EUROPEAN COMMISSION

ERAWATCH Research Inventory Report For:

JAPAN

This document presents information published in the Research Inventory of the ERAWATCH website. ERAWATCH provides timely and comprehensive information on national and regional research policies, structures, support measures and organisations. ERAWATCH is a being conducted on behalf of DG Research of the European Commission by DG Joint Research Centre - the Institute for Prospective Technological Studies. The information is mainly collected by the ERAWATCH Network.

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Relevance of research policy

The Relative Importance of Research Policy

There are a number of factors which suggest that research policy is of high importance to Japan. This is at the level at which policy decisions are made, the budgetary context, and from analysis of key research policy documents.

Decision-making for science and technology occurs within the Council for Science and Technology Policy (CSTP), located within the Cabinet Office, and includes direct involvement of the Prime Minister as well as the Ministers from key offices of state such as the Ministry for Internal Affairs and Communications (MIC); the Ministry of Finance; the Ministry of Education, Culture, Sports, Science and Technology (MEXT); and the Ministry of Economy, Trade and Industry (METI). Other Ministers may also sit as temporary members which may improve policy coherence between different cross-cutting policy instruments.

With the arrival of the new Hatoyama Government in the Autumn of 2009, the Council on Economic and Fiscal Policy (CEFP), which had also played some role in recommending policies for innovaton and economic growth related measures and strategies was shut down, with a new National Strategy Office to be developed in its place. At the time of writing, the role, responsibilities and activities of this office have yet to be fully clarified.

While the Japanese government looks for ways to constrain and reduce public expenditure as a proportion of GDP, expenditure on science has largely been protected from cuts at the macro level. For 2010 the overall budget for science and technology was ¥3,572.3bn (€27bn). This is an increase of ¥27.9bn (€211m) on 2009, or 5.2%.

Policy documents also place research policy in accordance with the key challenges that Japan is likely to face. Research policy, as set out in Third Science and Technology Basic Plan, promotes key scientific areas of importance to the development of future key technologies and innovative activity. Prioritised areas include the life sciences, information and communications, materials and nanotechnology, the environment, energy, production technologies, the social structure and frontier science. All of these fields are being promoted at the level of basic research, as well as technological development involving Ministries, funding agencies and research actors.

Research policy is closely linked to overcoming social and natural issues that are of importance to Japan. These span environmental problems, such as global warming and ozone depletion; energy and resource use and efficiency; aging and numerical decline of the population; social infrastructure; and protection from extreme weather such as typhoons, and earthquakes.

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Relevance of research policy

Recent political events relevant to research policy

2009: Government Revitalisation Unit

Appointed by the new government, a Government Revitalisation Unit publicly reviewed many programmes of the government in an effort to reduce public expenditure. The review panel was critical of many science and technology programmes, provoking protests from Japan's Nobel laureates and presidents of prominent universities. In the end, the government maintained its commitment to R&D, without reducing the budget for S&T programmes. A new GRU is to be appointed in 2010, this may again bring science and technology into the spotlight.

2009: Change of Government

The Liberal Democratic Party (LDP) lost the House of Representatives election held in August to the Democratic Party of Japan (DPJ). The new Prime Minister, Yukio Hatoyama, holds a PhD in engineering from Stanford University, and served as a researcher for several years at Japanese universities before entering politics.

Mr Tetsuo Kawabata is the Minister in charge of the Ministry of Education, Culture, Sports, Science and Technology, as well as the Minister in charge of Science and Technology Policy (see Cabinet Office 2010) .

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Policy goals and priorities

Key Research policy focus

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Policy goals and priorities

(Main aims of research policy)

Research policy goals for Japan can be summarised as:

1) Enhancement of the Research System

Through the Science and Technology Basic Law, government funding for science and technology has increased and has paid for the enhancement of research infrastructures and human resources for research and development (R&D). Current activities are shaped by the Third Science Third Science and Technology Basic Plan which runs from FY2006 to FY2010. This plan has been subject to a mid term evaluation by NISTEP as part of preparations for the development of a new science and technology basic plan. In 2009, particular emphasis was been placed on strengthening basic research.

2) Advanced Technologies

The development and exploitation of advanced technologies is a policy and funding priority and is actively promoted by the Ministry of Economy, Trade and Industry (METI) and implemented by various Independent Administrative Institutions, such as the funding organisation, the New Energy and Industrial Technology Development Corporation (NEDO), and the National Institute of Advanced Industrial Science and Technology (AIST). Since 2005, METI has unveiled a new Strategic Technology Roadmap on an annual basis that targets around 20 technologies within the remit of the Third Science and Technology Basic Plan. In 2010, the new government unveiled a new economic growth strategy that prioritises green innovation and health care innovation.

3) Human Resource Development

Human resource development has featured prominently throughout the science and technology basic plans and in government white papers related to science and technology and intellectual property. The main types of activities relate to internships, lifetime learning opportunities, graduate education, postdoctoral level researchers and specialist education. Employment growth in new technological fields is also being given a high priority.

4) Globalisation and Internationalisation

The two dimensions, globalisation and internationalisation relate to engagement with the international community, and in internationalizing the Japanese research environment. These objectives are implemented through various funding agencies such as the Japan Science and Technology Agency (JST), the Japan Society for the Promotion of Science (JSPS), which both operate various internationally oriented programmes. Such programmes include the International Cooperative Research Project (ICORP), Global Centre of Excellence (GCOE) initative, World Premier International Research Center Initiative (WPI), Global 30 Program, Strategic International Cooperative Program (SICP) or invitation schemes such as the JSPS Award to Eminent Scientists, or the JSPS Postdoctoral Fellowship for Foreign Researchers. Universities are also being encouraged to take a more international stance through programmes such as the Strategic Fund for Establishing International Headquarters. Funding for promoting science and technology diplomacy has been an important feature of the 2009 budget for science and technology, and also featured heavily in the 2010 budget, with collaboration with the USA on green technology development.

5) Regional Innovation Systems

Many national universities have participated in efforts to assist in regional economic development through establishing collaborative research centres. These centres typically engage in local network building, technology transfer or human resource development. There are also regional cluster policies promoted by government ministries, such as the Industrial Cluster Initiative, Knowledge Cluster Initiative and City Area Program.

6) Intellectual Property Rights

Various policy initiatives and legal reforms have sought to create a "nation founded on intellectual property". The most prominent legal reforms have been the introduction of the Basic Law on Intellectual Property in 2002 which has ushered in widespread and ongoing reforms to related laws and measures, and the establishment of a special dedicated headquarters in the Cabinet Office (see here for further details). Efforts have also been made by the Japan Patent Office to enhance the efficiency of the patent examination process. The annually published Intellectual Property Strategic Program outlines the major policies and measures to be introduced each fiscal year.

7) University-Industry Links

A number of organisational reforms, policy reforms and funding programmes have sought to promote greater development of university-industry links through adoption of US style transfer laws, such as the Japanese version of the Bayh-Dole Act. There has been a steady growth in university affiliated licensing offices and incubation offices for spin-out firms; as well as steady growth in the number of collaborative research projects, contract projects, and license agreements.

8) Small and Medium Sized Enterprises

There are a number of policies and funding programmes that seek to nurture and support SMEs both in relation to innovation activities, such as developing stronger relations with universities, and in advice and support related to intellectual property issues. Support is also being provided to support the internationalisation of SMEs and the marketing of their products in overseas markets.

9) Start-up Companies

Concern over the availability of funding in the early to mid stages of venture development has led to government initiatives to support venture and start-up companies. As part of this drive, universities have also been encouraged to develop Venture Business Laboratories to help foster start-ups likely to exploit university research.

10) *Responding effectively to Natural, Social and Environmental Issues*

Key issues that call on science and technology are: 1) addressing problems such as global warming and ozone depletion; 2) energy and resource use and efficiency; 3) aging and the population; 4) decreasing population in Japan; 5) social infrastructure and protection from extreme weather and geological systems. In many cases science and technology research is being deployed to understand these factors and mitigate their effects.

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Research policy

Main instruments of research policy

There are three main types of funding instrument. Project mission oriented R&D comprises the main form of budget and is dedicated to the priority research fields such as the life sciences, ICT, energy, and environment. The total budget in 2009 is ¥1,900b (€15bn), comprising 47.5% of total funding; this has declined from 52.8% in 2001.

The second main type of funding is Type 1 Basic Research, comprising around €12b per year, or 41.5% of the budget. This comprises block grants, competitive research funding, institutional subsidies. The bulk of this goes towards national university management expenses (70%), followed by competitive research funds (13%), subsidies to the private universities (11%) and other expenses.

The third main type of budget is that for promoting system reforms, budgeted at €3.2b (11% of the budget). This is for human resource development, university-industry links, regional innovation programmes, intellectual property strategies, and international activities.

For the private sector, the government has justified intervention in areas where the private sector is unwilling to bear all the risks involved (Cabinet Office 1996: 35). Generic policy takes the form of strategic guidance, subsidies for emerging technologies and technology diffusion, and stimulation through tax incentives and procurement. The Ministry of Economy Trade and Industry (METI) has published documents such as the Strategy for New Economic Growth which emphasises regional innovation and linking Japanese industry more firmly with economically active Asian countries, a theme reiterated in the most recent government strategy document (Cabinet Office 2009). In areas of research where there are high degrees of uncertainty and risk, the New Energy and Industrial Technology Development Organisation (NEDO) provides a number of technology subsidies and grants for research programmes, as well as for technology diffusion and other studies.

Many of these subsidies and grants provided by NEDO address both existing high-technology domains as well as emerging and medium intensity technological fields. For instance, NEDO operates a number of programmes within the electronics and information technology sector (relating to semiconductor, storage memory, network technology and other technologies, for instance related to plasma displays and novel nanophotonic devices). Other high technology sectoral programmes can also be found relating to nanotechnology and photonic materials, and biotechnology and medical technology. For emerging fields, NEDO provides funding in fields related to fuel cell and hydrogen technologies, and energy and the environment. NEDO also implements programmes related to machinery systems technology and chemical substance management (for an introduction to these programmes, please see here).

