20th March 2018
ASEAN Next 2018

Science, Technology and Innovation Policy Interventions for Achieving SDGs: Japanese Case

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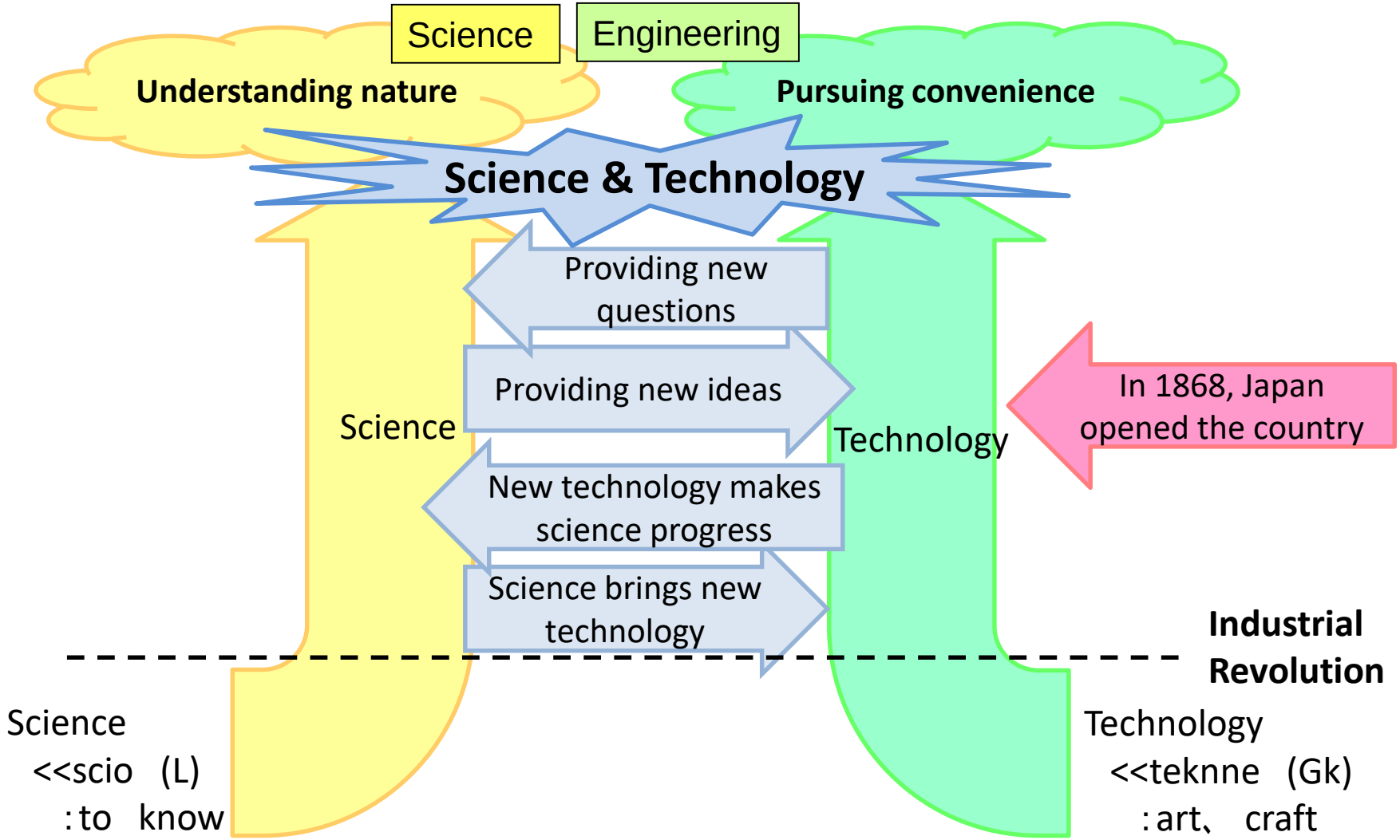
Historical Turning Point of Japan

- Modernization from isolation for about 300 years after 1868
- Dramatic economic growth starting 1960s from the ruin of the WW II
- Overcoming pollution and smog as distortion of rapid economic growth in 1970s
- S&T Basic Law, Basic Plan and administrative reform around 2000.
- Recovery and reconstruction from disaster 2011
- UN Sustainable Development Goals(SDGs) 2015

Modernization from Isolation

- In 1868, Japan opened the country by Meiji Revolution and started to catch up the advancing western world.
- They “imported” science from the Western countries, but they established engineering schools in universities to secure human resources and to establish new science-based disciplines.
- Eco system of engineering realized modernization.

Science and Technology



Modernization of Japan

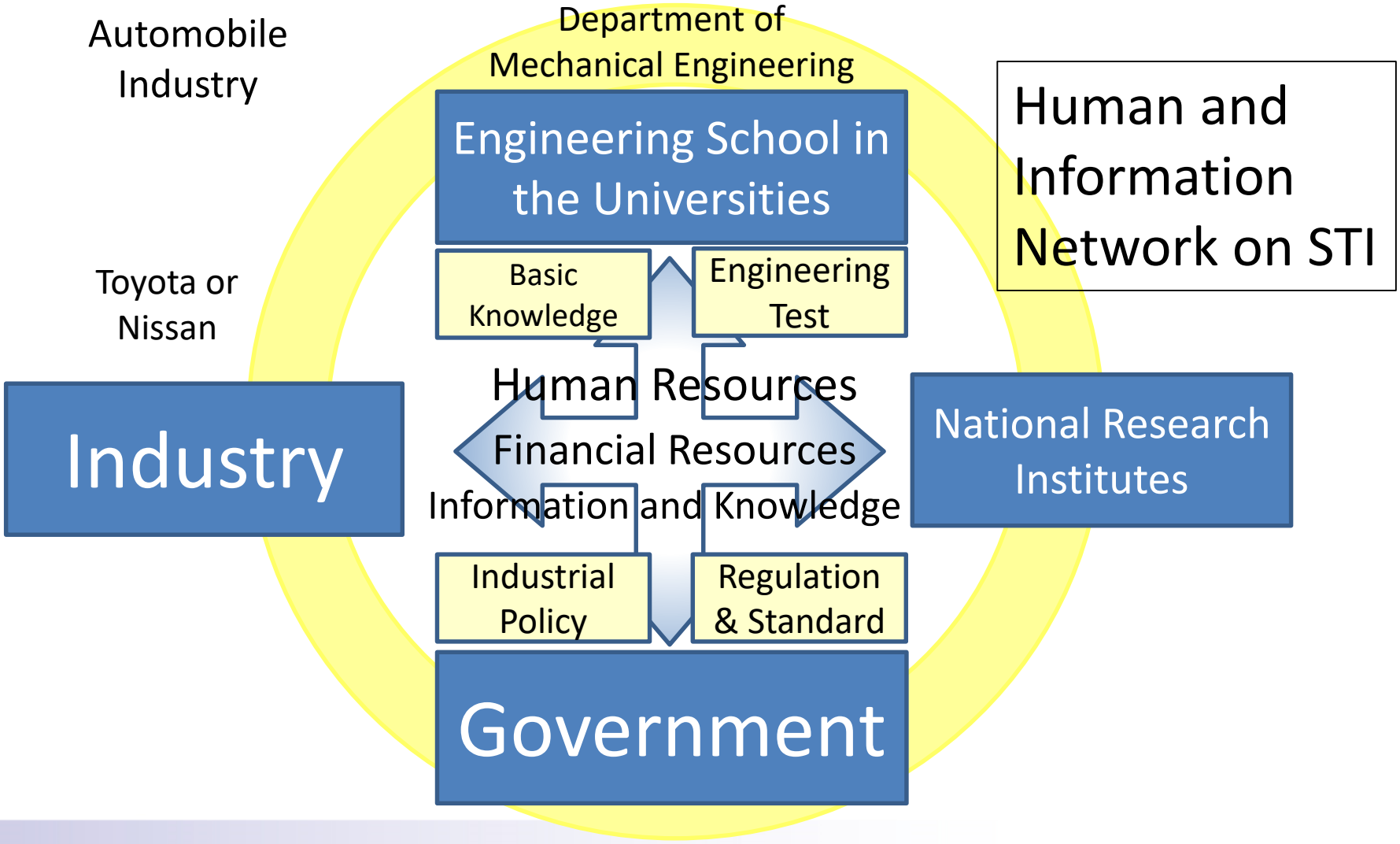
200 years ago

Center of Tokyo

Today

100 years ago

Success Story of Engineering School



Dramatic Economic Growth

- Eco system of engineering connected engineering schools, industry and government(ministries and institutes). Thus academy-industry-policy consortia were formulated.
- It enabled Japan to make enormous progress in economy after 1960's to be said "Japan as No.1" in late 1970's. The US NSF started the Engineering Research Center Program in 1985 to level up the US engineering.
- in 1962, the system of College of Technology was established and joined to the eco system as an integral part. The colleges provides higher technical persons with practical skills by engineering-based education
- No doubt, those systems were an engine for Japanese economic growth.

