Provisional Translation

Integrated Innovation Strategy (Summary)

- **As disruptive innovation proceeded throughout the world, the more game structure changed, but legacy policies won't win the game**
- **"The 5th Science and Technology Basic Plan" (Plan), "Comprehensive Strategy on Science, Technology and Innovation 2017" (Do) , evaluate policies (Check) and present perspective approach (Action)**
- **Break away from rigid socioeconomic structures and create a flexible and independent society for which total optimized socioeconomic structure is achieved into Society 5.0 by Japan's strengths**
- **Thereafter, "Global Target," "Logical Milestone" and "Timeline" are key. Policies must be integrated to develop a "one stop" model from basic research to social implementation and global markets**
- **For strengthening functions as innovation control tower establishing "Integrated Innovation Strategy Promotion Council" by summer of 2018 and realizing coordination and promotion horizontally and practically**

– Global Trends / Issues and Strengths in Japan –

Merging of Knowledge

【Global Trends】
- Intellectual assets (data, human resources etc.) as national strengths
- Seamless integration of cyber, physical, and psychological space

【Issues in Japan】
- Underdevelopment of data exchange platform among different fields as social infrastructure
- Absolute lack of IT human resource, both in quality and quantity

【Strengths in Japan 】
- Abundant data from high-quality manufacturing field, medical field, agricultural field, etc.

"Disruptive Innovation" and "Cambrian Explosion in Startups"

【Global Trends 】
- Significant time-shortening from basic research to social implementation
- Emergence and rapid growth of R&D startups
- Diversification of innovation ecosystems in each country
- Expansion of cyber business platforms toward the real world (logistics, automobiles, medicine, agriculture, energy, etc.)

【Issues in Japan】
- Relatively insufficient university reforms and low research productivities
- Inferiority in the number and size of R&D startups

【Strengths in Japan】
- R&D capabilities of universities and research institutes still maintained at high level
- Advanced technologies and sufficient funds in private sector

Global Action –Light and Dark side-

【Global Trends 】
- Development of bold policies on deployment of R&D investment, education reform, national security, trade investment, etc. in each country
- Expectation of SDGs achievement
- Polarization and hegemony competition as shadow of innovation

【Issues in Japan】
- Rigid socioeconomic structure and extreme lack of globalization

【Strengths in Japan】
- Experiences as eco-friendly country and of tackling number of social issues
- Achievement of the development support in Southeast Asia and establishment of stable socioeconomic relationships with Asia, Middle East, Europe, the US, and elsewhere

– Basic concepts of Integrated Innovation Strategy –

- **Reforming & strengthening three basic pillars (knowledge, regulation, and finance) and flexibly making Japan's regulations and customs totally optimized**
- **Achieving "the most innovation-friendly country in the world," showing models of problem-solving to other countries as the front-runner of the world**

Source of Knowledge
- Constructing a comprehensive public-private data exchange platform ahead of world (utilizing AI, collaboration with Europe and U.S. ,etc.)
- Open Science (management and utilization of research data) / Evidence-Based Policy Making (collection, accumulating and utilizing relevant data)

Creation of Knowledge

Creation of innovation ecosystem through means including university reform

- Improve managerial environment (promotion of collaboration and reorganization, formulation of academic governance code, create incentive schemes to differentiate grant allocations depending on collection of private funds)
- Improve human resource mobility and create opportunities for young researchers (introduction of annual salary system to be promoted through applying such system to newly employed faculty of national universities, proactive utilization of cross appointment system)
- Improvement of research productivity (specific review of competitive research grants to be made (through steps including priority allocation of KAKENHI etc. to young researchers, grants for challenging research to be promoted)
- Borderless challenges (globalization, large-scale cooperation between industry and academy) (guidelines for alliance with overseas)

Promotion of strategic R&D

- Promotion of R&D activities for creating discontinuous innovations continuously and steadily