Collaborative links between universities and industry are a policy priority and since 1998, 47 Technology Licensing Organisations have been established to assist universities in licensing their technologies. Following the granting of greater autonomy to the national universities, implemented through the National University Incorporation Law (2003: Law 113), universities have introduced their own policies for managing relationships with firms. Many technology development projects funded by government explicitly support university-industry links. Both METI and MEXT operate regional cluster initiatives that include participation by regional universities.

Human resource policies are of increased importance and a number of efforts are underway to generate stronger interest in science. These include use of scholarships, promotion of internships, as well as invitation scholarships for researchers from overseas. Immigration policy has also been subject to some revision with an extension of visa length for researchers, similar to measures that were introduced for software engineers.

The use and enforcement of Intellectual Property Rights figures strongly, both from an international perspective with respect to relations with other Asian countries and in the domestic context where there has been ongoing policy activity in response to the Basic Law on Intellectual Property (2002: Law 122), and through the annually introduced Intellectual Property Strategic Program (IPR link).

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Main instruments of research policy

Public-private collaboration

Significant reforms have been undertaken over recent years that have changed the nature of interactions between research performers. The introduction of legal mechanisms and policy guidelines by government has formalised methods of interaction, especially between universities and industry (for a discussion of the influence of these changes, see Walsh et al., 2008). Various policies have also seen the development of the institutional base for the promotion of partnerships. This includes 47 registered Technology Licensing Organisations (TLOs) (JPO 2010), which may be non-profit organisations, private companies or embedded within a university. There are also Venture Support Laboratories based at universities, and Intellectual Property Headquarters. In preparation for national university incorporation in 2004, many universities have drafted policies and regulations to structure previously informal relationships, with universities becoming corporate bodies and owning intellectual property.

To support these activities, the Ministry of Economy, Trade and Industry (METI) and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) have provided funding to linkage organisations, support for programmes that develop research ideas, start-up fund provision and the provision of fellowships for personnel employed in linkage organisations (METI 2010; see also: NEDO 2008-9).

In terms of indicators, the most recently available statistics suggest that the main types of partnership between the national, private and public universities and industry comprise (MEXT 2010):

- Collaborative Research projects with private companies (2003: 9,255; 2009: 17,638).
- Contracted Research (2003: 13,786; 2009: 19,201).
- Invention disclosures (2003: 8078; 2009: 9,529).

During the 1980s, around 80% of university-industry joint research projects were predominantly with large companies. Over the 1990s, this began to decline to around 70% in FY 1998-2001, with the proportion with SMEs increasing to around 30% (NISTEP 2005). More recently, the share of collaborative projects with SMEs is 23.5% (2009), part of an ongoing decline as a proportion of total projects (MEXT 2010). Research by Motohashi has suggested that large companies use university-industry links to strengthen in-house technological capabilities over the long-term, while SMEs tend to use joint university-industry R&D projects in the closing stages of product design (Motohashi 2005).

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Related policies in other domains

Fiscal Policies

A proportional research and development (R&D) tax credit was introduced by the Ministry of Finance in 2003. It comprised a proportional R&D tax credit of 8% (plus 2% for corporations with a higher proportion of R&D expenses in fiscal years 2003 to 2005). For R&D activities conducted by Small and Medium Sized Enterprises, a proportional tax credit of 12% (plus 3% applicable only for fiscal years 2003 to 2005). For R&D activities conducted jointly by academic, business and government, or R&D commissioned by the government in order to promote basic studies or innovative studies, a proportional tax credit of 12% (plus 3% for fiscal years 2003 to 2005) (see PriceWaterhouse Coopers2004). The scope of qualified R&D expenses included such expenses as labour, non-personnel expenses, depreciation for machinery and buildings, and expenses of R&D activities conducted overseas. The amount of the R&D tax credit is not allowed to exceed 20% of the amount of corporation tax. The amount of the R&D tax credit exceeding this ceiling may be carried-over for one year under certain conditions.

The Ministry of Finance introduced tax measures in 2007 to promote individual investments in ventures. This was done by extending the preferential treatment on capital gains on stocks by 2 years, as well as relaxing requirements for qualified ventures and rationalizing verification procedures (Ministry of Finance 2007). No R&D related measures were included in the 2009 Tax Reform (see MOF 2008) or the 2010 Tax Reform (MOF2009).

Further changes were introduced for taxation of SME R&D expenses in December 2007. These included the allowance of deductions for donations (up to Y10m (€65,000) when buying shares of designated SMEs within 3 years of their establishment. Furthermore, the introduction of a special tax credit for education and training costs if the ratio of costs to total labour costs exceeds 0.15% (see Ministry of Finance2007).

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Related policies in other domains

Human Resource Policies

According to the Organisation for Economic Cooperation and Development (OECD) Programme for International Assessment (PISA) results, published in December 2007, Japan continues to perform strongly in terms of attainments in mathematics and science. In the 2003 assessment, Japan was 6th in Mathematical Literacy, and 2nd in Scientific Literacy (MEXT 2005: 13). According to the 2006 assessment, Japan had dropped to 3rd in scientific performance, but remained at 6th in mathematical literacy (OECD 2007 2007).Interes t in science and mathematics also appears to be below the international mean for second year lower secondary school students, where 39% (international mean: 65%) and 59% (international mean: 77%) say that studying mathematics and science respectively is fun. In terms of whether students consider that mathematics or science is one of the subjects at which they are best, again Japan is below the international mean. 39% say that they are best at mathematics (international mean: 54%), 49% say that they are best at science (international mean 54%) (MEXT 2005: 14). These issues may have a bearing upon the future recruitment of science and technology researchers and technically proficient employees.

Within the Third Science and Technology Basic Plan, motivating interest in developing a research career in science and technology figures prominently. Human resources are seen as key to a “vibrant research environment”. To support this, the Science and Technology Basic Plan acknowledges the importance of a competitive environment based on fair and transparent procedures for the evaluation of personnel and research proposals. Recent initiatives have outlined efforts to increase the opportunities for younger researchers to obtain competitive research funds with prior analysis suggesting that most recipients have tended to be in their late 40s and 50s (CSTP 2007: 9).

Japan has very few researchers from overseas and the total is currently estimated at 3.5% of researchers (CSTP 2009). Promotional efforts have been launched to increase this and build on pre-existing schemes such as fellowships for overseas researchers operated by the Japan Society for the Promotion of Science, and the extension of the visa stay in Japan from 3 years to 5 years. Some efforts have also been introduced to introduce wider information on research employment opportunities in Japan by the Japan Science and Technology Agency (see JST). The expansion of bilateral agreements with other countries is also seen as a further priority (CSTP 2007). In 2009, the new government mentioned that they plan to introduce a new plan to increase the attractiveness of Japan for foreign researchers - no details have as yet been forthcoming (CSTP 2009).

It is also being increasingly noted that fewer Japanese researchers are going overseas to undertake research and gain international experience. In 2002, around 3000 Japanese researchers embarked on long term overseas research positions; by 2006 this number had nearly halved to 1,700 (CSTP 2009). Some of the reasons cited by Japanese researchers is the uncertainty of finding a new position once returning to Japan. Secondly, that Japanese researchers do not have the necessary connections overseas (see NISTEP 2009).

While a research career has been promoted, evaluation of the First and Second Science and Technology Basic Plans performed by the National Institute of Science and Technology Policy (NISTEP) found that most university students undertaking advanced study are primarily interested in pursuing an academic career on completion of their studies (NISTEP 2005); unemployment rates amongst those with doctorates have been close to 40% according to some studies, yet survey research has found there to be generally no major problems amongst employers of postdoctorates with experience broadly in line with expectations (see MEXT 2009: 10, Table 13). There has subsequently been a push towards broadening the range of experiences for those in education (see NISTEP 2003). Discussion in the Council for Science and Technology Policy (CSTP) has sought to address issues surrounding the interchange between different sectors of the economy

(CSTP 2006) as well as increasing the number of internships provided. This continues to be of relevance and was highlighted as a key issue in a review by the CSTP in 2009 (CSTP2009).

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Related policies in other domains

Interaction between Innovation and Research Policies

Science parks and incubation centres have been a feature of the Japanese innovation landscape since the late 1990s, with many universities and research centres now having such laboratories (see SMRJ for a listing).

Various policies have been put in place to support linkages between universities and industry, including the support of technology licensing organisations (of which there are now 47), venture support laboratories, and intellectual property headquarters. The New Energy and Industrial Technology Development Organization (NEDO) provides a number of fellowships for the staffing of these organisations.

Entrepreneurship education is being provided by some of the incubation centres attached to universities, but overall such education remains remains limited. The Management of Technology courses, which are provided at Masters' level, are one key source of this type of education.

While Japan is noted to have low levels of venture finance (OECD 2007), corporate venturing support is provided by the

2008).

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Related policies in other domains

Other Policies

The First Science and Technology Basic Plan stated that the government will extend support for research and development (R&D), notably in the form of subsidies, if the private sector is unwilling to bear all the risks involved (1996: 35; see also METI 2001). The New Energy and Industrial Technology Development Organisation (NEDO) provides many grants to firms, universities and the public research sector to support research in areas of high risk and to promote technology diffusion.

The guidelines, ordinances and international agreements governing public procurement are set out by the Cabinet Office (2001). Public procurement has featured in relation to super-computers, telecommunications, non R&D satellites (see Cabinet Office 2006), as well as electronic communications and medical technologies (Cabinet Office 2008).

Most competition policy activity has been concerned with efforts to eliminate bid rigging for public works projects with little activity directed to towards innovation related competition policies (JFTC 2005, 2007). Where intellectual property issues relate to competition policy, guidelines on patent pool arrangements were established by the Japan Fair Trade Commission (JTFC 2005: 13) to contribute to preventing violations of the Anti-Monopoly Act and promoting the specification of standardisation activities (for a discussion of the significance of the Anti-Monopoly Act to innovation, see Goto, A., (2009), Innovation and Competition Policy, The Japanese Economic Review, 60,1).

Merger & Acquisition activity is governed by the Guidelines Concerning Companies and Excessive Concentration of Economic Power (2002), and the Notification System Concerning M&As by Companies in Japan (1999). The JTFC published “Guidelines concerning Joint Research and Development under the Anti-Monopoly Act” in 1993.

