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The Role of Top-Level Key Actors in STI Decision-making in China

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The formation of national-level science and technology policies in China involves multiple actors from a broad range of institutions. While driven by central bodies, it strives to supplement top-down decision-making with bottom-up feedback and expert opinion. Disagreements arise, but they are resolved through democratic decision-making that often requires compromise between different parties. The creation of the National Medium- and Long-Term Science and Technology Development Plan (2006–2020) (MLP) typifies this process. High-level organizations including the Central Committee, State Council, National People's Congress, and various government ministries, including the Ministry of Science and Technology, all participated in the formation process over multiple years. The resultant MLP achieves both long-term benefits for China and realizes S&T feasibility through an intricate exchange of ideas across many parties.

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DEVELOPING A NATIONAL S&T PLAN

At his first meeting following his organization of the State Council, Premier Wen Jiabao put the MLP on both the State Council and the nation's agendas. At around this same time in 2003, SARS (severe acute respiratory syndrome) broke out in China. The National People's Congress (NPC) and the Chinese People's Political Consultative Conference (CPPCC) (*lianghui*) convened in March, and at the start of April, the whole nation stepped into a major battle to combat SARS. International exchanges were terminated and border entries were severely restricted. Every aspect of government work was aimed at combatting SARS.

By May, however, the epidemic had been effectively controlled, and in June the State Council formally organized the leading small group on the National Medium- and Long-Term Science and Technology Development Plan. Premier Wen Jiabao personally chaired the group, and Chen Zhili, the state councilor in charge of science and technology, served as deputy chairman. The remaining members consisted of key leaders from twenty-three State Council departments, including the Ministry of Science and Technology, National Reform and Development Commission, Ministry of Finance, Ministry of Education, Commission for Science, Technology and Industry for National Defense (COSTIND), and three academies of sciences: the Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), and Chinese Academy of Social Sciences (CASS).

Concurrently, an office was set up under the leading small group to handle related work plans. This office was positioned within the Ministry of Science and Technology.[1] The forming of the outline (*gangyao*) took place over the span of two years and seven months, and can be broken into three phases: strategic research (*zhanlue yanjiu*), outline preparation (*gangyao bianzhi*), and outline deliberation (*gangyao shenyi*).

Strategic Research

The strategic research phase lasted about ten months from June 2003 to April 2004. According to requirements put forth by Wen Jiabao, the primary focus of this phase centered on the national strategic goal of comprehensively building a moderately prosperous society (*xiaokang shehui*) by 2020. This included carefully analyzing major problems and constraints of realizing this goal, and focusing on those with a global, forward-looking, and long-term impact, thus setting an important foundation for the next phase. It was only after strategic research and identification of these larger problems that specific problems that might have S&T solutions could be identified. Thus, the science and technology plan emerged from the identifying the strategic needs of the whole nation's macroeconomic development, and from there finding ways that science and technology could contribute.

More than 2,000 experts from S&T, economic, and management departments and research institutes participated in the writing of the plan. These experts divided into about twenty topical research groups, primarily organized around S&T and economic development, with a focus on macro level strategy. These included important fields of economic and social development, such as energy, environment, manufacturing, agriculture, social development, environmental protection, and human health. Each of these small groups conducted research and held democratic discussions to pool the knowledge of individual members. After several months of work, they created a 1.2 million-character strategic research report that laid an important foundation of thought and technologies for further developing the plan. For example, the ninth topic concerned research on public security technologies and the Chinese government's strong emphasis on information management. Regarding the technology challenge of public security, from the very start of the planning process, Premier Wen put forward the need to engage in open-ended research.

During this period, an international workshop was held with the heads of S&T from more than ten countries. This included the U.S. director of the Office of Science and Technology Policy, as well as the South Korean, Indian, and British S&T heads. Premier Wen personally attended these discussions, and participants were invited to share their experience in national S&T development and policy. Concurrently, overseas Chinese experts and leading technology experts were invited to contribute ideas on developing the plan. Premier Wen also made multiple visits to other countries. During his visit to the United Kingdom, he held a forum with foreign experts to directly hear their views. These were new steps that had not previously been taken in preparing medium- and long-term science and technology plans in China.

