

The University of Tokyo

Symposium: Reforming Science, Technology Innovation Policy Making Process  
and Human Resource Development

**Session 2: Interdisciplinary Education Program for Science, Technology and  
Innovation Policy**

# **Japan's Initiative for the "Science of Science, Technology and Innovation Policy" and Human Resource Development Program**

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# Economic and Social Structural Changes

~ Progressing and Expecting ~

- ❑ Changes of Demographic Factor: Total population on the earth will be more than 90 billion in the middle of 21<sup>st</sup> century. (rapid increases in the developing countries, the aging problem in the developed country).



Population in size and location, Labor mobility, Income distribution, Fiscal balance and social security system, international competitiveness and trade imbalance etc.

- ❑ Capital flow will be expected to mobilize and activate around the world in the borderless business society.



Increasing necessities of the international coordination among countries in economic and diplomatic policy.

- ❑ Information Technology and development of the software will be enlarging the information flow around the world and expanding the perception gaps among countries and races among different religions and histories.



Realizing the perception gaps and increasing conflicts among countries and races

How can we develop science and technology to solve above problems and implement the new social value in the world?

# Why do we need to develop the “Science of Science, Technology and Innovation (STI) Policy ” now?

- ❑ Growing expectations for Science, Technology and Innovation (STI) to cope with societal challenges - responding appropriately to economic and social structural changes.



Multifaceted analysis and understanding of the economic and social conditions, societal challenges, and the present status and potential of science and technology - necessary to cope with the challenges.

Evidence-based policy formation, involving a more rational process, is required.

- ❑ Deepening the understanding the dynamic and complex process in STI, and visualizing the social and economic impact of STI policy. The results must be utilized in actual policy formation, ensuring transparency in decision-making in order to provide accountability to the public.
- ❑ Making use of evidence as a shared social resource, which serves as a foundation for public participation in policy formation.



Developing the “Science of STI Policy” to realize evidence-based policy formation.

# Requirement for Redesign of STI Policy Formation After the Great East Japan Earthquake

- ❑ Lost of the reliability of the scientists
- ❑ Poorness of the risk communication between government officials, academic communities and between government and public.
- ❑ Lack of control risk information between local and central government.
- ❑ Demand for policy reappraisal to ensure a safe and secure society, stable energy supplies and the dissemination of renewable energy.
- ❑ Renewed awareness of the limits of Science and Technology - required for a reappraisal of previous policies.
- ❑ High expectations of the role of Science and Technology to address social issues facing Japan in order to recover from the disaster and promote sustainable growth and development of the social economy.
- ❑ Need to conduct serious and objective reviews of previous policies to rethink the proper role of Science and Technology, and to identify a vision and strategy detailing how science and technology can contribute to society.



Now is the time to promote the "Science of STI Policy" to advance evidence-based policy formation.

# Design Philosophy

The design of the “Science of STI policy” should be based on the following philosophies:

1. Form policy with scientific rationality
2. Realize a rational policy-forming process
3. Increase transparency of the policy-forming process and assure public accountability
4. Make all knowledge obtained from the Science of STI policy available to the public
5. Establish collaborations among stakeholders, so as to engage in appropriate policy formation, in accordance with defined functional roles and responsibilities

# Guiding Principles

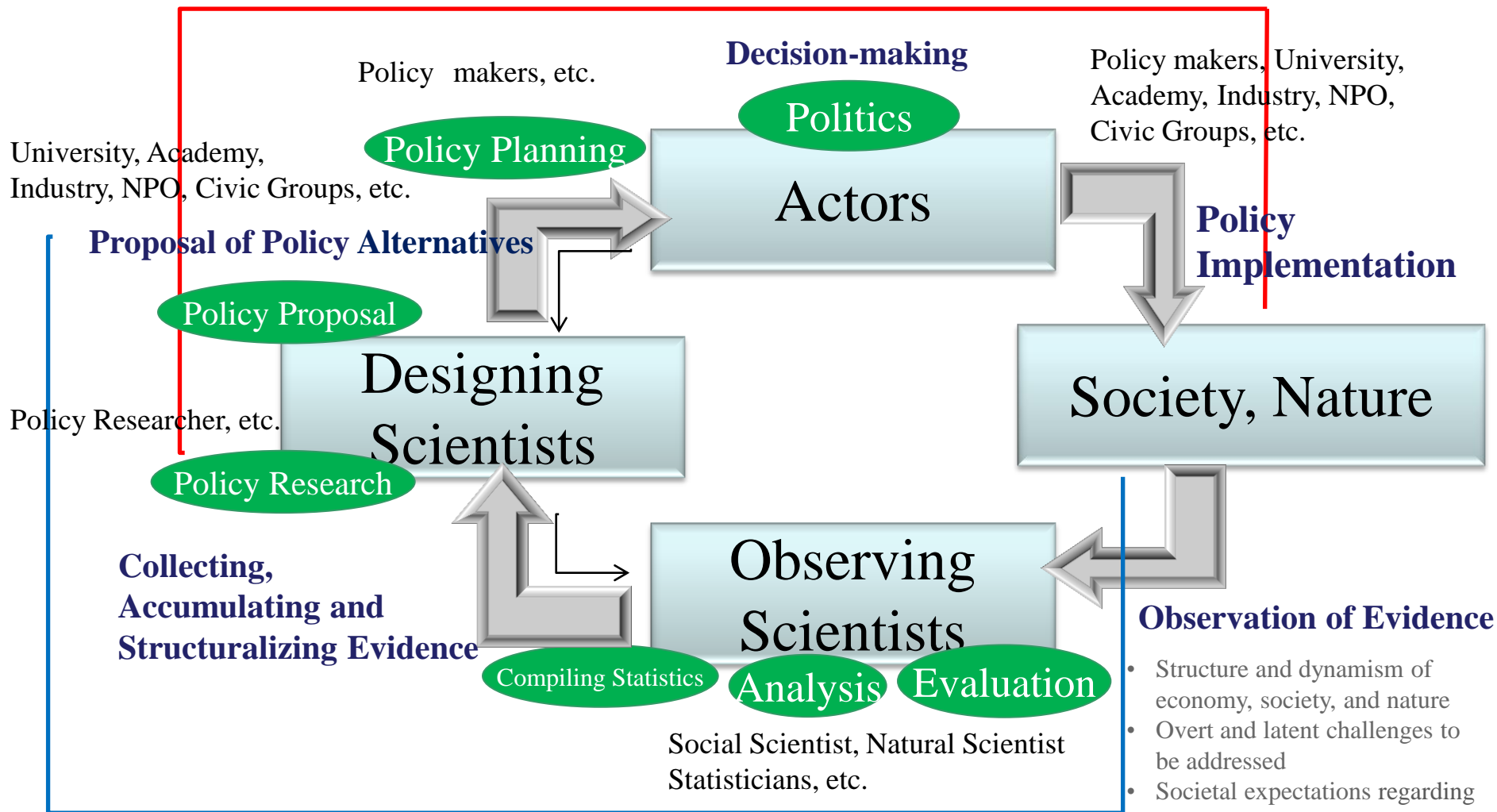
The guiding principles to realize the stated philosophy are as follows:

