Recent Trends in Japan's Science and Technology Policies for Sustainable Energy

June 26 2012

Japan-US Workshop on Sustainable Energy Futures

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Japan Science & Technology Agency (JST)

Contents

Since 1989

End of the Cold-War
ICT revolution

Globalization ⇒
The Conditions is Changing Rapidly …

- Sustainable development
- Climate change, Energy & Natural resources
- Water, Health,Food, Biodiversity
- Natural/Artificial Disasters
- Knowledge & Aging society

Now 2012

Disasters

Climate change

BRICS,
Economic Crises

Since 1989

Nov 2012

End of th…

The Rules of games are changing !!
In the middle of the great transformation

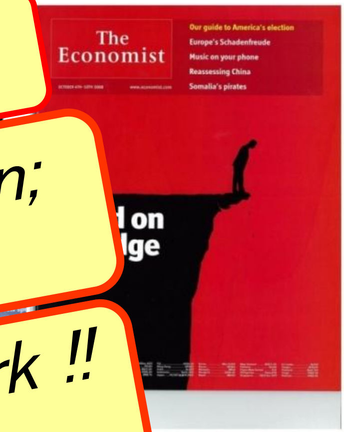
Shaping the new values and leadership
Changing social norms, Public engagement

Technological and social innovation
Innovation & entrepreneurship

Green new deal & smart ageing society

Redesigning governance of ST and Innovation;
Global, regional, national & local

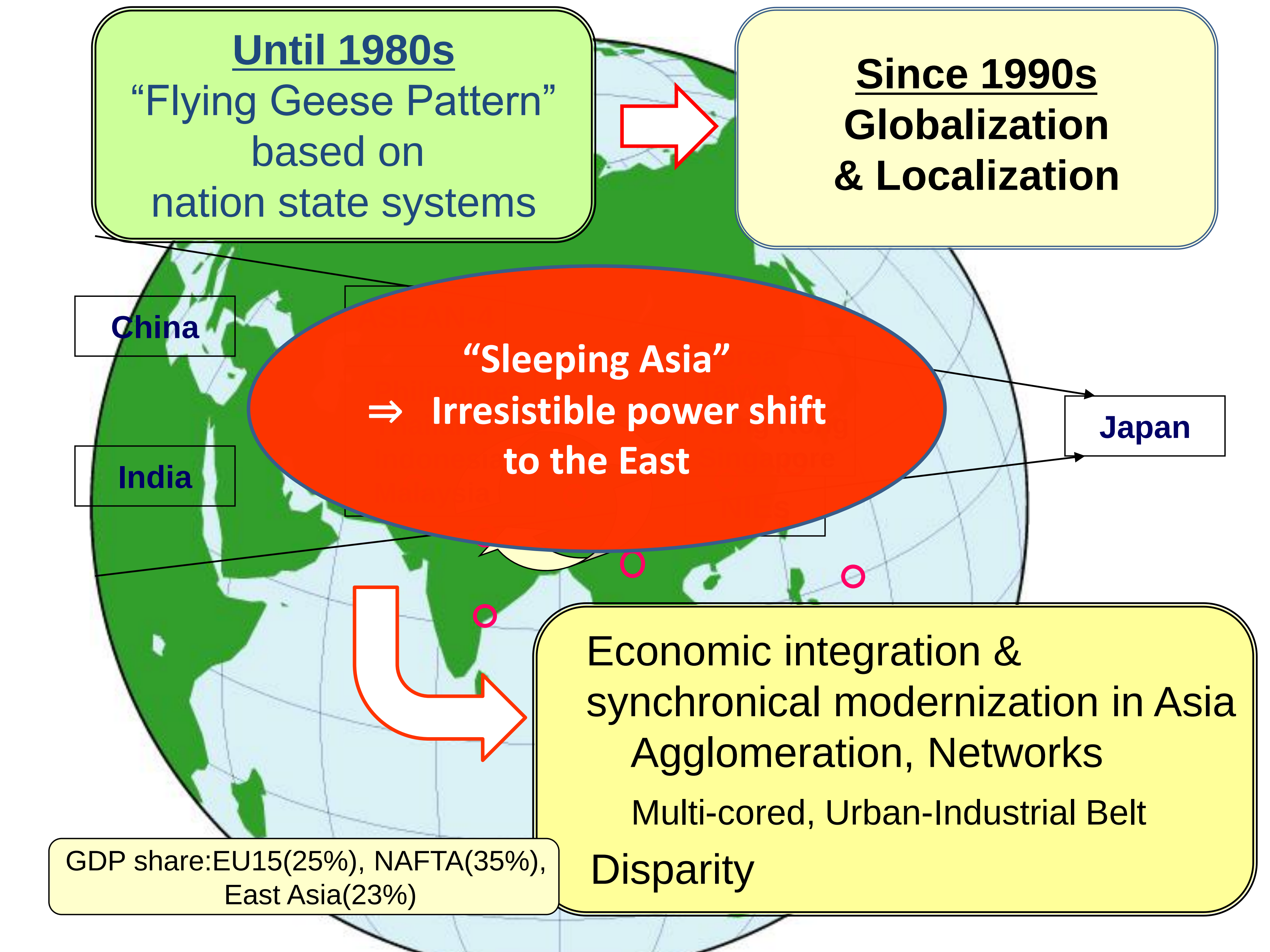
Breaking the conventional thought framework !!
Shaping new models



Climate change

BRICS
Economic Crises

- Kn… & Aging society


Until 1980s
“Flying Geese Pattern” based on nation state systems
Since 1990s
Globalization & Localization
China
India
Japan
“Sleeping Asia”
⇒ Irresistible power shift to the East
Economic integration & synchronical modernization in Asia
Agglomeration, Networks
Multi-cored, Urban-Industrial Belt
Disparity
GDP share:EU15(25%), NAFTA(35%), East Asia(23%)

Contents

“Changes & Movements after the Great East Japan Earthquake／Revision of Basic Energy Plan”

- **Committee for Natural Resources and Energy, Ministry of Economy, Trade and Industry, announced on June 19, a draft for New Basic Energy Plan, which indicates “1 reference case and 4 options” for future energy mix in 2030, where ratio of renewables, nuclear, fossil & cogeneration is designed.**
- **At the draft for future energy mix of “electricity generation”, ratio of renewables in 2030 varies from 25% to 35%, and nuclear from 0% to 35%.**
- **Based on these, it is estimated, CO_2 emission in 2030 varies from -33% to +5%, in comparison with 1990.**

