"The Prosperous Future" to be Pursued Beyond Innovation
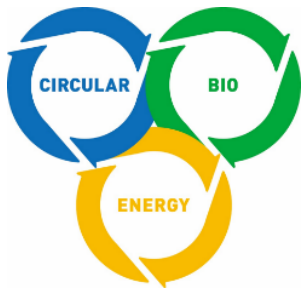
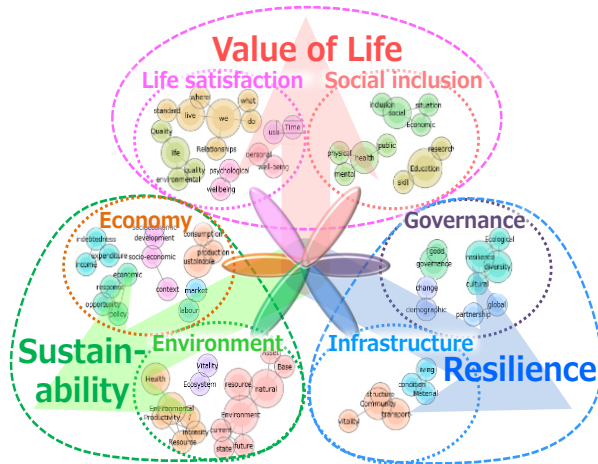# Purpose of "The Prosperous Future" Report

NEDO

- In recent years, new values such as well-being and diversity have been required in the international community.
- We conducted a co-occurrence network analysis of the components of affluence described in 29 reports on well-being, extracting a core value compass with six directions and 12 social visions to attain a prosperous future.

1. **Core Value Compass**

2. **Social Visions**

3. **Examples of Innovation**

Reports on Well-being
- Gross National Happiness (Centre for Bhutan Studies)
- Sustainable Development Strategy (European Commission)
- The Commission on Measuring Well-being (ESRI, JP) etc.

White Papers
- Annual report on Ageing Society
- Grab the future by TECH. Strategy
- White Paper on Manufacturing Industries (*Monodzukuri*=manufacturing)
- White Paper on Science and etc.

Future Forecast
- Dream roadmap 2014 (Science Council of Japan)
- Future Society 2050 (Mitsubishi Research Institute)
- TSC Foresight (NEDO/TSC) etc.

What values are required to increase when innovation transforms society?

What kind of society will be created by increasing those values?

Examples of specific goals and required innovation

A sustainable and nature-friendly society
A sustainable, nature-friendly society that aims for socioeconomic development within the planetary boundary, such as the limit for resources and environmental capacity.

A society everyone can reach their potential to be themselves

Achieving flexible work styles
Flexible and unrestricted work styles, balancing work and family life
A system that allows all the people who wish to work, including people with disabilities, the elderly, childcare, nursing care, and illness, can do so without any difficulty
Flexible employment conditions, Increasing paid-holidays, Shortening working hours, facilitating working relationships

⇒Achieving a society all people who want to work can do so without any difficulty

Value of Life — Life satisfaction, Social inclusion
Economy
Governance
Sustainability
Environment
Infrastructure
Resilience

Reports on Well-being Used to Derive the Core Value Compass and Visions of Society

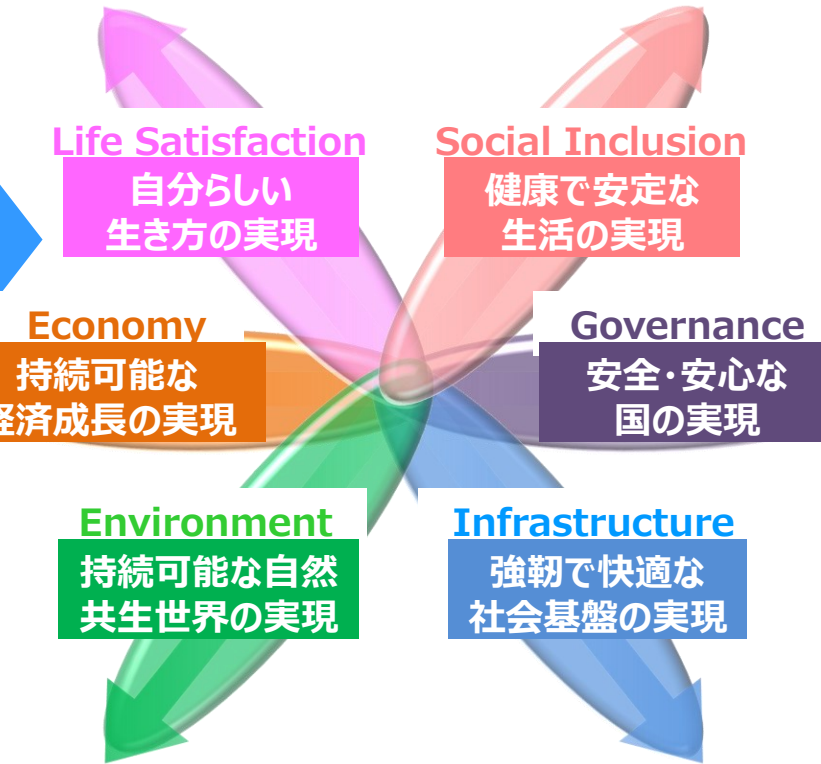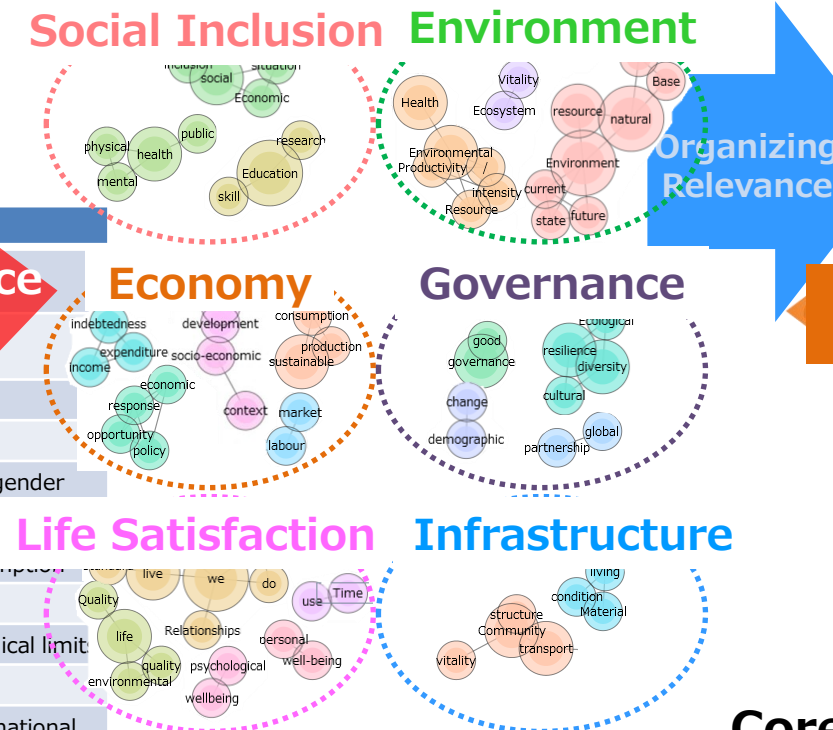|	Issuer	Report name	#Indicators
1	UN: United Nations: Integrated Environmental and Economic Accounting	environmentally-adjusted Net Domestic Product	–
2	UNDP: United Nations Development Programme	Human Development Index	3
3	UNEP: United Nations Environment Programme and UN University	Inclusive Wealth report 2014	3
4	OECD	Green Growth Indicators	15
5	OECD: Better Life Initiative	How's Life? :Measuring Well-Being	10
6	European Commission 欧州委員会	Outline of the 2001 EU SDS(Sustainable Development Strategy)	7
7	European Commission 欧州委員会	Sustainable Development Strategy	27
8	UK Government イギリス政府	Sustainable Development Strategy	14
9	Office for National Statistics, UK 英国国家統計局	Measures of National Well-being	40
10	Center for Environmental Law and Policy, Yale University	Environmental Performance Index	15
11	The French National Institute of Statistics and Economic Studies	Measurement of Economic Performance and Social Progress	17
12	Centre for Bhutan Studies	Gross National Happiness	33
13	Office of the National Economic and Social Development Council (Thailand)	Green and Happiness Index 2007 – 2018	6
14	Statistics Finland	Findicator 2007	102
15	The Netherlands Institute for Social Research	Life Situation Index 1974	8
16	Australian Bureau of Statistics	Measurement of Australia's Progress 豪州の進歩の測定 2010	14
17	James Tobin, William D. Nordhaus トービン、ノードハウス	Measure of Economic Welfare 1972	–
18	James Tobin, William D. Nordhaus トービン、ノードハウス	Sustainable Measure of Economic Welfare 1972	–
19	Herman E. Daly, John Cobb ハーマン・デイリー、ジョン・コブ	Index of Sustainable Economic Welfare 2013	–
20	Redefining Progress	Genuine Progress Indicator	–
21	Genuine Savings	Genuine Savings	–
22	Economic and Social Research Institute, Cabinet Office JP	Measuring National Well-being, The Commission on Measuring Well-being	20
23	Global Footprint network グローバル・フットプリント・ネットワーク	Ecological Footprint エコロジカル・フットプリント	–
24	Economic Planning Agency 経済企画庁経済審議会	Net National Welfare 純国民福祉	–
25	Kumamoto Prefecture, JP 熊本県	Smile Index 「"笑いの数"による幸福度指標」	–
26	Kumamoto Prefecture, JP熊本県	Aggregate Kumamoto Happiness 県民総幸福量	–
27	Fukui Prefecture, JP福井県	Quality of Community 地域の幸福度	–
28	Arakawa City, Tokyo, JP 荒川区	Gross Arakawa Happiness 荒川区民総幸福度	–
29	Niigata City, Niigata Prefecture, JP 新潟市	Net Personal Happiness 市民の幸福度	5
計			175