1. Realize co-evolution of the policy formation mechanism and the “Science of STI policy”
2. Facilitate public participation in the policy formation process by presenting evidence-based alternative policy menu (\*)
3. Develop the “Science of STI policy” through collaborations among various natural and social scientific fields. Use the knowledge collected, accumulated and structuralized from the “Science of STI policy” as common assets of society, to inform and guide policy formation.
4. Define the functional roles and responsibilities of government, the science community, industries and the public regarding policy formation in order to facilitate collaboration. Then establish a code of conduct for each party.
5. Foster human resources who can take leading roles in an innovative policy formation process and the “Science of STI policy”. Build communities and networks for them. Create improved environments that enable them to be active across organizational and national borders.

(\*) “policy menu” is defined as a combination of alternative policy instruments with a description of its estimated social and economic impacts.

# The Role of the “Science of STI policy” in Society

## Evidence-based Policy Formation

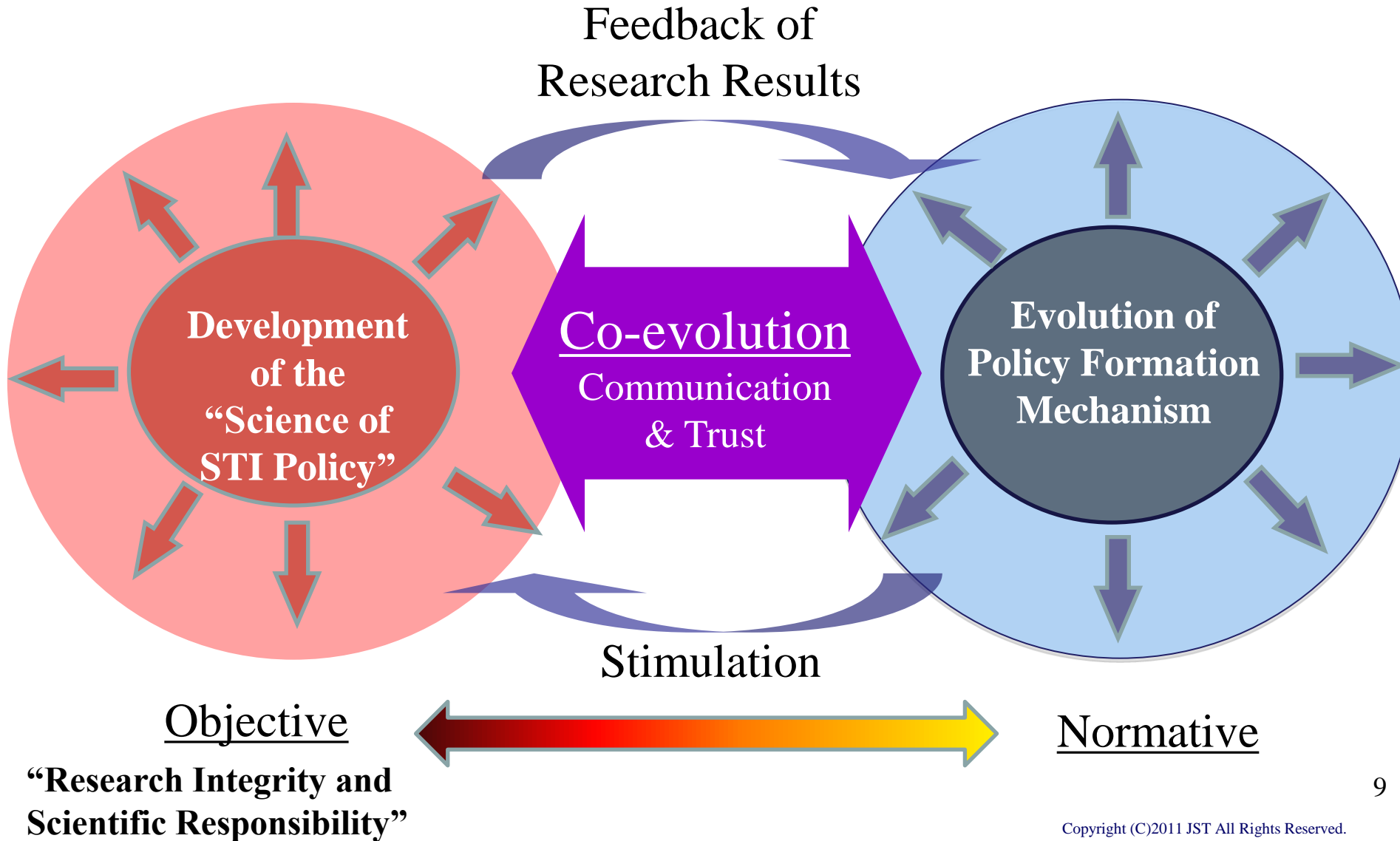


- Structure and dynamism of economy, society, and nature
- Overt and latent challenges to be addressed
- Societal expectations regarding science and technology
- Level of science and technology, and its potential