Overcoming Pollution and Smog

- After 1970's, unexpected effects of rapid development appeared to suffer society; wide scale of pollution and smog, and diseases caused by those.
- There were so many discussions, but finally Japan found a way to achieve both economic growth and environmental preservation.
- Science was no longer merely in experts domain, but became an important part of society, because public awareness and understanding of science became better. For example, number of people entered universities and collages changed from few % in early 50's, via 25-30% around 80, to about 60% now.

Fight against Pollution and Smog

City of Yokkaichi around 1970

City of Yokkaichi today

Landfill Site named Isle of Dream filled with wastes and garbage in 1960's

Isle of Dream was realized.

Facing New Millennium

- In 1995, the Science and Technology Basic Law was established by the congress to promote science and technology as one of the countries high prioritized issues.
- In 1996, the first Science and Technology Basic Plan was established as a Cabinet Decision required by the Basic Law.
- The 2nd Basic Plan established in 2001 clearly declared that the STI promotion should aim to build the country with frontier knowledge, economic vitality and solution of societal issues.
- In 2001, the administrative structure of Government was reformed and Council of Science and Technology Policy was established in Cabinet Office as a supreme advisory board on science and technology policy to the Prime Minister and his Cabinet.

11th March 2011

Science and Technology helped a bit

Science and technology could not save people and society.

- Great earthquake beyond the understanding of mechanism of recent seismology. = Incompletion of science
- Tsunami killed ten thousand people. = Alert system failure + lost past lessons
- Nuclear plant accident = Man-made disaster by the operator
- Radioactive contamination = Non systematic science advices

But some endeavor of ST experts achieved the recovery of the people and society by creating business and jobs.

- The local people were not good at explaining needs of ST for new business, while a lot of seeds able to respond to the issues.
- The match-makers made it possible to connect needs to seeds.

Future of Science and Society

- Science today becomes an integral part of society and our life.
- Thus, advancement of science is not only up to scientists and experts, but needs to involve many stakeholder, especially general public.
- SDGs are typical case, which will transform our society and science.
- In order to solve the global issues, activities of science should go beyond the borders of disciplines, sectors, generations, etc. to be transdisciplinary. Co-design, co-production and co-delivery with science and society is crucial.
- Japan as well as the world are in the very critical moment; exciting and worth challenging.

The Basic Plan is advancing

- The 4th Science and Technology Basic Plan established in 2011 changed the prioritization from science-area basis like ICT or life science, to issue-solving basis like green innovation or life innovation.
- The CSTP transformed into the Council of Science, Technology and Innovation (CSTI) in 2014.
- In 5th Basic Plan established in 2016, STI aimed to contribute to build “Society 5.0”, the image of innovative super smart society.

  1.0: Hunting society 2.0: Agricultural society

  3.0: Industrial society 4.0: ICT society
- The concept of “Society 5.0” is thought to resonate with SDGs highly.

Science and Technology Basic Plans

The 1st Basic Plan (FY1996～2000)

Total Budget:
17trillion JPY

Construction of new R&D system

The 2nd Basic Plan (FY2001～05)
The 3rd Basic Plan (FY2006～10)

Total budget:
2nd Plan: 24 trillion JPY
3rd Plan: 25 trillion JPY

Promotion of R&D on prioritized area

The 4th Science and Technology Basic Plan (FY2011～15)

Total budget:
25 trillion JPY

Promotion of societal and economical issue-driven R&D including recovery from the Great Earthquake

The 5th Science and Technology Basic Plan (FY2016～21)

Total budget:
26 trillion JPY

Promotion of R&D to realize “Society 5.0”, the holistic vision of super-smart society

SDGs and Global Issues toward 2030

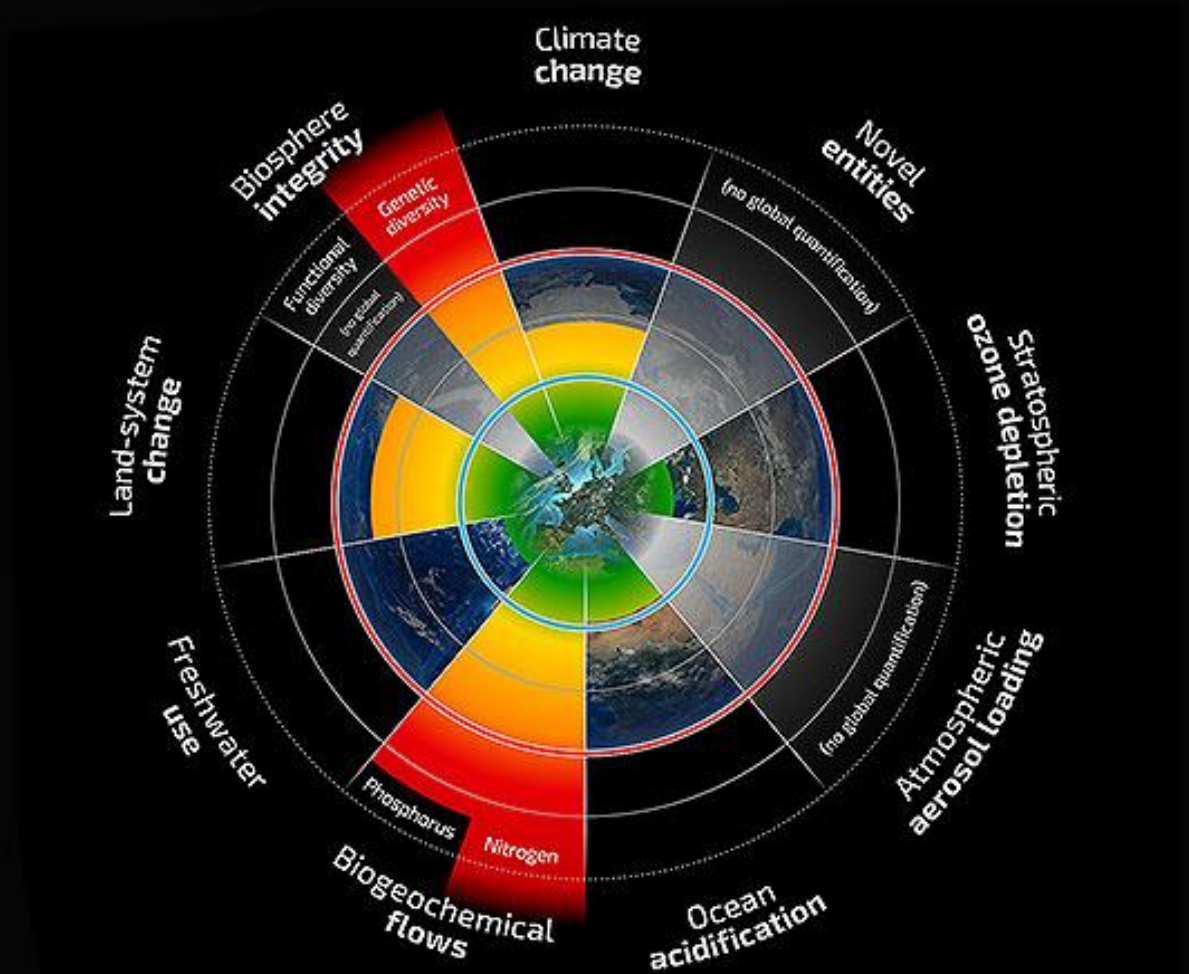
- Globally, three major frameworks will continue to guide the world toward 2030
  - The Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC)
  - Sendai Framework for Disaster Risk Reduction 2015–2030
  - United Nation's the 2030 Agenda for Sustainable Development(SDGs)

All the goals require the contribution of science, technology and innovation.

