The Japanese Science, Technology and Innovation Policy

Jun IWAMATSU
Director for SIP

28th June 2016
Bureau of Science, Technology and Innovation,
Cabinet Office,
Government of Japan
1. Introduction of the CSTI
   - Council for Science, Technology and Innovation (CSTI)

2. Formulation of the 5th S&T Basic Plan


4. SIP and ImPACT
   - Cross-Ministerial Strategic Innovation Promotion Program (SIP)
     - Automated Driving System
   - Impulsing Paradigm Change through Disruptive Technologies Program (ImPACT)

5. Growth Strategy 2016
Prior “Three Arrows” : Japan Revitalization Strategy

Three Arrows of the Economic Policies

1st

Bold Monetary Policy

2nd

Flexible Fiscal Policy

3rd

Japan Revitalization Strategy New Growth Strategy

Three Action Plans

I . Plan for the Revitalization of Japanese Industry

II . Strategic Market Creation Plan

III. Strategy of Global Outreach

Cabinet decision on June 14, 2013

NEW

Three Arrows of the Economic Policies

1st

A robust economy that gives rise to hope

2nd

Nominal GDP toward 600 trillion yen

3rd

Desirable birthrate of 1.8

Dream-weaving Childcare Supports

Social Security that provides reassurance

No one forced to leave their jobs for nursing care

Achieving economic growth, creation of new value, and enhancement of industrial competitiveness through Science, Technology and Innovation

Integrating STI policy and Industrial policy
## Administrative Organization for Promoting STI

### Cabinet Office

**Roles:**
- Support the Cabinet in **formulating important policies** and in **overall coordination** of Ministries
- Make total **planning and coordination from a higher standpoint of view** than other Ministries

**Councils on key policy fields**
2. **Council for Science, Technology and Innovation**
3. Advisory Council for National Strategic Special Zones
4. Central Disaster Management Council
5. Council for Gender Equality

### Council for Science, Technology and Innovation (CSTI)

**Chair:** Prime Minister

**Member:** 7 cabinet members (including PM & Minister for S&T Policy) and **8 executive members**

**Secretariat:** STI Bureau, CAO

**<Main Functions>**
1. Investigate and discuss **basic S&T Innovation policies**
2. Investigate and discuss S&T **budgets** and the allocation of **human resources**
3. Assess Japan’s **key R&D**
4. Investigate and discuss **Framework conditions** for the promotion of innovation

- Basic policies on S&T (Budget Allocation, Basic Strategy etc)
- Consultation
- Response

### Executive Members of CSTI

- **Chairperson:** Shinzo ABE
  - Prime Minister
- **Member:**
  - Dr. Kazuo KYUMA (Former Executive Adviser, Mitsubishi Electric Corp. (Full-time Position))
  - Dr. Yuko HARAYAMA (Former Professor, Tohoku University (Full-time Position))
  - Dr. Takahiro UNEYAMA (Former Vice President; Professor, National Graduate Institute for Policy Studies (Full-time Position))
  - Mr. Takeshi UCHIYAMADA (Chairman of the board, Toyota Motor Corp.)
  - Dr. Kazuhito HASHIMOTO (President, National Institute for Materials Science)
  - Dr. Motoko KOTANI (Professor, Tohoku University)
  - Mr. Masakazu TOKURA (Representative Director, & President, Sumitomo Chemical Co., Ltd.)
  - Dr. Takashi ONISHI (President, Science Council of Japan)

**Head of an Affiliated Organization:**
- Dr. Takashi ONISHI
  - President, Science Council of Japan
The Science and Technology Basic Plan is a comprehensive plan prepared by the Japanese government in accordance with the Science and Technology Basic Law in order to promote science and technology in Japan over a five-year term, based on a 10-year forward outlook.

The 5th Basic Plan (FY2016 to FY2020), the first plan formulated by the Council for Science, Technology and Innovation (CSTI), is focused on enhancing “Science, Technology and Innovation (STI) measures.”

Executing this Basic Plan will require a wide spectrum of parties—including the government, academia, industry, and citizens—to work together and lead to transform Japan into “the most innovation-friendly country in the world.”