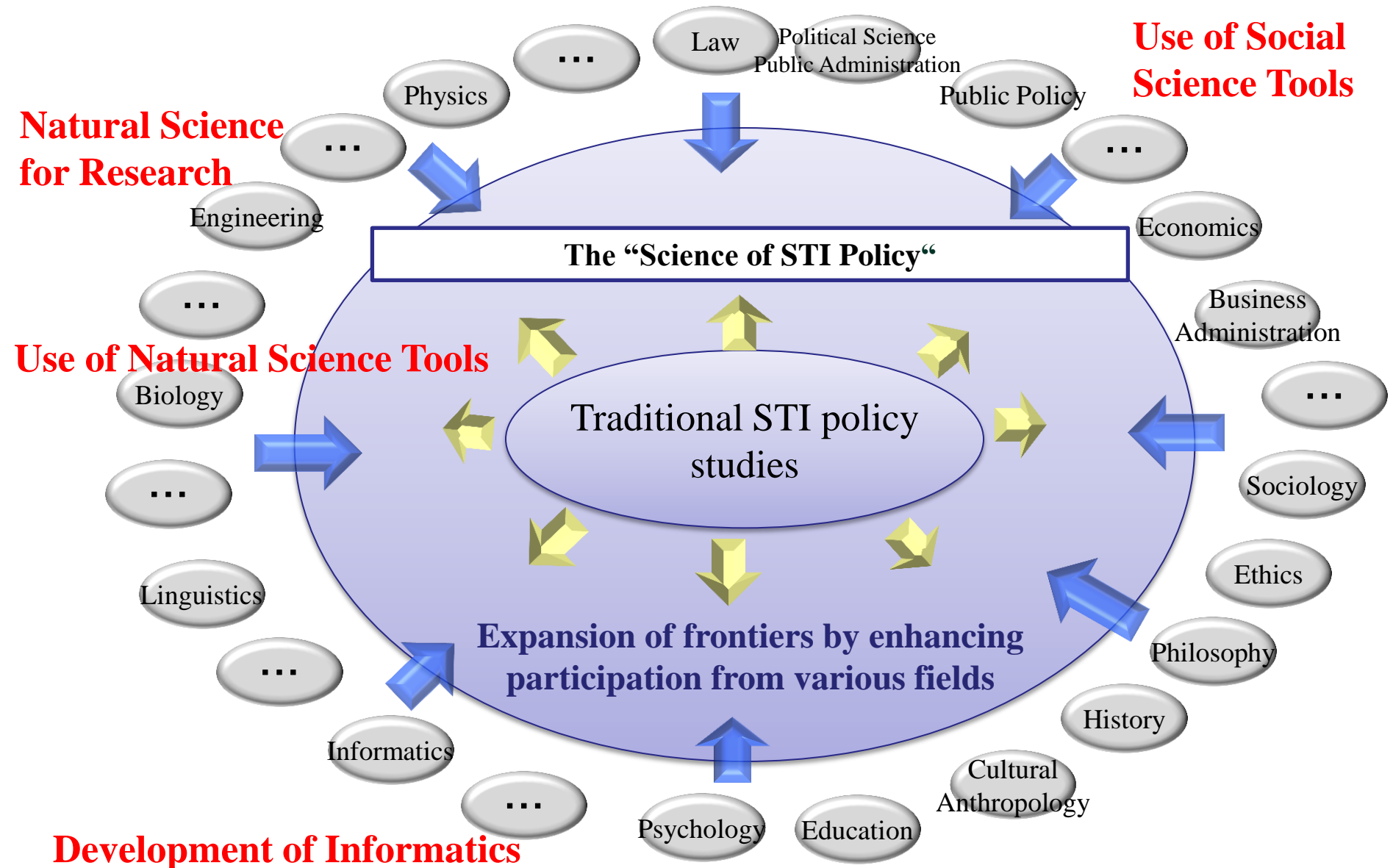
## The “Science of STI Policy”



