

Encouraging Evidence-based STI Policymaking in Japan: Overviewing Science for RE-designing Science, Technology and Innovation Policy (SciREX)

Shinano Hayashi,
Science, Technology and Innovation Policy Unit,
Center for Research and Development Strategy,
Japan Science and Technology Agency.
Shinano.hayashi@jst.go.jp

Context for this Presentation

- Background of Japan's 'Science of Science Policy'
- What is 'SciREX'?
- How far have we come?
- Re-defining the targets and linking to user needs
- New activities

Why Japan needs to polish STI policy

- Achieving Sustainable Economy: Vitalizing Abenomics,
- Value creation in the 21st century,
- Enhancing emerging technologies.



- Harmonizing policymakers and STI communities.
- Improving use of tools such as research funding.

What is 'SciREX'?

- *Science for RE-designing Science, Technology and Innovation Policy* (SciREX) is a program initiated by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) for enhancing evidence-based policymaking.



Design philosophy of the SciREX program (from *CRDS Strategic Proposal*):

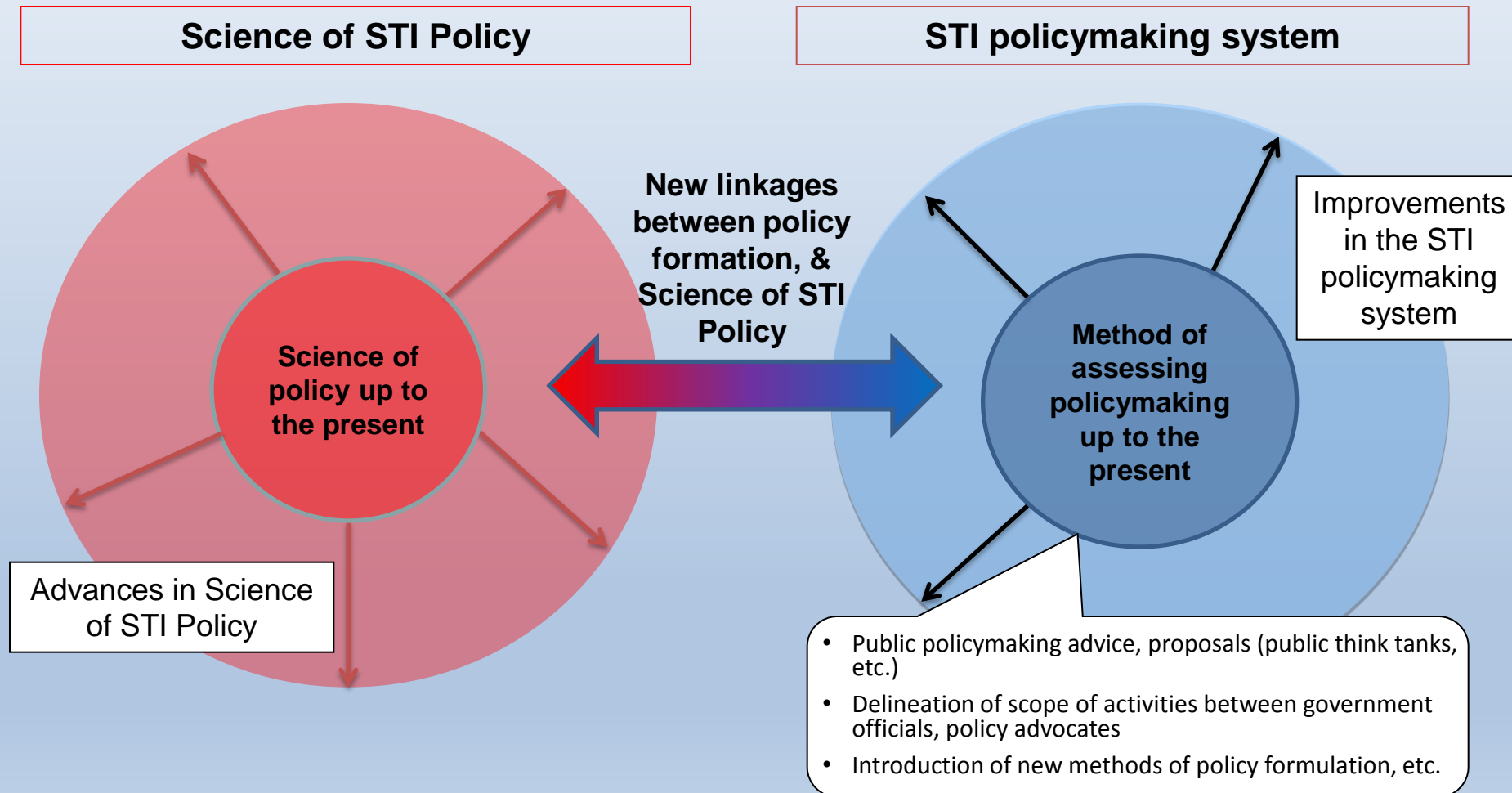
- 1. Formulate policy based on scientific rationality,**
- 2. Attain scientifically rational policymaking processes,**
- 3. Assure public accountability raising policymaking transparency,**
- 4. Publicly disseminate research results and findings so as to further public participation in policymaking processes,**
- 5. Promote collaboration, clarify division of responsibilities among policymaking participants and contributors.**

(Source: JST-CRDS (2010), *Towards Realization of Evidence-based Policy Formation: Development of Science of Science, Technology and Innovation Policy*, CRDS-FY2010-SP-13.)

In FY2011, MEXT established the SciREX program as an organizational framework for advancing such activities.

Science, Technology, and Innovation (STI) Policy and Science of STI Policy : An Integrated Approach