Social Implementation of Knowledge

Achieving world-class environments for business startups

- Build Japanese-style R&D startup ecosystem (such as improvement of human resource mobility)
- Build speedy and throughout support environments from training of entrepreneurs, startup, industrialization through growth stage (linkage enhancement of industry, government affiliated institutes and public-private funds)
- Build environments for creating moonshots (consideration of promoting award-type R&D programs)

Promotion of innovation in government projects and systems

- Build schemes of constant innovation in government projects and systems such as aggressive adoption of new technology (innovation transform), improvement of systems, regulation reform and such
- Enhance CSTI's capabilities for collecting and analyzing information

Globalization of Knowledge

Promotion of Science, Technology and Innovation(STI) for SDGs

- Formulate domestic roadmap by mid 2019 (utilize domestic action plan and dissemination into the world)
- Support formulation of roadmaps of each country
- Investigate "STI for SDGs Platform" that connects Japan's STI seeds and domestic/international needs

Issue solution model from Japan into the world

- Show solution models of issues through tackling "source of knowledge" to "global deployment"
- Promote tackling international standardization and open and close strategy

Development in fields to be enhanced

Promotion of tackling at each field

- AI technology
  - Personnel training at extraordinary scale at all levels
  - Strategic R&D away from all-by-ourselves-ism (Agriculture/ health, medical and nursing/ construction/ disaster prevention/ manufacturing)
  - Formulation of human-centered AI social discipline
- Biotechnology
  - Formulation of new biotechnology strategy by summer 2019 (Start in advance "data driven" technological development and other relevant steps)
- Environment and Energy
  - Roadmap building for goals from global points of view (focally implementing energy management system, energy creation & storage, hydrogen)
- Safety and Security
  - Ensuring comprehensive security against various threats through widely utilizing our excellent scientific technologies
- Agriculture
  - Deployment of smart agricultural technology and smart food chain system both at home and abroad (clarifying target and implementing far-sighted international deployment)
- Other important fields
  - Promotion with SIP (light quantum, medicine, oceanic, space, etc.)

– Major Objectives and Policies –

Source of Knowledge

Building data exchange platform - essential social infrastructure

【Major Objectives】
- Building cross-domain data exchange platform in 3 years, make it fully operational in 5 years (Analysis by AI made possible at time of full operation

【Major Policies】
- Cross-domain data exchange platform with cooperation of public/private sectors, verification tests to be conducted in certain specific fields/areas
- Ensuring security function necessary for cross-domain data exchange, ensuring smooth cross-border transfer of individual data
- Building data exchange platforms by fields, ensuring cross-domain data exchange platforms and their interoperability

＜Examples of specific initiatives covering data exchange platform for different fields＞
- (Health, Medical, Nursing) Full utilization of data bases in fiscal 2020 toward forming healthy longevity society
- (Autonomous Driving) Technical specifications to be developed while verifying and confirming effectiveness of dynamic map and international standardization to be promoted

Building bases for open science

【Major Objectives】
- Starting operation of system to promote management, disclosure and search of research data in fiscal 2020
- Developing policy/plan for management and utilization (national institutes to make policies by fiscal 2020)

Promotion of Evidence-Based Policy Making (EBPM)

【Major Objectives】
- Constructing evidence system, start utilization in government by fiscal 2019 and in academic institutes, R&D organizations and others by fiscal 2020

- (Oceanic) Developing AUV and build oceanic information sharing system for enhancing MDA capabilities
- (Space) Building satellite data platform for having satellite and other data utilized by industry, along with building infrastructure for devices including various satellites