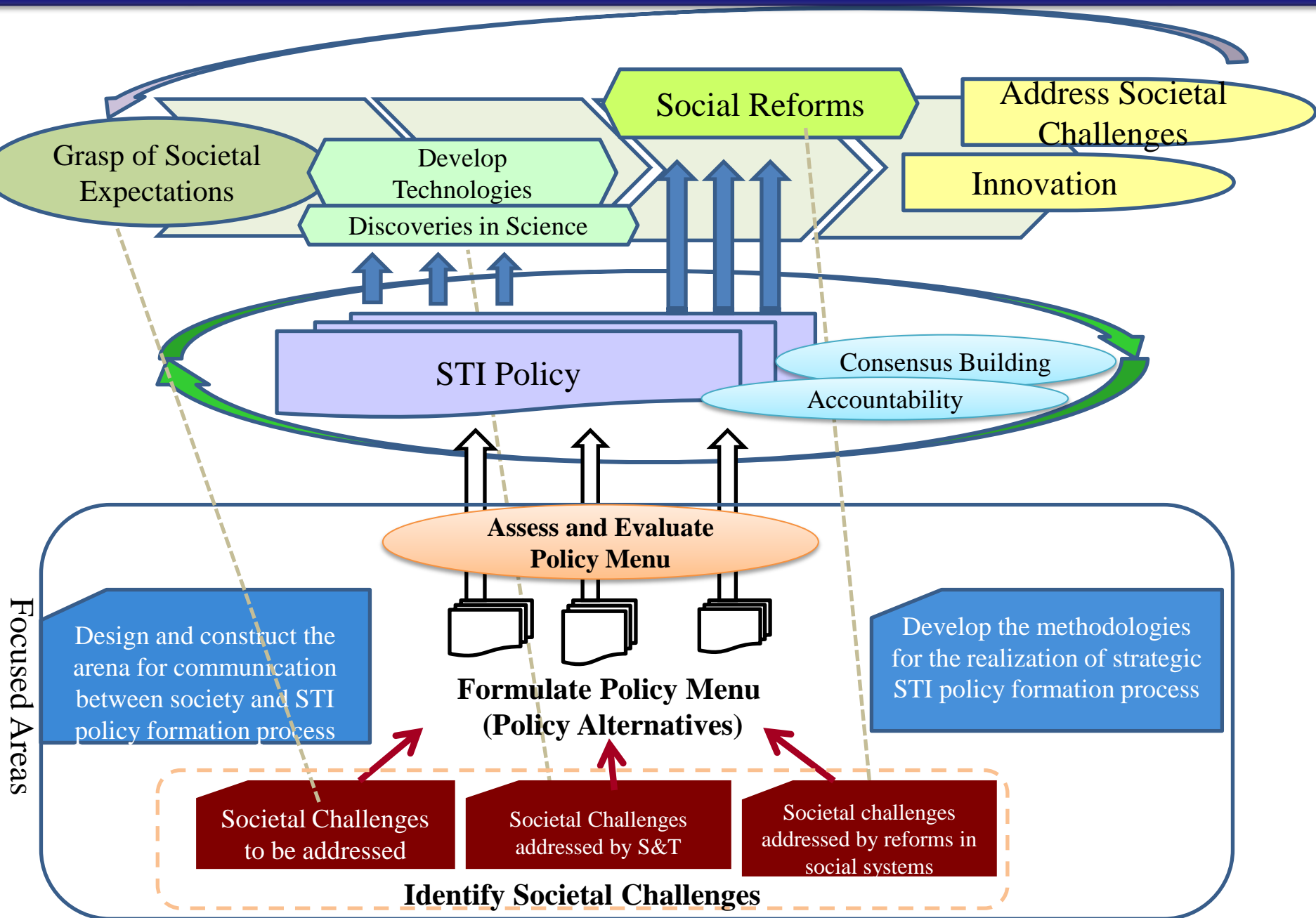
# Co-evolutionary Development of the “Science of STI Policy” and the “Policy Formation Mechanism”



# Expansion of Frontiers by Enhancing Participation from Related Fields



# Targets and Focused Areas of the “Science of STI Policy”



# The “Science of STI Policy” Needs to Answer Important Questions

Society

Science, Technology and Innovation (STI) System

Policy Formation Process

**Understanding the Social and Economic Impacts of STI Policy**

- How can we evaluate the impacts of STI Policy?
- What is the outcome? How to evaluate economic and social value ?
- What are the differences in outcomes among alternative policy instruments? How can we measure them? etc.

**Understanding the Dynamics of STI System**

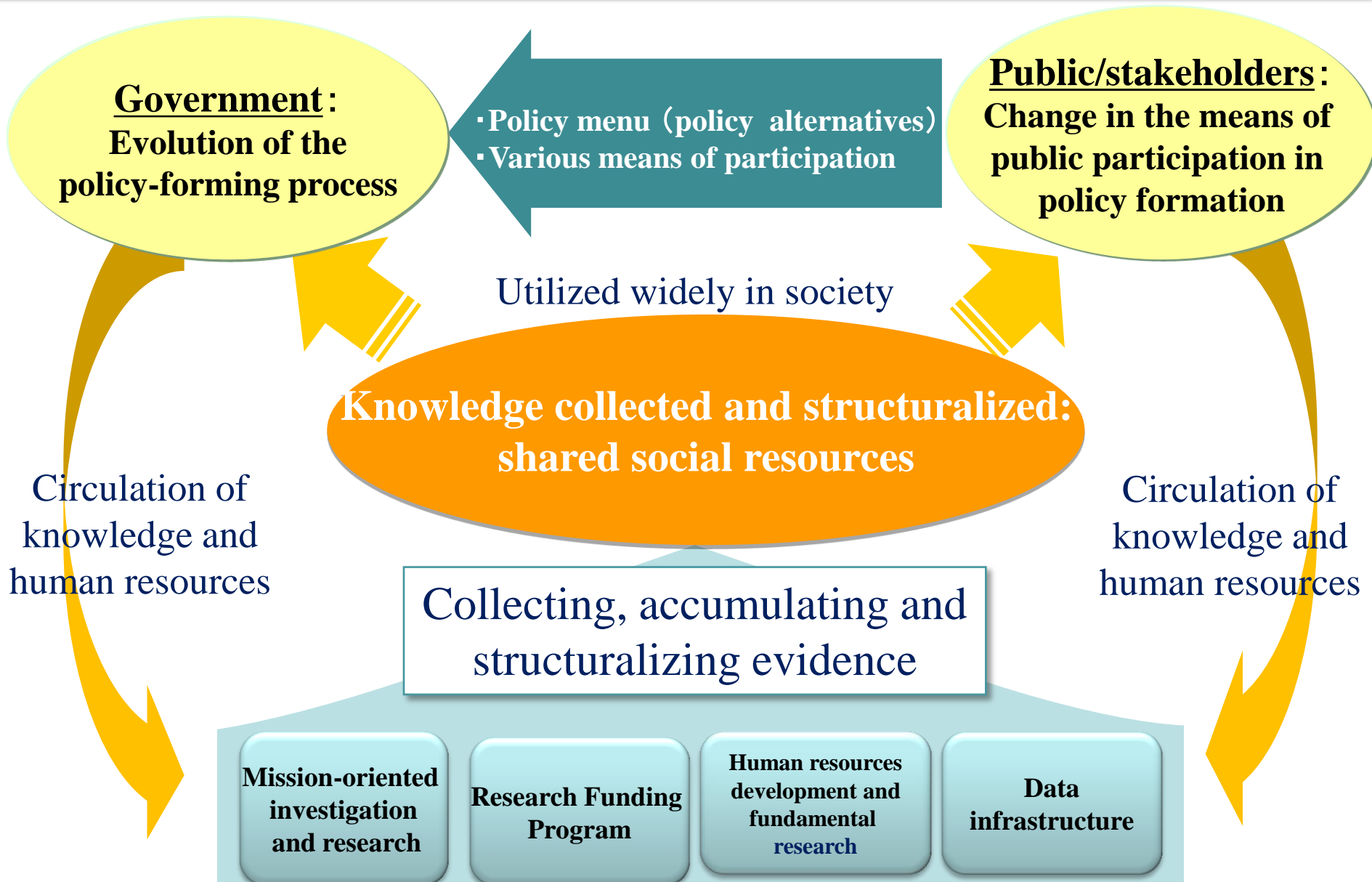
- What is the process involved in STI?
  - Who are the main actors?
  - What is needed ? (Finance, HR, Infrastructure, Management )?
  - Diffusion and adoption process of ST
  - Barriers to STI
  - Interaction with other types of innovation (ex. Social innovation) etc.
- What is the government role in STI Process?

