

Global Focus on Knowledge Lecture Series  
Energy and the Earth

# Governance of Energy and Environmental Problems

1. Science, Technology and Decision Making

Hideaki Shiroyama

University of Tokyo Graduate Schools for Laws and  
Politics

# At First...

- Development of science and technology is accompanied not only with **benefits** but various **risks and social problems**.
- As problems widen, range of those concerned **actor = stake holder** broadened.
- Each actor has responsibility as a detector of benefits, risks, and problems.

# Examples

- **Nuclear Power Technology** Energy Security; Safety, security (nonproliferation issues)
- **Biotechnology, Genetic Engineering**
  - (1) Transgenic foods — food security; safety (food, environment), ethics
  - (2) Gene therapy (genetic manipulation to humans) — health; safety, ethics
- **Recognition factors**: reality by recognition  
“Harmful rumor” is a real economic problem.

## What is Science and Technology Governance ?

- If society is to use technology which is possible to be used in various ways and has a social implication including both benefits and risks, **a system to make decisions and manage development and use of technology by the whole society**, in other words, **technology governance** would be needed.
- While **government** is an organization based on hierarchy , **governance** demands an organization which involves parallel relationships between various social groups and companies, and relationships to other governments.
- Leaders : experts of various fields, governments of various levels (international organization, country, municipalities, various groups (experts group, employer's organization etc. ), citizens

cf. importance of employers: **CSR** (Corporate Social Responsibility)

# Function of Technology Governance (1)

## Risk Management

### Speculation of Risk and Benefit

- **Risk Assessment:**

Possibilities of harm × Size of harm

Epidemiology data or animal experiment data are essential

Range of harm: Number of dead people or number of victims including injured or patients

Size of harm: Is a huge system disaster concerned to be qualitatively different?

- **Risk Management**

To judge to which extent level of risks can be allowed, presupposing risk assessment.

# Function of Technology Governance ( 1 )

## Risk Management

### Speculation of Risk and Benefit

- Judgment of risk management: Consideration for **a balance with benefits** that technology concerned brings is needed.
  - Why does society accept cars that have high risk numerically?
  - **Distributive implication**: To judge benefits, distributive implication to think who receive benefits is also important. Even if benefit is large as a whole, but only small part of the society receives this, society might turn down this technology.
- cf. Nuclear power generation and transgenic foods have low risks, but society does not accept them easily. One reason for this is because industries are direct receivers of their benefits. ( At least people think so.)
- cf. possibility to be used in developing countries

# Function of Technology Governance (1)

## Risk Management

### Speculation of Risk and Benefit

- Parts of **risk** are **ignored** or **exaggerated**. When a company is developing its technology, and if some risk were found to be accompanied by that technology, the company might refrain from announcing this to the public in order to recover investment to development. On the other hand, groups protesting to a certain technology (**competitors**) sometimes exaggerate a part of risks. Experts focus on different aspects of risks according to their specialties.
- **Benefits** are sometimes **presented insufficiently** or **exaggerated**. There is a huge gap between technologies such as genetic engineering or nanotechnology and benefits in real society. (increasing food production in developing countries, easing poverty, induction of medical diagnosis technology, preventive medicine based on continuous and easy monitoring, reducing medical costs.)  
On the other hand, technology developers complain that **only risks are discussed, and benefits are not focused on enough**. They insist on effects of the technology since they also need to acquire research funds, but sometimes **the effects they insist on are exaggerated**.