Japan's Ministry of Defense spends around 3.7% of government expenditure on R&D in 2009. The basic guidelines for R&D stipulate that the research should be carried out both internally and with universities, Independent Administrative Institutions and also with the American military.

The Ministry of Health, Labour and Welfare has a relatively low R&D budget spending around 3.9% of government expenditure. A large part of this budget is distributed to other actors or used for social security and health care related expenditures (MHLW2009). However, the life sciences are a major priority within the Science and Technology Basic Plans and there is a strong drive to push innovation in the medical field, both in relation to medical instrumentation, but also in drug approval timescales and development (CSTP 2009).

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Related policies in other domains

Policy mixes to stimulate research

A key instrument in efforts to enhance policy making efforts over a range of policy areas is through the Council for Science and Technology Policy (CSTP). The legal remit of the CSTP is broadly defined and Article One of the Law establishing the CSTP states that the CSTP is to review the whole of Japan's innovation policy as well as to plan and prepare in a comprehensive and basic manner policy for science and technology (CSTP 2001). A useful analogy for the CSTP is that of a "watchtower" over the innovation system.

The CSTP includes members from four different ministries with a further eight members with backgrounds outside of government, such as industry, the universities and public research institutes. In addition the CSTP comprises a number ofspecialist investigation committees that review basic policy, bio-ethics, evaluation methods, intellectual property and space activities. These specialist committees have a diverse membership, use public hearings and draw on a range of opinions in drafting policy reports, which are then provided to the CSTP.

While the scope of R&D and innovation policy is broad, gaps in terms of implementation do occur. The CSTP delegates implementation responsibility to various ministries, but as an OECD report noted "the council's specific recommendations [...] have not been fully implemented by the ministries" (Jones and Yokoyama 2006: 18). A further issue is duplication, since various ministries have competitive funds, university-industry link programmes, and regional innovation programmes, measures have been outlined in successive Science and Technology Basic Plans to avoid the duplication of programmes (see Second Science and Technology Basic Plan 2001: 19-20). To overcome some of these issues a database of funding programmes was developed so that it would be possible to locate which areas of research were being promoted by which organisations.

In 2010, the new Hatoyama administration pledged to introduce a new law regarding the CSTP. This ultimately aims to strengthen the managerial capacity of the CSTP for oversight of the innovation system. The new law will be passed towards the Autumn of 2010.

Recent reports by the CSTP suggest that there are a range of issues that have some influence on the performance of science and technology. With regard to human resources, a recent report observed maternity issues, healthcare and insurance systems, in addition to contract duration having some influence on the recruitment and retention of researchers (CSTP 2008).

Other studies have suggested that the certification procedures for drug development, leading to what is called "drug lag", disadvantaging Japanese drug companies and consumers (JPMA 2008). Indeed, where drug and medical related research has occurred a special programme has been developed which allows for greater flexibility in how research funds are used, outside of the normal system. The "Super Special Consortia for Supporting the development of cutting edge medical care" was unveiled in 2009 to facilitate the development and practical implementation of transformative technologies in the medical field, overcoming the fragmentation of government poliies and funding schemes. Under each scheme, which is a research group centred around a university, regenerative medicine, pharmaceuticals and medical technologies can receive fast tracking through regulatory process (see Stenberg and Nagano2009: 66).

While the Ministry of Internal Affairs and Communications has put in place policies to develop ubiquitous networks it is now considering using tax incentives to further stimulate the uptake of this technology. The MIC is also hoping that cloud computing will have positive effects on software development and medical delivery services.

The European Commission Policy Mix Web Portal

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- **JAPAN - Important policy documents**

Title of document	Date	Organisation responsible	Type of Document
Basic Law on Intellectual Property	2002-12-01	The Cabinet Office / The Cabinet Office	Law Number 122, 2002
Basic Space Law	2008-05-28	Japanese Government / Japanese Government	Law Number 43, 28 May 2008
Strategy for New Economic Growth	2006-03-29	Ministry of Economy, Trade and Industry (METI) / Ministry of Economy, Trade and Industry (METI)	Strategy Document: Interim Conclusion
The Science and Technology Basic Law	1995-11-15	The Japanese Government / The Japanese Government	Law Number 130 (1995)
Independent Administrative Institution Law	1999-11-07	Cabinet Office / Cabinet Office	Law Number 103, 1999
National University Incorporation Law	2003-07-16	Ministry of Education, Culture, Sports, Science and Technology (MEXT) / Ministry of Education, Culture, Sports, Science and Technology (MEXT)	Legal Document (Law 112, 2003)

Towards ERA and Lisbon

Towards European Research Area

The European Union, along with the United States of America (USA), is seen as a major competitor and point of comparison when measuring science and technology activities and performance. EU and USA performance in terms of scientific outputs is also closely monitored against national performance in the Annual White Paper on Science and Technology published by the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

With specific regard to the European Research Area, at a descriptive level many research organisations have provided information on this to the domestic audience (NEDO 2009; JST 2007), as well as on ERA-Link (now known as Euraxess Links which is targeted to the diaspora of European researchers based overseas) (see JSPS 2008). The ongoing efforts at European level to internationalise the research system have been noted as placing impetus on Japanese policy makers to further internationalise the Japanese system. There is also a feeling that the presence of Japanese efforts are likely to diminish with the growth of scientific capability in other parts of the world, particularly in China and India. At the same time, the existence of major challenges relating to energy and the environment are recognised as spurring the need for greater cooperation with the European Research Area.

While there are some signals that the ERA places pressure on Japanese policy makers, on the whole the overall gist of policy documentation until now, chiefly by reference to the MEXT review of EU-Japanese relations in 2008, suggests that a need for further cooperation is the main point of focus (MEXT 2008), emphasised by the new S&T agreement.

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Towards ERA and Lisbon

Lisbon-strategy related activities

Various factors such as European Union performance in science and technology, as well as certain similarities in the types of challenges faced with regards to population decline and aging, as well as labour productivity (Ogawa 2007) have led Japanese policy makers to take note of the Lisbon Objectives. This has, however, generally been through reviewing the types of policies adopted, rather than the Objectives having an explicit influence on Japan's innovation system policies.

It should be remembered that Japan already apportions more than 3% of gross domestic product to R&D. Japanese national statistics put the overall proportion for 2008 at 3.67% of GDP (MIC 2009). More recently, the new Hatoyama administration has talked of increasing this proportion to 4% by 2020 (Cabinet Office 2010: 39).

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Impact of EU instruments

Impact of Structural Funds on Research Funding

Not relevant to Japan.
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Impact of EU instruments

Impact of EU framework programmes

Japan is recognised as a Third Country within the Framework Programme and as such is eligable to participate in FP research initiatives, but this often requires extra justification and is largely on a self-financing basis (European Commission 2001). it is hoped that the new Science and Technology Agreement officially signed on 30 November 2009 will lead to more cooperation opportunities between the European Union and Japan.

The scope of programmes to which Japanese researchers or organisations can participate has broadened in consecutive Framework Programmes, with a joint project between the European Commission and Japan Science and Technology Agency issuing a joint call for research on the environment in 2008, and repeated in 2009.

Japan shares many research priorities with the European Union Framework Programme. Both the EU and Japan give priority to information and communications technologies, energy and the environment, nanotechnology and materials, the bio and life sciences.

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Impact of EU instruments

Other EU developments and impacts

An Action Plan for Japan-EU Cooperation was adopted in 2001. This set out four main objectives that are addressed through annual summits between the EU and Japan. The 17th Japan-EU Summit in 2008 stated that, amongst other things, the

- EU and Japan will continue to strengthen cooperation on intellectual property rights

- Cooperate more intensively in the field of science and technology and complete and sign a new Cooperation in Science and Technology agreement in the near future.

With the expiry of this Plan in 2011, discussions are currently under way on the structure of a new plan, and this will continue throughout 2010 (see the Delegation of the European Union to Japan for background; see also Woolgar, L., (2010) for further discussion).

Japan maintains numerous bilateral relations with European Union Member States. A full listing of bilateral agreements is available from Japan's Ministry of Foreign Affairs (MOFA 2009/ English Information).

On 30 November 2009 a new Science and Technology Agreement was officially signed between Japan and the European Community. This will provide new political impetus to research collaboration and is likely to see more joint initiatives and calls for bilaterally funded projects.

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Overview and governance

Overview

Japan has 47 prefectural governments and 10 regions (map). These 10 regions include Hokkaido (the northern island) Tohoku (the northern part of Honshu (the main island)), Kanto (the area surrounding Tokyo), Chubu (the central area of Honshu), Hokuriku (the area bordering the Japan Sea), Kinki (west-central Honshu, including Osaka and Kyoto), Chugoku (southern Honshu between Kansai and Kyushu), Shikoku (island south of Chugoku), Kyushu (southern island off Honshu) and Okinawa (between Kyushu and Taiwan).

Various policies have been put in place since the late 1980s by central government to support regional research systems. Early on, these policies ranged across Technopolis policies, the development of Science Cities, and the introduction of regional collaborative research centres at universities (from 1987). While some of these initiatives are still in place, recent efforts are targeted at regional cluster initiatives and strengthening regional innovation and regional innovation systems.

Following passage of the Science and Technology Basic Law in 1995, Article 4 set out the responsibility of regional government which is to implement science and technology policies in an autonomous manner.The science and technology basic plans have consecutively increased the role and importance of the regional dimension. The Second Science and Technology Basic Plan specifically set out to promote science and technology in each geographic region and the Third Plan has continued this theme with national universities expected to play a role in this process. The incorporation of the National Universities on the basis of the National University Incorporation Law (2003), which sought to give universities a more social role, has seen many universities seek to develop stronger local links.

Various funds have been put in place by central government to allow regions to develop their own innovation policies, with a number of government ministries including the Ministry of Economy, Trade and Industry (METI), the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Agriculture, Fisheries and Food (MAFF), the Ministry of Environment, and the Ministry of Internal Affairs and Communications (MIC) having programmes in place. Many of these programmes are implemented through regional offices for the Ministries in collaboration with local government and industry. A further policy is that of the Special Zones for Structural Reform. These are a unique policy experiment allowing regions to assess the impact of relaxing certain regulations as a way of introducing regulatory reform initiatives more widely throughout Japan.