■ **We conducted a co-occurrence network analysis of the components of affluence described in 29 reports on well-being, extracting core value compass to attain the prosperous future**

Report List on Well-being

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1	UN	environmentally-adjusted net …
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4	OECD	Green Growth Indicators
5	OECD: Better Life I..	How's Life? :Measuring Well-being
6	European Commission	Outline of the 2001 EU SDS
7	European Commission	Sustainable Development Strategy
8	UK Government	Sustainable Development Strategy
9	National Statistics, UK	Measures of National Well-being
:	:	:

Ex. EC: Sustainable Development Strategy

Elements	Indicators
Socio-Economic Development	Growth rate of GDP per inhabitant
Sustainable Consumption and Production	Resource Productivity
Social Inclusion	At-risk-of-poverty rate by gender
demographic changes	Employment rate of older workers
Public Health	Healthy life years and life expectancy at birth, by gender
Climate Change and Energy	Greenhouse gas emissions
	Share of renewables in gross inland energy consumption
Natural Resources	
	cal limit
Sustainable Transport	
Global Partnership	Official Development assistance as share of gross national income
Good Governance	–

Co-occurrence Network Analysis

Elements = Values to keep in mind for the prosperous future

We organized 22 word groups extracted from the analysis by the level of correlations and found out that they were able to be classified into six major categories

Social Inclusion   **Environment**

Economy   **Governance**

Life Satisfaction   **Infrastructure**

Organizing Relevance

Life Satisfaction 自分らしい生き方の実現

Social Inclusion 健康で安定な生活の実現

Economy 持続可能な経済成長の実現

Governance 安全・安心な国の実現

Environment 持続可能な自然共生世界の実現

Infrastructure 強靭で快適な社会基盤の実現

Core value compass with six directions

3

Toward Deriving the "Visions of Society to Achieve" I (Keyword Mapping)

■ **Firstly, we analyzed the co-occurrence network of indicators used in 29 reports on affluence, extracting keyword groups that characterize each of the "core value".**
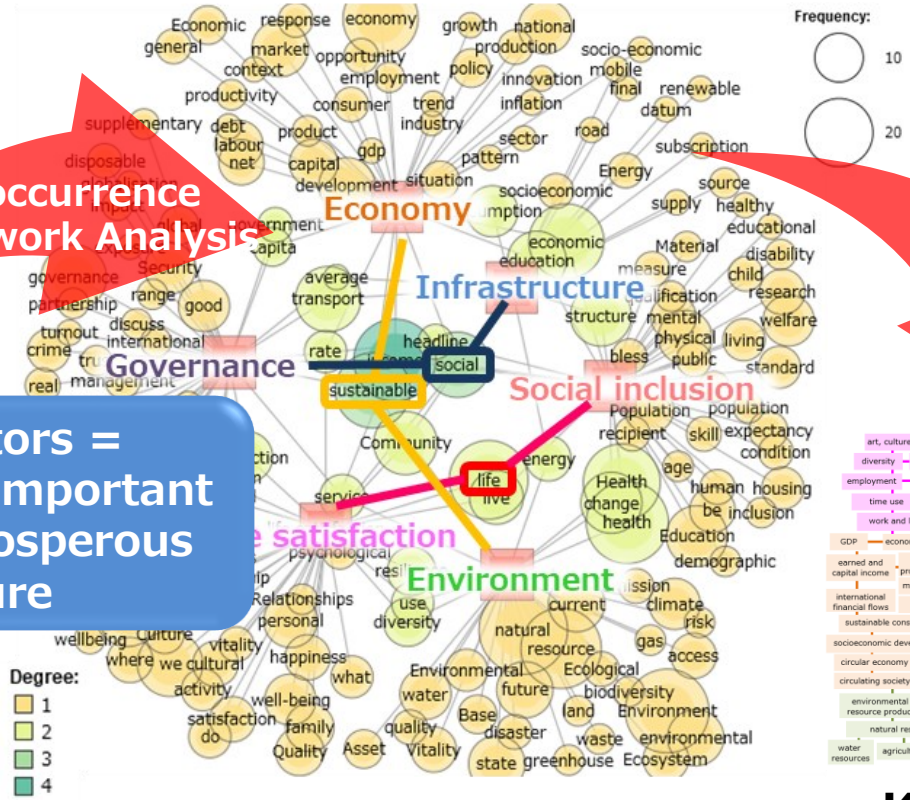
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Public Health	Healthy life years and life expectancy at birth, by gender
Climate Change and Energy	Greenhouse gas emissions
	Share of renewables in gross inland energy consumption
Natural Resources	Common bird Index
	Fish catches taken from stocks outside sage biological limits
Sustainable Transport	Energy consumption by transport mode
Global Partnership	Official Development assistance as share of gross national income
Good Governance	–

