SISSA – International School for Advanced Studies Journal of Science Communication
ISSN 1824 – 2049 http://jcom.sissa.it/

Comment

**BRIDGING THE GAP BETWEEN SCIENCE AND POLICY:
THE IMPORTANCE OF MUTUAL RESPECT, TRUST AND THE ROLE OF MEDIATORS**

Exploring work: the interaction between scientists and policy-makers. Case study of 863 Plan of China

Wen Ke

ABSTRACT: Improving communications between scientists and policy makers have being received more and more attention in China. Based on negotiation-boundary work theory (Jasanoff, 1990), this paper presents an analysis of the interface between scientists and policy makers by drawing on the Strategic High-tech Research and Development Program of China (863 Program). The analysis indicates, first, that it is very important of science advice in China, the negotiation and the consensus between scientists and policy makers is vital for policy making; second, that it is dangerous to rely on Technocracy in China, the policy makers give up the discretion while influence experts' decisions by controlling the consist of scientist advisory committee, which directly result in politicalizing academic research. For scientists and policy makers in China, they should redefine their respective authority boundary, and make the interaction process open and transparent.

Introduction

Today, as science and technology gradually become the driver for economic development and social impetus, they also have an impact on most core government functions,[1] which resulted in the use of scientific consultations in policy-making. Therefore, interactions between scientists and policy-makers are getting more remarkable, especially in policy-making of public fields, like medicine, health, energy-saving, climate change, etc.[2]

Generally speaking, the interaction between scientists and policy makers to a large possibility depends on a country's political context.[3,4,5] Nations with dispersed and pluralistic power, such as US, have networking-style scientific consultations. Their government departments have both standing and temporary expert consultation committees, and also seek advice from commercial consultation companies or non-governmental organizations[6,7] while western nations with relatively centralized power, like Germany and France, have accordant research and consultation institutes in their public policy-making and legislation institutions at all levels, where institutionalized scientist community plays critical roles in science-related policy-making.[8] China has a political system with special characteristics. In Chinese political system, the People's Congress is the legislative body; the Court and the Procuratorate are the judicial body; local governments at all levels are the administrative body; and the Chinese administrative body and the judicial body are elected by the People's Congress. Moreover, the legislative power is shared by the administrative body and the People's Congress, especially after 2000, when the regulations of administration body were specified as laws by the Legislation Law of the Peoples Republic of China. Thus, the administrative body plays the most critical and important role in the process of policy making. Accordingly, China's science consultation system is actually based on the administrative legislation system.

At present, China's science policy consultation institutions can be mainly categorized into three types: First, policy research institutions as a component of governmental departments, such as the policy

research office of departments or standing expert consultation committee or science committees in governments, etc.; second, independent institutions providing consultation services, like scientific institutions, universities etc.; third, non-governmental consultation institutions. Among these three types of institutions, the first type serves as internal think tank, whose independence and objectivity is usually questionable; the third type, restricted by the backward development of legislation on the non-governmental organizations, fails to develop well; the second type is playing a more and more important role, because of its relative independence and professional advantages. In this paper, the author will take the initiative and implementation of the 863 Program as a typical example to understand the interaction between the second type of institutions, i.e. researchers, and policy-makers by applying negotiation and boundary work theory.[9]

Background of 863 Plan

The most direct cause of the 863 Program is the Star Wars Project announced by US President Ronald Reagan in March, 1983, which commanded the attention of the whole world. The Reagan government adopted the strategy of "developing high technology under the cover of investment in military projects", and initiated a series of argumentation and feasibility researches in frontier science and technologies. Europe, Japan and the Soviet Union followed US and made accordant plans: the European Community initiated the "Eureka program"; Japan put forward "Outline for Promotion Policy of Science and Technology in the Future Decade"; Soviet Union immediately made adjustment and arrangement on its original plans, and launched the "Accelerated Development Strategy", to speed up the application of science and technology in military fields. At that time, Chinese scientists, especially those having access to more international cooperation and communication, had already been tracking and studying researches of advanced technologies. For example, Institute of Computing Technology, China Academy of Science (CAS) entered the field of computer at the emergency of 8-digit computer, and soon developed computer system with Chinese characters; Institute of Microbiology, CAS achieved rapid progress in the early 1980s by following the researches on genetic cloning and expression; Shenyang Institute of Metal Research and Changchun Institute of Applied Chemistry jointly established the Institute of Metal Corrosion and Protection Research, to help China's research on high performance metallic materials and chemical engineering approach the world's leading level. Accumulated researches by scientists enabled China to respond quickly to challenges in scientific competitions, and laid solid knowledge foundations for the initiative and implementation of the 863 Program.