Overall, central government is largely setting funding priorities to which regions are then responding. The role of central ministries is therefore an important factor in seeking to understand regional innovation governance in Japan. With the growth in regionally oriented initiatives, coordination and information on the range of programmes has become important, and a number of databases have been set up to assist in this.

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Overview and governance

Regional responsibilities

Japan is a unitary state, wherein central government can delegate political power to lower levels. In the Science and Technology Basic Law (1995), Article Four thus allowed regional government to implement science and technology policies in an autonomous manner. However, while regional policy has been emerging since the 1980s, there are no real governance institutions at the regional level other than the regional bureaus maintained by some central government ministries. These organisations provide information concerning funding opportunities for actors within the region, which include universities, firms and prefectural governments.

Regional governments are responsible for developing strategies and policies in order to bid for central government projects, as well as for providing their own funds to certain projects. The use of these funds and the development of these strategies has led to some diversity in how different regions approach regional innovation (Kitagawa and Woolgar2 008).

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Name of correspondent: Lee Woolgar

Overview and governance

Research governance

In the main there are no regional level organisations in Japan other than the regional bureaus of central government ministries. There are however a number of different actors that play some role in regional innovation activities. The types of acor include the following:

Central Government and Regional Bureaus

Ministries which maintain regional bureaus include the the Ministry of Economy, Trade and Industry (METI), the Ministry of Internal Affairs and Communications (MIC), the Ministry of Agriculture, Forestry and Fisheries (MAFF), and the Ministry of Land, Infrastructure and Transport (MLIT).

In terms of regional innovation policy, the bureaus that are most active, such as those of METI, act as the local point of contact for applicants on regionally oriented projects. The bureaus also collect and provide information on the region. METI's budget for regional initiatives is divided into a number of streams that include the strengthening of human resources and support programmes for regional small and medium sized enterprises (SMEs) (METI 2009). The Ministry of Education, Culture, Sports, Science and Technology (MEXT) budget for regions is also distributed through similar schemes and programmes(MEXT2009).

Local government

This includes prefectural governments (47 prefectures) and city authorities.

Many prefectural governments are currently facing financial difficulties and are using central government support to maintain operations. Over eight years Japan's regional governments have faced falling revenues (MIC 2009). Finance by prefectures is dedicated mainly to the basic functions of local government (MIC 2007) but local governments also have funds that they deploy towards local objectives. The Fukuoka Prefectural Government, for example, has a special budget which it uses to support measures related to tourism, relations with Asia, safe and secure society, employment and business creation, SMEs (€35m), and the development of advanced technologies such as robotics (€1.5m) (Fukuoka Prefectural Government 2007a, 2007b).

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Name of correspondent: Lee Woolgar

Regional research policies

Research policies and programmes

As the government has sought to promote regional innovation efforts a number of policies have been introduced. These include:

- The Industrial Cluster Program introduced in 2001 by the Ministry of Economy, Trade and Industry (METI). The objective of this programme is to strengthen the global competitiveness of Japanese industry through creating networks of universities, industry and government for the sharing of intellectual resources and the creation of a business environment conducive to innovation, the creation of new industries in areas of strategic importance, and developing beneficial relationships between the various regional actors. There are currently 18 projects throughout Japan. As of 2009, the total budget is €107m.

- Knowledge Cluster Initiative have been promoted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) since 2002. The objective of this programme is to create a concentration of knowledge and talent for internationally competitive technological innovation. Nine clusters in Hokkaido, Sendai, Nagano, Hamamatsu, Kansai and Fukuoka Kitakyushu are currently participating in the programme. As of 2009, the total budget is €133m.

- The City Area Program, also operated by MEXT, has the objective of utilizing universities and industry to create new business and foster the promotion and development of new and local businesses. In 2006, nine areas were selected for the City Area Program. As of 2009, the total budget for this scheme was €36m.

Other programmes are supported by other ministries including the Ministry of Agriculture, Fisheries and Food (MAFF) (54 projects selected since 2001), the Ministry of Environment (which has supported regional projects since 1993), and the Ministry of Internal Affairs and Communications (MIC), Many of these programmes are implemented through regional offices for the Ministries in collaboration with local government and industry.

Funding agencies, such as the Japan Science and Technology Agency (JST) also have regional innovation initiatives. The JST operates the Innovation Plaza's, which are for the nurturing of regional technological seeds, as well as research and technological development funding.

The Japan External Trade Organisation (JETRO) operates the Regional Industry Tie-up (RIT) programme that promotes two-way industrial exchange and collaboration between regions in Japan and other countries with the aim of facilitating business tie-ups and the stimulation of business in participating regions.

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Research policies and programmes

Important policy documents

- Science and Technology Basic Law (1995) (Article 4)
- First Science and Technology Basic Plan (1996-2000) (Section VII, p. 40)
- Second Science and Technology Basic Plan (2000-2005) (p. 37)
- Industrial Cluster Project (2001)
- Knowledge Cluster Initiative (2006)
- Third Science and Technology Plan (2006-2010) (pp.44-45)
- New Economic Growth Strategy (2006) (pp.18-22)
- Intellectual Property Strategic Program 2007 (2007) (pp. 117-9)
- Strategy for Enhancing Growth Potential (2007) (pp. 5-6)
- Strategy for Regional Revitalisation through Science and Technology (2008)

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Name of correspondent: Lee Woolgar

Regional research policies

Additional information

There are a paucity of innovation indicators at the regional level in Japan. According to an analysis of regional innovation systems undertaken by the National Institute of Science and Technology Policy (NISTEP), Tokyo (and the surrounding Kanto region), and the Kinki region (including Osaka and Kyoto) are the strongest regions in Japan for innovation in terms of research budgets, infrastructure, human resources, the number of private and public research and development (R&D) institutes (NISTEP 2005: Report No. 87). In confirming these findings, a 2008 working paper published by the OECD noted that the Kanto region was the most innovative region in the world in terms of patent cooperation treaty (PCT) patents, but lower on a per capita and per million population basis (see Usai 2008).

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Additional information

Region 1

The Technology Advanced Metropolitan Area (TAMA Project), located in the south-western part of Saitama, bordering on Tokyo, is now part of the Ministry of Economy, Trade and Industry (METI) Industrial Cluster Project and was established in 1998. The TAMA Association serves to work as an intermediary organisation to promote university-industry interaction and inter-firm links in order to develop new products.

Regarding membership of the cluster, according to data published by the association, in 2008 there are 344 corporate members; 39 universities and other educational institutions; 74 industry associations; 21 local government members and 137 TAMA coordinators. There are also 11 financial organisations, and 32 individual members. The TAMA Association, which is a corporation of METI, works as an intermediary, promoting new and existing collaborations and providing meeting opportunities.

According to one evaluation, members of the network gain a number of advantages over companies that are not members of the organisation. These include a higher number of patent applications, more product developments and greater linkages with universities (Kodama 2003). In later analysis, Kodama found that associations involved in the cluster have allowed for tacit knowledge sharing between participants (Kodama 2008)

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Additional information

Region 2

The Fukuoka Silicon Sea-Belt project is a transnational research project centred in Kyushu, that stretches to Korea, Taiwan, and Singapore. It involves

185 companies and 10 universities, that are regionally and nationally based. It was developed in 2001 and receives support from the prefectural government, Fukuoka Industry, the Science & Technology Foundation, theMinistry Ministry of Economy, Trade and Industry(METI) and the Ministry of Education, Culture, Sports, Science and Technology (MEXT). All these work closely with Kyushu University, the major university in the area, which has a comprehensive collaborative research centre. The project aims to nurture Systems for Large Scale Integration (LSI) design and development by building on historical strengths in the area. The project seeks to promote human resource development, industry-academia collaboration and venture businesses. The design of the programme reflects that of the Alba Centre in Scotland, a recognised model for relations between regional government, universities and industry.

Further Reading: Kitagawa, F., (2005), *The Fukuoka Silicon Sea-Belt Project: An East Asian Experiment in Developing Transnational Networks*, European Planning Studies, Vol. 13, No. 5, July

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Name of correspondent: Lee Woolgar

Additional information

Region 3

Since the 1970s a number of cluster initiatives have emerged in the northern island of Hokkaido. These initially centred on the information technology and electronics sectors, and from 2001 a new initiative to develop the biotechnology sector emerged. In terms of geography, the IT and electronics cluster is concentrated in the Sapporo area, chiefly around Hokkaido University. The biotechnology cluster covers the whole of Hokkaido.

Two government support funds have been drawn upon to support the clusters. The Ministry of Economy, Trade and Industry (METI) provided funding under the Super Cluster Promotion Initiative (2001-2005), and the Hokkaido Super Cluster Strategic Promotion programme (2006-2010) for the creation of business networks for technology development and commercialisation. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has also provided funding under the Intellectual Cluster Initiative (2002-2006) firstly to the IT sector in Stage I, and from Stage II, for the bio sector. The MEXT initiative is to promote technological seeds within the region that can then be developed or adopted by industry. Support and assistance has also been provided by the Sapporo Municipal Government and Hokkaido Regional Government.

Both programmes have been evaluated through survey questionnaires with participant firms. These have found that firms involved in the initiatives, particularly the bio initiative, have benefitted from participation. With respect to the bio cluster, firms that have participated report a higher number of tie-ups with firms within the region than the national average; have a higher opinion of regional university-industry links; and higher take-up of R&D by participant firms. In terms of outcomes, survey results also suggest that those firms that have participated in the bio cluster also report higher sales and profits, compared with all projects.