Way to SDGs

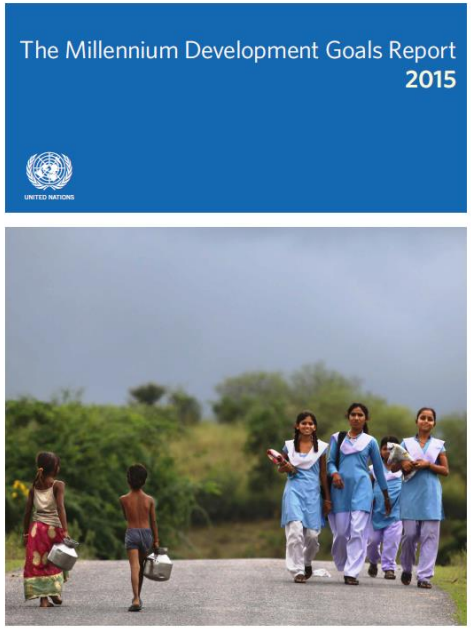
- Global Warming
  - In 1992, the Earth Summit adopted the United Nations Framework Convention on Climate Change (UNFCCC) and then COP started.
  - Planetary Boundary and Anthropocene
- Sustainable Development
  - In early 2000's, UN integrated several development goals established in 1990's into Millennium Development Goals(MDGs).
- Science
  - In 1999, Declaration on Science and the Use of Scientific Knowledge ("Budapest Declaration") defined four kinds of science.

Planetary boundary



Millennium Development Goals(MDGs

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development



- **Mainly issues in developing countries**
- **Not all realized to 2015, but remarkable improvement almost all the goals**

“Budapest Declaration

- In 1999, Declaration on Science and the Use of Scientific Knowledge(“Budapest Declaration”) defined four kinds of science:
  1. Science for knowledge; knowledge for progress
  2. Science for peace
  3. Science for development
  4. Science in society and science for society
- “Science for peace”, “Science for development” and “Science in society and science for society” relate to sustainability.
- World science community declared the role of science is an essential for sustainable development.

Japanese Government and SDGs

SDGs Promotion Headquarters

headed by the Prime Minister Shinzo Abe and composed of all ministers on May 20, 2016,in order to ensure a whole-of-government approach to implementing the 2030 Agenda in a comprehensive and effective manner

- **2016.12.22 "SDGs Implementation Guiding Principles" was adopted to represent Japan's national strategy to address the major challenges for the implementation of the 2030 Agenda**
- **2017.12.26 "SDGs Action Plan 2018" was decided with 3 pillars of**
  - **Promotion of "Society 5.0" linked with SDGs**
  - **Regional creation and resilient and environment-friendly attractive city planning by SDGs**
  - **Empowerment of next generation and women as a main player of SDGs**

Source: Official Website of the Prime Minister of Japan and His Cabinet
: Ministry of Foreign Affairs, the Government of Japan

Minister for Foreign Affairs on SDGs

- The Advisory Board for Promotion of Science and Technology Diplomacy 2017.5.12

  "Recommendation for the Future – STI as a Bridging Force to provide Solutions for Global Issues: Four actions to make the most of Japan's STI for SDGs Diplomacy"

1. Change through Innovation: Global Future Creation through Society 5.0
2. Grasp and Solve: Solution Enabled by Global Data
3. Link across Sectors, Unite across the Globe
4. Foster Human Resources for "STI for SDGs"

http://www.kantei.go.jp/jp/singi/sdgs/
http://www.mofa.go.jp/mofaj/press/release

Japan Business Federation (経団連):

"Bridging new national STI Policy (Society 5.0) and global policy/strategy (SDGs)

"A new grand model with a view of "solving social issues" as well as "creating a better future".

Evidence informed policy/strategy making :

Needs/problems ⇒ Data/analysis ⇒ Design ⇒ Action ⇒ Evaluation ⇒ cyclic

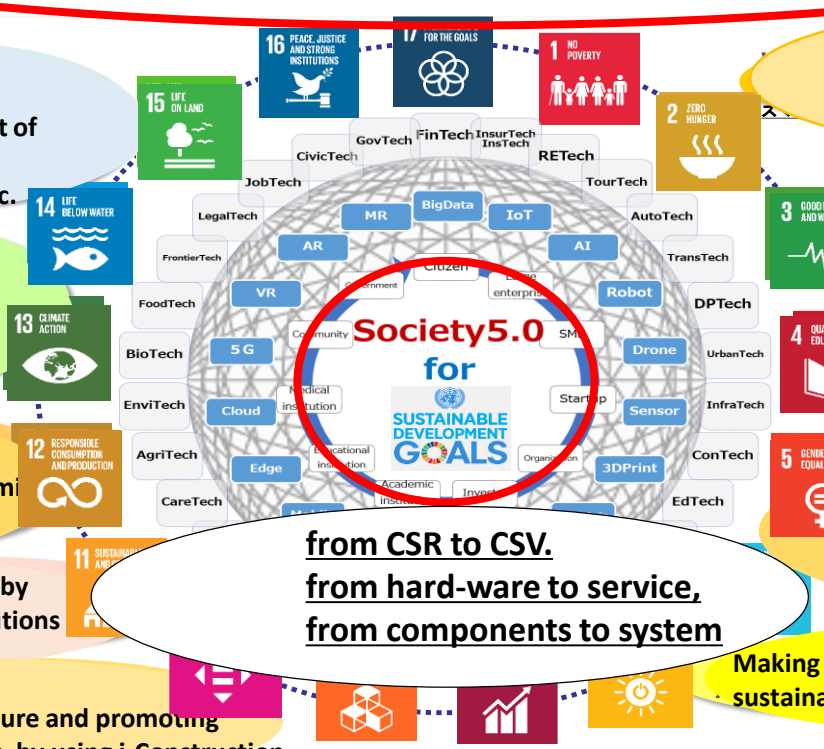
Using remote sensing and oceanographic data for monitoring and management of water quality, forests, land degradation, biodiversity, etc.

Resolving climate change issues with the simulation based on the analysis of meteorological and other observation data by using High Performance Computing

Creating smart cities where convenience, safety and economi efficiency are made compatible

Building global innovation ecosystems by connecting industries, academic institutions and other related stakeholders

Building resilient infrastructure and promoting sustainable industrialization by using i-Construction