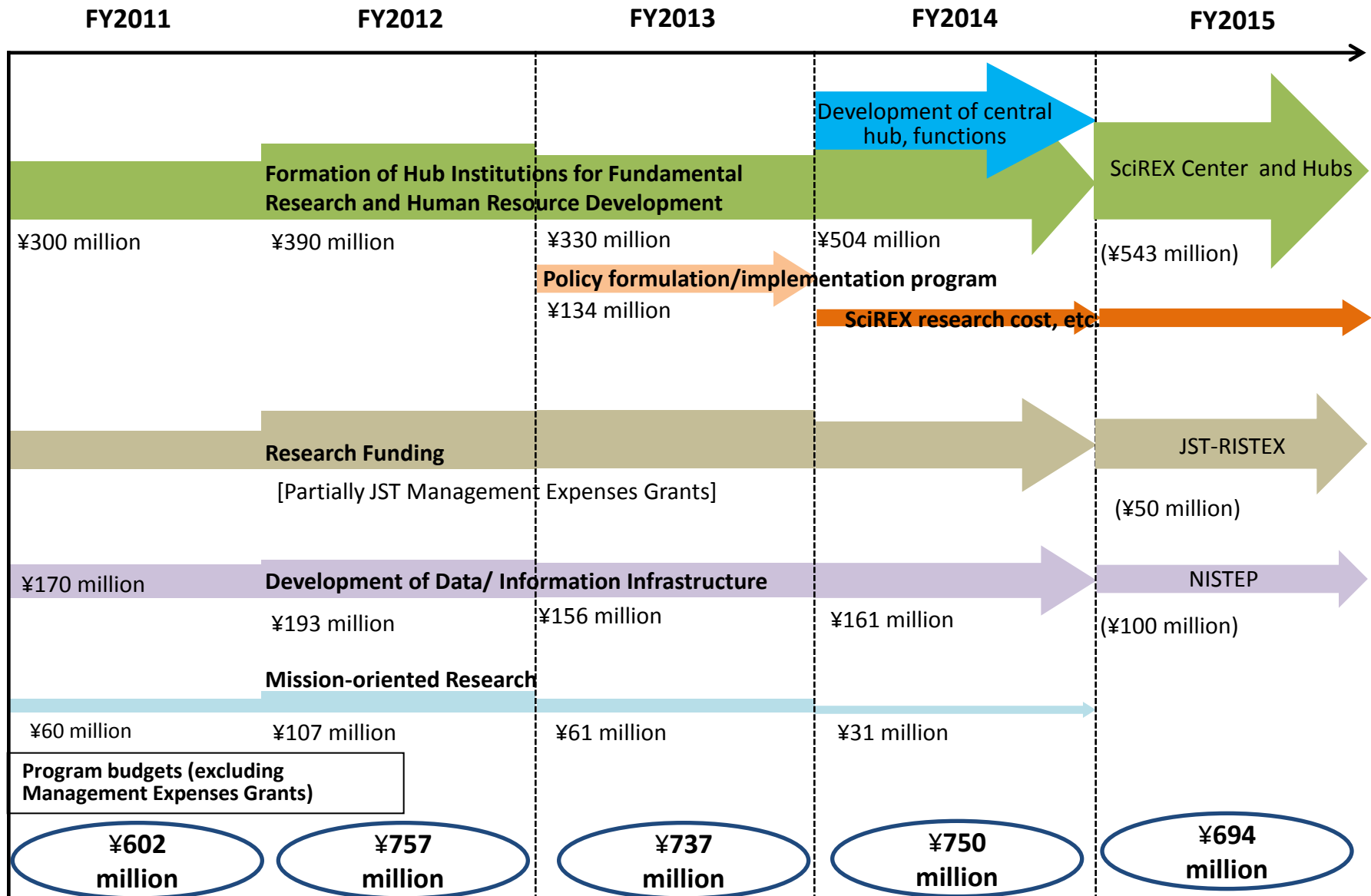
- Improving the science, technology and innovation (STI) policymaking system is only half the story. The other is developing Science of STI Policy.
- That is, advances in Science of STI Policy support improvements to the system, which in turn support advances in Science of STI Policy. Both are necessary for the process to work in a virtuous circle.



(Source)

CRDS Strategic Proposal: *Towards Realization of Evidence-based Policy Formation: Development of Science of Science, Technology and Innovation Policy* (2011)

Budgeting for Programs to Advance RE-designing Science Technology, and Innovation Policy (SciREX) under STI Policy



¥100 million is approx. 0.85 Euro as of Nov. 2016.

*FY2016 budget remains same level with FY2015.

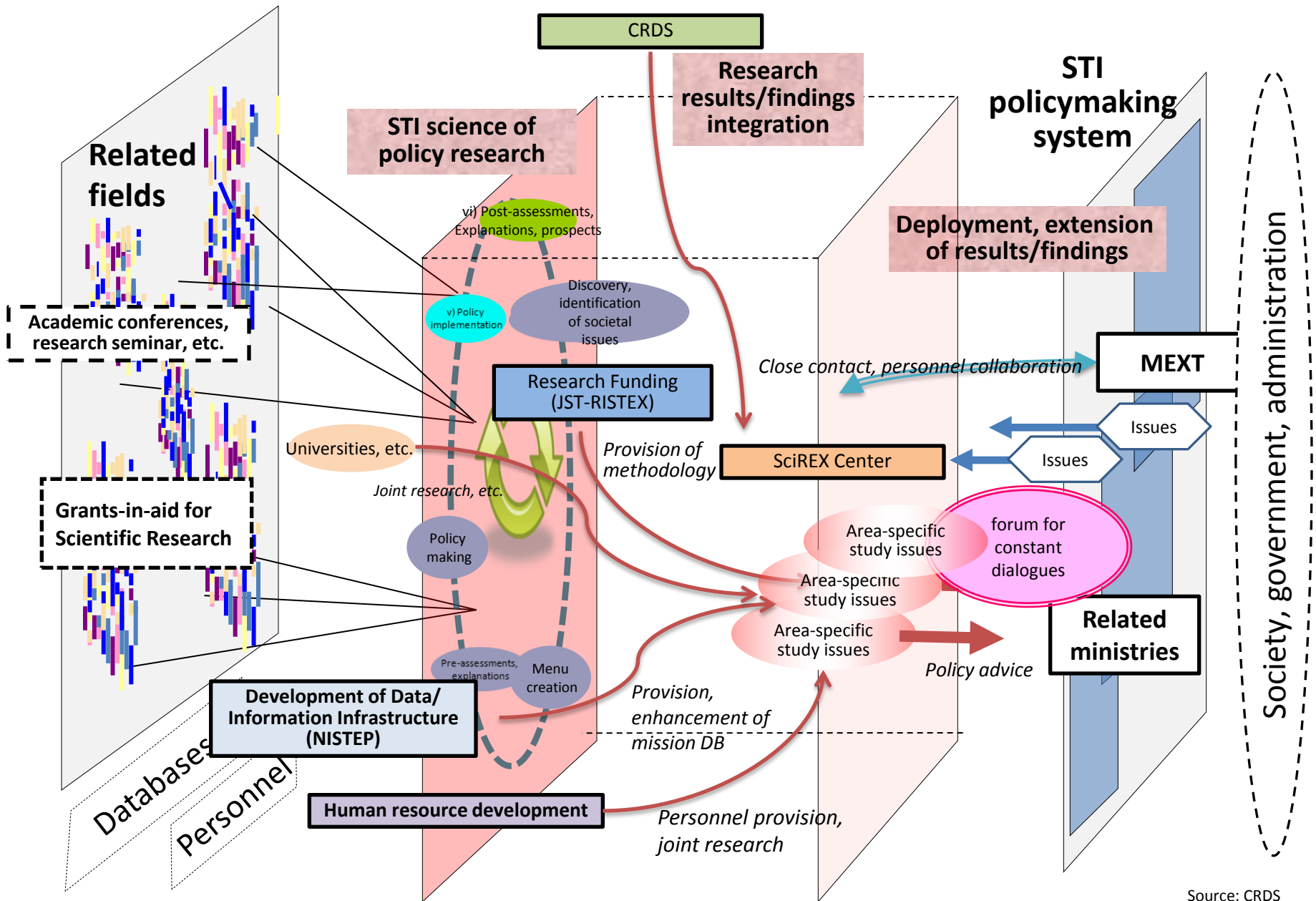
Structure of the 2nd phase SciREX Program