Chinese embassies and consulates, including those in the United States, also solicited the views of experts on the theme of China's S&T plan, and a website directed to the Chinese general public was launched. The general public could enter their ideas and send them directly to the Office of the Premier.[2] The MLP planning office also hired consulting groups to launch a wide range of social surveys aimed at understanding public opinion. During the strategic research process, there were around 600 representatives from state-owned enterprises and private enterprises and many experts that participated in the formulation of the plan.

Preparation

From April 2004 to August 2004, after the strategic research had progressed to a certain point, Premier Wen chaired seven separate State Council work meetings to hear each of the topical reports and discuss their find-

ings. Important guidance was also given to each group. Using the findings from these completed tasks from the research strategy phase, Premier Wen proposed that efforts be focused on preparing the plan, and he outlined seven guiding principles:

1. Technological innovation should lead to the nation's modernization through the S&T development path.
2. Key areas should be highlighted without attempts to grasp at everything.
3. Integration of disciplines needs to be strengthened along with technology integration.
4. Civil-military integration should be promoted to bring together defense research, defense technology, and civilian technology.
5. Enterprises should take the primary role in technological innovation.
6. A favorable environment for scientists to use their talent needs to be created.
7. Use of international S&T resources and international cooperation need to be maximized.

The plan preparation phase lasted about eight months and primarily included the following elements. The first was to complete the strategic goals of the plan. The second was to confirm priority fields—an issue everyone focused on. Twelve major priority fields were confirmed according to the needs of national socio-economic development. As examples, energy and environment were placed in the first priority field and issues related to people's livelihood were placed in another priority field. Besides the priority fields, the MLP included certain major frontier fields and technology, such as information, new materials, and nanotechnology. Additionally, the MLP included major basic research programs, as well as a concise set of national major S&T projects. These major projects, after much discussion, were finalized as sixteen megaprojects, which are currently being implemented. They are all large in scope, like the development of a large aircraft.

The MLP also included the construction of a national innovation system. This is the first time the national innovation system was inserted into an MLP. The system included the following:

1. Universities and research institutes as key parts of the knowledge innovation system and the key to basic research.
2. Enterprises in a primary role within the industry-university-research institute relationship of the technology innovation system.
3. Technology intermediary services.
4. A regional innovation system, including each locality.
5. A military-civilian integration system and ways to bring the two sides together.
6. The policy measures necessary for implementing the plan.

In January 2005, the work of preparing the outline was formally completed, and it was submitted to CAS, CAE, and CASS for consultation and to the leading small group's twenty-three department members for comments.

Deliberation

The deliberation phase lasted about eight months and began with Premier Wen directly chairing a meeting of the MLP leading small group to deliberate on the plan. During that meeting, it was decided to seek comments from central organizations from each department, China's thirty-one provinces and autonomous regions, local governments, and each of China's democratic parties.

Using these comments, the outline was again revised and deliberated on, then submitted to the Central Committee for discussion. Then-General Secretary and President Hu Jintao separately held meetings of the Politburo Standing Committee and the Politburo to deliberate on the proposed plan. The highest level of central leaders, including NPC Chairman Wu Bangguo and CPPCC National Committee Chairman Jia Qinglin, participated in these important meetings. Revisions were made and work began on developing the needed supporting policies. In total, there more than twenty departments participated in developing these policies. At the end of 2005, Premier Wen Jiabao formally signed and published the plan outline and transmitted the related policies.

The Central Committee and State Council held the National Conference on Science and Technology January 9–11, 2006, where the MLP was deployed for implementation. Hu Jintao and Wen Jiabao both delivered important addresses. In particular, Hu Jintao explicitly put forth the need to follow an innovation path with Chinese characteristics and to build innovative national goals. Premier Wen spoke on how to implement the outline and delivered important remarks on opening the horizons of innovation.

During the whole process, the preparation of national S&T development plans was the mandate of the State Council, in accordance with the PRC constitution. In each of the three years of plan preparation, Premier Wen Jiabao reported on the progress of the MLP's development in his annual work reports to the NPC, which deliberated on and approved the work report. Thus it can be seen that the important decisions of government are made according to law and through democratic processes. The ruling Chinese Communist Party proposed the MLP to the NPC, and China's highest administrative body—the State Council—organized its formulation. The State Council delivered the report to the NPC, and it was approved following deliberation. By this legal process, the national will and the people's will were unified.