**Understanding Policy Formation Process and its Interaction with Society**

- What is the objective of STI Policy?
- How do we identify and select societal challenges to be addressed by STI Policy ?
- What is the process of STI Policy Formation? Who are involved?
- How is it possible to build consensus in STI policy formation?
- What is the relationship between STI Policy and other policy areas?

Any synergetic effects or impediments? etc.

# Achievements in the Development of the “Science of STI Policy”



# Promotion of Science of STI (Science, Technology and Innovation) Policy

Draft Budget for FY2012: 1,077 million yen  
(Budget for FY2011: 802 million yen)  
(※Including estimated amount of JST budget)

## Current Conditions and Issues

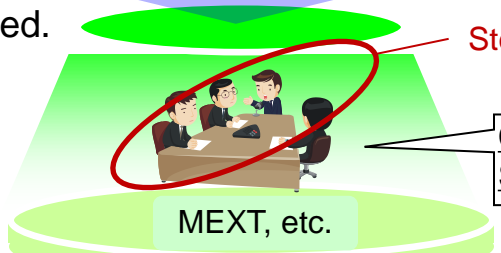
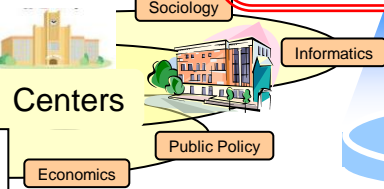
- Difficulty of assessing the impacts and effects of Public R&D investment scientifically.
- Data infrastructure is insufficient for evidence-based policymaking for STI.
- Professional STI policymakers who understand the overall policy area are scarce and their career path is unclear.

In order to realize “evidence-based policymaking” and to devise effective policies for solving issues based on measuring and understanding economic and social conditions from various viewpoints, the improvement of systems and infrastructure, and the promotion of related research and human resources development for the Science of STI Policy should be conducted.

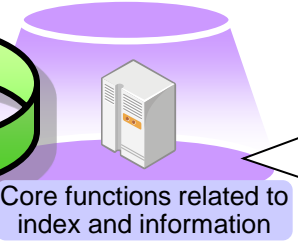
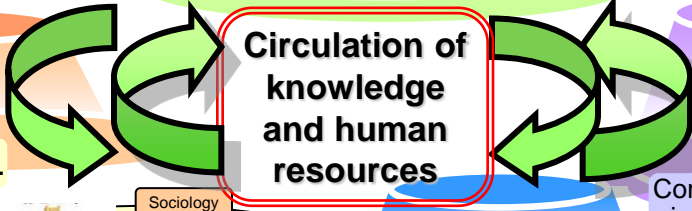
Launching research funding program for the Science of STI Policy 【JST】



Formation of centers for research and human resource development in the field of Science of STI Policy 【MEXT】



Constructing the system for promoting the Science of STI Policy 【MEXT】



Strengthening capacity of core functions of STI index and information 【MEXT/NISTEP】



Enhancing policy-oriented investigation research for STI policy 【NISTEP】

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# Human Resources to be Developed

## **1. Researchers who expand the frontier of “Science of STI policy” as science**

Ex.) Researchers who specialize in the “Science of STI Policy” and expand the frontier.

## **2. Policy-makers who proceed evidence-based STI policy-formation with scientific perspectives**

Ex.) Policy-makers for STI Policies / Personnel to conduct research strategies and corporate planning in universities and public research organizations.

## **3. Personnel who contribute to connect the “Science of STI Policy,” other academic disciplines and the society**

Ex.) Personnel who involve in STI Policy formation actively in universities, research organizations, private companies, and NPOs, as well as play active role based on each specialization in natural and social sciences and humanities. The public who understand policy and research outcomes and participate in the process of policy-formation through democratic means.



# Core Competencies of Human Resources for the “Science of STI Policy”

## EDUCATIONAL CONTENTS

III. Knowledge and skills for specified area

IV. Practical learning related to policy-formation and implementation

II. Understanding of STI

## CORE COMPETENCIES

V. Basic methodology for research

3. Formulate alternative policy options and estimate impacts of the alternatives.

## POLICY FORMATION PROCESS

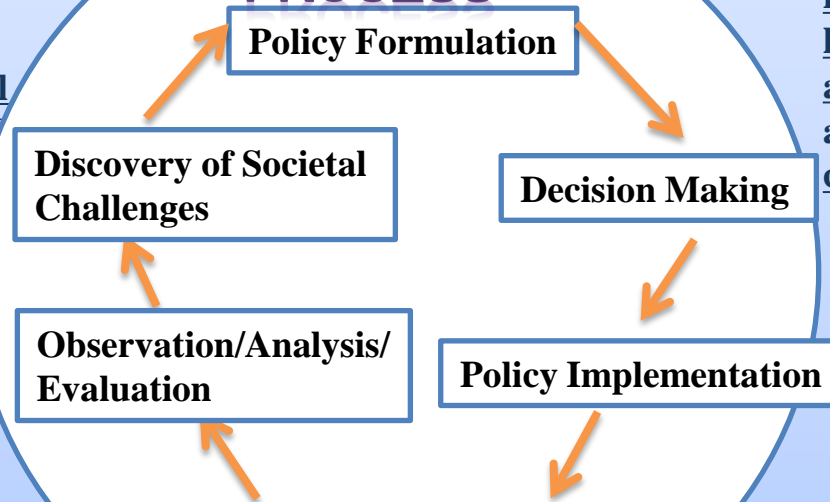
I. Understanding of STI Policy and policy-formation process