- The *Steering Committee*, consisting of members of MEXT, SciREX center, hub universities, and related institutes, is in charge of design and overall operation of the entire program.
- The *Advisory board*, externally selected panel, is designed to give suggestions for management of the program.
- The 2nd phase will last 5 years. In the 3rd year, external evaluation committee will examine a mid-term evaluation. And final evaluation will be given in the last year of the program.
- SciREX center and JST-RISTEX provide research funds respectively.

The former provides for researchers in hub-universities, and the latter is competitive fund.

- NISTEP initiates development of data infrastructure.

Relations among Central Hubs, Functions for Various SciREX Activities



Source: CRDS

Relation between (1) SciREX Center and (2) SciREX Hub Institutions for Fundamental Research and Human Resource Development

Functions of the SciREX hub



Construct collaborative/cooperative arrangements as a central hub

Promote research through projects within three programs

- Policy design program
- Policy analysis and impact assessment program
- Policy-making Process Program

Collaborative/cooperative arrangements among hubs

Centered on the National Graduate Institute for Policy Studies (central hub) and in collaboration with the University of Tokyo, Hitotsubashi University, Osaka University, Kyoto University, and Kyushu University (field-pioneering development hub), provide central core functions and, in addition to developing evidence-based indices and methods for policy implementation, work to acquire knowledge and experience through the medium- to long-term acquisition of data and know-how.

Hub of Institutions

GRIPS



Construct collaborative/cooperative arrangements

Field-pioneering development hubs

The University of Tokyo



Hitotsubashi University



Osaka/Kyoto Universities



Kyushu University



Joint programs

SciREX Hub Institutions for Fundamental Research and Human Resource Development

Human Resource Development by Hub: Progress Report

Type	Institution	Program type	Enrollment, FY2014	Enrollment, FY2015	Graduates, FY2013	Total enrollment, FY2014	Comments
Hub of Institutions	National Graduate Institute for Policy Studies GRIPS Innovation, Science and Technology Policy Program (GIST)	Degree program (master's, doctorate)	8 students (doctoral 7*, master's 1)	12 students ** (doctoral, new program, 2; doctoral, conventional program, 10)	2 students**	18 students (doctoral 17, master's 1)	* Including 3 students who enrolled in October **Including students in pre-existing related programs
Field-pioneering development hubs	Univ. of Tokyo Science, Technology and Innovation Governance (STIG)	Inter-departmental educational program	69 students	92 students	6 students*	145 students**	* Students for whom previous year credits were recognized (as a special measure upon course inauguration **Excluding 16 students who graduated in March 2014 and have no current affiliation with the school.
	Hitotsubashi Univ. Innovation Management and Policy Program (IMPP)	Doctoral-level certificate course	8 students	4 students*	-	12 students	* These 4 students accounted for 16 course enrollments in total (16 enrollments in the summer program).
	Osaka Univ., Kyoto Univ. Program for Education and Research on Science in Public Sphere (STIPS)	Osaka Univ. Minor program	11 students	15 students	2 students	23 students	In addition, 11 students newly enrolled in the advanced program (8 credits) in 2014 (total enrollment: 18 students)
		Kyoto Univ. Interdisciplinary research educational program	7 students	8 students	-	15 students	
	Kyushu Univ. Center for Science Technology and Innovation Policy Studies (CSTIPS)	Specialized course (shared graduate-level course)	Previous year's enrollment: 25 students (of whom 5 in adult education, etc.). Total of 40 students*, of whom 9* in adult education, etc.	Enrollees: 31 students (of whom 6 in adult education, etc.). Total of 53 students*, of whom 6* in adult education, etc.	2 students (enrollees who receive 8 or more credits for 4 courses)	44 students (2013 second semester + 2013 first semester enrollees). Cumulative total of 72 students.*	* Enrollees(cumulative total) who receive course credit. For 2013 academic year, 21 in first semester and 32 in second semester.

* Some figures are not directly comparable because of differences (e.g., in program or completion requirements) between hubs.

Hub Institutions for Fundamental Research and Human Resource Development Summer Camp

Time and place: Aug. 31 (Sun) to Sep. 2 (Tue), 2014; Awaji, Hyogo Prefecture

Organizers: Program for Education and Research on Science and Technology in Public Sphere (STiPS) of Osaka and Kyoto Universities

Participants: 88 (41 students, 37 educators, 10 others (personnel from MEXT, NISTEP, JST-CRDS, etc.))

Program

Day 1 (Aug. 31)

◆Greetings

Masahiro Kuroda (Principal Fellow, Center for Research and Development Strategy)

◆Keynote speech

Takashi Miki (Kobe Biomedical Innovation Cluster Promotion Headquarters, City of Kobe)

◆Student research presentations



Day 2 (Sep. 1)

◆Special lecture

Kousuke Motani (Chief Researcher, Japan Research Institute Investigative Department)

◆Student groupwork: "Population decline: 2045"

- [Theme] The year 2045 will mark the 100th anniversary of the end of WWII. Describe what Japan should ideally be like around that time. Put yourself in that timeframe. Now, looking back, what systems should we have implemented with regards to STI in a broad sense in order to attain that vision?
- {Contents} Working in a group with students from other hubs and under the direction of younger educators as mentors, predict (1) the society we will have if we continue on the present course and (2) the society we could have, ideally. Diagram both. Now, create policy proposals to bring us to that ideal.



Summer Camp 2014

Day 3 (Sep. 2)

◆Presentation of groupwork results

◆Closing ceremony (review, award presentations, etc.)