Another driver for the initiative of the 863 Program is the reform in China's science and technology system, which aimed at promoting the organic combination between science and economy. In March, 1985, the "Decision on the Reform in Science and Technology system by Central Committee of the Communist Party of China" (the Decision) was issued, indicating the formal start of China's reform in science and technology system. As the Decision clearly specified, the fundamental goal of the reform in science and technology system is to "*apply the achievements of scientific and technological researches rapidly and widely in production, bring the effects of scientific and technological researchers into full play, emancipate the productive forces of science and technology, and promote scientific and social progress.*"[10] Main scientific and technological manpower of China was mobilized to serve the national economy and economic construction.

On one hand, China had to face the international challenges in scientific completion; on the other hand, science and technology were badly needed to serve economic construction within China. Under this circumstance, the development of high technology was placed on the policy agenda. In November, 1983, Center for Economic and Technological Research under the State Council organized over a thousand experts all around China to study how to develop new technologies, and finished the 1.5-million-word "Research on Measures for China to Embrace Challenges and Opportunities in the world's New Technology Revolution Tide" after discussion.

The process of 863 program initiative and implement

Policy Agenda Set with Academicians' Proposal

On March 3, 1986, in order to promote the high-tech research and development as soon as possible, four Academicians of CAS, Wang Daheng, Wang Ganchang, Yang Jiachi, Chen Fangyun, jointly submitted a proposal to Mr. Deng Xiaoping —"The proposal on Tracking and Researching on Foreign Strategic High technology Research and Development". The proposal suggested, from the perspective of national security, that China should stipulate a plan of high technology development at the national level. The submission of the proposal, legendary to some extent, was not through the formal channel of Academician's reporting procedure, but was sent straight forward to Mr. Deng with the help of Mr. Deng's family. On March 5, three days after the delivery of proposal, Mr. Deng made a written instruction: "This suggestion is very important. We need some experts and officials in charge to discuss it, put forward opinions, and make a decision. The matter should be decided soon without any delay."[11] On March 8, 1986, the State Council convened a meeting of leading officials of the relevant departments to fully discuss the proposal by the four scientists. Through discussions, it was concluded that China should not only develop high technology only for the sake of national defense, but also for civilian ends; the high technology research and development should stick to the basic principle of "Combining Military and Civil Purposes, and Mainly Serving Civilian Ends". It was finally decided that, Song Jian, director of the State Science and Technology Commission (hereinafter referred as "SSTC"), and Ding Henggao, director of Commission on Science, Technology, and Industry for National Defense (hereinafter referred as "COSTIND"), would be responsible for organizing the argumentation of China's program on high technology research and development. In fact, Mr. Deng's instructions have implicitly made clear China's strategic choice to initiative the high technology research and development program, while the following argumentation actually served as a discussion on how the program should be organized and implemented.

Negotiation between Policy Makers and Experts — the Argumentation of 863 Program

From March to August, 1986, the Sci-Tech Leading Team of the State Council organized more than 200 experts from scientific institutions and universities, divided them into 12 teams, discussed and formulated the "Outline of National High technology Research and Development Plan"(hereinafter referred as "the Outline"), which was published after 7 meetings and 3 rounds of extremely strict scientific argumentation organized by the State Council. Based on China's demands and capability in research and development, the argumentation had clearly set the strategic goal of actively tracking and cultivating talents in key fields. Selection of projects was crucial for 863 Program. In argumentation of projects, scientists from scientific institutions and universities were invited to carry out peer reviews on the advanced character and the practicality of applying projects, and funds were allotted based on the results of peer reviews. Relevant government officials also took part in the argumentation process of projects. When experts diverged in opinions, officials usually collected more information by expanding consultation range (including foreign experts) and conducting field researches, and submitted to the leading officials at SSTC and COSTIND for final decision. The Outline finally specified 15 subject projects in 7 fields including biology, aerospace, information, laser, automatization, energy and materials.

In August, 1986, the Outline was passed in the meeting of the Standing Committee of the State Council. In October, the Politburo of the Communist Party of China convened an enlarged meeting and approved the Outline, decided to set up a high technology research and development program of RMB 10 billion, funding for 15 consecutive years. It was an extraordinarily generous program, based on the actual economic conditions in China then. On November 18, the State Council formally issued the notice about the Outline. A strategic high-tech research and development program oriented toward the 21st century was formally known to the public since then. Both the four scientists' proposal and Mr. Deng's instructions were made in March, 1986, so this high technology research and development program was called "863 Program".

Boundary work by scientists — The Implementation of 863 Program

After being initiativeed as a new high technology plan, 863 Program carried out exploration and made breakthrough in system building under the context of Sci-Tech system reform. 863 Program made an outstanding contribution through establishing the mechanism of decision-making by experts for the first time.