4. Conduct decision making, based on leaderships, evidences and consensus, under appropriate code of conducts.

2. Discover and select societal issues to be addressed by STI policy

1. Observe evidences, construct theories and models to explain the evidences and synthesis them

5. Conduct management and evaluation, informed by evidences.



Dynamics of Society and Nature

# Expected Educational Contents

## <Examples of contents>

### I. Understanding of STI Policy and policy-formation process

- Basic concept of Policy-formation
- System of policy-formation (Funding System, University-industry-cooperation, Intellectual property, Ethics etc)
- Tools for policy-formation (Policy evaluation, Evaluation of R&D, Technological forecasting etc)
- Benchmarking of STI policy in the world

### II. Understanding of STI

Knowledge for the history, current stage and prospects of the development of S&T

- Trends in S&T (Life science, Nanotechnology, Environment science etc)
- Understanding of basic concept and structure of Natural sciences and Engineering

Understanding of activities, process and system of STI

Understanding the relations between the economy and society and STI from the economic, historical, social and ethical point of view)

### III. Knowledge and skills for specific area

Basics and theory

- Economics, Business Administration, Sociology, History, Ethics, Law, Politics, Public administration etc.,

Empirical methodology

- Quantitative method (Econometrics, Bibliometrics etc)  
-Qualitative method (Case Study, Social Research Methods etc)

Issues and domain oriented knowledge

- Issues (such as energy and medical) and domains (such as life-science, and nanotechnology) oriented knowledge and skills

### IV. Practical learning related to policy-formation and implementation

Internship, etc.,

### V. Basic methodology for research

Methodology for research, Thesis/Research Project etc.,

# Outline of the “Hub Institutions for Fundamental Research and Human Resource Development Program”

( MEXT Promotion of the “Science of STI Policy”)

- **The aim of the program:** to support universities (“Hub Institutions”) to
  - Develop research personnel to advance the “Science of STI Policy”, and human resources to facilitate its social implementation,
  - Establish graduate programs with multidisciplinary curricula or coursework, incorporating social sciences and humanities and natural sciences, and
  - Establish a network structure joining hub institutions in order to enable nationwide, systematic HR development.
- **Program Period:**
  - The hub institutions will start their programs during fiscal year 2013. (Admission processes will be starting during fiscal year 2012.)
  - Total period: Fifteen years unless otherwise stipulated.

# Outline of the “Hub Institutions for Fundamental Research and Human Resource Development Program” (contd.) ( MEXT Promotion of the “Science of STI Policy”)

## Types of hub institutions selected:

- A “*Hub of Institutions*” (GRIPS):
  - Take a leading role to advance the “Science of STI Policy”,
  - Establish human resource development programs incorporating multidisciplinary curricula to foster human resource capable of enhancing the Science and demonstrating initiative in global society, and
  - Assume a leadership in coordinating all other hub institutions.
- “*Field Pioneering Hub Institutions*” (The University of Tokyo, Hitotsubashi University, Osaka University [Jointly with Kyoto University], and Kyushu University):
  - Establish human resource development programs independent of existing programs and leverage strengths in their respective fields of expertise to enhance the “Science of STI Policy”,
  - Foster human resource capable of enhancing the Science and demonstrating initiative in global society, and
  - Facilitate inter-hub coordination by assisting the *Hub of Institutions*.

# Outline of the “Hub Institutions for Fundamental Research and Human Resource Development Program” (contd.) ( MEXT Promotion of the “Science of STI Policy”)

## The University of Tokyo

- Focused area: Public policy and engineering
- Establish an interdepartmental education program within existing postgraduate program

## Hitotsubashi University

- Focused area: Interdisciplinary innovation research with a foundation in social sciences including management and economics
- Establish a doctoral-level certificate course

## GRIPS

### National Graduate Institute for Policy Studies

- Establish a master's program and doctoral program in the “Science of STI policy”
- Guide inter-hub collaboration and promote the development of the academic discipline and community

## Osaka University (Jointly with Kyoto University)

- Focused area: Ethical, legal and social issues (ELSI) in science and technology
- Establish a minor specialization as a part of existing master's programs