Summer Camp 2015:

Time and place: August 2015, Nagoya area, Aichi Prefecture

Organizers: University of Tokyo, STIG

Competitive Research Funds (JST-RISTEX)

	R&D Project	Principal Investigator	Affiliation	Period
Selected in FY2011	Development of Methods for Impact Assessment of Electric Power Innovation and R&D Network Evaluation	Taro Akiyama	Professor, Deputy Director, Center for Economic Growth Strategy, Yokohama National University	Nov. 2011 - Oct. 2014
	Scientometrics Conducive to Management of Funding Programs	Masashi Shirabe	Associate Professor, Graduate School of Engineering, Tokyo Institute of Technology	Nov. 2011 - Oct. 2014
	Methodology Development for Visualization and Quantification of Social Expectation to Science Technology	Masatoshi Tamamura	Associate Professor, Faculty of Policy Management, Keio University	Nov. 2011 - Oct. 2014
	Research on Scientific Sources of Innovations and Economic Impacts of Science	Sadao Nagaoka	Professor, Institute of Innovation Research, Graduate School of Commerce and Management, Hitotsubashi University	Nov. 2011 - Oct. 2014
	Integrating Joint Fact-Finding into Policy-Making Processes	Masahiro Matsuura	Specially Appointed Associate Professor, Graduate School of Public Policy, University of Tokyo	Nov. 2011 - Oct. 2014
	Study of Innovation Strategies Conducive to Creating Future Industries	Eiichi Yamaguchi	Professor, Shishu-Kan Graduate School of Advanced Integrated Studies in Human Survivability, Kyoto University	Nov. 2011 - Oct. 2014
Selected in FY2012	Framework for Broad Public Engagement in STI Policy	Kei Kano	Associate Professor, Graduate School of Education, Shiga University Specially Appointed Associate Professor, Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University	Oct. 2012 - Sep. 2015
	Development of the Case-Based Reasoning System for Regional Science and Technology Policy	Akiya Nagata	Professor, Director, Center for Science, Technology, and Innovation Policy Studies, Kyushu University	Oct. 2012 - Sep. 2015
	Economic Growth Analysis of Science, Technology, and Innovation Policies	Makoto Nirei	Associate Professor, Institute of Innovation Research, Graduate School of Commerce and Management, Hitotsubashi University	Oct. 2012 - Sep. 2015
	Resource Logistics as a Support Tool of Science, Technology, and Innovation Policy Decision	Kazuyo Matsubae	Associate Professor, Department of Metallurgy, Graduate School of Engineering, Tohoku University	Oct. 2012 - Sep. 2015
	Conservation and Energy Utilization of Water as Common Resources for Leading Innovation	Yoshihiko Amano	Professor, Director, Cooperative Research Center, Shinshu University	Oct. 2012 - Sep. 2015
Selected in FY2013	Institutions and Policies to Complement Science, Technology, and Innovation Policy: Recommendations for Implementation and Action	Reiko Aoki	Executive Vice President, Kyushu University	Oct. 2013 - Sep. 2016
	A Study on Methods for Objective/Quantitative Assessment of the Impact of Satellite Observations on Environmental Policy	Yasuko Kasai	Senior Researcher, Office for Sensing Infrastructure Research, National Institute of Information and Communications Technology	Oct. 2013 - Sep. 2016
	Action Research for Realizing Innovation with an Infometric Approach	Yuya Kajikawa	Associate Professor, Graduate School of Innovation Management, Tokyo Institute of Technology	Oct. 2013 - Sep. 2016
	Scenario Planning for Making Regulatory Policies and Technical Standards in Advanced Medicine	Shingo Kano	Associate Professor, Graduate School of Frontier Sciences, University of Tokyo	Oct. 2013 - Sep. 2016
	Resilience Analysis for Social Safety Policy	Kazuo Furuta	Professor, Director, Resilience Engineering Research Center, Graduate School of Engineering, University of Tokyo	Oct. 2013 - Sep. 2016
Selected in FY2014	Development of Benchmarks of the Quality of Prior Art Search in International Patent Prosecution Processes	Tetsuo Wada	Professor, Department of Management, Faculty of Economics, Gakushuin University	Oct. 2014 - Sep. 2017
	Establishment of a Methodology and Database for Life Cycle-Based Environmental Assessment and Installation to Society for the Promotion of Green Procurement	Norihiro Itsubo	Professor, Faculty of Environment Management, Tokyo City University	Oct. 2014 - Sep. 2017
	Innovation in Evidence-Informed Policy Making: Through Visualizing and Re-designing Social Systems for Countermeasures against Regional Disparity in Healthcare Quality	Yuichi Imanaka	Professor, Graduate School of Medicine, Kyoto University	Oct. 2014 - Sep. 2017
	Realizing a Policymaking Process for Infectious Disease Control using Mathematical Modeling Techniques	Hiroshi Nishiura	Associate Professor, Graduate School of Medicine, University of Tokyo	Oct. 2014 - Sep. 2017
	Development of the Evidence Base for Advanced Risk Management of Living Spaces	Yoshiki Mikami	Professor, Director, Research Center for Safe and Secure Society, Nagaoka University of Technology	Oct. 2014 - Sep. 2017

Current Status of NISTEP Data Infrastructure

Infrastructure for Science, Technology and Innovation (STI) Research

- Database of Government S&T Budget Allocation
- Database of Key S&T Policies
- NISTEP Dictionary of Names of Universities and Public Organizations
- Scopus Organization Name Variation Table
- Concordance Table between Scopus and NISTEP Dictionary
- WoS Organization Name Variation Table

<http://www.nistep.go.jp/research/scisip/data-and-information-infrastructure>
(in Japanese)

- NISTEP Dictionary of Corporate Names
- Correspondence Table between NISTEP Dictionary and corporate & patent data
- Japanese National Innovation Survey Data

Database of Doctoral Holders

Databases by Region/Industry

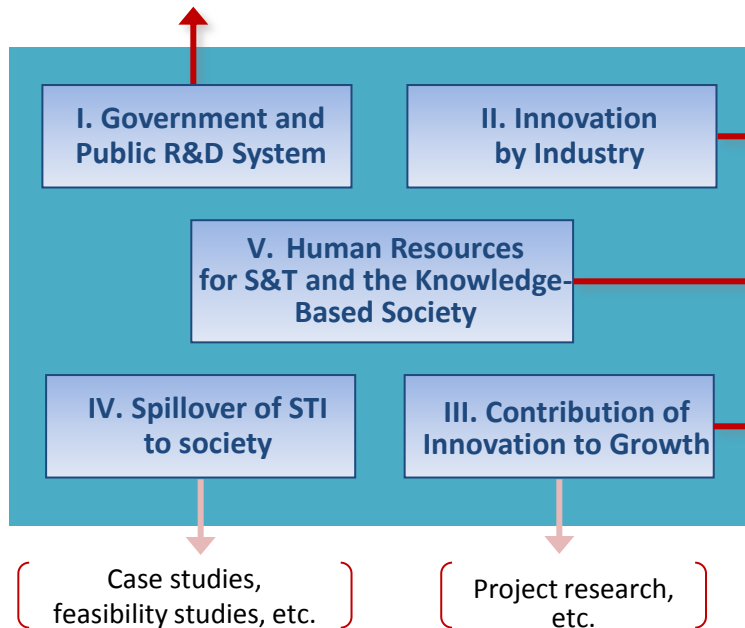
- Rate of Technological Knowledge Obsolescence
- Corporate and Public R&D Stock
- Corporate and Public R&D Spillover
- Technological Accessibility between Industries
- Technological Accessibility between Industries by Scientific Field
- Productivity by Region and Industry
- Japanese National Innovation Survey (only tabulations by industry)