863 Program set 2 levels of expert committees. The first level was the Expert Committee for Planning[12] of the whole program, which offered advice and suggestions for major issues, such as development strategy, goals, tasks and arrangements of Program, and inspected the implementation of the Progam. On the second level, Field Expert Committees[13] were set up in each field, and offered service and technological guide for the strategic decision, organization and implementation in the specific field. The responsibilities of field expert committees included: (1) Organizing researches on technological development strategy and forecast, and offering decision-making consultations for goals and tasks in the field; (2) Taking part in making application guidelines(bidding documents) for the projects and subjects; (3) Reviewing the initiation suggestions for subjects and projects; (4) Participating in the argumentation of the project implementation plans; (5) Participating in the inspection, assessment and approval of the projects(subjects); (6) Offering consultations for key technological development issues in the field.[14] Members of the Expert Committee for Planning should not be involved in the Field Expert Committees.

In the implementation of 863 Program, the management and decision-making process by experts was mainly manifested in the Field Expert Committees' decision-making right, not only in the projects, but also in allocating research funds. Undoubtedly, it was a breakthrough against the old sci-tech system in China for the past decades. Scientists transformed from passive performers of decision to important players in the decision-making, while government shifted its role from direct administrative command to indirect control from the perspectives of research and development priority, competition rules, etc.

Achievements and Challenges

As 863 Program was gradually carried out, both scientists and policy-makers realized that tracking of high technology should not be a short-term behavior. 863 Program was continued after 2000, combining with the Five-Year National Economic Plan. It was called the 2nd Phase of 863 Program.

After more than 20 years of efforts, the 863 Program has established a solid base for the initiation, development and industrialization for high technology in China. From 1986 to 2005, China has invested RMB 3.3 billion on 863 Program, which involved more than 150 thousand researchers, roughly 500 research institutes, more than 300 universities and colleges and nearly 1000 companies. According to available statistics, over two decades development of 863 Program witnessed more than 120 thousand research papers, more than 8000 domestic and foreign patents, as well as over 1800 national and industry standards.[15]

Besides great achievements, 863 Program also faces challenges in its positioning and development. It was a tracking program at first, emphasizing "tracing technologies", with more focus on strategy than industry. Moreover, the establishment of decision-making process by experts has entitled scientists at universities and institutes with the right of project selection and fund decision. Scientists stick to the basic and academic researches, calls for taking the "high ground" of high technology and new-tech industries, building "long-term technological reserve", but they lacks both the capability and motivation of industrialization, which leads to the fact that the 863 Program was out of step with industrialization.

Discussion and Conclusions

The initiative and implementation of the 863 Program is a typical case of China's sci-tech policy-making, and also a good example for us to observe the negotiation and boundary work between Chinese scientists and government agencies.

The initiative of the 863 Program has well proved that communication between scientists and policy-makers was the key for a successful decision-making. When agreement on developing high technology development to be achieved, there is not yet a solid scientific consensus as to the means of organizing high technology research and development. In such a context, four scientists have established their authority by direct communication with the toppest policy-maker; the top policy-maker also established

the reasonability of his decision with the help of scientific authority. The interaction between top policy-maker and scientific authority has rapidly pushed forward the initiative of 863 Program. In the argumentation process of 863 Program, a harmonious relationship was maintained between the supervisory departments and scientists in negotiation and boundary work. Suggestions of scientists were fully respected in project and field selection. However, policy-makers still reserved the wide discretion in controversial projects. In case of scientists having disagreements upon the selection of projects, the supervisory departments would take a more neutral stance, further consult international experts or conduct field research on the potential undertaker's qualifications. After collecting enough information from multiple channels, they would support the top policy-makers to make a decision.

Both the initiative and argumentation of subjects of the 863 Program were against the Technocracy theory.[16] Negotiations among scientists only cannot guarantee a decision both scientifically reasonable and generally accepted. In case of high stakes, no scientist community can gather sufficient authorities to solve disputes with scientific reasoning. Then it is important for policy-makers to exercise the discretion during policy making.

But in the implementation of the 863 Program, the decision-making process by experts became an innovative exploration towards the Technocracy. In practice, the mechanism of decision-making by experts had secured scientists' boundary work, but restricted the supervisory department's discretion. Scientists offering advice had carried out twice boundary work: the first time ruling out other scientists from funding range by compiling field project guidelines; the second time emphasizing the basic and academic features of researches, setting papers and patents as review criteria of projects, and ruling out industrialization from the 863 Program. The boundary work has successfully protected interests of some scientists. To pursue the restricted discretion, officials of supervisory departments tried to influence the constitution of the expert group members, so as to interfere with project review and fund allocation. Meanwhile, due to inadequate information disclosure in the implementation of 863 Program, policy-makers and scientists were indulged to form conspiracy and interest groups, which led to interpersonal politics affecting or dominating the management of science and technology.[17] As a result, the mechanism of decision-making by experts was damaged, and 863 Program was faced with more questioning and challenges.

