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International Science and Technology Issues: Summary of a Report to the Committee on Science

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Coordinated by
(name redacted)
Specialist in Technology and Telecommunications Policy
Science, Technology, and Medicine Division

ABSTRACT

This CRS report is a summary of a larger, two-part comparative study on international science and technology, prepared at the request of the Committee on Science of the House of Representatives. This paper provides a digest of analysis and findings on the science and technology policies, civilian research and development funding, and relevant policy issues of thirteen countries and the European Union. It also provides a brief description of why these findings and issues may be of interest to U.S. policymakers, as well as a brief analysis of issues and concerns about U.S. data collection and information. It concludes with a list of selected references for additional reading. International S&T issues may have a significant impact on a wide range of U.S. S&T legislative and oversight issues during the 105th Congress. This report will be updated annually.

International Science and Technology Issues: Summary of a Report to the Committee on Science

Summary

The 1990s have been a time of great vitality and change for U.S. science and technology (S&T) policy and research and development (R&D) programs. As a result, many Members of Congress have asked what might be done to set national S&T priorities more efficiently, establish policies, and fund or otherwise support R&D programs that best enhance U.S. resources?

The answers may be found, in part, by understanding other nations' S&T policies and R&D programs within the context of U.S. policy and programs. For many, U.S. S&T policy (and the R&D programs supported by the policy) is perhaps the most successful in the world, often admired and sometimes copied. But U.S. science and technology does not exist in a vacuum. The United States is constantly interacting with other nations that seek to cooperate and/or compete in science and technology. A better understanding of other nations policies and programs may better inform domestic U.S. S&T policy and R&D programs; other U.S. policies, such as trade or national security; and U.S. interactions with other nations in S&T issues, such as when countries engage in international agreements.

The Science, Technology, and Medicine Division of the Congressional Research Service prepared a comparative study of international science and technology at the request of the Committee on Science of the House of Representatives. This report is a summary of the larger two-part study completed October 1997 and February 1998.

The data in this two-part study shows a great variety of how nations support R&D. For example, governments in Russia, Brazil, India, and Mexico fund over half of the national R&D, while in countries such as Japan, Korea, Germany, and Canada, less than one-third of all national funding comes from government sources. In the United States, the R&D funding trend in recent years has been for less government support for total R&D and more industry support. In S&T policy, a wide range of national perspectives are documented as well. The European Union has a transnational S&T policymaking process known as the Framework program, unique in both its size and scope. The United Kingdom utilizes a technology foresight program as part of its national S&T policymaking. In Israel, a national S&T policy is directly linked to economic development and industrial growth. Yet other nations, such as Brazil, struggle with incorporating a coherent national S&T policy as a way to address national goals and objectives.

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Contributors
Science, Technology, and Medicine Division

Sandra A. Burr
Senior Production Assistant

William C. Boesman
Specialist in Science and Technology

(name redacted)
Specialist in Science and Technology Policy

(name redacted)
Specialist in Science Policy

(name redacted)
Specialist in Science and Technology

(name redacted)
Specialist in Technology & Telecommunications Policy

(name redacted)
Specialist in Science and Technology Policy

(name redacted)
Senior Specialist
Science and Technology

(name redacted)
Specialist in Science and Technology

Fred J. Sissine
Specialist in Energy Policy

International Science and Technology Issues: Summary of a Report to the Committee on Science[1]

Introduction

The 1990s have been a time of great dynamism and change in the United States for science and technology (S&T) policy and research and development (R&D) programs. During this time there has been a vigorous debate in government, industry, and academia regarding the fundamental issues affecting U.S. science and technology. Many Members of Congress have asked what can be done to set national S&T priorities more efficiently, establish policies, and fund or otherwise support R&D programs, which best enhance U.S. resources?

Dynamism also characterizes the international S&T activities of many foreign government, industry, and academic stakeholders. In Asia, economic growth has been directly fed by technological innovation and development, while in Europe, individual nations seek to develop S&T policies within a national, regional (European Union), and global framework of cooperation and competition. From India to Israel, from Mexico to Canada, nations increasingly have linked their S&T policies and R&D programs to improving standards of living, competing in the global marketplace, advancing their peoples' health and safety, and looking to challenges and opportunities in the next century.