Creation of Knowledge

Creation of innovation ecosystem through means including university reform

【Major Objectives】
- ➢ Improvement of managerial environment
- By fiscal 2023 double the number of research university which appoint more than one outside director compared to 2017
- ➢ Promotion of human resources mobility and creation of opportunities for younger researcher
- By fiscal 2023 bring the proportion of full-time university faculty less than 40 years old to 30%
- ➢ Improvement of research productivity
- By fiscal 2023 while increasing the total number of papers published from research universities, bring the proportion of the top 10% most-often cited papers among the total number of papers from Japan to reach 12%
- ➢ Borderless challenges (globalization, large-scale cooperation with industry, academia)
- By fiscal 2023 bring the increase rate of the papers co-authored internationally in the top 10% most-often cited papers equivalent to U.S. and European levels

【Major Policies】
- ➢ Improvement of managerial environment
- Promotion of collaboration among universities / reorganization of universities (through such steps as amendment to the National University Corporation Act in fiscal 2019 to enable multiple-institute management)
- Development of academic governance code in fiscal 2019
- Conducting studies for incentive schemes to differentiate grant allocations depending on academic institutes' obtain private-sector funds are other self-help programs in fiscal 2018 for early introduction on trial basis
- ➢ Promotion of human resources mobility and creation of opportunities for young researchers
- Promoting introduction of annual salary system through applying such system to newly employed teaching staff of national universities (aiming to fully introduce annual salary system based on strict performance evaluation)
- Proactive utilization of cross appointment system
- ➢ Improvement of research productivity
- Conducting comprehensive review of competitive research grants (through such steps as promotion of allocating KAKENHI to younger researchers and to challenging research on priority basis)
- ➢ Borderless challenges (globalization, large-scale cooperation with industry and academia)
- Development of guidelines for alliance with overseas companies in fiscal 2019

Promotion of strategic R&D

【Major Policies】
- Strongly promote SIP, while enhancing relevant management, along with PRISM
- Improve and enhance ImPACT approach into R&D to disseminate and entrench them into relevant ministries
- Promote R&D activities for creating discontinuous innovations continuously and steadily

<Examples of specific initiatives of SIP>
- "Society 5.0 realization technology using the light/quantum" light quantum technical basis
- Oceanic "Developing innovative technologies for exploration of deep sea resources"

<Examples of specific initiatives of PRISM>
- Cyber space platform technologies (AI/IoT/Big data)

<Examples of specific initiatives of ImPACT>
- Production of "supple tough polymer" through making the film extra thin and tough
- Realization bases for highly intelligent society where quantum AIs are connected via quantum network

Developing innovative technologies for exploration of deep sea resources

Social implementation of Knowledge

Achieving world-class environments for business startups

【Major Objectives】
- Improve environment of R&D-type startups to the world's highest level, equal to that of the US and China
- Create no less than 20 entities by 2023 - either unlisted startups (Unicorn) or listed startups having corporate value or total market valuation of more than one billion dollars

【Major Policies】
- ➢ Construct Japan's own R&D type startup ecosystem
- Conduct studies on promoting mobility of human resources including review of single-track career path
- Conduct studies on promoting collaboration/alliance between corporations/universities and startups on equal footing
- ➢ Build consistent supporting environments
- Enhance collaboration between industry, government-affiliated institutes, public-private funds (sharing information between such entities through contracts/agreements, unification of windows for applications at public organizations)
- ➢ Build environments for generating moonshots
- Conduct studies for supporting award-type R&D programs
- Review of regulations according to technological progress

Promotion of innovations in government projects and regulations

【Major Objectives】
- ➢ Proactive utilization of new technologies
- Raise ranking of introduction of advanced technologies in public procurement to the world's highest level by 2030
- ➢ Promote R&D investment
- Achieve goal of R&D investment (1% of GDP estimated at approx. ¥26 trillion* (government), 4% (public and private)
  *Total amount needed over the 5th Basic Plan based on certain assumptions
- ➢ Achieve the most innovation-friendly country in the world
- Raise business environment ranking of Japan by the World Bank to top-three level among developed counties (currently 24th)
- ➢ Achieve productivity gains of world's highest level
- Double Japan's productivity growth in 2020