from CSR to CSV.
from hard-ware to service,
from components to system

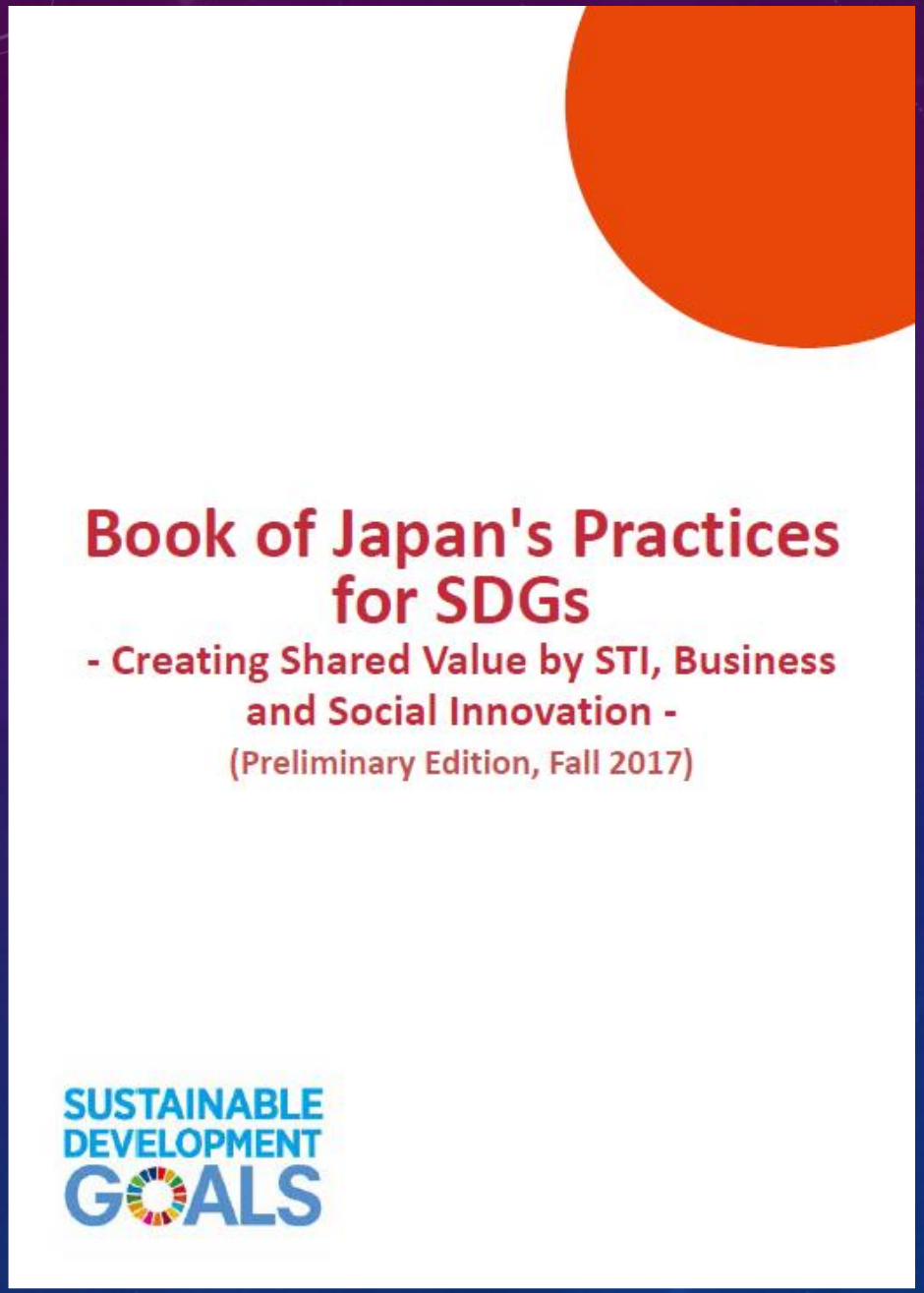
Boosting food production by smart agriculture utilizing IoT, AI and Big Data
Improving nutritional status with smart food by cutting-edge biotechnology

Developing early warning alert system for the prevention of infectious diseases by combining different types of monitoring data

Making high quality education affordable for everyone on the earth with e-learning systems utilizing state-of-the-art technologies

Empowering women with access to education and information through the Internet. Providing women with opportunities for startups by utilizing ICT

Making electric power supply and demand in a sustainable way by constructing smart grid system



http://www.jst.go.jp/EN/about/sdgs/doc/book_of_practices_for_SDGs_letter.pdf

Solar Kiosk Service for Off-grid Areas

"WASSHA"
provides a new experience for people in off-grid areas with affordable, accessible and safe electricity through Solar Kiosks based on Digitalgrid technologies developed in the University of Tokyo.

By indicating social system which utilize mobile money and local kiosks, "Wassha" has been broadly accepted up to 800 locations and over 240,000 people in 2016. This project is highly recognized for its contribution to the regional education and economy. WASSHA received invitation to summer Davos meeting Idea's lab in 2014.

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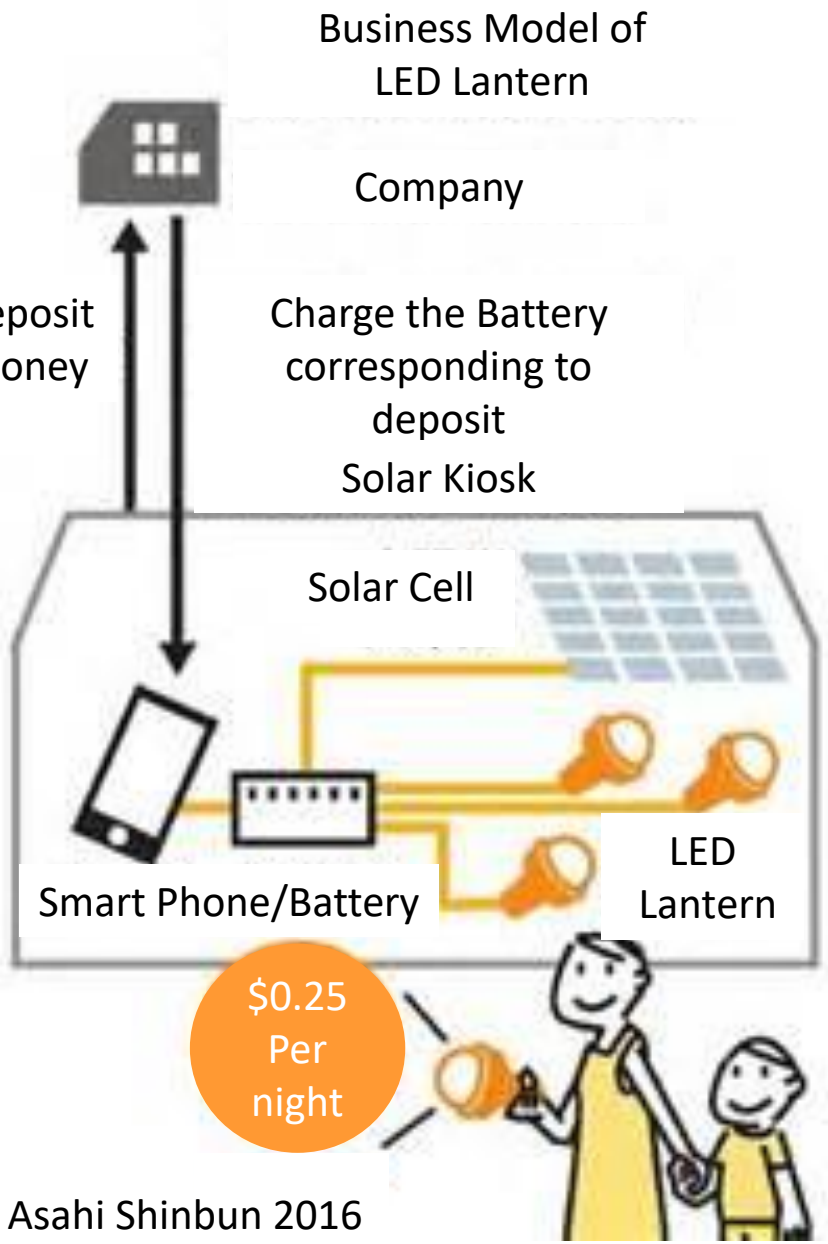


Necessary elements

- Sustainable business model with both cost recovery and user-friendly price setting

- Robust Solar Cell
- Smart phone based finance system
- Efficient battery
- Advanced LED

Key knowledge
-Various technology (soft and hard)
-Business model

United Nation System on STI for SDGs

United Nations

Economic and Social Council

|

High-Level Political Forum (HLPF)

- UN Conference on Trade and Development (UNCTAD)
- UN Forum on Sustainability Standards (UNFSS)

TFM (Technology Facilitation Mechanism)

- UN Inter-Agency Task Team on STI for SDGs(IATT) (DESA, UNESCO, UNCTAD, World Bank, etc) ; 10-Member Group
- Online Platform
- Multiatakeholder Forum for STI on SDGs (STI Forum)