Co-occurrence Network Analysis

Indicators = Keywords important for the prosperous future

Co-occurrence analysis of indicators

Keywords closely related to the "core value compass"

■ **The derived keywords are superimposed on the "core value compass".**

■ **"Visions of society to achieve" are derived using the keyword groups that are closely related to each value compass.**

| community | connection with the community / society | equality | liberty |
| personal/family connections | education | Basic rights |

| Social rights |
| health | poverty | hunger | safe and secure | population |

Social Inclusion

| what we do | taxation |
| political participation | trust in government |
| democratic society with good governance |
| government performance |
| global partnership | international military crisis management |

Governance

| security | crime |
| Community structure and transport |

Infrastructure

| sustainable transport |
| redevelopment of infrastructure |

| feeling safe |
| natural disasters/plague | rural and urban issues | empowerment of communities |

A society all citizens can participate and play an active role

A society everyone can be healthy and have food

A society with high transparency and reliability

A society everyone is ensured to act in liberty and safety

A robust and resilient society

A comfortable and dynamic society

Visions of Society to Achieve II

■ **"Visions of society to achieve" are derived using the keyword groups that are closely related to each value compass.**

A society everyone can reach their potential to be themselves

A society everyone can work comfortably for a lifetime

Remote Control

A sustainable society through resource circulation

Plan | Create
Return | Use
Recycle shop

A society emerging core industry and technology drive sustainable development

A sustainable energy society in harmony with the environment

A sustainable and nature-friendly society

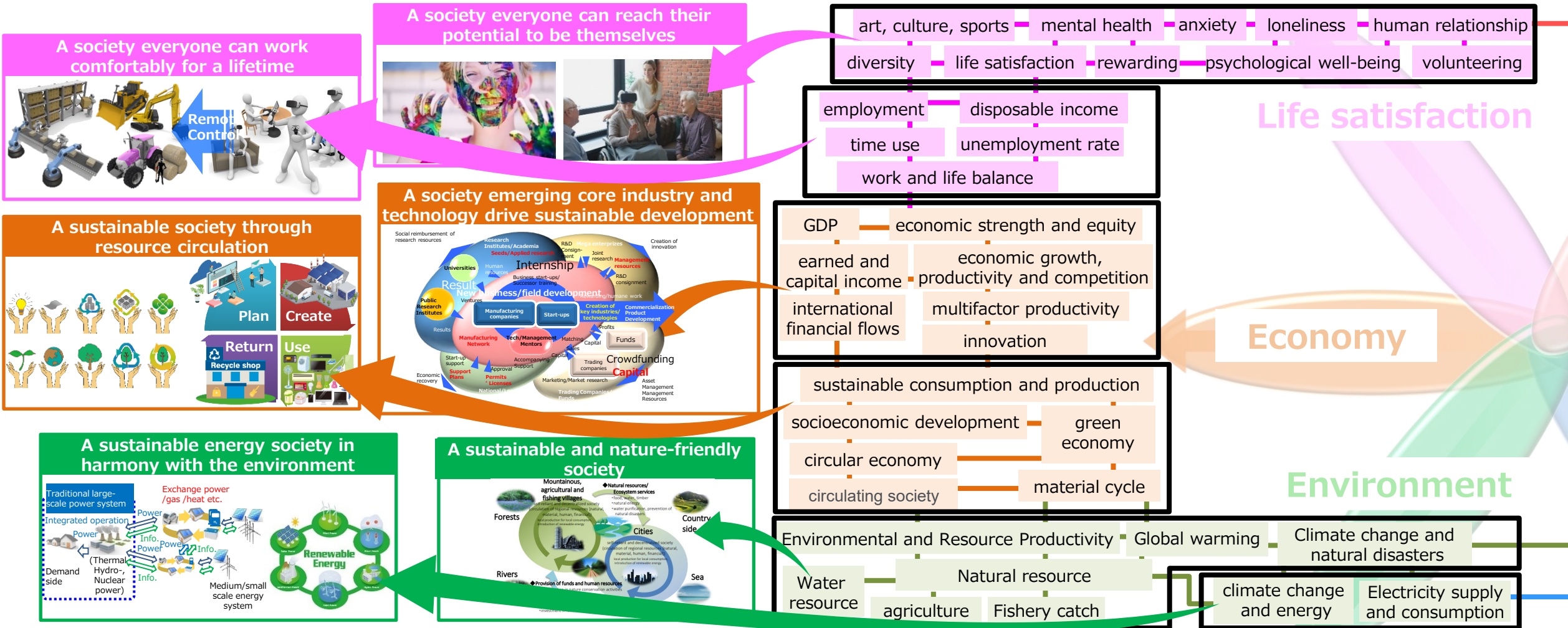| art, culture, sports | mental health | anxiety | loneliness | human relationship |
| diversity | life satisfaction | rewarding | psychological well-being | volunteering |

Life satisfaction

employment	disposable income
time use	unemployment rate
work and life balance	

GDP	economic strength and equity
earned and capital income	economic growth, productivity and competition
international financial flows	multifactor productivity
	innovation

Economy

sustainable consumption and production	
socioeconomic development	green economy
circular economy	material cycle
circulating society	

Environment

Environmental and Resource Productivity	Global warming	Climate change and natural disasters
Water resource	Natural resource	climate change and energy	Electricity supply and consumption
	agriculture	Fishery catch	

"Twelve Visions of Society to Achieve" to Enrich the Future

■ Implementing efforts toward the innovation to realize the 12 visions is important while being conscious of the six core values for the prosperous future.