【Major Policies】
- Enhancement of CSTI's capabilities for collecting and analyzing information
- Each ministry to review and reform its practice based on recommendations for introducing innovations and reviewing regulations
- Development of public procurement guidelines to promote introduction of new technologies in fiscal 2018

Globalization of Knowledge

Promotion of STI for SDGs

【Major Objectives】
- Achieve 17 objectives of SDGs by 2030 through utilizing Japan's STI, and then continue working on relevant initiatives to showcase Japan's good example and to lead the world

【Major Policies】
- Formulate the STI for SDGs roadmap by mid-2019 and present it to the world
- Support other countries for formulating their roadmaps
- Reflect governmental plans and strategies in line with SDGs
- Investigate the structure of 'STI for SDGs Platform' that connects Japan's STI seeds and domestic/international needs

Issue solution model from Japan into the world

【Major Policies】
- ➢ Present issue solution model
- Build system of constant innovation in government projects and regulations
- Start full operation of data exchange platform built by joint efforts of public/private sectors and connect various fields beyond their respective boundaries
- ➢ Promotion of initiatives with international standardization, open and close strategy

Development in fields to be enhanced

AI utilization in every scene (AI technology)

【Major Objectives】
- ➢ Establish human resource base
- Train and adopt advanced IT human resources on the order of several tens of thousands per year and IT human resources on the order of several hundreds of thousands per year by 2025
- Every student acquires IT literacy by 2032
- ➢ Promote strategic technical development
- Utilize data exchange platform of each domain and realize social implementation of AI technologies by 2022

【Major Policies】
- ➢ Establish human resource base (on an extraordinary scale on all levels)

<Advanced IT Human Resources (Top leader level)>
- Start utilization in SIP/PRISM
- Implement of specific steps to help develop top human resources excelling in science and mathematics in the stages of elementary and middle education

<Advanced IT Human Resource (fledged worker/apprentice level)>
- Expand skill-ensuring seminars for the 4th Industry Revolution
- Start curriculum development through collaboration between six hub universities and other universities and development of measures for online sharing and for expanding of textbooks and lessons

<General public>
- Station one ICT-supporting person for every four schools by fiscal 2022
- ➢ Promote strategic technology development
- Social implementation through utilization of data exchange platform
- Clarify and prioritize initiatives in 2018
- ➢ Formulate "Human-centered AI social discipline" in fiscal 2018

Bio economy and job creation (Biotechnology)

【Major Policies】
- Formulate new biotechnology strategy by summer of 2019
- Starting in advance scheme as "data driven" technological development

Paris Agreement "The 2 Degree Global Temperature Target " (Environment and Energy)

【Major Objectives】
- Build data exchange platforms for this domain and new framework for energy management system within three years
- Achieve globally competitive power generation costs of renewable energies
- Lead the world in materializing hydrogen society (2025 introduction quantity of hydrogen 5 million - 10million ton +α, 2030 introduction quantity of ammonia:3million tons, Equivalent cost with fossil fuel in 2050)

【Major Policies】
- Course setting for achieving objectives from global perspectives (priority areas for implementation =energy management system, creating energy, storing energy, hydrogen)
- Start of studies to CO2-free ammonia value chain
- Development of energy/climate change diplomacy from innovation perspectives

Ensuring safety and security of our nation and its citizen (Safety and Security)

【Major Policies】
- Promoting initiatives of "Know," "Develop," "Keep," and "Utilize" for ensuring comprehensive security against various threats

Expansion of smart agricultural technology/system both at home and abroad (Agriculture)

【Major Objectives】
- Almost all farmers utilize data and capture market of more than ¥100 billion by 2025
- Increasing exports of agriculture, forestry and fishery products to ¥1 trillion by 2019 and based on the results, to establish another goal of realizing exports totaling of ¥5 trillion in 2030

Promotion of SIP, especially in the fields of light quantum, medicine, oceanic, space, etc.