The 3rd Multiatakeholder Forum for STI on SDGs: 5th and 6th June 2018

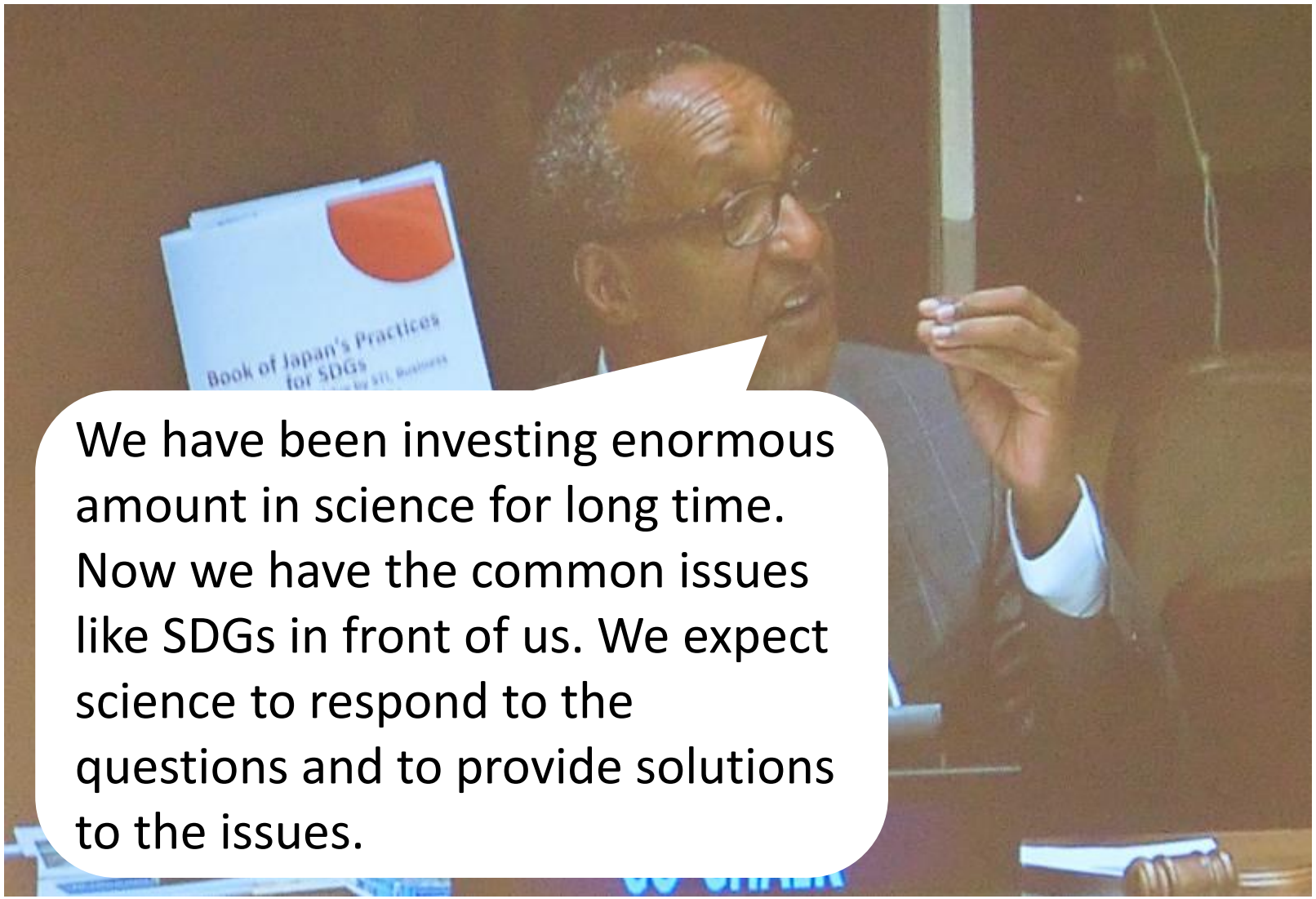
The 3rd HLPF: 9th–18st July 2017

Conclusion of the STI forum

1. **crosscutting potential of STI;**
2. **importance of capacity building;**
3. **importance of stakeholder engagement;**
4. **need to make the business case for private sector investment in innovation for the SDGs;**
5. **importance of roadmaps for tracking progress;**
6. **centrality of ICT infrastructure expansion to current development and STI efforts;**
7. **need to focus on match-making between existing problems and existing solutions; and**
8. **necessity for the STI Forum to conduct a "horizon-scanning" exercise on the changes happening in the STI field**

Identified by Bill Colglazier, Co-Chair of the TFM 10-Member Group and will be reported to High Level Political Forum in July

Ambassador Macharia Kamau (Co-chair)



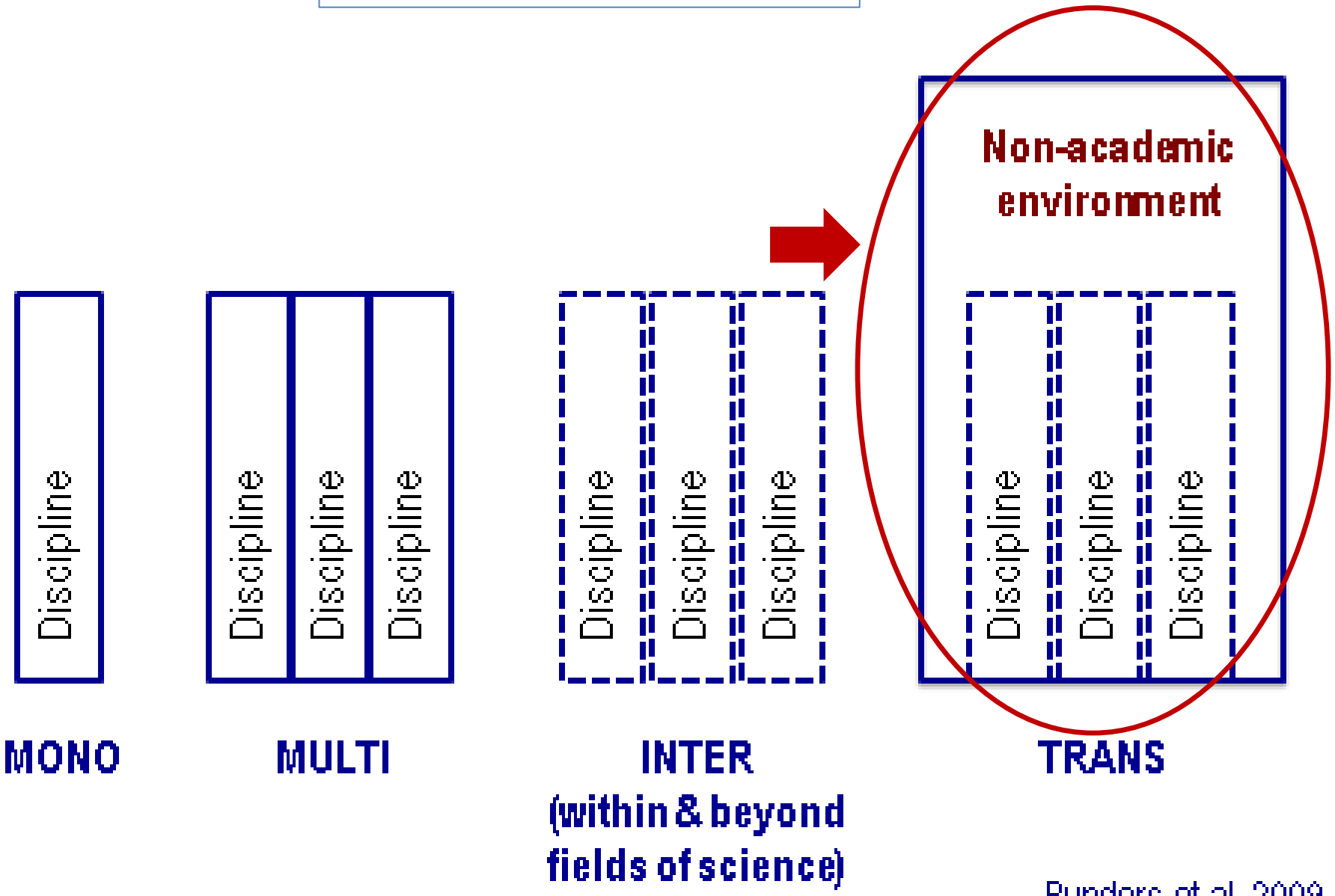
STI and SDGs

- Science are expected to contribute to solve SDGs.
- 17 goals of SDGs are interlinked each other. Thus single scientific discipline alone cannot provide sufficient solutions.
- Also science as a whole is not enough to tackle the societal issues. Social values matter.
- Traditional disciplines have variety of valuable achievement, some of which are very close to solve the issues.
- Solutions are realized through installation to the society.