Social Inclusion (Achieving a Healthy and Stable Life)
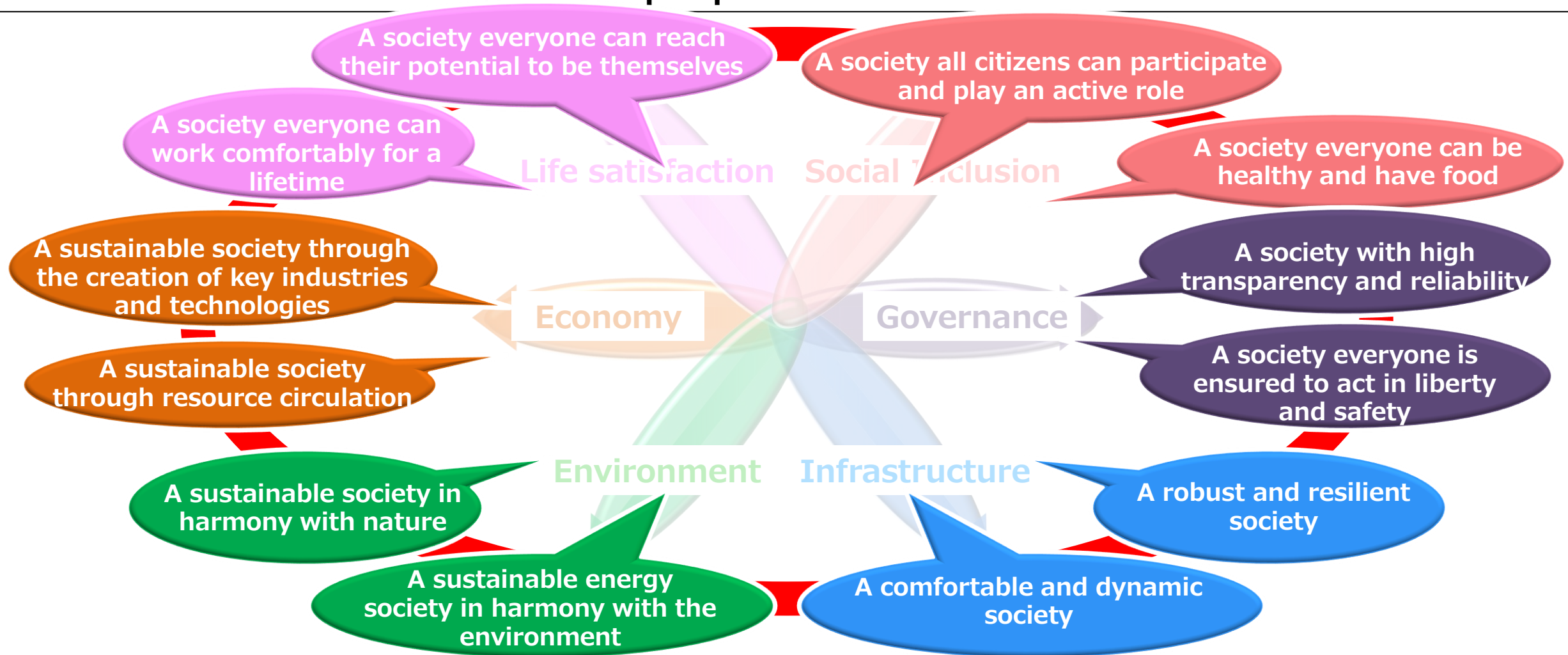
■ **By eliminating all concerns in our daily lives from the present to the future, we aim to achieve a "healthy and stable life" that allows us to enjoy true affluence.**

The key is for all people to live healthy and anxiety-free lives on a long-term basis.

■Overcoming lifestyle-related diseases and intractable diseases, making medical care and nursing care available for all

■Realization of fully resource-recycling food production

■Realization of a society in which all people can participate without any disparities and inequalities Equal guarantee of life, education, work, health, and housing

A society where everyone can be healthy and have food

Everyone embraces and supports each other to protect all people from loneliness, isolation, exclusion, and friction so that they can lead long-term healthy, comfortable lives without worries about food or housing and feel a sense of comfort.
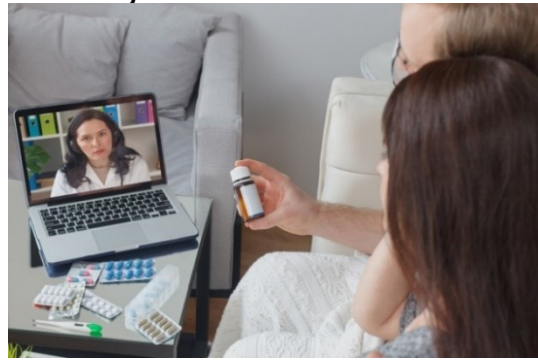
A society where all citizens can participate and play an active role

Every motivated people have opportunities to participate or become independent as leading members in it, and these independent individuals play diverse roles and participate in open communities.

.

9

Life Satisfaction (Achieving a Life of One's Own)

■ **The goal is to build a society with a high level of satisfaction by contributing to personal growth and developing a sustainable society resulting from everyone showing their potential, achieving their ideals, and implementing a rewarding decent work.**

A society where everyone can maximize their potential and accomplish what they want to do and be themselves without any restrictions.

■People are in harmony with a society while being their true/ideal selves.
■Everyone can achieve sustainable growth with freedom of choice in life.
■Self-realization and social contribution through a decent work
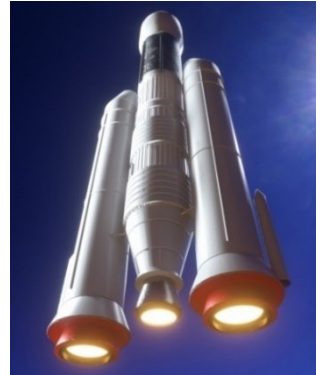
A society everyone can reach their potential to be themselves

Everyone has equal opportunities to make the most of their abilities without limitations to live a life true to themselves. They can become the people they want to be through high-quality life experiences.

A society everyone can work comfortably for a lifetime

Everyone is highly satisfied with their work that contributes to the sustainable development of a society by achieving a rewarding and humane job.

Remote Control

10

Economy (Achieving Sustainable Economic Growth)

■ **We aim to create a sustainable growth society centered on the transition of minimal resources into what is impeccable to survive and create vital industries/technologies for the production based on material circulation.**
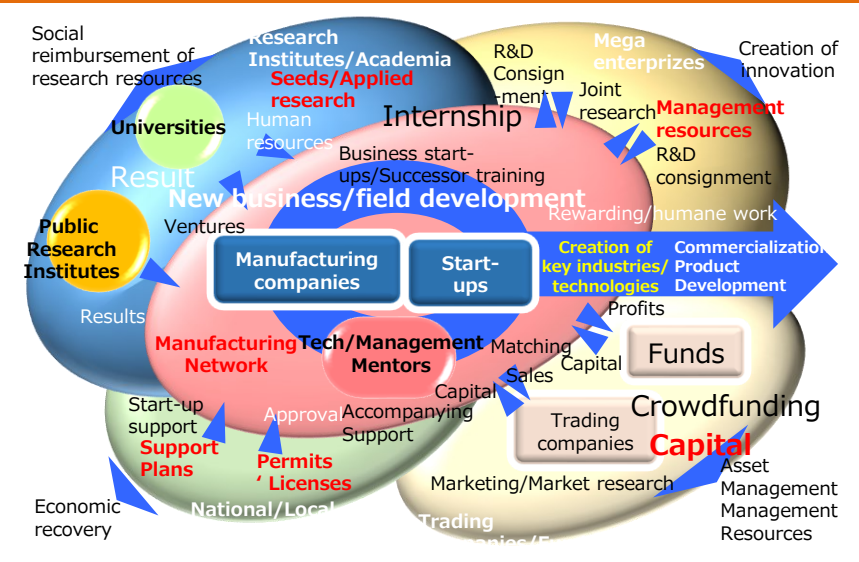
Achieving economic growth through sustainable production/consumption activities

