# Directivity on "Science of Science, Technology and Innovation Policy"

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Dr. Kumi OKUWADA
Senior fellow, Research Institute of Science and Technology for Society

# Circumstances

## US

- 2005 : Dr. John Marburger, OSTP Director & Assistant to the President for Science and Technology, stated the necessity of some scientific methods to support government officers in S&T policy.
- 2007 : SciSIP (Science of Science and Innovation Policy) program started as NSF funding program.
- 2009 : Pilot projects in STAR METRICS (Science and Technology in America's Reinvestment Measuring the Effect of Research on Innovation, Competitiveness and Science) started by OSTP/NSF/NIH etc. (Formal start in 2010)

## EU

- Traditional manners of evaluation to research and organization with indicators ( UK etc.)
- Many technology assessments in economics and sociology ( The Netherlands etc.)
- Developments in methodologies by supports in FP5-FP7 (1998 – 2013)
- OECD has continuously reported on competitiveness mainly on EU countries.

# US NSF Funding Program 2007 – Science of Science and Innovation Policy（SciSIP）

## Program Structure & Philosophy

- "The Science of Science & Innovation Policy (SciSIP) program supports research designed to **advance the scientific basis of science and innovation policy**.
- Research funded by the program thus develops, improves and expands models, analytical tools, data and metrics that can be applied in the science policy decision making process."



MODELS, TOOLS, DATA, METRICS

The unfolding science of science and innovation policy

By Joshua Rosenbloom, National Science Foundation

Current Program Director:
Dr. Joshua L. Rosenbloom

NSF 2013 open call

## Assessing the Impacts of Recent and On-going Changes in Federal Science Policy

Important avenue :

### Scientific analysis of the implementation and impacts of changes in federal science policy

A number of such changes have recently been announced or are currently being implemented. For example, in February 2013, the Office of Management and Budget announced plans to implement a policy of public access to data and scientific publications produced with federal funding. Another recent initiative involves creation of a shared, voluntary researcher profile system to facilitate the preparation of research bio sketches.

### Especially encouraged proposals :

- Develop new, or improve existing, analytical frameworks for evaluating the impacts of federal science policy initiatives;
- Explore different agencies' approaches to the implementation of particular policies to examine how variations in approach affect the achievement of intended policy outcomes;
- Collect case-study or quantitative data that facilitate identification of best practices in science and innovation policy implementation.

NSF 2013 open call

## Assessing and Enhancing the Impact of Science R&D in the United States: Chemical Sciences

This action needs to be grounded in answering important scientific questions, such as:

1. How can we measure the broad (economic, social, and scientific) impact of scientific research?
2. What is the nexus between industrial and federal investments in science R&D?
3. How can an optimal portfolio of (public and private) science R&D investments be characterized?
4. How can the social, behavioral, and economic sciences inform federal R&D investments?

The need for and value in a multi-disciplinary, multi-sector, multi-perspective investigation to inform our understanding about the impact of research investments in all sectors.

★ NSF revised their evaluation standard for all researches in Jan. 2013.
In NSF new standard, intellectual merit and broader impacts will equally be evaluated.

# US federal agencies program :

## STAR METRICS （2009 Pilot） 2010 Start

"Science and Technology for America's Reinvestment:
Measuring the Effect of Research on Innovation, Competitiveness and Science"

6 federal agencies : OSTP, NSF, NIH(Host), EPA, USDA, DOE

86 institutes


**Initial targets**

Phase 1
Evaluation on employments
by federal government investment

Phase 2
Impact evaluation on ;
- Indicators to economic growth :
  Patents, Stat-ups, ・・
- Outcome in employments :
  Students, Mobility, ・・
- Scientific knowledge :
  Publication and citation
- Social outcome :
  Impacts in social health and environment

**Modified targets in 2012**

Level 1
Recording the level and trend of employments by federal government investment

Phase 2
Open and automatic tools for recording and analyzing on input/output/outcome by federal government investment

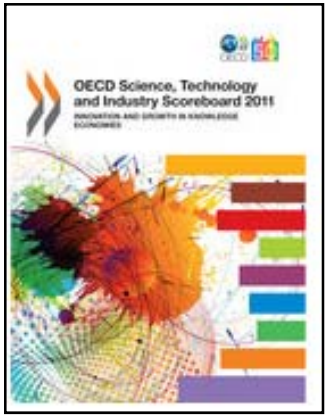
Noticed "outcome" : Job creation by public investment