Several recent reports and analyses have addressed important domestic S&T issues facing the United States.[2] However, assessment of the international context, in which U.S. R&D priorities, S&T policies, and issues are placed in comparative analysis with other nations, is rare. Given the growing importance of international S&T activities to the United States, a global perspective appears vital for making critical domestic decisions.

Findings and Issues

There are three reasons why U.S. S&T policymakers may wish to in obtain more information on other countries' S&T policies and R&D programs. First, U.S. policymakers must make decisions on domestic S&T policies and R&D programs,

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[1] CRS Report for the Committee on Science, *International Science and Technology: A Comparative Study [Part One]*, 1 October 1997, 100 pages; *International Science and Technology: A Comparative Study [Part Two]*, 5 February 1998, 94 pages.

[2] See: Congressional Research Service, *Analysis of Ten Selected Science and Technology Policy Studies,* coordinated by William C. Boesman, Report 87-836SPR, 4 September 1997, 51 pages.

and these are rarely made in a vacuum. Second, broad U.S. policy issues, like trade and national security, often have important science and technology issues underpinnings. Third, S&T agreements and arrangements between the United States and other nations are being renewed, terminated, reconsidered or otherwise examined by the United States and in its partners.

In all three areas, a lack of current and relevant information and data on foreign nations' S&T policies and R&D programs could affect U.S. S&T policy and decisions. Information and data on other nations' policies and programs are scattered among several federal agencies and non-profit S&T organizations. Many of these agencies and organizations struggle to maintain a capacity to gather, organize, and analyze information and data for public policy analysis. Beyond a few (if very important) countries like Japan, information on other nations' R&D programs often is not current. Very few agencies and organizations incorporate other nations' R&D funding data into a context that also explains the S&T policies of other nations.

Why understand other nations' S&T policies and R&D programs? As two S&T policy experts recently stated:

> The roles of science, engineering and technology in creating power and wealth are by now well-recognized the world over. But how a country supports, deploys and uses most effectively these resources in order to achieve national goals is a matter of enduring and critical concern. The quality of life, international standing, and indeed, the very future of the country is at stake. Clearly, each country has its own views, its own approaches, and its own constraints. And clearly, every country has something to learn from how other countries address these vital issues.[3]

A Summary of Several Nations' S&T Policies, Programs, and Issues

In response to congressional interest in these issues, the Science, Technology, and Medicine Division of the Congressional Research Service prepared a comparative study of international science and technology at the request of the Committee on Science of the House of Representatives. The following countries' S&T policies and civilian R&D programs were analyzed: the United States, Germany, the United Kingdom, Japan, Korea, India, Israel, Canada, the European Union, France, Russia, China, Mexico, and Brazil.[4] They are summarized in this report.

Countries face a wide range of S&T policy issues and support civilian R&D in many different ways. However, one common theme appears to be developing among most developed or industrialized nations analyzed: a greater reliance on non-governmental, usually industrial, sectors to support R&D. Among the developing

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[3] George Bugliarello and A. George Schillinger, *Technology In Society*, Exeter: Elsevier Science Ltd., August/November 1997, p. 207.

[4] Additional countries highlighted by short summaries in the February 1998 report were Taiwan, Singapore, Australia, Italy, Norway, Ireland, Sweden, Spain, South Africa, and Argentina.

countries analyzed, government support for R&D is substantially greater than industry, or, in some cases, roughly about equal. The relative percentage support of R&D, by country, is presented just after these summaries in Chart 1 (p. 6).[5]

In summary, the authors found:

- In the United States, a changing national R&D budget has resulted in a smaller government percentage of total R&D (now 35% of the national total). A shift in emphasis from a large percentage of government-funded R&D may have a permanent effect on how the United States supports R&D, who supports it, and why. International cooperation and competition in science and technology, already an important fact of U.S. S&T policy, may become a critical part of domestic collaboration and competition for scarce resources.

- In Germany, a rather elaborate coordinating and cooperative structure guides a complex R&D process. Of overall national R&D funding, 60% is funded by the industrial sector, 21% from government, and 19% by the states (*Länder)*. The major objectives of German S&T policy are to promote high technologies as drivers of innovation, spur economic innovation in small and medium-sized firms, and provide a better national understanding of science and technology.