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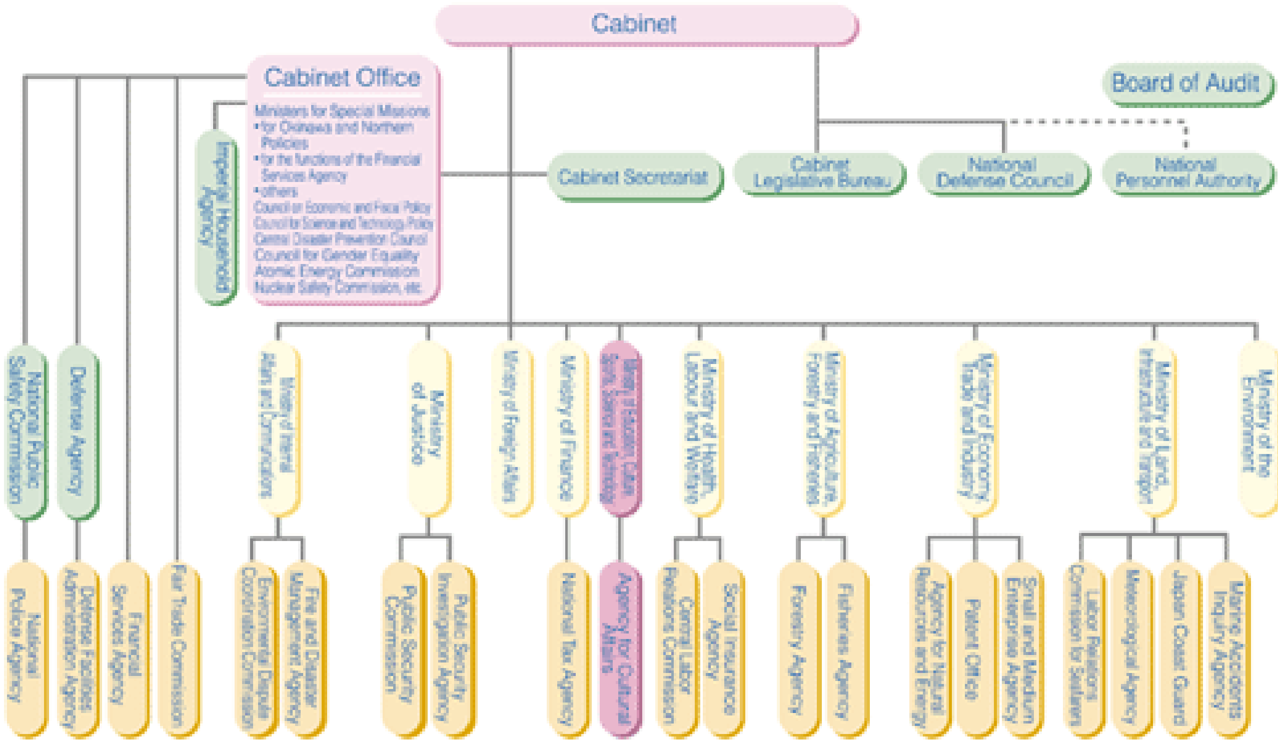
- **JAPAN - Organisations**

Title of organisation	Shortname
Science Council of Japan	SCJ
National Institute of Science and Technology Policy	NISTEP
National Institute of Advanced Industrial Science and Technology	AIST
The Japan Association of National Universities	JANU
Japan Society for the Promotion of Science	JSPS
Japan Patent Office	JPO
Japan Atomic Energy Agency	JAEA
New Energy and Industrial Technology Development Organisation	NEDO
Japan Aerospace Exploration Agency	JAXA
Japan Science and Technology Agency	JST
Ministry of Internal Affairs and Communications	MIC
National Institute of Academic Degrees and University Evaluation	NIAD-UE
Council for Science and Technology Policy	CSTP
RIKEN	RIKEN
Ministry of Education, Culture, Sports, Science and Technology	MEXT
Research Institute of Economy, Trade and Industry	RIETI
Ministry of Economy, Trade and Industry	METI

Overview of structure

Organogram



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Name of correspondent: Lee Woolgar

Overview of structure

Brief description of the structure of the research system

In terms of the structure of Japan's research system, the three main actors are the government, characterised by strong central coordination; the business enterprise sector, which performs most research and development (R&D); and the higher education sector, which has greater autonomy from government than hitherto.

Coordination of research policy is provided by the Council for Science and Technology Policy (CSTP), based within the Cabinet Office. Through the setting of the Science and Technology Basic Plans, the CSTP sets sectoral research priorities and funding levels, with policies then implemented by Ministries and funding agencies. With a new government elected in Autumn 2009, the main policy making apparatus was to shift to a National Strategy Unit in the Cabinet Office. The relations between this, and the CSTP, which is subject to reform due to the passage of a new revision law in the parliament by Autumn, 2010, is still not clear.

The Ministry of Education, Culture, Sports, Science and Technology (MEXT), which spends around 65% of government expenditure on R&D, shapes the structure of the education and research and development systems of Japan through the provision of institutional funds and research programmes. MEXT is also the home of the National Institute of Science and Technology Policy (NISTEP), which supports policy making through the production of data, analysis and reports on science and technology. The Ministry of Economy, Trade and Industry (METI) primarily develops policies for industry, industrial competitiveness and the regional economy. METI spends 14% of government expenditure on R&D.

Funding is distributed via the Ministries to Independent Administrative Institutions (IAIs). These include key funding bodies like the Japan Science and Technology Agency (JST) and the Japan Society for the Promotion of Science (JSPS) as well as the National Universities, which receive most of their budget from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Key agencies such as the Institute of Physical and Chemical Research (RIKEN), the National Institute of Advanced Science and Technology (AIST), and the New Energy and Industrial Technology Development Organisation (NEDO) are all independent administrative institutions that maintain relations with METI.

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Public Private Collaboration

Overview

The Japanese research system has undergone significant changes since the mid 1990s witnessing significant changes in the governance of science and technology performing institutions such as public sector research establishments such as Independent Administrative Institutions (IAIs) and national universities, both of which have gained greater autonomy from government, following theIndependent Administrative Institution Law (1999) and National University Incorporation Law (2003). Reform of the institutional position of these organisations was proposed to make them more accountable for their research performance and more socially responsive. The changes have seen the merging of different groups and organisations to achieve economies of scale or to reinforce key capabilities. There have also been dramatic changes to the management of such organisations, with greater influence from those with external experience, such as those that have private sector or governmental experience. IAIs and national universities have also reformed their internal rules of operation, especially where collaboration with industry is concerned.

The granting of greater autonomy from government has necessitated the introduction of performance reviews and the evaluation of institutional performance. Both the IAIs and national universities have been required to submit Medium Term Plans that set out the priorities of the organisation over a Six Year period and anticipated costings for key activities. The Plans are then submitted to the relevant Ministry for approval. Each organisation is then accountable for its performance against its stated objectives. In addition to the Medium Term Plans, there are also Annual Plans. Each organisation is therefore evaluated by a Ministerially appointed evaluation committee on an Annual and mid-term basis. It should be noted that evaluation of teaching and examinations is undertaken by a separate organisation, the National Institute of University Degrees and University Evaluation.

Last update date: 19/10/2007

Name of correspondent: Lee Woolgar

Public Private Collaboration

Relation between public and private actors

The role of public research facilities has historically been an important component of the Japanese research system that has continued through the activities of the Institute of Physical and Chemical Research (RIKEN), the New Energy and Industrial Technology Development Corporation (NEDO), and the National Institute of Advanced Science and Technology (AIST) as well as other Independent Administrative Institutions. Prior to being granted independent administrative status on the basis of the Independent Administrative Institution Law, central government research institutions were attached to a variety of ministries and conducted mission focused research. While these public laboratories undertake only a small part of overall R&D in Japan, many have an important niche position (1).

Last update date: 19/10/2007

Name of correspondent: Lee Woolgar

Main Research policy making mechanisms

Policy making and coordination

In the main there are no regional level organisations in Japan other than the regional bureaus of central government ministries. There are however a number of different actors that play some role in regional innovation activities. The types of acor include the following:

Central Government and Regional Bureaus

Ministries which maintain bureaus include the the Ministry of Economy, Trade and Industry (METI), the Ministry of Internal Affairs and Communications (SOUMU link), the Ministry of Agriculture, Forestry and Fisheries (MAFF), and the Ministry of Land, Infrastructure and Transport (MLIT).

In terms of regional innovation policy, the bureaus that are most active, such as those of METI, act as the local point of contact for applicants on regionally oriented projects. The bureaus also collect and provide information on the region. METI's budget for regional initiatives is divided into a number of streams that include the strengthening of human resources and support programmes for regional small and medium sized enterprises (SMEs) (METI 2006). The Ministry of Education, Culture, Sports, Science and Technology (MEXT) budget for regional science promotion is Y14,055m (€87m) (MEXT 2005 2005).

Local government

This includes prefectural governments (47 prefectures) and city authorities. Many prefectural governments are currently facing financial difficulties and are using central government support to maintain operations. In 2005, 28 regional governments were in debt (SOUMU 2007). Finance by prefectures is dedicated mainly to the basic functions of local government (SOUMU 2007) but local governments also have funds that they deploy towards local objectives. The Fukuoka Prefectural Government, for example, has a special budget which it uses to support measures related to tourism, relations with Asia, safe and secure society, employment and business creation, SMEs (€35m), and the development of advanced technologies such as robotics (€1.5m) (Fukuoka Prefectural Government 2007a; 2007b).

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Name of correspondent: Lee Woolgar

Policy making and coordination

Government policy making and coordination

The Council for Science and Technology Policy (CSTP) was established in January 2001 within the Cabinet Office as one of the top councils based on the Law for Establishing the Cabinet Office (2001, Law No. 89). The CSTP, which frequently refers to its role as that of a "watchtower", is composed of the Prime Minister, other relevant Ministers (including those for the Ministry of Education, Culture, Sports, Science and Technology, and the Ministry of

Economy, Trade and Industry); other experts from academia, including the Science Council of Japan (SCJ); and experts from industry. The CSTP discusses basic concepts for science and technology policy on a monthly basis and prioritises all national science and technology policies, which are then implemented by the various Ministries and Agencies.

A new law to revise the CSTP is to be submitted to the Japanese parliament in Autumn 2010. The law intends to strengthen the managerial competences of the CSTP. More details will be added in due course.