RESOLVING DIFFERENCES

While the MLP was being formulated, one of the large issues that arose was should indigenous innovation (zizhu chuangxin) be proposed as the guiding direction of China's future national S&T work. Introducing, digesting, and absorbing (yinjin, xiaohua, xishou) foreign advanced technology had been the focus since China's reform and opening up. Many of China's S&T plans were written based on importing technology and then digesting and absorbing it, and there were few examples of being truly able to indigenously grasp key technologies.

On this issue, the debate was between a group of experts, particularly S&T professionals, that believed that China needed to place more importance on increasing its own innovative capacity, grasping S&T technologies, and abandoning the practice of modernizing by buying. Core technologies, especially some defense key technologies, could only be advanced through indigenous innovation, according to these experts. The opposing argument was that China had reformed and opened up and the international environment was good, so that as long as money was available, China could and should buy technology.

Therefore, whether or not to propose indigenous innovation was central to the MLP deliberations, with intense debate on both sides. After repeated exchanges of opinions, unification was achieved through emphasizing three forms of China's S&T innovation: 1) original innovation (*yuanshixing chuangxin*); 2) integrated innovation (*jicheng chuangxin*)—or integrating various types of technology, international and domestic, to form a single technology used in major products or engineering projects, and 3) utilizing the environment of reform and opening up to fully absorb foreign advanced technology, introduce technology, and, on this foundation, digest, absorb, and re-innovate. In other words, on the foundation of respecting other's patents, "self-create" new developments. This third area comprised the main thrust of China's indigenous innovation, but through this compromise indigenous innovation was included as an element of future S&T innovation.

A second example of major differences that needed resolution concerns whether or not to make production of a large aircraft one of the megaprojects.[3] Because China has an immense market for aviation industry development and this type of technology could raise China's entire industrial level, many believed that China needed to develop its own large aircraft. But there were others who believed that China could just buy, not build. This issue was also repeatedly discussed until a resolution was reached. Currently, the nation is building and developing a large aircraft as one of its megaprojects, and there has been a successful flight test of a large cargo plane. A large passenger aircraft is estimated to begin flight tests in 2014. During the process of manufacturing the large aircraft, Chinese industry has also absorbed many foreign advanced technologies, including aircraft engines. China still purchases foreign engines, but in aircraft design and overall technology, China must grasp the technology itself.

A third example relates to the introduction of S&T supporting policies, including investment in S&T funding, intellectual property, government procurement, taxes, and talent. On these matters, the planning office received each department's coordination and consensus, particularly on the policies that emphasized positioning the enterprise as the primary innovator, the market as the guide, and the industry-university-research institute relationship as the core of the national innovation system. The policies also underwent repeated discussions before agreement was achieved.

CONCLUSION

In the seven years since the MLP was introduced, China's S&T progress has been clearly demonstrated through major advances. There has been major progress in every field, including aviation, energy, biological sciences, and materials. China is also actively pursuing international cooperation. For example, China is a participant in the ITER project, a controlled thermonuclear fusion project co-sponsored by the United States, Russia, the European Union, and Japan. This is the first time China has participated in a large-scale international S&T cooperation, and China is already fulfilling its obligations and continuing to take on more responsibilities.[4]

This plan will have an important influence in the coming years, including the current period of the Twelfth Five-Year Plan. Its influence will further drive the building of China's strategic emerging industries. Issues such as structural challenges, S&T funds management, fairness, openness, equity, and more are not going to be resolved overnight. Through practice, however, and step by step, they will receive complete resolution.

Endnotes

1. I sat as a member of that office, while concurrently acting as director for the Chinese Academy of Science and Technology Development (CASTED).
2. The website had more than 30,000 visitors in its first month.
3. Large planes like the Boeing 737 that seat more than 150 and are able to fly many thousands of kilometers.
4. According to China's obligation for S&T cooperation, we have already proposed the first batch of certified property protection.

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