- In the United Kingdom, the primary focus of S&T policy appears to be the application of science and technology to enhance economic growth. In terms of spending on R&D, 48% is funded by industry, 33% by the government, the rest from international sources. The Technology Foresight Programme of 1993, designed to help set national R&D priorities and strategy, is one of the key elements of UK S&T policy. However, the program has been under review by the Labour party since it gained control of the government in the 1997 elections.

- Japan faces a series of important, if not unique challenges as it heads into the 21st century. R&D investments and technological innovation remain high despite a sluggish economy and a loss of confidence in government. The Japanese government funds just over 20% of all national R&D, with almost of all the rest coming from Japan's large industrial firms. Still, the government performs an important role of setting policy. Three agencies dominate: the Ministry of Education, the Science and Technology Agency, and the Ministry of International Trade and Industry. Japan has embarked on an ambitious five-year plan to boost basic research and improve university facilities, although full implementation remains unclear.

- In Korea, within a relatively short time, the nation has evolved from a largely agrarian economy to one that has used S&T policy to industrialize. A highly centralized government plays a major role as policymaker and supporter of R&D. But the private sector is now the primary performer (73%) and

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[5] The European Union (EU) is not included in this chart, since its relationship between fifteen member states is a unique regional partnership. It does not provide comparable data relative to the other 13 countries

supporter (80%) of R&D. A Special Law for Science and Technology Innovation, passed earlier in 1997, provides an outline for Korea's development as a major player in basic research into the next century. However, the currency crisis of late 1997 has raised serious concerns about whether the government can fund more basic research and support industrial growth, and whether the Korean"chaebol" will support more R&D while facing more competitive pressures worldwide.

- India's form of parliamentary government places responsibility for S&T policymaking in the Ministry of Science and Technology. Currently, the government funds over 73% of R&D, industry 17%, and state governments around 10%. While technological innovation and research development remain top priorities for Indian policymakers, a "brain drain" of scientists and engineers continues to be a problem. One of the most important issues for U.S.. S&T policymakers — and of primary concern to the Indian government — is the expiration in 1998 of the United States-Indian Fund for S&T cooperation.

- In Israel, civilian S&T policy is an important part of the government's policies. These include strategies to meet various national objectives, including economic growth through value-added exports, expansion of employment opportunities for immigrants, and distribution of the population into largely unsettled areas. The Israeli government provides about 40% of all R&D funding, industry 36%, academia 10%, and non-profits and international sources the rest. Of all of the important Israeli international S&T agreements, the U.S.-Israel Binational Industrial Research and Development Foundation is the most prominent.

- Canada has the seventh largest industrial economy in the world. Principal R&D funders include industry (46%), the federal government (26%), foreign sources (11%), universities (9%), and provincial governments (6%), and other independent sources (2%). Two factors have driven Canadian S&T policy developments: a large budget deficit, and an "innovation gap" in certain industries. While the government has tried to address these issues, critics contend that as a result, long-term basic research is being unwisely neglected.

- The European Union (EU) is now operating under Framework 4, a multiyear science and technology program involving the 15 member states. Framework 4 is funded at $16.8 billion. The current proposal for Framework 5 is $17.3 billion. R&D priorities will include information and communications technologies, life science and technologies, energy, industrial, environmental, transportation, and targeted socio-economic goals. However, the EU also must address concerns that its bureaucracy is too cumbersome and its policymaking process too slow to adapt to rapid global developments.

- In France, a total of $22 million was spent on R&D in 1992, with the government playing a primary role as funder (40%) and performer (20%) of all national R&D. However, as the government has decreased its support for defense spending and moved to privatize its national industries, that role is starting to diminish. While most of the industrial R&D is performed by large firms and enterprises, most of France's industrial R&D policies are directed towards small and medium sized firms.