Going beyond the borders

- For SDGs, sustainable science should involve other disciplines and widen the coalition:
  - They have scientific hopeful outputs
  - They have money and human resources
- For realizing solution, coalition with other societal stakeholders, especially business sectors.

Disciplinarity



Bunders et al, 2009

Trade off

- If we have unlimited resources, time and space the rational discussion only decides the direction we should go.
- Unfortunately, we are under the limited conditions.
- We need to think about trade off among the issues, solutions, etc.
- We should see holistic scenery, i.e. wider nexus among the elements to make better trade off.

Expected Roles of STI for SDGs

- Focus on match-making between existing problems and existing solutions, in order to prove the power of science to provide solutions and to build trust between science community and society.
- Discussing nexus between goals with setting various scales to mitigate the constraint of “Planetary Boundary”.
- Pursuing the disruptive STI to resolve the constraint: It need serendipity and may be unplannable; need continuous efforts.

UN SDGs Technology Facilitation Mechanism

- UN Inter-Agency Task Team on STI for SDGs(IATT) (DESA, UNCTAD, World Bank, UNESCO, etc.) ; 10-Member Group → Steering
- Online Platform → Knowledge Storage
- Multiatakeholder Forum for STI on SDGs (STI Forum) → Match-making Arena

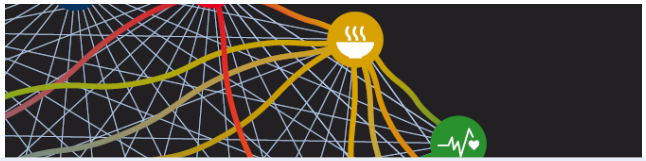
- What themes to be tackled? → Mapping of Interlinkage Emerging Technologies
- How to facilitate and to implement? → Road maps
- How to match-make? → Match-maker

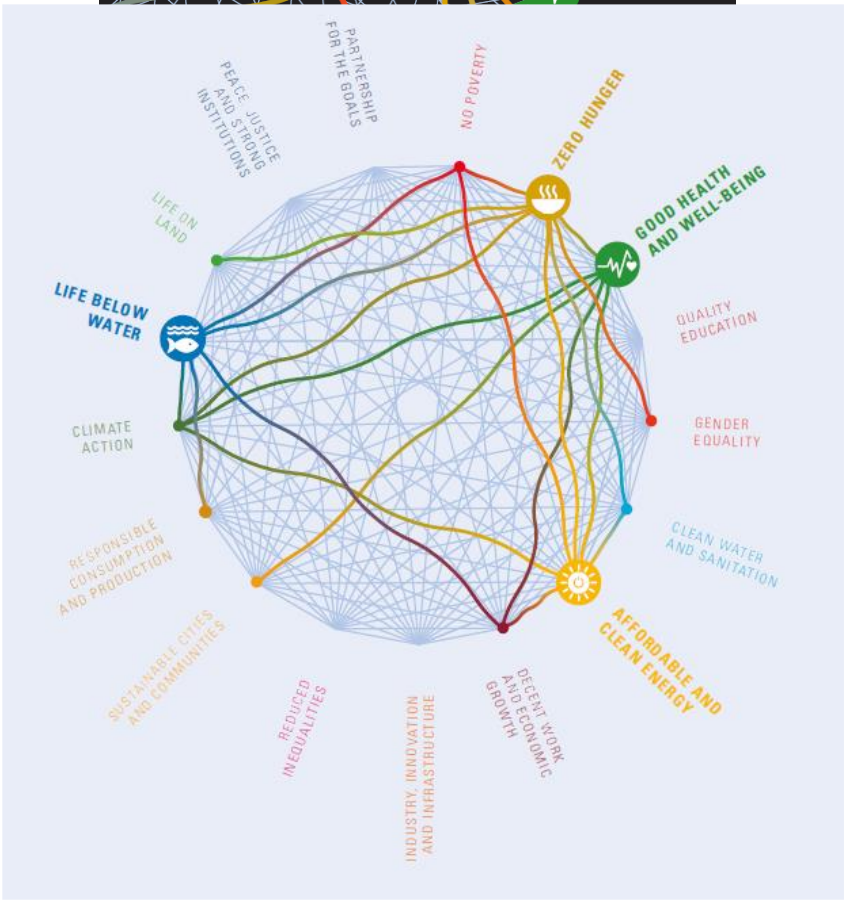
ICSU: Analysis on Interlinkage among SDGs

- ICSU Report 2017
- Interlinkage analysis
  - Food(SDG 2)
  - Health(SDG 3)
  - Energy(SDG 7)
  - Ocean(SDG 14)

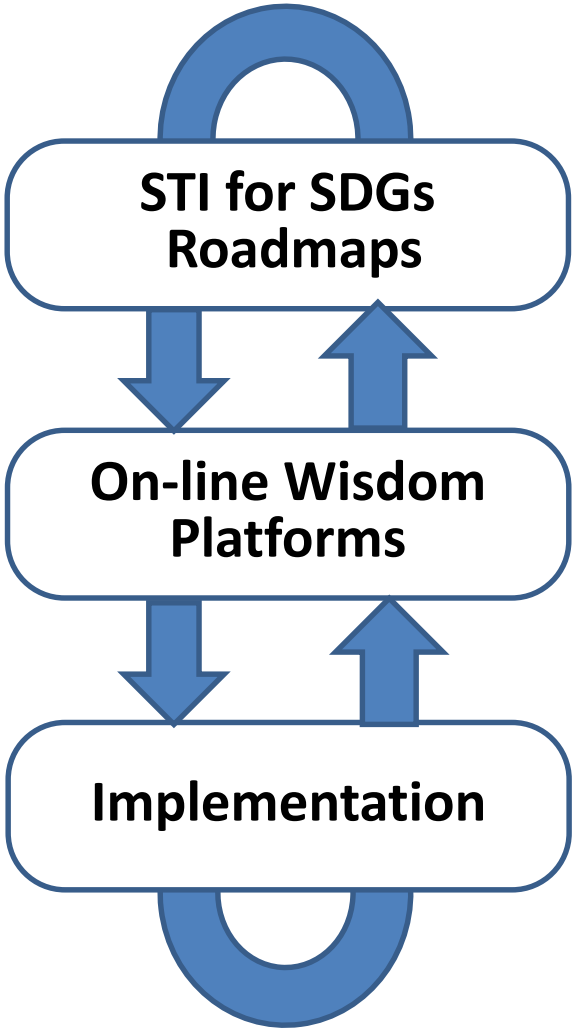
with other goals.

- Continue to analyze other goals from now on.





Facilitation Cycle of “STI for SDGs”



Back-casting approaches
Bridging STI and policy
Monitoring progresses

Services and systems
Technologies
Data
Social implementation functions

Performance indices
Finance
Coordination
Capacity Building

Three-layers of STI for SDGs Roadmaps

Roadmap (A)

"Roadmap for executive facilitation on STI for SDGs"

-an executive roadmap for high-level monitoring of progress by policy makers in the United Nations and the member countries

Roadmap (B)

"Roadmaps for strategic implementation of selected themes and goals"