In terms of governmental budgetary allocation processes for research expenditure, the Ministry of Finance (MOF) has general jurisdiction over public finance including budget formulation and thus plays an important role in providing finance for research and development (R&D). Each Ministry submits its budget request to the MOF, which follows Cabinet approved "Guidelines for Budget Requests". These set out the expenditure ceilings for public spending. After approval of the budget by the Diet, the budget is distributed from the cabinet to the heads of the ministries and agencies, according to the value decided by the Diet.

The Science and Technology Basic Plans, implemented on the basis of the Science and Technology Basic Law (1995), are a major instrument for coordinating the research system through the allocation of funds to specific areas of research. Each ministry, research institution, and funding programme follows the key areas outlined in the plans.

While there have been centralising tendencies since the establishment of the CSTP, there is also greater diversity and autonomy within the research system. Independent Administrative Institutions (IAIs), which includes key research centres such as the Institute of Physical and Chemical Research (RIKEN), the New Energy and Industrial Technology Development Organisation (NEDO), and the Advanced Industrial Science and Technology Organisation (AIST) have all been granted autonomy to set their own research agendas and to develop their own management systems on the basis of the Independent Administrative Institution Law (1999). The National Universities have also experienced similar reforms following the passage of the National University Incorporation Law (2003). Similar to the IAIs, the national universities now develop their own strategic plans and policies.

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Policy making and coordination

Science Policy Advice

The main forum for the discussion, development and assessment of science and technology policy is the Council for Science and Technology Policy (CSTP). This develops general policy and also has a number of expert committees that review specific areas of Japan's science and technology governance, including Basic Policy, Evaluation of National Projects, Space, Intellectual Property and Bioethics. These committees provide many reports and findings that filter into CSTP policies. Despite this, CSTP members regularly complain at conferences or events that there is insufficient evidence underlying science and technology policy interventions.

Special Ad-hoc committees comprising different stakeholders from industry and the universities are also frequently developed to address technological issues and challenges at the ministry level. Other specific stand-alone corporations (*Shadan Houjin)* and committees (*Iinkai)* are also frequently established to review particular policy issues.Within the ministries there is a high level of experience surrounding innovation policies. However, the new government elected in the Autumn of 2009 has pledged to reduce the influence of government ministries on policy making. It is not yet clear what implications this will have for how innovation policy is shaped and what inputs the professional civil service make to new policies.

One of the main actors in the provision of information related to science and technology policy is the National Institute of Science and Technology Policy (NISTEP). This has published reports and analysis of the funding for science and technology and undertakes international benchmarking exercises and foresight studies. The Research Institute for Economy, Trade and Industry (RIETI) also plays some role in assessing the economic aspects of science and technology.

Many business and scientific representative bodies have embraced the innovation policy agenda. The Japan Business Foundation (Nippon Keidanren), in its new vision outlined in January 2007, emphasized innovation as the centre of Japanese economic development. Other business organisations such as the Japan Chamber of Commerce and Industry have played a more operational role in developing technology stakeholder platforms. Likewise, the Science Council of Japan (Nihon Gakujutsu Kaigi), a national body representing academic researchers, has established an ad hoc committee for promoting innovation in response to the new Innovation 25 agenda.

The Science Council of Japan (SCJ) which represents around 80,000 scientists can make policy recommendations and deliberate on scientific issues. There are also smaller scientific societies and bodies representing particular fields (for a listing, please see Japan Links).

Japan has been noted as having a comparatively undeveloped policy advice and advocacy system (Suzuki 2006). There are, for instance, few permanent think-tanks, particularly in areas related to science and technology.

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Name of correspondent: Lee Woolgar

Policy making and coordination

Actors in policy implementation

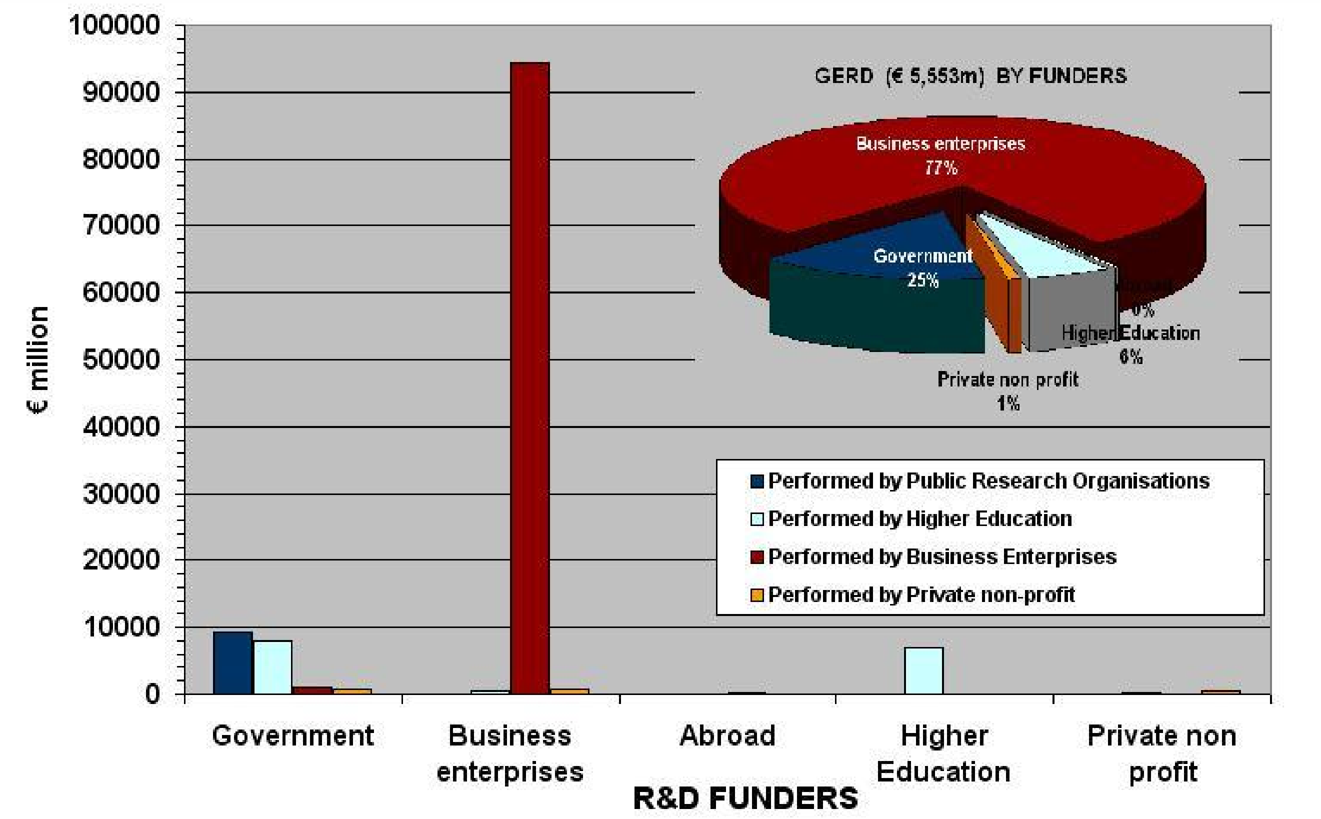
The Independent Administrative Institutions (IAIs) such as the Institute of Physical and Chemical Research (RIKEN), or the Advanced Institute of Industrial Science and Technology (AIST), play a key role in performing science and technology. IAIs are also involved in the funding of projects such as the Japan Society for the Promotion of Science (JSPS) and the Japan Science and Technology Agency (JST), as well as the New Energy and Industrial Technology Development Organisation, which supports basic projects which might be of high risk for the private sector, as well as technology diffusion projects (see NEDO2008-9).

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Overview of funding flows

Funding Flow diagram



Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Overview of funding flows

Brief description of funding flows

In terms of the volume of research and development (R&D) expenditure, Japanese total expenditure is €121.8b as of 2007; this compares against €226b for the EU27 for the same year. The main performer of research in Japan is the business enterprise sector. According to the data presented above (from EUROSTAT for 2007), business enterprises spent €93b on research and development (R&D). While most business enterprise research is performed intramurally, around €460m of business R&D is performed by universities.

The government is the second largest research funding provider. Here, according to the 2007 data, public research organisations institutions fund around €10b of research. The higher education sector funds €16b of research and development. Overall, a small proportion of funding comes from abroad.

Source: EUROSTAT (2009), Science, Technology and Innovation in Europe, October 2009

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

National public research funding

Overview

Funding by government for Science and Technology has remained stable since 2002. In 2002, ¥3,544.4b (€22b) was spent on research and development. In 2005, ¥3,577.9b (€22b); and in 2007 ¥3,511.3b (€21b) (CSTP 2007). In 2009, the budget for science and technology is ¥3,554.8b (€27b) (CSTP 2009). This budget is distributed through the various ministries of state in accordance with the basic policies for the science and technology budget, decided by the Council for Science and Technology Policy (CSTP). Over a number of years the proportion of competitively allocated funds has grown; while that at the institutional level has tended to decline.

For 2009, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) provided 65.8% of the total science and technology budget. The Ministry of Economy, Trade and Industry (METI), 15% of the budget. The Ministry of Health, Labour and Welfare, 3.8%; the Self Defence Agency (SDA), 3.7%; the Ministry of Agriculture, Fisheries and Food, 3.65%; and the Ministry of Land, Infrastructure and Transport, 1.9% (CSTP 2009: 9).

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

National public research funding

Institutional Support

Of the total ¥3,572.3b (€27b) (2009) of government expenditure on science and technology, national and regional public institutions are funded for a total amount of ¥1.1trillion (€13b). For universities, ¥1.2 trillion (€14b) is provided to universities and other educational institutions (CSTP 2010: 8). Of this, around 70% is for the national universities.

For the universities, the funding is based on a formula by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) which is based on:

1) Standard Faculty and Managerial Fees. This includes the basic management fee, the number of university departments, the number of faculty, the basic facilities expenditure and the income;

2) Specific Fees. This formula is a sum of the number of faculty and graduate school faculty, attached school research and tuition fees; education, research and medical expenditures, research establishments, facilities, and income.