Table of contents

1. Basic concepts
2. Acting to create new value for the development of future industry and social transformation
3. Addressing economic, social challenges
4. Reinforcing the “fundamentals” for STI
5. Establishing a systemic virtuous cycle of human resources, knowledge and capital for innovation
6. Deepening the relationship between STI and society
7. Enhancing functions for promoting STI
Key elements of the 5th Basic Plan

“society 5.0”

 ✓ aim at “systemization” of services and businesses, system advancement, and coordination between multiple systems;
 ✓ promote the measures needed to develop a common platform for this goal

※ Objective of “Society 5.0”

The next new social-economy after hunter-gatherer society, agrarian society, industrial society, and information society, “Society 5.0”:

- Sophistically integrates cyberspace with physical space;
- Achieves both economic growth and addresses social challenges by providing the necessary goods and services to the people who need them, regardless of their age, gender, region, and language etc.;
- Realizes the human-centered society where people can live vigorous and comfortable lives.
Outlook on **National Energy & Environment Strategy for Technological Innovation towards 2050 (NESTI 2050)**

1. Forming R&D Structures as Unified Government Agencies

   To meet the “2°C target” referred in COP21, global GHG emissions need to be reduced to about 24 billion tons per year by 2050. Currently, global annual GHG emissions are approximately to 50 billion tons. Since the amount is projected to be about 57 billion tons based on submitted INDCs, approximately 30 billion tons of additional reduction is necessary. In so doing, it is essential to promote innovation for drastically reducing emissions on a worldwide scale.

   Looking ahead to 2050, Japan has identified a number of innovative technologies with potential to make huge impacts on emission reductions, while assuming that the entire energy system will be optimized with the realization of “super smart society” (Society 5.0). R&D of the prioritized technologies will be promoted in the medium-to-long term, while identifying and addressing technological challenges.

   ⇒ Out of 30 billion tons of CO₂ reductions that are necessary to meet the 2 °C target, **several billion to 10 billion tons or more** of reductions are expected through this strategy.

   *Based on the figures estimated by IEA. In the selected technological areas, the application of innovative technologies is added to the application of technologies whose development and demonstration have already been advanced.*

II. Identified target technology fields

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Energy Systems Integration Technologies</th>
<th>Core Technologies for Systems</th>
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</thead>
<tbody>
<tr>
<td>(1) that are innovative and not the extension of the existing efforts but discontinuous and impactful</td>
<td>so that various components (i.e. energy production, transport, consumption) are networked by ICT and energy system is optimized by AI, big data and IoT</td>
<td>namely, next generation power electronics, innovative sensors and superconductivity</td>
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<tr>
<td>(2) with the potential for widespread adoption and significant emission reductions</td>
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<td>(3) that require medium-to-long-term investment and combined forces among industry, academia and government</td>
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<tr>
<td>(4) in which Japan can take the lead or demonstrate our superiority</td>
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</table>

<table>
<thead>
<tr>
<th>Each innovative technologies</th>
<th>Energy Saving</th>
<th>Energy storage</th>
<th>Energy generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Production process</td>
<td>Membrane Separation / Catalysts</td>
<td>Metal-Air Batteries / All-Solid-State Batteries</td>
<td></td>
</tr>
<tr>
<td>2 Structural material</td>
<td>Ultralight and super heat-resistant</td>
<td>CO₂ free hydrogen</td>
<td></td>
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<tr>
<td>3 Storage Battery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Hydrogen</td>
<td></td>
<td>Perovskite structure / Quantum dot</td>
<td></td>
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<tr>
<td>5 Photovoltaic</td>
<td></td>
<td>Hot dry rock geo-thermal / Supercritical geo-thermal</td>
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<tr>
<td>6 Geo-Thermal</td>
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<tr>
<td>7 Capture and Effective Usage of Carbon Dioxide</td>
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III. Enhanced R&D systems

1. Forming R&D Structures as Unified Government Agencies

2. Creation of Innovation Technology Seeds and Flexible Positioning

3. Mechanisms to Encourage Industry Investment in R&D

4. Promotion of International Coordination and Joint R&D

Leading the world through innovation while keeping mitigation efforts and economic growth compatible with each other.
Headquarters for Science and Technology to foster innovation

Promoting effective measures across ministries to create innovation beyond the borders of disciplines, ministries and sectors

Three Arrows of Reinforcement of the HQ

1st

Improvement of the process for policy-making
“S&T Budgeting Strategy Committee” and “Action Plans for S&T Priority Measures”

- Prioritized area: “Energy”, “Next-generation infrastructures”, “Local resources”, “Health & Medical”
- Budget for FY2014: ¥335bil

2nd

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

- Budget for FY2016: ¥50bil

3rd

ImPACT (Impulsing Paradigm Change through disruptive Technologies)

- Budget for FY2014-2018: ¥55bil
Realizing Science, Technology and Innovation through promoting R&D overlooking from basic research to application and commercialization by cross-ministerial cooperation.

Council for Science, Technology and Innovation (CSTI) defined the themes to solve societal issues and achieve economic growth.

CSTI appoints Program Directors (PDs) for each project and allocates the budget.