-practical roadmaps focusing on core challenges relevant to the SDGs

-shared by multi-stakeholders working together to tackle the core challenges

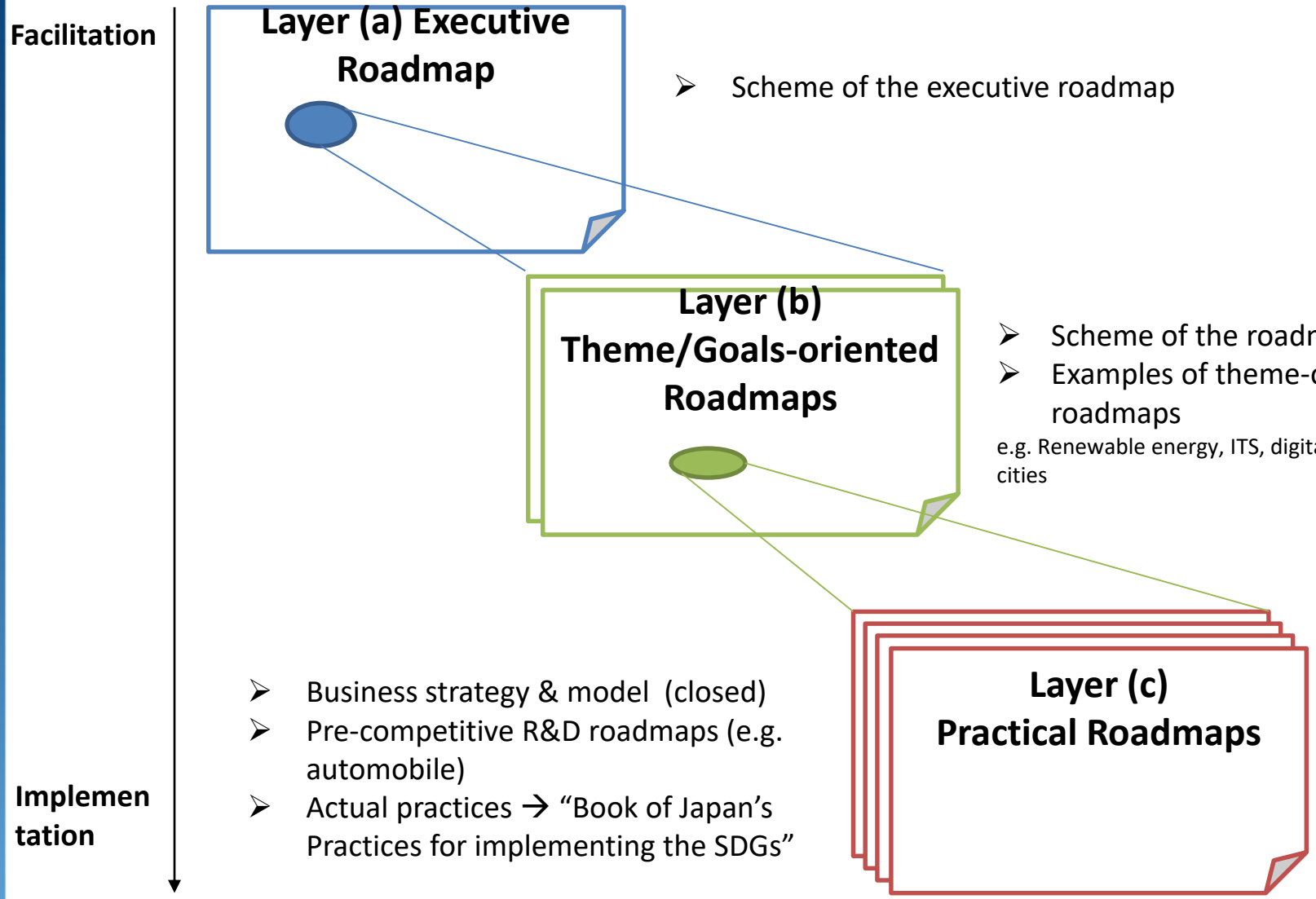
-composed of social, economical and technological dimensions to implement various activities among multi stakeholders

Roadmap (C)

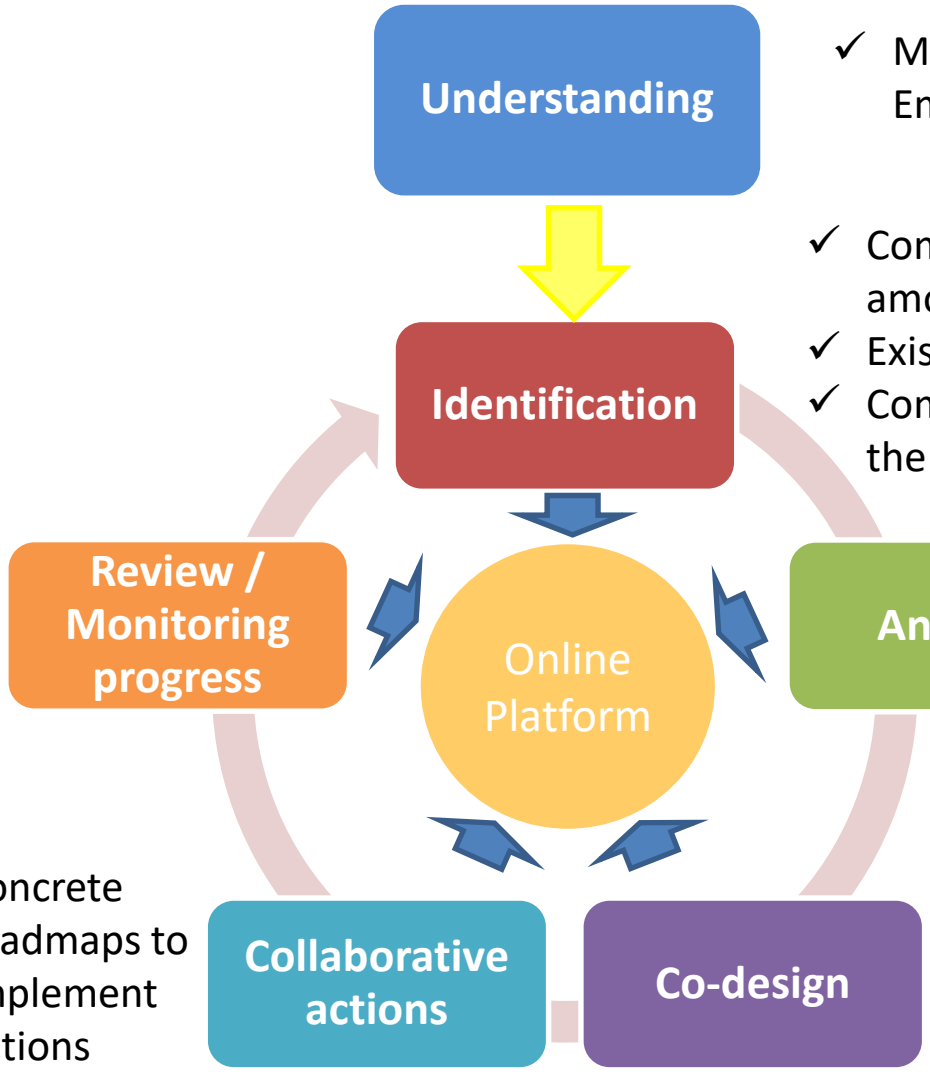
"Concrete roadmaps on individual projects on STI for SDGs"

-customized roadmaps to deploy S&T in a community, city, state and country

Correlation of the 3-layered roadmaps



DRAFT: How to develop STI for SDGs roadmaps



- ✓ Mapping and Interlinkage, Emerging Technologies

- ✓ Common challenges / issues to tackle among multi-stakeholders
- ✓ Existing roadmaps/ strategies/ instruments
- ✓ Common visions to achieve in relation to the SDGs