# Function of Technology Governance (1)

## Risk Management

### Speculation of Risk and Benefit

- **Science** that demands risk assessment is likely to be **fallible**. — How society judges certain fallibleness is questioned.
- “**precautionary principle**”: To develop some responses such as regulations preventively to cope with huge damage that might happen when the science is fallible.
- “**no regret policy**”: To make only responses that would be meaningful even if nothing happened and they do not take measures for mock situations, while it is unclear what would happen.
- There are **fallibleness** in benefits and risks by **using**. — Technology can be used for various purposes, and some are used for purposes that developers had **never thought of**. Also, some technologies are diverted to different purposes from the original ones (ex. military use) . There are cases where the true benefits or risks of technologies are not understood for a long time.  
cf. availability for poor people, gender impact



# Function of Technology Governance (1)

## Risk Management

### Many Faces of Risks and Benefits

- **Risks and benefits have many faces.** For example, by adding an idea of **international relationships**, different risks and benefits for same technology are often discovered.
- **Nuclear power generation technology domestic:** "cheap" energy provision, security risk; **international:** energy security, nuclear dispersal risk
- **Benefits from technology changes when purposes in society change.** For example, benefits from **nuclear power generation technology** for energy supply was already recognized, but as global warming became a social problem, a fact that nuclear power generation does not emit carbon dioxide which is a causative substance of warming was added to its benefits. On the other hand, **coal fired power generation technology**'s risk for emitting large amounts of carbon dioxide was emphasized in a social context of global warming, but as the price of oil rose and interest in energy security grew, the energy security benefit of coal whose **localities are relatively spread around the world** was recognized.

# Function of Technology Governance (1)

## Risk Management

### Risk Trade-off

- **Risk trade-off** is an effort made at reducing certain risks that end up in increasing risk inversely.
- Ex: A **car lightened** to improve fuel efficiency is vulnerable to collision; **early replacements of CFC** reduced damages to the ozone layer, but some of them promoted global warming; **methyl bromide** used for fumigant to lower risks in food safety had a risk for destroying the ozone layer.
- **Wind-power generation**: Trade-off between global warming risk or energy security risk and risks for killing birds, generating landscape noise.
- **Bio fuel**: Trade-off between energy security risk or global warming risk (?) and food security risk in developing countries

# Function of Technology Governance (2)

## Issue of Values and Role of Vision

- For any benefit or risk, there are important factors to be concerned which function as an **ace**—Issues of values concerned with **human rights** and **"dignity of humans"**
- Ignorance of **population problems** in discussions on sustainability—religious implication, human rights implication
- **Wrongful Life Case** (Children claimed their own life with disorders or congenital disorders—This became more real problem by advances in **prenatal diagnosis technology**)—France considers admitting these cases would mean admitting existence of life that is not worth living, and thus it would be against **human's dignity**. On the other hand, from the notion of human dignity to be an empowerment for giving humans right abilities, Netherlands consider admitting complaints by children born with disorders which were avoidable to be rather consistent with human dignity. This reflects whether human dignity is considered to be an important value to protect integrity, or a value to make individual decisions or to enjoy economic liberty.
- **Restriction on Animal Experiments Expedient thought** to reduce "pain": To reduce "pain" as much as possible is important, but animal experiments which offer materials for essential experiments to development of science and technologies cannot be banned.  $\longleftrightarrow$  "Animals' Rights": If comparable rights with human rights were given to animals, there is a possibility that any animal experiments cannot be admitted even if there are many benefits.

# Function of Technology Governance (2)

## Issue of Values and Role of Vision

- Social judgments among technologies are also related to issues of **social vision** — as nanotechnologies develop, **converging technologies** which is **the** mixed field of nano technology, biotechnology, and information technology attract attention — What kind of social implications these technologies would have is studied in Europe. (Control of benefits and collected information, analysis of privacy issues)
- The USA: "converging technologies for **human enhancement**" (interests in military capabilities, memories)
- Europe: "converging technologies for **knowledge society**" (interests in impact on social cohesion, use for social purposes)
- **Mining technologies into social purpose** has impact on political processes ( range and attitude of concerned people) cf. LRT (Light Rail Transit)