A Draft for New Energy Basic Plan / Electricity Generation

		energy source (%)						electricity generation (10^{12} kWh)	CO_2 emission in comparison with 1990 (%)
		renewables	nuclear	coal	LNG	oil	cogeneration		
2010 / actual		11	26	24	27	9	3	1.1	+25
2030 / current plan		20	45	11	12	4	8	1.2	-27
2030 / revised plan	ref. 1	25	35	16	3	4	15	1.0	-33
	case 1	25～30	20～25	21	8	4	15		-15
	case 2	30	15	23	11	4	15		-8
	case 3	35	0	24	17	6	15		+5

New Growth Strategy and The 4th S&T Basic plan

decision)

Growth driven by Japan's strengths | Opening new frontiers | Platforms to support growth

Green Innovation

【Targets to reach by 2020】

- Create over ¥50 trillion in new markets and 1.4 million new jobs
- Reduce worldwide greenhouse gas emissions by 1.3 billion tons using Japanese technology

Life Innovation

【Targets to reach by 2020】

Foster industries that meet demand and create jobs:

- Roughly ¥45 trillion in new markets and 2.8 million new jobs

Asia

local revitalization

Science & Technology; Innovative energy & envir.tech

Employ-ment & human resources

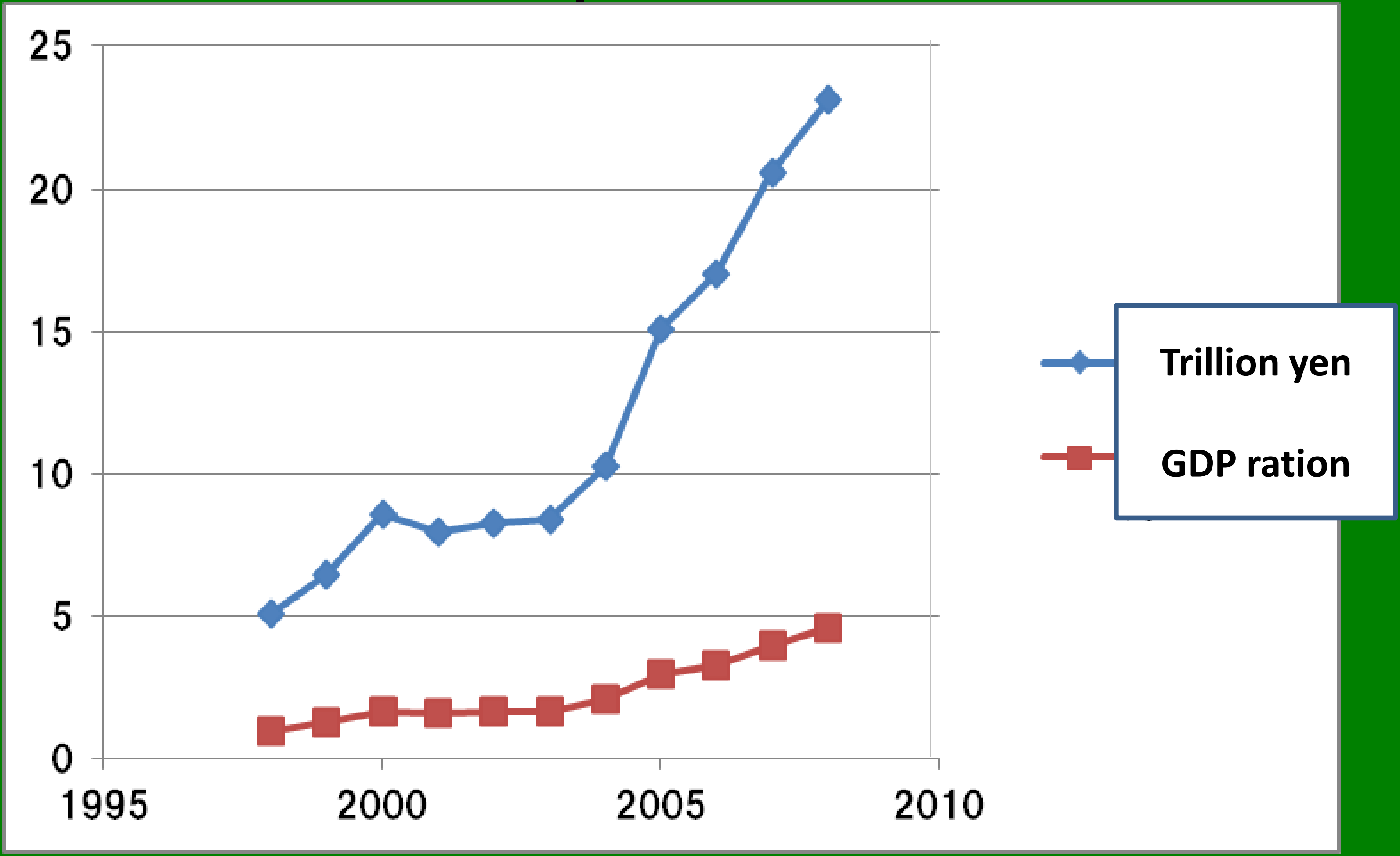
S&T for transforming challenges to growth