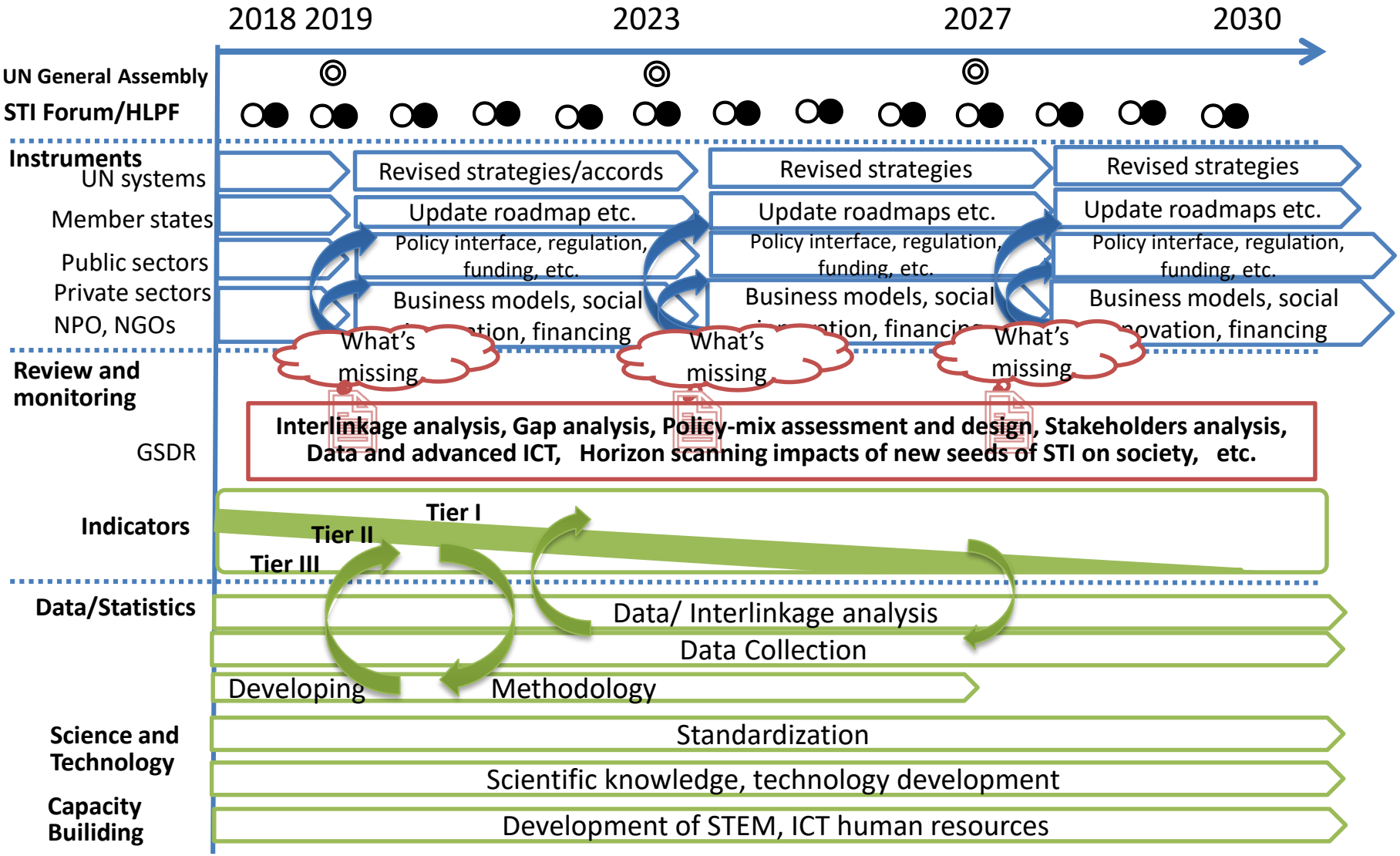
- ✓ Gaps between current status and goals
- ✓ Pre-competitive research areas
- ✓ Any socio-economical factors to be taken account

- ✓ Dialogue among various stakeholders
- ✓ Prioritize the goals and targets
- ✓ Finding collaborators

- ✓ Concrete roadmaps to implement actions
- ✓ Financing
- ✓ Standardization

Layer (a)

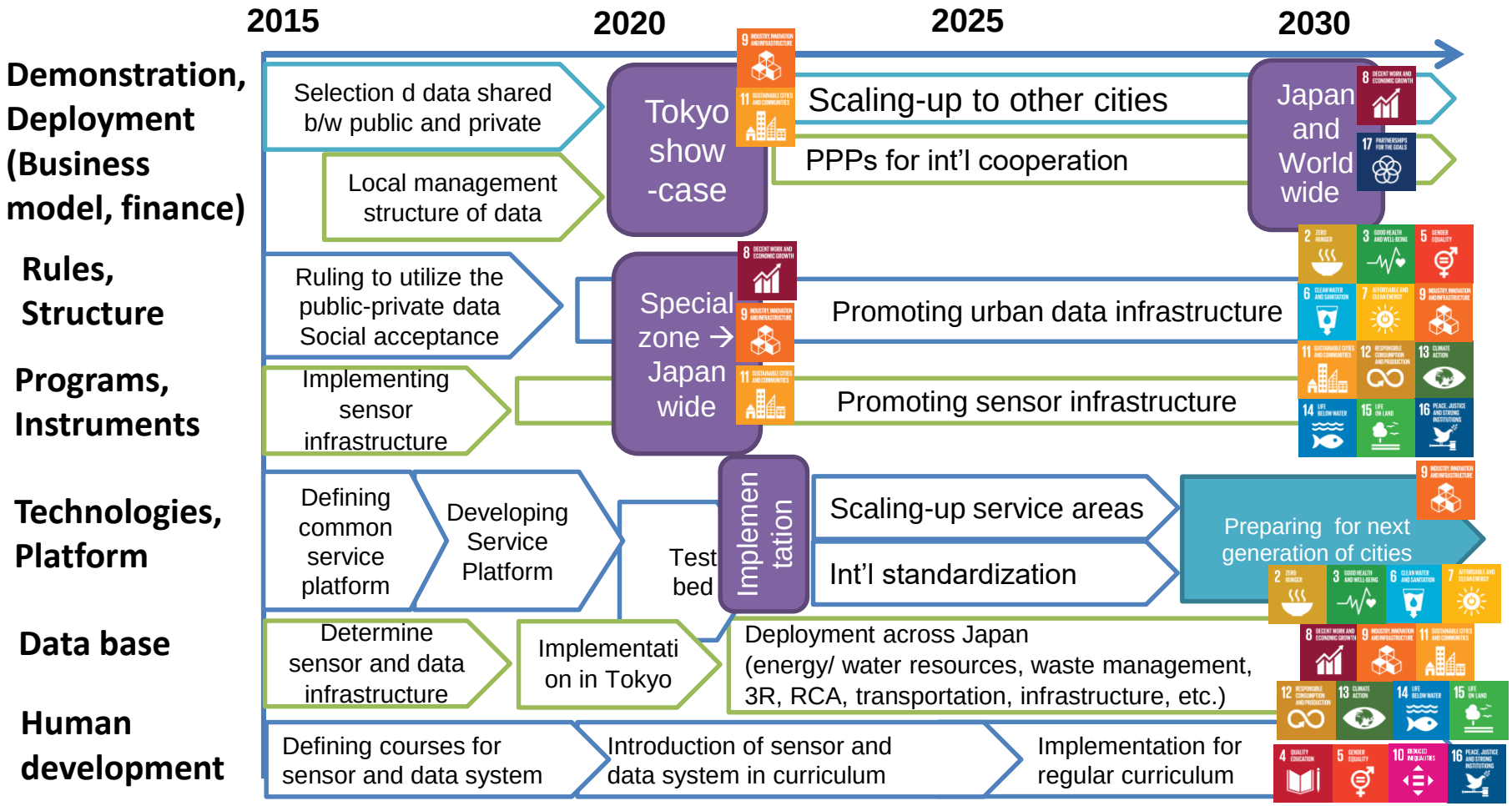
DRAFT: Scheme of an Executive Roadmap



Roadmap for Society 5.0

Modified by JST, Source from Keidanren

An example toward digitized activities in urban cities



Workshop on Road Maps on STI for SDGS

- Workshop will be held in early May 8th and 9th (Date and venue to be confirmed)
- Discussion on the roadmaps regarding
  - Sharing the scope on roadmaps
  - Methodology
  - Examples
- With UN IATT, Experts, Championing member states and other participants
- To be reported at the session in STI Forum 2018
- To expand toward 2019

Match-making

- May be necessary to create mechanism for match-making off line or analog rather than STI Forum or Online Platform.
  - Who will do?
  - Regional, national, community?

  etc.
- May Japanese experience of match-maker of needs to seeds be of some valuable reference?

Finally…

- How to build a happy relation between society and science is crucial.

=Building **“Trust”** of science or scientists by society and people

=Making interactive and trust worthy **science- policy interface**

- The key is science advice system in the context of **“science for policy”,** but not “policy for science”.

Thank you for your attention.