- Usage of renewable resources
- Support for High-Mix Low-Volume (HMLV) Manufacturing
- Shift to materials/manufacturing with low environmental impact
- Creation of industries/technologies using non-continuous innovation

Circular Economy

A sustainable society through the creation of key industries and technologies

The sustainable society by
1) creating key industries and technologies,
2) creating rewarding work, and 3) entrepreneurship, creativity and innovation

Social reimbursement of research resources

Research Institutes/Academia
Seeds/Applied research

Universities

Human resources

Internship

Result

Ventures

New business/field development

R&D Consignment

Mega enterprizes

Joint research

Management resources

R&D consignment

Creation of innovation

Business start-ups/Successor training

Rewarding/humane work

Manufacturing companies

Start-ups

Creation of key industries/ technologies

Commercialization/ Product Development

Results

Manufacturing Network

Tech/Management Mentors

Matching Sales

Capital

Capital

Profits

Funds

Crowdfunding

Capital

Public Research Institutes

Start-up support **Support Plans**

Approval

Accompanying Support

Permits' Licenses

Trading companies

Asset Management Management Resources

Economic recovery

Marketing/Market research

National/Local

Trading

## A sustainable society through resource circulation

Economic growth is achieved while environmental impact is reduced to its maximum level through the promotion of the 3Rs and the use of materials with low environmental impact

Plan

Create

Return

Use

Recycle shop

11

■ **We aim to shift from finite resources such as crude oil to energy sources that are more harmonious with the environment and live in harmony with nature, based on the worldview that humans are part of nature.**

Shift to a sustainable society that grows within the limits of planetary environmental boundary.

■ Enhance local production/consumption and resilience of energy resources
■ Integrated solutions to environmental, economic, and social issues
■ Preservation and creation of a healthy natural environment through both material circulation and resource conservation
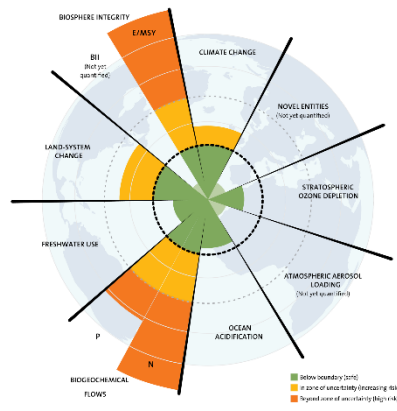

Planetary Boundary

■ A method to objectively evaluate the human impact on Earth Systems.
■ The scope and limits where humans can safely operate on a stable Earth
■ Deviation from the limit of the global environmental resilience will lead to irreversible changes

Source: Stockholm Resilience Centre, Stockholm University

### A sustainable society in harmony with nature

A sustainable, nature-friendly society that aims for socioeconomic development within the planetary boundary, such as the limit for resources and environmental capacity.
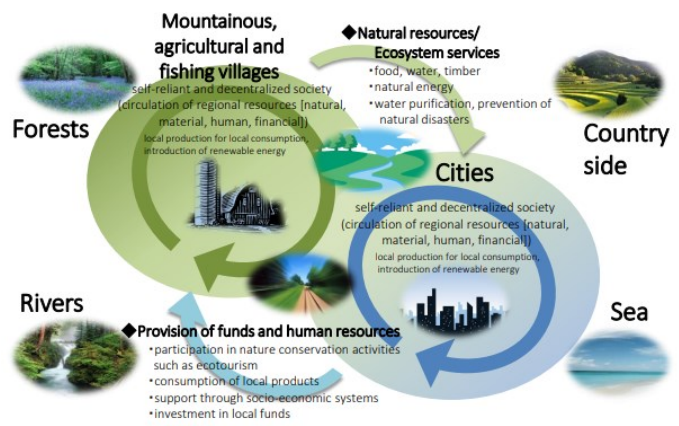
Source: Annual Report on the environment in Japan 2018 (Ministry of the Environment, Japan)

A sustainable energy society in harmony with the environment

Centered on initiatives for socioeconomic development and a symbiotic society with nature
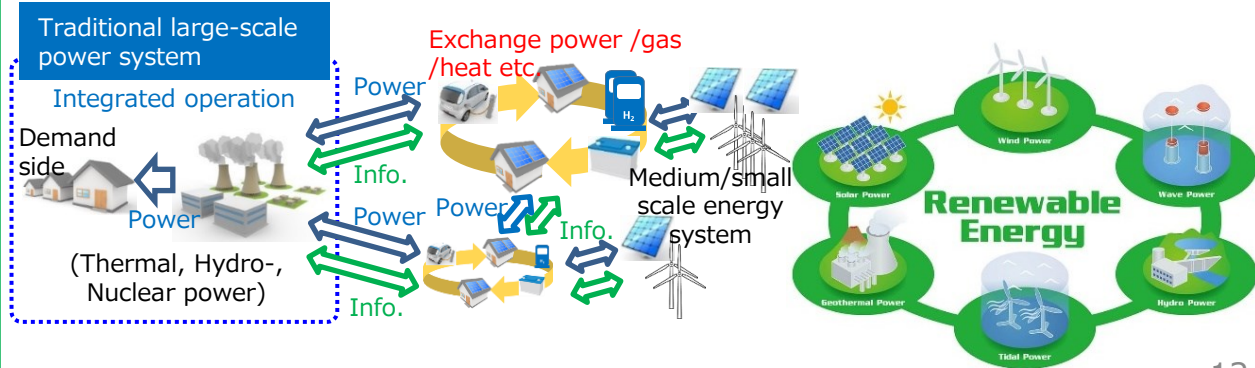
Source: NEDO TSC Foresight Vol.19(NEDO、2017)

12

Infrastructure (Creating a Robust and Comfortable Social Platform)

■ **We aim to build livable cities and highly resilient social infrastructures through an approach close to nature using ecosystems as a solution against issues cities face, such as flooding and air pollution.**

Reconstruction of highly resilient infrastructure is a pressing issue

Realization of
■the "symbiosis" between nature and humans and among regions
■resilient and sustainable cities based on urban development and infrastructure construction, mainly in terms of tangible aspects
■local communities where all people support each other and live at ease with a rich spirit

A nature-rich local community

An environment city

Freiburg, Germany

A comfortable and dynamic society

The relationship between the people and nature is being rebuilt, collaborating each other to cope with disasters.