Tools for Providing Evidence for Policymaking

- Science and Technology Indicators: HTML Version
- Information Retrieval System for NISTEP Expert Survey on Japanese STI System
- Information Retrieval System for Japanese S&T Foresight Surveys (Delphi Surveys)
- System for Displaying Maps of Data on International Co-authorship of Scientific Publications

General Data and Information Infrastructure

- Information Retrieval/Provision System for All NISTEP Reports (Repository)
- Compilation of Links to Data and Information Infrastructure in Japan and Overseas



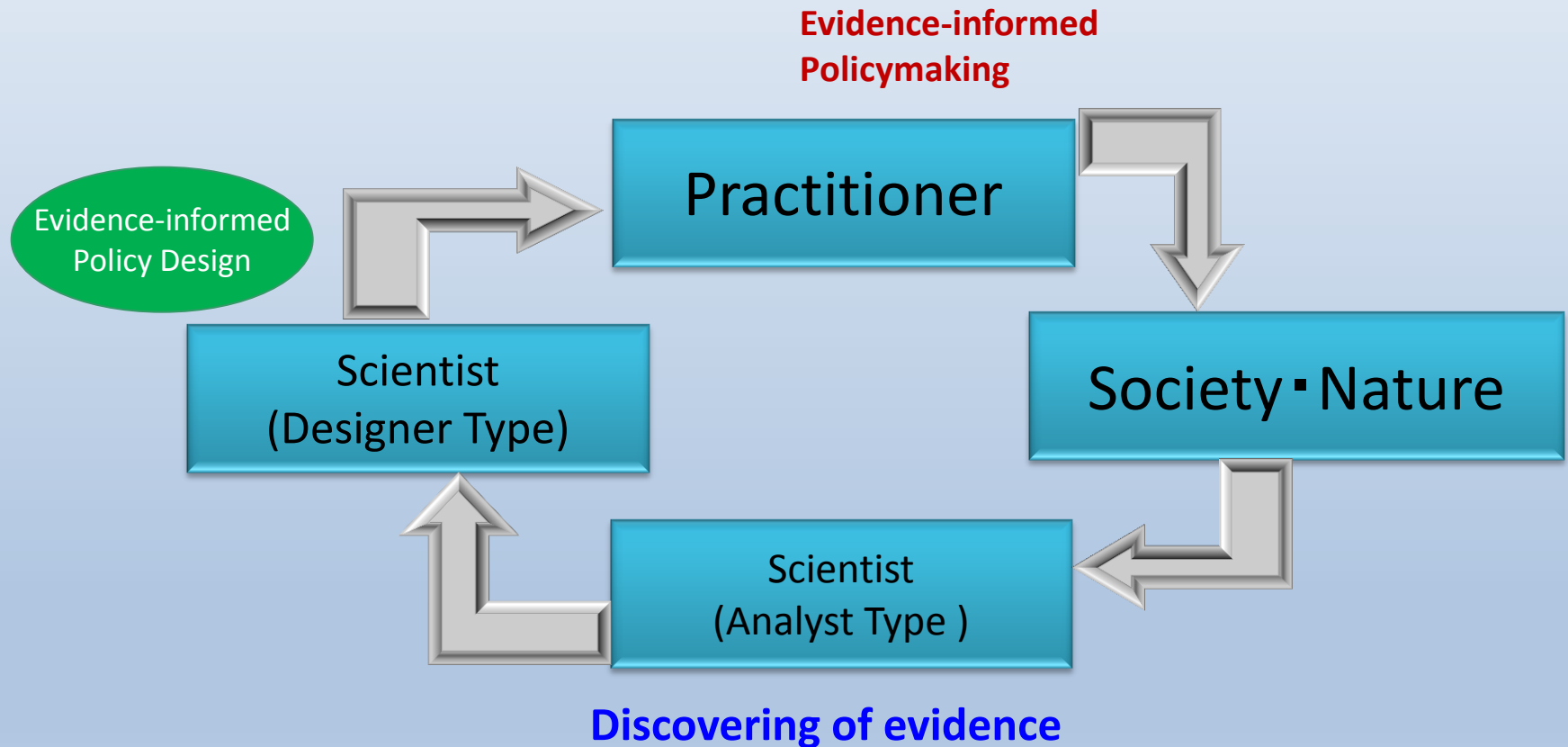
- Technology Impact Analysis Using Input-Output Table

Evaluation and Improvement for program management

Steps towards ‘Structuralization’: Achievements so far

- SciREX provides various inputs for completion of the 5th Science and Technology Basic Plan.
- Ministry of Foreign Affairs hired ‘Science Advisor’ for its minister, due to SciREX activities.
- One of the studies estimated various cases of diabetic related R&D, which differ future social impact.
- Human Development programs at hub-universities are producing various graduates, who choose academia and public sector for initial career.

What is 'Structuralization'?



Steps towards ‘Structuralization’: What have we done?

- For 5 years of the SciREX program, 3 major research projects at National Graduate Institute for Policy Studies and 21 research awards were conducted .
- Each research project / award was evaluated respectively, and the entire program management was scrutinized by external committee; nonetheless, we are not sure we are on the right path.
- Subsequently, we started to trace what we have done.

【SciREX Structure】 For STI Implementation

Research Phase STI Policy Areas	Basic Research								Analytical Method・Tools												Policy Design											
Basic Policy/ ImplimentMeasures	44 45																												22			
Human Resources	44		37		39																											
Intellectual Property / Standardization	44	18												17 17					16 16 16													
Development of Research Infrastructure	44	27																													6	
R&D Funds/ Evaluation System	Human Resource Development	34	35 36	37	R&D Investment DB	Innovation Index	Socioeconomics Database	Patent/Journal Articles	38	Discovery of Social Expectation	Policy Marketing	Others	Simulating Investment effects	38	Technological Forecasting	Technology Assessment	Operational Research	Consensus Development Method	Organization Theory	Bibliometric Analysis	Econometric/Statistical Analysis	Measuring Innovation	Investment Effect Analysis	Visualization	Regulatory Science	Study of Scientific Advice	Policy Options	Conditions for Social Implementation				
		34	35	37	40	39					2			28 29				11	2	2			3 4 9 9 41 42 28 29 30	9	6							
Business-Academia Collaborations/ Regional Development	46 44 47	44 48	34 8 8	36	40	39											13	18		2				6 8								
Society and Science & Tech	47								7		3 24					17		5 3 5 7 7		13	13		3									
Others										25						20		21 23	5				32 33	20						6		