The 4th S&T Basic Plan（FY 2011-2015）

Comprehensive promotion of science, technology and innovation policy

STI as an engine for Recovery and Sustainable Growth

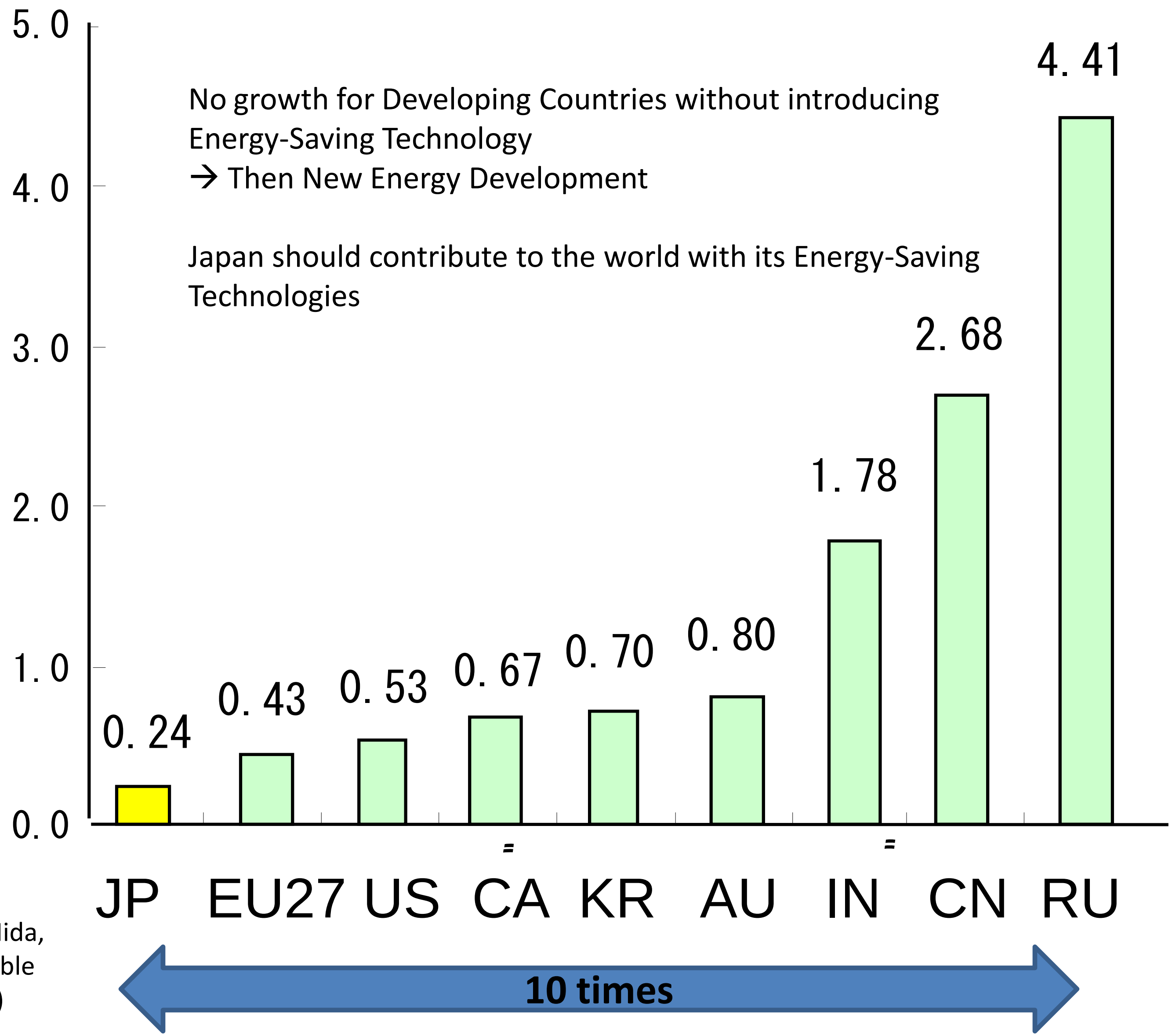
Foreign Payment for Energy by Japan



財務省統計データよりISEPが作成したデータに基づく
(ナフサ、潤滑油、グリースなど非エネルギー燃料は除外して作成)
http://www.customs.go.jp/toukei/info/index.htm

CO2 Emission per GDP (As of 2005)

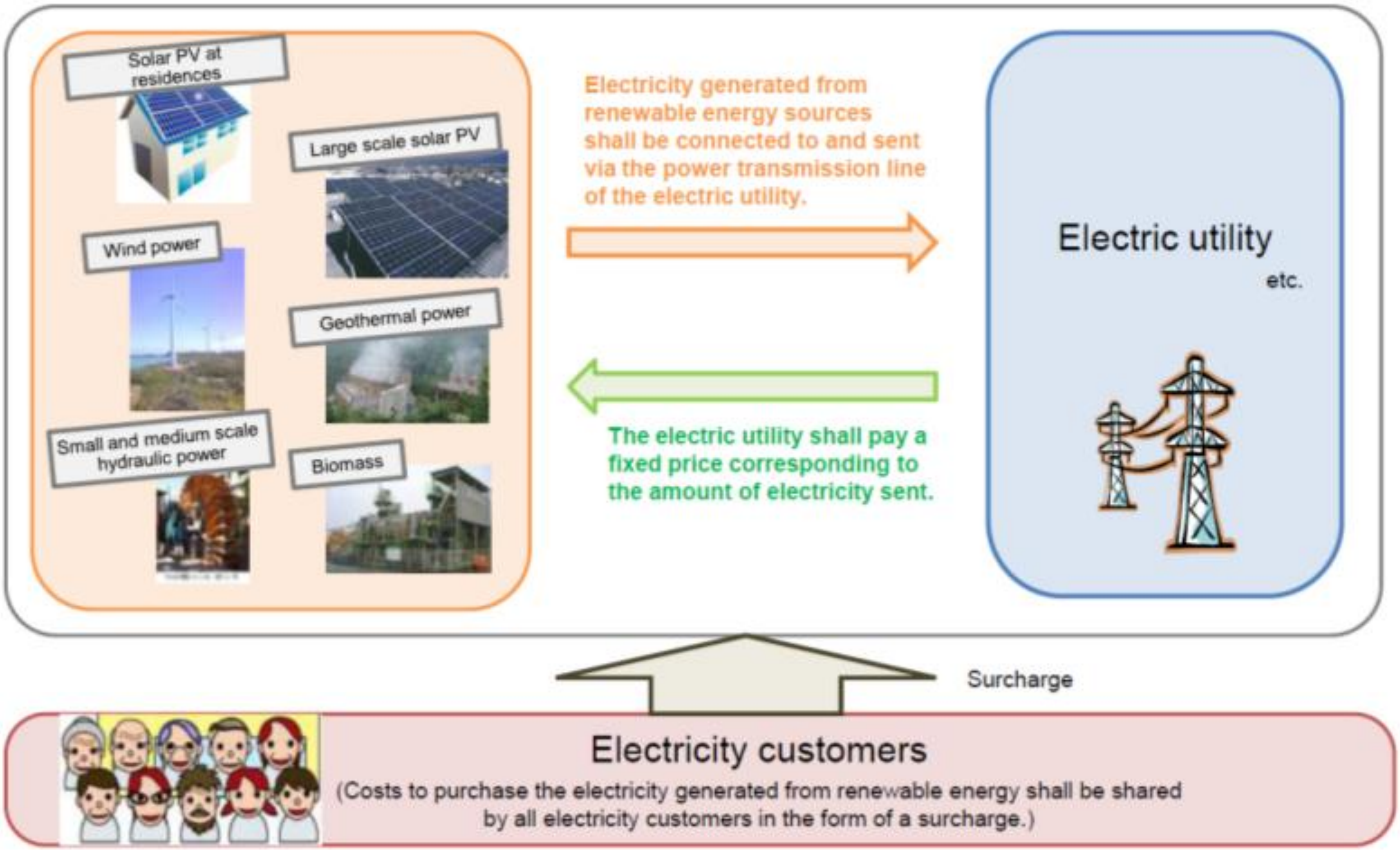
[KgCO2/US$ (Central Currency Exchange Rate of 2000)]



