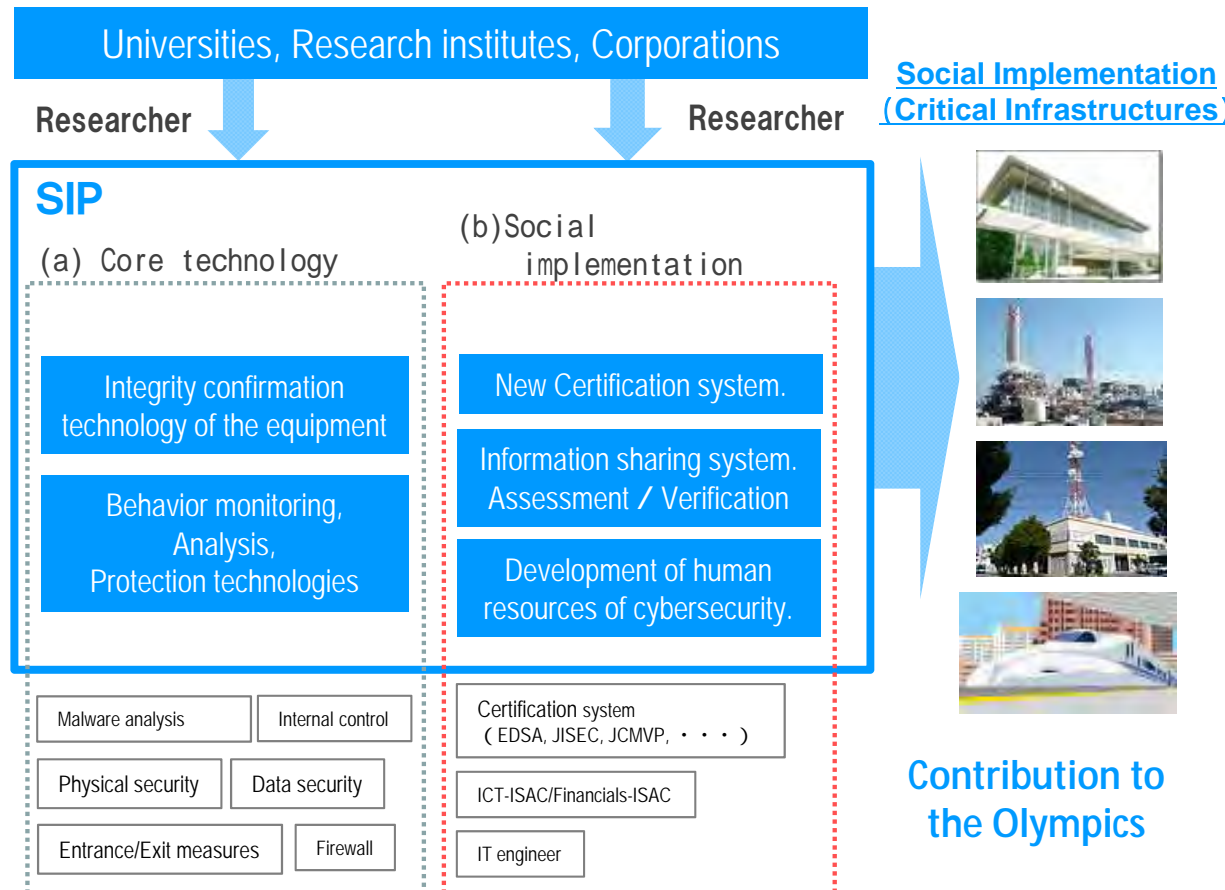
【Duration】 Five years **【Budget】** ¥2.62 Billion (for FY 2017)

- Contents:
 - a. The research and development of the core technologies of cybersecurity measures of control, communications equipment and the control network.
 - b. Establishment of the common platform for the social implementation. Development of human resources .

- Goal:
 - Reinforcement of the international competitiveness of the cybersecurity for Critical Infrastructures.
 - Contribution to stable administrations for the Tokyo 2020 Olympic and Paralympic games through keeping cybersecurity for critical Infrastructures.

■ Program director(PD):
Atsuhiro GOTO (President and Professor, Institute of Information Security)

Image of the system to build



Technologies for Creating Next-generation Agriculture, Forestry and Fisheries

【Objective】

- ✓ Developing agriculture and related industries by innovative technologies
- ✓ Improving quality of life by functional food
- ✓ Resolving food problems in the world

【Duration】 Five years 【Budget】 ¥2.660 Billion (for FY 2017)

■ Contents:

1. Smart farming system

- ✓ Innovative farming system to produce high-quality products and reduce labor time simultaneously
- ✓ Greenhouse systems for fine-tuning yield and quality (composition)

2. Groundbreaking agricultural products

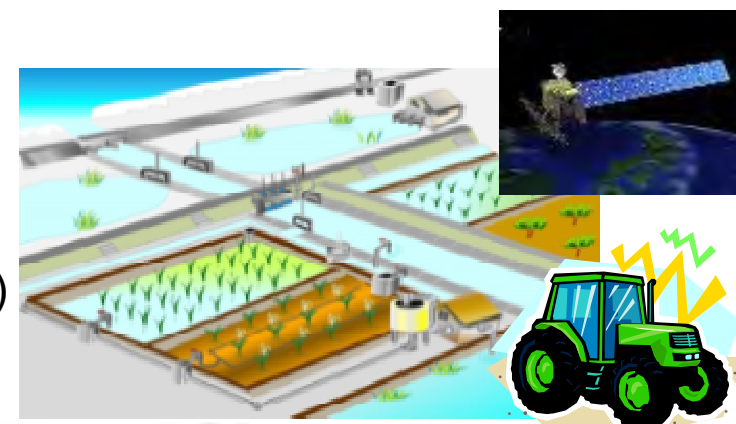
- ✓ New breeding techniques
- ✓ New plant protection technologies

3. Creating new market

- ✓ Next-generation functional food for improving quality of life
- ✓ Advanced system to produce high-value products from unused forest and marine resources

■ Program Director(PD):

Prof. Noboru NOGUCHI (Hokkaido Univ.)



Innovative Design / Manufacturing Technologies

【Policy】 Strengthen the global competitiveness of manufacturing in Japan

【Duration】 FY2014-FY2018 (sched.)

【Budget】 ¥1.0billion (for FY2017)

- Objectives:
 - Development of novel design/manufacturing technologies for high-value-added products.
 - Produce high degree-of-freedom design systems to support companies/Users.
 - Maximizing the strength in materials & components (Japan's strongest competitive edge in a global marketplace) for products / systems / services to create regional innovation in Japan.
- R&D Contents:
 - Development of support software/method for value-added design.
 - Innovation of production & manufacturing technologies to make new structures, generate new material functions, utilize high quality-control products at low cost.
 - Innovation Style – construct knowledge base by cyclic feedback to design/ manufacturing system from practical use of companies.
- **Practical-Use Strategy**
 - Open technologies for regional companies/SMEs/users, feedback their voices to design companies, study examples of practical use and spread the effect of innovation to other companies.
- Program Director (PD):
Naoya SASAKI (Hitachi, Ltd.)