Source: Regional Circulation Promotion Guidelines (Ministry of the Environment)

A robust and resilient society

It has a long and sustainable life cycle with adequate social infrastructures for the citizens to live a safe and enriched life.

13

Governance (Achieving a Safe and Secure Country)
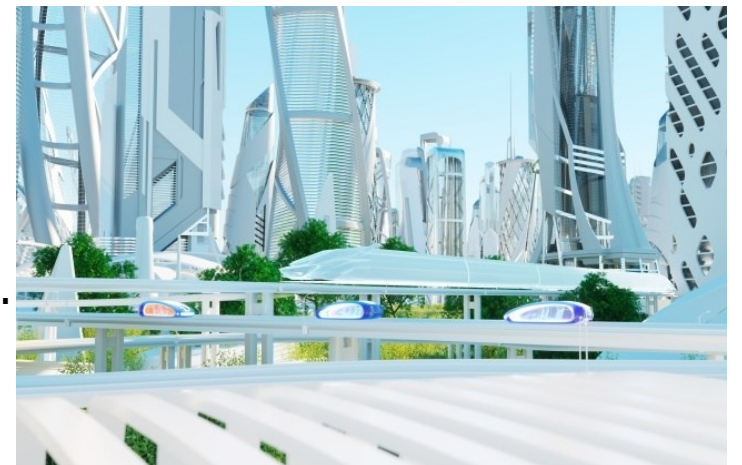
> ■ **We strive to create a society where everyone can participate safely without being restricted in their scope of action or worrying about their lives through social infrastructures where everyone can act freely with transparent and reliable governance.**

Building national infrastructures that support sustainable growth

■ Public assistance, self-help, and mutual assistance to cooperate to tackle challenges including disasters, defense, and other threats to national security.

■Solving urban and local issues caused by intangible aspects.

■Improving public security and ensuring transparency of administrative services.

Self-help

Mutual Assistance   Public Assistance
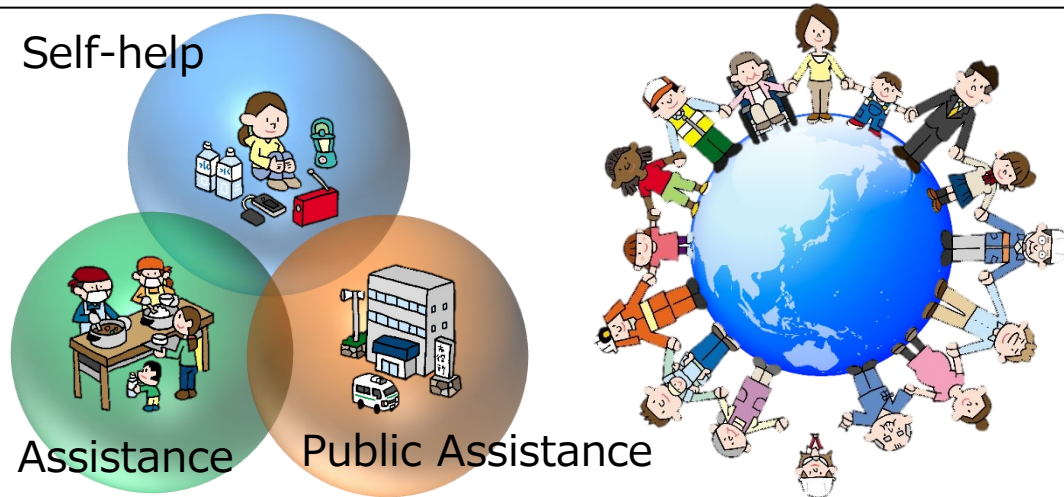
A society everyone is ensured to act in liberty and safety

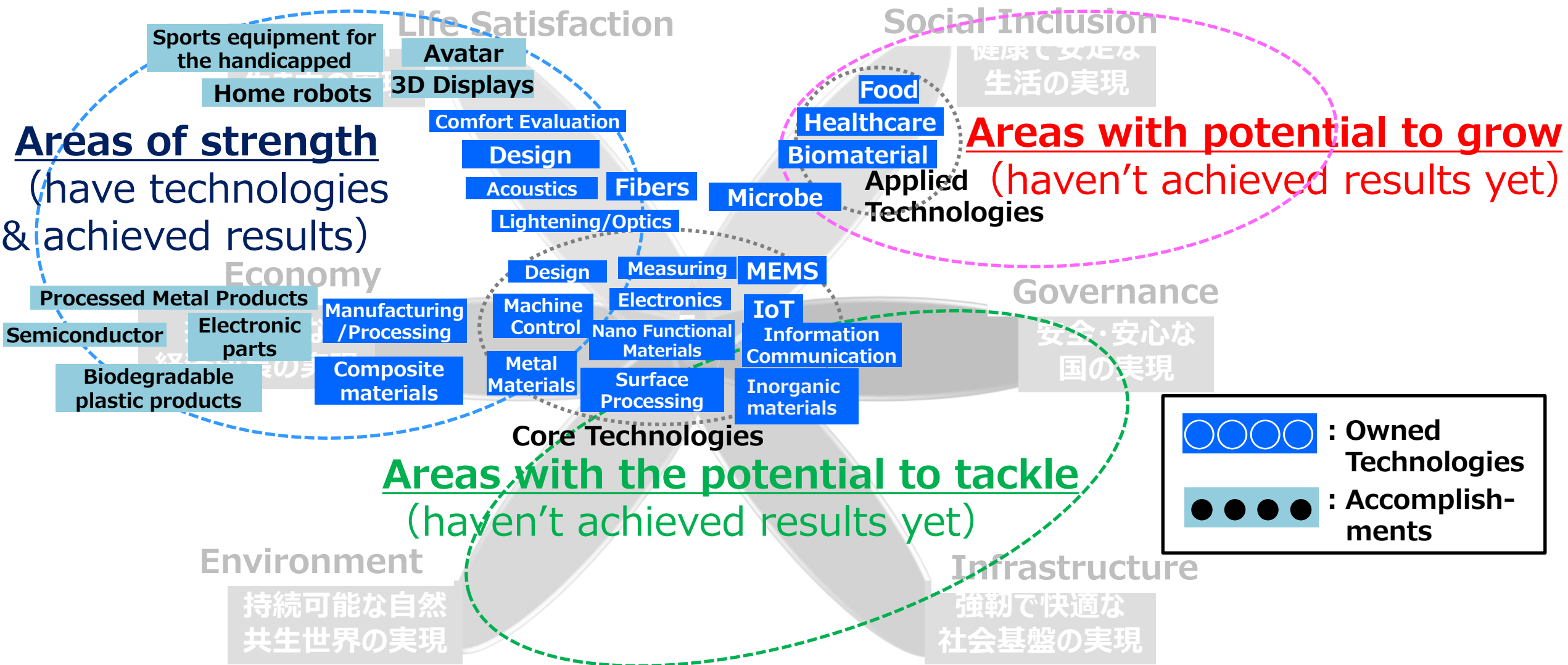All citizens can act and behave freely in a fair and secure manner.