The case of the 863 Program demonstrated that, communication between scientists and policy-makers is vital in policy-making in China. Apparently, scientist advice is a necessary component of realizing harmonious administration among science, society and the state. However, the predicament in implementing 863 Program also shows us that, it may be naive to wholly rely on decision-making by experts, but it is also wrong for supervisory departments to influence experts' decision results by manipulating the selection of scientists. What need to do for policy makers is not avoiding control by science, but how to improve the public interest through communication and use the collective wisdom of the scientific community.

Acknowledgement

I wish to thank CHENG Donghong, without her encourage did not this paper. In the process of writing this paper, her insightful comments and discussion help me a lot. Also, I am grateful for the valuable advice and information from FANG Xin, YANG Peiqing and YANG Xi. Any error and the views put forward remain by my entire responsibility.

Notes and references

[1] S. van den Hove (2007), *A Rationale for Science-Policy Interfaces*, Futures **39**: 807-826.
[2] G. Janse (2008), Communication between forest scientists and forest policy-makers in Europe — A survey on both sides of the science/policy interface, *Forest Policy and Economics* **10**: 183-194.
[3] B.R. Smith (1992), *The Advisers: Scientists in The Policy Process*, The Brookings Institution Press, Washington, DC, U.S.A.
[4] L. Gilson and D. McIntyre (2007), *The interface between research and policy: experience from South Africa*, *Social Science and Medicine* **67**: 748-759.
[5] D.P. MacMynowski (2007), *Pausing at the brink of interdisciplinarity: power and knowledge at the meeting of social and biophysical science*, *Ecology and Society* **12**(1): 20, available at http://www.ecologyandsociety.org/vol12/iss1/art20/.

[6] See Smith (1992).
[7] S. Jasanoff (1990), *The Fifth Branch: Science Advisers As Policymakers*, Harvard University Press, Boston U.S.A.
[8] J. Lentsch and P. Weingart (2009), *Scientific Advice to Policy Making: International Comparison*, Barbara Budrich Publishers, Opladen & Farmington Hill, MI, U.S.A.
[9] See Jasanoff (1990).
[10] The State Science and Technology Commission. Guideline for Science and Technology Policy of China (No. 1)/Beijing Scientific and Technological Documentation Press, 1986
[11] Source: http://paper.ce.cn/jjrb/html/2011-07/31/content_162025.htm.
[12] The Expert Committee for Planning was appointed by SSTC(now the Ministry of Science and Technology) and COSTIND(now the PLA General Armament Department), with a tenure system, 3 years each term, and a maximum service of 2 terms.
[13] Field Expert Committees were recommended by departments and local governments, selected and appointed by SSTC(now the Ministry of Science and Technology) and COSTIND(now the PLA General Armament Department), with a tenure system, 3 years each term, and a maximum service of 3 terms.
[14] Source: http://www.863.gov.cn/news///3536.htm.
[15] Source: http://www.863.gov.cn/1/1/index.htm.
[16] A form of government by technicians; specifically, management of society by technical experts. Technocracy was firstly invented by William Henry Smyth in 1919. In the 1930s, through the influence of Howard Scott and the Technocracy movement that he founded, the term technocracy came to mean government by technical decision making. http://en.wikipedia.org/wiki/Technocracy.
[17] Y. Rao, B. Lu and C.-L. Tsou (2004), *Transition from Rule by Man to Rule by Merit - Comments on National Planning of Science and Technology, Nature* **432**: A12-A17.

Author

Wen Ke is an Associate Professor of Innovation Policy at Institute of Policy and Management, Chinese Academy of Sciences (CASIPM) and the Deputy Secretary-General of Chinese Association of Science of Science and S&T Policy Research. After graduating from University of Science and Technology of China with PhD in 2004, WEN Ke joined in CASIPM as an assistant professor. At the beginning of 2008, she held the position as an associate professor. Between September 2011 and March 2012, she was a visiting scholar at Sloan School of Management, MIT. Her research interests focus on collaboration between science and industry, the organization of scientific research, and the role of science in national competitiveness. She also works widely with natural scientists and social scientists in understanding the process of science policy making in China. She as well as her partners translated "The Advisers: Scientists in Policy Making" into Chinese in 2010. E-mail: wenke@casipm.ac.cn.

HOW TO CITE: W. Ke, *Exploring work: the interaction between scientists and policy-makers. Case study of 863 Plan of China*, *Jcom* **11**(03) (2012) C04