Data by Dr.Tetsunari Iida, Institute for Sustainable Energy Policies (ISEP)

Feed-in Tariff Scheme for Renewable Energy in Japan

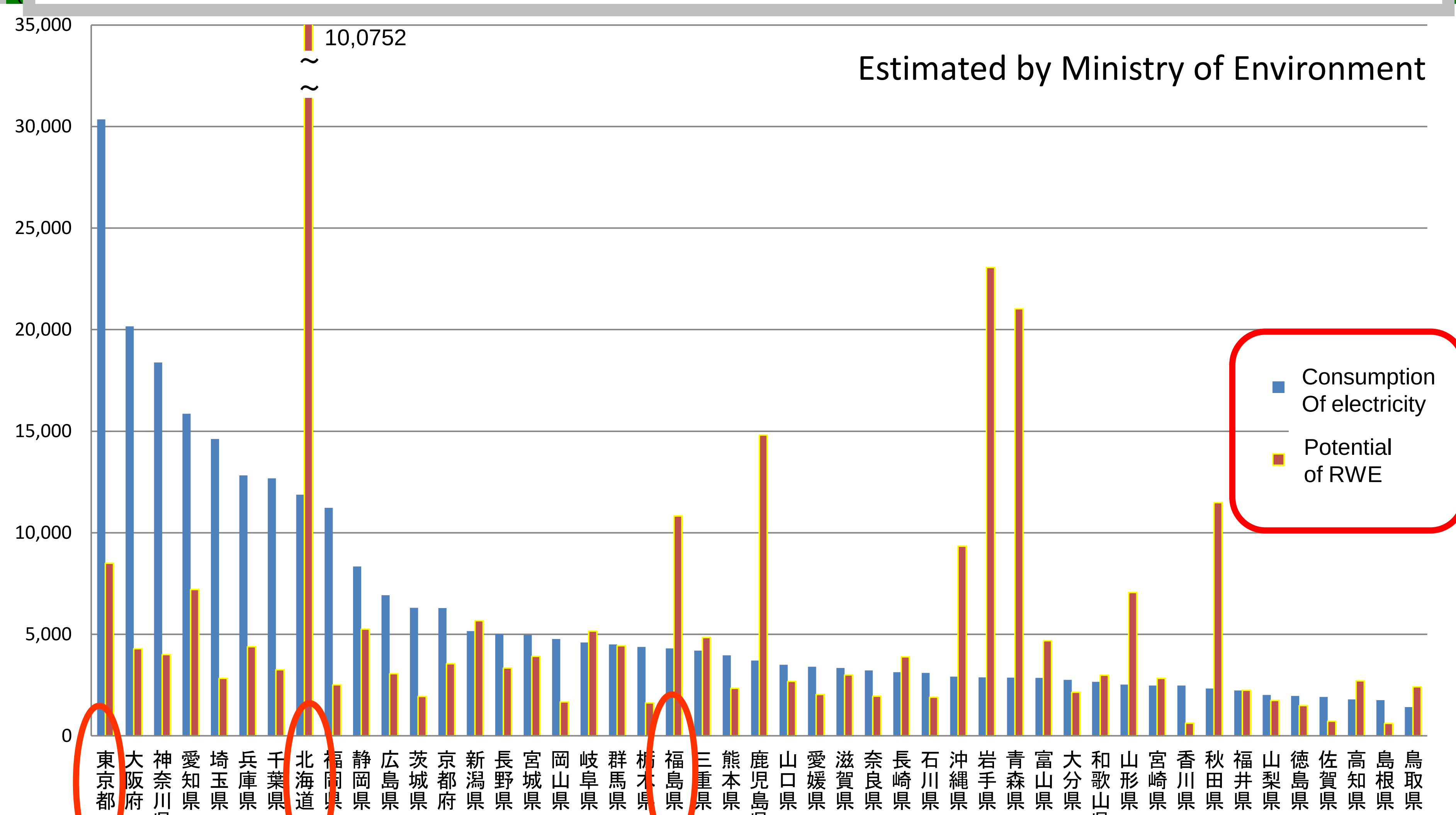
– A new scheme in which electric utility companies purchase electricity generated from renewable energy resources at a fixed-price and for fixed-period will start on **July 1, 2012.**



by F. Ishida

Source: METI

Potential of Renewable Energy in each prefecture in japan



出典：環境省総合環境政策局環境計画課「平成23年版　環境統計集」より作成

出典：総務省緑の分権改革推進会議 第四分科会「再生可能エネルギー資源等の賦存量等 の調査についての統一的なガイドライン」

※シナリオ①の数値を採用。ただし、風力は陸上のものだけとし、洋上はのぞく。

Contents

S & T and Innovation in the 21st century

- ○ STI for profit
- ○ STI for competitiveness
- ○ STI for growth
- ○ STI for employment
- ○ STI for wellbeing & quality of life
- ○ STI for safety, security & social cohesion
- ○ STI for sustainability & resilience

Innovation horizon is expanding.
Science and technology policy is changing.
Redesigning science & innovation system
– locally, nationally, regionally and globally –