A society with high transparency and reliability

Created by respective administrations, companies, and citizens exercise transparent and reliable governance

14

Mapping a certain organization's owned technologies and achievements

Life Satisfaction

Social Inclusion

健康で安定な
生活の実現

Sports equipment for the handicapped

Avatar

3D Displays

Home robots

Food

Healthcare

Biomaterial

Areas with potential to grow
（haven't achieved results yet）

Comfort Evaluation

Design

Acoustics

Fibers

Microbe

Applied Technologies

Areas of strength
(have technologies & achieved results)

Lightening/Optics

Economy

Design

Measuring

MEMS

Governance

Processed Metal Products

Machine Control

Electronics

IoT

安全・安心な
国の実現

Semiconductor

Electronic parts

Manufacturing /Processing

Nano Functional Materials

Information Communication

Biodegradable plastic products

Composite materials

Metal Materials

Surface Processing

Inorganic materials

Core Technologies

Areas with the potential to tackle
（haven't achieved results yet）

Environment

Infrastructure

持続可能な自然
共生世界の実現

強靭で快適な
社会基盤の実現

○○○○ : Owned Technologies

●●●● : Accomplish-ments

Use Case Examples: **Visualization of Initiatives in Organizations (Japan's Government)**

NEDO

A society everyone can reach their potential to be themselves

AI Strategy, Basic Plan for Space Policy: Developing the future of the sports industry, revitalizing the economy through culture and art resources, promoting space science and exploration, developing and upgrading core launch rockets and space transportation systems, developing and demonstrating satellites, achieving a society where people are free from the constraints of their bodies, brains, space, and time, developing robots that can learn and act on their own and live in harmony with people through the co-evolution of AI and robots (moonshot-type R&D)

A society everyone can be healthy and have hood

Health and medical care strategy, food, agriculture, forestry, and fisheries industries: Green food system strategy, Smart agriculture, Digital innovation in agriculture and food-related industries, Food tech, Data health reform, Plan for extending healthy life expectancy, Medical field R&D promotion plan (regenerative and genome medicine, infectious diseases), Prediction and prevention of diseases at a very early stage, Creating sustainable food supply industries, achieving sustainable medical and nursing care systems to prevent and overcome major diseases and enjoy life without health concerns until age 100 (moonshot R&D).

A society everyone can work comfortably for a lifetime

Work style reform: Establishing new ways of working and living, promoting countermeasures against the digital divide, developing robots that can learn and act on their own and coexist with humans through the co-evolution of AI and robots (moonshot-type R&D)

Life Satisfaction

Social Inclusion

A society all citizens can participate and play an active role

Strengthening research capabilities as a source of value creation: Creating an innovative ecosystem through university reforms, etc., the GIGA school concept

A sustainable society through the creation of key industries and technologies

Industrial Technology Vision, Strategy for strengthening the innovative power of materials: Strengthening supply chains/building supply nets, Creating innovation ecosystems (next-generation computers, materials), R&D startups, Creating key innovators and new industries and improving productivity, Deepening DX initiatives, Creating new value for future industrial creation and social transformation, Promoting science and technology innovation, Promoting open innovation

A society everyone can act in liberty and safety

Mobility: Promoting advanced safety vehicles, creating automated driving, utilizing drones and ensuring their safety, revolutionizing air travel, MaaS initiatives, forming a public transportation network in cooperation with compact cities, advanced road transportation system

A sustainable society through resource circulation

Economy

Governance

A society with high transparency and reliability

Establish a strong and sustainable social and economic structure, bio-strategy: Shifting to a highly recycling-oriented business model, early establishment of a resilient recycling system, plastic resource recycling strategy, achieving a sustainable and renewable recycling-based economic society (bio-economy)

Quantum technology innovation strategy: Developing communication and data infrastructure to support Society 5.0, Digital government, Digital markets (payment infrastructure, cashless, etc.), Ensuring cyber security as digitalization progresses, Digitalization of the whole society brought about by 5G, Realization of error-resistant general-purpose quantum computers (moonshot-type R&D)

A sustainable society in harmony with nature

Environment

Infrastructure

A robust and resilient society

A sustainable energy society in harmony with the environment

A comfortable and dynamic society

Plan to regenerate the global environment through complete resource and material circulation: Using woody biomass, smart fisheries, creation of new *Satoyama* (local mountains) and *Satoumi*(Local seas), and sustainable resource circulation for regenerating the global environment (moonshot research and development)

Environmental energy and green growth strategies: Building a sustainable power system, turning renewable energy into a main source of power, enhancing energy resilience, Promoting measures to combat global warming, Promoting the use of renewable energy, etc., Absorbing CO2 by farmland, forests, and oceans, Reducing methane and N2O emissions from agriculture and livestock industries, Utilizing renewable energy & smart agriculture, forestry and water industries, creating carbon-free sustainable communities, climate change x social transformation sustainable growth and autonomous development of local communities (energy, resources)

Safety and security: Maintaining local infrastructure, early realization of the super city concept, building a self-reliant and decentralized local economy, enhancing firefighting and disaster prevention capabilities and local disaster prevention capabilities, securing means of information transmission in times of disaster, taking countermeasures against internationally threatening infectious diseases, promoting green infrastructure, promoting smart cities, monitoring and forecasting weather phenomena, developing cities and infrastructure taking advantage of local characteristics, observing and monitoring the global environment, utilizing ICT for water management/water-related disaster prevention

Improving productivity in the infrastructure sector and resolving issues in disaster prevention, transportation, logistics, and cities: Strategic investment in advanced technologies such as Beyond 5G, Ensuring sustainable social infrastructure, Promoting i-Construction, Realizing sustainable infrastructure maintenance, Utilizing technology for infrastructure development, Realizing a society that makes advanced use of geospatial information (National Land Transportation Platform), Promoting national land fortification in vital social infrastructure, etc.