SciREX Institutes :

RISTEX公募

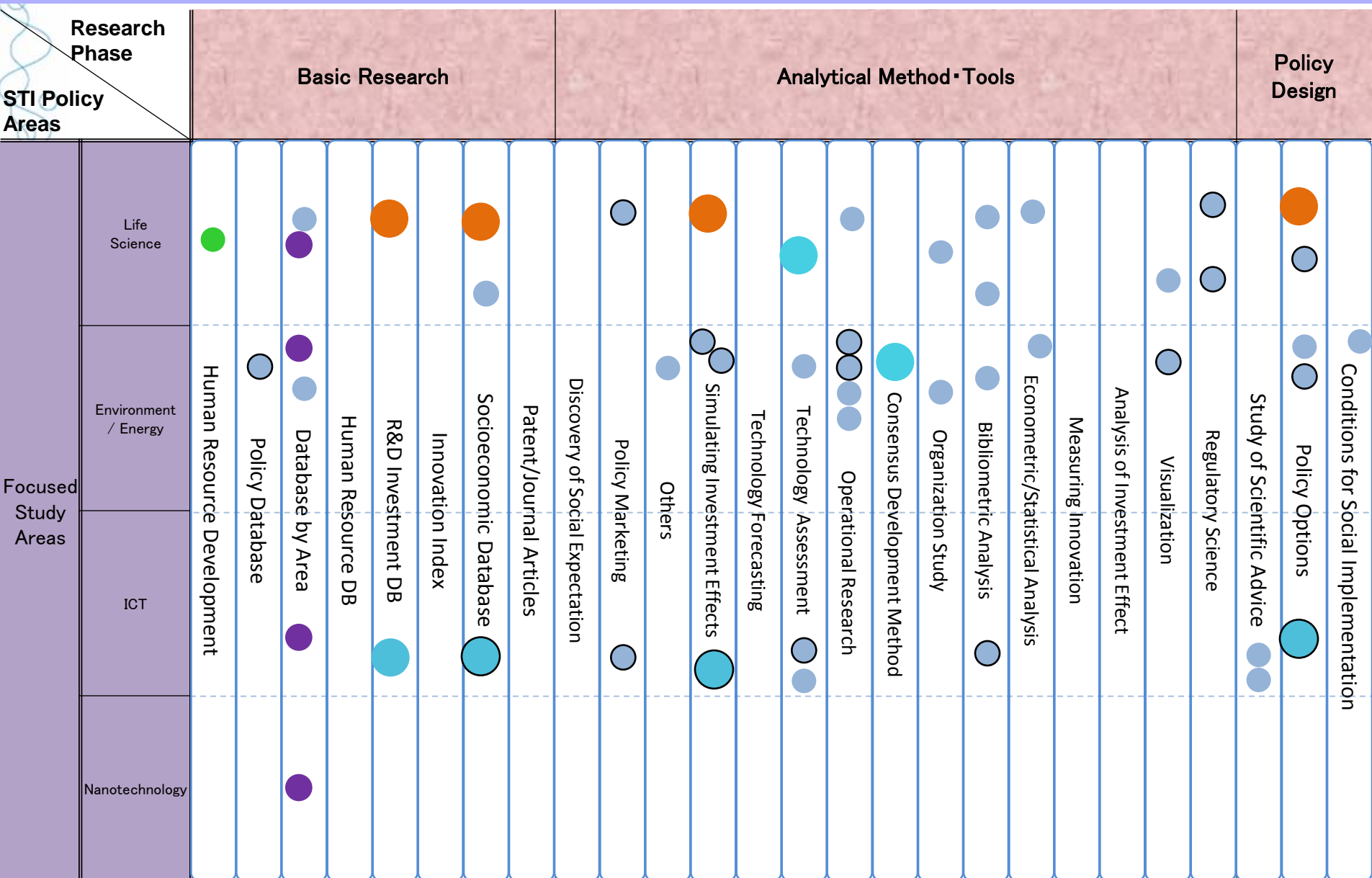
GRIPS

NISTEP

Universities

Projects with frame boarder are on-going.

【SciREX Structure】 For Focused Areas of Research



SciREX Institutes :

RISTEX

GRIPS

NISTEP

MEXT

Universities

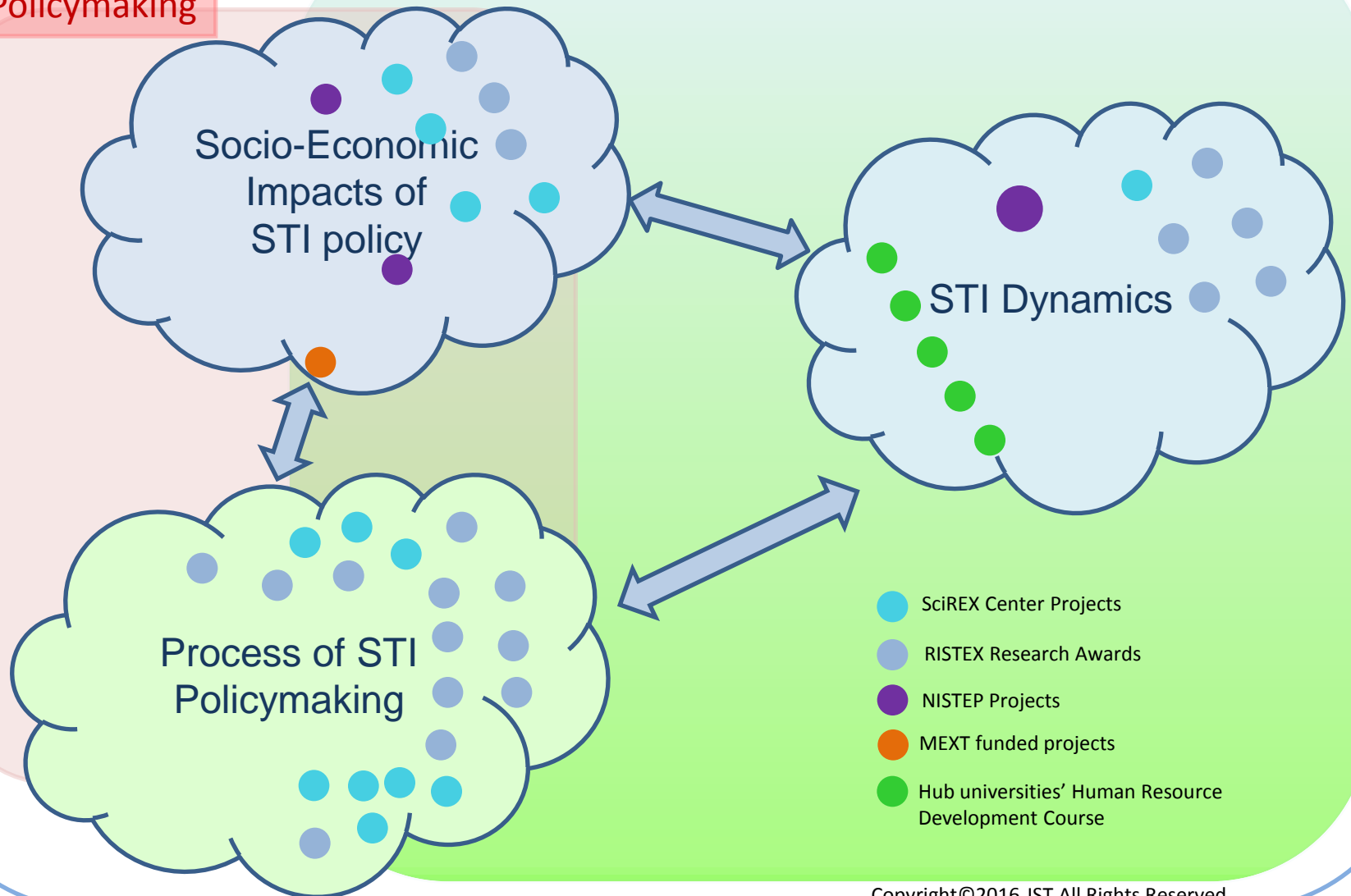
Projects with frame boarder are on-going.