Legal framework of Japan's S&T Policy: Basic Law and Basic Plan

Science and Technology Basic Law（enacted unanimously in 1995）

1st Basic Plan（FY 1996-2000）

●Increase in government R&D expenditure

The total budget for governmental R&D expenditure exceeded 170 B$.＜176 B$＞

●Construction of new R&D system

- Increase in competitive research funds
- Support plan for 10,000 post-doctoral fellows
- Promotion of industry-academia-government collaboration
- Implementation of evaluation systems

2nd Basic Plan（FY 2001-2005）

●Three basic ideas

(i) Creation of wisdom
(ii) Vitality from wisdom
(iii) Sophisticated society by wisdom

●Key policies

- Strategic priority set S&T
  - Promotion of basic researches
  - Prioritization of R&D
- S&T system reforms
  - Doubling of competitive research funds
  - Enhancement of industry-academia-government collaboration
- Total budget :240 B$ ＜211 B$＞

3rd Basic Plan（FY 2006-2010）

●Three basic ideas

Create Human Wisdom, Maximize National Potential, and Protect Nation's Health and Security

●Key Policies

Promotion of basic researches

- Quantum i… …edge, discovery and creation
- …researchers
- …as

…n of R&D

…ized 4 Areas	Promoted 4 Areas
*Life Science	・Energy
*ICT	・Manufacturing technology
*Environment	・Social Infrastructure
*Nanotech/Materias	・Frontier

Key Technologies of National Importance

S&T System Reform

- Developing, securing and activating human resources
- Creating scientific development and persistent innovation
- Total budget :250 B$ ＜ 215 B$ ＞

4th Basic Plan（FY 2011-2015）

The 4th Basic Plan for Science and Technology, Government of Japan, August 2011 after 3.11.

I. Basic Concept

1. Unprecedented Crises of Japan and Change of the World
2. 1st-3rd Basic Plans' achievements and problems
3. S&T policy to ST & innovation policy; Issue-driven beyond discipline-based innovation

Issue-driven STI policy

II. Realization of Sustainable Growth into the Future and Social Development

1. Basic principle
2. Realization of **Recovery and Reconst**[...]
   Disasters
3. Promotion of **green innovation**
4. Promotion of **life innovation**
5. **System reforms** to promote STI

***Recovery & reconstruction**
***Green and Life innovation**
***System reform**

III. A[...]ng[...]

[...]notion of measures to attain
[...]em reforms to attain key challeng[...] (same as II.5)
[...]egic development of globally integrated activities
[...]st Asian Science and Innovation Area (e-ASIA)"

Asian Research Area

[...]d
[...]nd
infrastructure

"Bridging science & society"
***Public participation**
***Addressing ethical, legal and social issues(ELSI) & technology assessment (TA)**
***Science & risk communication**
"Promoting Science of STI Policy"

V. Science and society
D[...]opment of policies together with society [...]

1. Basic principle
2. Deepening relations between society and science/technology innovation
3. Promoting effective STI policy
4. Expanding R&D investment

People's distrust of science is growing after 3.11.

National Institute of Science and technology Policy

I trust scientists; ①yes, ②rather than.
I distrust scientists ; ③rather than, ④yes. ⑤no response

THIS WEEK

EDITORIALS

DISEASE Prevalence of diabetes soars in the United Arab Emirates p.279

WORLD VIEW Spanish science faces trouble and terminal decline p.277

JUST SO How the zebrafish got its stripes p.279

Tough choices

Scientists must find ways to make more efficient use of funds — or politicians may do it for them.

Scientists in the United States can find plenty of good news as they page through President Barack Obama's 2013 budget proposal. Despite substantial cuts elsewhere — and fierce pressure from Republicans to cut more — Obama called for healthy overall increases in both fundamental research and science education (see page 283).

But the good news, of course, is tempered by reality. Obama's budget document is one long struggle to balance two contradictory goals: to stimulate the lagging US economy and to curb the annual budget deficit, which is more than US$1 trillion. Science and science education are widely viewed as helping with the first, and will doubtless continue to be seen as such no matter who wins November's presidential election.

The idea that science is a driver of prosperity is one of the few things on which the United States' bitterly divided political parties still agree. But the science funding agencies themselves are by no means immune to the second goal. The harder the cuts bite, the more those agencies will have to streamline their operations and merge or terminate programmes.

This week's budget proposal, which contains many references to "tough choices", shows that this process is already well under way. The Department of Energy (DOE), for example, wants to discontinue funding of several dozen projects that have not met their research milestones, or that seem otherwise unpromising. The National Science Foundation (NSF) is likewise cutting back on some $66 million in lower-priority education, outreach and research programmes. The National Institutes of Health (NIH) has been ordered to pursue "new grant management policies" to increase the number of new grants by 7%. And NASA is being obliged to make drastic cuts to its Mars exploration programme so as to finish building its flagship James Webb Space Telescope.

Conceivably, this process could get even more drastic. Last month, Obama asked Congress to give him the authority to consolidate and streamline agencies on his own initiative — and suggested that one early application would be to transfer the National Oceanic and Atmospheric Administration from the Department of Commerce to the Department of the Interior. If Congress were to give Obama that power, it is possible to imagine him — or some future Republican president — sending all of the NSF's science-education programmes to the Department of Education, or merging the DOE's particle and nuclear physics research into the NSF, under the guise of making management of science more efficient.

White House officials insist that no one in the administration is even contemplating such a wholesale restructuring. But the arithmetic of the deficit is unavoidable. Individual researchers, scientific societies and science funding agencies can no longer afford to be purely reactive, responding to each cut as it comes along. They need to be part of the debate, thinking systematically about how programmes and even whole agencies could be restructured to make them more efficient at using the scarce funds available, and more effective at promoting the best science.

> "Researchers, societies and funding agencies can no longer afford to be purely reactive."

To do that, and to address the increasing demands from politicians and voters for evidence that fundamental research is useful, scientists must also find better ways to measure the effectiveness of the nation's investments in science. The usual technique is to insist that principal investigators produce more and more reports, which tends to be a waste of everyone's time. A consortium of six universities called Star Metrics, launched in 2010 and headquartered at the NIH, has shown that it is possible to do better by using natural language processing and other tools to mine the data and reports that the agencies already collect. But even that is just a beginning. Researchers and research institutions need to help to devise still better measures — because if they don't do it themselves, politicians and others who know much less about science may very well do it for them. And who knows where that would end. ■

Nature, Feb.16,2012

EDITORIAL

Alan I. Leshner is the chief executive officer of the American Association for the Advancement of Science and executive publisher of *Science*.