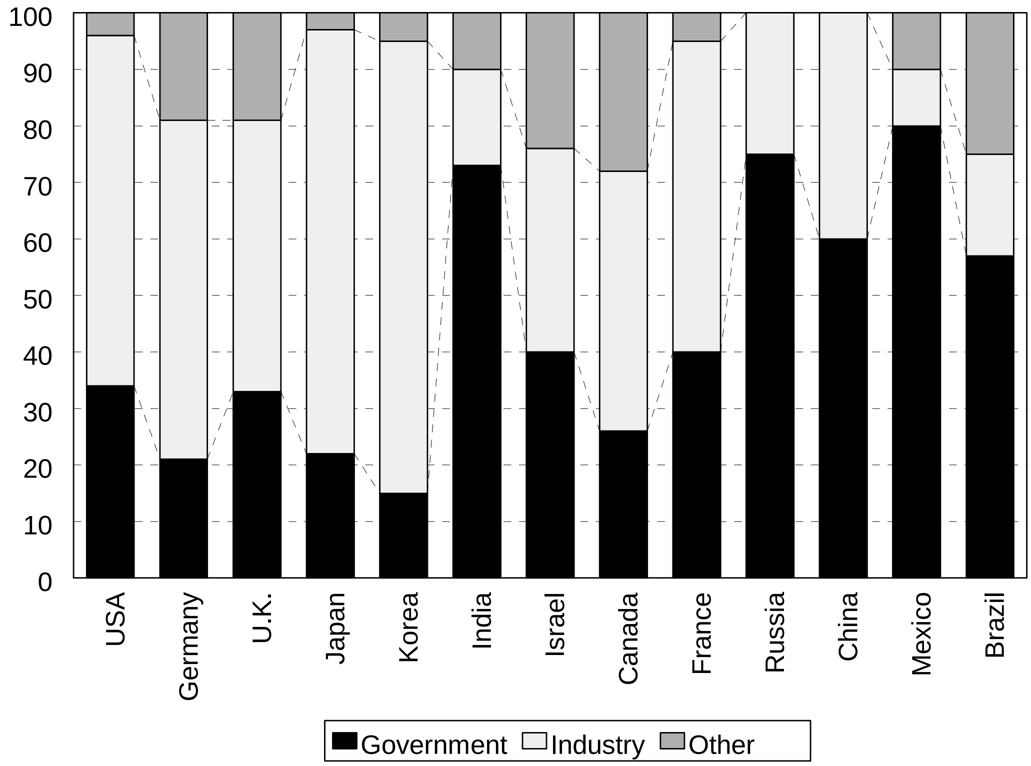
- Russia faces an unprecedented change in its R&D funding and S&T policies. The Russian R&D system has experienced a real decline in R&D funding of 78% from 1990 to 1995. The government funded about 75% of all R&D in the past. Even if successful, a transition from the well-financed Soviet R&D system of the past to a smaller Russian R&D system more geared towards civilian market goals may take another 10 to 15 years. This overall decline has a significant impact on ongoing domestic and international projects. Still, Russia's contribution to global S&T policy as partner and collaborator is important, as is the role of international funding to support Russian R&D.

- The People's Republic of China (PRC) is seeking to increase its national funding for R&D while addressing issues of wasteful duplication and ineffectiveness in certain areas and increasing incentives and capacity for effective research, particularly in Chinese industry. The Chinese spent about $22 billion on S&T activities in 1995. Most of this was directed towards science education and teaching. About $3 billion went for R&D, with the government providing 60% and industry 40% of the total. A bilateral S&T agreement between the United States and the PRC, to encourage broad scientific collaboration and exchange, was renewed in 1996 for another five years.

- Mexico's current S&T policy is focused on building a cadre of scientific personnel, improving its higher educational research institutions, modernizing its technology base, decentralizing its scientific institutions, and increasing international cooperation yet competing in the global marketplace. About 80% of all national R&D is supported by the government, 10% by industry, 10% from other sources. The government is seeking to raise industry's contribution of all R&D to 45% by 2000. In 1995, the government spent $2.64 billion on R&D.

- Brazil, with the ninth largest GDP in the world, spent $4.9 billion on R&D in 1994. Of that total, 57% came from the federal government, 18% from industry, and 25% from state governments and businesses owned by the states (with two states accounting for two-thirds of that percentage). Brazil faces some serious S&T policy issues going into the 21st century. They include a highly centralized and often slowly-responsive federal bureaucracy; low-paid R&D employees protected by tenure and without full education credentials; an education system which many contend does not measure up to the needs of a developing country; a lack of incentives for industry and other private sector support for R&D; and little cooperation among government, industry, and academic institutions.