SciREX Program analysis

Society

STI System

Policymaking



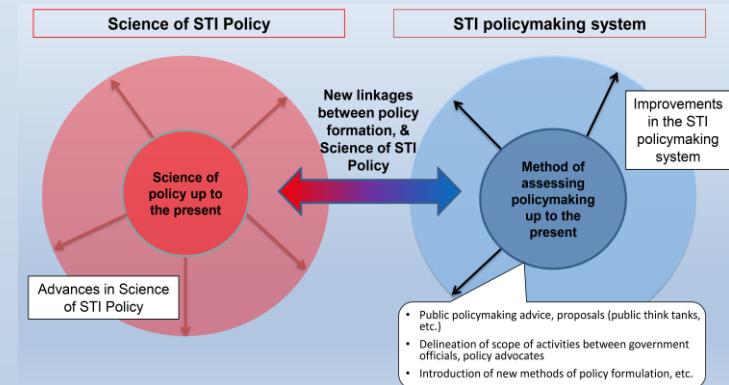
Society

Polcymaking



Steps towards ‘Structuralization’: We want to know ‘where we are’.

- Two communities, different visions
Building *Common Ground* → Setting common *Science Questions*.



- Frequent workshops, retreats
Researchers' view of the program, approaches, and targets.
Policymakers' demand on 'science'.
- Setting frame and link to existing studies
Which SQ can be solved? Which SQ remains question?

SciREX Seminar

- Enhancing communication over SciREX research outcomes, researchers and policymakers make discussion and exchange views.
- To promote co-evolution of policy formulation and policy research, providing opportunities for researchers and policymakers for networking.
- Date & Time: Weekday (from 6:30 pm to 8:00pm)
- Hold once or twice a month
- Held 16 Seminars in 2015

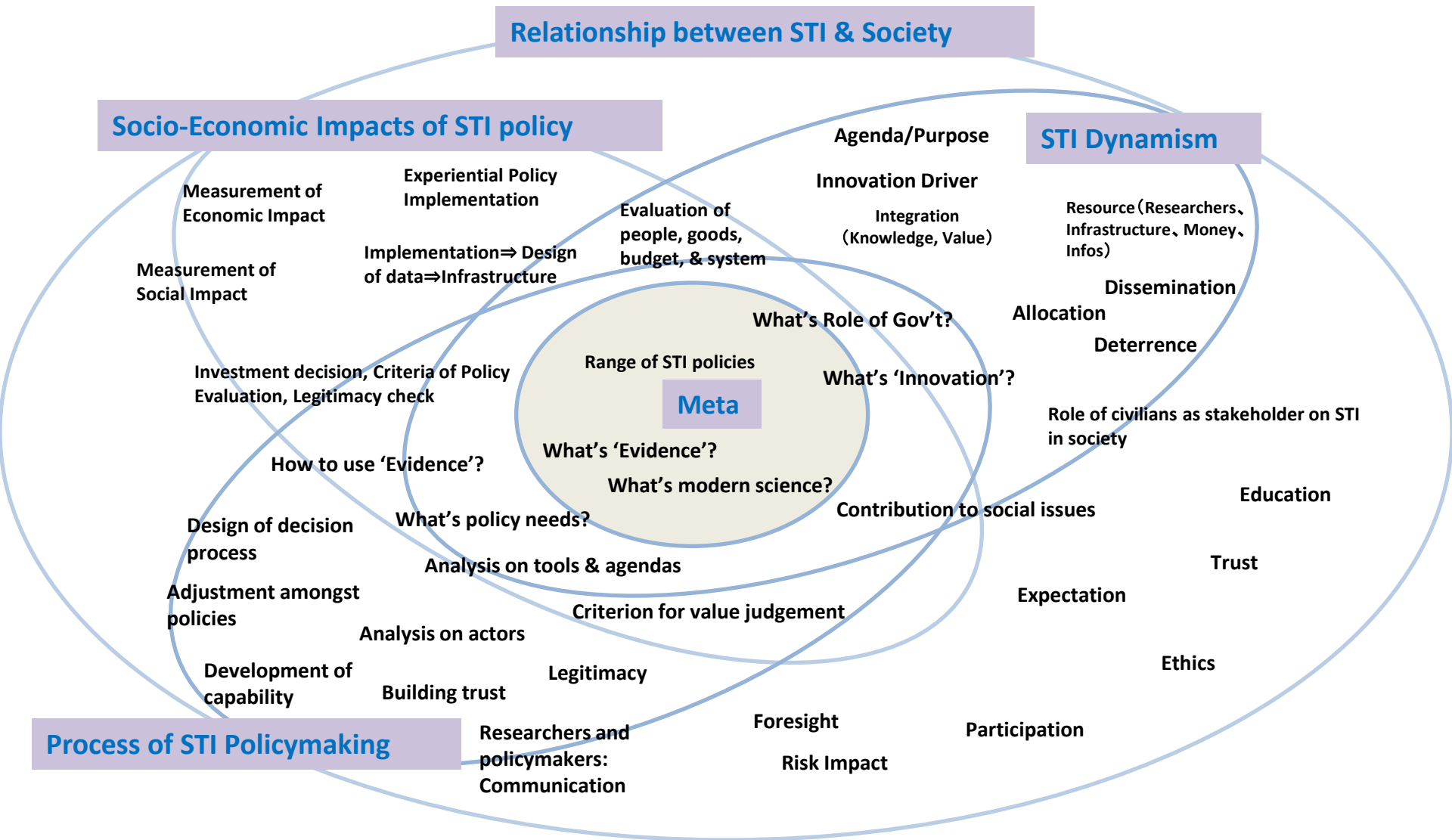


SciREX Multi-stakeholder Workshops

- Date: August 2nd & August 21st-22nd
- Venue: National Graduate Institute for Policy Studies (GRIPS)
- Organizers: GRIPS, JST-CRDS, & NISTEP
- Participants : Researchers from universities, SciREX-related institutes, and *Policy Liaisons* (35 participants)
- Group work (world café style)
Semi-closed meetings.