Rethinking the Science System

AS THE U.S. BUDGET ENVIRONMENT FOR SCIENCE AND TECHNOLOGY (S&T) THREATENS TO GET WORSE, it is essential for the scientific community to go beyond just advocating for special consideration. There is a strong case for maintaining investments in S&T as a foundation for long-term economic growth and social well-being. But when resources are constrained, it is essential that they be used effectively and efficiently to avoid losing scientific momentum and to ensure that society will benefit maximally from S&T's potential. The scientific community cannot afford to simply adapt passively to reduced budgets. The impact of impending cuts can be at least partially mitigated by some fundamental rethinking of the ways in which S&T are both funded and conducted. Although the United States is used as the example here, the same issues will apply in many other parts of the world.

Some relatively inexpensive process and policy changes could make a big difference. For example, the Federal Demonstration Partnership has reported that 42% of an American scientist's research time is spent on administrative tasks. Much of that burden comes from redundant reporting and assurance requirements that vary across granting agencies and universities. The National Science and Technology Council, which represents all of the U.S. research funding agencies, should intensify its efforts to harmonize funding and reporting policies across granting agencies to reduce wasted effort. As another example, in the face of potentially lower success rates that could end up generating even more proposals to review, new forms of shorter grant proposals or the use of preliminary proposals might help greatly in reducing the burden on funding agency program officers, on already overworked peer reviewers, and on project investigators. New models of streamlined or batch-processed peer review might also substantially improve efficiencies.

Another long-discussed issue that should be addressed at this time concerns funding grants based on detailed project descriptions versus grants based primarily on the accomplishments of the investigator. In a time of very constrained funding, it is not the best use of an established investigator's time to require yet another detailed project description when a simpler approach might suffice for renewed funding decisions. The National Science Foundation's Accomplishment-Based Renewal is one such example, where the decision on whether to renew a grant is based on recent success, rather than on projects yet to come. In considering this kind of approach, it would be important to include mechanisms that avoid skewing review decisions so heavily in the direction of established investigators that young investigators see little opportunity in the system for them. In that context, another approach that should be considered involves putting limits on the number of grants and/or the amount of funding awarded to any single investigator. This would make more funds available for young investigators or those new to the field.

The time is right for a fundamental re-envisioning of the system. Crisis can breed opportunity as well as hardship. Some in-depth analyses of the U.S. S&T enterprise are already under way and can provide excellent starting points for continued discussion. For example, the President's Council of Advisors on Science and Technology is currently studying the U.S. S&T enterprise and writing a report. The National Research Council is nearing completion of a study on the future of research universities. The difficult decisions will, of course, ultimately be made by policy-makers, but these decisions must be informed by a broadly inclusive conversation among all the stakeholders—government agencies and other policy-makers, industry, academia, patient groups, and researchers. The National Institutes of Health has recently sought broad input on its efforts to manage in fiscally challenged times (http://nexus.od.nih.gov/all/rock-talk/), and the S&T community should respond. Although consensus on the specifics may not be possible, the participants in the S&T system must all be willing to entertain truly bold and innovative ideas for moving forward in the new budget climate.

– Alan I. Leshner

[illegible]