New tool development : Open and automatic data collection and analyzing

# OECD

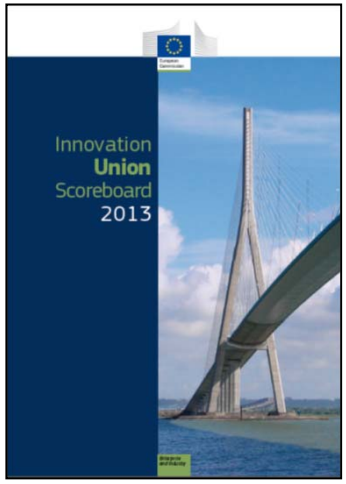
Science, Technology and Industry Outlook


Science, Technology and Industry Scoreboard :
Innovation and Growth in Knowledge Economies




# EU

Innovation Union Scoreboard



# NEMESIS

( New Econometric Model of Evaluation by Sectoral Interdependency and Supply )

- Economic model in EU 27 countries for impact assessments
- Research tool for long-term policy effects
  Economical developments, Competitiveness,
  Employments, Financial reform, R&D effects,
  Regulation, ・・・
- Scenario in BAU(Business As Usual) in the future
- Suggestion in effects of additional policies
- Supported continuously since FP5 to FP7
- Representative results : Evaluation of “Lisbon Strategy”

# Intensified factors in science and technology common in the world

## Relation between science and society after “Budapest Declaration”

- Serious global issues, Economic depression
- R&D investments for sustainable development
- Accountability in public investment

## Demand of creativity forward innovation

- S&T policy → ST&I policy
- Evaluation for “outcome” or “impact”
  （ex. Revision of evaluation standard for basic science in NSF, Re-recognition of DARPA model, ・・・）

## Revolution in methods

- Open data policy , e-Government
- Big data (Automatic data accumulation, Real-time visualization)

# Starting discussion forward SciSIP program in Japan (2010 - )

## Design philosophy

1. Form policy with scientific rationality
2. Realize a rational policy-formation process
3. Increase transparency of the policy-formation process and assure public accountability
4. Make knowledge obtained from the Science of ST&I 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

Source; Strategic Proposal "Towards Realization of Evidence-based Policy Formation: Development of Science of Science, Technology and Innovation Policy" , CRDS-FY2010-SP-13

# Starting discussion forward SciSIP program in Japan (2010- )

Guiding principals

1. Realize co-evolution of the policy formation mechanism and the "Science of ST&I policy"

2. Facilitate public participation in the policy formation process by presenting evidence-based alternative policy options

3. Develop the "Science of ST&I policy" through collaborations among various natural and social scientific fields. Use the knowledge collected, accumulated and structuralized from the "Science of ST&I 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 ST&I policy". Build communities and networks for them. Create improved environments that enable them to be active across organizational and national borders.

Source; Strategic Proposal "Towards Realization of Evidence-based Policy Formation: Development of Science of Science, Technology and Innovation Policy" , CRDS-FY2010-SP-13

# Whole structure of the program in Japan

SciREX

Science for RE-designing Science, Technology and Innovation Policy

"Re-designing"

About SciREX | Steering Committee | Programs
Learning Opportunities | News & Events | International Trends

The Science for RE-designing Science, Technology and Innovation Policy (SciREX) program aims to promote STI policy making based on a rational process using objective evidence by reforming the policy-making process and developing related interdisciplinary academic fields.


Implementation of investigation and research that meet policy needs (esp. concerning the economic and social impact of R&D spending)

Promotion of a variety of R&D projects on methods and indicators, etc. for use in medium- to long-term policy making

RISTEX Funding Program

Creation of international-level hub institutions for fundamental research and human resource development and the education of a broad range of human resources

Systematic, on-going compilation of data and provision of information systems for policy making and for investigation, analysis, and research