Figure 1. National R&D Funding by Percentage



Key Themes

The analyses in the two-part study for the Committee on Science covers several nations having differing resources, opportunities, and issues. Yet even with so many countries with differing R&D priorities and S&T policies, a broad set of themes emerge as to why a comparative study on international science and technology policy is important. CRS has found three overarching reasons, with supporting examples, of why understanding international S&T issues and R&D funding is vital.

Importance to the U.S. S&T Debate

First, some contend that the U.S. debate on domestic S&T policy and support of R&D programs is usually undertaken within either an explicit or implicit global context. Often, U.S. policymakers must consider a wide range of S&T policies and R&D programs, ranging from high-energy physics to the U.S. space program, in a context of international cooperation or competition. Even as some U.S. policymakers seek to develop S&T policies within a purely national context, a variety of U.S. S&T stakeholders at research universities, high technology industries, federal laboratories, and others, are constantly interacting with their foreign counterparts.

Consequently, U.S. domestic S&T policy has broad implications for international science and technology, and in turn may be affected by developments in the international community. Other nations' S&T activities and policies may become part of the U.S. S&T debate. Some may ask, if U.S. policymakers, business leaders, educators, and other stakeholders are going to consider fundamental S&T policy issues (e.g., scientific literacy or technology commercialization and competitiveness), how can we better inform U.S. S&T policymakers when a global context is needed?

One example where international science and technology can provide a context for domestic U.S. S&T issues is the government-industry-university relationship. The United States is facing a series of important policy questions about who should fund certain types of R&D and what is the rationale for their investment. Part of this discussion involves a declining percentage of U.S. government support for R&D, and how that may affect U.S. efforts in basic research. Should the United States provide incentives or otherwise encourage U.S. industry to support more basic research, are there other non-government sources for supporting U.S. R&D, and how will this affect other forms of S&T investments, such as university research?

In many other countries, the same debate is taking place in different forms. If other nations are also addressing dynamic changes in the government, industry, and academia S&T relationships, are there new opportunities for the United States to forge new partnerships, agreements, and exchanges to meet mutual needs? Are there lessons to learn, as well?

In Korea, national S&T policy has been directed towards obtaining innovative technology from abroad and domestic industrialization. Most of the basic research facilities are modest, and two universities receive most of the funding for science and engineering. Many Korean S&T policymakers contend that for Korean industry to remain competitive in more open domestic and world markets, it must support more basic research. Yet not all Korean policymakers agree with this strategy. Since many of Korea's best science and engineering students receive their education abroad, particularly in the United States, some argue that this arrangement should continue and that national R&D resources should primarily support industry. The currency crisis that developed in late 1997 has sparked renewed examination of the government-industry-university S&T relationship in Korea and how scarce resources should now be allocated.

Germany also is facing some important questions in its government-industry-university R&D relationship. Generally, the German federal-*Länder*-independent research institution relationship has operated effectively through an elaborate yet cooperative policymaking structure. Consensus on national R&D policies is usually achieved even when crossing political party lines. A single ministry, the Federal Ministry of Education, Science, and Research (more commonly known by its German acronym *BMBF*) provides national S&T policy direction, coordination, and funding by melding a variety of German S&T stakeholders' interests and goals. Some may argue that the U.S. S&T policymaking system, which is decentralized, could benefit from a more centralized arrangement like Germany's. However, currently the German S&T policy system is being severely tested by national budget constraints, the perceived need to reform the university research system, and the financial viability of several independent research institutes to continue. The outcomes of these and other S&T policy and R&D budget issues in Germany may illuminate if a centralized and complex national S&T system can change and reform over time.