## Joint Program

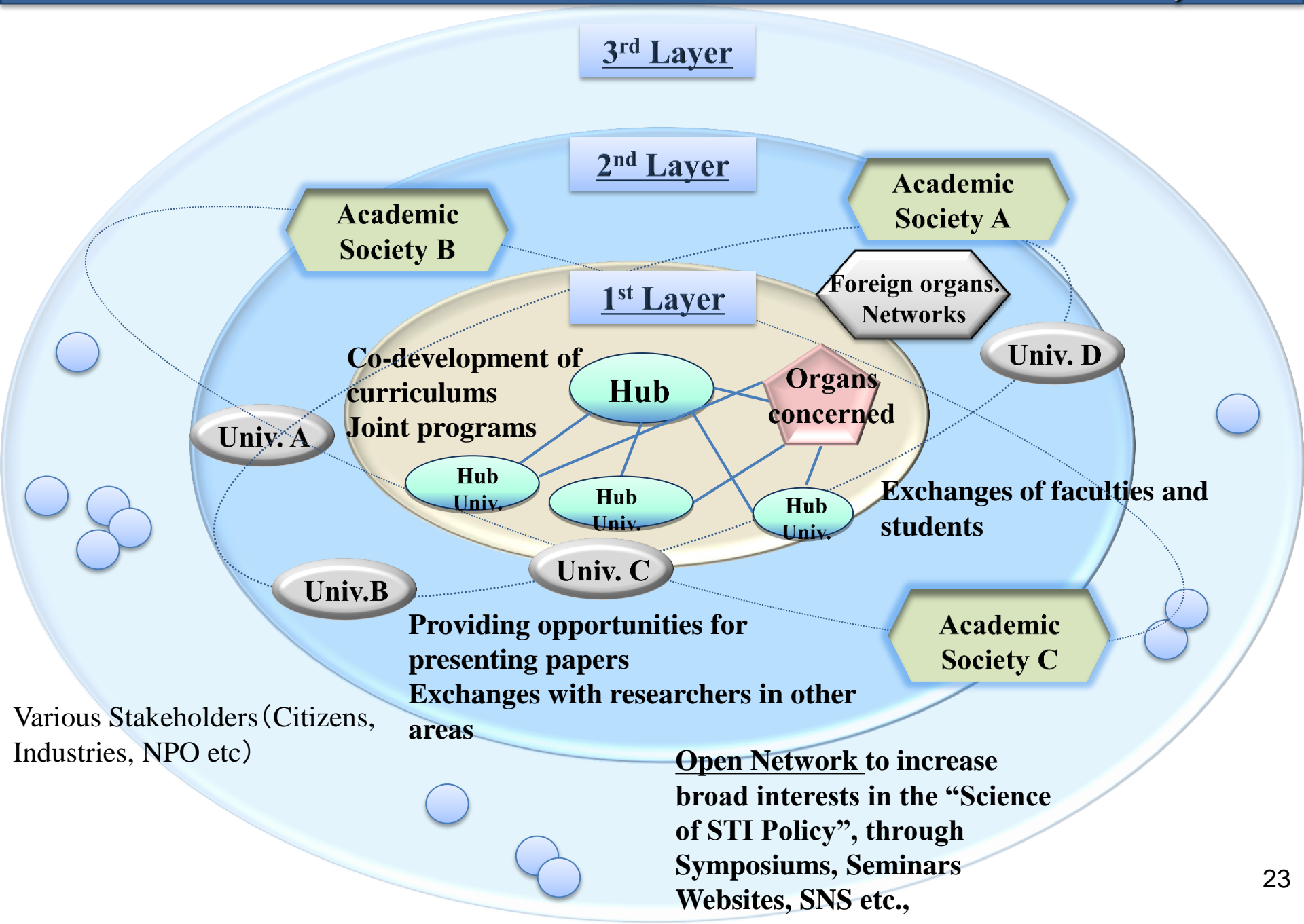
- Provide opportunities for gatherings : Seminars, summer-camps, etc.,
- Share characteristic curriculums of each institution etc.,

## Kyushu University

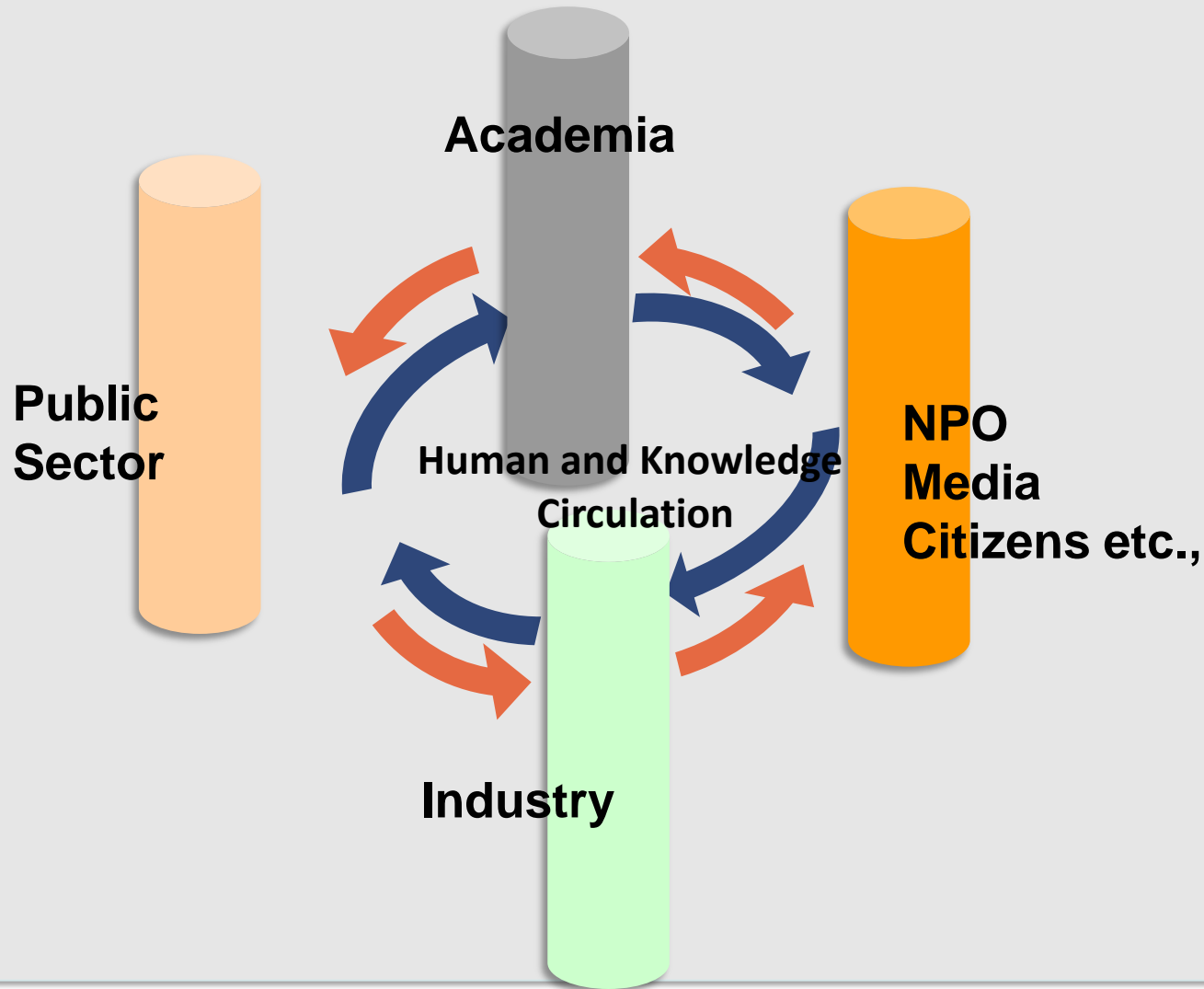
- Focused area: East Asian and regional innovation,
- Establish a specialized course consisting of interdisciplinary postgraduate subjects