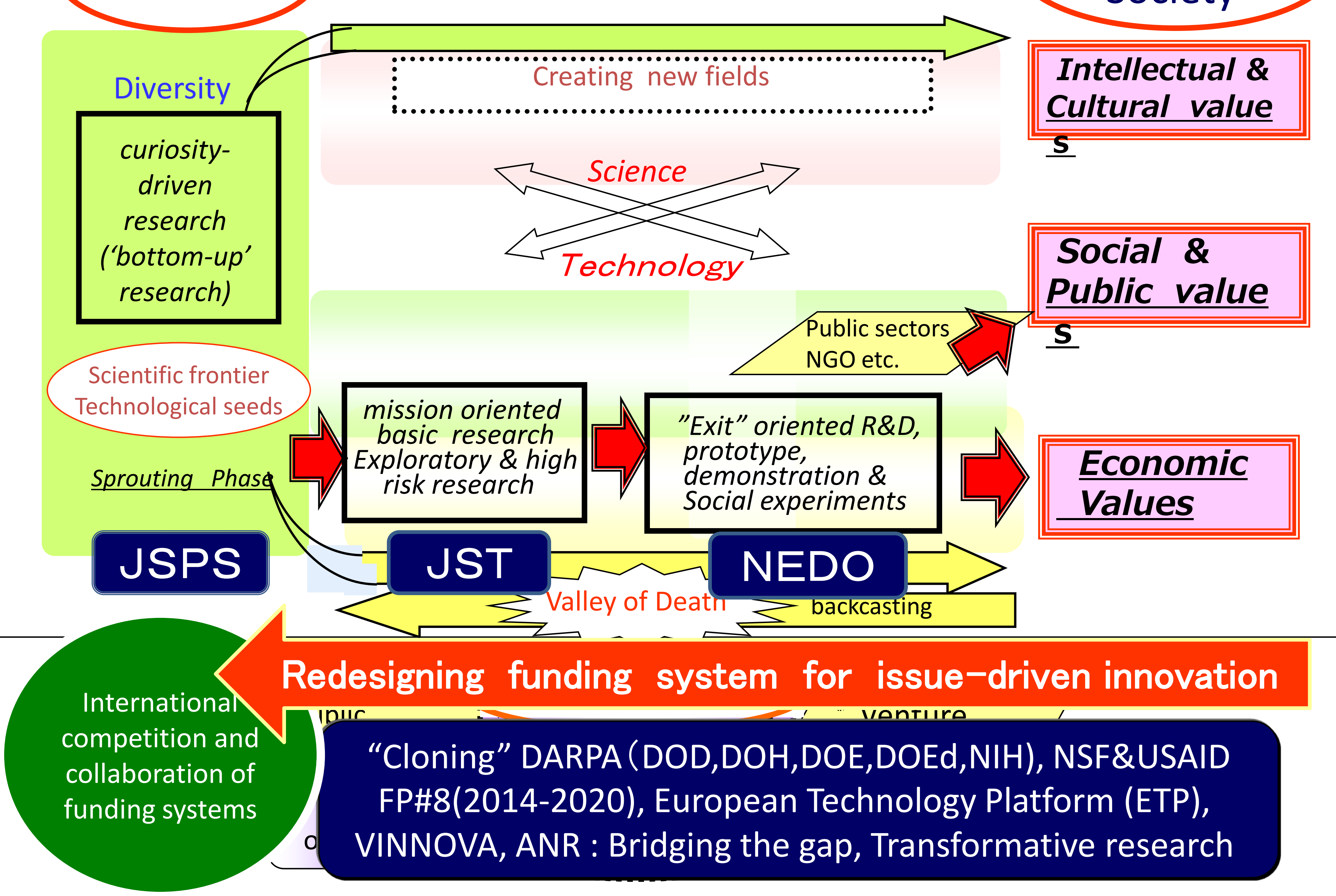
Science, Nov.11,2011

Contents

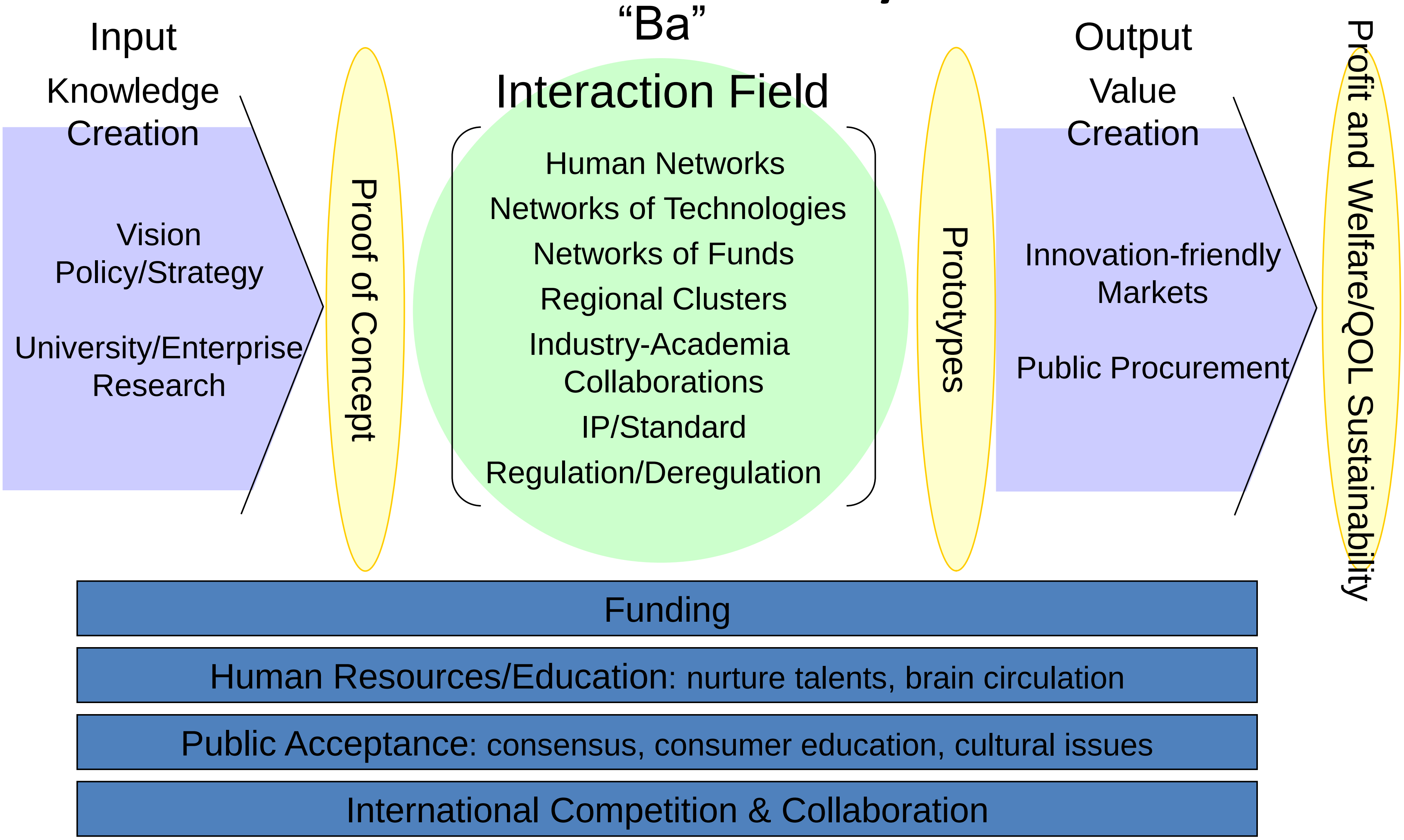
Science

Research funding system –based on national innovation system in Japan

Market & Society



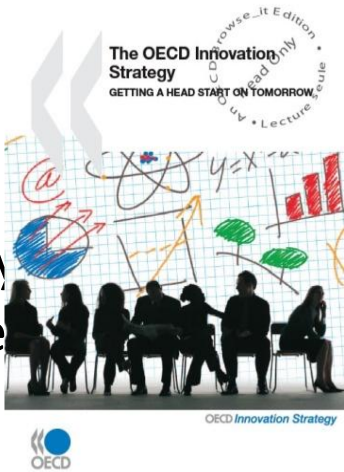
Innovation Ecosystem



The OECD Innovation Strategy : *Getting A Head Start On Tomorrow , May 2010*

In the post-crisis world, and with a still fragile recovery, we are facing significant economic, environmental and social challenges. While no single policy instrument holds all the answers, innovation is the key ingredient of any effort to improve people's quality of life. It is also essential for addressing some of society's most pressing issues, such as climate change, health and poverty.

Innovation today is a pervasive phenomenon and involves a wide range of actors than ever before. Once largely carried out by research and university laboratories in the private and government sectors, it is now also the domain of civil society, philanthropic organizations and indeed individuals. Therefore, policies to promote it should be adapted to today's environment and equip a wide variety of actors to undertake innovative actions and benefit from its results. Effective mechanisms for international co-operation in science, technology and innovation will also need to be put in place in order to make innovation an engine for development and growth.