Since 2004, each university was also subject to an annual reduction in management expenses of 1% (see MEXT 2006). Although the new government cut the management expense budgets of the universities in the 2010 budget by ¥11bn (€83m), they abolished the annual 1% reduction (see CSTP 2010).

With regard to public research agencies, ¥1.1trillion (€13b) is provided from central government. Here there is greater variance in budget management due to the various institutional laws and management policies in place for each institution.

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Name of correspondent: Lee Woolgar

National public research funding

Project-based funding

Funding for the policy mission oriented R&D for projects in the fields of life sciences, environment, energy, materials and nanotechnology, ICT, frontier fields, manufacturing, and social infrastructure comprises the bulk of public research funding. In 2009 this was €14b and is funded by through the ministries and research funding organisations. Other types of funding, totaling €1.3b is for competitive projects.

The three main funding organisations in Japan are the Japan Society for the Promotion of Science (JSPS), the Japan Science and Technology Agency (JST), and the New Energy and Industrial Technology Development Organisation (NEDO).

The JSPS and JST principally fund academic research, the JSPS chiefly in a "bottom-up" fashion - that is, with researchers submitting proposals based on their free ideas; whilst the JST selects topics and issues calls in those areas, mostly in academic areas that may be of benefit for technology development. NEDO, which funds industrial R&D through networks and partnerships, largely operates along similar lines to the JST in how it issues calls and determines research projects.

The main funding mechanism for competitively allocated research grants is the Grant-in-Aid scheme operated by the JSPS. This has an annual call in the Autumn for all fields of the natural, social sciences and humanities, with special application streams for younger researchers (those under 42 years old), special research areas, and programmes for small groups working in advanced areas.The acceptance ratio for the Grant-in-Aid scheme is 24% (JSPS 2009).

Funding programmes in which researchers or research teams are competitively selected but in response to calls either on pre-determined themes or on particular programmes with specific objectives are both numerically more common and comprise a larger proportion of the overall competitive research budget. For instance, the JST issues such calls under its ERATO scheme, or for international collaboration in set areas through its SICP scheme.

The greatest recipient of competitive funds are the national universities, the independent administrative institutions, the private universities, and private industry.

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Name of correspondent: Lee Woolgar

National public research funding

Other modes of funding

Co-funding and public funding of private R&D in Japan is minimal. According to EUROSTAT data on funding by the private, non-profit sector as a percentage of GERD, the level is around 0.7% (2007). By comparison, for the EU27, the level is 1.6% for the same year.

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Name of correspondent: Lee Woolgar

National public research funding

Targeted or Thematic Funding

Japan has introduced thematic priorities on the basis of the Science and Technology Basic Law, implemented through three basic plans covering 1996-2000, 2001-2005, and 2006-2010.

The Third Science and Technology Basic Plan is costed at ¥25 trillion (€160.8b) over fiscal years 2006 to 2010. The four primary prioritised fields within the Third Plan include the life sciences, nanotechnology and materials, information and communications, and the environment.

There are also four secondary prioritised fields: energy, manufacturing technology, infrastructure and the frontier (oceans and space).

In total, the outline budget for each of the prioritised fields is ¥16,870 million Yen (€125b)(2009). Of this, the proportion by field is:

- Life sciences: 20.5%
- Information 9.4%
- Environment: 7.2%
- Energy: 26.4%
- Nanotechnology: 5.2%
- Manufacturing: 1.6%
- Infrastructure: 15%
- Frontier: 14.6%

(Source: CSTP 2009)

Further funds are allocated to specific research issues for the reform of the research system. In 2009, the total budget allocated to these issues was ¥3,910 million (€29b). These issues comprise comprehensive policy promotion (9.8%), human resource development (12.5%) , regional innnovation systems (7.2%), university-industry links (9.5%), intellectual property promotion, international activities (7.8%), and other activities (54.2%) (CSTP2009: 7).

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

National public research funding

Role of European and international funding

Funding from European, European Union and other overseas sources plays a small role in the Japanese innovation system. Data from Eurostat suggests that the proportion of funding from all overseas sources abroad for fiscal year 2007 is 0.3% (Eurostat data).

Japanese participation in the Framework Programme is on a self-financing basis.

Some funding from European governments is provided to the Human Frontier Science Programme, and there are also many programmes operated by the Japan Society for the Promotion of Science and the Japan Science and Technology Agency that involve some form of bilateral funding with counterpart organisations overseas.

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Private research funding

Intramural

Business expenditure on Research and Development (R&D) in Japan is predominantly self-financed. Statistics suggest that 98% of all business expenditure on R&D is self financed (Eurostat 2009: 25). This has fluctuated little over time: in 1996, intramural BERD was 98.6% and in 2003, 98.1%. Distinguishing characteristics of BERD financing in Japan is the low reliance on government financing as well as the overall domestic nature of the activity. In 1996, 1.1% of BERD was financed by government; by 2003 this had declined to 0.8% and in 2006 is 1%. Similarly, in 1996 0.1% of BERD was financed from abroad; by 2003 this had increased to 0.4%, the same for 2006.

Japanese statistics published in December 2008 suggest that Japanese industry apportions 6.4% of research expenditure towards basic research, 20.1% to applied research and 73.5% to development (MIC 2008: Table 4).

In terms of sectoral activities, a major part of BERD expenditures in Japan are by the broadly defined manufacturing industry sector, at 88.2% of BERD for 2008 (MIC 2008: Table 7).

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

Private research funding

Extramural

Overall, Japanese firm expenditures have gradually shifted towards a more open innovation model over recent years with the proportion of extramural R&D expenses rising from 13.4% of R&D expenditure in 2003 to 14.9% in 2006 (MIC various sources). In 2009, 16.4% of research expenses were spent extramurally (MIC 2009 - Chart 2).

According to a 2007 survey by the Ministry of Education, Culture, Sports, Science and Technology, published in 2009, the main area witnessing growth in extramural R&D activities for Japan's firms has been with domestic universities. Of the 947 firm responses to their survey, 84.4% reported that they had increased their relationships with external partners over the past five years. 88.3% reported that they had increased the number of research relationships with domestic universities. Only a small minority had increased the number of relationships with overseas partners; most (35.51%) had developed research relations with overseas firms (MEXT2009: 13-4).

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Name of correspondent: Lee Woolgar

Private research funding

Charitable foundations and not-for-profit funding

According to Ministry of Internal Affairs and Communications (MIC) statistics, expenditure on research and development by the non-profit sector decreased from ¥298,796m (€188m) in 2005 to ¥273,229m (€204m) in 2008. The proportion of overall R&D expenditure for the non-profit sector is 1.45% .

The non-profit sector in Japan is typically comprised of small foundations and organisations, with only 15 organisations that perform intramural research employing over 100 people. The majority of organisations have 0-29 employees. A listing of the different foundations can be found here.

Last update date: 27/04/2010

Name of correspondent: Lee Woolgar

- **JAPAN - Support Measure(s)**

Title of support measure	Start Date	Organisation responsible
Exploratory Research for Advanced Technology (ERATO)	1994	Japan Science and Technology Agency (JST)
Grants in Aid for Scientific Research	1994	Japan Society for the Promotion of Science (JSPS)
Postdoctoral Fellowship for Foreign Researchers	1994	The administering agency for the Postdoctoral Fellowships for Foreign Researchers is the Japan Society for the Promotion of Science (JSPS)
Knowledge Cluster Initiative	2002	
Global COE Programme	2007	Japan Society for the Promotion of Science
Small Business Innovation Research (SBIR)	1994	13 Ministries and Agencies are involved in administering the Small Business Innovation Research (SBIR) programme
Third Science and Technology Basic Plan	2006	Chiefly the Japan Science and Technology Agency (JST) and the Japan Society for the Promotion of Science (JSPS).
JSPS Research Fellowships for Young Scientists	1994	The administering agency is the Japan Society for the Promotion of Science (JSPS)

Research performers

Private research performers

As of 2007, 77.7% of GERD is performed by industry in Japan. These firms also employ 60% of researchers in the corporate sector (Eurostat 2009 - total researchers by sectors of performance). Japan has some of the most innovative firms in the world. The European Innovation Scoreboard placed Toyota Motor as the highest ranked firm in the world in terms of research expenditure (€7.6b (2008)), with Honda Motor (€4.6b) and Panasonic (€4.4b) also in the top ten R&D performing companies (European Commission 2009). Indeed, most R&D expenditure (75%) in Japan is accounted for by large corporations with capital above ¥100b.

In numerical terms the industrial structure of Japan is composed predominantly of small and medium sized enterprises. The SME Agency of the Ministry of Economy, Trade and Industry also note that 70.2% of employees are based in SMEs. However, in terms of R&D spend, firms with capital less than ¥100m perform around 3% of research expenditure.

Extramural research expenditure is generally quite low, statistics suggest that this is 14.3% of self-financed R&D (MIC 2008: Table 7). While it is true that Japanese firms have increased their links with domestic institutions, particularly with Japanese universities and other Japanese firms over the past five years, most firms do not have relationships with overseas actors, with only slight increases in the number reporting links with overseas firms (MEXT survey of 947 firms (MEXT 2009).

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Name of correspondent: Lee Woolgar

Private research performers

Private Research and Technology Organisations

The role of such organisations in Japan is very small and low key, accounting for around 1% of expenditure on R&D. The ReaD database notes that there are around 400 private non profit research organisations in Japan (ReaD 2010).

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Name of correspondent: Lee Woolgar

Key research indicators

Key research indicators

ERAWATCH presents four categories of key R&D and other technology indicators. They are aimed at giving evidence of the overall EU situation with regards to research activities and to allow a comparative overview among EU Member States, Associated Countries and Other Countries.

The four categories of indicators presented are among the most disseminated, methodologically accepted and used descriptors of national research systems.

Unless otherwise stated, indicators are supplied by DG Research's Regional Key Figures Database.

Unavailability or incomplete series of indicators result in empty/incomplete tables and graphs

Expenditures on R&D

- Gross domestic expenditure on R&D (GERD) gives an overview of the overall investment in R&D. The data in Excel format include breakdowns by sector of performance and source of funds and by NUTS2 region.