# Function of Technology Governance (3)

## Promotion of Producing Knowledge

- Based on existence of science and technology, we have so far discussed how societies can utilize them and what must be considered to make social judgments. However, existence of scientific knowledge and technology is not clear. To generate them, **societies must cultivate groups of people called scientists or engineers, and urge their research activities.**
- There is a need to reconsider the role of legal concepts such as **"freedom of learning" or "freedom of research"**. These concepts have often been considered as concepts to justify "science for science" or "research for research". However, it can be defined again as **an organization principle to promote knowledge production.**
- To make **intelligent innovation**, conducting research as a job under directions from higher-ranking person in hierarchical organization is not enough. "Freedom of learning" and "freedom of research" **enable various trials and experiments in a bottom-up style**, and result in promoting intelligent innovation which can also dedicate to the society. In these processes, construction of **cross-disciplinary network** is important. cf. meaning of **diversity, popular cases in technology development**

# Function of Technology Governance (3)

## Promotion of Producing Knowledge

- Promotion of producing knowledge is essential for **risk assessment**
  - To promote production of information needed for risk assessment, **law of experiments** to allow various experiments is essential. cf. In Japan, safety regulations are so severe that essential data for applications to get approval of safety regulations cannot be obtained in domestic laboratories, and researchers have to use experiment data obtained in foreign countries.
- Comparisons of “academic freedom” and “freedom of research” with security and safety also will be needed. — When there is a risk of gradual **clinical trials** for drug development, trials of clinical technologies, and research results be used for terrorism, **should these results be not published to protect security?**
- Should **intellectual property rights** be used to enhance incentive for researchers? — On the other hand, when a motive for intellectual production is not economic incentive but satisfaction of intellectual curiosity or recognition from fellow members in the community of experts, intellectual property rights do not function. If intellectual property rights are set for every little classifications, constructing knowledge from combinations of various factors would be difficult. ; The classic principle of researchers community was the use of **academic commons**.

# In the End...

Recommendation of “We may sleep in the same bed, but we have different dreams”

- Various actors in society have **various points of view**, and it is important to understand **framing** which is a framework to recognize issues of each objects.
- Also, various viewpoints and a place to control benefits are needed. There is a need to “open” issues of science and technology to experts in other fields of science. **A dialogue between experts and citizens** is important then, but **a dialogue with experts of another discipline** and making a language for mutual understanding are also important.
- All the actors should not necessarily agree with the same vision in decision making. **“We may sleep in the same bed, but we have different dreams”** is also important. Actors in society have various viewpoints and concerns. In these cases, assessment of each actors rarely match. For example, an actor may have interest in **nuclear power technologies or biomass energy technologies** as countermeasures for global warming, and another actor might have interest in the same technologies as countermeasures for energy security. In this case, each actor has different interests, but they can agree to supporting this technology together.

# In the End...

## Toward Securing Sustainability Including Energy and the Earth Environment

- 1987 **Report from Brundtland Committee**, “**Our Common Future**” — “Sustainable development satisfies the basic needs of all the people in the world, and it would need enhancement of chances for all the people in the world to live a better life” — We have to find a way to deal with restrictions of environment ability not by restraining demands for “the basic needs” or “better life” that each person has, but by **achieving them at once**.
- Looking for simultaneous achievements in various dimensions constructing sustainability (①Population and Human Resources, ② Food Security, ③Species and Ecosystem, ④Energy, ⑤Industry, ⑥ The Urban Challenge)
- In fact, **a conflict with each other is possible** — food production (security) and ecosystems
- **The system of systems** (a system to make each systems coexist) is needed to realize sustainability = “Sleeping in the same bed, but having different dreams” is needed — Energy and environmental issues are parts of it.
- **However, there is a possibility that issues of values** (ex: **lifestyle** reconstructing issues) rise in the end — But not from the beginning.



# References

- Hideaki Shiroyama *Technology Governance* , Tosindo, 2007
- Tatsujiro Suzuki, Hideaki Shiroyama, Miwao Matsumoto (co-edit) *Social Decision Making in Induction of Energy Technologies*, Nippon-Hyoron-Sha, 2007