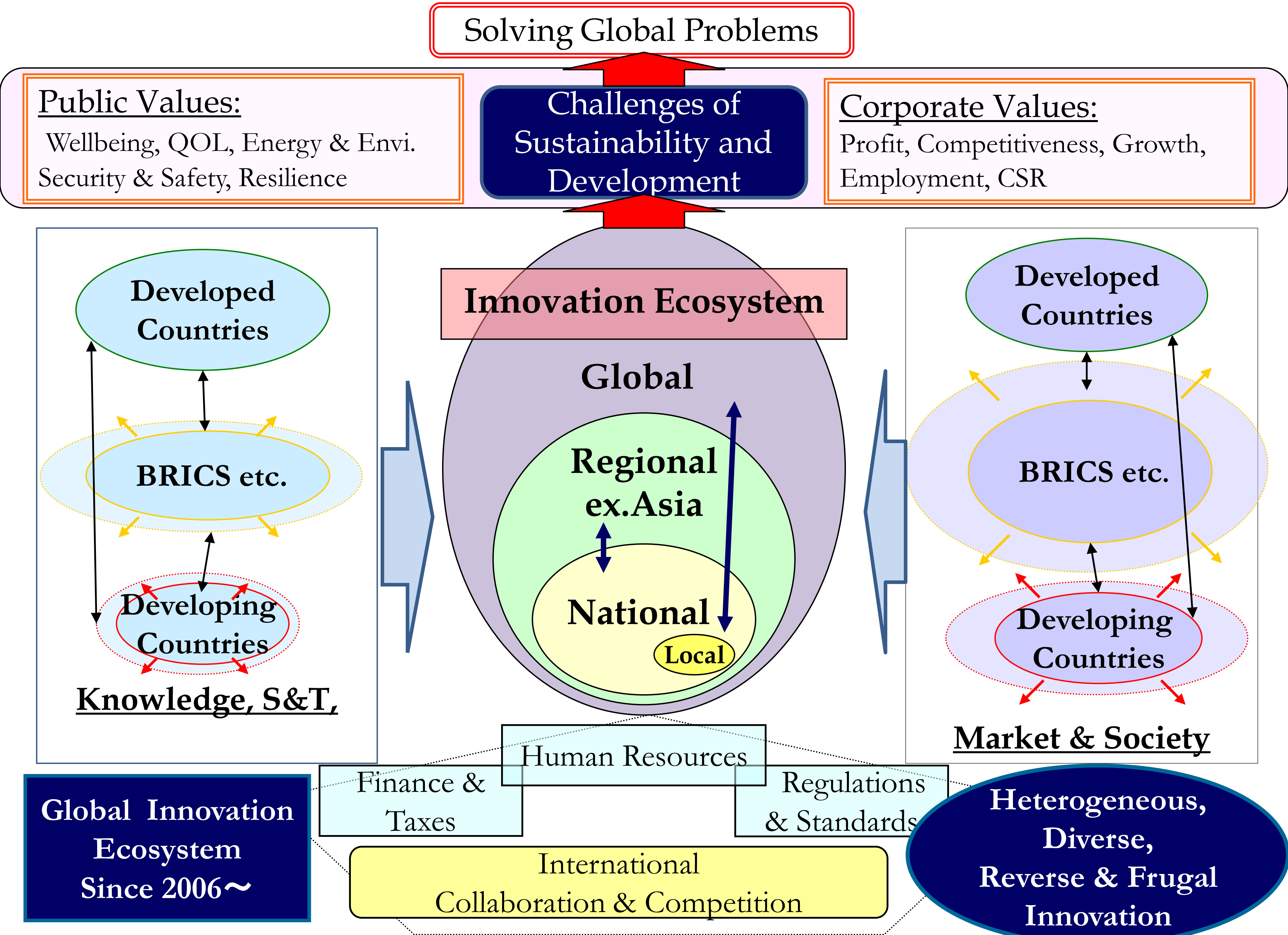


The OECD Innovation Strategy

The last few years have seen a burst of interest in steering research and innovation to address social challenges. This interest reflects the rise of **"social innovation"**, the use of innovation to address social problems. Many of today's social challenges, such as those associated with ageing populations and environmental sustainability, as well as longstanding problems such as poverty, education and migration, **have resisted conventional government or market solutions.** ………….

…….They can in fact be complementary, but this will require changes to the way policy makers promote innovation, for example **by involving stakeholders so as to link social demands with research agendas.**

…… Given **the multidisciplinary nature of many social problems**, research to address them must **bring together the natural and social sciences.**



Solving Global Problems
Public Values:
Wellbeing, QOL, Energy & Envi.
Security & Safety, Resilience
Challenges of Sustainability and Development
Corporate Values:
Profit, Competitiveness, Growth,
Employment, CSR
Developed Countries
BRICS etc.
Developing Countries
Knowledge, S&T,
Innovation Ecosystem
Global
Regional ex.Asia
National
Local
Developed Countries
BRICS etc.
Developing Countries
Market & Society
Human Resources
Finance & Taxes
Regulations & Standards
International Collaboration & Competition
Global Innovation Ecosystem Since 2006～
Heterogeneous, Diverse, Reverse & Frugal Innovation

Contents

New Perspectives of STI (No.1)

○ Gravity of scientific activities moving to developing countries

"Silent Sputnik" (Obama, Rita Colwell);

- AAAS2010 : "Bridging Science and Society"
- AAAS2011 : "Science without Borders"
- AAAS2012 : "Flattering the world : Building the 21st C. Global Knowledge Society"
- WSF2011: "The Changing Landscape of Science : Challenges & Opportunities"

○ Globalization and localization

Reshaping the values and leadership principles

○Global governance of science, harmonization of review system

Bridging science and society

Scientific integrity, ethics and norm

○New innovation models;

"disruptive"innovation,

"reverse" and "frugal" innovation

New Perspectives of STI (No.2)

○ Redesigning & reshaping science and innovation system

- issue-driven S&T policy beyond discipline-based policy
- NOE(Network of Excellences) and COE(Center of Excellence)
- Network, platform & connectivity for innovation

  Open innovation

  Beyond the boundaries

  (disciplines, , sectors, organizations, genders, generations, nations)

  Public and business partnership, non-traditional players

  System of systems (ex. ERA, ARA etc)

  (global/regional/national/local)

○Human capital for new innovation, reform of evaluation system

design and system thinking, non-traditional skills and sense, diversity and inclusiveness, collective intelligence, foresight under the complex and uncertain world

Thank you very much for your attention!!

Questions:
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http://www.jst.go.jp/