Other nations face similar issues. In Japan, a nearly decade-long recession has cast some doubt as to whether Japanese government can support policies with that focus national S&T policies on industrial technology innovation while also trying to increase funding for university research. Brazil, of all of the countries analyzed in this study, perhaps faces the most significant long-term S&T issues, with what many consider to be poor federal S&T coordination, an under-educated S&T workforce, and heavy reliance on government spending on R&D. In Mexico, policymakers are trying to apply national S&T policies to economic growth, yet face challenges to support university research and education, S&T policy and budget coordination, and increase high technology investment. Canada's S&T issues involve significant cuts in national government R&D; a perceived "innovation gap," resulting from Canada's relatively low ranking among industrial nations in industrial R&D; and, in the face of increased government support for economically and industrially relevant R&D programs, a concern that university research may be unwisely neglected for the long-term.

U.S. S&T public policy should not be just a reaction to other nations' S&T policies. It is also informed by these policies when necessary.[6] Within the framework of U.S. national S&T policies and priorities, an understanding of how other nations are addressing similar issues can be instructive. National S&T policy decisions are almost never made without affecting, or being affected by, international science and technology, regardless of the country.

Importance to U.S. Non-S&T Policies

Broad policy issues ranging from the domestic (health, education and training, the environment) to international (trade and global security) have roots in S&T policies and R&D programs and the national benefits accrued from S&T and R&D. Understanding U.S. S&T policies and R&D funding vis. a vis. other nations may be an important component for making these policy and funding decisions.

For example, China is seeking membership in the World Trade Organization and Most Favored Nation trading status with the United States. U.S. policymakers have raised many concerns, as well as support, for these two initiatives. Part of this issue may revolve around what China is trying to achieve by raising its status as a developing high technology nation, and its desire to be a high technology partner with the United States. While focusing on U.S. trade and security interests is important, a clearer understanding of Chinese national S&T policies and R&D priorities may provide a more beneficial discussion between the two nations.

In Israel, government S&T policies support a wide range of national education, employment, and economic development goals. As a nation, it has a policy that utilizes a highly trained workforce, incorporates a steady stream of immigrants, and assists communities targeted for high technology development. It also has made direct support of R&D, as well as financial assistance for commercialization and

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[6] For the U.S. private sector, which must compete intensely with foreign firms in product development and commercialization, a direct reaction to developments in foreign S&T not only occurs, but may be critical to survival.

marketing, an integral part of its economic growth strategy. When the Israeli S&T approach is compared to U.S. S&T debate, particularly within the context of the American system of incentives to promote technology development and commercialization, the contrast is stark. Yet Israeli S&T policy provides a concrete example of how science and technology is directly incorporated into national economic policy, while in the United States, the debate over the direct and indirect support of national S&T goals is still ongoing.

Importance to International S&T Agreements

U.S. policy debate regarding the U.S. role and contribution (if appropriate) to international S&T agreements may benefit from a better understanding of other nations S&T policies. In part, this is because such a knowledge is likely to inform U.S. policymakers as to what foreign nations would like to gain from such agreements with the United States. Also, successful multilateral and bilateral S&T agreements between nations can be instructive as to how the United States can best enter into these agreements in the future. Ultimately, the United States must pursue its own national interests when entering into these agreements, as do other nations.

One current S&T agreement due to expire in 1998 is the United States-India Fund (US-IF), a broad exchange agreement between the two countries. For U.S. policymakers, there have been serious concerns that in India, there is not strong enough protection of U.S. patent rights and that there are overly broad compulsory licensing provisions for foreign R&D. Some U.S. critics contend that since these issues come under the US-IF, the agreement needs major restructuring or should be allowed to expire. In India, many policymakers contend that patent and licensing problems have been addressed and corrected. They contend that some U.S. leaders do not recognize how important this agreement is to India, not only for the science and technology exchanged, but for the larger U.S.-Indian relations. Therefore, U.S. policymakers may ask whether there are lessons to learn about Indian and U.S. priorities and policymaking that can help both sides make informed decisions about the future of this S&T agreement?

The S&T policies of thirteen countries and the EU were analyzed in the report for the Committee on Science. Among this group, the EU probably has engaged in the most complex forms of S&T agreements, since it must coordinate the S&T policies of 15 countries into one coherent European policy. For some, the EU may provide a model of how nations can come together and agree upon basic S&T policies, while allowing private sector competition to continue. There is an extensive policymaking apparatus for regional and national approval of all EU policies, including those in science and technology. Since 1985, the EU has successfully completed four Framework programs. The Framework programs support a wide range of R&D initiatives that all member states contribute to, and from which they receive benefits. Supporters contend that the EU provides lessons for S&T consensus-building across borders, is a model for strategic planning and multi-year R&D budgets, and can provide a paradigm for international S&T cooperation by balancing national priorities with international objectives. Yet others contend that the EU is much too bureaucratic, its policymaking slow and cumbersome, and by serving all interests it lowers the European standard of S&T and does not raise it. Does the EU provide any lessons for U.S. international S&T policymaking, or by its nature and scope does the EU approach limit its replication and use at the national level?