Established in 2013
Total ¥50B (budget for FY2016)
<table>
<thead>
<tr>
<th>Priority policy issues</th>
<th>Themes</th>
<th>Objective</th>
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</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>Innovative Combustion Technology</td>
<td>Improving fuel efficiency of automobile engines</td>
</tr>
<tr>
<td></td>
<td>Next-Generation Power Electronics</td>
<td>Integrating new semiconductor materials into highly efficient power electronics system</td>
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<td></td>
<td>Structural Materials for Innovation (SM⁴I)</td>
<td>Developing both ultra-strong and -light heat-resistant materials for airplane such as CFRP, alloys, intermetallic, and ceramic-coatings and Materials integration system to predict performance of materials.</td>
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<td></td>
<td>Energy Carriers</td>
<td>Promoting R&amp;D to contribute to the efficient and cost-effective technologies for utilizing hydrogen</td>
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<td></td>
<td>Next-Generation Technology for Ocean Resources Exploration</td>
<td>Establishing technologies for efficiently exploring submarine hydrothermal polymetallic ore</td>
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<tr>
<td><strong>Next-generation infrastructures</strong></td>
<td>Automated Driving System</td>
<td>Developing new transportation system including technologies for avoidance accidents and alleviating congestion</td>
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<tr>
<td></td>
<td>Infrastructure Maintenance, Renovation and Management</td>
<td>Developing low-cost operation &amp; maintenance system and long life materials for infrastructures</td>
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<td></td>
<td>Enhancement of Societal Resiliency against Natural Disasters</td>
<td>Developing technologies for observation, forecast and prediction of natural disasters</td>
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<td></td>
<td>Cyber-Security for Critical Infrastructures</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Local resources</strong></td>
<td>Technologies for Creating Next-Generation Agriculture, Forestry and Fisheries</td>
<td>Realizing evolutionary high-yield and high-profit models by utilization of advanced IT etc</td>
</tr>
<tr>
<td></td>
<td>Innovative Design/Manufacturing Technologies</td>
<td>Establishing new styles of innovations arising from regions using new technologies such as Additive Manufacturing</td>
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### SIP (Cross-Ministerial Strategic Innovation Promotion Program)

#### Program Directors for SIP

|-----------------------------------|---------------------------------------------|-----------------|-----------------------------------------------------------|----------------------------------|
| **Masanori Sugiyama**  
Toyota Motor Corp. | **Teruo Kishi**  
Univ. of Tokyo, NIMS | **Shigeru Muraki**  
Tokyo Gas Co., Ltd. | **Tetsuro Urabe**  
Univ. of Tokyo, JMEC | **Tatsuo Oomori**  
Mitsubishi Electric Corp. |

<table>
<thead>
<tr>
<th>Infrastructure Maintenance, Renovation and Management</th>
<th>Automated Driving System</th>
<th>Enhancement of Societal Resiliency against Natural Disasters</th>
<th>Cyber-Security for Critical Infrastructures</th>
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</table>
| **Yozo Fujino**  
Yokohama National Univ. | **Seigo Kuzumaki**  
Toyota Motor Corp. | **Masayoshi Nakashima**  
Kyoto Univ. | **Atsuhiro Goto**  
Institute of Information Security |

<table>
<thead>
<tr>
<th>Tech. for Creating Next-Generation Agriculture, Forestry and Fisheries</th>
<th>Innovative Design/Manufacturing Technologies</th>
</tr>
</thead>
</table>
| **Takeshi Nishio**  
Hosei Univ. | **Naoya Sasaki**  
Hitachi Ltd. |
Automated Driving System

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

【Objective】 To achieve “Level 2” by the end of the mid-2010s and “Level 3” by early 2020s.

【Duration / Budget】 Five years (2014 - 2018) / ¥2.62 Billion (for FY 2016)

Goal & Strategy
1. Achieving the national goal, i.e. Reducing road crashes, etc.
   The national infrastructure for achieving the national goal
2. Realizing and spreading of Automated driving system
   Promoting practical implementation by progressing both R&D and international cooperation simultaneously
3. Implementation of next-generation public transportation system
   Developing in collaboration with Tokyo Metropolitan Govt. with Tokyo Olympics and Paralympics as a milestone

Definition of Automated Driving Levels

<table>
<thead>
<tr>
<th>Automation Level (SIP definition)</th>
<th>Overview</th>
<th>Systems to realize the level</th>
</tr>
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<tbody>
<tr>
<td>Level 4</td>
<td>All functions of acceleration, steering, and braking are controlled without a driver. Driver is completely uninvolved.</td>
<td>Fully automated driving system</td>
</tr>
<tr>
<td>Level 3</td>
<td>Vehicle controls all functions of acceleration, steering, and braking. Driver intervenes in the cases of emergency</td>
<td>Semi automated driving system</td>
</tr>
<tr>
<td>Level 2</td>
<td>Simultaneous multiple functions of acceleration, steering, or braking</td>
<td>Safe driving assistance system</td>
</tr>
<tr>
<td>Level 1</td>
<td>Single function, either acceleration, steering, or braking</td>
<td></td>
</tr>
</tbody>
</table>

Program Director (PD): Seigo KUZUMAKI (Toyota Motor Corp.)