Distribution of Science Questions (Keywords)



Science Questions (Result of Workshop)

Society

Socio-Economic Impacts of STI policy

- How can we measure success/failure of STI policies? (●5)
- How can we know time lag of STI policies? (●4)
- How can we measure impact of STI R&D? (●2)
- Proportion of investment on education and R&D? (●2)
- Measurement of social impact on STI policies? (●2)
- Can STI change life style and QOL? (●1)
- Difference between evaluation of pure science and that of STI research? (●1)
- How can we link evaluation of ex-ante and ex-post STI policies? (●1)
- How can we create linkage amongst data-analyses-policies? (●1)

STI Dynamics

- How can we design/create innovation using resources and idea? (●2)
- Current liquidity of Japanese scientists across borders? (●1)
- How to enhance communication amongst different scientific fields? (●1)
- How to provide funds to core actors of STI? (●1)
- What is major deterrence of innovation? (●1)
- Can we predict emerging technologies?
- How can we plan strategic scenarios using STI forecast?

Process of STI Policymaking

- What's policymakers' demand? How can we get them? (●4)
- Transition management : how can we create system of co-evolution? (●3)
- How can we make visualization of current inefficient policy process? (●3)
- How can we balance multiple policies? (●3)
- STI policymaking can be more efficient under democracy or strong leadership? (●2)
- Japan specific STI policies? (●2)
- How can we disseminate STI literacy to local regions? (●2)
- Who is responsible STI policymaking? (●2)
- Who should initiate STI policies? Experts? Politicians? (●1)
- How can scientists and politicians communicate efficiently? (●1)
- Who bridges science and policymaking? How? (●1)
- How to deal with brand new STI policy agendas in Japan? (●1)
- Why is political support to science not successful? (●1)
- Which comes first, evidence or political will? (●1)

Relationship between STI & Society

- How can we find 'lead citizen' and let them participate? (●10)
- Why is lead citizen important? (●2)
- Who judges if the STI is beneficial to society? (●6)
- What's Japan specific view on STI? Historical trend?? (●3)
- What does Japanese society seek STI in the future? (●2)
- What kind of society can internalize STI risks? (●1)
- How much is the cost of Japan's mistrust on STI? (●1)
- How can we fill in the gap between change in technology and law? (●1)
- How can we import civilians' value into policymaking process? (●1)

Meta: Overall Issues

- How big is the coverage of STI policies? (●9)
- What's innovation? Is it important? (●6)
- What's 'science' for STI policy? (●2)
- What does society expect from STI policy? (●2)
- What's SciREX's accountability? What is expected outcome? (●2)
- What is modern science? (●1)

New Activities

- **Handbook/Developing Core Curriculum**
- **Linkage of Existing Databases (SPIAS)**

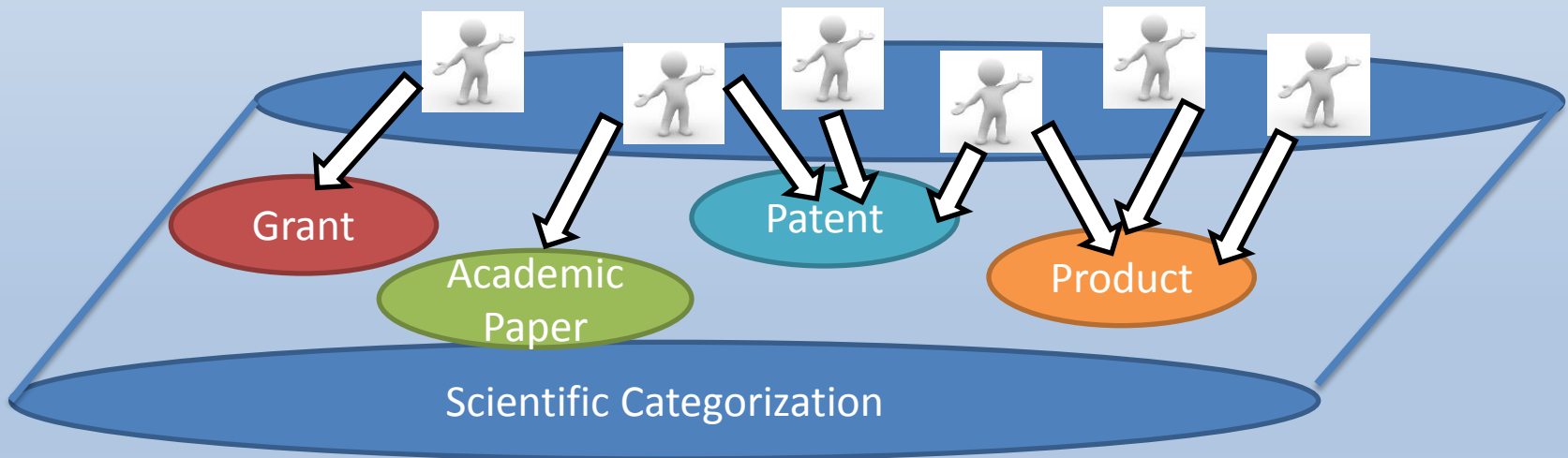
(1) HANDBOOK/DEVELOPING CORE CURRICULUM

- 6 hub-universities have original curriculum of STI policy and research.
- Nonetheless, they do not share basic contents.
- It is necessary to have core curriculum for all students in the universities.
- We conducted a research to detect tendencies of each curriculum by using text mining technique.
- The core curriculum should be correlated with Science Questions.

(2) Linkage of Existing Databases (SPIAS)

SPIAS beta version (in 2016/2017 FY)

- Updates;
 - Using Official Grant Information Data supplied by JST
 - Using Patent/Paper Database (J-global) supplied by JST
 - Using NIKKEI Press Release Data as the proxy of Product Information.
- Using ID-matching algorithm for patent/paper <-> authors
- Using Word2Vec matching scheme for scientific categories <-> grants



(2) Linkage of Existing Databases (SPIAS)

Connecting existing Data