- Business expenditure on R&D (BERD), Government expenditure on R&D (GOVERD) and Higher education expenditure on R&D (HERD) are the parts of GERD financed by the business enterprise, government and higher education sectors, respectively. The data in Excel format include a breakdown of BERD by economic sector.

- Government budget appropriations or outlays for R&D (GBAORD), using data from budgets, is linked to policy through classification by "objectives" or "goals".

Human resources for R&D

- Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned. The data in Excel format are expressed in Full Time Equivalent (FTE) units and include a breakdown by gender and by NUTS2 region.
- Scientists and engineers are individuals classified as scientists and engineers by virtue of their education or work experience (OECD Canberra Manual, 1995: p.69-70) aged between 15 and 74 years old, expressed as a percentage of active population.

Publications

- Publications: Data on scientific publications has been extracted from Thomson Scientific and processed for DG research by CWTS, Leiden University. The number of publications by a given country shows the research output in terms of quantity. Full counting of number of publications per country is used. The data in Excel format include breakdowns by main scientific field and by NUTS2 region.

- Citations: From the same source, it expresses the quality of the publication in a given country. The citation period is the publication year plus two years citation window.

Patents

These indicators refer to data concerning patent applications to the European Patent Office (EPO) and patents granted by the United States Patent and Trademark Office (USPTO). When available, the data in Excel format include patents by NUTS2 region (for EPO) and by technological field (for EPO and USPTO).

Last update date: 03/08/2010

Key research indicators

Expenditures on R&D

There are two ways of measuring the funds spent on R&D. The first is to consider the organizations that carry out R&D (firms, institutes, universities, etc.) in order to identify the amount spent on R&D: this is the way GERD is calculated. When displayed according to the sector of performance, it is possible to distinguish between business, government, higher education and private non-profit expenditure on R&D (BERD, GOVERD, HERD and PNPERD, respectively). The second way, using data from budgets, considers the government budget appropriations or outlays for R&D (GBAORD) identifying socio-economic objectives. These different measures of R&D expenditures are presented below.

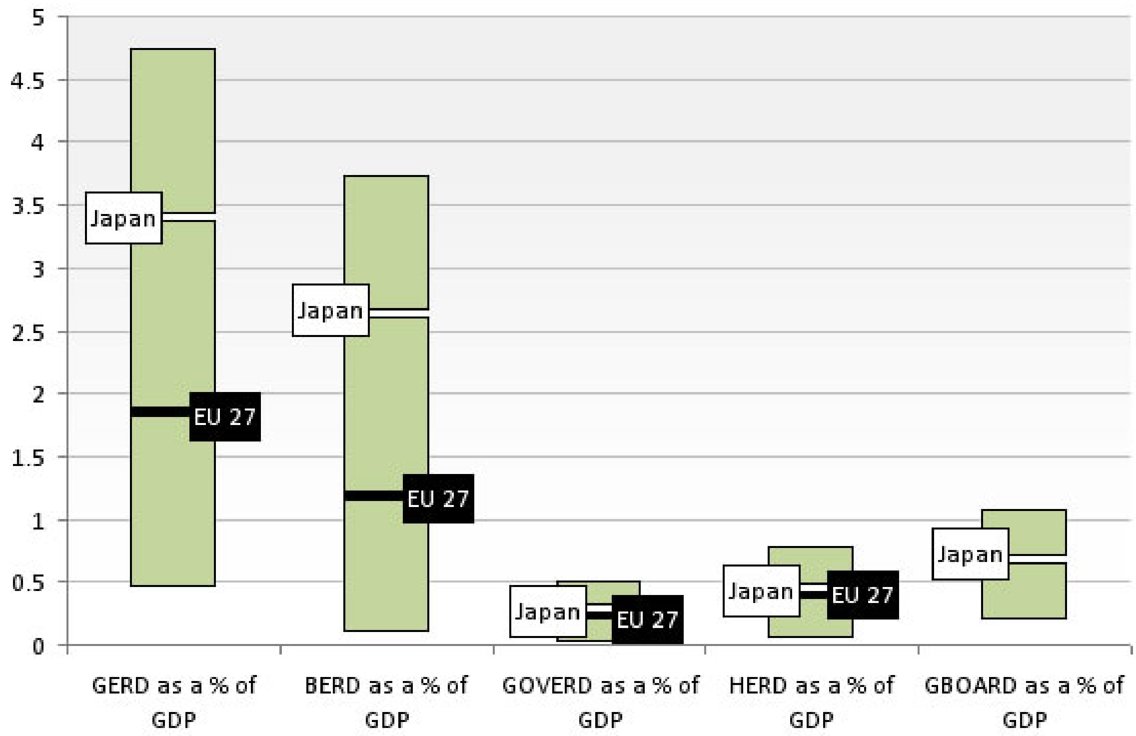
The excel file to be downloaded provides all indicators (time series from 1995 onwards) for a given country, including the breakdown by sector of performance, by source of funds and by NUTS2 region for GERD; by economic sector for BERD; and by socio-economic objective for GBAORD.

Indicators are supplied by DG Research's Regional Key Figures (RKF) database. Unavailability or incomplete series of indicators result in empty/incomplete tables and graphs.

Download the data in Excel format

The graph below is for 2008. Except for:
GERD as % of GDP: 2007 for EL, TR, JP, MX, NZ; 2006 for AU
BERD as % of GDP: 2007 for EL, TR, JP, AU, MX, NZ; 2004 for CH
GBAORD as % of total general government expenditure: 2007 for EL, JP, KR; 2006 for CH, RU

Relative performance in 2008



Source : RKF

Last update date: 17/11/2010

Key research indicators

Human resources for R&D

Human resources play a crucial role in knowledge production. This page displays the number of researchers found in the different sectors, such as business enterprise, government, higher education, and private non-profit institutions. It also shows data about scientists and engineers.The excel file to be downloaded provides indicators on researchers (time series from 1997 onwards) for a given country, including breakdowns by sector of performance, by gender and by NUTS2 region. It also provides data on scientists and engineers by absolute value and percentage of active population.

Indicators are supplied by DG Research's Regional Key Figures (RKF) database. Unavailability or incomplete series of indicators result in empty/incomplete tables and graphs

Download the data in Excel format

No data currently available for this Country

Last update date: 25/03/2010

Key research indicators

Publications

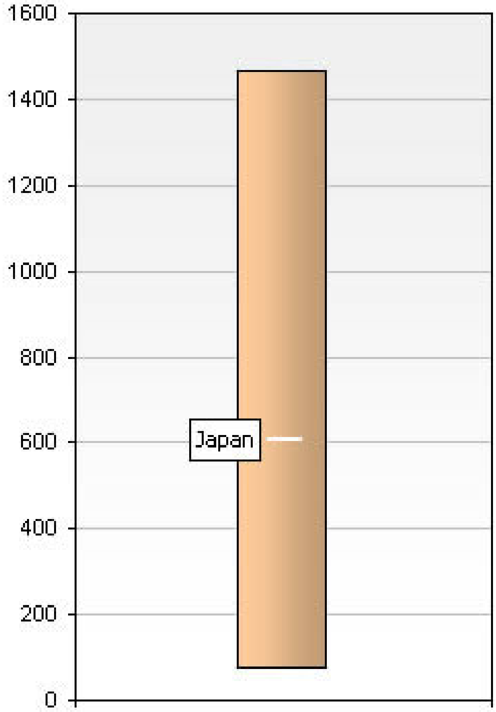
Publications are one of the most common indicators used to measure the output of scientific research. The number of scientific articles (deflated per million inhabitants) produced by a country can be considered as a basic proxy for the national scientific knowledge productivity. Full counting method has been used at country level.

The excel file to be downloaded provides data (time series from 1995 onwards) for each country.

Indicators are supplied by DG Research's Regional Key Figures (RKF) database (based on ISI -CWTS via DG-Research).

Unavailability or incomplete series of indicators result in empty/incomplete tables and graphs.

Download the data in Excel format



Last update date: 30/11/2010

Key research indicators

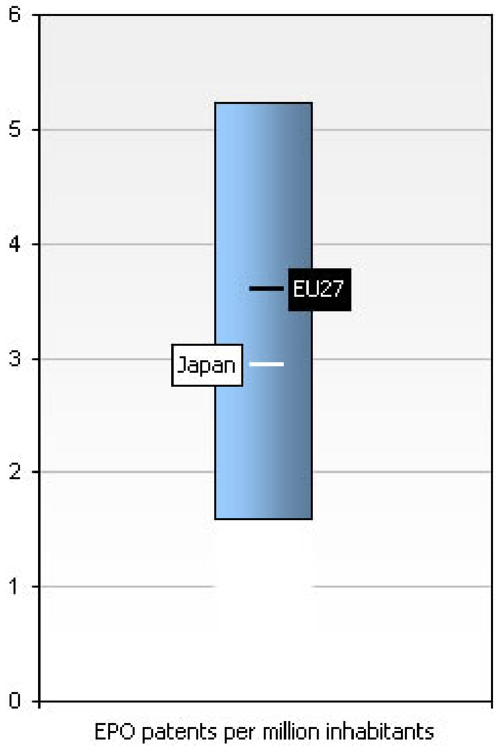
Patents

Patents are one of the most common indicators used to measure the technological output of R&D. The number of patents (per million inhabitants) in a country can be considered as a basic proxy for the national technological knowledge productivity.

The excel file to be downloaded (time series from 1995 onwards) provides indicators for each country, including patents from the European Patent Office, the US Patent Office, and their breakdown by technological field.

Download the data in Excel format

EPO filings per million inhabitants in 2005



Source : Eurostat and DG Research compiled by ERAWATCH

Last update date: 09/04/2010

- **JAPAN - Information source**

Name	Date
Japan Statistical Yearbook	2008-06-30
Science Links Japan	2010-04-27
Science and Technology Indicators 2004: A Systematic Analysis of Science and Technology Activities in Japan	2006-06-07
Institute of Intellectual Property Patent Database	2006-06-07
White Paper on Science and Technology (2008): International competition and the way of Science and Technology	2009-03-10