Innovation activities by the Japanese government mapped to the visions of society (NEDO survey referring to Japan's Cabinet Office Strategies and white papers by respective ministries)

Use Case Examples: Visualization of Initiatives in Organizations (NEDO)
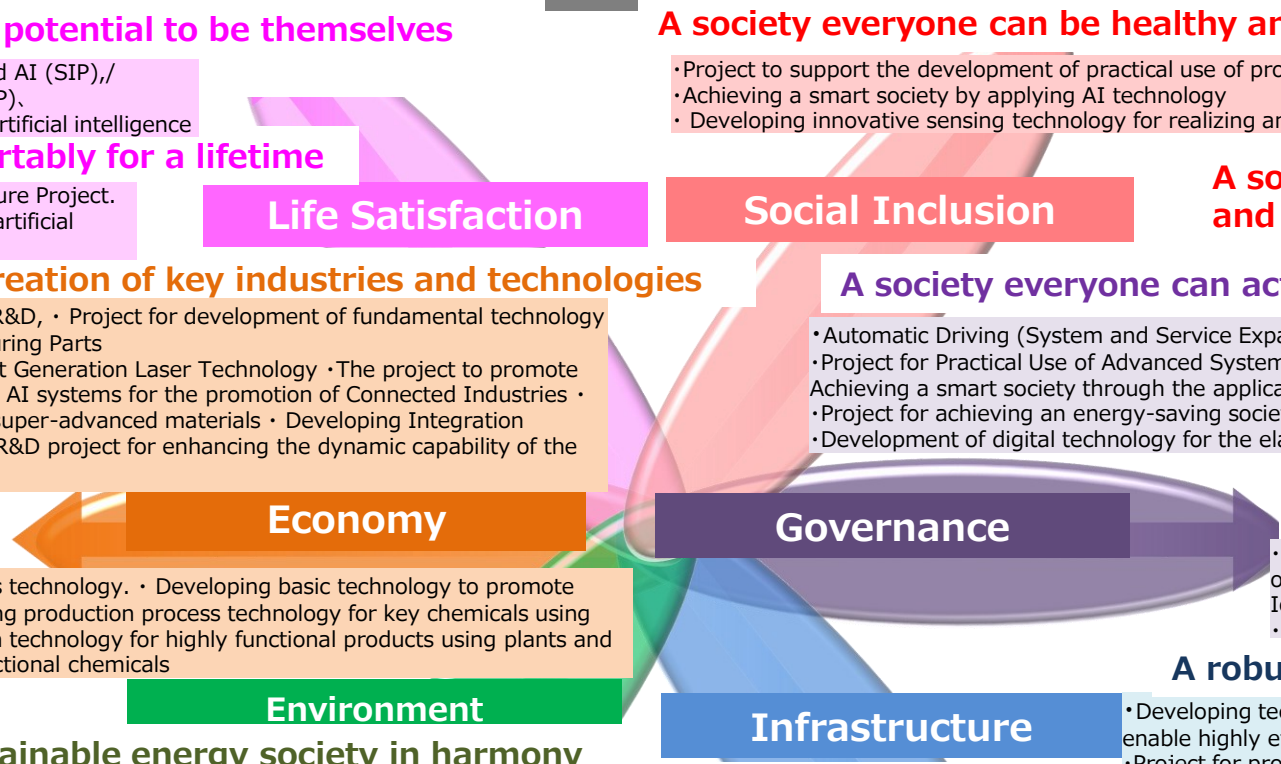
A society everyone can reach their potential to be themselves

- Cyber space infrastructure technology using big data and AI (SIP),/
- Physical space digital data processing infrastructure (SIP)、
- Development of innovative remote technologies using artificial intelligence

A society everyone can work comfortably for a lifetime

- Innovative Robot Research and Development Infrastructure Project.
- Technological development project for next-generation artificial intelligence that evolves along with people

Life Satisfaction

A society everyone can be healthy and have hood

- Project to support the development of practical use of problem-solving welfare equipment
- Achieving a smart society by applying AI technology
- Developing innovative sensing technology for realizing an IoT society

Social Inclusion

A society all citizens can participate and play an active role

A sustainable society through the creation of key industries and technologies

- Project for constructing a platform for innovative robot R&D, · Project for development of fundamental technology for efficient development of design for additive manufacturing Parts
- Development of High Brightness and High Efficiency Next Generation Laser Technology · The project to promote the development of collaborative domain data sharing and AI systems for the promotion of Connected Industries · Project for Basic Technology for ultrafast development of super-advanced materials · Developing Integration Technology as the core of next generation AI / robotics · R&D project for enhancing the dynamic capability of the manufacturing industry through the use of 5G, etc.

A society everyone can act in liberty and safety

- Automatic Driving (System and Service Expansion) (SIP)
- Project for Practical Use of Advanced Systems for Aircraft Achieving a smart society through the application of AI technology
- Project for achieving an energy-saving society in which robots/drones can play an active role,
- Development of digital technology for the elaboration of regulations

A sustainable society through resource circulation

Economy

Governance

A society with high transparency and reliability

- Developing digital technologies for further sophistication of regulations · Cyber-physical security responding to the IoT society (SIP)
- Physical Space Digital Data Processing Platform(SIP)

- Developing innovative plastic resource recycling process technology. · Developing basic technology to promote practical usage of innovative storage batteries · Developing production process technology for key chemicals using carbon dioxide as a raw material, · Developing production technology for highly functional products using plants and other organisms · Continuous precision production of functional chemicals

A sustainable society in harmony with nature

- Developing environment-friendly process technology · Project for demonstration of regional self-sustaining system for biomass energy · Project related to CCUS R&D and demonstration · R&D projects for recycling technologies to build a highly efficient resource recycling system · Developing next-generation refrigerant and refrigeration/air-conditioning technologies and their assessment methods, · Developing cellulose nanofiber-related technologies to contribute to a carbon-recycling society · Achieving sustainable resource recycling for global environmental revitalization (moonshot)

Environment

A sustainable energy society in harmony with the environment

- R&D on technologies to promote solar power generation as a main power source · R&D on wind power generation and other technologies · Biojet fuel production technology development project · R&D of technology for innovative utilization of unused thermal energy · R&D of supercritical geothermal power generation technology · R&D of technology for building a hydrogen society · R&D of technology for full-scale dissemination of ultra-high pressure hydrogen infrastructure 、· R&D on technologies to implement zero-carbon steel · Developing technology to stabilize next-generation power networks for the mass introduction of renewable energy · Technology development project to strengthen the manufacturing base for energy-saving electronics · Project for the practical application of advanced systems for aircraft

Infrastructure

A comfortable and dynamic society

- Developing basic technology for safe and secure drones
- Developing innovative sensing technology for achieving an IoT society
- Project to promote the development of collaborative data sharing and AI systems for promoting Connected Industries

A robust and resilient society

- Developing technologies for AI chips and next-generation computing to enable highly efficient and high-speed processing
- Project for promoting innovation to accelerate the development of AI chips
- Project for achieving an energy-saving society where robots and drones are playing an active role
- Technological development project for implementing a new delivery service using automated robots
- R&D project for strengthening the infrastructure of post-5G information and communication systems
- Developing innovative sensing technology for realizing an IoT society
- Developing technology for optoelectronic packaging systems with ultra-low power consumption · Developing digital technologies for further sophistication of regulations

Innovation activities by organizations mapped to the visions of society (NEDO's recent efforts)