Information and Data Resources

A chronic obstacle facing the contributors to this report has been that data and information about S&T policies and R&D funding often have been inconsistent, dated, or unavailable for many nations. While there are several excellent research sources on international science and technology, no single source provided timely R&D funding data *with* comprehensive analysis of science and technology policymaking issues for the range of countries addressed in the report to the Committee on Science.

- The National Science Foundation's (NSF) publications, most notably *Science and Engineering Indicators*, are considered by many as a definitive source of statistical information on other nations' R&D activities. NSF offices in Japan, Europe, and elsewhere provide important updates on foreign S&T issues. However, the NSF data can lag the publication date by up to five years, and the reports do not always provide a context for S&T policymaking in other countries. NSF appears to be similar to other organizations that would like to undertake more international S&T data collection and analysis, but, at the same time, must allocate scarce resources in order to do so.

- The Department of State has information on nations' S&T policies and international S&T agreements, mostly compiled by the Bureau of Oceans and International Environmental and Scientific Affairs. Yet departmental reorganization and budgetary constraints have reduced that institution's capability to compile and publish international S&T information.

- The Department of Commerce's International Technology Policy (ITP) division provides S&T policy analysis and R&D funding data for many countries. Parts of the larger report prepared for the Committee on Science were drawn from ITP research. In addition, several ITP analysts provided peer review for the larger report. Yet budget reductions and staff reorganization may hinder their ability to provide continued extensive, in-depth analysis of international S&T issues.

- The Organization of Economic Cooperation and Development (OECD) has several excellent S&T reports and experts on related subjects. However, since the OECD membership is made up of industrialized countries, important developing and lesser developed countries are not a major part of the analysis.

- The Washington area is home to embassies and chanceries of almost all nations. Most embassies have a Science Counsellor or Science Attache. Many counsellors or attaches provided research and advice to CRS analysts for the larger report. Other nations' representatives, however, lack the personnel, expertise, or interest to provide information on their S&T policies.

- Other sources of information ranged from international web sites to industry and trade groups which cover global S&T issues. Yet issues of accuracy, objectivity, timeliness, and comprehensiveness affected the quality of information and data from these sources.

Information and data on international science and technology remains fragmented and often lags comparable data on U.S. policies and programs by anywhere from one to five years. This is a significant obstacle for congressional researchers, analysts, and policymakers, and will likely to continue to be so for the foreseeable future. As international S&T policies and R&D programs continue to be an important part of U.S. S&T issues, policymakers may wish to consider how to best address the problem of fragmented, dated, and uneven information and data.

New Challenges in a New Century

As the United States prepares to enter a new century, Congress is asking some fundamental questions about U.S. S&T policy and programs that have been in place for over half a century. These questions include how and why the United States funds research and development, what comprises successful partnerships between government, industry, and universities that promote and preserve our national S&T infrastructure, and how we can best improve education, training, and scientific literacy in the United States, among others.

In many respects, the U.S. perhaps has the most successful S&T policy in the world, often admired and some times copied. But United States science and technology does not exist in a vacuum. We constantly interact with other nations that seek to cooperate and/or compete with the Unites States in science and technology. All nations have their own national S&T priorities and objectives. As a nation, we must not only be aware of U.S. S&T priorities, but those of other nations who engage us in a wide range of activities.

Therefore, policymakers may continue to seek a greater understanding and knowledge of what other nations are undertaking and planning in science and technology policy. While U.S. S&T policy should never be dictated by, or purely be a response to, other nations' S&T policies and programs, policymakers may benefit from being informed by those policies. Increasingly, many S&T stakeholders contend that it is in the national interest of all concerned to gain a greater understanding and knowledge of this complex issue.

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