1. Build open platform to promote collaborations and expand networks:
  - Among Natural Sciences: to understand diversified and complex nature of S&T
  - Social Sciences and Natural Sciences: to understand the process of STI in Social Systems
  - Science Community and Policy makers: to grasp policy needs to enhance the feedback to policy formation process
  - Industry and Society: Accountability and Consensus Building
  - International

# Collaborations and Networks for the “Science of STI Policy”



## 2. Diversified career paths to promote human and knowledge circulations

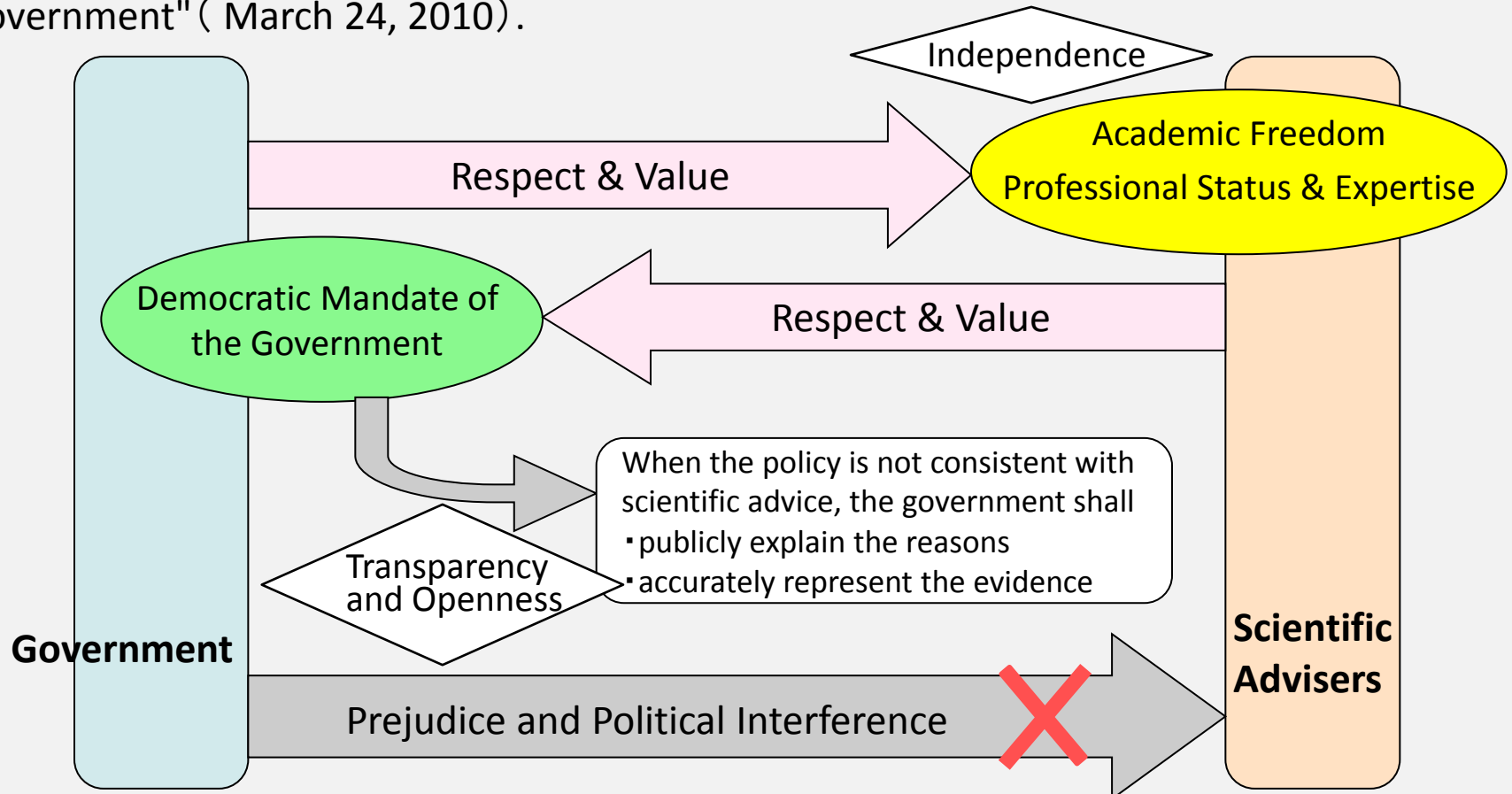




# Expectations for the Future Developments of Human Resources (contd.)

## 3. Define the functional roles and responsibilities of government, the science community, industries and the public regarding policy formation in order to facilitate proper collaboration.

Ref.) UK Department of Business, Innovation, and Skills, "Principles of Scientific Advice to Government" ( March 24, 2010).



“ Scientific advisers should respect the democratic mandate of the Government to take decisions based on a wide range of factors and recognize that science is only part of the evidence that Government must consider in developing policy.”