Scope of Research on Automated Driving

I] Development and verification of automated driving system

II] Basic technologies to reduce traffic fatalities and congestion

III] International cooperation

IV] Deployment for next generation urban transport
ImPACT (Impulsing PAradigm Change through disruptive Technologies Program)

— Synergize the US DARPA model with the Japanese FIRST model —

➢ Create disruptive innovations which revolutionize industries and society through high risk / high impact R&Ds.

➢ Giving great authority for planning, acting and managing the program to Program manager (PM).

➢ PM is expected to work as a producer, not as a researcher.

➢ Reinforcing the supporting system for PMs by following the previous Japanese Big Program, FIRST(*) Program, with the help of JST (Japan Science & Technology Agency).

\$55 billion fund was budgeted in FY2013 for 5 years program.

(*) Funding Program for World-Leading Innovative R&D on Science and Technology (2009-2013)
“Growth Strategy 2016” toward nominal GDP 600 trillion yen

1. “10 STRATEGIC PUBLIC-PRIVATE JOINT PROJECTS” toward GDP 600 trillion yen

1-1 : Creation of new promising markets

① Realize the 4th Industrial Revolution (e.g. IoT, Big Data, A.I., Robots) [Creation of added value: 30 trillion yen (by 2020)]
② Toward a world leading health care country [Market size: 16 trillion yen (2011) => 26 trillion yen (2020)]
③ Overcome environment-energy constraints and expand investments [Energy related investments: 18 trillion yen (2014FY) => 28 trillion yen (2030FY)]
④ Foster sport sector to become a growing industry [Market size: 5.5 trillion yen (2015) => 15 trillion yen (2025)]
⑤ Revitalize markets for transaction of existing houses and reform [Market size: 11 trillion yen (2013) => 20 trillion yen (2025)]

1-2 : Further promotion of Local Abenomics

⑥ Enhance productivity in service industries [Added value: 343 trillion yen (2014) => 410 trillion yen (2020)]
⑦ Innovate small, medium and intermediate-sized firms
⑧ Promote proactive agriculture and exports [Market size of vertical integrated (from production to sales) agriculture: 4.7 trillion yen (2013FY) => 10 trillion yen (2020FY)]
⑨ Make tourism a key industry [Consumption by foreign visitors*: 3.5 trillion yen (2015) => 8 trillion yen (2020) => 15 trillion yen (2030)]

1-3 : Stimulation of domestic consumer sentiment

⑩ Stimulate domestic consumer sentiment through public-private sector collaboration etc.

1-2 : Further promotion of Local Abenomics

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2. REGULATORY AND INSTITUTIONAL REFORMS TO REALIZE REVOLUTION IN PRODUCTIVITY

Introduction of new mechanism for regulatory and institutional reforms
Utilization of National Strategic Special Zones to accelerate structural reforms
Further reinforcement of Corporate Governance
Further utilization of private sector resources to public services / facilities (PPP/PFI etc.) [Projects volume: 2.4 trillion yen (FY2013-14) => 21 trillion yen (FY2013-2022)]

3. PROMOTION OF INNOVATION / PROVISION OF HUMAN RESOURCES WITH CHALLENGER’S SPIRITS

Promotion of innovation and venture business
Development and securement of human resources who drive the economic growth
Creation of employment environment and promotion of social participation of women, to remove the constraints to growth

4. TAKING IN GROWING MARKET OUTSIDE

Support the expansion of SMEs to international markets, making the most of TPP [13.8 trillion yen (2013FY) => 25.2 trillion yen (2020FY)]
Expansion of the exports of infrastructure systems [16 trillion yen (2013) => 30 trillion yen (2020)]
Promotion of inward foreign direct investment to Japan [24.4 trillion yen (2015) => 35 trillion yen (2020)]
Promotion of conclusion / revision of economic partnership agreements (EPAs), investment agreements and tax treaties

5. Utilization of growing momentum for reforms

Promote leading projects for year 2020
Considering that these technologies could continue to be in practical use after 2020 as a legacy of Tokyo Olympic and Paralympic games; Automated driving system, Decentralized energy system, Advanced robot technologies etc.
Thank you for kind your attention!

If you’d like to know more about our work:

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ImPACT:  http://www8.cao.go.jp/cstp/sentan/about-kakushin.html