URL: http://scirex.mext.go.jp

Influential factors for the RISTEX program in Japan

# Move from “ Group ” to “ Team ”

Group : Aggregation or classification based on some common sense

Team : Temporary network with diversity, having a common goal

## “ Team Science ”

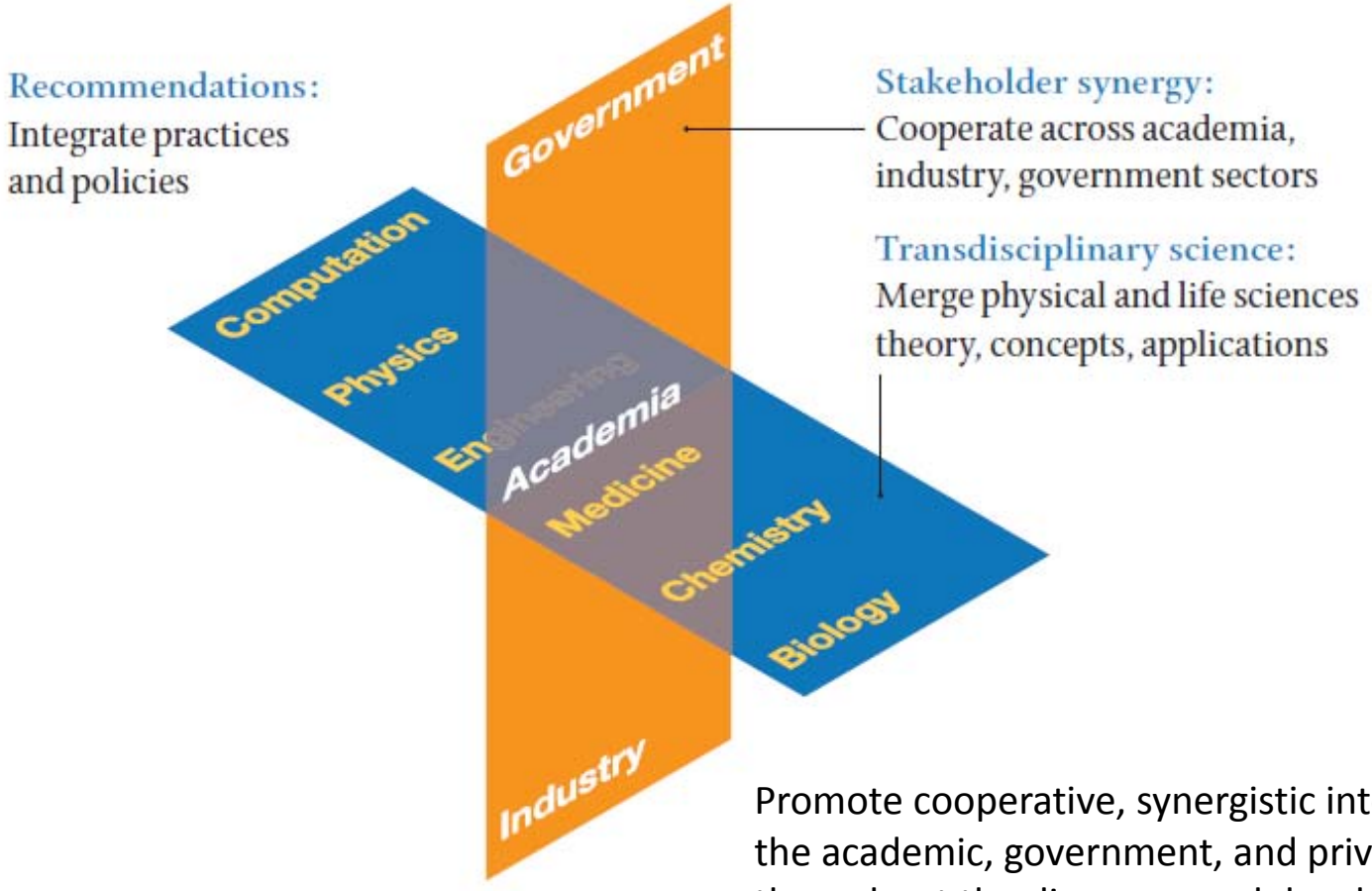
with Crossdisciplinarity ?
with Multidisciplinarity ?
with Interdisciplinarity ?
with Transdisciplinarity ?

## A key of SciSIP program in RISTEX

“ Bridging between academia and policy-makers ”

Other influential discussions

# Move from “Interdisciplinary” to “Transdisciplinary”




Promote cooperative, synergistic interactions among the academic, government, and private sectors throughout the discovery and development process

the American Academy of Arts and Sciences
“ARIZE 2 :Advancing Research In Science and Engineering”
- Unleashing America’s Research & Innovation Enterprise -

# Concluding Remarks

Along with increase of accountability for research investments, policy-making process has required some evidences. This is a reason why SciSIP program has been promoted.

S&T policy has already transformed into ST&I policy in many countries. This change become to need different types of evidences from until now. To prioritize “innovation in society” will require evaluation tools for outcome and impact in society.

Some kinds of measures and many datasets have already been developed in some countries. Furthermore, big data revolution will give us new measures such as automatic data accumulation and real-time impact analysis.

Interdisciplinarity among academic fields are not sufficient for innovation in society. Transdisciplinary science of theory, concepts and application with stakeholders’ synergy will be required from now.